a scalloped margin. The superficial form is most frequently found on the face and legs. The *serpiginous ulcer* may originate from a single circular ulcer, which heals at one side, while it progresses at the other; or it may take its origin in the breaking down and coalescence of several tubercles. Subsequently the new tissue thus formed at one part of the ulcer also breaks down. It is on the back, at the junction of the hairy scalp with the face and neck, and on the extremities that the serpiginous ulcer is most frequently found. The *deep ulcers* result from the breaking down of gummata (Plate LVII., Fig. 3). They are at the beginning surrounded by a reddened area of inflammation, the smaller ones being crater-like with punched-out edges, the larger ones having overhanging, thin, soft, inflamed edges. The base is of an angry, dusky-red color, dirty or sloughing in appearance, the slough being often of a greenish color. The discharge is thin, often bloody, and contains débris from the broken-down gumma. Under treatment and after they have existed for some time, they lose their characteristic appearance and take the form of simple chronic ulcers. The scar remaining is characteristic. It is thin, of a dead-white color, pigmented here and there, and when pinched up wrinkles like tissue paper. This form of syphilitic ulcer may occur anywhere on the surface of the body, but is particularly apt to be found on the upper half of the leg. In fact, an ulcer occurring on the upper half of the leg, unless directly due to traumatism, is nearly always syphilitic.

Tuberculosis.—Tuberculous ulcers, like those due to syphilis, occur both on the skin and on the mucous membranes, being more frequent on the latter. When occurring on the mucous membranes they may be primary, but are more often secondary, and are frequently part of a general tuberculosis. They result, as has been mentioned under Pathology, from the breaking down of tubercle tissue. In the mucous membranes of the mouth, tongue, larynx, and pharynx, tuberculous ulcers are as a rule painful, shallow, oval in shape, and irregular in outline. The base is made up of pale, flabby, anæmic granulations. The edges are bevelled and not undermined. The surrounding area is slightly swollen and pale, this pallor of the surrounding tissues being characteristic of tuberculous ulcers of the mucous membranes. These ulcers, although superficial at first, may become deep, and may result in the destruction of the deeper structures by extension of the tuberculous process, as in the larynx. In the intestine the ulcer usually begins by the deposit of tuberculous material in the Peyer's patches or the solitary follicles and the subsequent breaking down of this material. The ulcer is at first small, then becomes larger, irregularly oval in shape, and tends to run transversely around the lumen of the bowel. The edges are slightly elevated, thickened, and not undermined. The base is thickened from the presence of inflammatory and caseous tissue. It is usually roughened and irregular, sometimes sloughing. The process involves all the coats of the intestine, and there is usually a local peritonitis set up on the outer wall of the serous coat, through which white or yellowish tubercles may frequently be seen. In the rectum tuberculous ulcers are irregularly oval, often deep, and there may be a marked infiltration of tubercle tissue about them. They sometimes perforate the wall of the rectum and give rise to the formation of sinuses and fistulæ. In the bladder tuberculous ulcers, when secondary to tuberculous disease of the kidney, are most frequently found about the orifices of the ureters. Ulcerative lesions of the vulva and vagina may be found secondary to tuberculosis of the uterus and adnexa. Lupoid ulceration of the mucous membranes occurs only on those mucous surfaces which are near the natural openings of the body, and usually by extension from without, although cases primary on the mucous membrane have been reported. It occurs on the mouth, tongue, larynx, pharynx, nares, conjunctiva, vulva, vagina, and anus. It has the general characteristics of lupus of the skin, and will be described under this heading in the following paragraph.

