is a purgative. As such it is powerful in action, like the other alkaline sulphates, producing watery stools, with nausea and griping. From its sickening taste it has been almost wholly superseded by the less disagreeable magnesium sulphate (Epsom salt). From 15 to 30 gm. (℥ ss.–i.) is a full purgative dose, to be taken in aqueous solution, aromatized or slightly acidified to disguise the nauseous bitter taste of the salt. Sodium sulphate is a purgative ingredient of many mineral waters.

(*Di-*) *Sodium* (*Ortho-*) *Phosphate:* $Na_2HPO_4.12H_2O$.—This salt, the common tribasic phosphate, so-called, or *tasteless purging salt*, is official in the United States Pharmacopœia as *Sodii Phosphas*, Sodium Phosphate. It occurs in large, colorless, transparent, monoclinic prisms, which, on exposure to air, effloresce rapidly and become opaque, losing five per cent. of their water of crystallization. The salt is odorless, with a cooling, saline, and slightly alkaline taste. It dissolves in 5.8 parts of cold water and in about 1.5 parts of boiling water. It is insoluble in alcohol. Sodium phosphate is made from the calcium phosphate of calcined bone, by decomposition by sulphuric acid. It should be kept in well-stoppered bottles in a cool place.

Sodium phosphate is a bland salt, of low diffusion power, whose prominent physiological properties are to purge mildly, and, as animal experimentation has shown,[2] to excite quite notably the secretion of bile. At the same time it is feebly alkaline, and possessed of a clean, non-nauseous, salty taste, quite like that of common salt. Therapeutically this phosphate may be used for the general purposes of the milder saline purges, and, more specially, has also proved of avail, even in non-purgative doses, to correct bowel derangements associated with acidity and assumed sluggishness of the liver. From its mildness and not unpleasant taste it is particularly convenient for giving to young children. Mixed with foods, such as soup, in lieu of common salt, it may be administered in moderate quantity without suspicion. As a purge the dose for an adult is about 30 gm. (℥ i.); but for corrective purposes, much less—even so little as 0.65 gm (gr. x.)—given a number of times through the day, may suffice.

Normal Sodium Pyrophosphate: $Na_4P_2O_7.10H_2O$.—The salt is official in the United States Pharmacopœia as *Sodii Pyrophosphas*, Sodium Pyrophosphate. It is not used in medicine, and is official for pharmaceutical purposes only to prepare ferric pyrophosphate.

Sodium Nitrate: $NaNO_3$.—The salt is official in the United States Pharmacopœia as *Sodii Nitras*, Sodium Nitrate. It occurs in colorless, transparent, rhombohedral crystals, which deliquesce in moist air. It is odorless, with a cooling, saline, slightly bitter taste. It dissolves in 1.3 parts of cold water and in 0.6 part of boiling water. It is slightly soluble only in cold alcohol, but dissolves in 40 parts of boiling alcohol. It should be kept in well-stoppered bottles. Sodium nitrate is the salt called *cubic nitre*, and is obtained from South America, where it occurs native. It is a salt of high diffusion power, and in its physiological relations closely resembles ordinary nitre (potassium nitrate), except that it is, of course, devoid of the characteristic properties of a potassium salt as such. Its use in medicine has so far been an empirical employment in dysentery, in which disease 30 gm. (℥ i.) of the salt has been given divided in frequent doses throughout the day, in dilute aqueous solution. It is not a standard medicine.

Sodium Chlorate: $NaClO_3$.—The salt is official in the United States Pharmacopœia as *Sodii Chloras*, Sodium Chlorate. It occurs in colorless, transparent tetrahedrons of the regular system, permanent in dry air. It is odorless, with a cooling saline taste. It dissolves in 1.1 parts of cold water, and readily in boiling water. It is sparingly soluble only in cold alcohol, and dissolves in about 40 parts of boiling alcohol. If mixed with organic substances or with readily oxidizable chemicals, such as sulphur or phosphorus, trituration or concussion may cause a dangerous explosion, as in the case of the allied salt potassium chlorate. Sodium chlorate should be kept in glass-stoppered bottles. Sodium chlorate has the peculiar medicinal properties of the potassic salt of the same acid, except in regard to the effects of potassium compounds as such. It is important only because of its excess of solubility as compared with potassium chlorate. The medicinal uses are the same as those of the latter-named salt, which see under *Potassium*.

Edward Curtis.

[1] Sternberg: Am. Journal of the Med. Sciences, April, 1883, p. 334.
[2] Rutherford: The Practitioner, vol. xxiii., p. 414.

SODIUM DITHIOSALICYLATE.—This is the sodium salt of an acid formed by the reaction that occurs when salicylic acid and sulphur chloride are mixed together in molecular proportions at a temperature of 120° to 150° C. A large isomeric series is possible, but only two are utilized, the sodium salts of which are known as sodium dithiosalicylate I., and sodium dithiosalicylate II. The acids themselves are not employed for any therapeutic purposes, the sodium salts only being used. No. I. has not been used to any extent except in veterinary practice, in which two-and-a-half and five-per-cent. solutions are used in the treatment of foot-and-mouth disease. No. II. is the salt usually employed. It is a grayish-white powder, very hygroscopic, and entirely soluble in water. On the addition of acids a precipitate of yellow viscid drops is formed consisting of dithiosalicylic acid.

