of the wrist and in the supinators, with the occasional exception of the supinator longus. The wrist drops and the fingers are flexed at their distal joints. Some extension of the fingers, however, can be obtained through the action of the interossei and lumbricales. The typical distribution of the anæsthesia after actual division of the nerve above its cutaneous branches is along the outer part of the arm from the insertion of the deltoid to the lower third of the forearm, and there is more or less affection of the sensation of the dorsum of the hand, though in many cases there is little or no involvement of sensation.

The ULNAR NERVE is more exposed to INJURY than any other nerve in the body. In the wrist, at the elbow, and in the upper arm the nerve is liable to division from incised wounds, to pressure or contusion, or to involvement in fractures of the bone. Sometimes an apparently spontaneous ulnar neuritis is observed in persons otherwise in good health.

One peculiar accident is liable to affect the ulnar nerve as it passes behind the inner condyle of the humerus, namely, DISLOCATION from its bed. This accident is accompanied with more or less neuralgic pain referred to the region of distribution of its cutaneous branches, and with more or less involvement of the functions of the muscles to which it is distributed. The pain as well as the motor symptoms will be most marked when the arm is flexed. In short there is excited in the nerve at this point a localized neuritis. The accident, which is rare, may occur spontaneously during violent use of the arm, as in ball-playing and gymnastic exercise, or as the result of a contusion. Pain, numbness, and tingling along the ulnar side of the forearm and of the hand will indicate the moment of its occurrence and a cord can be felt running along the inner side of the epicondyle which reveals itself as the dislocated nerve through the aggravation of all these symptoms when pressed upon by the examining finger. To avoid extension of the neuritis and all the undesirable sequelæ of nerve degeneration, it is important that the nerve should be returned to its bed and securely fastened there. For this purpose a free incision should be made over the course of the dislocated nerve and a firm flap of connective tissue should be dissected up from the inner side of the condyle and turned outward over the nerve so as to bind it in its proper bed. The edge of this flap of connective tissue should be sutured to the capsular ligament of the elbow joint or to the periosteum of the humerus. It is wiser not to allow the needle to pass through the nerve sheath for fear of exciting neuralgic pains. The arm should be put up and fixed in extension and this position maintained until the parts shall have firmly united. If the symptoms of neuritis in the mean time have disappeared, the limb should be treated with massage, faradization, counter-irritation, active and passive motion, etc.

The MEDIAN NERVE is often INJURED, most frequently in incised wounds of the wrist. In the forearm it suffers in case of fracture of the ulnar and radius, and just above the elbow its course to the bicipital groove exposes it to injury. The nerve perforates the pronator radii teres, and it is possible for it to be injured in forcible contraction of this muscle without direct external violence.

The MUSCULO-SPIRAL NERVE is generally the sufferer in crutch paralysis from pressure in the axilla. Its close connection with the humerus leads to its frequent INJURY in case of fracture and to its frequent involvement in the callus or between the fragments. The most frequent cause of the paralysis is, however, damage to the nerve during sleep, the patient lying upon a hard bed with his arm under him. This is seen particularly in drunkards. In many cases this injury of the musculo-spiral nerve is due not so much to pressure as to stretching of the plexus by prolonged extension of the arm above the head. It is important for the surgeon to bear this in mind, as it is the frequent cause of arm paralysis after anæsthesia. The prognosis in paralysis of this description is almost invariably good; the most potent therapeutic agent being faradization of the affected muscles.

Progressive muscular atrophy and syringomyelia, together with the other spastic and paretic affections of the arm, though more properly due to nerve influences than to actual affections of the muscle, have nevertheless, for the sake of convenience, been treated above under the head of affections of the muscles.

VIII. HYSTERICAL LESIONS.

The elbow is a favorite seat for hysterical lesions, and the arm as a whole is frequently declared by the patient to be powerless, or may be held by perverted volition in some constrained attitude which may be the more natural one of extension, or of partial flexion, or again some strange or bizarre position from which the patient declares herself unable to move it.

