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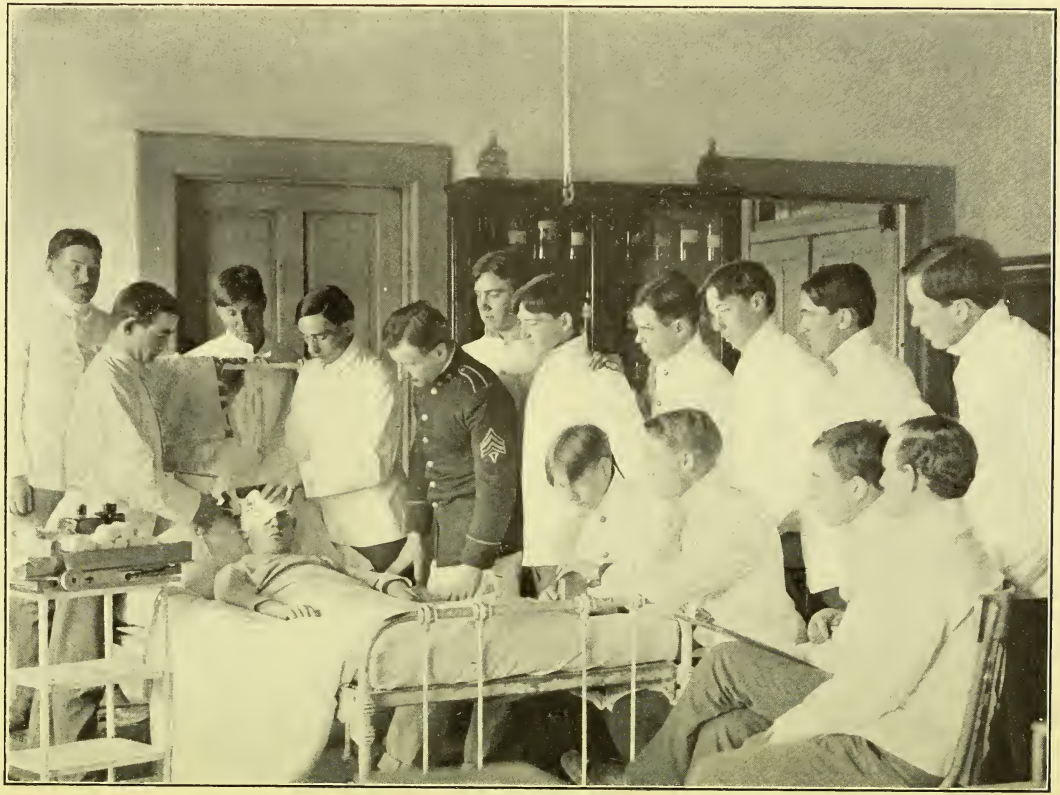

Class being Instructed in the Dressing of Wounds.

A COMPLETE HANDBOOK

FOR THE

HOSPITAL CORPS

OF THE

U. S. ARMY AND NAVY

AND

STATE MILITARY FORCES

BY

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Approved by the Surgeon-Generals of the Army and Navy

PROFUSELY ILLUSTRATED

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MDCCCCVI

Surgeon-General R. M. O'Reilly, U. S. Army.

GENERAL:—The adoption of a regular scheme of instruction for the hospital corps has occasioned the demand for a handbook which would include in concise form and in one volume all the various subjects taught, thus doing away with the necessity for some half-dozen or more books, from which what was needed must be carefully culled.

While it was desired to revise and retain in use the handbook of the late General Smart, which has done such good service in the advancement of the hospital corps toward the higher standard of training now required of them, it was found impracticable to do so, as it did not include many of the subjects now taught. It has, however, been freely drawn upon for material and illustrations used in the present volume, and the indebtedness is hereby acknowledged.

Very respectfully,

CHARLES FIELD MASON,

Major, Surgeon, U. S. Army.

WASHINGTON, January 1, 1906.

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A

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PART I.

THE HOSPITAL CORPS IN POST AND FIELD.

CHAPTER I.

THE HOSPITAL CORPS IN POST.

The medical department is composed of medical officers, contract surgeons and contract dental surgeons, the hospital corps, and the nurse corps (female).

The hospital corps consists of sergeants first class, sergeants, corporals, lance corporals, privates first class, and privates. The sergeants first class, and sergeants correspond to the former hospital stewards and acting hospital stewards; the number of the former is at present limited by law to 300; the number in the other grades is a matter of regulation; at present there are allowed 300 sergeants and 20 corporals; the total number of privates first class must bear a relation to the number of privates, not exceeding two to one. All original enlistments are in the grade of private.

Enlisted men may be transferred from the line to the hospital corps as privates. Married men are not accepted as recruits, nor transferred from the line for service in the corps. Candidates for enlistment should apply to a post medical officer or to a recruiting officer. Applicants who have graduated in pharmacy, or who have had training as nurses in civil hospitals, should present certificates of their special qualifications. Slight physical defects which, under existing orders, would disqualify for the line, do not disqualify for enlistment in the corps, provided they are not of such a character as would interfere with the full performance of the duties of a sanitary soldier in garrison or in the field. If a candidate is accepted he is forwarded to a company or detachment of the corps for instruction in: 1. Discipline and the duties of a soldier; 2. Care of animals and equitation; 3. Drill and field work; 4. Anatomy and physiology; 5. First aid; 6.

Nursing; 7. Army Regulations; 8. Cooking; 9. Materia medica and pharmacy; 10. Elementary hygiene; 11. Clerical work. All privates are instructed in the first seven subjects, and those who show special aptitude take the complete course.

Companies of instruction are established at such points as may be directed by the Secretary of War. At present there are companies at Washington Barracks, D. C., and the Presidio of San Francisco, California. The course prescribed by the Surgeon-General is both theoretical and practical and covers a period of four months.

The object of the detachments of instruction is to provide an emergency reserve of hospital corps men under the immediate direction of the department commander and chief surgeon; there is at least one in each military department, usually at the largest and most conveniently located post.

When the theoretical education of the recruit is considered complete he is assigned to duty at some post where his services are utilized as nurse, cook, or attendant, according to his special qualifications.

Privates first class or privates of the hospital corps who have shown special proficiency may be recommended for promotion by the surgeon. To test their capacity for performing the duties of a noncommissioned officer, they may be first detailed as lance corporals. Before being appointed sergeants they must pass an examination as to physical condition, character and habits, and general aptitude, and in the principles of arithmetic, in orthography and penmanship, in materia medica and pharmacy, care of sick and ward management, minor surgery and first aid, elementary hygiene, cooking and mess management, Army Regulations, clerical work and hospital corps drill.

Sergeants who have served a year as such, or enlisted men of the hospital corps who served as hospital stewards of volunteers or acted in that capacity for more than six months during and since the Spanish-American war, may be appointed sergeants first class upon the recommendation of the Surgeon-General, provided they have successfully passed a more extensive and detailed examination in the above subjects than is required for promotion to the grade of sergeant. A reëxamination before his first reënlistment may not be required if the surgeon certifies that the candidate has performed

his duties efficiently; but a reëxamination is called for before a second reënlistment, after which no further examination is ordinarily required.

Army Regulations provide for at least one noncommissioned officer and four privates at each permanent military post, with an additional noncommissioned officer for every additional four privates; six privates when the garrison is two hundred, and two privates additional for every additional one hundred of strength.

The uniform of the hospital corps for ordinary wear is the same as that of the line except that the facings are of maroon-colored cloth and that the caduceus is the emblem of the corps. Privates first class are distinguished from privates by wearing a caduceus upon the sleeves of the blouse above the elbow. For duty in the wards, kitchen, dispensary, and operating-room a uniform of white cotton duck is worn. The hospital corps man's equipment is detailed in the Drill Regulations.

The duties of the hospital corps in time of peace are largely confined to the hospital service; that they are many, varied, and important may be gathered from the scope of the scheme of instruction detailed in the following pages.

The peace hospitals of the army are of two kinds, *post hospitals* and *general hospitals;* they are distinguished from each other by the fact that the former usually receive only the sick of the post to which they belong, while the general hospitals receive the sick from widely separated commands. Some of the general hospitals are of a special nature, such as that at Fort Bayard for the treatment of tuberculosis, and the general hospital at Hot Springs, Arkansas, for the treatment of cases requiring a course of bathing.

The duties of noncommissioned officers are, under the direction of the surgeon, to look after and distribute hospital stores and supplies; to care for hospital property; to compound and administer medicines; to supervise the preparation and serving of food; to maintain discipline in the hospital and watch over its general police; to prepare the hospital reports and returns; to supervise the duties of the hospital corps in hospital and in the field; to assist the medical officers in their sanitary duties and to perform such other duties connected with their positions as may, by proper authority, be required of them.

The senior noncommissioned officer must be an efficient discipli-

narian, expert clerk, accurate arithmetician, and a trustworthy pharmacist, with as much knowledge of materia medica, therapeutics, and minor surgery as will enable him to give sound advice and suitable treatment in the minor ailments and accidents which in civil life are dependent on the resources of domestic medicine or the knowledge of the nearest pharmacist; in addition, he must have that higher knowledge, for use in the wards, which enables the experienced nurse to appreciate the condition of those who are seriously ill, that their improvement may be fostered and all harmful influences excluded. At small posts, during the temporary absence of the surgeon, the unforeseen casualties and even many of the exigencies of military life impose duties upon him the satisfactory performance of which may be of the first importance to the individuals concerned.

The daily routine of the service of a post hospital begins at reveille, when, after roll call, the wards are tidied up and breakfast is served and cleared away before sick-call is sounded. Promptly on this call a noncommissioned officer from each company brings his sick to the place designated for their inspection; usually the hospital or a dispensary. The surgeon examines each man, indicating in the company sick report book those who are to be treated in hospital and those who are to be excused from duty or portions thereof as sick in quarters, etc. Morning reports are then sent to the adjutant's office for the information of the commanding officer. Prescriptions for those in quarters are now filled, and the register of sick and wounded is brought up to date by the careful entry of the morning's changes. After breakfast the wards are visited and the prescription and diet orders recorded. After this the kitchen, dining-room, and other parts of the hospital are inspected, and the regulation visit is at an end. Emergency calls bring the medical officer to the hospital at any hour, and generally, when serious cases are on hand, he may be expected before retreat or tattoo. After the morning visit he attends to his patients in the families of officers, married soldiers, laundresses, and other attachés of the garrison, and his prescriptions reach the dispensary from time to time during the forenoon. By the time these are filled the senior noncommissioned officer has posted the records, supplied the wards with needful articles of bedding, etc., given directions for the diet of the day, and provided the required supplies from his sub-

sistence stores and special diet fund and hospital fund purchases. The afternoon may be devoted to instruction, exercises, or amusements, in the absence of special call for its occupation otherwise, and the evening to study, or, at certain periods, to the preparation of official reports and papers. The studies of the members of the corps are naturally such as will fit them to act intelligently in all matters relating to the management of the hospital and the sick and wounded. Every surgeon supervises the instruction of his men and the higher education of his noncommissioned officers; the latter guide and perform similar offices to those who serve under them. The medical officer is required by regulations to devote at least five hours each week to instructing the men of the corps in their various duties. These duties will eventually lead every capable member of the corps to the position of a noncommissioned officer; but besides this personal influence they serve a higher end by preparing the corps for a sudden expansion in time of war. When every sergeant is qualified to undertake the duties of a sergeant first class, and every private ready to step into a higher position, the expansion of the command can be effected by merely recruiting for the lowest grade.

The surgeon is responsible for the timely and accurate rendition of the reports and papers required in the service of a post hospital; but the work, except in the case of special and professional reports, is usually performed by a member of the corps, to whom the clerical work has been assigned. For all routine reports blank forms are provided by the War Department, and full instructions are printed on each of these to insure accuracy, the said instructions having the force of Army Regulations.

CHAPTER II.

IN THE FIELD.

THE duties of the hospital corps in the field are even more varied and important than in time of peace and are apt to be more clearly defined. Thus some men will be assigned as litter-bearers, others as nurses, orderlies, cooks, operating-room assistants, etc. It is necessary that even privates should understand something of the field organization of the medical department.

Each regiment has a detachment of the hospital corps consisting of three noncommissioned officers and nine privates, with proportionate quota for similar organizations; for each division of about 18,000 men there are four field hospitals, each divisible into a hospital section and an ambulance company section.

"The service of the medical department in the field is divided into:

"*Service of the front*, comprising all medical department formations which march with troops.

"*Service of the rear*, comprising all medical department formations which belong to the army but do not march with it." F. S. R., 632, 1904.

"The lines of medical assistance for an army traced from front to base are as follows:

"*Front:* Regimental aid. Field hospitals, including ambulance company sections. Advanced medical supply depots.

"*Rear:* Stationary hospitals and rest stations on the lines of communications. Base or general hospitals at base of operations. Convalescent camps. Base medical supply depots" (Fig. 1). F. S. R., 633, 1904.

Service in camp: "In camp, regiments brigaded will establish regimental infirmaries and not regimental hospitals. These infirmaries will care for emergency cases and for those slightly sick or injured. All serious cases will be promptly transferred to field hospitals, which will be located by division surgeons.

"Regiments operating independently, or at such great distances

from field hospitals that it is impracticable to transfer serious cases to them, will under authority of the division surgeon, establish regi-

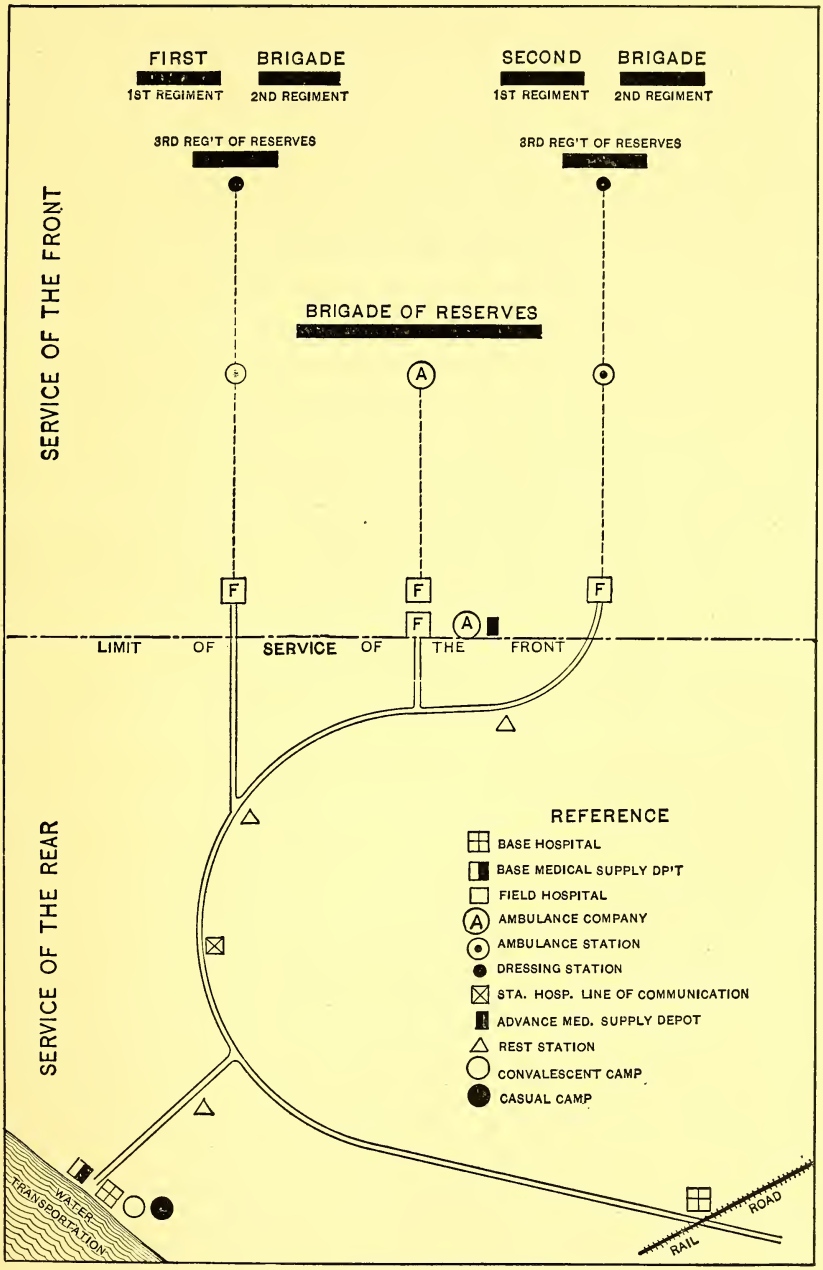


FIG. 1.—The Lines of Medical Assistance in Battle.

mental hospitals. These hospitals should have their full personnel and equipment which should always accompany regiments changing base, except in the operations of an active campaign, when the personnel will be assigned and the equipment stored under direction of the division surgeon" (Fig. 2). F. S. R., 644, 1904.

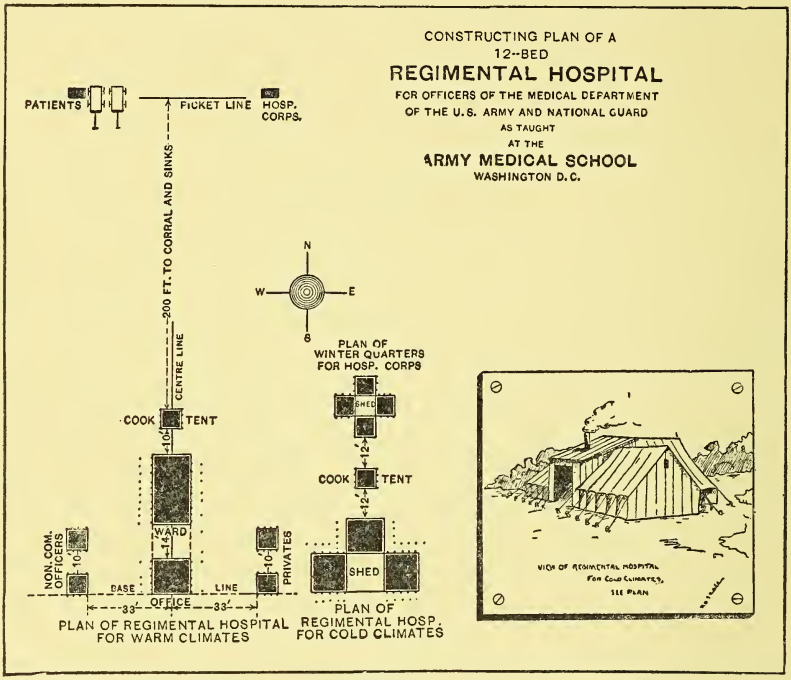


FIG. 2.

The ambulance company sections camp near the field hospitals to which they belong, so as to render all necessary aid. The field hospitals are located at convenient points. Each has a capacity of 108 patients in 18 tents.

The advanced medical supply depots are located at convenient points.

"When the command moves forward the sanitary personnel of the troops should be promptly relieved by corresponding units from the 'service of the rear.' In case of retreat the necessary personnel remains with the immobile sick and wounded under protection of the Geneva Convention." F. S. R., 646, 1904.

On the march: Camp is usually broken up soon after reveille. Ambulance drivers and teamsters groom, feed, and water their animals; litter-bearers pack up their shelters and blankets, and fill the ambulance kegs with fresh water, while nurses and cooks attend to their respective duties. After breakfast the sick are examined and medicines prescribed and provided for their use during the day. They are then transferred to the ambulances, while the hospital tents and bedding, kitchen utensils, and other property are packed up and stowed away in the heavy wagons, which have by this time reported for their loads.

"The regimental medical officers will habitually accompany their regiment, the senior with the commander at the head, one junior with the ambulance at the rear, the other at the rear of the leading battalion." F. S. R., 647, 1904.

On ordinary marches the field hospitals will march in rear of the last regiment of the division.

Usually when an engagement is in prospect the personnel for a dressing station, with pack transportation to carry the equipment, will march at the rear of each brigade, except the first which will be followed by an ambulance company. The field hospitals will ordinarily march at the rear of the division; but when there are several divisions in one column one field hospital from each division would usually be held in reserve and march with the "second line" of ammunition columns and trains, that is, a short day's march in rear.

The regimental ambulances will rejoin the ambulance company before an engagement.

"Sick and wounded falling out in line of march will be be placed in the regimental ambulance; when this is filled diagnosis tags will be given as passes to the ambulance train and other transportation, or the weak and foot-sore may be relieved of their equipment and permitted to march in rear of the regimental ambulance." F. S. R., 649, 1904.

The arms, equipments, and clothing of soldiers who fall out will be carried with them in the ambulances.

"Upon arrival at the day's destination all but the trivial cases will be transferred to the field hospital. Those unable to march

next morning will be transferred to stationary hospitals, or they may be left under shelter—in houses if practicable—with the necessary attendance until taken charge of by the medical service of the line of communications, the chief of which should be duly notified" (Fig. 3). F. S. R., 650, 1904.

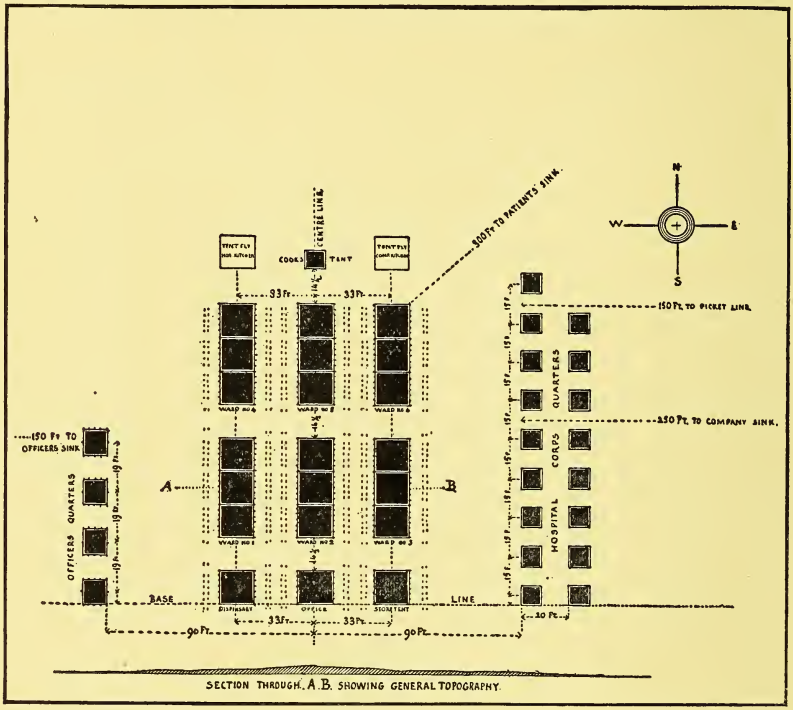


FIG. 3.—Plan for Field Hospital.

As soon as the baggage train arrives, as many hospital tents as will accommodate the sick are unloaded, pitched, and provided with such bedding and other articles as may be needful, after which the litter-bearers transfer the sick from the ambulance wagons. The tents of the officers are then pitched. Meanwhile, the cooks provide a refreshment of tea, coffee, or consommé. Later in the evening dinner is served. Pending its preparation the ambulances and baggage wagons are parked, and the horses and mules fed, watered, and groomed, while the litter-bearers pitch their shelters in the designated place and trench around the wards to keep their floors dry

in case of rain. With dinner the labors of the day are at an end, save for the wagon guard, the hospital guard, if the season requires one to attend to the fires, and the special work of medical officers and nurses in particular cases. In the establishment of this camp each man, by drill and experience, knows his particular duty, and by doing it well enables the whole to be accomplished with ease and

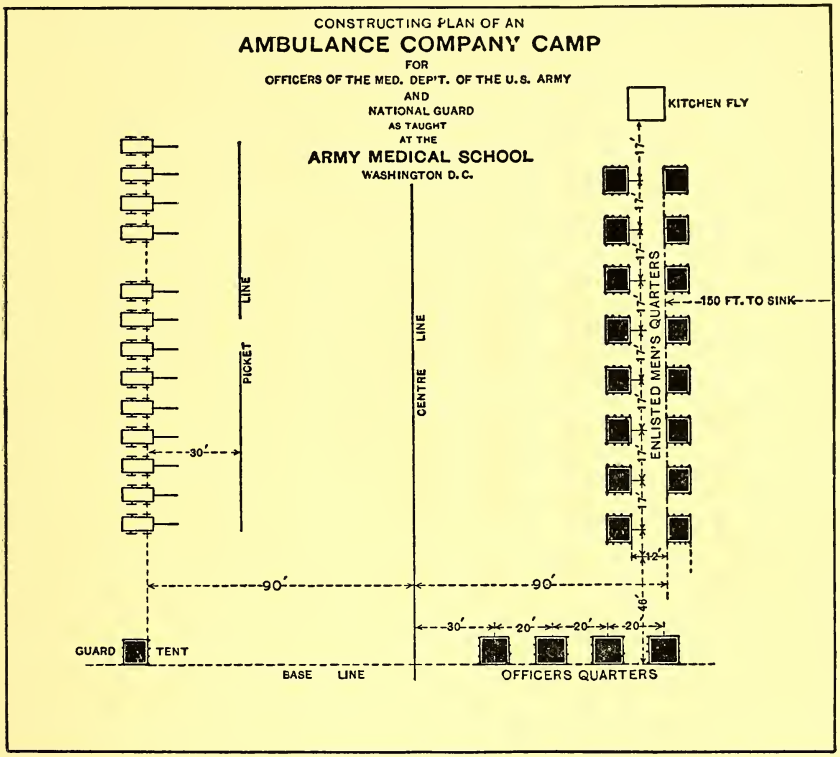


FIG. 4.

rapidity. Less than an hour will suffice to transform a deserted field into a hospital settlement as orderly and as perfect in its field appointments as if it had been in existence for many days (Fig. 4).

During and after a battle: "At the beginning of an engagement, while the troops are deploying, the wounded will be cared for by the regimental surgeons. Those able to walk will be directed to the rear, the others will be taken to sheltered places out of the way of advancing troops.

"As the troops take battle formation the officers and men of the regimental sanitary personnel, previously equipped, accompany their organizations." F. S. R., 652, 1904.

"Each officer and man will carefully retain the first-aid packet issued by the regimental surgeon at the beginning of the campaign and, when wounded, *will apply the bandage himself* or *with the assistance of a comrade.*" F. S. R., 653, 1904.

"The distribution and work of the *regimental hospital corps men* will be under the direction of the senior medical officer with the regiment. The band will be utilized as directed by the regimental commander. The wounded will be placed under cover from fire if possible. They will not be taken to the rear at this stage as the regimental personnel must remain in touch with their units.

"Diagnosis tags will be attached to all wounded at this or a later stage, whichever may be practicable." F. S. R., 654, 1904.

If the wounded man is able to walk, both colored borders of the tag are torn off; if he must be carried, only the blue border is left; if he is not able to stand moving, the blue border is torn off leaving the red; if the case is urgent, one of the *urgent* tags is also attached. The purpose of the tag is to show at a glance what has been done and what is necessary to be done so as to avoid undue handling and interference.

"The following stations will be established for the care of the wounded: 1. Dressing stations; 2. Ambulance stations; 3. Field hospitals." F. S. R., 655, 1904.

As soon as the advance ceases, *dressing stations* will be established by dressing-station parties from the ambulance company, under the direction of the brigade surgeon, at the nearest points in rear of the line of battle where the wounded will be sheltered from fire. The point selected should be near roads leading to the rear, or in proximity to open country over which ambulances may be driven. An abundant supply of water should be at hand to satisfy the thirst of the wounded and also for use in connection with dressings. If the men are fighting behind breastworks, the best protection may be on the line itself; otherwise, advantage is taken of some superficial depression, gully, ravine, fence, wall or building, about half a mile in rear. Here two of the medical officers of the ambulance company with the

thirty-six bearers and an appropriate number of noncommissioned officers take station and make ready for the reception of the wounded.

The ground is policed, underbrush cleared away, and the dressings and other appliances which have been brought forward on pack mules made ready. Meantime the litter squads are sent out to bring the wounded to the station. These squads should take advantage of cover in making their way to the front and rear so as to give themselves and the wounded all practicable protection.

The amount of surgical work performed here is greatly affected by circumstances. If the cases are numerous or the station exposed, many may be permitted to pass to the ambulance after a glance at their condition and a caution to permit no unauthorized handling of the wound, while the attention is mainly devoted to arresting bleeding, removing shock, and supporting fractures in slings or light splints for ease in transportation. But if casualties are infrequent and the station well protected, flesh wounds may be thoroughly cleaned with boiled water, the first-aid dressing applied, and the patient tagged to intimate that further interference is unnecessary. Dressing stations are distinguished during the day by red cross flags, and at night by red lanterns.

Ambulance stations at the rate of one to a brigade will be established by the brigade surgeon at places affording protection from fire. Here the senior medical officer of the company, with such others as may be assigned, takes station.

The ambulances are drawn up facing the rear to receive patients, and the cook at once starts a fire and prepares restoratives such as coffee, hot bouillon, etc., for those wounded requiring stimulation.

The medical officers clean and place protective dressings on wounds that escaped attention at the first dressing stations, marking such as require no further investigation and also such as seem to call for immediate operative procedure. They superintend the loading of the ambulances, and see that every case is in the best possible condition to undertake the journey to the hospital. The topographical features of the battlefield are often such that the first dressing stations and ambulance stations may be consolidated. When the ambulances can get close up, there is no need of an intermediate halt in the removal of the wounded; and when the roads and the ground permit

of it, ambulance stations may be established at more than one point in rear of a brigade, in order to shorten the distance over which the wounded have to be assisted or carried. In the event of an advance or a yielding of the line of battle, a corresponding change of position of the dressing and ambulance stations must be effected. In the former case, a few of the ambulances follow up the advancing line, leaving the greater part to clear the field before participating in the forward movement. In the latter case positions are assumed in rear of the reformed line, except when the hospital becomes exposed, in which case special orders from the chief surgeon determine the further movements.

Helpless wounded brought in during the engagement will be removed to the field hospital, but the principal work of the ambulances begins at the end of the battle and consists in the evacuation of the dressing stations.

Such *field hospitals* as may be required will be established by the division surgeon, after consultation with the division commander if practicable. The site should be at least three miles from the front, near a by-road, and on a stream when feasible. An ample supply of water is necessary, and suitable buildings are of great advantage.

In order to avoid confusion and loss of time, all the wounded are brought to the *receiving section* where the medical officer in charge examines and distributes them to the *operating section*, the *dressing section*, or directly to the *wards* as the case may require.

Generally, some time before the first ambulance load of wounded arrives from the front, the surgeons on duty at the hospital are engaged in receiving, dressing, or operating on, injuries of the hand and flesh wounds attended with little hemorrhage or shock. These cases probably left the field stations without waiting for attention and made the journey unaided and on foot. Each is assigned to a specified ward, the wardmaster of which is thereafter responsible for his comfort. Shelter tents may be pitched at regular intervals near the hospital tents to form the ward for these lighter cases. Hospital corps or band men attend to this work, trenching the ground, weather-guarding the open ends of the shelters, and providing some material, as hay, straw, freshly cut grass, leafy twigs, wood-shavings, etc., for bedding. If no suitable material can be found in the immediate

vicinity, one of the now empty transport wagons may be despatched to some point where a supply may be obtained. During inclement weather these lighter cases may be housed in the as yet unoccupied hospital tents until their special camp is prepared. When thus systematically camped, their wants are not overlooked, as each ward-master has his duties aggregated and defined.

When ambulances arrive from the field, the whole staff of the hospital becomes at once engaged. Should the reports from the front indicate that the tents will be insufficient for the accommodation of the wounded, the flies are moved forward to extend the wards, and extra bedsacks are filled with such material as may have been collected. If this extension is insufficient for the shelter of the incoming wounded, the neighboring dwellings or their outhouses may be utilized.

