of variola. I have encountered a syphilitic vesicular eruption which was distributed over the surface of the body; a portion of the vesicles were umbilicated, and they closely simulated variola in the vesicular stage. I have also observed pustular syphilides which bore a close resemblance to the pustular stage of smallpox. Such cases are to be differentiated from smallpox by the following points: (1) None of them commence with the symptom complex of smallpox, *i.e.*, chill, fever, vomiting, headache, and lumbar pain. In each of these varieties of syphilides, if fever be present, as it not infrequently is, it persists beyond the appearance of the efflorescence, while in smallpox the fever disappears immediately after the exanthem appears. Pain may be a prominent symptom of syphilis, but it is never confined to the lumbar region as in smallpox. In any and all forms of syphilitic exanthem it will be found that the syphilides, whether papular, vesicular, or pustular, have persisted as such far beyond the time limit of either variety of the smallpox eruption. Again, the eruption in any variety of smallpox is of uniform size, while in syphilis it is of various sizes. The eruption of smallpox consists of one crop, while that of syphilis is commonly observed to be in various stages of development, thereby showing a succession of crops. In doubtful cases the diagnosis is easily cleared up by isolating the patient and awaiting the development of the exanthem.

Diagnosis of Smallpox from Pemphigus.—When pemphigus is scattered over the body it may for the first few days simulate the vesicles of smallpox. Pemphigus commences as minute red spots upon which vesicles form. The vesicles present a clear citrine or yellow color, in whites, owing to the fact that the translucency of the epidermic covering allows their serous contents to shine through it. When fully developed the vesicles are tense and firm to pressure. The fluid in them changes from a serous to a milky color. In some instances the exanthem attacks all parts of the body, but ordinarily it is confined to the limbs. The palms and soles are rarely invaded. When the eruption reaches the vesicular stage the vesicles are of uniform size, about the size of a split pea, though at a later stage a majority of the vesicles develop into bullæ of sizes varying from that of a chestnut to that of a split walnut. By reason of the thinness of their covering the vesicles and bullæ easily rupture and fold over on the adjacent sound skin, leaving a superficial raw surface on the site of those which have been broken. The major part of the eruption does not rupture, and the walls of the unbroken ones become progressively shrunken and flattened until the tops of the vesicles and bullæ sink down on the underlying layer of skin. The exanthem develops in crops and sooner or later all sizes of vesicles and bullæ will be represented. Pemphigus pursues a chronic course. Pitting does not occur in this malady. The eruption may attack the mucous membrane of the mouth, conjunctivæ, and genitalia. Fever attends the majority of cases of pemphigus in which the eruption is extensive. As a rule the fever will be in proportion to the extent and intensity of the exanthem. Four years ago I attended a case of pemphigus in which the eruption was scattered over all parts of the body. When I saw this patient the case was in the acute stage. For the first two days the vesicles counterfeited those of variola, but on the third day many of them formed bullæ varying in size from that of a chestnut to that of a guinea egg. The fever ranged from 105° to 108° F., and continued until the death of the patient on the eighth day after I was called to see him. This case in its eruption pursued the typical course of pemphigus. In cases of pemphigus which in their incipiency simulate smallpox, the diagnosis is arrived at by the following points of difference: Pemphigus is devoid of the symptom complex of smallpox, *i.e.*, chill, fever, headache, vomiting, and lumbar pain. The vesicles of pemphigus do not umbilicate; umbilication is common in variola. When fever attends pemphigus it persists for days after the eruption has appeared; this rule is reversed in smallpox. The exanthem never, in pemphigus, goes through the four stages of macule, papule, vesicle, and pustule common to variola.

Diagnosis of Smallpox from Impetigo Contagiosa.—Inasmuch as many physicians claim that the recent epidemic of smallpox was impetigo contagiosa, I give the following sketch of the malady. It is a contagious disease occurring mostly among children, and at times as a quasi-epidemic. The initial symptoms are malaise, chilliness or chill, and fever, though not infrequently these symptoms are absent. As a rule the eruption commences on the face around the mouth, on the chin, cheeks, alæ nasi, forehead, and about the eyes. The exanthem commences as small vesicles, which soon contain a turbid serum; the exanthem then extends peripherally, and assumes the character of flat, somewhat flaccid bullæ containing a sero-purulent fluid, and surrounded by an inflammatory areola of greater or less intensity. As the bullæ expand and flatten, the contained fluid dries, and in a few days a yellowish-green or straw-colored crust covers each bulla. This crust becomes dry and of a papery consistence, and has the appearance of having been stuck on its site. When it becomes detached at its margins it curls up and finally falls off; the underlying site seems superficially excoriated. After desiccation a shiny epithelium of a pinkish-red color is left on the site of the eruption, but this gradually fades to the normal color of the skin. The fully formed bullæ vary in size from that of a split pea to that of a silver three-cent piece. The eruption lacks uniformity in size, and commonly appears in small crops. After the exanthem has gradually developed over the face it attacks the abdomen and extremities in successive limited advances. As a rule the force of the disease is expended on the face, only a few scattered spots appearing on the other parts of the body. To the physician practised in smallpox it is readily seen that impetigo contagiosa bears no resemblance of any kind whatsoever to any variety of smallpox, and that these two diseases ought never to be confounded by any physician who has even a limited acquaintance with smallpox.