The differentiation of hysterical from organic disease of the arm may be extremely difficult. Hysterical affections simulate especially disease of the joints. The differential diagnosis has been formulated by Dercum as follows: Hysterical disease of the joints is not associated with deformity and shortening of bone, nor with the formation of pus, nor with the local rigidity, nor with the septic temperature that is seen in tuberculous diseases. The stiffness is caused by contracture of the muscles, which is usually much more extensive than in organic disease, and the pain is usually more diffuse and more spontaneous. There are, moreover, characteristic mental and physical stigmata present. The hysterical patient dreads to move or assist in the examination of the limb, and obviously dwells upon each symptom, while she is very apt to have segmental anæsthesia in the affected limb or even hemianæsthesia of the body. A very significant symptom is paralysis of the limb, which is never present in tuberculous joint disease. Finally, under full etherization the hysterical joint is found to be freely movable in all directions. It must not be forgotten, however, that hysterical symptoms may be added to those of genuine organic disease of the joint.

Hysterical paralysis may be caused by emotion, such as fright, anger, chagrin, or disappointed love. It may vary in degree from slight loss of power to total palsy. The deep reflexes of the affected side are usually increased and the skin reflexes abolished. The tendency to contracture is often marked; some cases, however, present a flaccid type. In mild cases the nutrition of the limb is not affected, but in severe cases of long duration slight but distinct loss of volume may be noted. True atrophy with reaction of degeneration is practically unknown, and when present must throw a doubt over the exactness of the diagnosis. Hysterical paralysis is often accompanied also with anæsthesia or hyperæsthesia. The anæsthesia is likely to be sharply defined and limited to the paralyzed part. The boundary of the anæsthetic area will be at right angles to the long diameter of the limb. The paralyzed part may become œdematous and blue or mottled. The hyperæsthesia accompanying hysterical paralysis is usually hyperalgesia. This hyperalgesia may be attended with contracture. The painful cramp-like state of the muscles causes the patient to cry out and to shed tears. Hysterical paralysis is not as a rule confined to the distribution of particular nerve trunks; in other words, it is central, not peripheral. Contracture is very likely to coexist with paralysis in hysteria, still this is not a constant rule. Neither is the reverse true: that a contracted limb or muscle is always paralyzed. Hysterical contracture is most obstinate and resisting, being very difficult to overcome even with great force. Moreover, the antagonistic muscles are involved; in other words, the limb is drawn into a vise-like immobility. The contracture is sometimes so persistent that it does not relax even in sleep. It does relax, however, under ether or chloroform.

The duration of hysterical paralysis may be greatly prolonged. Some cases recover promptly, but others persist so long and simulate so closely the effects of organic disease that even the most careful observer may come to distrust the exactness of his diagnosis. The

termination of hysterical paralysis is sometimes sudden, following some shock or strong mental or moral impression. Sometimes, however, recovery is gradual under well-directed treatment.

IX. TUMORS.

Of the tumors affecting the arm and forearm none is peculiar to this locality. KELOIDS following scars of any sort are found here as elsewhere, as are the other forms of neoplasm which may develop from the skin or its appendages. FIBROMATA may occur on the arm in the form of painful subcutaneous nodules over the course of the superficial nerves. LIPOMATA are found with considerable frequency upon the upper extremities. They are most commonly of the cutaneous variety, and are found chiefly upon the posterior side of the arm and upon the ulnar side of the forearm, frequently also upon the shoulders and over the scapula. They have also been found burrowing beneath the muscles of the forearm.

SARCOMA sometimes occurs here as a primary growth, usually in the callus of a fracture or as a tumor of the bone. Secondary metastatic sarcomata may of course be deposited from the blood-vessels in the arm as elsewhere. In this case they are generally seen as subcutaneous sar comatous nodules.

CARCINOMA very rarely occurs excepting as a secondary growth from epithelioma of the hand. Epithelioma of the hand in turn develops with comparative frequency in old age from purely benign warts which are so frequently encountered upon the fingers, and a case has recently come under observation in which a verrucose condition existed symmetrically on the extensor aspect of each elbow, suggesting the possibility of a primary carcinoma in this region with a pathological history similar to that of epithelioma of the hand.

Leonard W. Bacon, Jr.