The end and aim of the work of the hospital is to have all operations that are imperatively called for completed and the wounded ready for transportation to the base of supplies at the earliest possible moment, because an advance or retreat is sure to follow the battle unless it has left both sides unfit for immediate aggression.

If, as an immediate result of the battle, the enemy withdraws to another position, it is not necessary for the hospital to follow up the advance of the troops unless the distance is considerable. Should this be so, the hospital moves forward, carrying the wounded, if few in number, with it, or turning them over to the corresponding unit from the " service of the rear."

Should the battle be indecisive, the losses will probably be great, but time will usually be afforded for the completion of the surgical work, because neither party is in a condition to renew the contest. The hospital, therefore, remains undisturbed probably for several days; but so great is the uncertainty of battlefield conditions that every effort should be made to complete the surgical work. Promptly on the cessation of the battle, medical officers who have been on duty at the stations report to the surgeon in charge for assignment to temporary duty at the hospital.

The " service of the rear " eventually converts the field hospitals into stationary hospitals, releasing the personnel and material. It takes charge of the sick and wounded and of their transfer to their home stations.

Let us now trace a seriously wounded man from the skirmish line where he is wounded to the general hospital at home.

Falling wounded on the *skirmish line* he receives his first aid from a medical officer or hospital corps man of the *regimental detachment* who stops hemorrhage if serious, applies the contents of a first-aid packet, and perhaps a diagnosis tag, and then moves him if possible to the nearest point where there is some shelter from fire; to do this, however, members of the regimental detachment must not lose touch with their regiment; next the wounded man is reached by a litter squad from the *dressing station detachment* of the ambulance company who apply splints if necessary, a diagnosis tag if he has not one already, and then carry him on the litter to the *dressing station.* Here after a glance at his condition to see that his wound is already properly dressed he is passed on to the *ambulance station.* At either of these two last stations he receives whatever additional assistance he may need. He is then loaded in the ambulance, all this time on the same litter, and carried to the *field hospital,* the rear limit of the service of the front. At the field hospital he receives such attention as he requires, and as soon as opportunity offers is turned over to the service of the rear by which he is transported by ambulance train, railroad, or boat to the base hospital. If the journey is long he is fed and his wants are attended to when necessary at *rest stations* or he may rest a day or two in a *stationary hospital on the lines of communication.*

Finally reaching a *base hospital* he remains there until convalescent, when he goes into a *convalescent camp* from which when well he is sent back to the front.

Should it appear, however, that it will be a very long time before he can return to duty, or that he is permanently disabled, he is put on a *hospital transport* and sent to a *general hospital* (Fig. 1).

When an army goes into a comparatively permanent camp, as in winter quarters, during sieges, or in the occupation of hostile territory, the sick and wounded need not be sent away unless they accumulate beyond the capacity of the hospital to accommodate them. Commanding officers generally approve of retaining the men in the field hospital, as return to duty on recovery is better assured than from distant hospitals. They therefore further the efforts of the medical department in improving the condition of the hospital.

Lumber is obtained, and the tents are framed, floored, and weather-boarded, while shelves, tables, and benches are put in, with suitable stoves or brick fireplaces to warm the wards. Board walks are laid, and the grounds fenced in and thoroughly policed. As thus established the field hospital presents an air of permanence and stability; but it should be kept in proper drill, and ready at a few hours' notice to be packed up and following the division in the column of march.

The Treaty of Geneva has of late years done much to mitigate the sufferings of the wounded of a defeated army. Its provisions together with those of The Hague Peace Conference are given in detail in Part IX of this handbook. In connection with this subject the War Department in 1898 issued orders to the following effect:

All persons connected with the medical department of the army in the field, or referred to in Article II of the treaty, shall wear habitually during the war, on the left sleeve of the coat, midway between the shoulder and elbow, a brassard or arm-badge, consisting of a red cross on a white ground.

All hospitals, ambulances, and field stations of the medical department will habitually display the red cross flag accompanied by the national flag.

Permits, in duplicate, for civilians to be present with the army, in the service of the medical department, may be given by authority of a division commander; one copy of the permit will be retained by the person neutralized, and its duplicate should be forwarded promptly to the chief surgeon of the army.

Persons neutralized under this authority will report themselves at once to the chief surgeon of the division for instructions.

The wearing of the arm brassard by any person not officially neutralized is prohibited.

The War Department recognizes for any appropriate cooperative purposes the American National Red Cross as the civil central American committee in correspondence with the International committee for the relief of the sick and wounded in war.

PART II.

ANATOMY AND PHYSIOLOGY.

In order that the hospital corps man may intelligently perform his numerous duties in connection with the sick and wounded, it is necessary that he should understand something of the structure of the human body and the functions of its various organs. It is not intended to give him that little incomplete knowledge that is a "dangerous thing," but rather a knowledge which, while not like that of a physician, is complete as far as it goes.

CHAPTER I.

THE SKELETON AND JOINTS.

The skeleton is the bony framework of the body, gives it stability and form, and protects the organs, while the joints permit of motion.

Bone is composed of about one-third animal matter, mostly gelatin, and two-thirds mineral matter, chiefly lime salts. The animal matter gives bone its toughness and elasticity; this may be demonstrated by leaving a bone for some time in dilute acid by which the mineral matter is removed and the gelatin alone is left; the bone may then be tied in a knot. The mineral matter gives the bone its hardness; the animal matter is all removed by burning the bone which then becomes brittle as chalk. Young bones contain more animal matter and are hence tougher and harder to break; when they do break, the fracture is apt to be incomplete like a broken green stick. Elderly persons' bones break easily because they contain more mineral matter.

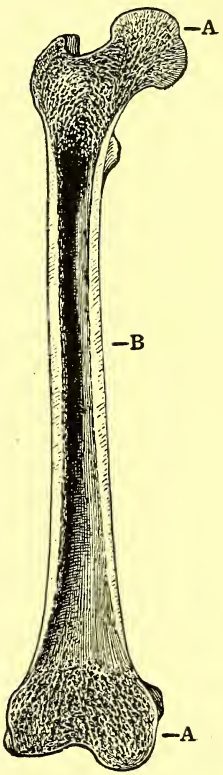


FIG. 5.—Section of Femur. *A*, *A*, Cancellous tissue; *B*, compact tissues.

If you saw a long bone across, the end will be found spongy or *cancellous*, while the shaft is *compact* and dense. The shaft is also hollow and contains *marrow* (Fig. 5).

Bone is covered by a vascular membrane, the *periosteum*, which nourishes the bone; where the periosteum is stripped off, the bone is apt to die from insufficient nourishment, the death of the bone being known as *caries* or *necrosis*.

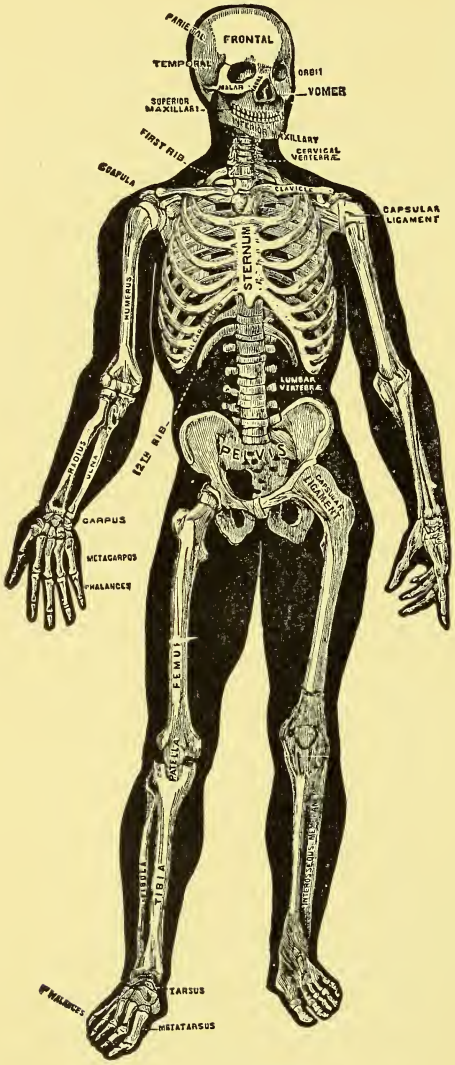


FIG. 6.—Skeleton.

The bones of the human body number about two hundred, without counting the thirty-two teeth and some accessory small bones; taken together with the cartilages they compose the skeleton. *Cartilage*, or *gristle*, is an elastic substance, like bone without mineral matter; it is seen extending from the lower ribs to the breast bone and covering the ends of the long bones.

The bones are classified as *long*, *short*, *flat*, and *irregular*.

The *long bones*, of which the thigh bone is an example, form a system of levers which support the weight of the body and provide the means of locomotion. The *short bones*, such as those of the wrist, are found where strength and limited motion are the requisites; the *flat bones*, of which the bones of

the skull are an example, serve principally for protection; the *irregular bones* are illustrated by those of the pelvis.

In considering the skeleton (Fig. 6) let us start from the *vertebral column*, also called the *spinal column*, *spine*, or *backbone*. The name *vertebra* is given to each separate bone composing the column. The separate bones are not allowed to rub against each other, but are separated by pads or buffers of elastic cartilage, and at the same time tied together with strong fibrous *ligaments*.

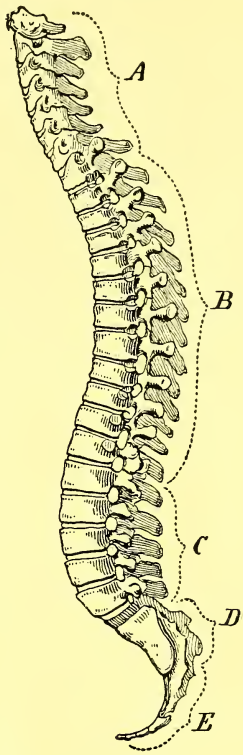


FIG. 7.—Spinal Column. *A*, Cervical; *B*, dorsal; *C*, lumbar; *D*, sacrum; *E*, coccyx.

These buffers of *intervertebral substance* break up and distribute the shock which would otherwise result from falls or in jumping.

On looking at the spine (Fig. 7) it will be observed that it increases in size from above downward, which is but natural when one considers the increase in weight to be borne by the lower part as compared with the upper. The highest vertebræ, those of the neck, seven in number, and called *cervical*, support the head only. Next in order come the twelve *dorsal*, which in addition support the ribs, chest, and upper extremities. In the next region, the *small of the back*, are found the five massive *lumbar* vertebræ, which have the entire trunk to support. The vertebral column ends in two large masses of bone known as the *sacrum* and the *coccyx* or tailpiece. In the growing youth the sacrum is composed of five separate bones and the coccyx of four, but in the adult these separate bones are welded into one mass.

Each vertebra consists of a solid *body* in front and an *arch* enclosing a central cavity behind. When the vertebræ are in their natural position one resting upon another, the arches together form

a canal, the *spinal canal*, which in the living body contains and protects the *spinal cord*.

This spinal cord is everywhere in contact with the bony canal in which it lies, so that when a fracture or dislocation of the spinal column occurs a laceration of the cord is almost certain to occur, and it is this coincident injury to the cord which gives to these injuries their special importance.

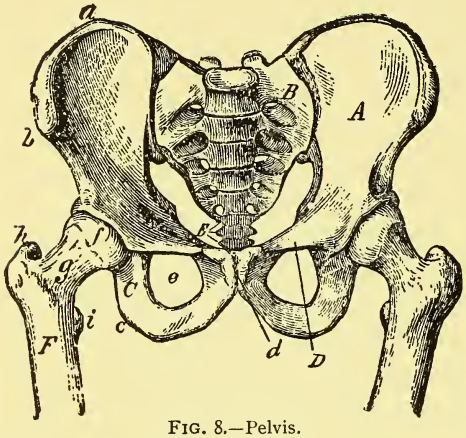


FIG. 8.—Pelvis.
A, Innominate bone; *B*, sacrum; *E*, coccyx.

If the fingers are drawn along the center of one's back they come in contact with a number of projecting bony points; these are the *spinous processes* of each vertebra and are situated on the back of the arch.

Both the sacrum and coccyx take part in the formation of the large girdle of bone met with at the lower part of the trunk under the name of the *pelvis*, or basin (Fig. 8), and which receives the weight of the body and hands it over to the lower extremities at the hip joints. The sacrum forms the keystone of the arch, the sides of which are composed of the two *innominate bones* or *nameless bones*, separated in front by a pad of cartilage, and all locked together by powerful ligaments.

Within the pelvis are situated the urinary bladder in front and the rectum behind, and, in the female, between the two is placed the uterus. Each innominate bone consisted originally of the three bones, the *ilium*, *ischium*, and *pubis*, but these become fused together so as to form one bone in the adult. On each side of the pelvis is seen a cup-shaped cavity in the innominate bone, known as the *acetabulum*, the purpose of which is to receive the spherical head of the *femur*, so as to make the hip joint.

A *joint* is the place where two bones meet and move upon each other; the ends of the bones are covered with smooth cartilage and to still further prevent friction the cartilages and the whole joint are

enclosed in a smooth, glistening membrane, the *synovial membrane*, which secretes the *synovia* or joint oil.

Outside the synovial membrane the bones are firmly bound together by fibrous *ligaments*, while the joint is still further strengthened by the surrounding muscles. A joint, therefore, consists of bones, cartilages, synovial membrane, and ligaments.

Joints differ very much in their character and the kind of motion they permit. Thus we have the almost perfect freedom of motion permitted by the *ball-and-socket joints*, like the shoulder and hip, the more limited motion of *hinged joints*, like the knee, and the almost motionless, imperfect joints, such as the *sutures* of the skull.

A *dislocation* is a slipping away of the joint surfaces from each other to such an extent that they remain "out of place" and the joint is locked; in such a deep, strong joint as the hip, violence is more apt to give rise to fracture to than dislocation.

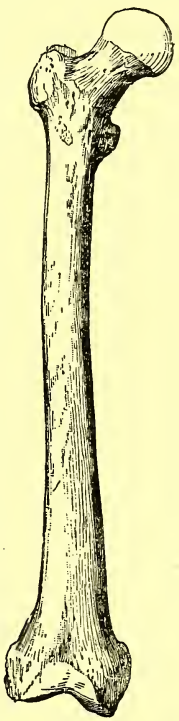


FIG. 9.—Femur.

Entering into the formation of the hip joint is the *thigh bone* or *femur* (Fig. 9), the largest and longest bone in the body. Like other long bones it has a *shaft* and *two extremities*. The upper extremity consists of a *head*, *neck*, and two *trochanters*. The head is globular and attached to the shaft by a narrow neck set at an angle; it is in this narrow neck that fracture so frequently occurs.

The trochanters are merely bony knobs to which muscles are attached to move the joints; the *great trochanter* is the bone which you may feel just under the skin on the outer side of the hip. The lower extremity of the femur is expanded into two broad *condyles* which with the upper end of the *tibia* or *shin-bone*, and the *patella* or *knee-cap* (Fig. 10) form the *knee-joint*. The patella is the small round bone lying just in front of the knee and in the extended position of the leg is freely movable with the tendon in which it lies.

FIG. 10.—Patella.

The knee joint is the largest in the body and from its exposed position one of those most liable to injury; once injured it is apt to be sensitive ever afterward.

Beyond the knee we come to the leg composed of the *tibia* on the inside and *fibula* or *splint bone* on the outside (Fig. 11). The tibia is a strong prism-shaped bone, the inner surface and front edge just beneath the skin and constituting the *shin;* on account of its being just beneath the skin, fractures of this bone are apt to be *compound* The fibula is a long slender bone deeply buried under the muscles; it is frequently broken just above the ankle where it can be felt; such a break is known as a " Pott's fracture."

FIG. 11.—Tibia and Fibula.

The ankle joint is made up of the tibia and fibula above and the astragalus below; it is a strong joint, so much so that while it is frequently subjected to violent wrenches and strains, dislocation seldom occurs; under such conditions the joint surfaces do not slip entirely away from each other, but the ligaments and synovial membrane are torn and blood is poured out into and about the joint, constituting the condition known as *sprain.*

Beyond the ankle is the *foot,* composed of the *tarsus, metatarsus,* and *phalanges.* The tarsus, besides the *astragalus,* already referred to as helping to form the ankle joint, contains the *os calcis* or heel bone, and five other small bones, making seven in all. The metatarsus lies in that part of the foot just behind the toes, and is composed of five long bones. The *phalanges* or *toe joints* are so called because they are arranged in phalanx or rows; there are three for each toe except the great toe which has only two.

To go back to the vertebral column. Connected with its dorsal portion are twelve *ribs* on each side, and closing in the space between the ribs in front so as to form the *thorax* is the *breast bone* or *sternum.*

It is scarcely necessary to say that the number of ribs is the same in man as in woman, though there is an old tradition that Adam lost

one rib in order to gain a wife. The seven upper ribs are connected directly to the sternum in front by their cartilages and are known as *true ribs;* the five remaining are known as *false ribs*, and the last two which are not connected with those above are known as *floating ribs.*

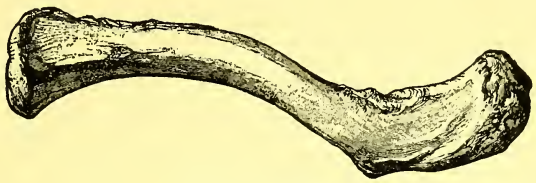


FIG. 12.—Clavicle.

The *breast bone* or *sternum* is composed of three parts and extends from the root of the neck to the pit of the stomach. The *thorax* or *chest* so formed is a bony cage which encloses and protects the heart and lungs; it is separated from the abdomen by a broad, muscular partition, arching upward and known as the *diaphragm.*

Connected with the thorax is the upper extremity composed of the *shoulder* and *shoulder joint, arm, elbow joint, forearm, wrist joint,* and *hand.*

The shoulder is composed of the *clavicle* or *collar bone* and the *scapula* or *shoulder blade.* The clavicle (Fig. 12) is a very strong bone with a double curve like the Italic letter *s.* It is connected at one end with the breast bone and at the other with a process of the shoulder blade known as the *acromion;* it is the acromion process which we feel just under the skin at the point of the shoulder. The clavicle notwithstanding its strength is very frequently broken owing to its fixed position and the fact that it receives the jars transmitted through the upper extremity when one tries to save himself in falling by throwing out the arm. The *scapula* (Fig. 13) is a freely movable flat bone

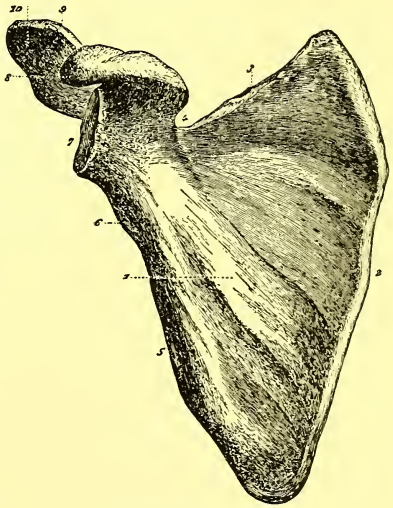


FIG. 13.—Scapula.

connected at one end with the collar bone to form the arch of the shoulder; its outer angle or head contains a shallow, saucer-shaped depression known as the *glenoid cavity* for the reception of the head of the humerus to form the *shoulder joint.* The shoulder, like the hip, is a ball-and-socket joint, but unlike the hip, the socket is very shallow, so that the head of the humerus in the very free motion permitted easily rolls over the edge and becomes dislocated; as a matter of fact dislocation at the shoulder joint is many times more frequent than at all the other joints of the body put together, so that in obscure injuries to the shoulder we always look for dislocation.

FIG. 14.—Humerus.

The arm is that portion of the upper extremity which lies between the shoulder and elbow; like the thigh it contains but one bone, the *humerus* (Fig. 14). The upper end of the humerus consists of the *head* and the *tuberosities*, the *anatomical neck* lying between the two, and the *surgical neck* being the constricted portion of the shaft just below the tuberosities; the surgical neck is so called because it is the part most frequently broken.

The lower end of the humerus is expanded to form the elbow joint and has a projection on each side known as a *condyle.*

The elbow joint is made up of the humerus and the two bones of the forearm, the *radius* and *ulna* (Fig. 15).

The *radius* lies on the outer side of the arm and is so called because it radiates about its fellow in the motions of *pronation*, in which the palm of the hand is turned down, and *supination*, in which the palm is turned up. The radius has a small *head* which takes but little part in the elbow joint, but a large lower end which with the *carpus* forms the wrist

FIG. 15.—Radius and Ulna.

joint to the entire exclusion of the *ulna*. It is because of the radius resisting almost alone the force of falls upon the hand that it is broken so much more often than the ulna. Such a break just above the wrist joint is very common and is known as a "Colles's fracture."

The *ulna* has its upper end most highly developed, forming a projection which extends back behind the elbow joint, protecting it in the same manner as the patella does the knee joint. This protection forms the "point of the elbow" and is called the *olecranon*.

The *wrist* or *carpus* is composed of eight small bones in two rows of four each, the upper row together with the lower end of the radius forming the *wrist joint*. The hand is composed of the five *metacarpal* bones, while the fingers have three rows of *phalanges*, except the thumb which has two only.

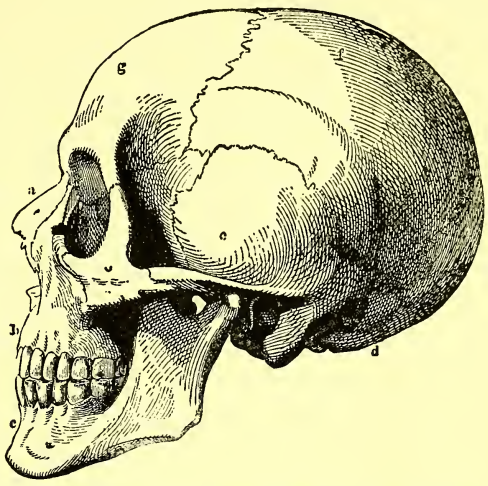


FIG. 16.—Skull. *a*, Nasal bones; *b*, superior maxilla; *c*, inferior maxilla; *d*, occipital bone; *e*, temporal bone; *f*, parietal bone; *g*, frontal bone.

Balanced on the top of the spinal column and forming a joint with its uppermost vertebra is the skull (Fig. 16). The *skull* is usually considered in two parts, the *cranium* which contains the *brain*, and the *face*. The cranium is that part which lies above a line drawn from the nape of the neck through the ears to above the eyebrows, and the brain here lies everywhere in contact with the bone, so that a fracture of the cranium, like one of the spine, derives its special seriousness from the accompanying injury to the brain. In front, however, just over the eyes, the two plates of which the cranial bones are composed separate to leave a space known as the *frontal sinuses;* here fractures of the outer plate may occur without injury to the brain. The cranium varies in thickness from about that of paper at the temples to a quarter of an inch or more behind.

The visible portion of the cranium is composed of six bones, the *frontal* in front, the *occipital* behind, the two *parietals* on the top, and

the two *temporals* on the sides. In the lower part of the occipital bone is a large round hole known as the *foramen magnum* through which the spinal cord makes connection with the brain.

The face is composed of fourteen bones, arranged mostly in pairs, and forming the two *orbits*, the *nose*, and *mouth*. The only facial bones necessary to remember are the two, tiny, *nasal bones* which form the arch of the nose, and the two *superior maxillary bones* and the *inferior maxillary bone* which contain the teeth and enclose the mouth.

The inferior maxillary is the only movable bone of the face; its joints with the upper jaw lie just in front of the ear where the head of the bone can be felt to move when the mouth is opened.

The *teeth* appear in two crops; the first, ten in number in each jaw, are known as the *milk teeth;* at the end of the sixth year they begin to be replaced by the *permanent teeth*, sixteen in each jaw. The second dentition is not concluded until about the twenty-first year when the wisdom teeth or last molars appear.

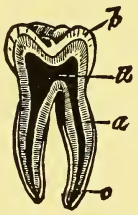


FIG. 17.—Section of Lower Molar. *a*, Dentine; *b*, enamel; *c*, crusta petrosa; *d*, pulp cavity.

Every tooth has a *crown*, the part above the gum, a *neck*, the constricted portion just below the crown, and a *root*, the part embedded in the jaw. In structure (Fig. 17) they are composed of *enamel*, the hard surface covering, the *dentine* which comprises the mass of the tooth, the *cement* which covers the root, and the *pulp* composed of nerves and blood-vessels which nourishes the tooth and lies in its interior. When the teeth

Canine or Eye Tooth of Upper Jaw.

Second Biscuspid of Lower Jaw.

Central Incisor of Upper Jaw.

Second Molar of Upper Jaw.

Wisdom Tooth of Upper Jaw.

FIG. 18.

are not properly cared for the protective enamel cover breaks down, exposing the dentine which rapidly decays, undermining the enamel

and finally exposing the sensitive pulp; pain then begins, and unless the tooth is filled death of the pulp occurs and the tooth is lost.

The four front teeth in each jaw are adapted to cutting and are called *incisors;* next to these on each side is a tearer or *canine* tooth, and then two *bicuspids;* all of these usually have a single root. After the bicuspids come three *molars* or grinders on each side. The upper molars usually have three roots, two on the outer side and one on the inner, while the lower molars generally have two roots. A knowledge of the number and arrangement of the roots of the teeth is necessary in order to select the proper pair of forceps to use in tooth extraction (Fig. 18).

CHAPTER II.

THE MUSCLES, CELLULAR TISSUE, AND THE SKIN.

Muscles are simply *lean meat.* Each muscle is composed of a number of fibers held together by *connective tissue,* and collected into bundles which are enclosed in a sheath of fibrous tissue known as *fascia.*

FIG. 19. — Fracture of Thigh. Deformity from muscular action.

The function of muscles is to contract and thereby move the various parts and tissues of the body; their tendency to contract is constantly present during life, so that if a muscle is cut the two ends at once pull apart and a gaping wound is left. For the same reason if a bone is broken the contracting muscles on each side of the fracture have a tendency to shorten the limb, making the ends of the bone override each other and produce deformity (Fig. 19). It is this muscular contraction which must be overcome in setting fractures or reducing dislocations.

As muscles taper toward the ends they become more and more fibrous until white, glistening *tendons* or *sinews* are formed which finally blend with the periosteum at the point of attachment to bone.

Most muscles, like those of the limbs, are under the control of the will and are known as *voluntary muscles* (Fig. 20), while others, like those of the heart and intestinal tract, are entirely *involuntary.* This involuntary action of the important muscles which preside over the necessary functions of life is a wise provision of nature; otherwise one might forget to breathe or make the heart beat, and sleep would be out of the question.

The muscles in their action upon the bones produce various special motions; bending a limb is called *flexion,* straightening it is

extension; turning the palm down is *pronation,* turning it up *supination;* motion of the limb on its long axis is *rotation. Abduction* is throwing a limb out from the body, while drawing it toward the body is *adduction.*

In a variable time after death *rigor mortis* sets in, a change in the muscles by which they become rigid, and remain so until decomposition

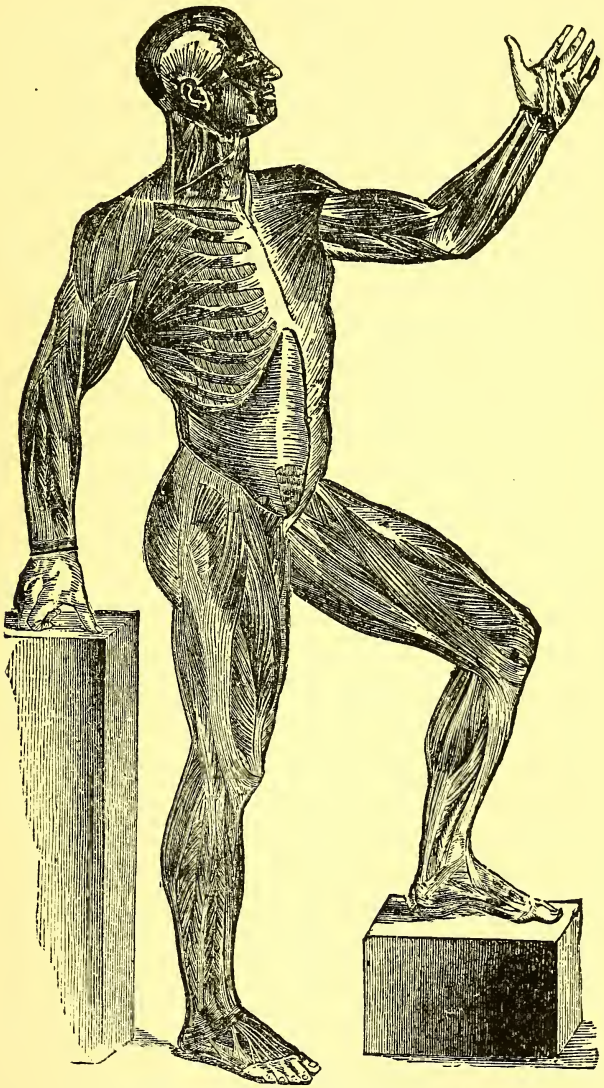


FIG. 20.—Superficial Layer of Voluntary Muscles.

begins. When the person has undergone great muscular exertion to the point of exhaustion just before death this change takes place almost immediately, so that the soldier killed in battle may be found rigidly fixed in the same position in which he met his death.

The only voluntary muscles which it is necessary for you to remember are the *sterno-mastoid*, the *biceps*, and the *diaphragm*. Important involuntary muscles are the *heart*, *stomach*, and *bladder*.

The *sterno-mastoid* is the prominent muscle seen on each side of the neck when the head is turned in the opposite direction and extending from behind the ear to the top of the sternum; its front edge is a guide to the carotid artery. The *biceps* is the big muscle on the front of the arm, familiar to all, and the inner border of which is a guide to the brachial artery.

The *diaphragm* is the great muscular partition between the thorax and abdomen.

The *connective* or *cellular tissue*, so called because of the spaces contained in its spongy structure, connects together all the other special tissues, and serves as a support for the blood-vessels, nerves, and fat.

The fat is the padding which fills in empty spaces and gives form and pleasing outlines to the body. Its important functions are to serve as a reserve of nutritive material for emergencies, and to act as a blanket in retaining the bodily heat. The emaciation which follows an exhausting illness is largely due to the using up of the reserve fat, and everyone is familiar with the fact that a fat person stands cold better and heat less well than a thin one.

The *skin* is a tough, elastic membrane which covers the entire body and is continuous at the various orifices with the *mucous membrane*. Anatomically it consists of two layers, the *cuticle*, and the *derma* or *true skin*. The *cuticle* is that part which is raised when a blister occurs and which peels off after scarlet fever.

The *derma* constitutes the greater part of the thickness of the skin, and contains the blood-vessels, nerves, sebaceous and sweat glands

The appendages of the skin are the *hair* and the *nails* which are modified cuticle (Fig. 21).

The *sebaceous glands* secrete an oily substance which gives to the

skin its softness and pliability; the orifices of the ducts of the sebaceous glands are particularly large about the face and nose, and when plugged with dirt form the familiar *black-heads*.

The sweat glands are in vast numbers all over the body and their

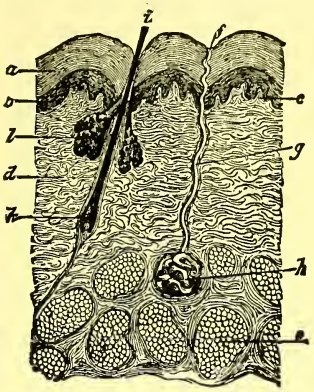


FIG. 21.—Perpendicular Section of the Skin, showing: *a*, The epidermis, cuticle, or scarf skin; *b*, a layer of dark-colored cells; *c*, the papillæ on the surface of *d*, the corium, derma, cutis vera, or true skin, and *e*, the fat cells underlying it; *f*, a perspiratory pore or aperature, *g*, the duct, and *h*, the coiled substance of a sudoriparous gland; *i*, the shaft of a hair, *k*, its root, and *l*, sebaceous glands communicating with the interior of the hair follicle.

orifices constitute what are known as the *pores*. They secrete a variable amount of water, averaging about two pints a day, and the water contains organic matter and salts, and constitutes the *perspiration* or *sweat*.