Diagnosis of Smallpox from Measles.—Up to the vesicular stage of smallpox its eruption simulates that of measles so closely that it is impossible positively to differentiate these diseases prior to the appearance of the vesicles of variola. If the physician awaits the vesicular stage of variola, as he should invariably do before committing himself unqualifiedly to the diagnosis, he will have no difficulty whatever in separating these two diseases. The catarrhal symptoms of measles should put the physician on his guard as to the probable nature of the malady, and the fact that the fever persists after the eruption has appeared, while it disappears in smallpox, gives added strength to the probability of the case being one of measles. Yet these two points in diagnosis, together with the difference in the initial symptoms of each malady, do not justify the physician in committing himself to a positive opinion as to the disease, inasmuch as neither these two nor all of the symptoms are pathognomonic. His duty to the public will be fully discharged by isolating the patient until the time has passed for the appearance of the vesicular stage of the exanthem. If the patient presents the initial symptoms of smallpox, has never been vaccinated, and is known to have been exposed to the former disease, the physician is justified in making a provisional diagnosis of smallpox and reporting the case as a suspicious one, reserving the right to amend his opinion thereon should the course of the disease demand it. Suit for damages has been sustained in a number of instances in which physicians reported the disease as smallpox, the patient on this diagnosis having been sent to the smallpox hospital and subsequent events having demonstrated that the diagnosis was erroneous.

Diagnosis of Smallpox from Febrile Lichen.—Febrile lichen bears a close resemblance to the efflorescence of variola in the papular stage. The exanthem of the former appears as small, slightly red papules, ordinarily of the size of millet seeds. In differentiating these two maladies time is an important factor. The eruption of

lichen follows within twenty-four to forty-eight hours after commencement of the initial symptoms, and it never passes through the four stages characteristic of smallpox. In lichen the eruption is practically devoid of fluid contents, and even when it is present it is so unlike that of variola that after the vesicular stage of the latter has appeared it is impossible for the trained observer to mistake the one disease for the other.

Finally it may be said that the eruption of smallpox is the only one of all the various eruptions which passes through the four successive stages of macule, papule, vesicle, and pustule. This, then, is a crucial test of smallpox.

Prognosis.—The type of the disease largely determines the rate of mortality. If a large number of cases extending over a period of many years be taken, so that epidemics of mild and severe types shall be represented, the mortality from the several more important types will be about as follows: Hemorrhagic, 95 per cent.; confluent, 50 per cent.; semiconfluent, 10 per cent.; discrete, 7 per cent.; varioloid, 0. In individual epidemics characterized by marked virulence of the disease the mortality will greatly exceed that above given, while in epidemics of marked mildness, like the one in this country for the last four years, the mortality will fall below it. Marson, from the records of the London Smallpox Hospital from 1836 to 1851 inclusive, reports that of the 2,654 cases of confluent, semiconfluent, and discrete types of variola there were 996 deaths, being a mortality of 37 per cent. Welch, from the records of the Municipal Hospital of Philadelphia, Pa., shows that from 1870 to 1894 the total number of cases of smallpox was 5,000; total number of deaths, 1,562; mortality per cent., 31.24. So much for general considerations. Several other circumstances must be considered in estimating the result in individual cases. They are mainly as follows:

Vaccination.—In the vast majority of individuals vaccination performed in infancy confers immunity from smallpox during the remainder of life, yet it is a proven fact that in some persons the protective power of vaccination decreases after a greater or less number of years, and thereby fails fully to protect these individuals from smallpox. It is also a demonstrated fact that even in those cases in which vaccination fails wholly to protect against variola, it markedly decreases the mortality from this disease. The mortality from post-vaccinal smallpox varies with the length of time intervening between the attack of vaccinia and that of variola. Marson, of the London Smallpox Hospital, claims that the mortality in post-vaccinal smallpox is greatly influenced by the number of insertions of the vaccine virus. After examining into 4,896 cases of post-vaccinal variola he says that the percentage of mortality was as follows: Having one vaccine cicatrix, 7.73 per cent.; two vaccine cicatrices, 4.70 per cent.; three vaccine cicatrices, 1.95 per cent.; four or more vaccine cicatrices, 0.55 per cent.

My experience does not agree with that of Marson. In this locality vaccination is made by only one puncture, and I have never observed a fatal case of variola in a patient having a typical vaccine scar. Marson shows by elaborate statistics that the death risk from smallpox in the unvaccinated is as three to one compared with the most defective vaccination, and as seventy to one after the best vaccination.