On the skin tuberculous ulcers follow five distinct types. *Tuberculosis cutis*, a rare form, occurs almost exclusively about the mucous orifices—mouth, anus, vulva, and glans penis. It is part of a general tuberculosis, but the ulcers are due to local infection. It consists of one or more discrete, shallow, painless ulcers, with a reddish-yellow granular base and an irregularly eroded, moderately infiltrated edge. The discharge is thin and scanty, and is apt to dry and form crusts. When the ulcer extends to a mucous membrane, small yellow miliary tubercles may exist near them. The ulcers never heal and may attain considerable size, and by coalescing with others become serpiginous. *Tuberculosis verrucosa cutis* occurs as one or more brown or livid-red warty patches, ulcerating on the surface, varying in size from about a lentil to a silver half-dollar, and surrounded by a narrow zone of erythema. Several patches may unite to form an irregularly shaped lesion, with a scalloped border. Usually there are no subjective symptoms, but there may be slight pain on pressure. It is most frequently found on the hands. *Lupus vulgaris* occurs most frequently on the alæ nasi, at the junction of the skin with the nasal mucous membrane. When an ulcerative lesion occurs, it is preceded and surrounded by small, soft, brownish-red, semitranslucent tubercles which resemble apple jelly in appearance. These easily break down and ulcerate. The base of the ulcer may be quite superficial and smooth, composed of pale flabby granulations, covered by a crust, or the process may destroy the cartilages and the ulcer become deep and irregular. The edges are sharp, soft, irregular, and eroded, and, when the ulcer is spreading, surrounded by small lupoid tubercles. The development of the disease is very slow. It has a tendency to cicatrize at one portion while spreading at another, and leaves a thin, red, irregular scar, in which new tubercles may form and break down. When an ulcer occurs as a result of *erythema induratum*, it is preceded by a subcutaneous nodule, the skin over which later becomes red, then purple in the centre. If it breaks down, the nodule sloughs or suppurates and leaves a round, excavated ulcer with a grayish base. The edges are not undermined. The lesions are apt to be symmetrical, being most frequently found on the legs, especially on the outer and posterior aspect. The origin of that form of tuberculous ulcer which is known as the *scrofuloderm*, has already been mentioned (Plate LVII., Fig. 6). The base of the ulcers is covered with pale flabby granulations which are often exuberant; its edges are thin, undermined, and of a peculiar livid or violaceous color. The discharge is a thin, sanious pus. Frequently the ulcers are connected with other tuberculous ulcers, or with tuberculous glands, bones, or joints. They are usually painless. When the ulcer has healed the scar left is usually puckered and disfiguring, and is often bridled. Tubercle bacilli may be found in the tissues and discharge of any of the tuberculous ulcers, but they are infrequent, and often in old ulcers cannot be obtained.

Other Specific Ulcers.—The symptoms arising from ulcers due to typhoid, diphtheria, dysentery, leprosy, glanders, actinomycosis, etc., together with those due to certain skin diseases, such as pemphigus, ecthyma, herpes, and eczema, are those rather of the disease than of the ulcer, and the reader is therefore referred to the special articles in this work on these subjects.

Malignant Ulcers.—*Epitheliomatous Ulcer.*—The most frequent form of malignant ulcer is that of epithelioma. It is infrequent under forty years of age. Its usual situations have already been mentioned. The base of the characteristic epitheliomatous ulcer is hard, nodular, and irregular, made up of hard warty granulations and often covered with sloughs. It bleeds easily and has a foul discharge. The edges are hard and everted (Plate LVII., Fig. 4). The amount of pain, the involvement of neighboring lymphatic glands, and the rate of growth vary. Epitheliomata which develop from

congenital warts, moles, or nævi are apt to be very malignant. When epitheliomatous degeneration occurs in a chronic ulcer, it begins to get hard about the edges, which become everted and bound down to the deeper tissues. The granulations about the edges become large, red, nodular, hard, and bleed very readily. This condition spreads over the whole ulcer, and it assumes a sloughing and foul character. The tissues immediately surrounding the edges may show a stony-hard induration, due to extension of the malignant process. The diagnosis is confirmed by the microscopical examination of a section cut from the edge of the ulcer.

Rodent Ulcer, or, as it is sometimes called, Jacob's ulcer, is histologically a form of epithelioma, although it may be differentiated from it clinically. It occurs on the upper half of the face, beginning as a small nodule like a wart. Various observers have believed its origin to be in the hair follicles, sebaceous or sweat glands, or the deep layers of the rete. J. M. McFeely [36] states that the deep layers are involved first, but that the disease shows a tendency to avoid the hair follicles. The ulcer grows very slowly. Its base is smooth, glossy, and depressed, being lighter in color than epithelioma (Plate LVII., Fig. 1). The edges are hard from infiltration, smooth and rolled over. The discharge is slight and apt to form crusts. The deeper tissues are not involved until late and the ulcer is movable. There is a tendency toward cicatrization. Caustics retard its growth, while, unless they are thoroughly applied, they stimulate epithelioma. Rodent ulcer never forms metastases, causes cachexia, or involves the lymphatic glands. Auche [37] reports a case of the disease which existed for twenty years without glandular involvement.