The functions of the skin are to protect the underlying parts from injury, from the invasion of bacteria, and from undue evaporation; to receive the nerve ends and thereby serve as a special organ of touch; and through the agency of the sweat glands to act as an important excretory apparatus and a regulator of bodily temperature.

The importance of a whole skin as a protection against the bacteria of disease is well known; subcutaneous wounds, that is contusions, give us little anxiety, but if the skin is broken special dressings must be applied to take its place. Plague frequently invades the body through a break in the protective wall of the skin and syphilis is contracted in the same manner.

The excretory function of the skin, by which it throws off poisonous waste products dissolved in the perspiration, is illustrated by what happens in extensive superficial burns by which this function of the

skin is destroyed; the man becomes poisoned by his own waste products and death is the result.

As a temperature regulator its action is shown by the increased perspiration in hot weather, the evaporation of the water serving to cool the body; conversely in winter perspiration is imperceptible.

The skin has also absorbing powers; thirst may be allayed by prolonged immersion in a bath; the vapor of mercury and even metallic mercury may be taken up through the unbroken skin.

CHAPTER III.

THE NERVOUS SYSTEM AND SPECIAL SENSES.

THE *nervous system* consists of the *brain*, *spinal cord*, and the nerves constituting the *cerebro-spinal system*, and the *ganglia* and connecting nerves composing the *sympathetic system*.

The *brain* situated within the cranium is the seat of the intellect and will, and the great headquarters telegraph office from which all the orders for motion are sent out and to which all the reports called sensations are forwarded. The *spinal cord* extends downward from the brain through the spinal canal and is largely an aggregation of nerves or wires connecting the brain with all parts of the body. The ganglia (Fig. 22) are small masses of nervous matter arranged in pairs along the spinal column and in groups about the heart and great viscera; they are connected with each other and with the cerebro-spinal system, and their distribution is to the heart, lungs, blood-vessels, the gastro-intestinal tract, and the great viscera.

The *nerves* are composed of bundles of minute tubules enclosed in a protective sheath, each of these tubules corresponding to a telegraph wire and ultimately reaching its destination without branching.

The *brain* (Fig. 23) consists of the cerebrum and cerebellum, and pons and medulla. The *cerebrum* is the soft, pulpy, oval mass which is seen when the top of the cranium is removed; it is divided from before backward by a deep fissure, almost but not quite complete, so that there is a bridge left connecting the two halves.

The surface of the brain presents numerous grooves or *sulci*, between which are the *convolutions*. The exterior is composed of *gray matter*, and the interior of *white matter*, the latter being nothing more than a collection of nerves connecting the various parts of the brain with each other and with the spinal cord. In the interior of the cerebrum are a number of cavities known as *ventricles*. The gray matter is the seat of the mind.

The brain is very delicate and easily injured; injuries or even slight pressure seriously interfere with its functions. So when a

fracture of the skull occurs with depression of bone, or even a slight bleeding from one of the cerebral vessels, pressure on the brain re-

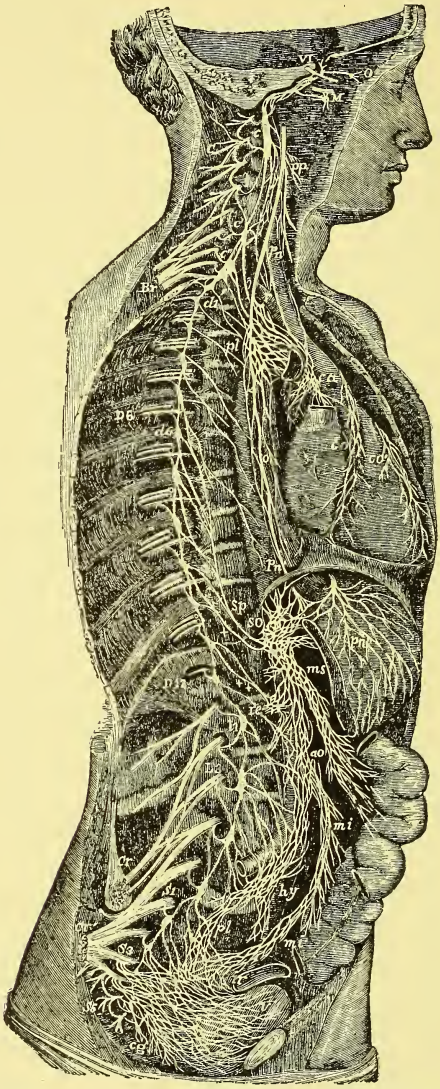


FIG. 22.—Sympathetic System of Ganglia and Nerves.

sults and we have unconsciousness or paralysis or both; this is the condition in apoplexy which is merely a hemorrhage within the cranium; as the blood cannot escape it must produce pressure.

Lining the interior of the cranium is a strong fibrous membrane which protects and suspends the brain and is called the *dura mater;* this with the *pia mater* and *arachnoid* constitute the *meninges* or membranes, inflammation of which is known as *meningitis.*

If we lift up the back part of the cerebrum we see below it a small mass of nervous tissue known as the *cerebellum* or *little brain* (Fig. 24). It is chiefly concerned with the maintenance of the equilibrium of the body.

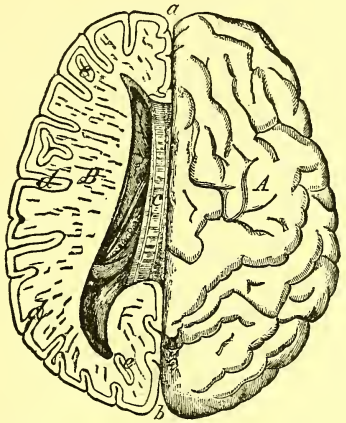


FIG. 23.—The Hemispheres of the Brain. *A*, The right; *B*, the left, divided from before backward by *a*, *b*, the longitudinal fissure, and connected by *c*, the bridge of transverse fibers called the corpus callosum. On the right side the convolutions and sulci are shown; on the left the upper part of the convexity of the hemisphere has been cut away to show the gray matter *d*, *d*, dipping into the sulci and appearing as islands, *e*, *e*, in the interior of the white matter; the elongated cavity with curved extermities is the lateral ventricle of that side.

The *pons* is the connecting link between the cerebrum and medulla and between the two lobes of the cerebellum.

The *medulla oblongata* is the enlarged upper end of the spinal cord lying just within the cranium, and containing the important nerve centers presiding over the action of the heart and lungs. It is also the part in which the nerves coming from each side of the brain cross over to the opposite side of the spinal cord, so that an injury of the brain above this crossing causes a paralysis on the opposite side of the body.

The *spinal cord* (Fig. 25), like the brain, is enclosed in membranes and is a tail-like column of nervous tissue composed chiefly of nerves but containing in its interior a central column of gray matter. A pair of nerves leave it opposite each vertebra, those of the cervical

region being arranged in two groups. The upper group supplies the face and neck and the interior of the chest; one of the most important of the branches is the *phrenic* which controls the movements of the diaphragm. The lower group is known as the *brachial plexus* and supplies the upper extremity.

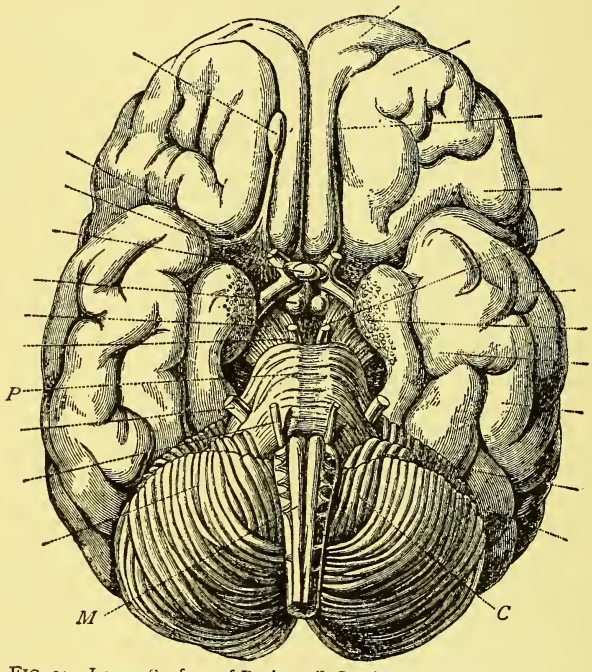


FIG. 24.—Lower Surface of Brain. *C*, Cerebellum; *M*, medulla; *P*, pons.

The *dorsal nerves* supply the chest wall, those of the *lumbar* and *sacral* regions go to the pelvis and lower extremities; one great cord which emerges from the pelvis on each side and passes down the back of the thigh is called the *sciatic nerve;* it is often the seat of the neuralgic pain known as sciatica.

As all the nerves of the body except those of the face must pass through the spinal cord on their way to the brain it is evident that if the spinal cord is cut completely across there must be paralysis of all the parts below; such a paralysis is called *paraplegia.* If the injury is high enough up the nerves controlling the action of the heart and lungs are involved and death quickly follows. As the motor nerves are

collected in the front part of the spinal cord and the sensory nerves in the back part, a partial injury of the cord may cause paralysis of motion without affecting sensation or *vice versa*.

There are two kinds of nerve tubules, *motor* and *sensory*. The former convey from the brain orders directing motion, while the latter carry to the brain information as to sensation. If a motor nerve is cut the muscles supplied by it are paralyzed because orders from the brain can no longer reach them; if a sensory nerve is cut sensation is lost in the part supplied by it because information as to the sensory condition of the part can no longer reach the brain. Usually nerves contain both motor and sensory fibers, but some nerves, like the facial, are purely motor.

There are certain reports and impressions which are sent by way of the nerves from various parts of the body which it is not necessary to refer to the brain for its action; the necessary action is provided automatically by what is called *reflex action*.

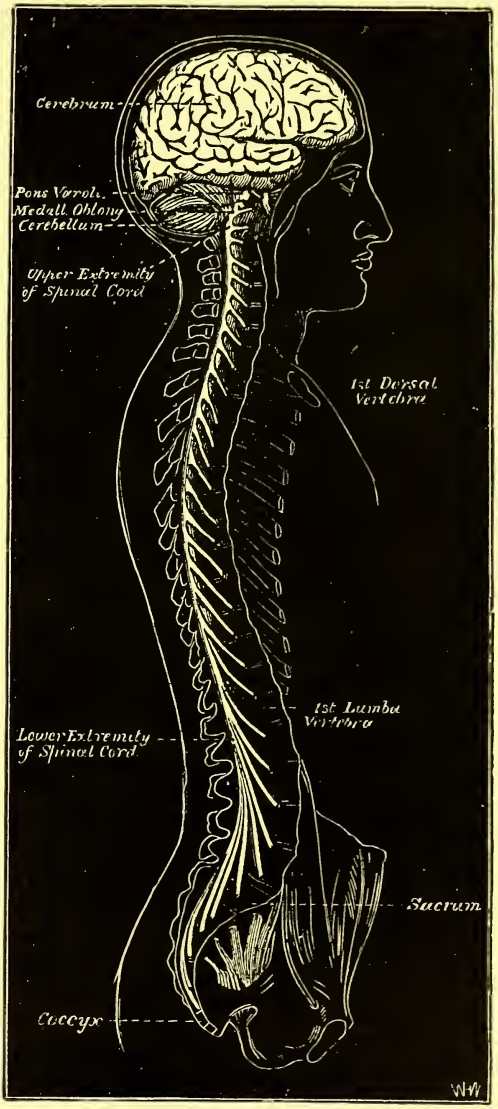


FIG. 25.—Spinal Cord and Nerves.

The quick withdrawal of the hand when it touches something hot and the rhythmical contraction of the heart under the stimulus

of its distention with blood are instances of reflex or automatic action originating respectively in the gray matter of the spinal cord and ganglia.

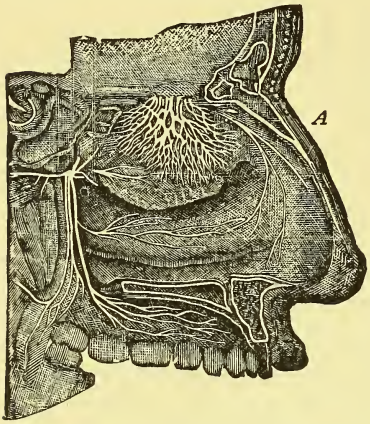


FIG. 26.—Section of Nose. *A*, Olfactory nerves.

The *special senses* are *touch*, *taste*, *smell*, *hearing*, and *sight*. The three latter are presided over by special *cranial nerves*, that is, nerves coming directly from the brain without passing through the spinal cord.

The sense of *touch* is resident in the skin generally, but is most highly developed in the ends of the fingers.

The sense of *taste* is located in the mouth, more especially in the tongue; for its action it is necessary that the substance should be in solution; this is in accordance with our knowledge that insoluble medicines are tasteless.

The sense of *smell* resides in the upper nasal cavities where the filaments of the *olfactory nerve* are distributed to the mucous membrane (Fig. 26).

Hearing or the perception of sound vibrations is provided for by the ear through the auditory nerve. The ear (Fig. 27) consists of the *external ear*, the *auditory canal*, the *tympanum* or *drum membrane*, the *middle ear*, stretching across which are the small bones or *ossicles*, and the *internal ear*. The tympanum is stretch-

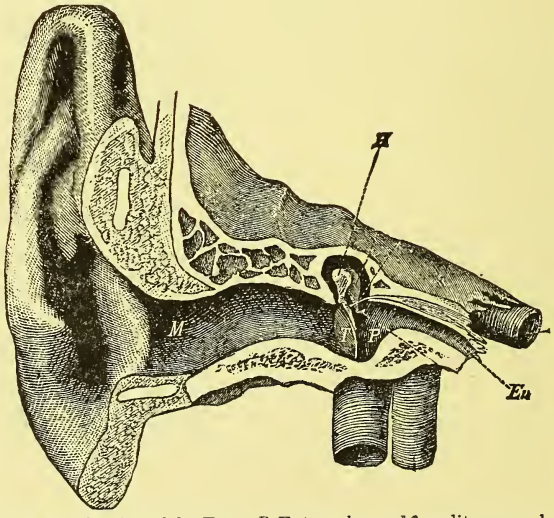


FIG. 27.—Section of the Ear. *B*, External ear; *M*, auditory canal; *T*, tympanum; *P*, middle ear; *H*, ossicles; *E*, Eustachian tube.

ed like a drum-head across the auditory canal, separating the external and middle ears; in order that the air pressure on the two sides of the drum may be equalized there is an air tube leading from the middle ear to the throat and known as the *Eustachian tube;* stoppage of this tube in chronic inflammation of the throat is one of the causes of deafness.

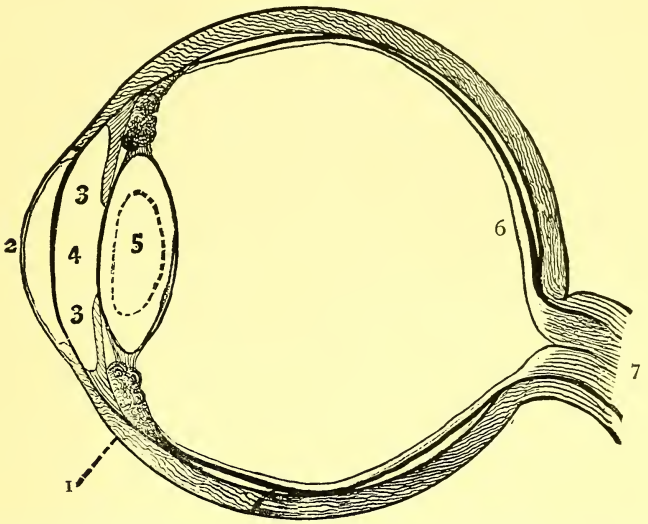


FIG. 28.—Section of the Eye. 1, Conjunctiva; 2, cornea; 3, 3, iris; 4, pupil; 5, lens; 6, retina; 7, optic nerve.

The sense of *sight* consists in the perception of light, color, form, size, and distance; it is resident in the eye.

The *eye* (Fig. 28) is situated in the orbit, the projecting upper border of which, together with the quickly moving lids, give it protection. It is covered in front by a thin vascular membrane which also lines the lids and is known as the *conjunctiva.* Light enters through the transparent *cornea* which is set in front of the eye like a watch-glass; behind the cornea is hung a curtain of muscular fibers variously colored and called the *iris;* the black *pupil* is really a hole in the iris to let in the light which then passes through a *crystalline lens* just behind the pupil and is brought to a focus on the *retina;* the retina is merely an expansion of the *optic nerve* which transmits the luminous impressions to the brain. The dense white outer coat of the eye, lying beneath the conjunctiva, is known as the *sclerotic.*

The eye is a camera, focusing being accomplished by changes in the convexity of the lens effected by the contraction of the *ciliary muscle*, the muscle of *accommodation*.

Color-blindness is the inability to distinguish certain colors, particularly reds and greens.

CHAPTER IV.

THE DIGESTIVE APPARATUS.

INASMUCH as the nutritive constituents of the blood are being constantly used up in the repair of tissue and the production of heat and force, it is necessary that some provision should be made for a constant supply of new material. This is done by the food through the digestive apparatus; the function of the digestion is to prepare the food for absorption and nutrition.

Foods are usually classified according to certain definite compounds or *alimentary principles* which they contain; these are four in number: 1. *Albuminates, nitrogenous substances* or *proteids;* 2. *Fats* or *hydrocarbons;* 3. *Starches* and *sugars* or *carbohydrates;* 4. *Minerals*, including *water* and *salts.*

The especial uses of these alimentary principles in nutrition are as follows: The *albuminates* are essential for the repair of all the nitrogenous constituents of the body, that is to say, they are muscle and blood builders; they regulate the absorption and use of oxygen; they sometimes form fat, and hence force and heat. The *fats* produce force and heat, prevent the waste of the nitrogenous tissues, and serve as a reserve of heat and force. The *starches* and *sugars* also are readily convertible into heat and work, and, though they have little part in the composition of the tissues of the body, they contribute directly or indirectly to the deposit of fat. Water constitutes nearly 60 per cent of the human body and is the most important constituent of foods; without the other foods one may live weeks, but without water it is a question of a very few days. Water is the great solvent without which even the circulation of the blood cannot go on.

The various *salts* are also essential; the alkaline carbonates formed from the salts of the vegetable acids maintain the necessary alkalinity of the blood and body fluids; without a due proportion of them *scurvy* occurs.

All these alimentary principles are necessary for life; some one or

more of them are contained in all foods; if any one food contained them all in proper proportion that substance would constitute a complete diet; milk contains them all and in a complete form for infants, but for adults a mixed diet is necessary. Beef consists largely of albuminates, pork of fats, bread of starch, candies of sugar.

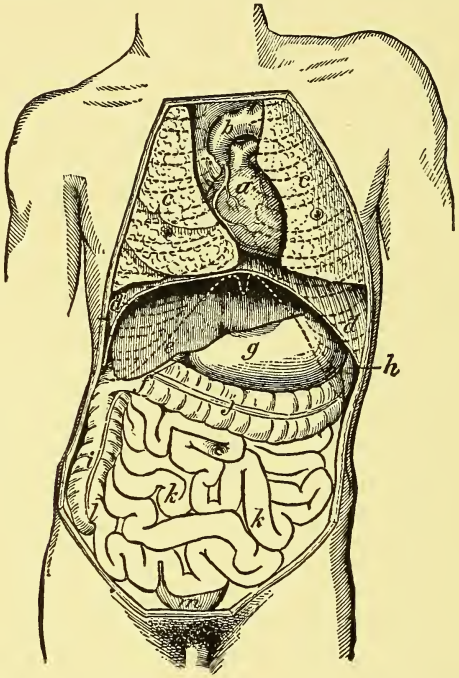


FIG. 29.—View of Thoracic and Abdominal Organs; anterior walls removed, but the relative position of the ribs, navel, etc., indicated. *a*, Heart; *b*, great vessels; *c*, *c*, lungs; *d*, *d*, diaphragm; *e*, liver; *f*, gall bladder; *g*, stomach; *h*, spleen; *i*, ascending colon; *j*, transverse colon; *k*, coils of small intestine; *l*, position of ileo-cecal valve at junction of small and large intestines; *m*, urinary bladder.

The proper quantity of the various articles of food necessary per day to maintain a man in good health while performing ordinary labor constitutes a *ration*.

Great exertion calls for an increase of the albuminates and fats, while great cold demands a special increase of the fats.

Now these alimentary principles, in the form they exist in in foods, are not ready for absorption; they must be reduced to soluble forms: the albuminates to peptones, the sugars and starches to glucose, and

the fats to an emulsion; to accomplish this is the purpose of the digestive apparatus.

When too much food is taken the excess is not digested but acts as a foreign body and causes irritation of the stomach and bowels, followed by pain and diarrhea, or the poisonous products of decomposition are absorbed, causing fever—auto-intoxication.

A deficiency of food causes the tissues of the body to be drawn upon and emaciation is the result.

The apparatus for the digestion of the food consists of the alimentary canal, and the salivary glands, liver, spleen, and pancreas. The *alimentary canal* includes the mouth, pharynx, œsophagus, stomach, small intestine, and large intestine; it is a muscular tube lined with mucous membrane, about thirty feet long and extending from the lips to the anus (Fig. 29).

In the *mouth* provision is made for the *mastication* of the food and its admixture with saliva; beyond this is the apparatus for swallowing, the *pharynx* and *œsophagus*, which convey the food to the *stomach*, where a partial reduction and solution of it take place; in the small intestine the digestion and solution are completed, and the nutritive principles, composing the *chyle*, are separated, by its admixture with the bile and pancreatic juice, from that portion which passes into the large intestine, most of which is expelled from the body.

In looking into the mouth (Fig. 30), we see the teeth and tongue, already described, and, stretching across the upper and back part, a fleshy curtain known as the *palate;* hanging down from the center of the palate is the *uvula*, and on either side behind the palate are the *tonsils.*

In the mouth the food is thoroughly broken up by the teeth and, assisted by the tongue, mixed with the saliva, and formed into a suitable lubricated mass for swallowing. The only digestion which takes place in the mouth is the slight conversion of the starch into sugar; nevertheless thorough mastication is of the greatest importance, as, the more completely the food is broken into small particles, the more easily the digestive fluids of the stomach and intestines get at the particles to dissolve them. If we wish to dissolve out the soluble constituents of a crude drug, we first pulverize it in a mortar, and the same principle obtains here.

After the food has been masticated it is pushed into the pharynx by the tongue and there passes beyond the control of the will through the eight or nine inches of the *œsophagus* or gullet into the stomach.

The saliva comes from the *salivary glands*, which are three in number on each side, the *parotid*, *submaxillary*, and *sublingual*. The parotid glands are situated just in front of and below the ear, and are

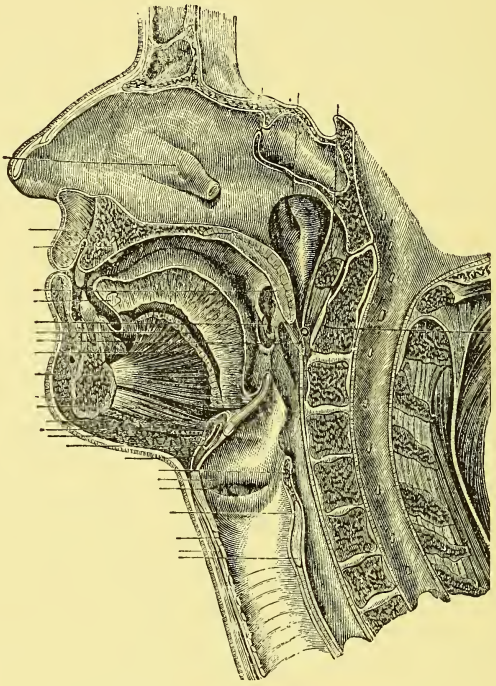


FIG. 30.—Section of Head and Neck.

the seat of the inflammation known as *mumps*. The other salivary glands are placed below the tongue and lower jaw.

The *stomach* (Fig. 31) is a muscular bag lined with mucous membrane, pear shaped, with the large end to the left and lying in the upper part of the abdomen, largely behind the ribs, and separated from the thoracic cavity by the diaphragm. The heart is just above it, with only the diaphragm between, so that it can easily be seen how distention of the stomach may cause disturbances of the heart and how pains in the stomach are so often referred to the heart.

The stomach opens into the œsophagus at one end and into the small intestine at the other by small openings known as the *cardiac* and *pyloric* orifices, respectively. The *small intestine* is about twenty-five feet long, and lies in the central and lower part of the abdomen, extending from the stomach to the right groin, where it terminates in a valvular opening into the large intestine.

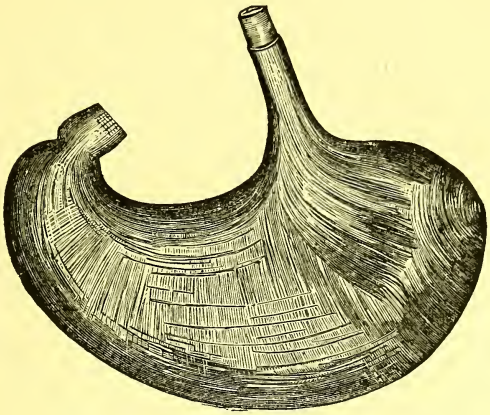


FIG. 31.—Stomach.

The *large intestine* is about five feet long. It commences at the termination of the small intestine in the right groin, this part of it being known as the *cecum* and having attached to its lower and back part a tail-like appendage known as the *vermiform appendix;* this appendix, about the size of a goose quill and two to five inches long, is the part which is so frequently inflamed, constituting the disease called *appendicitis.*

The cecum as it passes up the right side of the abdomen is known as the *ascending colon;* under the liver it turns and crosses to the left in front of the stomach, becoming the *transverse colon;* on the left side of the abdomen it turns downward, the *descending colon;* in the left groin it makes a curve like the letter S, the *sigmoid flexure,* and ends in the *rectum,* which descends to the right and backward to the *anus.*

The intestines are covered with a smooth, shining membrane which lines the abdomen and is known as the *peritoneum;* inflammation of this membrane is called *peritonitis.*

The *omentum* is a sort of apron made of a fold of the peritoneum, containing much fat, which lies over the intestines and protects them. The *mesentery* is the name applied to other folds of the peritoneum which bind the intestines loosely to the abdominal walls behind them. In the abdominal walls are certain weak places where blood-vessels pass out of the cavity and the intestines have a tendency to follow the vessels; these places are the *umbilicus* or *navel*, the *in-*

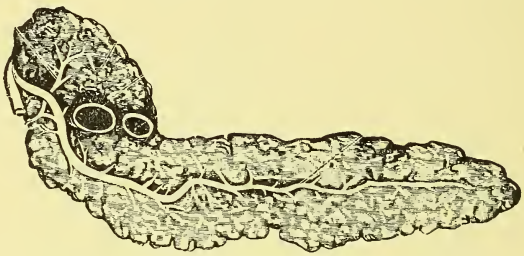


FIG. 32.—Pancreas in Section to Show Its Duct.

guinal canal, along which the vessels pass to the testicle, and the *femoral canal*, for those to the thigh. When the intestine does so escape we have *hernia*, *umbilical*, *inguinal*, or *femoral*, respectively.

In the upper part of the abdomen, on the right side and extending somewhat to the left, we have the liver (Fig. 29); it is the largest gland in the body, weighing between four and four and a half pounds, and in its natural state lies almost wholly behind the ribs. The liver has two large lobes, between which and projecting just beyond the ribs is the *gall bladder*, which empties by a narrow duct into the small intestine just beyond the stomach.

To the left of the stomach and also behind the ribs is another gland, which has no duct, called the *spleen;* it is dark colored and about the size and shape of the hand without the fingers.

Deeply placed behind the stomach and extending transversely across the abdomen is a slender tongue-shaped gland, the *pancreas* or *sweetbread* (Fig. 32). It is about six inches long by three-fourths of an inch broad, cream colored, and has a duct which terminates in the small intestine together with the common bile duct.

In the stomach the food which has already been masticated and part of the starch converted into glucose by the action of the saliva

is brought into contact with the *gastric juice;* this juice is a sour liquid, containing pepsin and hydrochloric acid, secreted by the countless small glands found in the mucous lining of the stomach. This is the same pepsin and hydrochloric acid which are used outside the body to digest milk and other albuminates. The contraction of the muscular walls of the stomach caused by the presence of food thoroughly mixes it with the gastric juice, and continues this churning motion as long as the food remains.

Under this process albuminates are partially converted into peptones, a form suitable for absorption, and part of these peptones are immediately absorbed by the capillaries of the stomach. The solution of the albuminous intercellular materials aids in the liquefaction of other food principles, which pass slowly out of the stomach into the intestine in the form of a whitish fluid known as *chyme.* The process of stomach digestion requires from one to four hours, depending upon the character of the food, the thoroughness of mastication, and other factors. Thus fish and chicken are more quickly digested than beef, and beef sooner than veal, baked and stewed meats sooner than the same articles fried.

The mucous lining of the small intestine is thrown into numerous folds known as *valvulæ conniventes*, the purpose of which is to increase the extent of surface and this is still further accomplished by the innumerable *villi* or tiny projections which stud the surface of the mucous membrane and give it a velvety appearance. There are also millions of small *glands* or *follicles* which secrete the *intestinal juice*, an important aid to digestion. Beside the intestinal glands we have already seen that the liver and pancreas empty their secretion into the small intestine at its upper part.

The *functions of the liver* are many; the most important are the production and storage of sugar, the production of urea, and the secretion of bile. The *bile* helps to emulsify fats, stimulates the intestinal muscle to contraction, acting as a laxative, and is a natural antiseptic preventing putrefaction of the intestinal contents. It is a familiar fact that when bile is absent from the intestine, as in some forms of jaundice, constipation and very offensive stools are apt to result.

The *pancreatic juice* digests all three classes of food, albuminates starches and sugar, and fats.

Unlike the gastric juice, it is alkaline and incapable of acting except in the presence of an alkaline reaction.

To digest foods outside of the body we now use pancreatin and soda almost to the exclusion of pepsin and acid.

Under the combined influence of all these intestinal juices the chyme is soon converted into a milky liquid known as *chyle*, and this is absorbed by both the capillaries of the intestinal tract, whence it passes to the liver through the *portal veins*, and by the *lymphatics* or *lacteals*, another system of vessels which, arising in the *villi*, passes through a number of *lymphatic glands* situated in the mesentery and known as the *mesenteric glands*, to reach a large duct known as the *thoracic duct*, which passes up the left side of the spinal column and empties into the left subclavian vein, just before its junction with the left internal jugular.

The *spleen* has no direct part in digestion, but it does serve indirectly by acting as a reservoir for the storage, in the intervals of digestion, of the additional amount of blood needed during digestion. Other important functions of the spleen are the production of leucocytes, the destruction of erythrocytes, and the production of uric acid.

Passing on down the small intestine, the intestinal contents become more and more solid by the absorption of the liquid chyle, and this process is continued in the large intestine until finally the indigestible residue is cast out of the body as feces.

Some digestion and absorption do take place in the large intestine, as we know from what occurs when we use nutrient enemata, but the action is not a powerful one, and it is safer to give the enemata predigested.

CHAPTER V.

THE BLOOD AND THE CIRCULATORY SYSTEM.