Constitutional Condition.—The constitutional condition of the patient markedly influences the prognosis in this disease. Intemperate and debilitated patients show a greater mortality than those who are in full health and of robust constitution.

Age and Sex.—The age of the patient influences the prognosis. Among infants the mortality often reaches ninety per cent., and the same is true of those at the other extreme of life. Sex has no influence on the mortality of smallpox except in cases of pregnant females in whom abortion or miscarriage results during the attack of variola.

Complications.—The complications of this disease will be referred to under the head of treatment.

Treatment.—The treatment of variola embraces two important though widely divergent indications, viz.: (1) Prophylaxis. (2) Therapeutics.

Prophylaxis.—In the whole range of preventive medicine prevention and control of smallpox can be more certainly accomplished than in any of the other contagious diseases, provided measures for the attainment of this end are wisely planned and faithfully executed. Vaccination, isolation, and disinfection constitute the measures necessary to be applied in prevention and control of this malady.

Vaccination.—No fact is better established than that vaccination, when duly and efficiently performed, is a full and efficient preventive of smallpox. It is equally true that vaccination, properly performed and properly cared for, is devoid of danger to health or life. In the twenty thousand vaccinations made by me, or under my personal supervision, no one of these individuals ever had any trouble other than the mild fever and pain in the arm which constitutes the vaccine disease, except a small number who contracted erysipelas or developed an abscess at the point of insertion of the vaccine virus. In every instance in which erysipelas or an abscess complicated the vaccine disease it was due to lack of care to prevent infection of the vaccinal site, and in nowise to vaccination. The subject of vaccination has been assigned to another writer, and therefore I will dismiss the subject with the following general statement: In view of the prophylactic power of vaccination every citizen should be vaccinated, and it should be deemed a solemn duty on the part of authorities of cities, counties, and States continuously to provide gratuitous vaccination for indigent citizens. When smallpox threatens a community the authorities should resort to universal vaccination, and, in needful cases, to revaccination. Every unvaccinated person is liable to contract variola if exposed to it; therefore all such persons should be excluded from schools, hospitals, asylums, and other public institutions. The same rule should be applied to all employees in business enterprises wherein large numbers are assembled. Compulsory vaccination should be resorted to where citizens are known to have been exposed to smallpox.

No matter how absolute the protection conferred by vaccination, there will always be great and insurmountable difficulties in the way of enforcement of this measure in America, where individual ignorance and prejudice are allowed to contravene public welfare, and for this reason isolation and disinfection must be added to vaccination. If a case of smallpox be introduced into a community it cannot be disseminated if the patient be promptly isolated and all infected materials disinfected.

Whenever a case of variola is encountered the patient should be promptly isolated and provided with an immune nurse if the case is not to be moved to hospital. All unvaccinated persons in the domicile, together with all outsiders who have been in contact with the patient, should be immediately vaccinated. If any of them have been previously vaccinated the procedure should be repeated. The patient should be removed to hospital, unless he can be isolated in perfect safety to the inhabitants of neighboring houses and unless the necessary nurses, guards, and medical service can be provided. When a patient is allowed to remain at home the sanitary authorities should, at the patient's expense, furnish reliable guards to compel isolation of the patient and household and compliance with all necessary sanitary precautions. When a case of smallpox is moved to hospital, all fabrics of every kind whatsoever should be thoroughly disinfected, together with the entire domicile. The fabrics in the patient's room should be taken to the public disinfection station for treatment, and, after having been thoroughly disinfected, they should be returned to the owner. It is indispensable in waging warfare against smallpox that every community should be provided with a properly located and equipped hospital, detention buildings, and a disinfection room located on the same premises. Persons who have been directly exposed to the disease should be

taken to the detention building, vaccinated, and kept there for twenty-one days, and at the expiration of this time they should be sent home if free of smallpox. A community which attempts to treat smallpox without a hospital and detention buildings will do so in a haphazard manner, and thereby prolong the existence of the disease among its citizens. A suitable detention building is as necessary as a hospital in attempts to stamp out smallpox in a community. Of the three hundred and seventeen persons who were taken to the detention apartments after they had been exposed to smallpox, fifty-nine contracted the disease and were transferred to hospital. But for the prompt removal of these suspects to detention buildings, they would have constituted that additional number of centres of smallpox in our community. The fabrics of smallpox suspects should be disinfected as carefully as if it were known that their owners were affected with the disease. Smallpox patients and their fabrics should be taken to hospital in a closed conveyance used exclusively for that purpose.

The origin of every case of smallpox should be vigilantly traced. It is equally important to ascertain the name and residence of every person who has been in the presence of the patient or has entered the house. Every such individual should be promptly apprehended and vaccinated, forcibly if necessary. Those who have been in only momentary contact with the disease can, after being vaccinated, be detained at home until the period of incubation of smallpox has passed; in the mean time a sanitary officer should visit and inspect every suspect every second day in order promptly to detect any who may fall ill of variola. Suspects detained in their homes should undergo detention for three weeks.