ARMY FIELD HOSPITAL ORGANIZATION.—The organization of a national military force must be so flexible as to permit of an efficient adjustment to the conditions of peace as well as to those of war. The United States Army as authorized by Congress consists of a number of regiments each subdivided into companies composed of a prescribed number of officers and enlisted men. In times of peace the regimental organization may be said to exist only in a latent condition, as the companies of a regiment may be scattered for garrison duty at various military stations, each having no communication with the others except that usually, but not always, all are serving in the same military department and under the command of the same general officer. The army practically consists of the garrisons of sea-coast fortifications, of posts on the national frontiers, and of certain important points in the interior. In time of war, however, the companies are aggregated under the regimental flag, the regiment being the tactical unit for war purposes. Two or more regiments under the same immediate commander constitute a brigade; two or more brigades constitute a division, and two or more divisions form an army corps. The medical organization of the army must have a similar flexibility to enable it to do its duty efficiently under these different conditions.

At a small post garrisoned by one or two companies in time of peace, one medical officer has to discharge all the duties of the medical department. He is the sanitary or health officer of the command, charged with the duty of supervising the hygiene of the post under the direction of the commanding officer and of recommending such measures as he may deem necessary to prevent or diminish disease. He is the surgeon in charge of the post hospital, responsible for its condition and efficiency, its food and medical supplies and its medical records. He is attending surgeon, responsible for the proper care and judicious treatment of the sick and wounded; and as commanding officer of the detachment of hospital corps men on duty at the post, he is responsible for their subsistence, clothing, and equipment, for their instruction in their special duties, and for their discipline. At a larger post, where two or more medical officers are stationed, the senior medical officer is responsible for the whole of the work of his department, but the details of certain of the duties are carried out by his assistants.

When a small expeditionary force of one or two companies leaves a military post a medical officer is assigned to accompany it. Before starting, this medical officer duly considers the probable issues of the expedition as affecting the well-being of the men engaged in it, and makes suitable provision for their occurrence so far as can be done with existing facilities or under existing restrictions. From the supplies of the post hospital he obtains such medicines, instruments, dressings, stimulants, and medical comforts as may be necessary. If the military operations are to be conducted in a difficult mountain country these supplies are packed on mule-back; but if the roads are passable to wheeled vehicles, an ambulance wagon accompanies the expedition for the transportation of sick or wounded men, while stores and hospital canvas are carried in one of the heavier wagons. An acting hospital steward and a few privates of the hospital corps constitute the personnel of this elementary field hospital. On the march the ambulance wagon follows in rear of the column of troops, constituting an ambulant or travelling hospital. When camp is reached the medical officer selects a suitable site for his hospital tents, to which his patients are transferred and in which they are fed and otherwise cared for by his men. If casualties occur from an engagement with the enemy, the medical officer gives such aid to the wounded as is possible on the field and superintends their removal to the hospital, the ambulance wagon or stretchers being used for their transportation according to the distance or to the character of the injuries sustained in individual cases. At the hospital the needful surgical assistance is rendered and the wounded are treated until facilities are afforded for their transfer to some permanent military post. But the military conditions necessitating advance or retreat may call for the removal of the wounded from the field hospital at the earliest possible moment, in which case, if the ambulance is insufficient for the needs of the occasion, certain of the supply wagons which have been emptied during the progress of the march or campaign may be utilized for their transportation to some neighboring post or with the command until an opportunity is afforded of transporting them to a permanent establishment.

If the command is larger, consisting of several hundred men, provision is necessarily made for a larger number of sick and wounded. The surgeon is accompanied by one or more assistants, and by a hospital steward in charge of supplies. The hospital train consists of two or three ambulances and a heavy wagon containing the supplies, tents, stretchers, hair mattresses, blankets, and a mess chest and kitchen utensils. Before starting on the expedition assignments of men are made for hospital duty, as for stretcher bearers, cooks, and nurses. The surgeon exercises general supervision, acting as medical officer on the staff of the commander, or as health officer of the command. The senior assistant has charge of the ambulant hospital; the junior keeps the records and carries out special instructions in individual cases.