THE *circulatory system* includes the *lymphatic system* and the *blood-vessel system.*

The *lymphatic system*, or *absorbent system* (Fig. 33), includes the *lymphatic* and *lacteal vessels*, and the *lymphatic glands.*

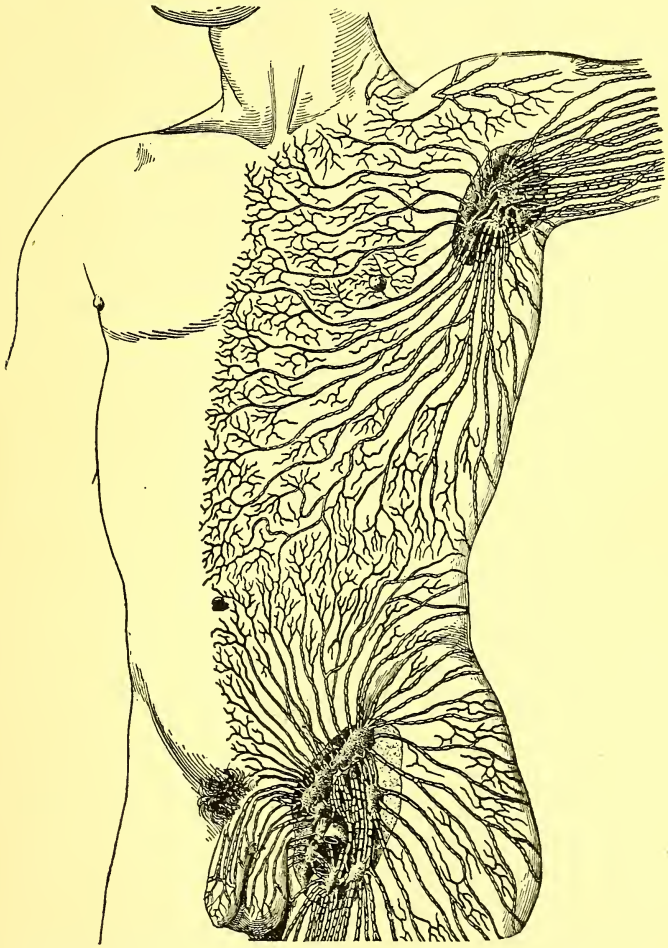


FIG. 33.—Lymphatic System of Trunk, Genitals, and Upper Arm.

The *lymphatic vessels* are found in all parts of the body, wherever there are blood-vessels; they contain lymph, a colorless fluid like water, except those of the intestine, which during digestion contain a milky fluid, which gives to these particular lymphatics the name of

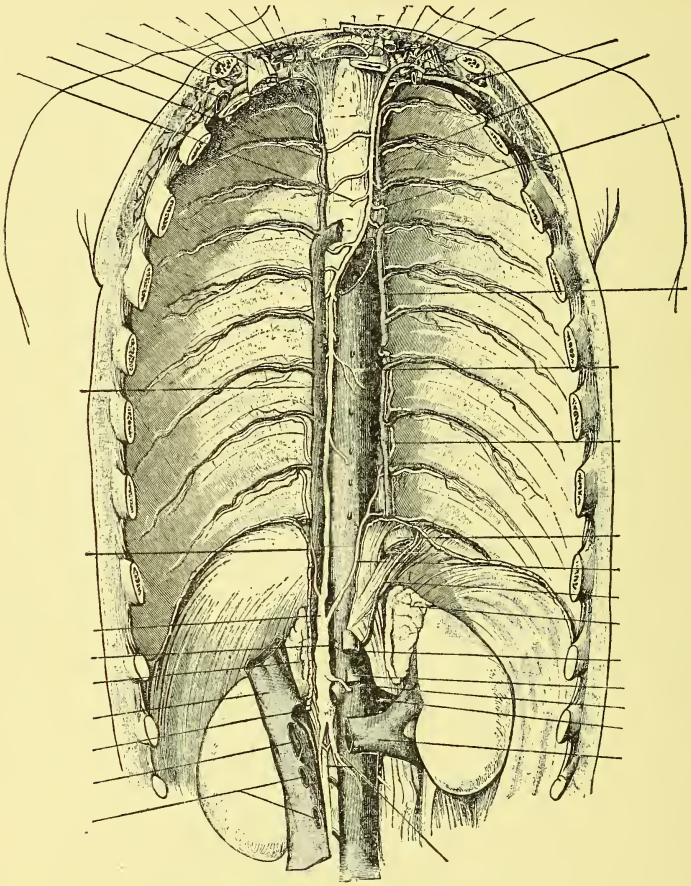


FIG. 34.—Thoracic Duct.

lacteals. All over the body also are found *lymphatic glands*, varying in size from a pin head to a small almond; all the lymph passes through these glands before it reaches the blood by way of the thoracic (Fig. 34) and lymphatic ducts. The lymphatic system has an important function in connection with the elaboration of the blood,

more and more blood cells appearing in the lymph as it passes through successive chains of glands.

The glands also serve a very useful purpose in resisting the invasion of the body by disease germs.

In the case of an infected finger wound, for instance, one sometimes sees fine red lines running up the arm and the patient complains of a *kernel* in the arm-pit; the red lines are inflamed lymphatics and the kernel is an inflamed gland; again, in the case of a sore on the penis the glands in the groin swell, constituting a *bubo*.

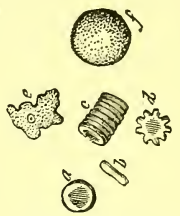


FIG. 35.—*a*, *b*, *c*, *d*, Red cells, side, edge, in rouleaux, crenated; *e*, *f*, white cells.

Certain groups of lymphatic glands are important owing to their connection with special diseases.

A characteristic of syphilis is an enlargement of the *inguinal*, *epitrochlear*, and *post-cervical glands*, found respectively in the groin, just above and behind the inner elbow, and at the junction of the neck with the back of the head.

The inguinal glands also become inflamed in other venereal diseases. The glands in the front of the neck become enlarged, cheesy, and sometimes suppurating in the condition commonly called *scrofula*, really a tuberculous invasion through the mouth.

The *functions of the blood* and *blood-vascular system* are to receive from the lungs and alimentary tract and to carry to all parts of the body the materials necessary for its nutrition and proper temperature and moisture, and to carry away to the excretory organs the waste matters which if retained would prove poisonous. It has also important functions in the protection of the body from the invasion of the bacteria of disease.

The total quantity of blood is usually estimated at one-twelfth of the weight of the body, or an average of about a gallon and a half.

The blood is red in color, bright red in the arteries, dark red in the veins. It is composed of *cells* or *corpuscles* floating in a liquid, the *liquor sanguinis*.

The cells are of two sorts, the *red cells* or *erythrocytes* and the *white cells* or *leucocytes* (Fig. 35). The red cells are much the more numerous, there being about five hundred times as many as there are of the white. They are very small, about one-three-thousandth of an

inch in diameter, and, though red in mass, the individual cells are seen under the microscope to be light yellow in color. They are round, flattened discs, like a copper cent, except that they are concave on each side, and are largely composed of *hemoglobin*, a substance which has a great oxygen-carrying capacity.

The leucocytes are not flat like a cent, but spherical like a ball, a little larger than the red cells, composed of protoplasm, and capable of changing their own form and of making their way through the unbroken walls of the blood-vessels.

The *liquor sanguinis* consists of *serum* and the elements of *fibrin;* when bleeding occurs the fibrin at once forms and the blood *coagulates* or *clots;* but for this property of the blood hemorrhages would never stop.

Serum, which is liquor sanguinis less fibrin, contains the principal nourishing ingredients of blood—albumin, fats, sugar, salts, and gases.

In a general way the blood current may be likened to a river and the cells to boats floating upon it; the red cells are the freight boats loaded with oxygen which they receive in the lungs and carry to all parts of the body; the white cells are the war ships, always on the alert for an attack by disease germs; when such an attack occurs the leucocytes hurry to the invaded point and a battle ensues in which there are killed and wounded on both sides; the dead white cells, when in large number, constitute *pus* or *matter*. The blood serum itself not only carries nourishment to all parts of the body, but, coming back, acts as a sewer, bringing away the waste products, both liquid and gaseous.

In order to maintain a constant circulation of the blood, a complete system exists, consisting of a constantly acting pump, the *heart*, the *arteries* which carry the pure blood to all parts of the body, the *capillaries* from which the blood delivers its nutritive materials to the tissues and takes on a load of waste products, and the *veins* which return the impure blood to the right side of the heart; this is the *systemic circulation* and requires about a half a minute for the entire trip; then there is a subsidiary system known as the *pulmonary circulation*, whose arteries take the impure blood from the right side of the heart to the lungs, in the capillaries of which it is purified, losing carbonic acid and waste matters, taking on a load of oxygen,

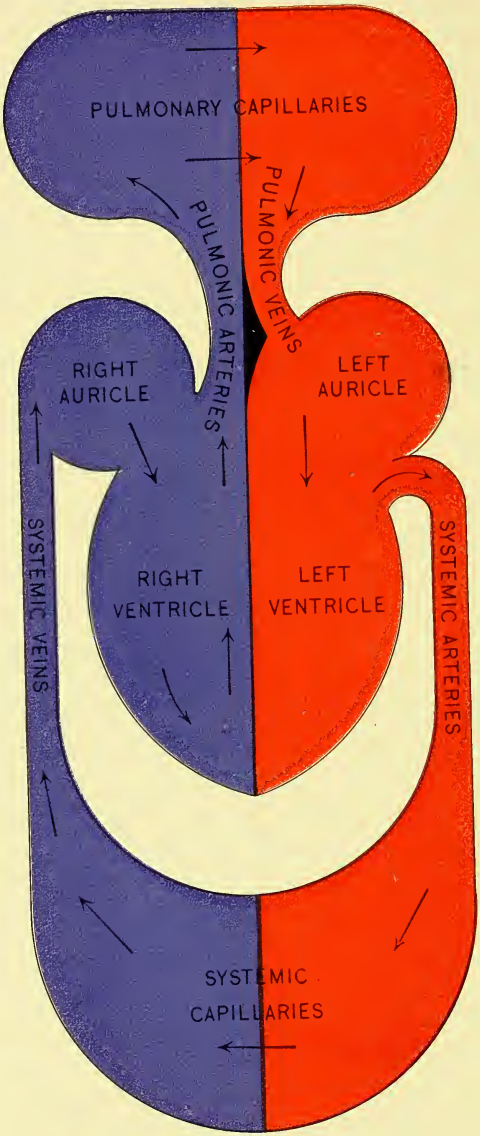


FIG. 36.

DIAGRAM TO SHOW THE COURSE OF THE BLOOD IN PASSING FROM A GIVEN POINT THROUGH THE TWO SETS OF CAPILLARIES TO THE STARTING POINT.

and then passing through the pulmonary veins to the left side of the heart for another trip through the systemic circulation (Fig. 36).

The *heart* is a conical hollow muscle, situated between the lungs and behind the sternum and enclosed in a fibrous sack, the *pericardium* (Fig. 37). It is about the size of a closed fist, its average

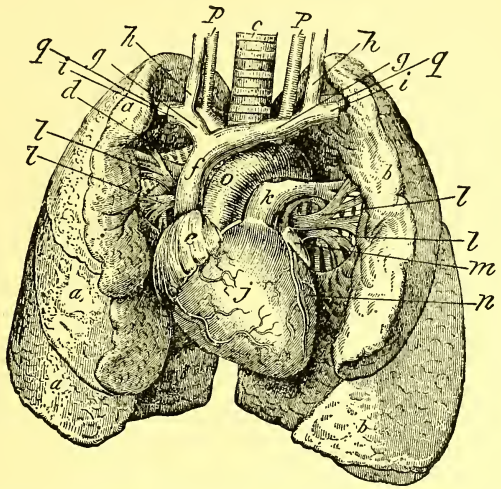


FIG. 37.—The Thoracic Organs. *a*, Right lung divided into three lobes, and *b*, left lung into two lobes, their anterior margins thrown back to expose the deeper parts; *c*, trachea, with its cartilaginous rings; *d*, right bronchial tube; *e*, right auricle, receiving from above, *f*, the superior vena cava, which is formed by the junction of *g*, *g*, the right and left innominate veins, and each of these by the confluence of *h*, *h*, *i*, *i*, the jugular and subclavian of its own side; *j*, the right ventricle, giving issue to *k*, the pulmonary artery, which divides into two branches, that for the right lung passing behind the other great vessels; *l*, *l*, *l*, *l*, pulmonary veins, bringing oxygenated blood to *m*, the left auricle; *n*, the left ventricle, from which the blood is carried to the organs and tissues by *o*, the aorta; *p*, *p*, *q*, *q*, carotid and subclavian arteries, given off from the arch of the aorta.

weight being three-fourths of a pound. The apex is found between the fifth and sixth ribs, just inside of the nipple line. It is divided by a vertical partition into two lateral halves which have no communication with each other. Each of these lateral halves is further subdivided by a horizontal constriction into two communicating cavities, an *auricle* and a *ventricle;* the whole heart is lined by a smooth membrane, the *endocardium*, and all its openings are protected by *valves* (Fig. 38).

The right is the venous side of the heart; its auricle receives the venous blood from the entire body through the superior and inferior

vena cava; when it is full it contracts and passes the blood into the right ventricle, which in its turn contracts and sends the blood to the lungs, whence it is returned arterialized to the left auricle, and from there to the left ventricle which forces it through the arteries to all parts of the body. This contraction or beating of the heart takes place about seventy-two times to the minute. The valve between the auricle and ventricle on the left side is known as the *mitral*, that on the right side as the *tricuspid*, while the valves which prevent regurgitation from the aorta and pulmonary arteries are known as the *aortic* and *pulmonary*, respectively.

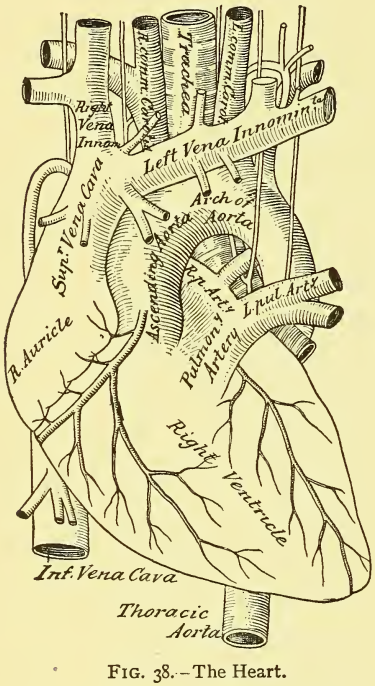


FIG. 38.—The Heart.

The *arteries* are elastic, muscular tubes, which stand open when cut across, and are without valves except at their exit from the heart. The elastic tissue in their walls allows them to expand when blood is forced in from the heart, and by subsequent contraction to maintain a uniform pressure between heart-beats. It is this expansion, caused by the heart forcing more blood into the already full arteries, which constitutes the *pulse*. The muscular tissue allows of a local regulation of the circulation under nervous influences such as occur in blushing or the pallor of fear.

The arteries freely communicate with each other by the *anastomosis* of small branches, so that when an artery becomes blocked by a clot, or is tied, the blood goes around the obstruction by means of the communication between the small branches given off on either side and the *collateral circulation* is established. It is by reason of the freedom of this collateral circulation that both ends of a cut artery spurt, and but for it gangrene might ensue when an artery is tied.

By the constant giving off of branches the arteries become smaller and smaller until they finally terminate in the capillaries.

The *capillaries*, so called because of their resemblance to minute hairs, though they are much smaller than the finest hairs, differ from the arteries in being of a uniform size throughout, and in having only a single thin cellular coat through which the ultimate interchange of materials takes place between the blood and tissues.

The smallest *veins* start from the capillaries and constantly join each other, growing larger and larger, until finally all the venous blood in the body enters the right side of the heart through the superior and inferior vena cava. The pulmonary veins, unlike other veins, return arterial blood from the lungs to the left auricle.

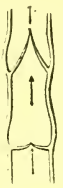


FIG. 39.—The Valves of a Vein.

Veins differ from arteries in the following particulars: *Veins:* The contained blood is dark red; it flows in a continuous stream without spurting; it flows toward the heart. The veins have thin walls so that they collapse when cut across; bleeding occurs only from the far end of the cut vein, because the valves (Fig. 39) with which all veins (except those of the rectum) are supplied prevent a backward flow of blood from the near end. Many veins are superficial and may be seen under the skin.

Arteries: The contained blood is bright red; it flows in waves, and spurts from the vessel when cut; it flows away from the heart. Arteries have thick walls and stand open when divided, like a piece of hose; bleeding occurs from both ends, owing to the absence of valves and the freedom of the collateral circulation. The large arteries are deeply placed near the bone and are usually on the inner or protected side of a limb. The circulation of the blood in the arteries is effected by the pumping action of the heart. In the veins the action of the heart is only one factor, the other two being pressure of the muscles in exercise and the aspirating power of the chest in inspiration. When the muscles contract they press on the thin-walled veins, and, as the blood is prevented from going backward by the valves, it must go toward the heart.

When any obstruction exists in the course of a vein it is apt to become enlarged or *varicose;* such enlargements we see in the leg, con-

stituting *varicose veins*, in the scrotum, called *varicocele*, and about the anus, called *hemorrhoids* or *piles*.

All the arterial blood leaves the left ventricle of the heart by means of a large artery, called the *aorta* (Fig. 40); this vessel arches backward over the root of the lung, to the left side of the spinal column, down which it passes to the fourth lumbar vertebra, where it divides into the *common iliacs*. From the *arch of the aorta* are given off three large vessels, the *innominate*, the *left common carotid*, and the *left subclavian;* the innominate soon divides into the *right common carotid* and *right subclavian*, so that at the root of the neck the two sets of arteries are symmetrical. The *common carotids* on each side pass up alongside the trachea, or windpipe, where they can be felt, to the upper border of the thyroid cartilage, or "Adam's apple," where they are divided into the *internal* and *external carotids*. The *internal carotids* supply the interior of the cranium; they lie just behind the tonsils on the inside of the throat. The *external carotids* supply the exterior of the cranium and face, and the tongue; the front edge of the sterno-mastoid muscle is the guide to this artery; the *external carotid*, or better, the *common carotid*, may be compressed against the vertebral column. The *facial*, a branch of the external carotid, curves over the lower jaw about an inch in front of its angle and can be compressed there; the *temporal*, another branch, passes up just in front of the ear and divides into an *anterior* and *posterior temporal branch*. The *superior* and *inferior coronary* branches of the facial unite with those from the opposite side to form a complete arch in each lip.

The *subclavian artery* passes across the first rib just behind the clavicle, then beneath the clavicle to the axilla, where its name changes to axillary; in the hollow behind the clavicle the subclavian can be felt and compressed against the rib. The *axillary artery*, where it passes beyond the armpit, is called brachial; the *brachial* extends from the lower margin of the axilla down the inner and anterior aspect of the arm, and terminates about a half inch below and in front of the bend of the elbow, where it divides into the *radial* and *ulnar*. The course of the brachial artery is roughly indicated by the inner seam of the coat sleeve, or by a line drawn from the arm-pit along the inner border of the biceps muscle to the front of the elbow; it may be compressed against the humerus.

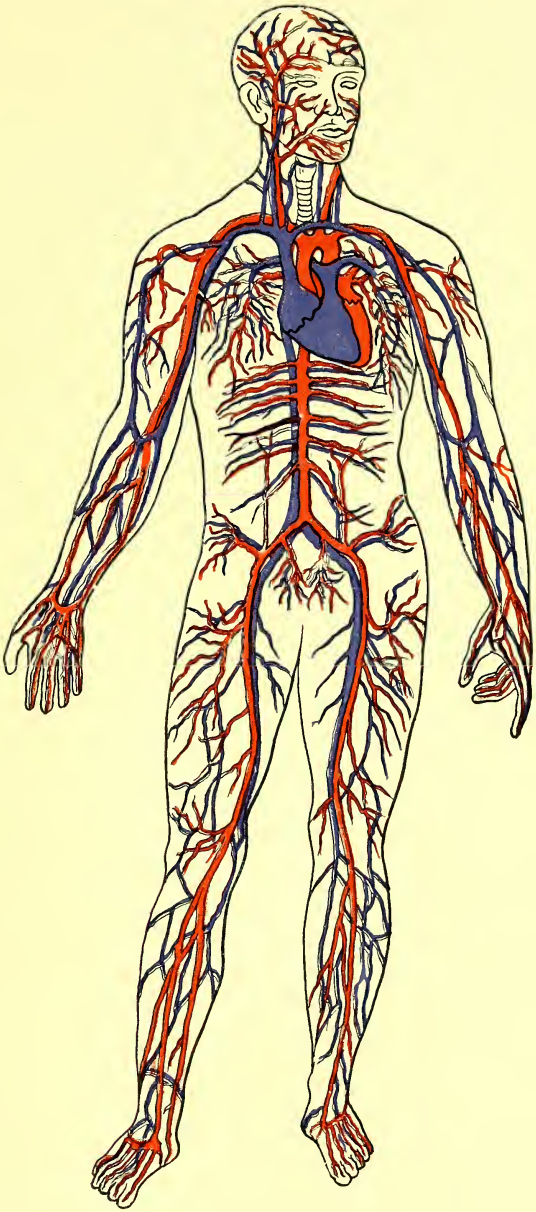


FIG. 40.—The Circulation, Venous and Arterial.

The *radial artery* passes down the radial side of the arm to the wrist, where it winds around the outer side and then passes forward to the palm between the thumb and index finger; the *ulnar artery* in like manner passes down the ulnar or inner side of the arm and divides into two branches which anastomose with two similar branches from the radial, forming the *superficial* and *deep palmar arches*. Both the radial and ulnar are deeply buried under the muscles until just above the wrist where they become superficial; it is at this point that the beating of the radial is felt for in taking the *pulse*. The position of the palmar arches is important, because, owing to the fact that they receive branches from both the radial and ulnar arteries, bleeding from them is profuse and requires for its control pressure on both vessels. The *superficial palmar arch* is on a line with the lower border of the extended thumb, while the *deep palmar arch* is a half inch higher up.

The *digital arteries*, which supply the fingers, are branches of the palmar arches and pass along both sides of each finger.

In the thorax the aorta gives off the *intercostals*, which run along the inner surface of the upper and lower borders of each of the ribs; in the abdomen it gives off important branches to all the abdominal viscera, and divides into the common iliacs. The *common iliac* on each side passes downward and outward to the margin of the pelvis where it divides into the external and internal iliac. The *internal iliac* goes to the interior of the pelvis and supplies it together with its viscera and the generative organs. The *external iliac* passes downward and outward to the fold of the groin, where it enters the thigh and becomes the femoral. The *femoral artery* commences at the center of the groin and passes down the front and inside of the thigh to the back of the knee, where it is known as the popliteal; its course may be shown by stretching a string from the center of the groin to the back of the knee; just below the groin it may be compressed against the head of the femur.

The *popliteal artery* extends from the termination of the femoral to just below the knee where it divides into the anterior and posterior tibial; it is so tightly held down under fascia and tendons that it is hardly accessible for compression. The *anterior tibial* passes forward between the tibia and fibula to the front of the leg and then down

deeply beneath the muscles to the front of the ankle, where it becomes the *dorsalis pedis* which is distributed to the back of the foot. The *posterior tibial* gives off a large branch, the *peroneal*, and then passes down the back of the leg beneath the deep muscles to the inner ankle, whence it passes to the sole of the foot and divides into two branches, the *internal* and *external plantar*, which supply the toes with *digital arteries* having the same distribution as those of the fingers. Behind the inner ankle the posterior tibial may be felt and compressed.

The veins may be divided into three sets, the *pulmonary*, the *systemic*, and the *portal*.

The *pulmonary veins* differ from all others in that they convey arterial blood from the lungs to the left side of the heart; conversely, the *pulmonary artery* conveys venous blood from the right ventricle to the lungs.

The *systemic veins* (Fig. 40) are arranged in two sets, deep and superficial; the *deep veins* accompany their corresponding arteries, each of the large arteries of the leg, forearm, and arm having two veins; the deep veins communicate with the superficial set. The *superficial veins* lie just under the skin where they can, in many localities, be plainly seen; those of the lower extremity are the *internal saphenous*, which starts on the top and inner side of the foot, runs up the inside of the leg and thigh and terminates in the femoral just below the groin, and the *external saphenous* starting in like manner on the outer side of the foot and emptying into the *popliteal* behind the knee.

Those of the upper extremity are the *radial* on the outer side, the *ulnar* on the inner side, and the *median* in the middle; opposite the bend of the elbow the median splits into two veins, the one, known as the *median cephalic*, joining with the radial to form the *cephalic*, and the other, the *median basilic*, uniting with the ulnar to form the *basilic;* the basilic and cephalic both empty into the *axillary*. The *median cephalic* is the vein ordinarily opened in bleeding. The great superficial vein of the neck is the *external jugular*, which passes down from the angle of the jaw to the middle of the clavicle; it may be brought into view by pressing with the finger just above the middle of the clavicle.

The *portal system* is composed of four large veins which collect

the venous blood from the viscera of digestion. The trunk formed by their union (*vena porta*) enters the liver and breaks up into capillaries from which another set of veins, the *hepatic veins*, arise, which terminate in the *vena cava*. This circulation is for the purpose of subjecting the products of digestion contained in these veins to the special action of the liver before they go into the general circulation.

CHAPTER VI.

THE RESPIRATORY APPARATUS.

THE respiratory apparatus consists of the larynx, trachea, bronchi, and lungs; the thyroid gland, which lies upon the trachea, may be conveniently considered in this connection (Fig. 41).

The *larynx*, or *Adam's apple*, is the organ of voice, and is situated in the middle line of the neck, where it may be felt and seen moving up and down in the act of swallowing. It lies between the trachea and the base of the tongue, and its upper opening is closed during swallowing by a cartilaginous flap called the *epiglottis;* when the tongue is drawn well forward, especially if the patient gags, the epiglottis may be seen as a white cartilage curving forward over the root of the tongue. When one chokes in swallowing because the food is said to have "gone the wrong way," it means that the epiglottis has failed to close efficiently the opening into the larynx, and food has gotten in, causing coughing for its expulsion.

The larynx is composed externally of cartilage; internally two white fibrous bands stretch from front to rear, and are known as the *vocal cords;* it is the vibration of these vocal cords that produces sound.

The *trachea* or *windpipe* is a cartilaginous and membranous tube which extends downward about four and one-half inches from the larynx to its division into the two *bronchi*, one of which goes to each lung. The cartilages of the trachea and bronchi are arranged in rings, and serve the purpose of keeping the windpipe open. The *right bronchus* is larger and shorter than the left, and foreign bodies which get into the windpipe usually lodge in this bronchus.

The bronchi divide and subdivide and give off branches like a tree, at the same time gradually losing their cartilages and getting thinner and thinner until the little bronchioli terminate in a sack the walls of which are studded with *air cells*, a terminal bronchus and its air-cells resembling a bunch of grapes.

The termination of the bronchi together with the air cells constitutes the lung tissue proper.

When the larynx becomes obstructed by disease so that air cannot get into the lungs and death is otherwise imminent, a tube is introduced into the larynx between the vocal cords, *intubation*, or an opening is made into the trachea and a tube inserted there, *tracheotomy*.

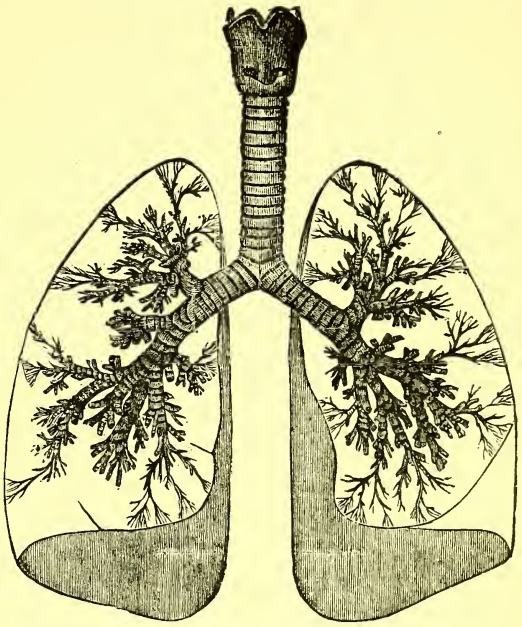


FIG. 41.—The Larynx, Trachea, Right and Left Bronchus, and the Lungs. The latter have been cut open to show the method of division and subdivision of the Bronchi.

The *lungs* are the essential organs of respiration; they are commonly known as "lights," and with the heart between them fill the entire chest cavity (Fig. 37). Each is covered by a smooth, shining *serous membrane* which also lines the chest cavity and is called the *pleura*. Ordinarily the lungs are everywhere in contact with the chest walls, but when an opening is made in the chest, as by a shot or stab wound, or when inflammation of the pleura occurs and fluid is poured out, a space is formed between the lung and the chest wall, known as the *pleural cavity* (Fig. 42).

The right lung has three lobes, the left lung two, and each is composed of bronchi, air cells, and the divisions and subdivisions of the pulmonary arteries and veins.

In the ultimate air cells the venous blood of the pulmonary arteries circulating in the capillaries is brought in contact with the air in the cells, and the interchange takes place which results in the blood receiving a supply of oxygen and becoming arterial, while the air becomes charged with carbonic oxide, waste organic matter, and watery vapor.

In inflammation of the lungs, *pneumonia*, these air cells become filled with liquor sanguinis containing some red blood cells, so that air can no longer enter and that portion of the lung is temporarily useless. In *laryngitis* and *bronchitis* mucus is poured out into the bronchi and coughed up, but the air cells are free; hence those affections are much less serious.

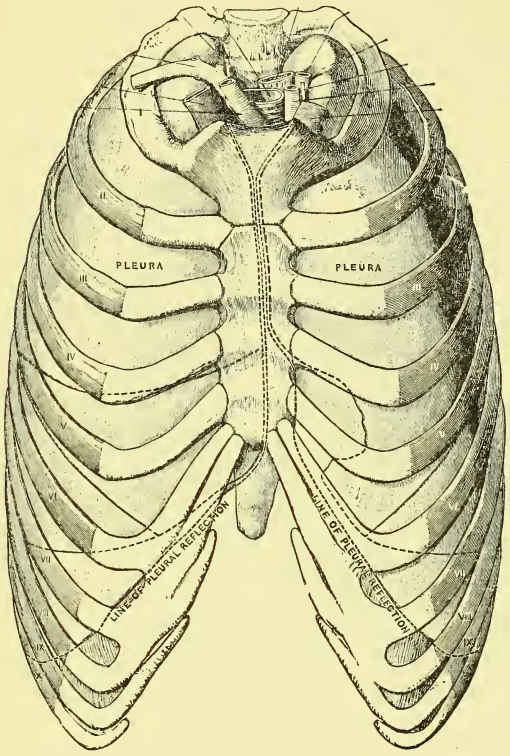


FIG. 42.—Chest, showing Pleuræ.

Breathing or *respiration* consists in the alternate expansion and contraction of the chest, by which air is drawn in and forced out; the drawing in is known as *inspiration* and the forcing out as *expiration*. The number of these movements in health is about eighteen to the minute. In ordinary quiet respiration the principal muscle concerned is the diaphragm, which in its relaxed state is arched upward into the cavity of the chest; in its contraction the muscle is flattened out, largely increasing the capacity of the chest, so that the air rushes in through the larynx to fill the vacuum; inspiration completed, the diaphragm relaxes, the chest walls collapse, and expiration occurs. When respiration becomes more active the intercostal muscles, which raise the ribs, come into play, and when still more effort is required all the muscles attached to the chest come into action, and even the nostrils are dilated to allow the entrance of more air.

Ordinary outdoor air contains about twenty-one parts of oxygen,

seventy-nine parts of nitrogen, and four hundredth parts of carbonic acid, or four parts in ten thousand.