Among our servant class of population (negroes) it is necessary to exercise the closest possible supervision, inasmuch as they habitually conceal the disease in their families. They also commonly go from their infected houses to their duties in the families of their employers, while others of them carry on their work in the household, as washer-women, during the full bloom of variola, and deliver this washing without the owners suspecting that their clothing had been in the midst of the disease and was being returned without being disinfected. In scores of instances I have found the clothes of white families being done in a room occupied by a patient in the full bloom of smallpox.

Disinfection.—The contagious element of smallpox resides in the eruption, exhalations, secretions, and excretions of the patient. These contaminate the sick-room and adhere to all fabrics therein. The vitality of the poison of variola persists for a long time when contained in fabrics which are laid away in closed receptacles. By intelligent use of germicidal agents every particle of contagion in houses and fabrics can be destroyed. To do this the germicide must be used in sufficient quantity, and of sufficient potency, and the fabrics must be opened so that the disinfectant can come in immediate contact with every particle of the contagion. Fabrics in bundles cannot be disinfected even by boiling. Gaseous disinfectants are to be relied upon only for surface disinfection. Every discharge which passes from the patient's body, mouth, nose, kidneys, or bowels must be received in suitable receptacles containing a potent germicidal solution. The discharges from the nose and mouth are best disposed of by being received upon bits of old cloth, which should be burned as soon as soiled. Every handkerchief, towel, every article of bed or body linen, should be thoroughly saturated in a germicidal solution prior to being sent from the patient's room. All articles of crockery and utensils of every kind whatsoever used in the sick-room must be disinfected before being sent from it. In order, as far as possible, to confine the contagion to the patient's room, all communicating doors, except the one leading to the hall, should be securely sealed by pasting paper over all joints, and a sheet saturated with a germicide should be hung on the hall-side of the door. The nurse should wear a washable suit, and the physician should put on a linen duster which covers his entire body when he enters the room. The patient should be detained in isolation until desquamation has been completed on every part of the body. The epidermis being thicker on the palms and soles, desquamation is slower on these parts than on the remainder of the body.

After desquamation has been completed the patient should be given a general sponge bath charged with creolin or carbolic acid, and then, dressed in a fresh suit of clothes, just brought into the room, may be allowed to mingle with the household. The nurse should take similar precautions as to bath and fresh clothing before leaving the room. As soon as the room has been vacated, it, with its contents, should be disinfected. The first step is to stop up all openings in the apartment, then to open and hang all unwashable fabrics on furniture or wires, and fumigate it with sulphur or formaldehyde. Formaldehyde fumigation is preferable by reason of its greater convenience and economy and because it does not injure household articles. Sulphur fumigation is, however, equally efficacious. After fumigation the room should remain closed for twenty-four hours, when all fabrics which are washable should be wrung out in a hot germicidal solution and subsequently boiled for half an hour. It is extremely difficult, if indeed it be possible, to disinfect pillows and mattresses except by placing them in a chamber and subjecting them to superheated steam. Inasmuch as few municipalities are provided with this apparatus, it will be found cheapest and safest to burn such articles. All stuffed furniture in the infected room should be stripped and the stuffing burned. If a carpet is on the floor it should be thoroughly scrubbed with a solution of bichloride of mercury (1 to 5,000), then removed from the floor and hung in the air for a week or more. All unwashable fabrics, after having been fumigated, should be hung in the open air for several days. After the room has been fumigated and the carpet and other fabrics have been removed therefrom, the floor and woodwork should be scrubbed with a germicidal solution, the walls carefully swept, and the apartment thrown open for atmospheric disinfection for a period of two weeks, after which it may be safely reoccupied. Where mattresses, pillows, and other articles belonging to citizens are destroyed, they should be replaced at public expense, inasmuch as they were destroyed for public protection.

It should be remembered that it is impossible to disinfect an inhabited room, and that there should be no such thing as partial disinfection. Disinfection must be perfect in all of its details or it will prove a failure. To demonstrate that disinfection can be made a perfect success, I cite the fact that the fabrics of fully eight hundred smallpox patients and suspects have been disinfected, as above outlined, in Augusta, Ga., and in no instance have these fabrics spread the disease after having been so treated by our chief sanitary inspector.

In fatal cases of smallpox the body should be thoroughly washed in a strong disinfectant solution and subsequently enveloped in a sheet charged with a solution of chloride of zinc, bichloride of mercury, or undiluted commercial formaldehyde. Under no circumstance should public burial be permitted, nor should the corpse be transported in a public conveyance. The body should be carried to the grave in the smallpox ambulance, but if no such conveyance is available, the vehicle in which the corpse is so transported should be disinfected under the supervision of the sanitary authorities immediately after it has been used.