This salt is said to be superior to the salicylates in the treatment of acute and gonorrhœal rheumatism. It is given in doses of three grains, twice a day in mild cases, and more frequently when the attack is severe.

Beaumont Small.

SODIUM OLEATE. See *Eunatrol.*

SODIUM PARA-FLUORO-BENZOATE is a white powder soluble in water and used in tuberculosis in dose of 0.5 gm. (gr. viij.) three times a day. *W. A. Bastedo.*

SODIUM PERSULPHATE. See *Persodine.*

SODIUM SULFORICINATE. See *Polysolveol.*

SOILS IN THEIR RELATION TO HEALTH.—Under this heading we will consider, along with the soil more strictly speaking (that is, the débris of various kinds of rocks and the organic matter from animal and vegetable life forming what is ordinarily called soil), the influence exercised by vegetation.

Soils influence health: (1) Directly, by their component parts and immediate products being taken into the organism; (2) indirectly, by their influence in modifying other surrounding conditions.

(1) The direct influence of soils above alluded to may be exerted (*a*) chemically; (*b*) by introducing pathogenic micro-organisms; (*c*) by acting mechanically on the tissues.

(*a*) Gases and particles of organic matter taken into the organism in various states of chemical change may act by lessening its vitality or by introducing toxic material. The commonest example of this will be found in what are called "made soils." Holes and depressions in the surface of the soil are frequently filled up by street scrapings, garbage, bodies of dead animals, and other refuse, mixed, it may be, with earth, ashes, etc. These after a time are covered with grasses or other forms of vegetation, and eventually may become portions of streets and building sites. In the latter case it will readily be seen how noxious gases may be generated and carried up by the ascensional air of the houses built in and over such sites. Soil so made may also be ground up into dust and inhaled. The same is true in regard to various forms of animal and vegetable organic matter, scattered upon the surface of the ground, especially in our roads and streets.

In the case of houses built on made soil, or soil rich in organic matter, the cellar walls should be made impermeable to gases by the use of cement or other impervious material. A ventilated air space around the foundation wall will be serviceable in this regard, as well as for

securing dryness of the walls. All cellar floors should be built of a sufficient depth of concrete or other similar material.

In those soils which contain a large amount of organic matter, the danger will be increased if they are underlaid with a stratum of impermeable marl, clay, or rock. The decomposing material will be retained in the soil. The writer placed on record, in the previous edition of THE REFERENCE HANDBOOK, in the article on *Sewage Disposal*, a remarkable instance of this in connection with the yard of one of our public schools, and also another instance in which filth had travelled laterally one hundred and forty feet over a substratum, saturating the earth in its course.

(*b*) With regard to *pathogenic micro-organisms* contained in the soil and taken from it directly into the organism, there has been and still is much speculative discussion among bacteriologists, but it may be looked upon as quite certain that some diseases are produced in this way.

It has been pretty well established that the germs of *typhoid fever* may be introduced by this method. The writer was one of a committee charged with investigating the causes of the spread of an endemic of typhoid fever in a small village. By a process of exclusion the committee came to the conclusion that some of the cases were due to the germs from typhoid washings drying upon the soil, being wafted in the dust, and inhaled by those who were attacked.

It is the generally received opinion that *tetanus* is caused by the germs finding their way from the soil into wounds and abrasions. It is also supposed by some that *malignant œdema* is caused in the same manner.

Anthrax, as has been established by frequent observations, is taken from the soil of pasture lands by cattle grazing upon them, and there are numerous instances where men have been attacked from the germs on the surface of the soil or from streams running through these pasture lands. We have not been able to collect data which would enable us to form an absolute decision, but there is no reason to doubt that with carelessness the anthrax germs may be taken into the system from the soil by man as well as by other animals.

By some, *diarrhœa* and *dysentery* are believed to be caused by the dust of infected soil. Dr. E. W. Hope,[1] of Liverpool, is quoted by Harrington as having made some important investigations in this connection. It has been noticed by many observers that a period of long-continued dry hot weather, followed by heavy rains, has been succeeded by endemics of diarrhœa and dysentery among children and others. This has been interpreted differently by different observers, as will be noticed hereafter, but Hope states that the highest death rate from these causes, during a period of twenty years, "occurred in the year whose summer had the least rainfall, and the lowest in that in which the summer rain was greatest in amount, and that the fourteen years with average dry summers, in which the mean June to September rainfall was 10.9 inches, averaged about fifty per cent. more mortality during the quarter than the six average wet summers with a mean rainfall of 13.8 for the corresponding period." Hope believed that the absence of showers allowed an accumulation of dust and filth in the streets, roofs, and elsewhere, and that this floating in the atmosphere was the cause of the increased disease and mortality.

So general is the opinion as to the germs of *tuberculosis* being carried from the soil into the human organism through the respiratory passages and other channels, that it is now enacted in most communities that spitting in streets and other public places shall be prohibited. A case came under the notice of the courts in Toronto in connection with our public schools: A lad who had scrofulous sores was excluded from school, and the action of the school authorities in thus excluding him was upheld by the court, one of the reasons being the probability of the germs being conveyed in the dust of the school-room and premises into the lungs of the other scholars.