Since the close of the civil war many such expeditions have been sent out from our military posts, and in some of these, as in the Sioux Indian disturbances of 1890, several thousand men, detached from various military posts, were organized for field service. Each detachment brought with it to the rendezvous its medical officers, hospital corps men, ambulances, and medical supplies for the formation of the medical department of the expeditionary force. The chief surgeon of the consolidated command organized this department. He established a hospital for the treatment of serious cases of sickness or wounds, and assigned medical officers, stewards, nurses, cooks, and attendants to carry on its work. He organized an ambulance corps and a company of litter bearers to operate in connection with the hos-

pital, and certain members of the medical and hospital corps were left with the troops to treat the lighter cases, to give immediate assistance in emergency cases, and to send to the hospital those who could not be treated to advantage in their company quarters. With a sufficiency of experienced medical officers and well-trained members of the hospital corps, there is no difficulty in organizing the medical and hospital forces of various detachments of regular troops into a hospital service competent to meet all the needs of such a special expedition; but if in the opinion of the chief surgeon the available personnel and supplies are insufficient for the purpose, a requisition is made on the surgeon-general of the army to supply deficiencies.

In time of war, however, the regiment is the unit of organization for masses of men. Ordinarily it consists of ten or twelve companies of about 100 men in each; but the number of companies and of men varies in accordance with Congressional acts affecting the organization of the army. At present the regiment of infantry consists of three battalions of four companies each. The company has, when full, an enlisted strength of 111 to 128 men, and the regiment aggregates 1,413 to 1,617 commissioned and enlisted. The regiments of volunteer infantry now serving in the Philippine Islands also are three-battalion regiments, aggregating, when full, 1,342 officers and men. Congress has authorized to each a surgeon and two assistants, the surgeon having the rank of major and the assistants that of captain and first lieutenant, respectively. This medical force is insufficient for the performance of all the duties incidental to the care of so large a command. There should be at least three assistants, one for each of the battalions. As the strength of the regiment varies from time to time, according to existing legislation, the medical provision authorized for it is also variable. At the present time there are allowed to each regiment one hospital steward, three acting hospital stewards, and twelve privates of the hospital corps. Two four-horse wagons are allowed for each hospital and three or four ambulances, or at the rate of one ambulance for every four hundred men of the effective force. If members of the hospital corps cannot be obtained as drivers, the Quartermaster's Department is authorized to hire civilians for this purpose. The tentage consists of four hospital tents, two of which are used as wards, one as dispensary and for storage, and one as a mess tent. Each hospital tent is fitted up for the care of five patients. There are in addition to the hospital tents two common tents for non-commissioned officers, three common tents for privates, and one common tent as a cook tent. The allowance of medical supplies and hospital property is very liberal, and is fixed by the surgeon-general. It consists of two medical and two surgical chests, a sterilizer, a filter, and hospital corps and orderly pouches; chloride of lime as a disinfectant: cream, farina, whiskey, and castile soap as hospital stores; folding field furniture with desk, food and mess chests, and an ample supply of bedding for ten patients, together with the many miscellaneous articles that are needful in the dispensary and ward. The purpose of the regimental hospital in field service is to furnish protection and care to the sick of the command while on a march or in the field, or to those temporarily sick in camps of instruction. It is an emergency hospital in the one case and a detention hospital in the other, but is not intended for the treatment of seriously ill patients who, in the event of a move, would prove to be an incumbrance to the regiment. When such cases are found they are to be transferred promptly to some hospital less exposed to the vicissitudes of war. But in certain cases when regiments are isolated, or when the sick cannot be sent to another hospital, the regimental hospital may be expanded to meet the necessities of the case.

But when troops are aggregated in large camps for war purposes the regiments are brigaded and the brigades organized into divisions and corps to facilitate the coordination of their movements in active service. The general commanding cannot handle a large army by regiments, nor can the chief surgeon of such an army have a competent field hospital organization on a regimental basis. On this basis there are as many small hospitals as there are regiments. But these regiments are in camp for field service, and as soon as the orders to march are published, the inaptitude of their hospitals to meet the new conditions becomes manifest. Military policy dictates that a column of troops on the march should be a column of fighting men, unbroken, at regimental intervals, by ambulances carrying sick men and by wagons with medical or other supplies. The ambulances with the sick are, therefore, aggregated into a single train, with position in rear of the last regiment, forming practically a general ambulant hospital for the command. The wagons containing the tents and hospital stores form part of the general supply train, which follows the command under the protection of the rear guard. On arriving at the site selected as the camp ground for the night, the ambulances which have travelled as an aggregate hospital during the day become separated into their regimental elements, each camping in the vicinity of its own command; and as the regiments may be widely scattered, many of them at considerable distances from the direct line of march, the day's march for the sick men may be thus needlessly lengthened. The troops, who carry their shelter tents and rations with them, are able to make themselves comfortable as soon as the camping ground is reached, but the hospital attendants must await the arrival of the rear guard and the wagon train before they can place the tired and suffering sick under shelter and refresh them with appropriate nourishment. Delays of this kind are especially frequent in wet and inclement weather, when the condition of the roads impedes the progress of the supply train.