Therapeutics.—There is no known curative treatment of smallpox. It is wholly symptomatic and must be adapted to the case in hand with a view to mitigate the severity of the symptoms. Vaccination, if successfully performed within three days after exposure to smallpox, will in some cases prevent, in others abort, and in still others markedly modify the course of smallpox. In a number of instances I have vaccinated individuals from three to five days after they had been exposed to smallpox, and these individuals failed to contract the disease notwithstanding the fact that they continued to occupy the

room of the smallpox patient. Some of them continued to sleep in the same bed with a case of the disease, yet remained immune. I have known five infants to be successfully vaccinated three days after the eruption of variola commenced on the mothers, and although they continued to nurse the breast of these mothers, they nevertheless remained free from the disease. I recall three instances of individuals who had been vaccinated five days after exposure to smallpox, and who had continued to nurse relatives affected with the disease. In each of these individuals, who in due time contracted smallpox, the disease was ushered in with a severe chill, high fever, vomiting, headache, and lumbar pain, and from the severity of the initial symptoms I expected them to develop severe cases of variola, yet the entire crop of eruption consisted of one vesicle. In other instances, under like circumstances, I have counted only ten or twelve vesicles on the entire body. In still other cases I have seen the vaccine disease and smallpox affect the patient at the same time, neither malady at first seeming to interfere with the other, but in whom at a later period the eruption rapidly dried up and the crusts soon dropped from the body. On the other hand, I have observed several cases in which individuals, who had been known to be exposed to smallpox, were vaccinated for the first time after such exposure and promptly developed vaccinia; then, twelve days after this exposure to smallpox, they contracted the disease, and the two diseases, smallpox and vaccinia, pursued typical courses, apparently travelling together in the patient's system as harmonious companions. That vaccination, even after persons have been exposed to smallpox, has a marked power to prevent the latter disease is shown by facts observed in the smallpox hospital of Augusta. Within the last four years three hundred and seventeen persons, who had never previously been vaccinated, but who were known to have been exposed to smallpox, were vaccinated and taken to the detention hospital, and yet only fifty-nine of them contracted variola. It would not, in my judgment, be fair to claim that this favorable result was wholly due to vaccination, inasmuch as a certain number of these individuals—exactly how many cannot be determined—doubtless escaped because they were separated at an early moment from the smallpox patients. I regard smallpox as but slightly contagious up to the vesicular stage. It is most actively contagious in the pustular stage. In view of the proven fact that vaccination, done even a few days after exposure of individuals to smallpox, has the power to prevent, abort, or mitigate the latter disease, it is important that every such exposed person should be promptly vaccinated. The character of the vaccine virus is a matter of importance. The vaccine should be used in that form which will most promptly and certainly produce vaccinia. Glycerinized lymph possesses both of these requisites. In my hands glycerinized lymph from approved propagators has succeeded in producing typical vaccine vesicles in from ninety-five to ninety-nine per cent. of primary vaccinations; and the vaccinia appeared from two to four days earlier than when dry lymph on points was used. In my experience glycerinized lymph in capillary tubes is infinitely superior in all respects to dry lymph on points. I have used glycerinized lymph in vaccinating about ten thousand individuals.

As soon as the patient has contracted smallpox he, if he is to remain at home, should be isolated in a well-ventilated room, preferably on the upper floor of the house. All unnecessary clothing, bedding, furniture, carpeting, and other household effects should be immediately removed from the room, disinfected, and stored away. In the winter season the temperature of the sick-room should be maintained at or near 72° F When the patient has a chill he should be warmly covered, and a mustard plaster should be applied to the spine for twenty minutes. When the fever is high it should be treated by hot foot baths and if need be by general warm baths, repeated as indicated. The fever being the result of the toxins of the smallpox infection in the patient's system, the chief indication for treatment of the pyrexia will be met by opening up the emunctories of the body. This is to be accomplished by administering such agents as will induce free diuresis, diaphoresis, and catharsis, as indicated by the case in hand. It should be remembered that children are liable to convulsions during the febrile period of smallpox, and when they are so threatened hydrate of chloral and bromide of potassium should be administered in suitable doses. After the eruption has appeared the initial symptoms disappear. As a rule, fever returns when the pustular stage of the malady is reached. This is best combated by general warm baths followed by enveloping the patient in blankets in order to induce free sweating. In treating fever on the above plan, the warm baths, besides producing active diaphoresis, will induce free action of the kidneys and allay the patient's restlessness. The exanthem in the mouth and throat causes discomfort and difficulty in swallowing. To alleviate these symptoms glycerinized astringent gargles are indicated. The diet of the patient should consist mainly of milk, soup, eggs, beef-tea, gruel, oatmeal, stewed fruit, etc., during the early course of the disease; while in the later part of the attack the food may consist of almost anything which the patient's appetite may call for. In severe cases of smallpox the patient's strength will be severely taxed, and for this reason it is important that suitable food should be freely administered. In these severe cases the conjunctivæ are commonly invaded. The lids become swollen from the eruption on them, and not infrequently purulent conjunctivitis sets in, the secretion causing temporary adhesion of the eyelids, which necessitates their forcible opening so that the pent-up secretion may be removed and the eyes treated. If this be not done a diffuse keratitis may set in, and it may go on to ulceration and perforation of the cornea. In cases attended with intense swelling of the eyelids the vesicles thereon should be emptied immediately upon their reaching that stage. The lids must be frequently opened and the eyes wiped out with absorbent cotton, and at least every six hours a suitable astringent solution should be instilled between the lids. In all cases the physician must carefully watch for iritis, keratitis, and ulceration. As soon as the inflammation appears atropine should be instilled into the eyes, and iced compresses applied over the lids.