Much experimentation and discussion are going on regarding the conduct of many other pathogenic bacteria in the soil and the influence of the soil upon them. These cover too wide a territory and the conclusions are still too uncertain to be profitably taken up in this article.

(*c*) *Mechanical irritations* of certain tracts of the organism are produced by particles of the soil taken in from the air or mixed with drinking-water or other media. Sharp particles in the form of dust inhaled into the respiratory passages give rise to *bronchitic affections;* those blown into the eyes cause *conjunctivitis*. The action of such dust on the respiratory passages is well known where it has been caused in connection with the soil of mines and also in the prosecution of some trade or employment such as stone-cutting, grinding of agricultural implements, etc. When similar effects arise from the natural disintegration of the soil it is more difficult to trace them to this specific cause, inasmuch as it is accompanied by other influences.

The inhalation of coal dust and its deposit in the lungs of miners give rise to the disease known as *anthracosis*.

The mechanical irritation of the mucous membrane of the intestines from sand conveyed in drinking-water is well known, and is more properly considered in connection with the subject of water.

2. (*a*) The *ground water* is very largely influenced by the structure of the soil for receiving, holding, and retaining water, and not only by the structure of the superjacent soil but also by that of the subsoil, and by the configuration of both the soil and the subsoil. It will readily be seen that sandy or gravelly soil will be best adapted for receiving water and allowing it to run through it, and that such percolation of the water would be lessened if it had beneath it an impermeable subsoil, as of clay, marl, or shale, with a flat or concave surface.

Clays and marls are least adapted to allow water to pass through them, and hence retain their dampness for a greater length of time.

These conditions of soil in regard to the water in them influence health in various ways. In the first place, habitually wet soils act by increasing the humidity and coldness of the air at their surfaces, and it has been found by long experience and observation that such soils are conducive to *rheumatism*, *diphtheria*, and *tuberculosis*.

With regard to the last-named disease, statistics were collected by Dr. Henry I. Bowditch,[2] showing that the disease is much increased by dampness of the soil, and is notably lessened by drainage. Similar observations were made independently by Dr. Buchanan in England.

While the Klebs-Loeffler bacillus of *diphtheria* is aërobic and does not flourish in water, it has nevertheless been a matter of repeated observation that diphtheria is more prevalent in the presence of cold, wet soils. Whether this may not be due to a condition of the respiratory mucous membrane produced by such soils, is a suggestion.

We have spoken above of the condition of a concave, impermeable subsoil underlying a more porous structure. To depressions of this kind in an exaggerated form the term "punch bowl" has been applied, and such situations are particularly unhealthy. The condition of a stagnant body of water filling the interspaces of the soil here comes into play.

By similar conditions on a more extended scale marshes are formed, and in addition to the insanitary effects already alluded to they become breeding-places for mosquitoes, and consequently under suitable conditions give rise to *malarial affections*, *yellow fever*, and, it may be, other diseases.

The bad effects of damp soils on habitations may be lessened by the use of weeping drains so constructed and protected as to prevent the introduction of gases through them when there is no moisture in the soil which they are supposed to drain. Air spaces around the foundation walls have been alluded to when speaking of the means for preventing polluted air and noxious gases gaining entrance into houses. A damp-proof course of slate or similar material should also be interposed through the

whole thickness of the wall at or above the level of the surface of the ground. Unless such precautions be adopted dampness is likely to strike through and up the walls.

The influence of wet soils in interfering with outdoor living and exercise will be apparent.

(*b*) Before leaving the subject of the influence of soil upon water we must not lose sight of the fact that *water supplies* receive from the soil substances which have a decided influence upon health, both from the chemical and from the bacteriological standpoint. In this connection there is one aspect in which loose soils may, from accident or carelessness, become detrimental to health, and that is the ease with which they will allow pathogenic bacteria, such as the bacilli of *typhoid* and of *cholera*, to be carried for a considerable distance through their interspaces into wells and watercourses. It is highly probable that the colon bacillus is carried in the same way, giving rise to *diarrhœa* and *dysentery*. It has often been noticed that typhoid is very prevalent at that season of the year when the level of water in wells becomes low, an indication of the washing of bacteria into the wells. Instances of contamination in this way from and over the surface of the soil are also on record and must be laid to the account of the more impervious soils.

Soils rich in organic matter will, of course, yield much of this latter to the waters percolating through them. Some of these must contain toxic material, while all of them are more apt to serve as culture media for the growth of micro-organisms.

The chemical additions received by water from the soil are various. The analysis of our mineral waters is abundant evidence of this, and for this part of the subject the reader is referred to the article entitled *Water* and to the articles which treat of the different mineral springs. The prevalence of *calculus, goitre, and cretinism* in certain districts has been attributed to the presence of limestone formations and similar conditions of soil, but the evidence is very conflicting and does not seem to warrant the assumption.

Some observers consider that the absence of minerals in drinking-water is injurious, and as proof of this have cited the less hardy condition of French recruits coming from districts in which rain water is almost exclusively used for drinking purposes.

It has also been concluded, from analyses of river waters made before and after flowing through certain mining districts, that mineral additions taken up from the soil are sometimes of service in lessening the amounts of organic impurities.