The *oxygen* is the element of the air which is necessary to sustain life; it serves the same purpose as it does in a fire, maintains the combustion by which heat and force are produced. If you shut off the supply of air (oxygen) to a furnace the fire goes out; if you shut off the supply to the lungs life goes out. The nitrogen has no other value than to dilute the oxygen.

When air is breathed it loses a portion of its oxygen, is raised in temperature, and has added to it in the lungs carbonic acid, organic matter, and the vapor of water; the amount of contained carbonic acid is increased a hundred times, to about four per cent.

As the air in a confined space is breathed over and over again, these impurities increase until they cause the headaches and drowsiness which we experience in a crowded room; if fresh air is not provided these impurities will even cause death.

A notable instance of this character occurred in India in the year 1756, when one hundred and fifty-six British prisoners were confined in a dungeon eighteen feet square; the next morning one hundred and twenty-three of them were dead.

The inflow of fresh air to take the place of that which has been breathed is known as *ventilation.*

The heat which is produced in the body by the burning or oxidation of carbon, the resulting carbonic acid escaping through the lungs, would raise the temperature of the body too high were it not that provision is made for its regulation. The evaporation of water is the principal cooling agency, the evaporation taking place from the lungs and skin; this is going on all the time, though the vapor from the lungs is only visible in cold weather. So with the skin, the water is only visible in hot weather, when so much escapes that the unevaporated portion becomes visible as *sweat* or *perspiration;* the harder we work, the more heat is produced, and the more evaporation of water is required to reduce the body temperature. If the skin stops action the body temperature rapidly rises, and we have the condition of *heat-stroke,* in which the hot, dry skin is a familiar symptom.

CHAPTER VII.

THE EXCRETORY APPARATUS.

We have already seen that in all life processes waste products and poisons are produced, which, if not gotten rid of, are finally fatal even to the life which produced them. The yeast fungus growing in sugar solution produces a poison, alcohol, which when it reaches a certain proportion destroys the life of the yeast; so with the human body, it produces very deadly poisons which must be thrown off if the body would live, and the apparatus by which these poisons are eliminated is known as the excretory apparatus. The skin, lungs, large intestine, and urinary apparatus all take part in excretion.

The excretory functions of the skin, lungs, and rectum have been fully described elsewhere. It remains to give a description of the *urinary apparatus*, whose practically sole function is excretion. It consists of the *kidneys* which secrete the urine and the *ureters* which convey it to the *bladder*, where it accumulates until it is convenient to discharge it through the *urethra*.

The *kidneys* (Fig. 34), one on each side, are situated in the loins, at the back of the abdomen, behind the peritoneum, on either side of the spinal column, and just below the last rib. They are about four inches long by two and a half inches wide, by a half inch thick, and weigh about five ounces each. They are covered by a fibrous capsule which may be stripped off, and consist of two portions, a cortex and a medullary portion. The *cortex* is the secreting part, while the *medulla* is largely an aggregation of urinary tubules on their way to the pelvis of the kidney.

Each *urinary tubule*, after many twists and loops, terminates in a little sack, in which is a bunch or tuft of tortuous capillaries; the veins emerging from these capillaries are smaller than the arteries that empty into them, so that the blood in passing through is subjected to some degree of pressure, and under the pressure water and salts escape from the vessels. Farther on down the tubule the secreting

epithelium with which the tubule is lined takes from the blood the urea and other waste products necessary to purify it and complete the urine.

On the inner side of each kidney is a deep depression containing a funnel-shaped sac, the *pelvis*, which receives the terminations of the urinary tubules, and is itself the starting point of the ureters. The *ureters* are two musculo-membranous tubes, about the size of a goose quill, and sixteen inches long, extending from the pelvis of the kidneys to the urinary bladder (Fig. 43).

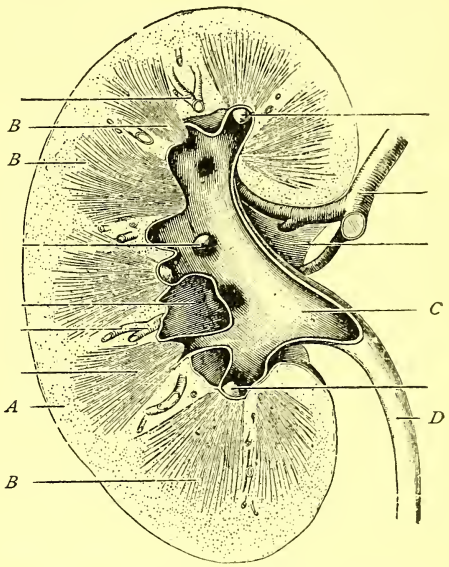


FIG. 43.—Section of the Kidney. *A*, Cortex; *B*, medulla; *C*, pelvis; *D*, ureter.

When a stone formed in the pelvis of the kidney finds its way into one of these ureters, in its passage to the bladder, it naturally has a hard time in getting through such a small canal, and the result is the excruciating pain experienced in such a condition which is known as *renal colic.*

The *bladder* is a muscular bag which serves as a reservoir for the urine and in a moderately distended condition holds about a pint. When empty or containing only a small amount of urine it lies wholly within the pelvis, and behind the pubis; when full it rises into the abdomen and can be felt and percussed above the pubis. To determine whether the bladder is full we tap on the finger placed just above the pubis; if we get a hollow sound we know that it cannot be distended (Fig. 44).

As the bladder rises into the abdomen it leaves exposed in front a small area not covered by the peritoneum and through which it can be aspirated without opening the peritoneum. Likewise there is a similar area behind, where the bladder rests on the rectum and through which it can be reached. The neck of the bladder is embraced by

the *prostate gland* which in old men becomes enlarged and makes a bar to the passage of urine.

The *urethra* is eight or nine inches long and extends from the neck of the bladder to the *meatus:* when the penis is held up that portion of the urethra under the pubis describes a curve with the concavity upward, hence the curved shape of catheters and sounds.

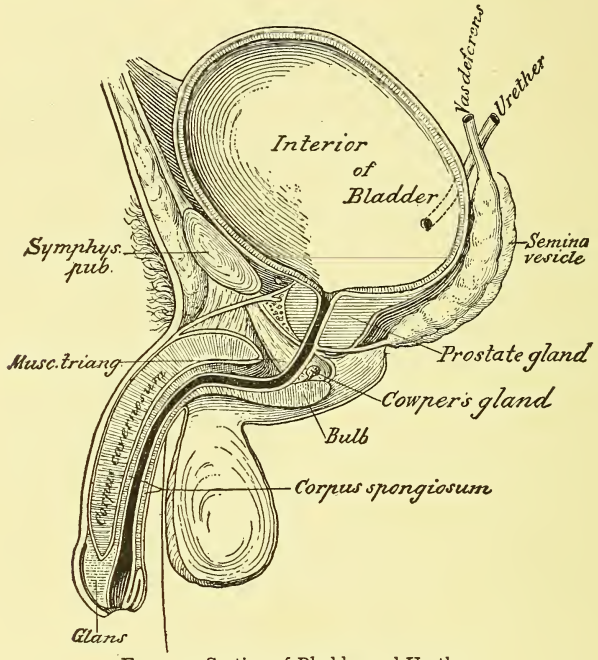


FIG. 44.—Section of Bladder and Urethra.

Urine is a watery solution of urea, uric acid, coloring matter, and salts, mostly urates, phosphates, carbonates, and chlorides. The average man passes about fifteen hundred cubic centimeters or three pints of urine a day, and this urine contains about fifty grammes or one and one-half ounces of solids. Normal urine is yellowish in color, acid in reaction, and has a specific gravity of from 1015 to 1025.

The *urea* is the most important constituent, a little more than an ounce being excreted daily.

Healthy urine when passed is ordinarily clear, but it may quickly become cloudy and a sediment form without indicating disease. If such cloudiness disappears when the urine is heated it is due to

urates; if the cloudiness disappears on the addition of a few drops of acid it is due to *phosphates.*

Among abnormal constituents of the urine, indicating disease, are albumin, sugar, bile, blood, and pus.

Just above the kidney on each side is a small triangular ductless gland known as the *suprarenal gland.* It has nothing to do with the excretion of urine but is considered here for convenience. That these little glands add something important to the blood is shown by the fact that their removal in animals is quickly followed by death, and that their diseased condition in man is the cause of a fatal malady known as *Addison's disease.* Their function appears to be to sustain muscular tone, especially in the blood-vessels, and a substance known as *adrenalin* has been isolated from them which has a very powerful effect in that direction.

PART III.

FIRST AID.

CHAPTER I.

EMERGENCIES, CONTUSIONS, AND WOUNDS.

ONE of the most important of the many duties of the hospital-corps man is to render first aid; in time of war it becomes his most important duty. In order that this duty shall be performed promptly and efficiently and without excitement or hesitation he must be taught what to do until he possesses the confidence born of knowledge.

If called upon for assistance in an emergency under other conditions than those of an action his first duty is to send word to a medical officer; in action this often cannot be done. The next step is to see that the sick or injured man is not crowded about so that he cannot get air; then the nature of the case must be ascertained as quickly as possible. Look for bleeding; if it is at all profuse it must be stopped at once; if there is shock lower the head and give a little aromatic spirits of ammonia in water; if there is a wound protect it by a first-aid dressing, ripping up the clothing if necessary to get at it, but not attempting to clean or handle it in any way; if there is a fracture immobilize it before moving the patient a foot, so that a simple fracture may not be made compound. Then remove any equipments the soldier may have on, unbutton his collar, and loosen the clothing about his chest and abdomen.

In action the amount of first aid to be rendered will depend on circumstances; perhaps the arrest of severe hemorrhage is all that can be attempted.

The clothing must be preserved as far as possible, for it is often impossible to replace it. On reaching the hospital the clothing must be very gently removed. To remove a shirt, pull it up from the back, then draw it over the head to the front, and lastly disengage the arms;

if one arm is injured disengage the well arm first, then draw the shirt over the head, and lastly free the injured arm; if necessary rip up the seam on the injured side.

A *contusion* or *bruise* is a subcutaneous or closed wound: a laceration of the deeper tissues without a division of the skin. Contusions vary in extent from an ordinary "black and blue" spot, to the almost complete pulpification of a limb with laceration of the blood-vessels and nerves such as sometimes occurs in railway or other accidents. The first evidence of contusion is usually rapid swelling of the part; every one knows that when one is struck a hard blow on the eye the swelling closes it almost immediately, or a blow on the head is promptly followed by a "bump." There is only one thing which could cause such rapid swelling, and that is bleeding caused by the laceration of the subcutaneous tissues and vessels, the blood not being able to escape. At first there is no discoloration, but after a few hours or a day, the blood makes its way toward the surface, and the part looks black and blue and, as changes later take place in the blood, greenish or yellow. Another symptom is pain. If the injury is severe there is shock; the more shock the less pain usually. *Shock* is a condition of nervous depression like fainting, only shock is due to physical causes, while fainting is due to mental impressions. The symptoms of shock are anxiety, pallor, dilated pupils, trembling, chilly feeling, nausea, clammy skin, very weak pulse, sighing respiration, often a subnormal temperature. The amount of shock will depend upon the part of the body injured and the gravity of the injury; it is much more marked in injuries of the trunk than in injuries of the extremities; injuries of the testicle are apt to be attended with marked shock. Shock may be so severe as to terminate fatally without reaction.

The treatment of shock consists in the use of heat externally and stimulants internally; hemorrhage must be carefully looked for and controlled if present. In severe shock on the field it is often safer not to attempt to move the patient until there are signs of reaction; give him some stimulant and leave him temporarily. If he can be moved get him in bed as quickly as possible; wrap him in hot blankets and surround him with bottles of hot water; give him hot coffee or hot beef tea; keep him perfectly quiet with the head low.

For the treatment of the contusion itself the indication is to stop the subcutaneous bleeding; this can be done by very hot or very cold applications; if the injury is in a limb, firm, even pressure of a bandage may be effective. Later when the bleeding has ceased the absorption of the extravasated blood may be hastened by hot fomentations and massage.

A *wound* is a division not only of the tissues but of the overlying skin. Wounds are classed as *incised*, *lacerated*, *contused*, *punctured*, and *poisoned; gunshot wounds* are usually considered in a class by themselves.

An *incised wound* is one made with a sharp cutting instrument, the class of wounds commonly known as *cuts*, such as cuts with a razor or knife.

A *lacerated wound* is a *torn* wound, such as is made by barbed wire or a piece of shell; it does not differ practically from a *contused* or *bruised* wound made with a blunt instrument such as a club or stick.

A *punctured* wound is deep and narrow; stabs are punctured wounds.

A *poisoned wound* is one in which some poison has been introduced by the same agent which made the wound; any of the above-named classes of wounds may be poisoned.

Gunshot wounds are both punctured and contused; they may also be lacerated.

Incised wounds are especially apt to be attended by bleeding; lacerated and contused wounds are less apt to give rise to dangerous hemorrhage because the vessels are torn and twisted; a limb may even be entirely torn off without serious bleeding, but shock in this class of wounds is apt to be severe.

Punctured wounds are dangerous because, while the external opening may be small, they often penetrate so deeply as to seriously injure important organs, or cause internal hemorrhage.

The immediate dangers of wounds are hemorrhage and shock; if these are removed the one great danger is *infection;* if that can be prevented the most serious wounds may be recovered from unless of course there is irreparable injury to some important organ.

The healing of wounds takes place in two ways; if there is no infection and no loss of tissue and the parts are brought into proper

apposition healing occurs by *first intention;* otherwise by *granulation* with or without *suppuration.*

Most incised and bullet wounds are originally aseptic or germ free, and if kept so will heal or grow together under one dressing, without heat, redness, severe pain or swelling, and without fever. The bullet itself after it has lodged is usually harmless and may be ignored as far as the treatment is concerned.

If the wound becomes infected with pus cocci, *inflammation* occurs with its attendant symptoms of heat, redness, pain and swelling, and usually more or less fever; suppuration follows, and if the pus cannot escape freely some of the poisons produced by the growth of the pus cocci are absorbed, *septic toxemia,* or the cocci themselves get into the blood-vessels, *septic infection;* the septic infection may result in the formation of abscesses in the different parts of the body, *pyemia.* All these blood poisonings are attended by chills, or chilly feelings, fever, headache, a peculiar waxy appearance of the skin, and perhaps delirium and stupor. Unless arrested the process terminates in death.

The first-aid treatment of wounds consists in the arrest of hemorrhage—and by hemorrhage must be understood serious bleeding, and not the moderate bleeding which accompanies most wounds and only requires the pressure of a dressing—the relief of shock and the prevention of infection.

To prevent infection is all-important and may be accomplished by following a few simple rules: do not touch the wound with the fingers or anything else; do not attempt to wash it or remove particles of dirt or clothing; if the intestine is protruding do not attempt to replace it; if the sharp end of a broken bone is sticking through leave it undisturbed; remove the soiled and bloody clothing about the wound, and apply the contents of the first-aid packet, handling the gauze with the waxed paper so as if possible not to touch any part of the dressing with the fingers. Each soldier in the field is issued a *first-aid packet* for his individual use; it has a waterproof cover and contains a couple of pieces of antiseptic gauze, each wrapped in a piece of waxed paper; an antiseptic roller bandage; a triangular bandage, and a couple of safety pins.

The first-aid packet is carried by all officers and enlisted men in a special pouch attached to the center of the back of the waistbelt.

To protect the extensive wounds often caused by shell fire the ordinary first-aid packet is not large enough, so that these packets are now supplied in two sizes.

The larger packet measures six, by three, by two and three-quarters inches and contains one compress of one square yard of antiseptic gauze wrapped in waxed paper, one antiseptic muslin bandage six inches wide and three yards long, and four safety pins wrapped in waxed paper; the whole contents are again wrapped in wax paper, and covered with rubber cloth sealed. For use at artillery posts the rubber sheeting cover is replaced by one of Japanned tin.

If a first-aid packet is not at hand, the dressing may be of ordinary sterilized gauze, or any other thoroughly clean material, dry if possible.

Wounds of the skull if penetrating are usually accompanied by injury to the brain which will be manifested by unconsciousness, paralysis, unequal pupils, etc. No special first-aid treatment is required.

Wounds of the chest if penetrating are usually attended by injury to the lungs. The signs of penetration of the chest cavity are the presence of air bubbles in the wound, difficult breathing, cough, and spitting of blood. The treatment consists in laying the patient on the injured side and firmly bandaging the chest.

Wounds of the abdomen may or may not be penetrating, and there may or may not be injury of the viscera. The signs of injury of the intestine are the escape of gas or feces through the wound and the passage of blood in the stools.

Injury to the stomach may be attended with the escape of its contents and by vomiting of blood. No special first-aid treatment is required in these conditions, except that the patient should be placed in such a position as may favor the escape externally of the contents of the intestinal tract.

Injury of the bladder is shown by the escape of urine through the wound and the passage of blood in the urine; if these signs are present the urine should be drawn frequently to prevent its escape into the abdomen.

In all cases of injury to the abdominal viscera the signs of shock are usually well marked.

Poisoned wounds may be divided into those in which the poison is chemical, including the bites and stings of insects, scorpions, tarantulas, centipedes, and snakes; and those in which it is bacterial, including the bites of man and other animals not rabid, the bites of rabid animals, and wounds infected with *tetanus* or *anthrax*.

The bites and stings of insects cause considerable smarting and if in loose tissues often much swelling; relief may be afforded by the application of ammonia, soda, or even wood-ashes; the sting if left in the wound should be extracted. *The bites of the tarantula and centipede* and the sting of the *scorpion* may cause great pain, considerable shock, and much local swelling and inflammation, but are seldom or never fatal. The treatment is the same as for the bites of other insects, but in very severe cases it may be necessary to incise the wound and suck out the poison. Stimulants may be given if necessary and morphine for the pain.

When a person is *bitten by a poisonous snake*, of which the rattlesnake and copperhead are the principal varieties in this country, prompt action is required.

If the wound is in the extremity tie a bandage or handkerchief tightly about the limb above the wound; incise the wound freely and suck out as much of the poison as possible; then with a hypodermic syringe inject a two-per-cent solution of permanganate of potash into and about the bite so as to destroy any poison which is left. If a hypodermic syringe and permanganate solution are not available, the bite should be cauterized with a lighted match, a hot coal, or a little gunpowder rubbed in and ignited. Meanwhile give stimulants freely but not to the point of intoxication. The ligature should be loosened about every half-hour so as to allow restoration of the circulation, but should be immediately tightened up if symptoms of general poisoning occur.

The bites of man and other animals not rabid are always more or less poisonous from the presence of the bacteria constantly found in the mouth and on the teeth; sometimes they are fatal; such wounds should be thoroughly disinfected and wet antiseptic dressings applied.

Rabies or hydrophobia is a very fatal disease caused by the bite of a rabid animal or " mad dog." The effect is not immediate like that of snake bite, but may be delayed weeks or months.

The treatment of the bite when the animal is known to be rabid is exactly like that of snake bite, but no ligature need be used.

Tetanus or lock-jaw is a disease the result of a wound infected by the bacillus of tetanus. It is especially apt to occur after toy-pistol wounds or any wound in which dirt has been carried deeply into the tissues.

The tetanus germ grows best in the absence of air; hence it thrives in deep, punctured wounds. The germs are found in the soil especially about gardens, stables, and in the streets. Wounds of such a character should be opened up freely, disinfected, and drained. If available, tetanus antitoxin should be injected into and about the wound.

Anthrax or malignant pustule is sometimes caused by the bite of an infected fly. It starts as a very hard swelling like a carbuncle, often on the lip. If its nature is recognized it should be at once excised.

In warfare with savage peoples the latter often used *poisoned weapons*, especially arrows. Many different poisons are used, vegetable, animal, and bacterial.

The local treatment is the same as that of snake bite; the general treatment must be symptomatic, unless the nature of the poison is known.

CHAPTER II.

HEMORRHAGES.

In *capillary hemorrhage* there is a steady oozing of red blood from all over the wounded surface; nature's method of arresting such a hemorrhage is by the coagulation or clotting of the blood in the mouths of the tiny vessels, and by the contraction of their cut ends. In treatment we imitate nature. The part should be elevated and very hot or very cold water applied to the wound; the effect of either one is the same as the other, the result being the contraction of the vessels, coagulation of the blood, and arrest of hemorrhage.

After this, uniform pressure applied to the wound by means of a gauze compress and bandage is all that is required.

Epistaxis or nose-bleed is a form of capillary hemorrhage which is sometimes difficult to control; the arms should be held by an assistant vertically above the head, and a sponge dipped in cold water applied to the back of the neck between the shoulders, and another over the root of the nose; very cold or very hot water should be snuffed up the nose; if this fails an astringent should be added to the water—alum or tannic acid. Should the bleeding still continue, plug the nostrils with absorbent cotton; but if the blood then runs into the throat from the back of the nose, the assistance of a surgeon will be required.

Capillary bleeding from a tooth socket is sometimes excessive; plug the cavity with a narrow strip of gauze, place a compress over the gauze, and bandage the lower jaw firmly against the upper.

In *venous hemorrhage* there is a rapid flow of dark blood, a welling up as it were, without any spurting. In the treatment the first step is to elevate the part; so little velocity is there in the venous current that elevation alone will often stop the bleeding; if it does not, pressure must be made directly over the wound, and hot or cold water may be applied if necessary; if in an extremity, the limb should be bandaged from the toes or fingers up to the bleeding point, in addition to the pressure over the point.

In *arterial hemorrhage* the blood is bright red in color and escapes in jets. Nature's method of arresting such a hemorrhage is by the formation of a clot, the contraction of the muscular coat of the artery lessening the caliber, and the retraction of the middle and inner coats affording an obstacle to the escape of the blood and favoring clot formation, and the diminished force of the blood flow caused by the weakening of the heart's action, the result of the hemorrhage.

When fainting follows the loss of blood the hemorrhage often ceases at once because the heart's action is so weak that it cannot force out the clot which forms in the mouth of the vessel; in such a case, however, the bleeding is apt to start again when reaction takes place, or when some sudden movement displaces the clot. The recurrence of bleeding with reaction is known as *intermediate hemorrhage* to distinguish it from *primary hemorrhage*, that which occurs immediately on receipt of the wound, and *secondary*, that which occurs at a still later period from the reopening of the artery by the slipping of a ligature, or from an extension of sloughing or ulceration to the vessel.

FIG. 45.—Compression of the Femoral Artery.

In the *treatment of arterial hemorrhage* prompt action is required; bleeding from a large artery like the femoral may cause death in a minute or two; as a matter of fact a large proportion of the deaths on the battlefield are due to hemorrhage.

The thing to be done is to compress the artery between the wound and the heart, or if that cannot be done then in the wound itself; the point selected for pressure should be where the artery crosses a bone because there it can be made most effective. If a hose connected with

a hydrant breaks we stop the flow of water by putting a foot upon the hose between the broken part and the hydrant; we apply the same principle in arterial hemorrhage. The pressure should be made with the fingers, preferably the thumbs, and should be firm enough to arrest the bleeding (Fig. 45); it should be made over the clothes, as too much time may be lost in removing them. You will know that you are pressing on the right place by feeling the artery beating beneath the fingers and by the arrest of the bleeding; if you cannot find the artery make pressure directly over the bleeding point. As pressure with the fingers soon becomes tiresome, get an assistant to slip his thumb over yours, and take your place while you prepare a *tourniquet.* The principle of all tourniquets is a pad over the artery to bring the pressure on the artery and take it off the veins, a band around the limb and over the pad, and some means of tightening the band. There are a number of special tourniquets, but as they are not usually at hand a suitable one must be improvised; an excellent tourniquet may be extemporized from the rubber bandage of the hospital-corps pouch; a number of turns are made about the limb and the rolled portion of the bandage then placed under the last turn in such a position as to press directly upon the artery (Fig. 46). The most common improvised tourniquet is the *Spanish windlass;* in this arrangement any rounded, smooth, hard object, such as a stone, a cork, or a roller bandage, is used as a compress; for the band a handkerchief, a suspender, a waistbelt, a bandage, or any-

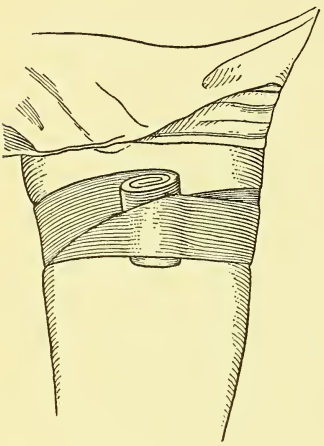


FIG. 46.—Compression of the Femoral Artery by a Rubber Bandage.

FIG. 47.—Spanish Windlass.

thing of the sort may be used; to tighten up the band a stick or bayonet, scabbard or something of the kind is passed under the band and twisted until the bleeding ceases, when the ends of the stick are tied to the limb to prevent the band from becoming untwisted (Fig. 47). A tourniquet applied tight enough to stop arterial hemorrhage causes pain and swelling of the limb, and if left long enough may cause gangrene of the part; it should therefore be watched and loosened up from time to time, say every half-hour or so. If on loosening the tourniquet the bleeding starts again tighten it up; if there is no appearance of bleeding leave the loose tourniquet in place with an attendant watching to tighten it up should the hemorrhage recur.

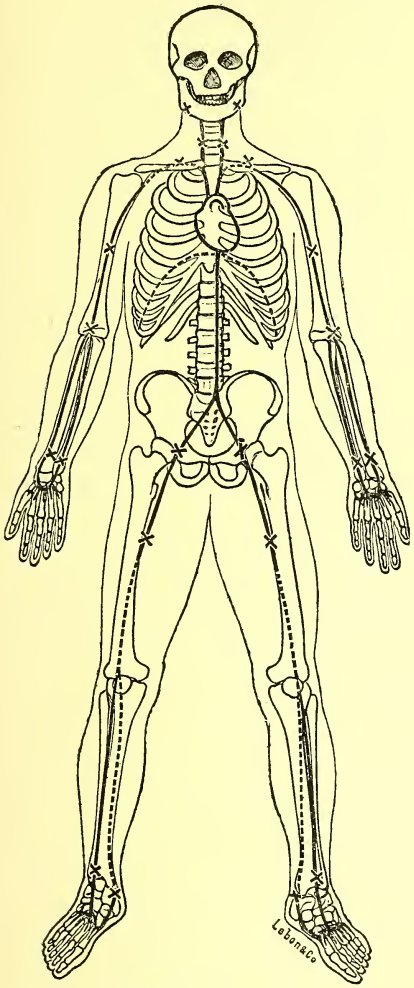


FIG. 48.—Skeleton with Black and Dotted Lines Showing the Course of the Arteries and a X Indicating the Pressure Points.

FIG. 49.—Compression of the Brachial Artery.

The surgeon arrests the hemorrhage permanently by tying or twisting the divided ends of the artery.

Fig. 48 shows on the skeleton the points at which the various arteries may be compressed to the best advantage.

For bleeding anywhere in the upper extremity below the middle of the arm compress the brachial in the manner shown in Fig. 49 and then apply a tourniquet a little higher up. If the wound is

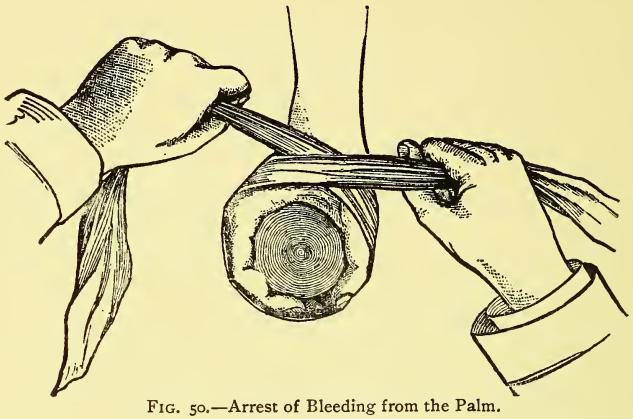


FIG. 50.—Arrest of Bleeding from the Palm.

low down in the palm of the hand, it may not be desirable to arrest the circulation in the entire limb, in which case the pressure may be made in the palm by a roller bandage over which the fingers are doubled and tied in place with a bandage (Fig. 50);

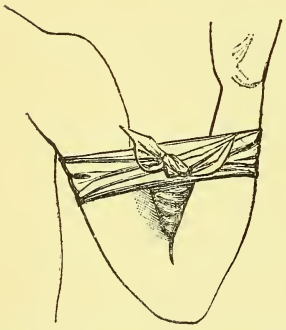


FIG. 51.—Flexion of the Elbow to Arrest Bleeding Below.

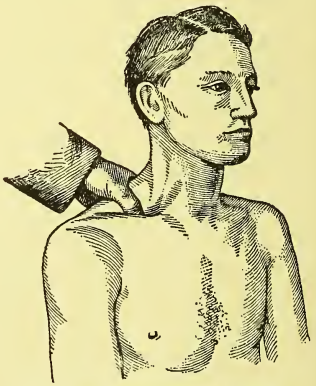


FIG. 52.—Compression of the Subclavian Artery.

or we may put a pad in the elbow and bend the forearm on the arm and tie the two together (Fig. 51).

If the wound is in the axilla, pressure must be made on the sub-

clavian against the first rib and in the hollow behind the clavicle (Fig. 52); as a tourniquet cannot be applied here the fingers may be relieved by making the pressure with the handle of a large key, or the end of a pocket knife well wrapped.

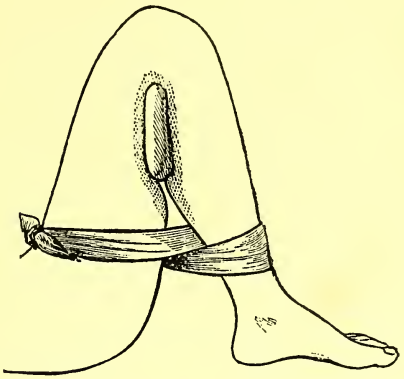


FIG. 53.—Arrest of Bleeding by Flexion of the Knee.

In *bleeding from any part of the lower extremity* compress the femoral against the head of the femur just below the middle of the groin, with both thumbs, as shown in Fig. 45, then apply a tourniquet to replace the thumbs.

FIG. 54.—Compression of the Carotid.

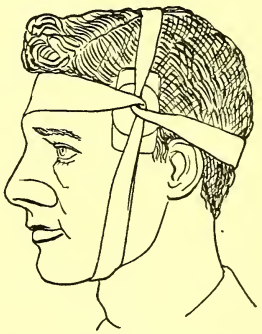


FIG. 55.—Compression of the Temporal Artery by Knotted Bandage.

If the *bleeding is from the foot* another method is to put a pad behind the knee and flexing the leg forcibly, tie the leg to the thigh as shown in Fig. 53; if from the top of the foot a tourniquet may be

placed over the anterior tibial in front of the ankle, or if from the sole of the foot over the posterior tibial behind the inner ankle.

Hemorrhage of the neck from the branches of the carotid is controlled by compression of the carotid with the thumb against the vertebræ (Fig. 54); a tourniquet cannot be applied here.

Bleeding from the tongue may be controlled in the same way, or by rinsing the mouth out with ice water, or holding pieces of ice in the mouth.

Bleeding from the lips may be very severe; it is controlled by grasping the lip between the thumb and fingers; as the arteries of the lip come from both sides, pressure must be made on both sides of the wound.

Bleeding from the face may be arrested by pressure on the facial in front of the angle of the jaw.

Bleeding from the scalp is easily arrested by pressure with a compress on the bleeding point, the pressure being made by a knotted bandage as shown in Fig. 55.

In *bleeding from the lungs* the blood is bright red, frothy, perhaps mixed with mucus, and is coughed up. Listen over the chest and where rattling is heard apply an ice bag; give the patient pieces of ice to swallow, and keep him perfectly quiet in the recumbent position; he should neither talk nor move.

In *bleeding from the stomach* the blood is vomited, is usually dark in color, and may be mixed with food. It is always well to remember that vomited blood does not necessarily indicate hemorrhage from the stomach; the blood may have been swallowed, coming from the back of the nose or throat; inquire whether there has been any nose-bleed. The treatment is the same as for hemorrhage from the lungs, except that the ice bag is applied over the stomach.