The eruption on the surface of the body is often the source of extreme discomfort. This may be alleviated by brushing it over several times daily with a solution of two grains of carbolic acid to an ounce of glycerin or linseed oil. Various plans of treatment looking to prevention of pitting of the face have been advocated. I have tried all of them and have found them to be utterly useless. If, as previously stated, only the superficial layer of the skin be involved, the patient will escape being pockmarked. If, on the other hand, the true skin be involved, pitting is inevitable. I have encountered cases of all varieties of variola unattended by pitting, although no local treatment had been used.

In some cases of variola sleeplessness is a prominent and distressing symptom. This should be overcome by the use of morphine or of a mixture of chloral and bromide. In cases of variola attended by profuse expectoration opiates should be given with caution. Constipation should be overcome by saline purgatives. When diarrhœa is present it should be controlled by astringents and careful feeding.

Abscesses not infrequently form in the subcutaneous tissues during the course of smallpox. The scalp is a favorite seat of these abscesses, and when they first appear they are of small size, but they continue to enlarge and show but little disposition to point. Whenever they form they should be promptly laid open. As soon as it is known that a patient has smallpox the hair on the scalp ought to be shaved, inasmuch as the eruption is commonly copious on the head, and if this be not done the hair will become matted and the mass putrescent. Boils over various parts of the body are of common occurrence, and these frequently terminate in foul ulcers.

Boils should be promptly lanced and both they and the abscesses should be carefully watched and treated. Wherever suppuration is present it calls for treatment with quinine, iron and strychnine, wine, and full nourishment.

Complications such as erysipelas, laryngitis, pleurisy, pneumonia, nephritis, etc., are to be treated on general principles.

In severe cases of smallpox the heart muscle usually undergoes fatty and parenchymatous changes. This fact suggests the necessity of guarding the patient against heart-strain by rest in bed and, when needful, by the administration of cardiac tonics, such as strychnine and alcoholic stimulants. Delirium, restlessness, weak and rapid pulse, shrunken features, with great prostration, demand free, even bold administration of alcoholic stimulants and strychnine. The amount of alcoholics and strychnine to be administered in adynamic states of smallpox must be decided by the degree of vital depression to be combated. Convalescence is protracted in those who have had a severe type of smallpox. During this period marked benefit will be derived from taking Aitken's pills of arsenic, iron, strychnine, and quinine, with full feeding and alcoholic stimulants in moderate doses.

Eugene Foster.

SMELL, SENSE OF. See *Olfactory Nerve.*

SNAKEROOT, CANADA, or *Wild Ginger*, is the rhizome of *Asarum Canadense* L., and that of *A. reflexum* Bicknell has probably been more or less used for and with it. These plants are natives of rich woodlands in the Northeastern United States. The rhizomes lie very near the surface of the soil, may become a foot or more in length, branch rather freely, and bear few coarse roots. The leaves are long-petioled, kidney-shaped, and sometimes reach a breadth of six inches. The solitary flower is terminal, cup-shaped, three-lobed, about an inch broad, and of a deep purple color. The dried rhizomes are quadrangular or two-edged, longish-jointed, deep-purple, lightly curved, and about as thick as match-sticks. The odor and taste remind one strongly of ginger. With some resin, starch, gum, and sugar, Canada snakeroot contains an unknown bitter principle and 1.5 to 3.5 per cent. of a volatile oil. An alkaloid is also thought to be present. It is an excellent aromatic bitter, the aromatic element predominating, and a carminative and diaphoretic. The dose is from 1 to 2 gm. (gr. xv.–xxx.), the tincture being the preferable form of administration. The volatile oil is also known to commerce. Its active constituent is *asarol* ($C_{10}H_{18}O$). Under the name "*asarabacca,*" the rhizome of *A. Europeum* L. has long been employed similarly. It is now very little used. Its oil contains *asarone* instead of asarol, and it is distinctly emetic, or even purgative in the dose above specified for the other species. Its ordinary dose is only one-tenth as large.

Henry H. Rusby.