(*c*) The *ground air* also is influenced by the structure and consequent porosity of the soil. The movement of the air will follow the movement of the water, and in addition will be influenced by barometric pressure, by the action of winds, and by temperature. While these forces will influence the movement of the air, it will be acted upon in respect to its humidity by the capacity of the soil particles for holding water by the force of attraction, and in respect to its chemical composition it will be modified by the chemical constituents of the soil. In this way, for example, the relative amounts of oxygen and of carbon dioxide will be modified.

It will readily be seen how great a difference in this respect there will be between the ground air, and consequently the air close to the surface of the soil, in arid, sandy soils, and that in soils rich in humus. For example, in and above a soil which is rich in humus, and which therefore contains large quantities of organic matter, the air will, other things being equal, be poorer in oxygen. On the other hand, it is very reasonable to suppose that the absence of such organic matter is one of the causes of the suitability, for tuberculous patients, of some of the arid health resorts, such as certain districts of Arizona. That other factors also play a part in rendering these resorts so beneficial will of course be apparent to the student of climatology.

The prevalence of diarrhœa and dysentery after a period of long-continued dry weather has been referred to in connection with the observations of Dr. Hope, who attributed this prevalence to some "infective agent . . . blown about in the dust of the air." It has also been stated that others have considered it to be due to the accumulated infective material being carried into depleted wells. By others again it has been attributed to the ground air, laden with this "infective agent" during a long period of inaction, being suddenly driven out by a downpour of rain, which, by providing moisture, favored at the same time a certain amount of decomposition and germ growth.

(*d*) The *temperature* of the air, besides being influenced by altitude, is largely modified by certain characters of the soil. The influences of the ground air and ground water on the temperature have been alluded to. The color and structure of the soil play an important part in determining to what extent the rays of the sun shall be reflected and to what extent they shall be absorbed by the latter. Thus, for example, soft loamy soils, and those containing a good deal of humus of a dark color, have a much greater capacity for absorbing heat and then parting with it later when the air above them becomes cooler. Hence the temperature in such districts is more equable, and the changes will be less rapid. The direction of the slope of the soil also acts by reflecting the rays of the sun more or less perpendicularly. If the ground slopes in a southerly direction, the rays are reflected more perpendicularly and consequently the temperature is increased. The movements of the air will, as a consequence, be affected by the same conditions which modify the temperature on the surface of the soil.

(*e*) *Insolation*, while largely dependent upon altitude and other associated atmospheric conditions, will also be modified by the influence exerted by the soil. Reflection of the rays of the sun, just now alluded to, is one of these factors. Another is the absence or presence of dust, which is shown to be largely dependent upon the condition of the soil. This absence of dust, very noticeable in some districts, was brought very forcibly under the notice of the writer in the district of Muskoka. Having occasion to ascend to an open attic floor in a cottage in Muskoka, after a year's absence, he was surprised to find that it was almost entirely free from the dust which would have accumulated in a similar position in most other districts, and especially in our cities or in the vicinity of country roads. The condition observed in the case of the cottage is to be attributed to three factors: that there is very little loose surface soil, the ground being composed principally of rock; that there are no roadways nor wagon roads in the vicinity of this cottage, travelling being effected in boats; and that the soil in the neighborhood is covered with trees and mosses. These conditions make such localities very desirable for the treatment of diseases of the respiratory organs.

(*f*) The influences of the *configuration* of soils have been alluded to in some of their aspects, such as slope and direction of slope both of the soil and of the subsoil. Some other influences under this head remain to be considered.

Valleys and *ravines* have an influence on temperature and also in the determination of the direction of the wind. The positions of the ends of valleys influence their temperature and the character of the wind blowing through them. As an example of the former, the writer has been told by botanists that the valley of the Desjarnins Canal, near Hamilton, Ontario, contains plants which on open ground are not to be found farther north than the isothermal line of Virginia.

The question of *altitude* belongs to the article on *Climate* (*q.v.*), but the altitude of a particular locality in relation to surrounding localities—whether situated on hill, valley, or plain—will have a determining effect on its temperature, humidity, and immediate atmosphere. An elevated spot may be unhealthy by relative depression.

A plain situated at the foot of a range of hills will be influenced by the circumstance whether it is on the north or the south side of the range. Vegetation is also likely to be influenced by such situation.

(*g*) The influence of *vegetation* must be further considered. It will depend upon the quantity and kind of vegetation. Low scrub and brush-wood are injurious by preventing a free circulation of air on the surface of the soil, and by favoring the accumulation of organic deposit which is likely to decompose slowly and to vitiate the air. Such vegetation should not be disturbed during the existence of a camp in its immediate neighborhood, inasmuch as this removal tends for the time being to increase the unhealthy condition of the atmosphere by the rapid liberation of the vitiated air. This kind of vegetation is also a harboring place for the lower forms of insect life, including mosquitoes, the injurious action of which has already been considered.

The tendency of forests is to equalize temperature, cooling the atmosphere by evaporation from their leaves during hot weather, and also by shielding the ground from the rays of the sun. They also tend to keep up a more equable supply of water in the streams of the locality. Evergreen trees are supposed to have an additional beneficial effect by the exhalation of resinous vapors. Belts of trees are sometimes of service in sheltering localities from bleak winds, and have been supposed to be of service in warding off malaria. In former days rows of sunflowers were planted for this latter purpose of shielding a locality against the malarial "miasm," as it was termed. According to our present knowledge, it may be that these effects were due to these trees and plants forming barriers or receiving-places for the winged bearers of infection.