But it is chiefly during and after a battle that the incompetency of the regimental system of hospital organization is manifested. The hospitals are scattered at various distances from one another along the rear of the line held by the troops. They are inconspicuous, and not easily reached by such wounded as come rearward without assistance or guide. No satisfactory supervision can be exercised over them. Some of the regiments suffer more than others. Their ambulances and stretcher bearers are unable to remove the wounded with promptitude from their exposed position in the field. The medical officers are overworked yet cannot accomplish all that should be done. Their hospital shelters are insufficient, and their supplies perhaps inadequate. Meanwhile the medical officers of those regiments that have not become engaged, or have not suffered severely, are at their posts awaiting developments on the line of battle. If there seems to be no prospect of an immediate call to action, these officers may assist their overworked comrades; but they may show some hesitancy in sharing their stores and dressings with others if there is a likelihood of their own commands becoming engaged before opportunity is afforded for replenishing these at a purveying depot. In fact, a regiment may at any time have more wounded men than can be provided for within the limits of a regimental hospital.

If a brigade of two or three regiments is operating as an independent command, a brigade field hospital is established by consolidating the medical and hospital equipment of the regiments. When the line of march is taken up the ambulances and transport wagons of the hospital follow in rear of the marching column. Two medical officers are placed on duty with this ambulant hospital, while the others remain with their respective regiments to give care to new cases until their transfer to the hospital is effected. This brigade hospital is not broken up into its regimental elements on reaching camp, but preserves its organization under canvas as on the march. In the event of an encounter with the enemy the hospital staff is strengthened. Standing orders in this event prescribe the special duties of every medical officer of the command. These are issued on the recommendation of the brigade surgeon. One surgeon is assigned to duty as the operator for the command. Three

medical officers are detailed as his assistants; the others give first aid on the field. As soon as the position of the line of battle is determined the brigade surgeon selects the site for the hospital, which is immediately established, while the ambulances and stretcher bearers proceed to the front to bring in the wounded. Thus, though but one regiment may suffer, the medical strength of the brigade contributes to the care of its wounded. The medical officers detailed to accompany the regiments in the field select the nearest point to the line of battle where some shelter from infantry fire may be obtained. The nature of the ground often renders it advisable for the medical officers of several regiments to aggregate at one point, to which the wounded are assisted or borne upon stretchers; but although there may be a large accumulation of wounded at such a point, it is never recognized as a field hospital, but as an ambulance depot, to which wagons repair for the conveyance of the sufferers from the field of danger. Water supplies and stimulants are to be found at these depots, where the wounded are prepared for transportation to the hospital.

Some of the objections to regimental hospitals in field service are applicable as well to brigade hospitals when large bodies of troops are serving together. It is inadvisable for military reasons to have the marching column of a large army broken up at brigade intervals by hospital trains. And as one regiment of a brigade may suffer more than another from contact with the enemy, so one brigade of a division may bear the brunt of a battle in which the whole division was more or less engaged. The brigade may at any time have more wounded men than can be provided for within the limits of a brigade hospital. Hence the necessity for a further consolidation or a higher organization, the division field hospital. We do not know what have been the maxima of battle losses suffered by commands of various strengths, but as in a division one brigade will suffer more than another, it follows that the loss expressed as a proportion of the number of men engaged will be smaller in a large than in a small command, and that there will be better facilities for the care of the wounded in a division hospital than in one based on a smaller military unit.