SNAKEROOT, VIRGINIA, OR TEXAS.—(*Serpentaria*, U. S. P.; *Serpentariæ Rhizoma*, B. P.) The dried rhizome and roots of *Aristolochia Serpentaria* L. (True Virginia Snakeroot or Serpentaria) or of *A. reticulata* Nutt. (Texas Snakeroot or Serpentaria) (fam. *Aristolochiaceæ*). These are perennial herbs, a foot or so high, from knotty, horizontal, aromatic rhizomes; stems slender, flexuose, branching at the base; leaves of various shapes between ovate and narrowly lanceolate, with heart- or halberd-shaped base, petiolate, entire; flowers lateral, on slender, straggling, crooked peduncles in the axils of bracts near the surface of the ground, about an inch long, consisting of a dull-purple, single perianth (calyx), whose curved tube has a wasp-like constriction near the middle, and a very oblique, spreading, three-lobed border; stamens six, short, connected with the style in three pairs; ovary three-celled, many-ovuled, inferior. The first named is a native of the Eastern United States, especially of Pennsylvania, Virginia, and Kentucky, where much of the drug is collected. The second named, of Texas and the adjacent region, is somewhat larger and coarser.

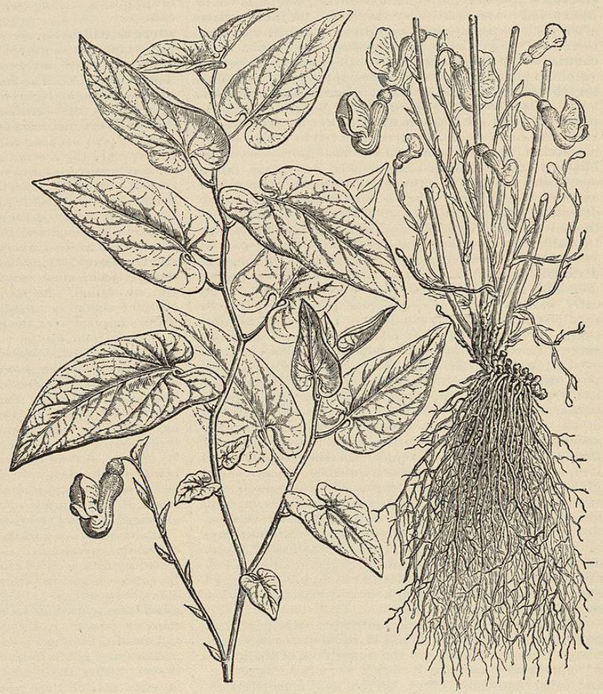

FIG. 4320.—Virginia Snakeroot. About one-half natural size. (Baillon.)

DESCRIPTION.—*Virginia Serpentaria.*—Rhizome of oblique growth, 1 to 3 cm. ($\frac{2}{5}$ to about 1 in.) long and 1 to

2 mm. ($\frac{1}{12}$ to $\frac{1}{12}$ in.) thick, crooked and somewhat branched, bearing on the upper surface approximate, short stem bases, and underneath a dense tress of long, thin, branched roots, which are straightish, except as they are bent and doubled by pressure; dull yellowish-brown, internally whitish, the wood-rays of the rhizome longest in the lower side; fracture of both rhizome and roots weak; odor strong, aromatic, and camphoraceous; taste warm, aromatic, bitter.

Texas Serpentaria is larger, coarser, of a more gray color, and the roots are fewer.

CONSTITUENTS.—Serpentaria owes its aromatic properties to a volatile oil, existing to the extent of from one-half to one per cent., of which *borneol* is the important constituent. Associated with this is five or six per cent. of resin, the greater portion of it soluble in petroleum ether. Tannin, starch, gum, and sugars also occur. The bitter principle is not well known, but is believed to be, in part at least, a very small amount of the alkaloid *aristolochine*, extracted by Hesse from *A. Argentina* Griseb. The amaroid *clematitin* ($C_9H_{10}O_6$), obtained from *A. Clematitis* L., is believed to be identical with a constituent of serpentaria which has been called *aristolochin*, also *serpentarin*, and which is poisonous: but the relationship of these to the alkaloid named above is not known. Hesse also describes *aristinic*, *aristidinic*, and *aristolic acids* from *A. Argentina*, and these are believed also to be present in serpentaria.

ACTION AND USE.—Although aristolochin has been found, as stated above, to be poisonous when pure, it is present in the drug in such small amount that the latter is not poisonous in any ordinary doses. Neither has serpentaria any specific properties, although such have been ignorantly ascribed to it. Its action is merely that of an excellent aromatic bitter and its antiperiodic and antirheumatic reputation is doubtless due entirely to its indirect effects as a general tonic. The dose of serpentaria is 1–4 gm. (gr. xv.–lx.); of the official fluid extract, 1–4 c.c. (♏xv.–lx.). The Pharmacopœia provides also a ten-per-cent. tincture, of which the ordinary dose is 4–16 c.c. (fl. ʒ i.–iv.). Like other bitter stomachics, serpentaria is far better taken in small doses, of the weaker preparations, a short time before eating.

The genus contains a large number of species, many of which have been similarly used in their own homes. Some of them are far more active than serpentaria, large doses acting as emetico-cathartic poisons.