Scirrhous Ulcer occurs usually with scirrhous carcinoma of the breast in women over forty. The slow-growing tumor gradually involves the skin, which breaks down and ulcerates. The ulcer is deeply depressed, with a pale pink, smooth base and no granulations. It is intimately adherent to the new growth below; in fact, its base consists of the new growth. There is slight discharge. The edges are raised and very hard, but may be undermined by ulceration. The surrounding skin is often atrophic, wrinkled, and adherent to the new growth. The ulcer increases in size very slowly, as this is a very slowly developing form of carcinoma.

Fungating Ulcer.—Rapidly growing carcinomata and sarcomata, which are near the surface, may either involve the skin or protrude from an operation wound; they form large, foul, exuberant masses composed of cancerous and granulation tissue which are covered with sloughs, bleed easily, and have a foul, sanious discharge. They grow very rapidly (Plate LVII., Fig. 2).

The symptoms caused by malignant ulcers of the mucous membranes would be those of the new growth, and would not be included within the scope of this article.

Ulcers of the Mucous Surfaces.—Besides those forms of ulcer on the mucous membrane which are due to malignant disease and the various specific infections previously mentioned, there occur the ulcerative forms of stomatitis, gastric, duodenal, and other intestinal ulcers, as well as ulcers of the rectum, bladder, vagina, and vulva from various causes. For the symptoms of these, together with the symptoms of ulcer of the cornea, and fissures of the nipple and anus, the reader is referred to the special articles on these subjects.

Differential Diagnosis.

The diagnosis of ulcers does not as a rule present much difficulty, but occasionally it may not be easy to determine the form of ulcer present. To facilitate this a number of tables are given below, showing the points which determine the differential diagnosis of those forms in regard to which confusion is most apt to occur.

Lupoid ulcer and a tuberculous syphilide might easily be confused. From the latter lupus is differentiated by the facts that it usually appears at an early age, that it develops very slowly, that it is characterized by the presence of apple-jelly-like tubercles, that the ulcers are more shallow and have only insignificant crusts, that there is no tendency on the part of the disease to involve the bones, that other syphilitic symptoms are lacking, and finally that potassium iodide produces no benefit.

Complications and Sequelæ.

The most frequent complication of ulcer of the skin is cellulitis. This may sometimes be so severe as to necessitate operation. Erysipelas may also complicate cutaneous ulcers. After the healing of an ulcer the resulting cicatrix may by its contraction cause severe deformity—distortion of the features when the ulcer is upon the face or neck, or partial ankylosis in the case of extensive ulcers, as those resulting from burns, in the neighborhood of a joint. Keloid formation occasionally occurs in the scar resulting from an ulcer. Hemorrhage, especially from a varicose ulcer, is a common complication and has been fatal. Involvement of the lymphatic glands and destruction of the deeper structures (cartilage, bone, muscles, or joints) may occur in malignant, tuberculous, syphilitic, or phagedenic ulcers. The continuous drain on the system from the profuse discharge from an extensive ulcerating surface in a debilitated subject may cause such weakness as to indicate amputation. Malignant ulcers may form metastases in other structures.

In the case of ulcers on the mucous membranes, besides the destruction of the deeper tissues, the complications most common are perforation of the stomach or intestines, and hemorrhage. An actual perforation is frequently prevented by the formation of adhesions due to the localized peritonitis which occurs when the serous coat is involved in the inflammatory process. Strictures are frequent sequelæ to ulceration of the mucous membranes.

Treatment.

The treatment of ulcers is both constitutional and local. The constitutional treatment consists in building up the system by tonics when this is necessary, and in treating those general conditions and diseases which act as direct or predisposing factors in the etiology of the ulcer (such, for example, as the gouty diathesis, arteriosclerosis, diabetes, scurvy, etc.). It is also important to improve the hygienic surroundings, to administer mercury and the iodides for syphilis, to prescribe cod-liver oil, the hypophosphites, and a change of climate for tuberculous conditions, and iron and arsenic for anæmia, etc., thus making it possible to obtain the best results from the local treatment.