In *bleeding from the bowels* the blood is bright red if fresh; black and tarry if old. All that can be done is to apply cold applications to the abdomen and keep the patient quiet.

CHAPTER III.

DISLOCATIONS AND SPRAINS.

A *dislocation* is a permanent slipping away from each other of the bones which form a joint, with locking of the bones in the new position; the joint is out of place. Necessarily the dislocation is attended with tearing of the ligaments and often with rupture of the muscular attachments as well.

The cause is usually indirect violence, especially falls and twists. In attempting to save one's self from falling the hand is thrown out and the weight of the body coming on it causes a dislocation of the shoulder; or the thigh in falling is bent backward, resulting in dislocation of the hip.

The symptoms of dislocation are as follows: The patient has fallen and cannot move the affected joint; there is pain of a sickening character, often with numbness or tingling in the limb below from pressure on the nerves and blood-vessels; on attempting to move the joint we find that it is locked and cannot be moved; on uncovering and examining it, it will be noticed that there is marked deformity in the joint, and that the limb is fixed in an unnatural position, and appears longer than the corresponding limb on the other side.

A dislocation must always be carefully distinguished from a fracture or a sprain. In fracture there is unnatural movement between the joints instead of immobility at the joint, and the movement is attended with a grating sensation and sound; the deformity is between the joints and there is usually shortening of the limb.

In sprains there is absence of any of the signs of dislocation except swelling and pain; the joint can be moved, though the patient will resist on account of the pain. Always uncover the limbs and compare the corresponding joints on the two sides.

If the services of a surgeon can soon be obtained nothing should be done for dislocations except to loosen the clothing about the injured part and support it as comfortably as possible in the new po-

sition. If the patient must be moved the limb should be supported in a sling, or by splints and bandages.

When, however, a physician cannot be reached for some time, there are certain dislocations which a hospital-corps man may attempt to reduce. He must always remember that no force is to be employed, as it may do serious damage to the important vessels and nerves near the joint; the secret of success lies in the skillful manipulation with a clear understanding of the anatomy of the joint.

FIG. 56. — Subglenoid Dislocation of the Shoulder.

Dislocation of the shoulder occurs more frequently than dislocation of all the other joints in the body taken together; the reason of this has been explained on page 28; the most common dislocation of the shoulder is downward (Fig. 56). The symptoms are those described for dislocations in general; there will be a hollow under the point of the shoulder

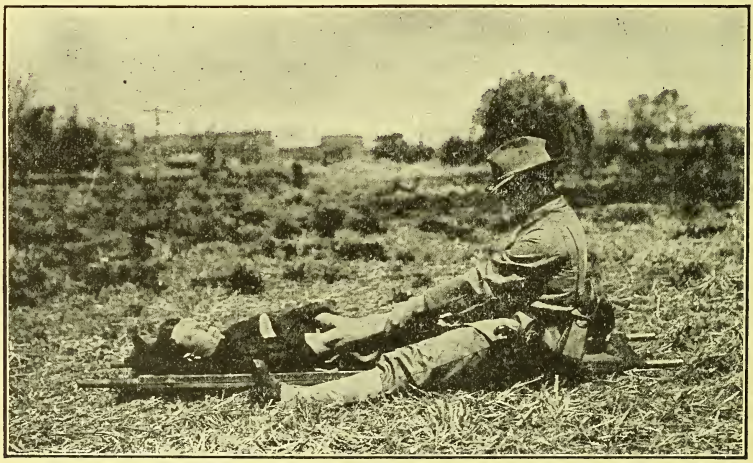


FIG. 57.—Reduction of Dislocation of the Shoulder by the Foot in the Axilla.

which will be very conspicuous when compared with the convexity on the other side, and the head of the bone can be felt in the arm pit where it should not be. To reduce this dislocation place the patient on his back on the ground; sit beside him; remove one

shoe from your foot and place that foot in the patient's axilla; then using the foot as a fulcrum, draw the arm downward in the direction of its axis, then outward, and finally carry it across the chest (Fig. 57); or *Kocher's method* may be tried as follows: Flex the forearm to a right angle, bring the elbow to the side; carry the hand and forearm outward; then lift up the elbow and sweep the forearm across the front of the chest. If successful the humerus will suddenly slip into place with a click; the arm should then be bandaged to the side for a week or two to give the torn ligaments a chance to heal. If unsuccessful after a few minutes' trial further attempt should be postponed. A shoulder once dislocated is usually permanently weak, and the dislocation is apt to recur from slighter violence than at first.

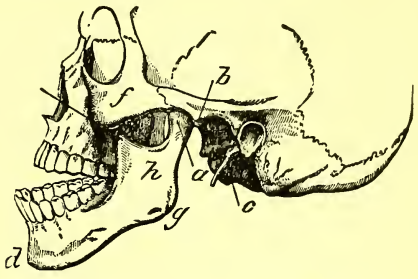


FIG. 58.—Dislocation of the Lower Jaw.

In *dislocation of the lower jaw* (Fig. 58) the patient cannot speak or close the jaws, and is in great distress.

This dislocation is usually reduced without much difficulty, but there is great danger of the thumbs of the operator being bitten. Wrap the thumbs well with a handkerchief or bandage; stand in front of the patient, and while pressing with the thumbs in the mouth just back of the last lower molars, at the same time with the fingers lift up the chin; the jaw will usually at once snap into place, and the thumbs must be quickly withdrawn to prevent them being bitten. After reduction bind the lower jaw to the upper with a four-tail bandage.

In *dislocation of the finger joints* pull on the dislocated end, at the same time bending it backward if the dislocation is forward, or forward if the dislocation is backward, and pushing the joint into place. After reduction strap or splint the finger.

The *patella or knee-cap* may be dislocated outward or inward; there is sickening pain, the knee cannot be moved, and on examination there is a hollow in front of the knee where there should be fullness, and the patella can be seen and felt in its new position.

Extend the knee as much as possible and flex the thigh so as to relax the muscles, when the patella can usually be pushed into place.

In *sprains* the joint surfaces slip apart, tearing the ligaments, but slip back into place again; a sprain is really a momentary dislocation. The tearing of the ligaments causes hemorrhage into and around the joint, and as the blood cannot escape externally the joint is immediately swollen; that the swelling is due to the bleeding is shown by the black and blue discoloration of the skin over the joint which begins to appear after a day or two as the blood comes to the surface.

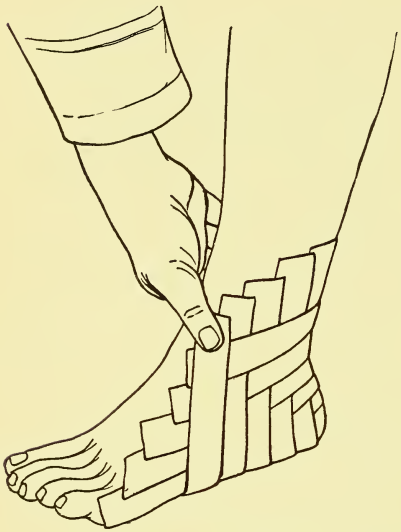


FIG. 59.—Strapping the Ankle.

The treatment consists in stopping the hemorrhage, causing the absorption of the blood already poured out, and supporting the joint until the ligaments heal.

A *sprained ankle*, the most common of all sprains, may be taken as a type. The patient twists his foot stepping on a stone, there is sharp pain in the ankle, lameness, and prompt swelling of the joint, but the joint is movable, thus excluding dislocation, and there is an absence of the signs of fracture.

To control the bleeding put the foot at once into a pail of hot water, as hot as can be borne, and keep it there ten minutes; or if there is no water hot enough use ice water. Then strap the joint firmly with rubber adhesive plaster, using strips about an inch wide and fifteen to eighteen inches long (Fig. 59). The first strap should form a stirrup of the heel, closely following the tendo Achillis on each side; the second should cross the first at a right angle, extending along the border of the foot from the root of the little toe to the root of the great toe or *vice versa;* the third strap covers one-third of the first and the fourth one-third of the second and so on until the entire ankle is covered except a narrow strip in front which is left open to allow of free circulation. Each strap is drawn tight and the crossings are

made strongest over the swelling. When the strapping is completed a bandage is applied over all until the plaster is firmly adherent, when the bandage is removed, the sock and shoe put on and the latter firmly laced, after which the patient should begin to walk, commencing with a crutch or cane.

The walking is at first very painful, but must be persisted in, as the plaster takes the place of the torn ligaments and the movement of the joint in walking causes rapid absorption of the blood. As the strapping becomes loose it must be reapplied after thorough massage of the joint.

CHAPTER IV

FRACTURES.

A *fracture* is a *broken bone.* There are two great classes of fractures, simple or closed and compound or open.

A *compound or open fracture* is one in which there is a wound communicating with the broken ends of the bone; the broken bones are open to infection. A *simple* or *closed fracture* is one in which the broken bones are closed to the air and to infection in that there is no wound communicating with the fracture.

FIG. 60.—Green-stick Fracture.

A fracture is *comminuted* when the bone is broken into more than two pieces; *complicated* when there are also injuries to the adjoining vessels, nerves, or muscles; *impacted* when the broken ends are driven into each other so that they cannot move; *green stick* when the bone is bent and only partially broken as a green stick is broken (Fig. 60).

Fractures are caused by *direct violence,* as when a wagon wheel passes over a limb and breaks it; *indirect violence,* as when a man falls on his hand and breaks his collar bone; *muscular action,* as when one breaks his arm in throwing a ball.

How will you know that a fracture has occurred? First there is a loss of power in the part; if the leg is broken the man has fallen and cannot get up; if it is the arm he cannot use it. Then the limb is in an unnatural position; if you compare it with the uninjured limb you will see that there is a deformity between the joints, and that the injured limb is probably shorter. If you attempt to move the limb you find there is *movement between* the joints where there should be none, and you can both feel and hear the broken ends of the bone grating together—*crepitus.*

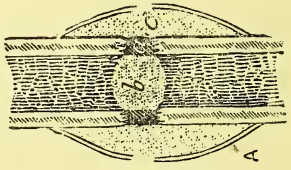


FIG 61.—Union of a Fracture.

The patient complains of great pain and tenderness at the seat of fracture and there is swelling there due to bleeding from the broken ends. There is a history of violence and often the patient will say that he heard the bone crack and give way.

In the treatment of fractures the great point is to keep them from becoming open; a closed fracture is a very simple matter, not dangerous to life, and usually healing promptly if kept quiet in proper po-

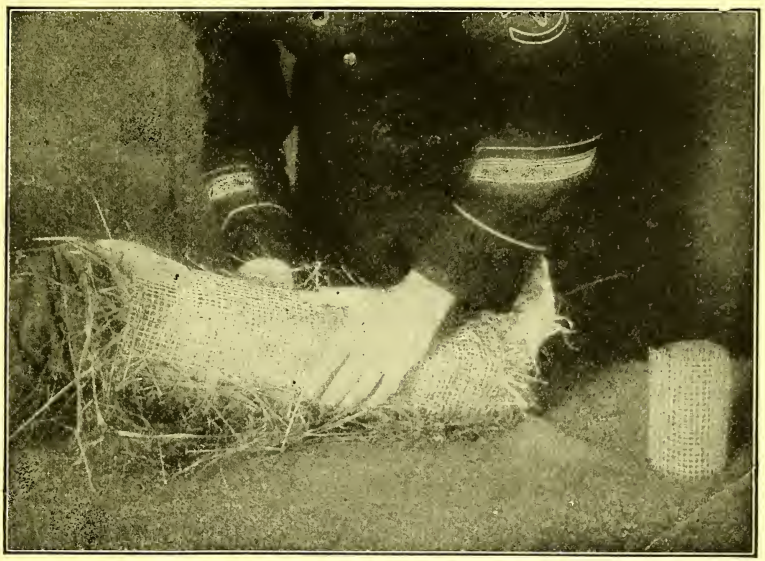


FIG. 62.—Use of Wire Gauze as a Splint.

sition; an open fracture is quite another matter, always taking a long time to heal and often threatening loss of limb and even life from infection.

Therefore never attempt to move a man with a fracture until the fracture has been fixed so that the broken ends of the bone cannot move. If a physician can be obtained at once merely make the patient comfortable with pillows and supports where he lies; if he must be moved apply splints, handling the broken bones very carefully so that sharp ends may not come through the skin and make the fracture compound. If a physician cannot be reached for a day or two set the fracture and then splint it.

The cause of deformity in fractures is muscular contraction, and this contraction must be overcome in *setting* the fracture, which is merely getting the broken ends into proper position; this is done by *extension* and *counter-extension;* extension is pulling the far end of the limb, and counter-extension is merely holding the end next the trunk; pull until the deformity and shortening disappear and the two limbs look alike, then hold them so while the splints are applied.

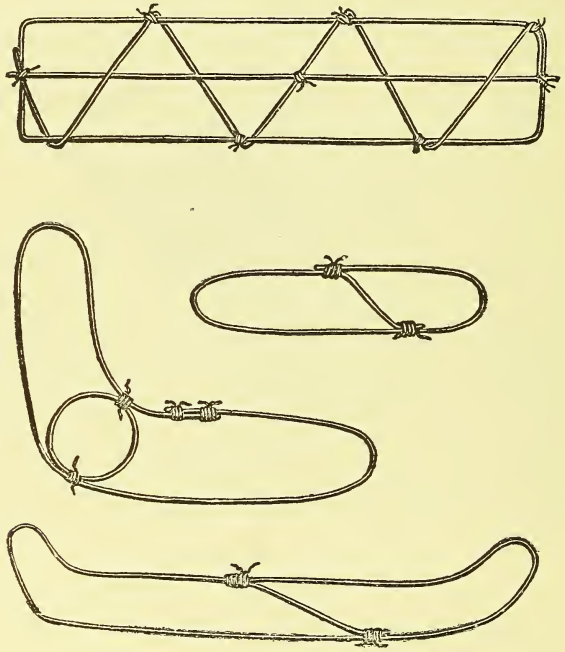


FIG. 63.—Splints of Telegraph Wire.

When a fracture is properly set the blood which escaped into the tissues about the break is gradually absorbed and at the end of a week or ten days *callus* is thrown out or the limb begins to *knit;* callus is a soft, cement-like substance which is poured out between the broken ends, around them, and in the medullary cavity; the callus gradually hardens into bone. That which is around the break forming a sort of ferrule or splice, and that in the medulla forming a pin, are absorbed after many months; but that between the bones remains permanently,

knitting the bone together (Fig. 61). Sometimes the callus is not sufficient in quantity or quality and union fails to take place.

When a fracture is already open or compound the object of treatment is to convert it into a simple fracture, or at least to prevent infection. The wound is first dressed and then the fracture is treated.

A *splint* is merely a splice to hold the bones in proper position until nature unites them. Splints must be light but sufficiently rigid to prevent bending; long enough to fix the joints above and below the fracture; broad enough to prevent pinching of the limb in bandaging; sufficiently padded to protect the part from undue pressure.

FIG. 64.

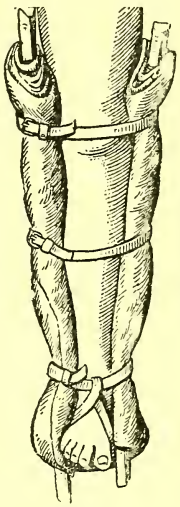


FIG. 65.

There are many splint materials supplied, among the more common being thin boards, cardboard, felt, leather, wire gauze (Fig. 62), etc. Often in the military service splints must be extemporized; one of the most useful and most accessible materials for preparing them is telegraph wire; the method of using it is illustrated in the figures (Fig. 63). On the battlefield the various weapons may be employed: rifles, bayonets, swords, scabbards (Fig. 64), and tent pins; splints may also be prepared from blankets and straw, from hay, small sticks, the bark of trees, barrel staves, broom handles, canes and umbrellas.

Padding may be made of clothing, hay, straw, grass, leaves, excelsior, cotton, crumpled paper, etc.

The best things to hold splints in place are straps which can be readily buckled and unbuckled; the next best is the loop bandage applied as shown in Fig. 66; roller bandages, triangular bandages, tape, and many other things may be used. Before the splints are applied permanently the limb is usually bandaged from the extremity up to the fracture in order to prevent swelling below; after the application of the splints another bandage is applied over all. Be careful not to make the dressing too tight, and always leave the tips of the fingers exposed so that the circulation may be watched. If the tips of the fingers are blue and cold, or if upon pressing the blood out from under the nails it does not quickly return the dressing is too tight.

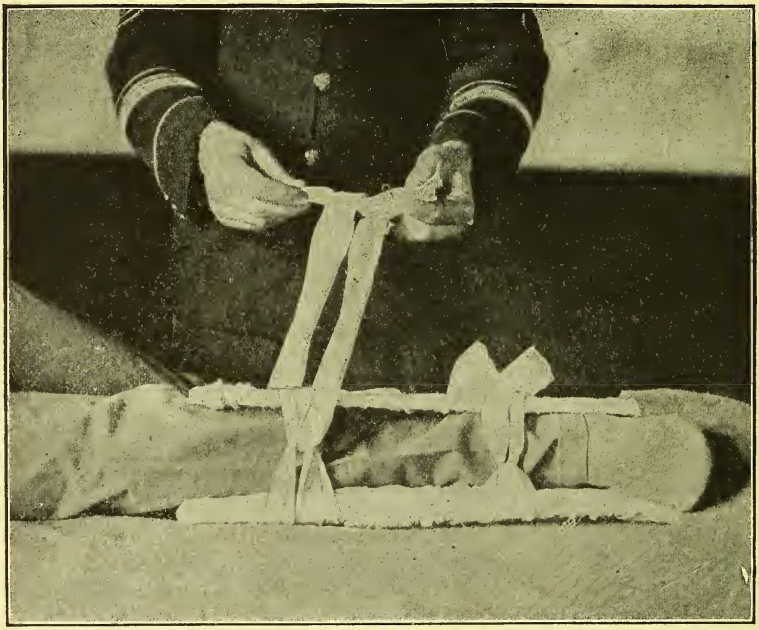


FIG. 66.—Loop Bandage to Retain Splints.

After splinting the upper limb it must be placed in a sling; if there are no materials available to form one, the coat sleeve may be simply pinned to the coat, or the flap of the blouse may be turned up and pinned, ripping the seam if necessary (Figs. 67 and 68).

Fractures of the *skull* and *spinal column* are chiefly of importance on account of the coincident injury to the important parts of the nervous system which lie immediately beneath the bone. In fractures of the skull, unless compound or depressed, all the usual symptoms of fracture are absent, or entirely overshadowed by the injury to the brain. The most prominent brain symptoms are loss of conscious-

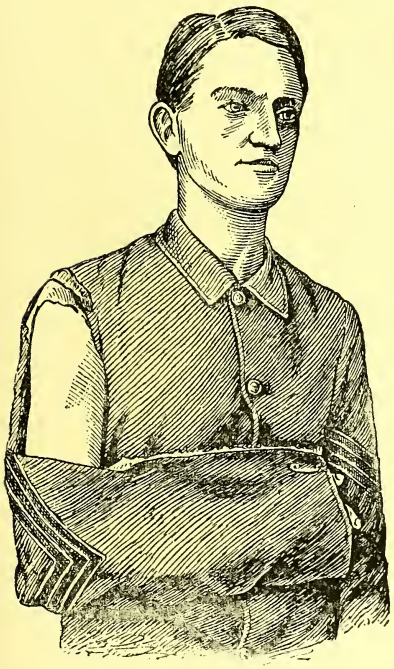


FIG. 67.

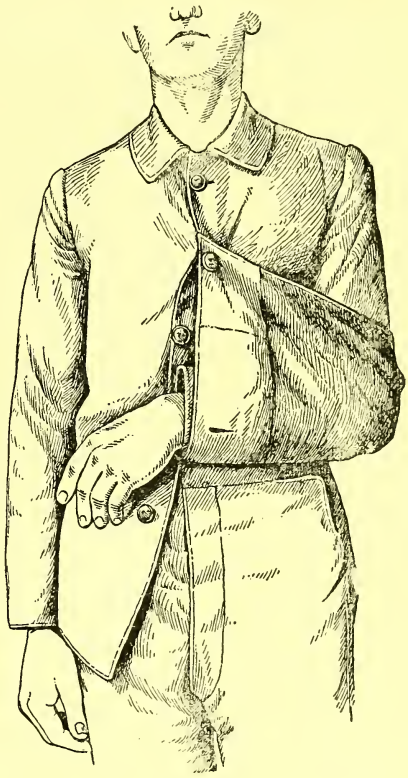


FIG. 68.

ness and paralysis; if the loss of consciousness is sudden it is probably due to the pressure of a piece of bone; if it comes on slowly it is apt to be the result of hemorrhage from a torn vessel. *In fractures of the base of the skull* there may be bleeding from the nose or ears, or into the orbits and under the conjunctiva; the escape of cerebro-spinal fluid—a clear, watery serum—from the ears is considered a sure sign of fracture of the base.

Treatment: Keep the patient quiet in a recumbent position and apply an ice bag to the head; if the fracture is compound a dressing will be required.

In fractures of the *spinal column* the spinal cord is generally injured or cut across, with resulting paralysis of all parts below the fracture. On examination, irregularity of the spinous processes will be noted, usually with angular deformity. Handle the patient with great care so as not to produce or increase injury to the spinal cord. Before moving him apply splints on both sides, from his armpits to his feet, so as to make the body as rigid as possible, then work a blanket under him, and, drawing it as tight as possible, lift him on a litter.

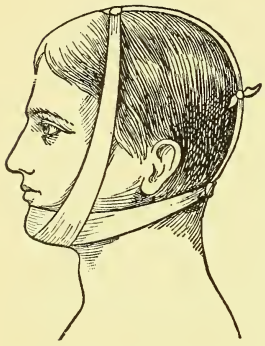


FIG. 69.—Four-Tail Bandage for Fracture of Jaw.

Fractures of the ribs and pelvis are also chiefly important on account of the injury to the contained viscera.

In *fracture of the ribs* the sharp end of the bone is apt to stick into the lung every time the patient breathes; hence in these cases the patient will often complain of a sharp sticking pain when he breathes, and there may be cough, with spitting of frothy blood. When the fingers are passed firmly along the ribs they may be felt to give at the broken point, which is also very tender.

The treatment consists in confining the movements of that side of the chest as much as possible, in order to give the broken bone an opportunity to rest and *knit*. This is done by circular bandaging of the whole chest or by strapping one side.

FIG. 70.

The *pelvis* is so strong that the bones are broken only by the most severe direct violence, as when a heavy wagon passes over it. The symptoms are inability to stand or sit up, and crepitus may be felt when firm pressure is made. If there is an injury to the bladder the urine contains blood. The treatment consists in the application of

splints on both sides from the axillæ to the feet; if the bladder is injured a catheter must be introduced and left in, so that the urine will not accumulate and escape into the peritoneal cavity.

In *fracture of the nasal bones* there is usually considerable deformity, the bridge of the nose being caved in and pushed to one side; crepitus is generally to be felt, and there is considerable nose-bleed.

Check the bleeding by syringing with hot or cold water; push the bones into place by means of a probe or slender, smooth stick in the nostril, aided by the fingers outside. Apply cold dressings over the bridge of the nose and warn the patient not to attempt to blow the nose.

FIG. 71.

In *fracture of the lower jaw* the line of teeth is irregular and there may be bleeding from the mouth; the patient cannot open his mouth, and the fracture can usually be readily felt.

Push the bones into place and apply a four-tailed bandage (Fig. 69) or two narrow cravats. The patient cannot chew and will have to live for a time on liquid food taken through a tube.

In *fracture of the clavicle* the attitude of the patient is often characteristic; the shoulder drops downward, inward and forward, and he attempts to support it by holding the elbow of the injured side in the hand of the sound side. The collar bone lying immediately under the skin, the fracture is easily made out.

FIG. 72.—Colles' Fracture.

As a first-aid dressing, put the arm in a large sling, place a pad in the axilla, and bind the arm to the side. The fracture is put up permanently in a *Sayre's dressing* or a *Velpeau bandage.*

Fracture of the humerus or arm bone has all the common signs of fracture and may ordinarily be recognized without difficulty. Two splints are required; they should be placed on the inner and outer sides, except in fracture near the lower end of the bone, when the splints should be front and rear (Fig. 70).

If the fracture is near the shoulder joint a shoulder cap must also be used, and if near the elbow joint the inner splint should be rectangular and include the forearm. The wrist should be supported in a sling, leaving the elbow hanging down so as to produce extension. If no splints are available the arm should be at least bandaged to the side or placed in a sling.

When *both bones of the forearm are broken* all the usual signs of fracture are present. Place a splint on each side, from the elbow to the root of the fingers, and put the arm in a sling (Fig. 71).

As a general rule, in all fractures of the upper extremity flex the elbow to a right angle, and place the forearm in such a position that the thumb will point up.

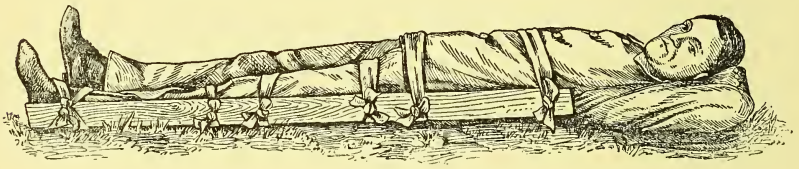


FIG. 73.

The reason of this is, that should the elbow become stiff, the arm is more useful in that position than any other; the thumb should point up, that is, the forearm be midway between pronation and supination, for in that position there is the widest possible space between the radius and ulna, and therefore they are less apt to become fused together by the callus which is thrown out in the process of union.

Fracture of the radius alone, just above the wrist, is very common and is known as *Colles' fracture.* It is attended by a peculiar silver-fork deformity (Fig. 72), and as the bones are usually impacted, crepitus is absent. The setting of this fracture can only be properly done by a surgeon; meantime the arm should be placed in a sling.

Fracture of the metacarpals—a broken hand—usually occurs in a fight. The most prominent signs are deformity and pain. Splints should be applied on the back and front of the hand, reaching from the finger tips half way up the forearm.

Fractures of the fingers are treated by the application of narrow finger splints, usually on the palmar surface only.

In *fractures of the femur* all the common symptoms of fractures are

usually present; the foot may be everted, lying on its outer side, and the leg is shorter than the other. Two splints must be applied; the one on the outside reaches from the armpit to beyond the foot; the one on the inside from the crotch to the foot (Fig. 73). The splints should be tied on in five places: around the ankles, over the knees,

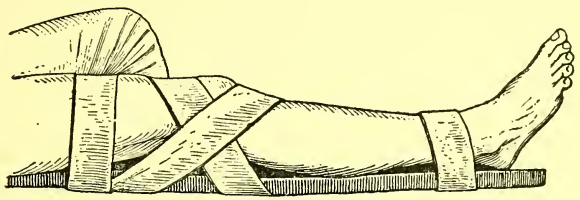


FIG. 74.—Dressing for Broken Knee-Cap.

just below the hips, around the pelvis, and just below the axilla. It is well also to tie the two limbs together.

So powerful are the muscles of the thigh, constantly tending to make the bones overlap, that in the permanent treatment in hospitals it is customary to provide special arrangements for overcoming the muscular action.

These arrangements comprise what is called *extension*. A weight is attached to the foot by adhesive-plaster straps, and a cord running over a pulley, and counter-extension is provided by raising the foot of the bed, thus utilizing the weight of the body.

Fractures of the lower extremity are always put up with the entire

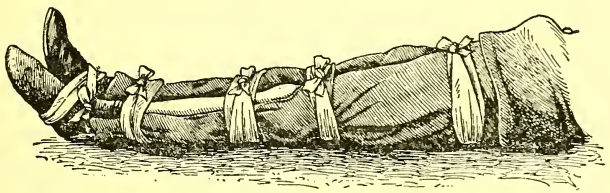


FIG. 75.

limb straight, so that if the joints get stiff the limb can be at least utilized for standing and walking.

In *fractures of the patella or knee-cap* the patient cannot stand or walk; the upper fragment is drawn up the thigh by the powerful muscles attached to it, and the gap can be readily felt. The joint

swells up at once. A splint should be applied to the back of the knee so as to keep the limb extended, and the upper fragment should be brought down by figure-of-eight bandaging (Fig. 74).

If *both bones of the leg are broken* the fracture is very apt to be compound because fracture of the tibia is usually oblique with a sharp point that may come through the skin; such a fracture should be handled with the greatest care. Apply splints from the knee to beyond the foot on the inside, outside, and behind (Fig. 75). Tie the feet together.

Fracture of the fibula alone just above the ankle is called *Pott's fracture;* the signs are usually indistinct, but if the lower end of the tibia is fractured as well there is apt to be marked eversion of the foot.

Treat in the same manner as a fracture of both bones, except that the posterior splint is not necessary.

Fractures of the bones of the foot are best treated by a plaster-of-Paris dressing.

CHAPTER V.

FOREIGN BODIES.

In the eye: Foreign bodies such as particles of dust, cinders, etc., may lodge under the lids, upon the conjunctiva, or upon the cornea. In the latter situation they are seen and removed with the greatest difficulty, and the removal should not ordinarily be attempted by other than a physician. To remove a foreign body from the eye the best improvised appliance and one that is nearly always at hand is a match. Light the match and after it has burned a moment blow it out; then with a clean handkerchief and a circular movement of the fingers wipe off the charred end, leaving a soft, aseptic, splinterless point with which to remove the foreign body.

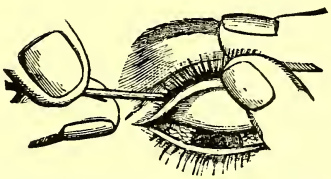


FIG. 76.—Eversion of the Upper Eyelid.

To examine the lower lid draw it down with the fingers, at the same time telling the patient to look up; if the foreign body is not found there, evert the upper lid (Fig. 76) by standing behind the patient with his head upon your chest and telling him to look down at his feet; att he same time press a match or the end of the finger firmly against the outside of the lid about a quarter of an inch behind its margin, draw the lid down by the lashes and turn it upward and outward over the match or finger tip. If the particle is still not visible search the ball of the eye carefully for it, and when it is found lift it off gently by a quick movement with the point of the match. If the eye is very irritable it may be necessary to drop in a little cocaine solution.

It is important to remember that even after a foreign body is re-

moved from the eye, there is often for some time a sensation as if it were still there.

In the ear: The foreign body here may be an insect, a pea, or grain of wheat, a pebble, a plug of hardened wax, etc. An insect in the ear by its movements and buzzing often causes the most intense annoyance.

Hold the head over on one side with the ear containing the insect uppermost; fill the ear with warm water; this will drown the insect in a few minutes, and then by suddenly turning the head to the other side it may come out with the water; the maneuver should be repeated several times; if the insect does not come away syringe the ear.

If the foreign body is vegetable such as a pea, water should not be used as it may cause the pea to swell and thereby render its extraction more difficult. If the pea is visible bend the loop end of a fine hair-pin, and try to get beyond it so as to hook it out. As there is always danger of injuring the drum when instruments are pressed into the ear, it should be a guiding rule that no instrument should be passed beyond the point where its tip can be seen.

Hardened wax must be removed by syringing with a warm five-per-cent solution of soda.

In the nose: Children push peas and such things into the nose, and occasionally flies deposit their eggs there with the result that maggots develop in the nasal cavity. Foreign bodies are best removed by closing the free nostril with the finger and forcibly blowing through the obstructed side; snuffing up a little powdered tobacco or pepper will cause sneezing and aid in the expulsion; if this does not succeed and the body can be seen it may be hooked out with the bent hairpin in the same manner as described for the ear; or finally a small, smooth stick or a slender pencil may be wrapped with a little cotton and used to push the foreign body gently back through the posterior nares into the mouth; press straight backward, never upward.