To the above remarks regarding the health of forests there are exceptions. In some places the influences described keep the soil in a permanently wet condition; as, for example, in the tamarac and mangrove swamps, of temperate and tropical regions respectively. Again, in other forests, through lack of sun and air no opportunity is afforded for the disposal of the decomposing vegetation, which is sometimes very luxuriant.

Wm. Oldright.

[1] Public Health, July, 1899.
[2] Topographical Distribution and Local Origin of Consumption in Massachusetts, Transactions, 1862.

SOLVEOL is a neutral solution of cresol in aqueous sodium cresylate. It contains 23.6 per cent. of cresol.

W. A. Bastedo.

SOMNAL.—Introduced as an hypnotic by Radlauer, of Berlin, in 1889. He described it as a true chemical compound formed by the direct combination of chloral alcoholate with urethane.

It is properly a clear, colorless crystalline powder, with a hot burning taste, and very deliquescent, but is supplied in the form of a liquid on account of its instability. It is an alcoholic solution, one part in three. It has also been described as a solution of chloral hydrate and urethane in alcohol.

It is used solely as an hypnotic, the dose being from twenty to thirty minims for adults. *Beaumont Small.*

SOMNAMBULISM. See *Consciousness, Disorders of.*

SORREL. See *Poisonous Plants.*

SORREL WOOD. See *Oxalidaceæ.*

SOUTH DAKOTA HOT SPRINGS.—Fall River County, South Dakota.

Post-Office.—Hot Springs. Numerous hotels and cottages.

Access.—Viâ Freemont, Elkhorn, and Missouri Valley Railroad (branch of the Chicago and Northwestern system), or viâ the Chicago, Burlington, and Quincy Railroad (Burlington route) direct to Hot Springs, arriving at the same depot by either route.

This attractive new spa is located in the heart of the Black Hills, at an elevation of 3,400 feet above the sea level. Hot Springs is the county seat of Fall River County, and is located about seventy miles south of Deadwood. The town has a permanent population of about 1,500 and a summer population of 3,000. Its proximity to extensive pine forests, in addition to the favorable features of location above mentioned, assists in preserving a mild and agreeable climate, and has brought the resort into much favor with persons afflicted with hay fever, asthma, and incipient phthisis.

The advantages of Hot Springs as a health resort are numerous. First, as to topographical features. The scenery in and adjacent to the place is varied and delightful. The lofty pine-clad hills, grand canyons, rippling streams, and beautiful falls of the Minnekahta and Cheyenne, make up a group of attractions difficult to excel. Second, as to climate. By reason of certain peculiar circumstances of location this resort is favored by very mild, equable atmospheric conditions. Summer days are followed by evenings of delicious coolness, while the autumns are unusually pleasant. During the winter months the temperature has observed an average of 42° F. above zero for the last four years. Situated in the Minnekahta Valley and sheltered on all sides by heavily timbered hills, this resort is almost perfectly exempt from cold winds and sudden changes of temperature. The winter temperature in the valley is from 20° to 25° F. higher than it is in localities only a dozen miles distant. It is said that the protection afforded by the hills is supplemented in no small degree by the millions of gallons of hot water flowing through the valley. During the winter of 1892–93 Dr. C. W. Hargens, of Hot Springs, kept a record of the temperature for five months, beginning with December 1st and ending with April 1st. This was the coldest winter this country has had for many years. We make the following extracts from his notes:

December, 1892. Snowed once; fall of snow three-quarters of an inch. Five cloudy days.

January, 1893. Three cloudy days. No snow during the month; average temperature for the month, 40° F. (for the last two weeks of the month it was 50.2° F.).

February, 1893. One day and a half cloudy. Snowed four times, with total precipitation nine-sixteenths of an inch.

March, 1893. Two and one-half days cloudy. Snowed twice. Total precipitation, two-fifths of an inch. Average daily temperature, 50.3° F.

April, 1893. No snow. No storms of any kind. Mild, pleasant weather throughout the month.

The visitor will find excellent accommodations. The largest hotel, the Evans, is constructed and equipped throughout in accordance with the latest and most approved methods. Other excellent hotels are the Gillespie, the Hot Springs, the Catholicon, the Davis, and the Parrott House. Cottages are also at hand for those who desire them. The hills afford attractive spots for camping out. Adjoining the Evans House is the Evans Sanitarium, containing sixty bathrooms and embracing all varieties of baths. The Stewart Sanitarium, recently completed, also affords falcilities for all kinds of bathing. The Catholicon Sanitarium, now under construction, will add another to the list of the sanitaria of Hot Springs. The springs at this resort are eight in number. The name, the "Minnekahta," is given to a great Indian spring, the word being a synonym for health, pleasure, and recreation. It is said that the waters of this spring were in use by the Sioux and other tribes long before the approach of civilization. The natural temperature of this spring is 98° F. It furnishes the drinking fountain of the Evans House, the Evans bath-house, and the Minnekahta bathhouse. An analysis by Prof. Charles B. Gibson, of Chicago, resulted as follows: One United States gallon contains (solids): Magnesium sulphate, gr. 4.32; sodium sulphate and potassium sulphate, gr. 25.62; sodium chloride and potassium chloride, gr. 13.79; calcium sulphate, gr. 16.32; silica, gr. 2.46; and a trace of iron peroxide. Total, 62.51 grains. The waters are perfectly clear, have a decidedly alkaline reaction, and contain no organic matter.