Local Treatment.—In considering the subject of local treatment, it must be remembered that there are several things which we should aim to accomplish. These are: (1) the reduction of inflammation in and about the ulcer; (2) the cleansing and sterilization of the ulcer; (3) the stimulation of the granulations; (4) the relief of congestion and the establishment of a proper blood supply; (5) the promotion of new epithelial growth and cicatrization.

Reduction of Inflammation.—Frequently, when an ulcer comes into the hands of the surgeon for treatment, the ulcer and the surrounding tissues are in a state of considerable inflammation and cellulitis. For the reduction of this inflammation and the relief of pain moist dressings are the most effective form of treatment. A solution of alum acetate, made by adding 5 parts of lead acetate and 1 part of alum to 100 parts of water; or a one-per-cent. aqueous solution of ichthyol; or Thiersch's solution (1 part salicylic acid, 5 parts boric acid to 500 parts water)—any one of these solutions applied on a thick gauze compress and kept moist and cool, acts admirably in this condition. The permanent bath of Kaposi,[38] consisting of clean or if possible sterilized water, but containing no antiseptics, acts in the same manner. It has no advantages over the former treatment, except perhaps in the case of ulceration following extensive

Tuberculous, Syphilitic and Epitheliomatous Ulcers, and Rodent Ulcer.

	Tuberculous Ulcer.	Tertiary syphilis.	Epithelioma.	Rodent ulcer.
History	Of previous glandular, bone or lung disease.	Of syphilis	Sometimes of small abrasion or irritation.	Often of wart or papule.
Age	Generally youth	Any age. Most frequently middle life.	Seldom before thirty-five or forty.	Seldom before forty-five or fifty.
Base	Soft, pale, œdematous granulations.	Smooth or sloughy. Apt to be of a dirty-greenish color.	Hard, wart-like granulations. Bleed easily and apt to slough.	Hard, smooth, depressed. May show evidence of cicatrization.
Edges	Thin, undermined, violaceous color.	Punched out or undermined. Dusky red. May heal at one point and advance at another.	Very hard, elevated, nodular, everted,	Hard, sharply cut. Not much elevated.
Glands	Usually involved. Not necessarily secondary to ulcer.	Not involved	Usually in from three to six months.	Not involved or very late.
Course	Slow	Rapid without treatment. Heals with it.	Varies. Malignant	Usually very slow.
Other symptoms	Other signs of tuberculosis—sinuses, bone disease, etc.	Other signs of syphilis	May be cachexia or metastases.	Usually none.

Leg Ulcers.

	Traumatic.	Varicose.	Syphilitic.
History	Injury	Varicose veins or phlebitis	Syphilis.
Situation	Where injury occurred	Usually lower third of leg anteriorly or laterally.	Usually upper third of leg. Often posterior aspect.
Base	Shallow, inflamed, often grayish yellow.	Bluish, pigmented granulations; sluggish. Usually superficial.	Dirty, sloughing; often greenish. Deep.
Edges	Not elevated or thickened	Undermined or thickened. Shape irregular.	Punched out or thin and undermined. deep dusky red. Shape round or serpiginous.
Surrounding area	Red and inflamed	Pigmented. Varicose veins; often œdema and eczema.	Dusky red. Scars of old, syphilitic ulcers.
Healing	Rapid under antiseptic treatment.	Support of veins necessary	Mercury and potassium iodide necessary.

Ulcers of Tongue.