Maggots in the nose is a very serious condition which may result in death. Let the patient inhale through the nose a half-teaspoonful of chloroform, and while the maggots are stupefied syringe them out with warm normal saline solution.

Foreign bodies in the throat are usually bones or masses of food. If the bone can be seen and reached it may be removed by fingers or forceps; if not it may be carried down by eating dry bread. If the

obstruction is a mass of food it may be dislodged by forcible blows on the back between the shoulders, or the fingers may be passed into the throat to hook it out or to cause its ejection by vomiting.

Foreign bodies in the air passages cause violent cough and difficult breathing; the case is urgent, and if a child he may be held up by his heels and shaken; if an adult inversion may also be attempted and blows between the shoulders given as in the case of foreign body in the throat.

Foreign bodies are sometimes swallowed and reach the *stomach* and *intestines*. Such cases are not usually serious. If the body is angular or pointed such as a tack or a pin, feed the patient on substances which leave considerable residue to cover and protect the sharp points;—potatoes, bananas, bread, etc. Do *not* give laxatives as they will render the movements liquid and thus leave sharp points exposed.

In the skin: Here we find *splinters, thorns, needles, pins, fish-hooks, pieces of glass, gunpowder, etc.* For splinters and thorns pass the point of the blade of a pocket-knife under them, with the thumb-nail press the splinter against the blade and draw it out; or use a pointed dissecting or dressing forceps. If the splinter is buried open up the skin a little with the point of a knife or a needle until it can be reached. If under a nail make a notch in the nail so as to expose it.

If a needle or pin is broken off in the skin and cannot be grasped with forceps, cut a small hole in the end of a cork and press it down over the point of entrance of the needle; this may cause the needle to emerge so far that it can be grasped. The needle may be so situated that it is best to push it through and extract it on the other side. If the needle or pin is in the foot or hand and cannot be extracted, the patient should be directed not to use the part, as muscular action will cause it to work in deeper. A fish-hook or an arrow cannot be drawn out on account of the barbs; they must be pushed through. Gunpowder is best removed by a thorough scrubbing with soft soap and a stiff brush, the remaining grains being picked out with a needle.

CHAPTER VI.

THE EFFECTS OF HEAT AND THE EFFECTS OF COLD.

THE *effects of heat* may be general or local. The *general effects of heat* are manifested in two entirely different ways, viz.: heat stroke and heat exhaustion.

Heat stroke, sunstroke, or insolation is due to prolonged exposure to excessive heat, usually the heat of the sun. But heat stroke may occur in hot rooms, and in the stoking rooms of steamships. Exhaustion and improper clothing are powerful contributing factors, hence it is especially apt to occur to soldiers on the march.

The premonitory symptoms are headache, dizziness, irritability, frequent desire to urinate, seeing things red or purplish; with or without these symptoms the patient suddenly falls unconscious; the skin is dry and intensely hot; pupils contracted; pulse full and strong; respirations snoring; there may be convulsions; if the temperature of the body can be taken it will usually be found to be very high, 105° F. to 109° F. or higher.

The condition is a very serious one and unless immediately relieved terminates in death.

The treatment has for its object rapid reduction of the temperature. The man should be brought to the coolest accessible spot, in the shade if out of doors, on deck if in the fire room of a steamer, his clothing removed and an ice bag applied to his head and cold water poured over him continually. At the same time the body may be rubbed with ice, and if a tub is available he may be immersed in cold water. The treatment should continue until the temperature is reduced. If the patient is able to swallow he should be given cold, not iced, water to drink, and this should be repeated as often as possible.

Serious results are liable to follow a sunstroke, even when death does not occur; the most common of these after-effects are permanent headache, paralysis, mental confusion, or even insanity. Moreover,

one who has had a sunstroke is ever after very susceptible to the action of the sun.

Heat exhaustion is a very much less severe condition, closely allied to fainting. It occurs among soldiers on the march and very frequently among soldiers standing for some time at "*attention*" on a hot day. The soldier suddenly drops his piece and falls; he is not unconscious or may be easily aroused; face is pale, skin cool and moist, pupils dilated or normal, pulse very weak; respiration shallow, perhaps sighing.

Such a patient should be moved into the shade, his clothing loosened, equipments removed, head kept low, and a drink of water or some stimulant given. On removal to the hospital he should be kept perfectly quiet in bed and hot-water bags used if necessary.

The *local application of heat* produces burns or scalds.

Burns are produced by a flame, hot solids, or caustics. *Scalds* are produced by hot liquids; they differ only in that in the former the hairs are destroyed, in the latter they are not; the treatment is the same.

Burns are usually said to be of the first, second, or third degree. Burns which merely cause redness are of the *first degree;* if blisters are raised they are of the *second degree;* and if there are charring and destruction of tissue the burn is of the *third degree.*

The symptoms of burn are shock which may be profound, chilly sensations, and pain. The pain may be agonizing or slight.

The result of the burn depends more upon the extent of surface affected than upon its depth; a burn of the first degree is almost certainly fatal if two-thirds of the surface of the body is affected, and one of the second degree if one-third of the body is burned; the chances for recovery are much less in children and elderly people.

The danger in the first twenty-four hours is from shock; after that from internal congestions and inflammations, suppression of urine, ulceration of the duodenum, and intestinal hemorrhage; and finally from exhaustion, blood poisoning, or tetanus.

If the entire thickness of the skin is destroyed terrible deformities are apt to follow the contraction of the skin which occurs in healing.

In burns of the first degree, of which *sunburn* is a type, soft cloths dipped in a saturated solution of cooking soda should be applied, and

this followed by any fresh oil or fat; cream or olive oil answers excellently well.

In burns of the second and third degrees the objects of treatment are first protection from the air which greatly aggravates the pain and shock; secondly relief of shock, and third prevention of infection.

The quickest temporary means of excluding air is to immerse the part or the entire body in warm water; then having gotten everything ready carefully cut away the clothing, leaving such as is sticking to the burned skin; blisters should be left undisturbed unless they are very tense and painful, when they may be punctured by a sterilized needle and the contents allowed to escape.

The wound should next be dressed with sterile gauze dipped in a warm solution of boric acid, or a solution of picric acid ten parts in eighty parts of alcohol and a thousand parts of water; the picric acid relieves the pain and has value as an antiseptic; over the gauze place a thick layer of sterile absorbent cotton. When the burns are extensive small portions only should be exposed and dressed at a time. When the first dressing is finished it should be left on as long as possible.

Meantime stimulants and hot drinks should be given internally and morphine and strychnine injected hypodermically if necessary.

When there has been skin destruction the parts should be retained in proper position by splints when healing is taking place.

In *burns from corrosive acids*, such as sulphuric and nitric acids, the parts should be thoroughly flushed with water and a solution of soda, after which the treatment is the same as for other burns.

In *burns from caustic alkalies*, such as lye, vinegar diluted with water should be used to neutralize the alkali before applying the usual treatment for ordinary burns.

When the clothing of a person, usually a woman, is on fire she should be enveloped in a blanket, rug, cape, or woolen coat and thrown upon the ground while the flames are smothered; the reason she should be thrown upon the ground is to prevent her from running about and thus fanning the flames, and also because flames rise, and in the erect position would reach the mouth and throat.

The *effects of cold*, like those of heat, may be general or local.

In *general freezing* there is at first a very unpleasant sensation of cold with pain in the extremities, then numbness and stiffness, and

finally great drowsiness with an irresistible desire to lie down and sleep, which if yielded to is soon followed by death.

When one is found in such a condition, life not yet being extinct, he should be taken into a cold room, all clothing removed, and the body rubbed briskly with sheets or towels wet with cold water. As soon as the stiffness is removed artificial respiration should be performed; and when the patient is able to swallow, warm drinks should be given. When there are signs of returning consciousness and circulation the body may be enveloped in a blanket and the temperature of the room gradually raised.

The reason a frozen person must not be brought into a warm room is that the sudden restoration of the circulation gives rise to violent congestions and often to sudden death from the formation of clots in the blood-vessels.

Local freezing is of two degrees, frost-bite and chilblain.

Frost-bite is usually of the extremities, fingers, toes, nose, or ears, but a whole limb may be frozen. The part is at first red and painful, then livid, and finally white, hard, and painless; the sudden cessation of pain in the freezing part is always a bad sign. The danger of frost-bite is that sudden thawing may cause such severe congestion as to result in gangrene.

Therefore the patient should not go into a warm room or near a fire. Rub the part vigorously with wet snow or ice water, never with dry snow as the temperature of dry snow may be much below freezing, and rubbing with it would aggravate the condition. When the pain and redness return apply cold dressings.

Chilblain is a condition of acute or chronic congestion occurring especially in the feet, and due to bringing cold feet near the fire too suddenly, or merely following exposure to cold in persons with poor circulation. On the part affected are red spots, more or less swollen, which burn and itch intensely. The treatment consists in stimulating applications, such as liniments and tincture of iodine. Susceptible persons should wear woolen socks.

CHAPTER VII.

INSENSIBILITY AND FITS.

Among *conditions causing insensibility* are fainting, shock, concussion and compression of the brain, apoplexy, lightning stroke, electric shock, heat stroke, freezing, epilepsy, Bright's disease, alcoholism, narcotic poisoning, and asphyxia or suffocation.

Fainting is a condition due to too little blood in the brain, and is caused by mental impressions, exhaustion, heat, bleeding, overcrowded rooms, etc. The symptoms are sudden unconsciousness, pale face, cool, moist skin, weak pulse, shallow breathing, and dilated pupils.

Treatment: Get more blood to the brain by laying the patient flat on his back with the head low and the legs raised; sprinkle cold water in his face and apply ammonia or smelling salts to the nostrils to make him breathe, get him out of a crowd into the fresh air, loosen the clothing about his neck and waist.

If he is sitting in a chair and about to faint the attack can often be prevented by thrusting the head down between his own knees and holding it there until the face becomes flushed.

Shock is a condition similar to fainting but due to physical injury. It has been fully dealt with on page 74.

Concussion of the brain is the condition present when we say a man has been "knocked senseless" or "stunned." It is a jarring and shaking of the brain due to blows or falls upon the head or falls upon the feet; the brain almost stops working for a while. The symptoms are unconsciousness, pallor of the face, breathing so quiet and shallow that it can hardly be detected, pulse fluttering, pupils equal and usually contracted.

The degree of insensibility varies; sometimes the patient can be aroused but is irritable and lapses again into unconsciousness which may last minutes or hours. Vomiting and turning on the side are favorable symptoms.

Treatment: Perfect rest in a dark, quiet room; warmth externally if the surface is cold; aromatic spirits of ammonia internally or by inhalation if there is much depression.

Compression of the brain is as its name implies a pressure on the brain. This pressure is due usually to either a piece of bone or to blood from a torn vessel which has escaped inside the cranium and as it cannot get out must compress the brain, and this compression prevents certain parts of the brain from working. When the bleeding is the result of injury the condition is called simply compression of the brain; when it is the result of the bursting of a diseased vessel without any violence it is called *apoplexy;* the result and the symptoms are just the same.

The symptoms of compression are profound unconsciousness; loud, snoring breathing; slow pulse; pupils usually unequal and not reacting to light, and paralysis on one side of the body.

If the compression is due to a piece of broken bone the symptoms come on immediately after the injury, while if it is due to bleeding they may come on later and gradually.

Treatment: If the compression is due to a piece of depressed bone the bone must be raised. If due to bleeding, the bleeding must be stopped; surgical relief can only be given by a surgeon, but meantime keep the patient quiet with his head slightly raised; apply an ice bag to the head, give him a hot mustard foot bath, and put a few drops of croton oil on his tongue, so as to send the blood from his brain to the feet and intestinal tract.

Lightning stroke may cause sudden death, insensibility, or severe burns. If the patient is unconscious but living, effort should be made to keep him alive; perform artificial respiration if the breathing fails; give stimulants if the heart is weak, and apply heat externally if the surface is cold. Burns must be treated like other burns.

Electric shock is caused by coming in contact with a "live wire"; spasmodic contraction of the muscles occurs so that the person cannot let go. The condition and results are exactly like lightning stroke.

The first thing to be done is to rescue the patient by setting him free from the wire, and this must be done with great care, as to touch him with the bare hands will cause the rescuer to get the same shock.

If thick rubber gloves are not at hand the body may be pushed away from the wire with a stick or a plank or other non-conductor. If the current is not a very powerful one the hands may be protected with a thick *dry* woolen coat or blanket, being careful not to come in contact with the bare skin of the patient.

The treatment of the shock is the same as in the case of lightning shock.

The forms of unconsciousness due to heat stroke and to freezing have already been described.

Unconsciousness from acute alcoholism is the condition known as "*dead drunk.*" The patient is insensible, though he can usually be partially aroused, the face is flushed and bloated, eyes bloodshot, pupils usually dilated, skin cold and clammy, temperature subnormal, respiration snoring, pulse rapid and weak; there is no paralysis.

Treatment: The case is one of acute poisoning by alcohol. The first thing to be done is to empty the stomach, by tickling the throat or by giving an emetic of mustard or salt and warm water. Then sprinkle cold water freely upon the face, but apply heat to the body; a cup of hot coffee may help to clear the brain after the stomach is emptied. Usually an undisturbed sleep is necessary.

It must not be forgotten that alcoholism and apoplexy are frequently confounded, the more so as a man who has been drinking and has the odor of liquor upon his breath may be stricken with apoplexy.

In apoplexy there are paralysis, unequal or contracted pupils, some fever, slow pulse; in alcoholism no paralysis, equally dilated pupils, rapid pulse, subnormal temperature.

In *epilepsy* there may be *fits* with insensibility, or a mere momentary unconsciousness with slight muscular twitching, but in which the patient does not fall.

In the severe form, with or without some premonitory sign, the subject suddenly cries out in a peculiar manner and falls in a fit; at first the entire body is rigid, then there are general convulsions with jerking of the limbs, contortions of the face, and foaming at the mouth; after a few minutes the convulsions are followed by profound stupor, and this generally passes off in deep sleep. During the attack the eyeballs may be touched without the patient flinching, the pupils are

dilated, he often bites his tongue, and there may be involuntary evacuations of the bowels and bladder.

Epileptic stupor may be distinguished from other forms of unconsciousness by the history of the fit, and of other fits, by the foam at the mouth and the bitten tongue, and by the absence of any paralysis.

Treatment: You can do nothing to stop the fit or to control it; all that can be accomplished is to prevent the patient from hurting himself and to make him as comfortable as possible; do not attempt to hold him, but twist a handkerchief and passing it between the jaws tie it at the back of the neck to keep him from biting his tongue until after the fit is over; after which let him sleep as long as he wishes.

Epileptic fits are frequently feigned by soldiers in order to secure their discharges. The feigned attacks usually occur at night when no one can see them; the man does not fall so as to hurt himself, does not bite his tongue, flinches when the eyeball is touched; the pupils are not dilated; the patient can be aroused; when there is foaming at the mouth a piece of soap will often be found inside.

A pail of cold water suddenly thrown upon the man's head and shoulders usually makes the diagnosis; it promptly revives the malingerer, but has little or no effect upon the epileptic.

The insensibility of Bright's disease is really an acute poisoning from the retention of the waste products which the diseased kidneys are not able to carry off. The unconsciousness is often attended with delirium and convulsions. The pupils are contracted, the pulse slow, and the breathing loud and snoring.

The distinguishing characteristics are the history of Bright's disease, the waxy color of the skin, sometimes dropsy, the equally contracted pupils, the absence of paralysis.

Emergency treatment: Cold cloths to the head and a hot mustard poultice to the back over the kidneys.

In *opium poisoning* the patient may be very sleepy or deeply unconscious, the pupils are minutely contracted, the respiration very slow, as low as eight or ten to the minute, and snoring, and the pulse rapid and weak. If the opium has been swallowed, empty the stomach by an emetic, and then give a half gramme of permanganate of potash dissolved in half a pint of water to destroy what opium is left.

Next keep the patient awake by giving him strong, black coffee, pinching him, talking to him, and walking him up and down if possible, but not to the point of exhaustion.

Asphyxia or suffocation is another cause of unconsciousness, to which it is necessary to devote a special chapter.

CHAPTER VIII.

ASPHYXIA.

Asphyxia or *suffocation* is that form of unconsciousness due to the cutting off of the supply of oxygen to the lungs. This may occur in several ways. The air may be so full of some other gas that the proper amount of oxygen cannot reach the lungs; this is what happens in cases of poisoning from illuminating gas, the gases in mines, etc.

When a person is buried up to his neck in a slide of earth or snow he may be asphyxiated as a result of the inability to expand his chest, even though the mouth and nose be free. The air may be cut off at the mouth as when one is smothered by a pillow; in the throat by the lodgment of food in the larynx, or its obstruction with the membrane of diphtheria. The supply of air may be shut off by the pressure of a rope or fingers when one is hanged or strangled. In drowning, water gets into the air passages and mechanically shuts off the air. Finally when anesthetics, such as ether or chloroform, are given, asphyxia may result from an insufficient admixture of air.

The treatment of asphyxia consists first in removing the cause, second in restoring the breathing by artificial respiration. If the patient is overcome by gas remove him to the fresh air, if he is taking an anesthetic stop it, if he is buried in a snow-slide dig him out as quickly as possible, if there is a piece of meat in the throat put your finger in and hook it out or beat him between the shoulders and jar it out. If the larynx is obstructed by membrane it may be necessary to make an opening into the trachea (tracheotomy) and put in a tube; if the patient is hanging cut him down; if he has been drowned get the water out of his air passages; do these things first, then perform the artificial respiration.

Artificial respiration seeks to imitate the natural breathing. There are several methods, Sylvester's method being generally considered the best.

Sylvester's method: Place the patient on his back with his shoulders slightly raised by a small pillow or a folded coat; clear the throat, nose, and mouth of mucus, froth, and dirt; draw the tongue forward

FIG. 77.—Sylvester's Method of Artificial Respiration. **Expiration.**

to keep it from dropping back and closing the opening of the larynx, keep it forward by passing an elastic band or piece of tape over the base of the tongue and under the lower jaw, or by forcing a pencil be-

FIG. 78.—Sylvester's Method of Artificial Respiration. Inspiration.

hind the last teeth and over the tongue, or by having an assistant hold it between his fingers covered by a handkerchief to keep them from slipping; loosen the clothing about his neck, chest, and abdomen;

kneel behind the patient's head facing his feet; grasp his forearms just below the elbows and press them against the front and sides of the chest throwing the weight of your body forward and upon his arms and chest (Fig. 77); this forces the air out of the lungs; then draw his forearms slowly upward above the patient's head, throwing your own body back so as to make the extension complete (Fig. 78); this draws the lower ribs upward and outward, expands the chest, and the

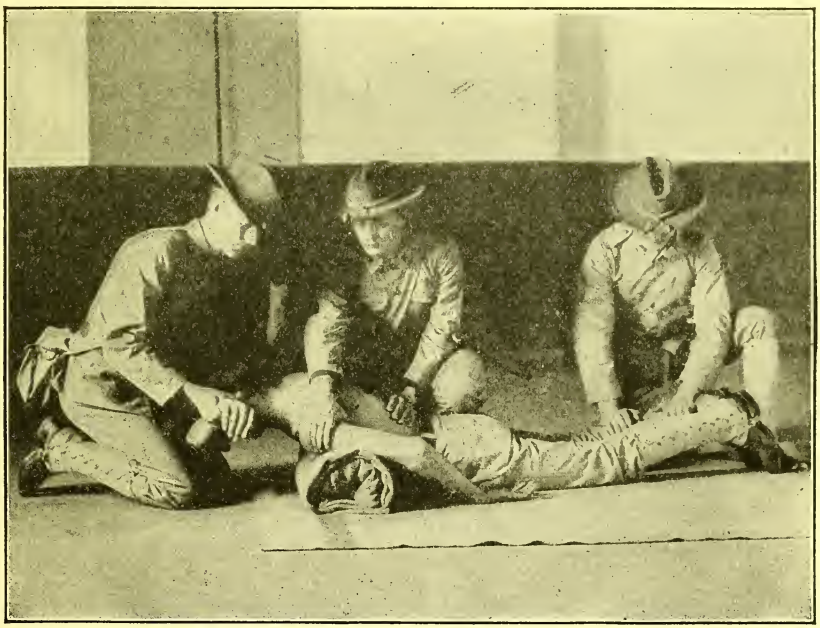


FIG. 79.—Artificial Respiration. Marshall Hall's method. Expiration.

air rushes in; repeat these movements about fifteen times to the minute and keep it up until the patient begins to breathe by himself or until there appears no possibility of his doing so; usually the effort is continued for at least an hour.

Pause for a moment occasionally to see whether the patient makes any effort to breathe; if he does, time your movements so as to correspond to the natural inspiratory and expiratory efforts. Usually the first signs of success are a change in the color of the face and faint sighing.

Meanwhile efforts should be made to excite respiration in other

ways; apply snuff, tobacco, pepper, or smelling salts to the nostrils, and strike the chest with towels dipped in hot and cold water alternately.

Marshall Hall's method: In this method the patient is placed on the floor or ground with the face downward, his forehead resting on one arm, and a roll of clothing supporting his chest. While in this position the weight of the body compresses the ribs and expels the air from the chest—an artificial expiration which is deepened by making

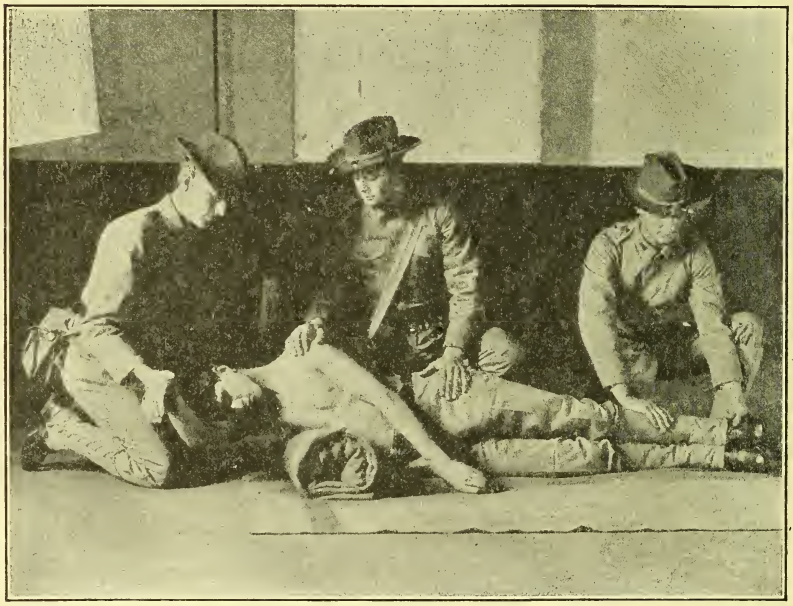


FIG. 80.—Artificial Respiration. Marshall Hall's method. Inspiration.

pressure on the lower ribs (Fig. 79). Then the operator, with one hand on the patient's free arm, near the shoulder, and the other placed under or in front of the corresponding hip bone, rolls the body from face downward to its side and a little beyond (Fig. 80). An assistant aids in this movement by handling the head and underlying arm. When the body has been thus rolled somewhat more than half round, the chest becomes relieved from superincumbent weight, and a certain volume of air enters. After resting a second or two in this attitude of

inspiration, the patient is returned to the prone position, and pressure made along the ribs to imitate the expiratory act.

Drowning: There are wide differences of opinion as to how long a man may remain under water after drowning and yet be resuscitated. It is probable that five minutes is the limit, but inasmuch as no record is usually kept of the time and it may be actually much less than what it appears under the influence of excitement, it is well to make an effort at artificial respiration unless the time is actually known to have been greater than a quarter of an hour.

FIG. 81.—Getting Water Out of the Lungs.

To clear the lungs of water preliminary to artificial respiration turn the patient on his face with his forehead resting on his wrist and a roll of clothing under his chest; then getting astride the body press on the back to force out the water; next drop your hands under his abdomen and lift up his body with the head hanging down so that the water will run out (Fig. 81).

Besides artificial respiration it is necessary to restore the heat of the body, which is rapidly lost by immersion in the water, and to stimulate the circulation.

While efforts at artificial respiration are going on remove the wet clothing, wrap the body in dry, hot blankets, apply hot-water bottles to the feet, and rub the limbs actively toward the heart; stimulants should be given hypodermically, by the rectum, and by the mouth when the patient can swallow.

When respiration is established put the patient in a hot bath until the body heat and circulation are restored. Even when artificial respiration is successful after drowning, congestion of the lungs, bronchitis, or pneumonia is apt to result from the cold and the irritation of the lungs by the water which has gotten into them; to prevent these complications large mustard plasters should be applied to the chest.

CHAPTER IX.

POISONING.

POISONS may be divided into two classes, *those which are taken internally or hypodermically* and *those which are applied to the skin.*

Of those taken internally the *caustic acids and alkalies* may also be applied to the skin; in either case they produce burns. When swallowed the burns are upon the lips, in the mouth, throat, and stomach. The stains are seen upon the lips, and the symptoms are intense pain and agony, and vomiting of bloody matter mixed with mucus and shreds of membrane. The *treatment* consists in trying to neutralize the poison, protecting the burnt surfaces by administering soothing substances such as oils, milk, white of egg, flour and water, etc., and relief of pain by opiates.

The *caustic alkalies*, such as lye, are best neutralized by vinegar or lemon juice and water, and the *caustic acids*, such as sulphuric and nitric, by magnesia, cooking or washing soda, tooth powder, or soap suds. The remainder of the internal poisons may be divided in three general classes:

1. *Those whose principal effect is upon the gastro-intestinal canal, causing violent irritation or inflammation;* such as arsenic, corrosive sublimate, nitrate of silver, oxalic acid, croton oil, and sugar of lead.

2. *Those which produce little or no local irritation, but have a powerful general effect, especially upon the nervous system;* such as opium, chloral, belladonna, prussic acid, and strychnine.

3. *Those which are both local and general poisons;* such as phenol, cantharides, phosphorus, and aconite.

In the *treatment* of cases of poisoning our first object is to empty the stomach and prevent the absorption of any poison that may be left in it; then to relieve pain and obviate the tendency to death.

An emetic is ordinarily used to empty the stomach, and those which

are most readily available are warm water, mustard, salt, and ipecac, give a tablespoonful of mustard or salt or a half teaspoonful of ipecac dissolved in a half pint of tepid water; encourage vomiting by running the fingers down the throat or tickling it with a feather; the water should be tepid to produce nausea, and vomiting should be repeated until the water returns clear. If a stomach tube is available the stomach should be washed out.

To prevent absorption we give an antidote, that is something that will destroy the poison or its effects, usually rendering it insoluble.

Antidotes are general and special. The *general antidotes* are given when we do not know the exact nature of the poison; thus tannic acid and substances such as tea which contain it are antidotal to the poisonous alkaloids and therefore to most vegetable poisons, and albumin and substances such as white of egg, milk, etc., which contain it are antidotal to most mineral poisons. The *special antidotes* should be used when we know the exact nature of the poison; hydrated magnesia or hydrated oxide of iron is the special antidote to arsenic, salt to the nitrate of silver, chalk or tooth powder to oxalic acid, soluble sulphates such as Epsom or Glauber's salt to phenol and sugar of lead, sulphate of copper to phosphorus, and permanganate of potash to opium.

The antidote is given at the same time as or immediately after the emetic.

The relief of suffering calls for soothing, bland liquids, such as olive oil or milk when there is burning pain in the stomach and bowels, and also for morphine hypodermically.

To obviate the tendency to death observe in what way life is threatened and endeavor to counteract that effect. If there is shock and collapse, use stimulants, warmth, and rubbing; if the heart is failing as in poisoning by aconite, chloral, or prussic acid stimulate it by hot coffee, strychnine, digitalis, etc.; if there is failure of respiration as in phenol poisoning use coffee, cold douching, and artificial respiration; if there are violent convulsions as in strychnine poisoning use bromides, chloral, or chloroform; if there is tendency to sleep keep the patient awake by the administration of coffee, slapping the face and chest with a wet towel, and walking him about.

To sum up: *if you do not know what the poison is, but there are*

signs of burning or caustic action about the mouth and lips, do not give an emetic, give a tablespoonful of bland oil, such as olive oil or cotton-seed oil, or castor or cod-liver oil; get the patient to bed, relieve his pain, put a mustard plaster over the stomach, and try to keep him alive. You do not give an emetic in such cases because the burned stomach might give way in vomiting, and the caustic would burn as much coming up as it did going down.

If you do not know what the poison is, but the lips and mouth are not burned, give an emetic followed by two or three raw eggs, a glass of milk, or flour and water, and then a cup of strong, hot tea, after which relieve pain and obviate the tendency to death.

When you do know the poison give the emetic, and the antidote; then relieve pain and keep the patient alive.

Among the substances which most commonly cause poisoning are phenol, opium, wood alcohol, foods, chloral, arsenic, corrosive sublimate, nitrate of silver, phosphorus, and strychnine.

Phenol is usually taken in concentrated form, and may produce death in an hour or two. The symptoms are white patches on the lips, burning pain in the stomach, intense depression, cold, clammy skin, weak pulse, failing respiration, stupor, and death. The antidotes are the soluble sulphates, alcohol, and albumen. Give emetics, then two tablespoonfuls of Epsom or Glauber's salt dissolved in a half pint of water, a couple of ounces of whisky or brandy or an ounce of alcohol in four ounces of water, two raw eggs, or a half-pint of milk. Perform artificial respiration and use stimulants, heat, and rubbing.

When phenol is dropped on the skin, alcohol, if used promptly, will completely prevent any burning.

Opium.—The treatment of opium poisoning has been described on page 113.

Wood alcohol or methyl alcohol is a very dangerous poison used as a fuel, and in the manufacture of toilet preparations such as bay rum. The symptoms of poisoning by it are severe pains in the head and abdomen, dizziness, vomiting, delirium, partial or complete blindness, dilated pupils, great depression of the heart and respiration, sometimes albuminuria, stupor, and death. If the patient recovers he is often left blind.

The treatment consists in use of emetics, or washing out the stomach,

emptying the bowels by cathartics and enema, active stimulation by whisky and coffee internally and strychnine hypodermically, artificial respiration if necessary, and external warmth.

Ptomaine poisoning is usually due to the use of foods which have undergone partial decomposition, though there may be no change in their taste or odor. The poisonous decomposition is especially apt to occur in hashes, milk, or foods containing milk which have been kept over night in warm weather. Sausage, cheese, and shell-fish sometimes undergo the same changes. Many cases of poisoning of this kind have occurred at military posts; sometimes whole companies have been poisoned at the same time.

The symptoms are much like those of wood-alcohol poisoning, only vision is not usually affected and there may be some fever and some purging.

In treatment the first thing to do is to empty the stomach and bowels of the poison by the use of emetics and active cathartics. Then relieve pain and give stimulants with heat externally and mustard plasters over the abdomen.

Chloral is the drug usually employed to make *"knockout drops."* It causes deep sleep followed by insensibility, with failure of the heart and sometimes the respiration. Empty the stomach and keep the patient awake by the same means as in opium poisoning, except that on account of his weak heart the patient must not be made to walk about as in opium poisoning, and for the same reason strychnine must be freely used hypodermically.

In arsenic poisoning there is great pain in the abdomen, with vomiting and purging, tenderness, straining and perhaps suppression of urine, severe depression and anxiety, weak, rapid pulse, and cold, clammy skin. Use emetics or the lavage tube, give a tablespoonful of freshly prepared *hydrated oxide of iron* every ten minutes for five or six doses. The hydrated oxide is prepared by precipitating the tincture of the chloride of iron with aqua ammonia, and washing the precipitate to remove the excess of ammonia. Then give morphine, stimulants, and soothing drinks, with external heat and friction.