A second spring, known as the Mammoth Mineral

Spring, furnishes a water which is still richer in solid constituents. The analysis shows that one United States gallon contains (solids): Sodium sulphate, gr. 23.26; potassium sulphate, gr. 5.63; calcium sulphate, gr. 36.11; calcium chloride, gr. 5.59; magnesium chloride, gr. 4.11; magnesium carbonate, gr. 3.51; organic and volatile matter, gr. 12.11; and very small quantities of ammonium chloride, magnesium nitrate, magnesium phosphate, iron sesquioxide, alumina, and silica. Total, 92.71 grains.

The analysis of the water of the third spring, known as the Lakatah Spring, shows that one United States gallon contains (solids): Sodium sulphate, gr. 8.82; potassium sulphate, gr. 3.33; calcium sulphate, gr. 16.29; calcium chloride, gr. 8.50; magnesium chloride, gr. 3.14; magnesium carbonate, gr. 3.04; organic and volatile matter, gr. 8.05; and very small quantities of ammonium chloride, calcium phosphate, magnesium nitrate, iron sesquioxide, alumina, and silica. Total, 53.79 grains.

According to the report of the National Association of Railway Surgeons, which visited this resort in 1893, "treatment by the Hot Springs water may be said to stimulate all the secretions and organic functions, to promote digestion and assimilation, and to favor tissue metamorphosis and excretion, thereby relieving internal congestions, stimulating blood-making, increasing the appetite, and favoring new and healthy tissue at the expense of the old and inactive." This treatment may therefore be confidently recommended in "gout and rheumatism after the inflammatory stage; in neuralgia, especially when depending upon gout; in metallic or malarial poisoning; in paralysis not of organic origin; in neurasthenia; in the early stages (only) of Bright's disease; in syphilis; in functional diseases of the liver; in dyspepsia, not of organic origin; in catarrhal affections of the respiratory tract; . . . and in chronic skin diseases, especially of the squamous variety."

James K. Crook.

SOZOIODOL.—(Di-iodo-para-phenol-sulphonic acid.) An acid base which was introduced in 1887 as an antiseptic. It contains forty-two per cent. of iodine, twenty per cent. of carbolic acid, and seven per cent. of sulphur. The acid itself is not employed, but it forms salts which possess all the properties of the acid. The potassium and sodium salts are the ones most employed. They resemble one another in physical characters, forming in colorless, well-defined prisms, soluble in water, the potassium compound in fifty parts and the sodium in fourteen.

The use of these compounds is in all those conditions in which iodoform is likely to be proved useful. It is said to be preferable, as it is soluble in water and glycerin, does not decompose when exposed, readily combines with other substances, and is free from irritating action and disagreeable odor. The zinc salt has been specially recommended for gonorrhœal discharges. It is soluble, one part in twenty of water. All the solutions should be freshly prepared and not exposed to the light, as they are decomposed and free iodine is liberated.

The mercurial salt is a lemon-yellow powder, soluble in about five hundred parts of water. It is mainly employed in the treatment of syphilitic affections. It has been recommended as the most suitable form of mercury for hypodermic injections. The injections should be made in the gluteal regions, alternately on the right and on the left side. It causes a little pain, but the local effects are said to be much less than with any other mercurial salt. The dose is one grain and a half, and one injection a week is equal to three of other forms of mercury. The absorption of the drug is rapid, and the gums have to be carefully watched, as its action is very marked.

Beaumont Small.

SOZOL.—(*Paraphenol-sulphonate of aluminum.*) It occurs in brownish granules of a strong astringent taste and faint carbolic odor. It is very soluble in water, glycerin, and alcohol, and forms very stable solutions.

It is not a powerful antiseptic or bactericide, but has been found to be a very serviceable application to wounds, ulcers, etc., as it possesses an astringent action in addition to its antiseptic properties.

Beaumont Small.

SPARKLING CATAWBA SPRINGS.—Catawba County, North Carolina.

POST-OFFICE.—Sparkling Catawba Springs. Hotel and cottages.

ACCESS.—Viâ Western North Carolina Railroad to Hickory, sixty miles west of Saulsbury; thence six miles by carriage to springs.

The location of the Sparkling Catawba Springs is within the shadow of the Blue Ridge Mountains, 1,150 feet above the sea level. This part of the State, known as the "Piedmont Section," has long been famous for its bracing climate, pure air, and uniform temperature. The springs are three in number, and gush from the ground in a shaded valley surrounded by a circular range of timbered hills and within one mile of the banks of the Catawba River. No analysis has been made, but the springs are said to be blue and white sulphur and chalybeate in character. The new hotel and cottages afford comfortable accommodations for about four hundred guests. We are informed by Dr. E. O. Elliott, of the springs, that the waters possess well-marked alterative and tonic properties, and generally increase the appetite, assist the digestion, and promote the assimilation of food. A very complete and comfortable bathing establishment is at hand.

James K. Crook.

SPARTA MINERAL WELLS.—Monroe County, Wisconsin.

POST-OFFICE.—Sparta. Hotel.