	Chancre.	Tertiary syphilis.	Tuberculosis.	Carcinoma.
Age	Usually before thirty	Usually before forty	Any age. Rare before puberty.	Usually after forty.
History	Sometimes of infection	Previous syphilitic	Usually of pulmonary tuberculosis.	Often of irritation and of cachexia.
Number	Single	Often multiple	Generally single	Single.
Situation	Usually tip or anterior part of edges.	Often mid-line toward median or posterior surface of dorsum.	Usually tip or anterior portion of dorsal surface.	Most common on one side at middle or posterior third.
Shape	Generally round	Round or oval	Sinuous outline or oval	Irregular.
Base	Hard, smooth, superficial	Deeply excavated, Sloughy, not much induration.	Pale, flabby granulations	Hard, irregular, vascular, sloughy, purulent.
Edges	Hard, indurated, sloping	Ragged, irregular, undermined, or sharply cut.	Bevelled. Surrounding area pale.	Raised, everted, thickened, indurated.
Pain	Slight, if any	Slight	Painful	Very painful.
Glands	Submyoid in six weeks	Usually not	May or may not	Usually in a few months.
Course	Rapid healing with development of secondary syphilis.	Heals with antisyphilitic treatment.	Slow progression. Part of a pulmonary tuberculosis.	Generally rapid. Floor of mouth or pillars of fauces involved. Loss of speech.
Microscope	Round cells	Gummatous tissue	Tubercle bacilli	Carcinoma cells.

burns or gangrene on the trunk, where it is difficult to keep dressings applied.

Cleansing and Sterilization of the Ulcer.—Before healthy granulations can form on an ulcer, the removal of sloughs and cleansing of the base must be accomplished, with as much sterilization as is possible. Many means toward this end may be effective. A one-half to one-per cent. solution, or rather emulsion, of creolin, is very useful in cleaning up those extensive, dirty ulcers from which a profuse foul discharge escapes. A one-per-cent. solution of formalin is of great value in cleaning up smaller ulcers, especially those due to tuberculous disease. The destruction and removal of sloughs may be hastened by cauterization with the solid stick of nitrate of silver and the application of iodoform or naphthalin powder, the latter particularly. The use of certain ferments, such as brewers' yeast, papoid, caroid, or protonuclein, may help in the clearing up of a chronic ulcer which shows a tendency toward a croupous condition. The most frequent means employed for the cleansing and sterilization of the ulcer, previous to the application of some stimulating dressing, is washing its surface with bichloride-of-mercury solution (1 in 1,000) or one of carbolic acid (1 in from 40 to 80), or with hydrogen peroxide. In addition to these means of sterilization and also with the aim of promoting healing, Zeimer [39] recommends a one-per-cent. filtered solution of chloride of lime. Colleville [40] suggests that the ulcer be subjected, for a period of from twenty minutes to one hour, to the heat radiated from a plate of metal that has been brought to a dull-red heat, and that is held at a distance of ten inches from the ulcer. Von Langsdorf,[41] recommends the application of calomel and salt, the chlorine from the salt uniting with the calomel to produce bichloride of mercury. This method is often very painful. Tarabrin,[42] employs the Paquelin cautery at a dull red heat, holding it at a distance of 5–6 cm. from the ulcer; nearer if no pain ensues. Bukovsky [11] uses a culture of B. pyocyaneus fourteen or fifteen days old, diluted with a solution of potash and hydrochloric acid. Stone [43] recommends twenty grains of mercurol in one ounce of vaseline. Tshitsherin [44] reports favorable results from the employment of phenosalyl, especially in ulcerating gummata.

Stimulation of the Granulations.—Having reduced the

inflammation and succeeded in cleansing the ulcer, the next thing to consider is the means by which granulation may be stimulated. This may be done by applications in the form of powders, solutions, or ointments. In the form of powders are used iodoform, aristol, nosophen, xeroform, orthoform, bismuth subnitrate and subgallate, boric acid, salol, antipyrin, sulphur, charcoal, lycopodium, zinc oxide, and other substances. In the form of solutions one may employ argentic nitrate, zinc and copper sulphate, potassium permanganate, formalin, ichthyol, balsam of Peru, camphor, myrrh, and benzoin. In the form of ointments, zinc oxide, boric acid, ichthyol, mercury, balsam of Peru, Lassar's paste, salicylic acid, and camphor are available. All of these drugs have their advocates. One of the oldest and best of the stimulant applications is balsam of Peru, which has a powerful effect in increasing the growth of granulations; but often, after this has been accomplished, the granulations are apt to become exuberant, with little tendency to cicatrization. In some cases it has considerable irritant action and may cause a dermatitis. Unna[45], twenty years ago, made a study of the action of certain drugs in regard to their effect on granulations. He found that carbolic acid, bichloride of mercury, and salicylic acid favor the growth of granulations, but hindered cicatrization. Iodoform and boric acid favored both, while pyrogallic acid, sulphur, and ichthyol particularly favored the growth of epithelium. The latter drug, which was introduced by Unna,[46] is useful not only for favoring the growth of epithelium, but also for reducing inflammation and stimulating granulations.