The experience of the civil war shows that if a division hospital is thoroughly prepared to give the needful primary attention to twelve hundred wounded, the history of its service will not fail to give satisfaction. All ordinary and probable occasions will be provided for, and, if the extraordinary and unlikely should occur, the circumstances which attend them may be susceptible of being turned to account in the interest of the wounded.

The ratio of killed and wounded is found to have varied considerably in different engagements, and especially if the casualties in small constituent parts of the army are made the basis of the calculation; but the rate obtained from the summary of engagements and battles in the "Surgical History of the War of the Rebellion" may be accepted as indicating the probabilities:

	Killed.	Wounded.
United States troops	59,860	280,040
Confederate troops	51,425	227,871
	111,285	507,911

This corresponds to one man killed for every 4,564 wounded; or, in percentage of casualties, killed 17.97, wounded 82.03.

For a division of ten or twelve thousand men to have ten to twelve hundred wounded in one engagement implies a loss to it in killed and wounded, and to the army of which it is a part, which ordinarily involves days of recuperation before the struggle can be renewed. This lengthens the existence of the hospital, giving an extra day or two to complete the primary operations, and permitting medical men, hitherto on duty at ambulance depots on the field, to reinforce the hospital staff and hasten the completion of the work.

During the civil war the medical service of our volunteer armies was organized at first on the regimental basis, but the incompetency of this to give prompt and judicious care to the wounded during and after an engagement was soon recognized. Cooperation between regimental hospitals established in the same locality, particularly if supervised by a brigade surgeon, constituted an extemporized brigade hospital for the emergency. Prior to the battle of Antietam, Dr. Jonathan Letterman, Medical Director of the Army of the Potomac, made arrangements by which the surgical work of each division should be done at a field hospital for the division. As soon as the probability of an engagement was recognized a site was selected. The wagons with their tentage and supplies were brought up and the ambulances were sent to the front. The surgeons designated for hospital duty reported from their regiments. One took general charge of the preparations for the reception of the wounded, a second supervised the work of the hospital kitchens, a third recorded the cases as they were received, and three operators, each with three assistants, reported for surgical work. Medical officers not assigned to specific duties at the hospital accompanied their regiments to give first aid. This extemporized hospital was a great improvement on the want of system which led to its establishment. After proper disposition was made of the wounded the hospital ceased to exist until another battle was imminent. The medical department of the division reverted to its regimental status.

The success which attended this experiment led ultimately to the organization of a permanent field hospital with its attached ambulance company for the division. It had a surgeon in charge with three or four assistants permanently assigned. In the twelve or more army wagons attached to it were carried hospital canvas, cots and bedding, underclothes, food supplies and kitchen utensils, medical and surgical stores and supplies, forage, and the personal baggage of officers and men. The supply of hospital shelter, cots, bedding, and underclothes in such an ambulant hospital is measured not by the total number of casualties in a battle, but by the number of cases of severe wounds. This number includes only about twenty per cent. of the total; hence if provision is made for two hundred patients, the severely wounded may be properly cared for under all but the most exceptional conditions. To extemporize couches for the slighter cases when the total exceeds two hundred, bedsacks which are light and occupy but little space should be carried. The food supplies include the ordinary army rations for the men of the command, issued from the general subsistence train, together with special rations for twelve hundred men for one day, for use in case of an engagement, to insure food supplies to the wounded until communication is opened with the supply trains after the battle.

The number of ambulances attached to the division of twelve thousand men should not be less than thirty. Many men with flesh wounds and even fractures of the upper extremity find their way to the hospital on foot. Others bear transportation comfortably in the sitting position, and an ambulance can carry six or more such cases per trip according to its plan and construction. Nearly twenty per cent. of the total require to be carried in the recumbent position, which, in some distressing instances, must be effected by the litter bearers. A wagon when laden with such cases can carry only three, two severe cases within and one of less gravity on the seat with the driver. The number of those who reach the hospital without ambulance transport is always large, but it is relatively larger after severe engagements, for, when the stations are crowded with men awaiting transportation, many will undertake the journey on foot, rather than await the return of the wagons. The ambulance wagons should be used but seldom for the removal of the wounded from the field hospital en route to the base, and only when they can return in time to secure a few hours' rest before the order to march has to be carried out. They should be regarded as a formal part of the field hospital, and ought not to be separated from it without a thorough knowledge of the military