ACCESS.—Sparta is a station on the Chicago, Milwaukee, and St. Paul Railroad, two hundred and fifty-five miles from Chicago. Bulletin 32 of the United States Geological Survey reports twelve mineral wells in Sparta, only two of which appear to have been analyzed. We present the following analysis of the Magnetic Well, made by J. M. Hirsh in 1876: One United States gallon contains (solids): Magnesium carbonate, gr. 3.35; iron carbonate, gr. 11.94; and very small quantities of manganese carbonate, calcium carbonate, ammonium carbonate, lithium carbonate, strontium carbonate, barium carbonate, potassium sulphate, sodium sulphate, calcium sulphate, sodium chloride, calcium chloride, sodium phosphate, aluminum phosphate, sodium iodide, and silica. Total, 19.25 grains. This analysis shows an almost pure chalybeate water, the remaining ingredients being all of a secondary character.

James K. Crook.

SPASMS. See *Convulsions.*

SPEARMINT.—*Mentha Viridis. Brown, Garden, Lamb,* or *Mackerel Mint.* "The dried leaves and tops of *Mentha spicata* L. (fam. *Labiatæ*)," U. S. P.

Spearmint is a native of Europe and Asia, and has spread widely through nearly all temperate regions, where it is also cultivated to a large extent, and shows a high degree of variation in characters. It usually covers quite large patches, propagating by slender runners. The quadrangular, slender, frequently purplish stems are prostrate below, one to two or three feet long, and much branched. The drug is thus described:

Sparingly and obscurely hairy, the hairs short and stout, without menthol crystals in their cells; branches quadrangular, slender, usually pale green, rarely purplish; leaves opposite, exstipulate, very shortly petioled, the blades usually less than 5 cm. (2 in.) long and about one-third as broad, lanceolate, or lance-ovate, rounded at the base, acuminate and acute, sharply serrate, thickish, and rigid, deep and usually dark green; flower spikes usually appearing clustered at the summit, interrupted, elongated, and acute, about 5–8 mm. ($\frac{1}{4}$–$\frac{1}{3}$ in.) thick; flowers about 3 mm. ($\frac{1}{8}$ in.) long, the calyx tube nearly

equally five-toothed, ten-nerved, the corolla light purple, nearly equally four-lobed, the stamens four, nearly equal, rather long; odor characteristic, aromatic, rather heavy; taste characteristic, pungent.

It is readily distinguished from peppermint by the elongated, slender, and acute flower spikes, the relatively longer stamens and style, and the ranker odor. As seen under the microscope, its hairs never exhibit menthol crystals.

The only important constituent of spearmint is about one per cent. of volatile oil, with which there is associated a little tannin. This oil, although quite similar in properties, is very distinct in composition from the closely related peppermint oil. It contains no menthol, nor apparently any other crystalline substance. Its important constituent appears to be carvone (see *Caraway*). Pinene and limonene also exist.

The action and uses of spearmint are almost identical with those of peppermint. It is somewhat milder in action, on account of which it is often preferred for administration to infants.

Powdered spearmint is often given in doses of 1–2 gm. (gr. xv.–xxx.). The infusion is also popular. The best form of administration is the oil (*Oleum Menthæ Viridis*), dose one to five minims, or one of its two preparations.

The spirit or essence (*Spiritus Menthæ Viridis*) contains ten per cent. of the oil and one per cent. of spearmint, and the dose is 0.3–1 c.c. (♏v.–xv.). The water (*Aqua Menthæ Viridis*) has a strength of 0.2 per cent. and the dose is 15–60 c.c. (fl. ʒ ss.–ij.).

Henry H. Rusby.

SPECTACLES—from *spectare*, to view; French, *besicles,* lunettes;* German, *Brille;** Dutch, *bril;*† Italian, *occhiali;* mediæval Latin, *perspecillum, conspecillum, ocularius*—are first mentioned about the close of the thirteenth century.‡ Seneca mentions the fact that "letters, however minute and indistinct, appear larger and clearer when viewed through a glass globe filled with water."[9]

The first mention of a lens, properly so called, is attributed to the Arabian mathematician Alhazen (*obt.* 1038),[10] who describes the magnifying property of a segment of a sphere of glass.[11] Roger Bacon (*circa* 1267) mentions the magnifying property of convex lenses, and suggests the benefit to be derived from their use by old persons with weak sight.[12] The step from the use of a convex lens, as a magnifier, to the construction of binocular eyeglasses or spectacles, to be worn by presbyopes in reading, implies a considerable development of the optician's art, in the direction of grinding lenses of relatively long focus. The invention of spectacles is variously attributed to Salvino degli Armati, a Florentine (*obt.* 1317),[13] and to Allessandro della Spina, a Dominican friar of Pisa (*obt.* 1313). The use of concave glasses, as a help to myopes in distant vision, must have followed at no very long interval; the date of their first employment is, however, unknown. The necessity for the selection of lenses of different focal length for different persons, as well as for the same person at different periods of life, must also have been very early recognized; but there is no reason for believing that the choice was made in any better way than by trying them at random, until a pair was found which appeared to be suited to the kind of work for which they were to be used.* Certain it is that spectacles had been in use for from two to three centuries before the theory of their action was explained,† and it is only since the middle of the nineteenth century that anything like a complete understanding of the subject has been reached.