When an ulcer is particularly indolent, the application of the solid stick of nitrate of silver, or of solutions of nitrate of silver, zinc, or copper sulphate in strengths of from two to ten per cent., may, by inducing some inflammatory reaction, hasten granulation. The application of antiseptic and astringent powders finds its chief use when the discharge is profuse, the ulcer being covered after the application with a soft absorbent dressing. They may also be applied to advantage when the ulcer is quite small, with so little discharge that it may be healed under a scab. In painful ulcers orthoform is of great value on account of its analgesic action. In the majority of cases the best results are obtained with moist dressings, which, while they stimulate granulation, also absorb the discharge. Balsam of Peru and ichthyol have already been mentioned. In addition to these, one of the most valuable applications for promoting the healing of an ulcer is "red wash," made up after the formula: Zinc sulphate, gr. xx.; compound tincture of lavender, ʒ ss.; distilled water, ℥ viij. This solution has a powerful astringent action and promotes cicatrization, especially when there is a tendency for the granulations to become exuberant. Walbaum[47] recommends the application of wine of camphor under rubber tissue after sterilization of the parts and reduction of inflammation with liquor aluminis acetatis. Kindler[48] has obtained good results in the treatment of chronic ulcers with hot water, using two litres of water as hot as could be borne, and allowing it to fall on the ulcer from a height of six feet. This was repeated two or three times a day, and the procedure was followed by the application of iodoform or dermatol.

In regard to the employment of ointments, it may be said that their use is generally contraindicated where there is a very profuse discharge, as they prevent its absorption by the dressing. It has also been observed that there is often a tendency for the granulations to become soft and flabby under their influence. They are often valuable, however, in combination with the fluid applications, especially where the discharge is small in amount and apt to dry, and also when the ulcer is surrounded by an area of eczema or dermatitis. Under both these circumstances the ulcer may be dressed with gauze soaked in balsam of Peru, red wash, etc., and then, over this and the surrounding area, some form of bland ointment, such as Lassar's paste or zinc oxide ointment, spread on lint, should be applied. When used in this manner the ointment prevents the rapid absorption of the discharge by the underlying dressings and the subsequent drying and irritation of the ulcer; at the same time it exerts a soothing effect upon the surrounding inflamed skin. Schultz[49] strongly recommends the use of camphor in the form of an ointment for chronic leg ulcers. He says: "Of all the remedies, new or old, for ulcer of the leg, camphor gives the best results." He gives two formulæ: (1) Triturated camphor, ʒ ss.; zinc oxide, ʒ viiss.; lard, ad ℥ iv. (2) Triturated camphor, ℥ ss.; zinc oxide, ℥ iij.; and olive oil, ℥ iij.

In addition to the use of the above applications, various other therapeutic measures have been employed for stimulating granulations and promoting healing of chronic ulcers. Oxygen gas has been recommended by Semple.[49] Galvanism and high-frequency electric currents have been used by several since the publication of the cases of Meyer and Blackwood,[50] but apparently they have little to recommend them as being superior to other methods. Heeve[51] reports favorable results in the treatment of chronic leg ulcers by means of the *x*-ray combined with the brush discharge. Zarabin[52] and others have also cured varicose ulcers by means of the *x*-ray. The subject of radiotherapy and phototherapy will be taken up in the consideration of the treatment of special forms of ulcer. In a certain number of cases in which there has been a considerable loss of substance, which it is desirable to replace by granulations, the method of sponge grafting, introduced by Hamilton,[53] may be of use. Briefly, this consists in the application of a sterilized piece of sea sponge to the area to be grafted, the aim being to cause the granulations to grow into and fill the spaces in the sponge, which latter is subsequently absorbed, its place being taken by the granulation tissue. Sometimes this is successful, but frequently the sponge acts as an irritating foreign body.