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SNAKES AND SNAKE-POISON. See *Poisonous Reptiles.*

SOAP.—When natural fats or oils are decomposed by treatment with salifiable bases, they split up into the alcoholic body *glycerin* on the one hand, and a series of *acids* on the other—principally oleic, palmitic, and stearic acids, in varying proportions, according to the nature of the fat, which acids then unite with the base used in effecting the decomposition of the fat, to form salts—oleates, palmitates, or stearates, or all combined, as the case may be. Such salts are generally called *soaps*, but in common parlance the name soap is applied only to the fatty salts of the alkali bases—potassa, soda, and ammonia—which, in contradistinction to the soaps derived from earthy and metallic bases, are soluble in "soft" water and in alcohol. Of the alkali soaps, furthermore, ammonia soap is used only in the preparation called *ammonia liniment*, or *volatile liniment* (see *Ammonia*), so that the soaps in common use as such are narrowed down to soda and potassa soaps.

Between soda soaps and potassa soaps, as distinct classes, the broad distinction is that soda soaps tend to be comparatively hard, and potassa soaps soft, so that the phrase *hard soap* is applied generically to soda soaps, and *soft soap* to potassa soaps. But the consistence of soaps is also markedly affected by the nature of the fat used in the manufacture, in the way that fats rich in olein, as is the case with oils, tend to yield softish soaps, whereas those rich in stearin and palmitin, typified by the solid fats, such as tallow, furnish soaps of greater consistence.

Soaps are bodies of a well-known characteristic odor and disagreeable alkaline taste. They dissolve in alcohol and in "soft" water, but in "hard" waters they suffer decomposition by the calcic salts present, and the resulting lime soap floats in insoluble flocculi on the surface of the water. Soaps are, in general, decomposed by acids, by earthy bases and salts of the earths, and by the heavy metals. The useful property of soaps is that they attack grease, dirt, and dried animal débris, probably by virtue of their free alkalinity, and so affect those substances as to render them soluble in water, and thus readily removable.

The kinds of soap official in the United States Pharmacopœia for use in technical medicine are as follows: Under the simple title *Sapo*, Soap, is recognized "soap prepared from soda and olive oil." Such a soap corresponds to what is commercially called *Castile*, or *Spanish*, soap, and is an opaque, white substance, hard, but when fresh easily to be cut. It has the simple, characteristic smell of soap and an unpleasant alkaline taste. It dissolves readily in water and in alcohol. If the soap, as first separated in the making, be not purified, it presents a marbled appearance from contaminating streaks of an insoluble iron soap. This unpurified soap is stronger than the purified, white soap, since in the process of purification the soap combines with more water.

Castile soap is locally detergent, and, by virtue of its free alkalinity, mildly irritant to tender surfaces. Taken internally, it is innocent in moderate quantity, and tends only to relax the bowels and neutralize acid in the *primæ viæ*. Locally, free ablutions of soap and water are beneficial in certain forms of skin disease, such as acne, and, as regards internal giving, the principal application of soap is as a ready and innocent alkali to administer in cases of poisoning by any of the strong acids. A strong aqueous solution—one part of soap to four or five of water—should in such cases be very freely administered pending the arrival of more powerful and appropriate alkaline antidotes. Soap and water is also much used as a cathartic enema, but in sensitive conditions of the rectum may irritate. Pharmaceutically, soap is much used as an excipient in pill composition, but due regard must be paid to its chemical susceptibilities, as above detailed. From Castile soap are made the following official preparations: *Emplastrum Saponis*, Soap Plaster, is compounded of soap, one part, and lead plaster, nine parts, mutually incorporated when in the fluid condition, and the product evaporated to the proper consistence. Soap plaster is a feebly active plaster, devoid of specific medicinal properties. *Linimentum Saponis*, Soap Liniment, is compounded of soap and camphor with a little oil of rosemary, made into a liniment with dilute alcohol. This preparation makes an excellent gently stimulant embrocation, and takes the place of the *camphorated soap liniment*, or so-called *opodeldoc* of older revisions of the Pharmacopœia, an article substantially the same in composition as the present, but prepared from the common white soap made of animal fat, instead of from Castile soap.

The second variety of official soap is entitled *Sapo Mollis*, Soft Soap, and is made from potassa and linseed oil. It is a soft, unctuous substance of a brownish-yellow color. "*Green soap*" or "*German soap*" is a soft soap made in Europe and formerly imported into America. Its greenish color is due to impurities in the oils from which it is made.

Soft soap is more strongly alkaline, and therefore more detergent on the one hand, and more irritating to sensitive tissues on the other, than the hard soda soaps. Severe pain is easily excited upon tender surfaces, such as that of an eczematous patch of skin, by applications of soft soap. The medicinal use of the soap is as a detergent and "alterative" application in certain forms of skin disease, notably in *eczema rubrum*. The part is com-