Spectacle lenses, as late as the second half of the eighteenth century, were generally, so far as is known, of the plano- or double-convex, or of the plano- or double-concave form.[16] Both the plano-convex and the plano-concave glasses appear to have been mounted, sometimes with the plane surface and sometimes with the curved surface next the eye. Concavo-convex lenses were used to some extent in the eighteenth century, but with varying practice as regards the side turned next the eye.‡[17] Under the name of *periscopic* spectacles, concavo-convex lenses, with the concave surface turned toward the eye, were brought into use by Wollaston (1804).[18] A special construction of double-convex and double-concave spectacle lenses, made by grinding the two surfaces of the glass to cylindrical curves of equal radii, but with crossed axes, was introduced (before 1830) by Galland de Cherveux;[19] such lenses are still manufactured in limited quantity, but, aside from certain inherent defects, they offer no compensating advantage over the several forms of lenses with spherical surfaces; their existence in commerce made it possible, however, to furnish a cylindrical surface, on demand, at a time when plano-cylindrical lenses were not yet readily obtainable. Cylindrical lenses proper, as used for the correction of astigmatism, were first employed by G. Airy, Astronomer Royal (1827),[20] who was himself the subject of compound myopic astigmatism. Airy discussed the relative advantages, in compound astigmatism, of a bicylindrical lens of unequal radii of curvature, and a spherico-cylindrical lens. The common use of cylindrical spectacle lenses dates from the special study of astigmatism by Donders.[21] Since 1884 it has been possible to have spec-

* From the old French form *bericle*, diminutive of *berille*; Latin, *beryllus, beryllus*; βήρυλλος, the beryl[1]; *cf.* the derivation of "brilliant"—French, *briller*, etc.—from *berrylus*.[2]

† From *berillus, beryllus*, βήρυλλος, the beryl; "the colors of the beryl range from blue through soft sea-green [aquamarine] to a pale, honey yellow, and in some cases the stones are entirely colorless";[3] *ocularii vitri aut berillorum*: Guy de Chauliac (1363).[4] The most available material for spectacle lenses, excepting glass, is rock crystal or quartz, and it is highly probable that this mineral, still largely used under the name of pebble, was utilized by the older opticians.

‡ Spectacles, both convex and concave, were in common use by the Chinese before the opening of commerce with Europe. They were made of a transparent stone, of a color like that of a strong infusion of tea, called *scha-chi* (tea-stone), and were tied upon the head by silken cords.[5] Chinese spectacles are now made of rock crystal, and are mounted in thick frames of tortoise shell or of metal, evidently borrowed from old European models.

The common use of some form of magnifying glass by the ancients is wellnigh proved by their perfect workmanship as displayed in the engraving of gems. On the other hand, it appears certain, from the notices on presbyopia and myopia, by Paulus Ægineta (seventh century A.D.),[6] and by later as well as earlier writers, that they had not applied lenses to the relief of persons laboring under these disabilities.

Pliny's description of the visual defect of the Emperor Nero[7] strongly suggests a case of myopia or of compound myopic astigmatism. The statement of Pliny—Nero princeps gladiatorum pugnas spectabat in zmaragdo[8] — taken in connection with what is said of this gem in the same chapter, would seem to be best explained upon the supposition that the emperor possessed a large and highly polished emerald, or gem of like color, most probably of unequal curvature in its two principal diameters, and that he viewed the combatants, in the strong light of the amphitheatre, by reflection from its convex surface. This theory would imply that the use of the gem for this purpose was the result of an observation made by Nero himself, who may, therefore, be accredited with the discovery of an optical device suited to the correction of myopia, or of compound myopic astigmatism; the invention would appear to have died with the inventor.

* Bartisch (1583) protests earnestly against the widely spread abuse of spectacles.[14]

† "Maurolicus, in his treatise '*de lumine et umbra*' (1554), considers the crystalline as the principal instrument of vision, and as transmitting to the optic nerve the images of objects; and he explains why some persons are long-sighted and others short-sighted, according to the less or greater convexity of the surfaces of the crystalline, showing that in the former case the rays have not been converged to a focus when they reach the retina, while in the latter they have been converged before they reach it. He explains, also, how the convergency may be hastened in the long-sighted eye by the use of a convex glass, and delayed in the short-sighted by a concave one. These observations of Maurolicus were not known to Kepler, when it was proposed to him, as a question by his patron, Dietrichstein, in what manner spectacles assisted sight? The first answer he gave, as he tells us in his '*Paralipomena ad Vitellionem*' (1604), was, that convex glasses were of use by making objects appear larger. But his patron observed, that if objects were by them rendered more distinct, because larger, no person would be benefited by concave glasses, since these diminished objects. . . . He now gave a clear account of the effect of lenses, whether within or without the eye, in making the rays of a pencil of light converge or diverge; and explained that convex glasses assist the sight of presbyopic persons by so altering the direction of rays diverging from a near object, that they fall upon the eye as if they had proceeded from a more remote one, that concave glasses benefit the myopic by producing a contrary effect upon rays which diverge from a distant object, making them fall upon the eye as if they proceeded from a near one."[15]

‡ Aside from the misinterpretation of special optical formulæ, caprice has played its part in determining many eccentricities of practice; from the beginning, the business of selling spectacles appears to have been conducted largely under the cloak of mystery, and very often of deliberate misrepresentation.