Relief of Congestion and the Establishment of a Proper Blood Supply.—In the case of chronic leg ulcers, and especially those associated with varicose veins, it is impossible to effect a cure until the chronic congestion of the limb is relieved and the blood supply of the part approaches normal. Often all that is necessary is a muslin or flannel bandage properly applied over the dressing, and reaching from the toes to the knee. Volkmann[54] in 1862 first suggested the use, for ulcers of the leg, of occlusive cotton dressings. He used a thick layer of cotton, bandaged on with firm even pressure and left in place until the odor of decomposition appeared. Lister's method was similar to this, only he used protective over the ulcer, after sterilizing it and the limb, and then enveloped the latter in borated cotton. Martin's[55] rubber bandage, when applied with moderate, even pressure, has for its purpose the relief of congestion, but in some cases the rubber has an irritating effect on the skin. Unna's paint as a dressing for chronic leg ulcers is strongly recommended by Michel.[56] It is made from glycerin and water, āā 10 parts, gelatin and white oxide of zinc āā 4 parts. The leg should be cleaned, rubbed with alcohol, and dried thoroughly. The paint is warmed until it becomes fluid, and then it is applied all over the leg, including the ulcer, from the toes to the knee. A wide-meshed gauze bandage is then applied without reverses, care being taken to avoid wrinkles and to exert an even pressure. Over this is then painted another coat of the mixture. When cold the dressing looks and feels like white rubber. If properly applied, such a dressing should last for from four to eight weeks. If there is much discharge, a window may be cut over the ulcer, through which it may be dressed. Gaudin[57] employs a somewhat similar method, using traumatol and starch bandages, so applied as to draw the edges of the ulcer as much together as possible.

When the granulations are almost on a level with the surrounding skin, and also when there is considerable thickening of the edges of the ulcer, the best means of keeping up an even pressure, and causing absorption of the thickened margins, as well as hastening epithelial growth, is to apply zinc oxide adhesive plaster in strips one-half to one inch in width. These strips should overlap to the extent of about one-third of their width, should be evenly and smoothly applied, and should extend about three-fourths of the way around the limb. They should be started about one inch below the ulcer, and should run up one inch above it. When the callosity of the edges is very marked, it can often be made to disappear by the application of a piece of wood or metal a little larger than the ulcer, tightly strapped on so as to overlap and make firm pressure on the edges. In a considerable number of chronic leg ulcers, however, it will be found that the various methods which I have described are inadequate, and that satisfactory results can be attained only by putting the patient to bed and keeping the leg slightly elevated. Probably a great many of the favorable results obtained from the various therapeutic measures so highly recommended by different writers, are largely due to the adoption of the measures last named. It is also necessary in some cases to immobilize the limb when the ulcer is over a joint, for the motion of the latter prevents healing.

When varicose veins are associated with chronic ulcers of the leg, which fail to heal under the above methods of treatment, various operative measures may aid in effecting a cure. Multiple ligation of the veins with or without excision, or ligation of the internal saphenous after the method of Trendelenburg, may, by directing the circulation through the deep veins, relieve the superficial congestion, and aid in effecting a cure in obstinate cases. Wenzel[58] has obtained very favorable results in the cure of varicose ulcer by means of a circular incision at the junction of the lower and middle thirds of the thigh, and the resection of from one-half to one and one-half inches of all the cutaneous veins in the wound. In this connection should be mentioned the operations advocated by several French writers, who believe that the relationship which exists between an ulcer of the leg and varicose veins is effected through the nerves, the degeneration or chronic inflammation of which produces trophic disturbances. Silvy[9] recommends fascicular dissociation of the sciatic nerve. Chipault[59] reports favorable results in cases of chronic ulcer by stretching the musculo-cutaneous, internal saphenous, sciatic, and external popliteal nerves. Thernot[60] reports the cure of a recurrent traumatic ulcer by stretching the external popliteal and saphenous nerves, with resection of the saphenous vein.

Promotion of Cicatrization and New Epithelial Growth.—The value of nitrate of silver and red wash as stimulants of the healing process has already been mentioned. They are also of value in producing cicatrization and promoting the covering of the ulcer with new epithelium. If the solid stick of nitrate of silver be touched very lightly to the edges just inside the pale bluish line of advancing epithelium, so as to produce a white film on the surface, this slight cauterization will be found to aid in strengthening and cornifying the new delicate, previously invisible epithelial cells, and in preventing them from being washed away by the discharge from the ulcer. The solid stick of nitrate of silver is also of value in destroying exuberant granulations which project above the surface of the surrounding skin; and often by piercing these flabby granulations in several places with the solid stick held perpendicular to the surface, cicatrization is hastened. After the granulations are level with the surrounding skin, the covering of the ulcer with new epithelium is hastened by the application of some smooth surface, along which the epithelium can spread. For this purpose zinc oxide adhesive plaster, thin rubber tissue, or protective may be used.

In a number of old chronic cases healing is prevented by the fact that the base of the ulcer cannot contract, owing to its being bound down by fibrous scar tissue. This binding down of the base and edges of the ulcer also tends to cut off the blood supply, and therefore in this additional manner the healing of the ulcer is hindered. For the relief of this condition a number of operations have been devised. Gaffky[61] employed mattress sutures, introduced through the normal skin beyond the edges of the ulcer and passing beneath it, out through the skin on the other side. By tightening these sutures over a button or metal plate the ulcer was lifted from the underlying tissues. Liston[62] introduced the method known as starring of the ulcer. He made a series of radiating incisions through the base and edges of the ulcer, the point from which the incisions radiated corresponding with the centre of the ulcer. In this and in the following operations, in order to obtain a favorable result, it is necessary that the incisions pass completely through the cicatricial tissue that forms the base and edges of the ulcer, into normal tissue. "Cross-hatching" of the base of the ulcer by means of a series of incisions at right angles to each other, and at a distance of about one-half inch apart, was suggested by Harbordt,[63] and is often of value in aiding healing of a chronic ulcer, the continued existence of which and failure to heal having been due to its thickened, adherent base and edges. The method of circumcision of the ulcer was introduced by Nussbaum.[64] This consists in making a circular incision around the ulcer, through the normal skin surrounding it. The procedure was modified by Hodgen,[65] who made a series of overlapping, short, curved incisions surrounding the ulcer, instead of the single circular incision. In these last two methods it is necessary that the incisions be made through normal skin, and that the wounds be made to gape—if necessary, by packing them with gauze.

When an ulcer is of considerable size, it is often impossible to secure healing, even by these methods. It may for a time appear as if it were going to heal, and a pale blue line of newly formed epithelium may spread out from the edges; but instead of the epithelium continuing its progress, at a subsequent dressing it will be found to have melted away. In these cases as well as in those in which the size of the ulcer would necessitate a long wait for a cure, or in which the subsequent contraction of the scar (as on the face or palm of the hand, for example) would produce deformity, skin grafting, skin transportation, or some form of plastic flap operation is indicated. The method of Reverdin, as modified by Thiersch,[66] is the one most frequently employed. (For the details of this method see the article on *Skin, Transplantation of.*)

The method of skin transportation, as devised by Wolfe,[67] and also by Lefort,[68] and which was further developed by Esmarch, consists in the use of the whole thickness of the skin, removed from a healthy surface, and tacked down by a few stitches to the edges of the surface to be covered. The advantages which this method possesses over the Thiersch method are these: the cosmetic result is better, the tissues are more elastic, and less contraction takes place. It is, however, much easier to make the Thiersch grafts adhere, and the area from which they have been obtained is easier to heal than if the entire thickness of the skin has been removed. Kellock[70] has suggested a method which consists in a combination of both skin grafting and skin transportation. After marking out an area of skin which is to be removed in its entire thickness, he cuts with a sharp razor, from the skin surrounding the marked-out area, a number of small, thin, superficial grafts, one edge of each being left attached to the margin of that area of skin which is to be removed in its entire thickness. The thin grafts are then reflected up over the central area where the skin is dissected up in its entire thickness, and the fat is removed from its under surface. Thus is obtained a graft, the centre of which consists of the entire thickness of the skin, the margins being only of thin epithelium. When the graft is put in its new position special care must be employed in spreading the thin margins, as they adhere first and retain the whole graft in position. This method has all the advantages of skin transportation, and the new graft is more apt to adhere than when the old methods are used.

The use of plastic flaps was first suggested by Graefe and Maas.[71] In this method a flap of skin from some neighboring part, left attached by a pedicle, is applied to the area to be covered, and after it has become adherent so that it can obtain its nourishment from its new base the pedicle is cut. Flaps may be taken from a part