Corrosive sublimate may be swallowed by mistake in the form of an antiseptic solution. The symptoms are about the same as in arsenic poisoning and the treatment is much the same except that the

antidote is albumen instead of hydrated oxide of iron, and that the antidotal effect is only temporary so that emetics must be used after the antidote.

Nitrate of silver may be swallowed accidentally as when a piece of lunar caustic breaks off and drops down the throat. Common table *salt dissolved in water* should be given freely; it is at once a special antidote and an emetic.

Phosphorus is sometimes taken in the form of match-heads. It is an irritant poison like arsenic and corrosive sublimate. *Sulphate of copper is the antidote* and also an emetic; it should be given one-fifth of a gram every five or ten minutes with tepid water.

Phosphorus is the one irritant mineral poison for which oils should not be given because its absorption is favored by them.

Strychnine causes violent convulsions with intervals of rest; there are also pains and cramps in the abdomen. Death is the result of asphyxia in the convulsions or exhaustion following them. *Use emetics* or the lavage tube, *bromides and chloral, chloroform.*

Substances which produce poisoning when applied to the skin are chiefly plants of the *rhus family* such as "poison oak," "poison ivy," and "poison sumac." Other plants such as the common garden parsnip produce poisoning occasionally.

Some persons are not susceptible while other persons are so much so that they appear to be poisoned even without actual contact. "Poison oak" is a stubby plant with three leaflets notched on the edge and downy on the under surface; "poison ivy" climbs on rocks and trees; it is distinguished from "Virginia creeper," which it resembles, by having three leaflets instead of five and by having a hairy trunk and little clusters of white berries; "poison sumac" is distinguished from the harmless variety by having white berries instead of red. The symptoms of *rhus poisoning* are an inflammation of the skin closely resembling erysipelas, redness, swelling, burning and itching, sometimes vesicles; it is especially apt to occur on exposed parts such as the face and hands.

The treatment consists in dissolving off any remaining poison with alcohol and then applying alkaline lotions, such as a saturated *solution of bicarbonate of soda.*

PART IV.

NURSING.

NURSING in post and field hospitals is ordinarily done by members of the hospital corps. In general hospitals, base hospitals, and other fixed hospitals of active service it is done by the nurse corps (female) and the hospital corps.

The conditions most essential to the recovery of the sick are rest, absolute cleanliness, and an abundance of fresh air, and these the nurse should always seek to secure. Not all hospital corps men are fit to become nurses, but all must receive training in this subject in order to show whether or not they possess the aptitude. Study and experience are both necessary and the two must go together.

CHAPTER I.

THE WARD.

THE wards of all *post hospitals* are arranged on the same general plan, which is shown in Fig. 82.

The number of beds in each ward varies from twelve to eighteen and usually there is connected with each a toilet-room with baths, basins and water-closets, and a wardmaster's room. Near the ward is a room or cabinet for patients' effects, and a linen closet sufficient to contain enough linen for current ward use.

The beds are arranged in pairs between adjacent windows, with a space of three feet between the beds and three and a half feet between each pair of beds. About 90 feet of floor space and 1,800 cubic feet of air space are allowed to each bed.

Between each pair of beds is a chair, and adjoining each bed a glass and iron bedside table; this with a folding bed-screen constitutes the official furniture of the ward which is purposely made as free as possible from appliances which are not only useless but

collecting places for dirt and disease germs. Usually, however, there is a table for the wardmaster or nurse, and another with a small cabinet to contain ward medicines.

In the *field hospitals* which have an ordinary capacity of one hundred and eight beds there are six wards, each composed of three hospital tents pitched end to end. The furniture consists of a folding

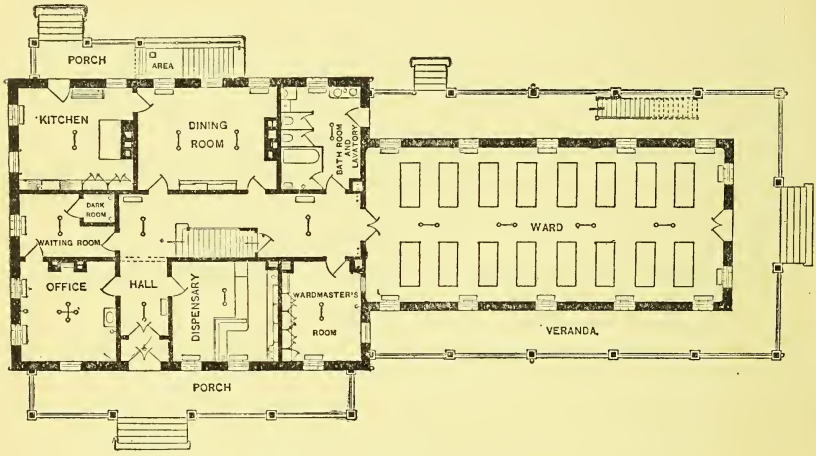


FIG. 82.—Floor Plan for a Post Hospital.

stool and a folding bedside table to each tent, four commode chests, four folding bath tubs, and one operating table to each hospital. With moving commands no cots are prescribed, the bedding consisting of bed sacks, pillow sacks, blankets, and rubber blankets to be placed between the bed sack and the ground. In fixed camps cots and mosquito bars, chairs and tables are supplied.

The post hospital ward is heated by hot water or steam and ventilated by special openings for entrance and exit of air. These air shafts are calculated to introduce three thousand six hundred cubic feet of fresh air per hour per patient. The entering air is warmed by passing over hot-water coils beneath the floor, while foul air escapes through shafts artificially heated by hot-water pipes so as to produce an up draught.

When no special arrangements are made for *ventilation* the natural openings of the ward, such as doors and windows, are used for the purpose. The object must be to introduce as much fresh air as

possible without reducing the temperature of the ward below the normal standard of 68° to 70° F., and without causing unpleasant draughts.

One of the simplest plans to secure *ventilation* when this is not specially provided for is to place a board under the raised lower sash, the air passing in between the sashes (Fig. 83), or to pull down the upper sash and protect the opening by a sloping board (Fig. 84). In either case the cold entering air is directed upward. Occasionally it is necessary to flush out the ward by opening wide the doors and windows for a few minutes; in such cases the patients should be thoroughly wrapped up as if out of doors.

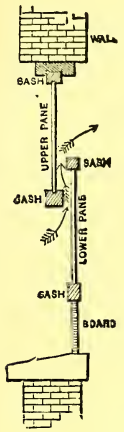


FIG. 83.—Window Ventilation; board below lower sash.

Each ward is under the care of a noncommissioned officer or private first class assigned as *wardmaster*, who is responsible for the comfort, diet, and medication of the patients, the performance of their duty by the nurses, the preservation of the ward property, the regulation of the heat, lights, and ventilation, and the cleanliness of the bed linen and clothing, lavatories, baths, water closets, etc. One nurse is sufficient for a ward of twenty beds when the cases are not of an acute character, but two may be required under special conditions.

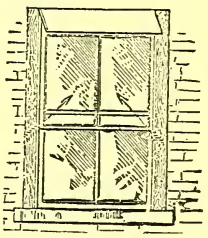


FIG. 84.—Window Ventilation; board above sash.

The wardmaster or nurse accompanies the medical officer on his rounds, takes down his directions in the ward book, and sees that they are carried out. Each nurse has specified duties assigned to him, so that each may know exactly what is expected of him. He should from the first cultivate habits of observation, neatness, and system. Each time he passes about his ward he should observe the condition of his patients, the beds, chairs, tables, etc., and should at once correct anything that is out of order. There should be a place for everything and everything in its place. When anything has been used it should at once be cleaned and put back where it belongs, so that when occasion

for its use comes again no time may be lost in looking for it and cleaning it.

When a medical officer unattended by a noncommissioned officer enters the ward the wardmaster should at once arise and call *attention* and at the same time approach the medical officer to render any assistance he may require; the same courtesy must be rendered the commanding officer of the post or other authorized inspector.

When strangers enter the ward he should ascertain their business and show them proper courtesies; they should not be allowed to wander through the ward by themselves.

A wardmaster should never leave his ward without informing his senior nurse where he is going and for how long and placing the latter formally in charge.

The tour of a *night nurse's* duty usually extends from immediately after dinner until after breakfast the following morning. The day nurses serve the dinner to the patients and the night nurses the breakfast; each completes his own work and cleans up everything that has been used by him during his tour of service. The night nurse renders a written report of all that has happened during the night and turns over to the day nurse any instructions he may have received.

In each ward a book should be kept containing a complete inventory of all the ward furniture, bedding, and appliances; when any of these articles become soiled, worn out, or broken they are exchanged for clean or new ones, but the number of each should as far as possible be maintained unchanged.

When a wardmaster is relieved in a ward he should turn over the articles to his successor and take his receipt in the book.

Going on duty in the morning the nurse must begin at once to get things in order for the morning rounds, usually at nine o'clock. Chairs should be put in their places, bedside tables cleared of superfluous articles, and beds made up. Bed patients should have their hands, faces, and teeth washed, and hair brushed. Convalescents who are able to do so may be required to assist in the ward work.

The floors should be swept with a broom covered with a cloth wrung out of five-per-cent phenol solution and quickly polished with the polishing brush, and the chairs, tables, beds, and window-sills freed from dust by a cloth dampened in the same solution.

Hospital floors should be made as impervious as possible, so that they may not absorb germs and dirt. They ordinarily have a hard finish and are kept smooth and polished by using on them a solution of paraffin or paraffin and wax in turpentine, and frequent polishing with a weighted polishing brush covered with a piece of blanket. A commonly used preparation consists of six ounces of paraffin dissolved in a gallon of turpentine, with the addition of an ounce of soft soap just before using; this is applied with a mop, and when dry is rubbed in with the floor polisher.

A floor so finished should not be scrubbed with water; spots may be removed with turpentine.

After the ward is mad ready the lavatory should be attended to; all urinals, bed pans, and bottles should be thoroughly cleaned, shelves wiped off, closet-bowls and seats washed, and bath tubs scrubbed.

In addition to this daily cleaning a more thorough preparation is made for Saturday inspection. Windows and sills, tables, chairs, and unoccupied beds are washed, and cots and mattresses gone over for bed-bugs.

To destroy bed-bugs a saturated solution of phenol, or kerosene oil is usually employed, the solution or kerosene being freely applied in all cracks and crevices and along the seams of mattresses. Recently the Department of Agriculture has recommended hydrocyanic acid gas for the destruction of bed-bugs, flies, cockroaches, and other vermin which may infest hospitals. The hydrocyanic acid gas is generated from cyanide of potash by the addition of commercial sulphuric acid. An ounce each of cyanide of potash and sulphuric acid and two ounces of water are required for each hundred cubic feet of air space, and the apartment must be tightly closed for six to eight hours in the same manner as in fumigation with sulphur or pyrethrum. The objection to cyanide fumigation is the great danger to human life from breathing the fumes of the gas, which precludes its employment in any part of an occupied house, or in a house in a block separated from other houses by party walls only.

Beds and mattresses, however, may be freed from insects by fumigating them in a tightly constructed chamber or box such as is used for disinfecting objects with formaldehyde gas. The room

having been made ready, the proper amount of sulphuric acid and water is placed in a porcelain basin or slop jar to which is quickly added a thin paper bag containing the corresponding quantity of cyanide of potash; the operator then *immediately* leaves the room and closes the door. After six to eight hours the door is thrown open for the escape of the gas and the entrance of fresh air, and on no account must any one enter the room until the odor of the gas has practically disappeared.

It must never be forgotten that this gas is absolutely deadly to human life, and that even a momentary exposure to it may be fatal.

Whenever a bed is vacated mattress and bedding should be thoroughly aired and sunned, and disinfected if necessary. The same bed linen should never be used, without washing, for two consecutive patients.

In addition to the daily and weekly cleaning there should be a thorough disinfection of the wards twice a year or whenever infected.

To prevent the pollution of the ward air, all discharges, such as urine, feces, sputum, and vomited matter, soiled dressings and linen, and dirty vessels should be promptly removed. The vessel containing discharges should be covered at once, using a piece of rubber sheeting or a towel if the vessel has no cover, and should never be carried through the ward uncovered.

Soiled dressings should be received in a covered pail and promptly burned.

Sputum cups in use should be frequently disinfected by boiling, and bed pans and urinals scalded with hot water after each use and always kept clean.

CHAPTER II.

WARD MANAGEMENT.

A PATIENT may be able to walk to the hospital or he may be brought there in an ambulance or on a litter. In either case he should be examined at once by the senior noncommissioned officer present; if he has been seen already by a medical officer direction for his disposition should accompany him; if he has not been seen by a medical officer one should be notified promptly. Pending his arrival the noncommissioned officer should take the necessary steps, taking care that no contagious case goes into the general wards. Generally there is a standing rule in hospitals that all patients should be given a bath before being put to bed unless there are orders to the contrary or the patient's condition is such as to render a bath undesirable. After the bath the patient is given a suit of hospital clothing and put to bed. An inventory of his effects is made in duplicate and signed by the wardmaster, one copy in a book and the other on a name slip which is attached to the bundle; the clothing is then inspected and if it requires disinfection is at once sent to the disinfecting chamber; otherwise the underclothing should go to the laundry and the remainder, tied securely in a bundle, to the locker corresponding to the patient's bed. Valuables should be listed, placed in an envelope marked with the name, date, and contents, and at once turned over to the senior noncommissioned officer for deposit in the hospital safe. Meantime it is well to offer the patient a glass of water or milk to make him feel that he is being cared for. After the patient is comfortably in bed, his pulse, temperature, and respiration are taken and recorded; the first urine passed is saved in a clean vessel for examination.

Bed patients should wear hospital clothing only; but, on the other hand, patients allowed up should not be permitted to wear hospital gowns or pajamas under their own clothes; unless this point is looked to, hospital clothing will often be missing.

Food and medicines must be administered promptly and in a proper way.

The nurses' hands must be kept clean and free from odors. Nothing is more disgusting to one who is already ill than to have food presented from dirty hands.

One of the most important duties about the hospital and perhaps the one most frequently neglected is the *serving of diets.* The noncommissioned officer in charge of the mess is responsible under the senior noncommissioned officer and should be in the wards at meal times to see personally that the diets are promptly and properly served. Utensils should be clean, plates warmed, and no slopping over allowed. Food which is intended to be hot should reach the patient in that condition. Used utensils and unconsumed food should be promptly removed from the ward and all crumbs and débris cleaned up.

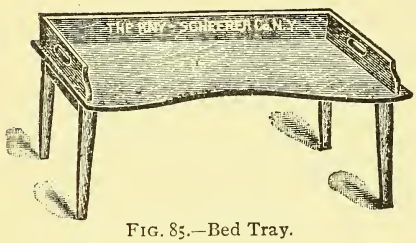


Fig. 85.—Bed Tray.

Patients able to sit up in bed use the bed tray (Fig. 85), those unable to sit up must be fed by the nurse. To administer liquids the head and shoulders are raised and a feeding cup (Fig. 86) or an ordinary cup or tumbler is used. When the head should not be raised the liquid may be taken through a bent glass tube. When the sick man is unconscious, liquids must be given very slowly, taking care to avoid choking.

Utensils used for patients with infectious diseases must be kept separate from others and separately washed. Especially is this important in the case of syphilitics with mucous patches in the mouth, which are very contagious.

Fig. 86.—Feeding Cup.

Very ill patients on liquid diet should have their nourishment regularly at night as well as by day unless there are special orders that the patient shall not be awakened. Very often wakefulness is due to insufficient nourishment, and a glass of milk or a cup of beef tea will often secure several additional hours of sleep.

Liquid diet includes only liquids, the most useful of which are milk, meat extracts, broths, gruels, albumen solutions, and, last, but not least, water.

Milk by reason of containing a proper proportion of all the important food principles is by far the most valuable single article of liquid diet. It may be given in many forms: Plain, peptonized, as buttermilk, whey, or junket; a patient on milk diet alone should take from two to five pints in the twenty-four hours.

Meat extracts have little value except as stimulants; it should never be forgotten that a patient fed exclusively on them would promptly starve; the same remark applies, in a less degree, to broths and gruels. Albumen water is valuable when milk is not tolerated. In all diseases, but especially in fevers, water in large quantities is indispensable; it flushes out the excretory organs, removing poisonous substances, aids the circulation, and lowers temperature in its evaporation from the skin. In all fever cases the amount of water given should be noted on the clinical record.

Medicines must never be left with a patient to be taken by him; the nurse should give them himself and see that they are swallowed before he leaves the bedside. In giving medicines great care must be exercised to avoid mistakes. The label indicating the nature of the medicine and the dose must be carefully read, the bottle shaken, and the dose measured out by pouring from the side of the bottle opposite the label so as not to spoil the latter. After the dose is taken the fact should be recorded, never before. A graduated medicine glass should always be used to measure doses instead of spoons which vary so much in size. Medicines ordered to be taken before meals should be given about twenty minutes before, while those to be taken after meals should usually be given immediately after. Sour medicine should not be given within a half-hour of the time when milk is administered. Sleeping patients should not be aroused to take medicine unless the medical officer has specially so ordered.

Pills are administered by putting them far back on the patient's tongue and giving him a swallow of water.

A powder if small should be placed on the back of the tongue and washed down with water or placed on a spoon and moistened

with water; if large and bulky it should be stirred up with water in a tumbler and swallowed quickly before it settles.

The *ward medicine closet* must be kept locked and the wardmaster must take care to avoid an accumulation of medicines. When a patient for whom a mixture has been especially ordered leaves the ward his medicine bottle should be at once turned in to the dispensary, and the same rule applies to all medicines not in current use.

To give medicines subcutaneously, the *hypodermic syringe* is used. Certain rules are necessary to prevent accidents with this instrument. The solution used must be freshly prepared; the needles must be clean, sharp, and aseptic; the skin where the injection is made must be cleansed.

To render the needle aseptic boil it a moment in a spoonful of water, or draw phenol or cresol solution through it several times. Never attempt to use a needle the point of which is dulled or bent. In making the injection care must be taken to avoid blood-vessels, nerves, and bones; for this reason a fleshy part should always be selected and the injection made obliquely; the outside of the fore-arm or the front of the thigh is usually chosen.

Draw the medicine into the syringe, screw on the needle, hold the syringe vertically, needle up, and gradually press the piston until all air has been forced out as indicated by the escape of a drop of fluid; wash the skin at the point of injection with a little alcohol or plain soap and water, draw the skin tight, and thrust in the needle quickly. When the needle has penetrated about half an inch, force out the liquid slowly, withdraw the needle, and press the finger for a moment on the puncture. Before putting the syringe away draw a disinfecting solution through it, remove the needle, blow out of it with the lips the last drop of fluid, and at once insert the wire.

The *bed pan* should be warmed before use by dipping it in hot water or placing hot water in it for a few minutes; as soon as removed from the patient it should be promptly covered, taken from the ward, emptied, and washed.

The patient's nails should be kept clean and special attention should be paid to his mouth and teeth. The teeth and mouth of helpless patients should be washed with a gauze sponge dipped in a mild antiseptic solution.

Dying patients should preferably be removed to a separate room; but if this is not practicable their beds should be surrounded by screens so that the other patients may not be unfavorably affected by the sight. A medical officer should always be notified. As soon as death occurs the body should be removed with as little disturbance as possible and given proper attention.

The *signs of death* are cessation of respiration and of the heart's action, dilatation of the pupils with flaccidity of the cornea, and later coldness of the body, rigor mortis, and decomposition.

When respiration can no longer be seen its complete cessation may be verified by holding a mirror over the mouth; if there is any breathing at all the mirror will be clouded. When the heart and pulse can no longer be felt, tying a string around the finger will show whether the circulation has ceased; if it has not there will be some congestion of the end of the finger, while there will be no change if death has occurred.

In hospitals the sign of death most relied upon is the sudden and permanent dilatation of the pupils with flaccidity of the cornea; the latter sign is elicited by touching the cornea with the finger, when, instead of being firm and resilient, it will be found soft and flaccid.

As soon as the body is removed from the ward the rectum, mouth and nostrils must be packed with cotton to avoid post mortem discharges, a triangular bandage with an absorbent cotton pad applied to the perineum, and the limbs straightened out and placed in position before *rigor mortis* or stiffening sets in. A little cotton should be placed under the upper lids which are then closed. To prevent the jaw from dropping, a four-tailed bandage is applied to the chin, or a rolled-up bandage is fixed between the chin and sternum. The body is then wrapped in a sheet wet with an antiseptic solution and in hot weather placed in an ice box.

Should an *autopsy* be necessary preparations are made for it. The body is placed on a table in the dead-house; the post-mortem case is procured and the instruments laid out; the other arrangements necessary are three pails, one containing water, another to receive discharges, and the third for specimens which it may be desired to keep; a large bath sponge, two pairs of rubber gloves, basin with water, towels, strong thread and needles.

CHAPTER III.

BEDS AND BED-MAKING.

THE regulation hospital bed is of white enameled iron with woven wire springs, and is excellent in every way. The mattress is of hair in three sections fastened together by straps, so that the soiling or destruction of one section does not necessitate the loss of the entire mattress; further to protect the mattress each is supplied with a movable cover which should always be used.

The bed covering should be warm but light; counterpanes being heavy and not porous are objectionable, and for occupied beds should be replaced by sheets.

To prepare a hospital bed first see that the springs are in good condition and not sagging; then select a good mattress free from hollows, cover it with a mattress cover, and place on the springs. Over the mattress spread a sheet, tucking it in first at the head and foot and then at the sides.

If the patient is liable to soil the bed a *draw sheet* comes next, otherwise it is omitted. The draw sheet consists of a rubber sheet about three by four feet, covered by a folded cotton sheet and spread across the bed where the hips will rest, and tucked in at the sides, or pinned to the mattress. Over this is placed the upper sheet and blankets, and over the latter for their protection another sheet is spread; to protect the upper edge of the blankets from soiling, the outer sheet or spread is folded over it, and finally the upper inside sheet folded back over the outer one.

When a patient is placed in bed always pull out the covers a little at the foot of the bed, so that they may not press upon his upturned feet; this is a little point, often neglected, but meaning much to the patient.

All of the beds in a ward should be prepared in the same way so as to give a neat and uniform appearance. Patients are very fond of tucking things away under the mattress, a practice which should be carefully prevented by frequent search.

The bed linen of an occupied bed may be changed easily by a single nurse unassisted and that without seriously disturbing the patient. To change the lower sheet, first loosen all the bed clothes at top, sides, and bottom, remove all the upper covering except a sheet and blanket, and roll up the bottom sheet lengthwise together with the draw sheet into a tight roll close to the patient's body; then in like manner make one side of the clean sheet and draw sheet into a roll and place it alongside the first roll, tucking the free edges under the mattress. Now stand on the other side of the bed and with both hands turn the patient on his side with his face toward you; tuck in the rolls under his back, turn him back on his other side on to the clean sheet, then withdraw the soiled one and pull the clean sheet into place.

To remove the upper bedclothing the covers should first be loosened as before, then spread the clean sheet and blanket over them and tuck in at the sides, after which the soiled clothes may be drawn out at the foot.

Bed linen should be changed whenever it is soiled, when a patient is discharged, and at least once a week, depending on the nature of the case; in the infectious fevers it may be necessary to change daily. Even when the sheets are not changed they should be drawn tight and straightened up daily.

Sometimes it is more convenient to move the patient to a fresh bed so that the other may be aired and changed; this may be done in several ways. The two beds may be moved close alongside of each other and the patient gently lifted over on the sheet by two attendants, one at the head and the other at the foot; the lifting may be facilitated by rolling the edges of the sheet around a pole on each side, thus forming an improvised litter.

If there is only one attendant a rubber sheet may be pinned to the occupied bed and stretched across the interval to form a smooth surface on which the patient is pulled over on his own sheet; or the mattress on which the patient is lying may be pulled a little way over the other and the patient then rolled over the edge or drawn over on his own sheet. Where there is only one bed and the mattress is to be changed draw the soiled mattress half way off, and then place the clean one alongside; draw the patient on his sheet

from the soiled to the clean mattress, remove the soiled one, and draw the clean mattress in its place.

A *bed is prepared for an operative case* the same as for any other with the following differences: The pillow is removed and a towel pinned to the mattress in its place, this because nausea is less apt to occur if the head is low; in case there should be vomiting a couple of towels are hung over the head of the bed and a basin placed on the bedside table. A number of hot-water bags are placed in the bed, and a blanket is put under the upper sheet; the object of these procedures is to diminish shock by having the bed as warm as possible. Before the patient is placed in the bed the hot-water bags are removed lest the patient in his unconscious condition should be burned without knowing it. The covers on one side of the bed should be turned back to the edge of the mattress in order that the bed may be quickly opened up for the reception of the patient.

Beds for fractures of the lower extremities should be firm and solid so that the sinking in of the bed from the weight of the body may not cause displacement of apparatus and in order that the patient may be better handled; this is accomplished by placing under the mattress a frame of slats or a number of separate wooden slats. A great variety of fracture beds and invalid beds have been invented, but they are all too complicated, and an extemporized bed is better.

To move a patient from one side of the bed to another; standing on the left side, pass the right arm well under the patient's shoulder and back, so that his shoulder will rest upon that of the nurse, and pass the other hand over the patient's other shoulder; lift gently and move over the upper half of the body; then place the right arm under the back lower down, and the left below the hips, and move the lower half of the body over

To lift to the upper part of the bed pass the right arm obliquely under the patient's shoulder and back and the left below the hips and lift toward the head. If the patient is strong enough to clasp his arms around the nurse's neck he can assist considerably in these movements.

To change the pillows one arm should raise the shoulders and head, while the other hand adjusts the pillows.

To raise the patient to a semi-recumbent position a bed-rest may be used; or a straight-backed chair turned bottom side up and padded with pillows answers very well, or the support may be made of pillows entirely, the first being placed low down beneath the back and the others packed in above.

Where there is a tendency to slip down in bed, a firm cylindrical pillow about eight inches in diameter is used; this is placed beneath the patient's knees and firmly tied to the head of the bed by broad bandages fastened to the pillow at each end.

Rubber cushions of various shapes and sizes are very useful about a sick-bed, and when there are involuntary discharges a "Kelly pad" or surgical pad is invaluable.

In cases of paralysis or other cases requiring long confinement to bed *air mattresses and water mattresses* are used. The air mattresses may be placed on an ordinary bedstead and inflated with a bellows or by the mouth.

The water mattress requires a frame on each side of the bed to keep it from slipping off, and a rubber sheet must be spread over the springs to prevent sticking. After the mattress is in position it is filled with water by a hose or through a funnel; the temperature of the water must be not less than 98° F., that is, the temperature of the body. No pins should be used about water and air beds lest puncture and leakage occur.

When patients are confined to the bed for long periods of time and their vitality is at the same time very much lowered, as occurs in cases of paralysis, long-continued fever, and in old persons, *bed-sores* are very apt to form; starting as an inflammation of the skin, ulceration and sloughing soon follow and the destruction of tissue is often very deep, even laying bare the bone in many instances, and this with very little pain so that the patient may be unaware of the existence of the ulcers. The causes of bed-sores are long-continued and uneven pressure, frequent wetting of the skin, such as occurs in incontinence of urine, and uncleanliness. Constant watchfulness is necessary to avoid them in chronic bed cases, especially when the patient must remain in one position. It is much easier, however, to prevent bed-sores than to cure them. The beds must be kept clean and free from crumbs; the sheets and the patient's

night dress must be drawn smooth and free of wrinkles and should be changed whenever they get wet or soiled.

The parts of the body most liable to be affected are naturally those most subjected to pressure, the lower part of the back, the shoulders, elbows, and heels. These parts should be washed frequently with soap and water, thoroughly dried, and well sponged with alcohol, whisky, or a one-per-cent solution of tannic acid in whisky. After this lanolin may be rubbed in to make the skin supple, followed by dusting with talcum or starch to absorb moisture. In addition, pressure should be taken off the threatened points by frequent changes of position or the use of rubber rings; in the absence of rubber rings ring-shaped cushions may be made of cotton batting rolled in a tight cylinder, formed into a ring, and then wrapped with a roller bandage. In very chronic cases a water or air bed is necessary.

When the skin is reddened and apparently about to break, it may be protected by strapping with adhesive plaster or a thin layer of absorbent cotton may be placed over it and held in place with a coating of collodion.

After the bed-sore has formed it is treated like any other ulcer; wet antiseptic dressings are applied, and, after all sloughs have separated, balsam of Peru or other stimulating applications are used.

CHAPTER IV.

BATHS AND BATHING.

BATHS are given for several purposes, among the more important of which are:

1. To promote cleanliness.
2. To produce sweating or relaxation.
3. To reduce fever.

According to temperature baths may be:

1. Tepid; at temperature of the body; 98° F.
2. Hot; 100° to 110° F.
3. Cold; 90° to 70° F.,

According to extent baths are classified as:

1. General.
    a. Tub.
    b. Sponge.
2. Local.
    a. Sitz or pelvic.
    b. Foot.

Besides water baths, hot-air and steam baths are employed. The wet pack is a modified form of bath.

To promote cleanliness tepid water is used either in the tub or by sponging.

To give a *sponge bath* in bed, cover the entire bed with a rubber sheet; on this place a blanket upon which the patient lies with another blanket or sheet over him; provide a pail of tepid water, a slop pail, basin, sponge, soap, and towels. The bathing should be quickly done in sections, the rest of the body being meanwhile protected from exposure.

If the purpose of the sponge bath is to reduce temperature the water should be cold and the whole body may be exposed; in such a case if the patient seems chilly after the bath a glass of hot milk or a little stimulant may be given.

To produce sweating or relaxation, hot-water, hot-air, or steam baths are used.

The *hot-water bath* is given in the tub in the ordinary way except that the head is kept cool by cold cloths or an ice bag. Care must be taken not to continue the bath too long, to the point of fainting; fifteen to twenty minutes is sufficient, after which the patient is taken out and, without drying, placed on hot blankets and covered by three or four more which are wrapped closely about him up to the neck. Hot weak tea or hot water is given freely to encourage sweating. After about an hour the blankets are gradually removed, and the patient sponged off under the last one with alcohol and water, this being followed by a brisk rub with dry towels.

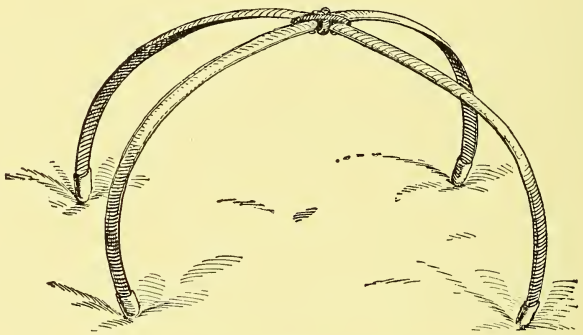


FIG. 87.—Bed Cradle from Barrel Hoops.

Hot-air and steam baths may be given in bed or sitting up. In the first method the bed is covered with a rubber sheet upon which is placed a blanket on which the patient lies stripped. Over his body are placed two or three bed cradles or extemporized bed cradles (Fig. 87). Bed cradles may be extemporized by tying together at right angles two half barrel-hoops. Over the cradles and tucked in about the patient's neck is another rubber sheet and blanket. At the foot of the bed is placed an oil, gas, or alcohol heater with a section of stove pipe and an elbow to conduct the heat under the bedclothes, or, if steam is to be used, upon the heater is set a tea-kettle with a hose attached to the spout for the same purpose (Fig. 88). After the steam or hot air has passed in long enough to get perspiration well started, the upper rubber sheet and the cradles are re-

moved and the blankets tucked in closely around the patient's body, after which the case is managed in the same manner as the hot-water bath.

To give these baths to a patient sitting up, after removing all clothing he is made to take his seat upon a chair with perforated bottom; under the chair is placed an alcohol lamp, or a pail of water in which are dropped hot stones or bricks. The patient is then surrounded from the neck downward by a rubber sheet and blankets arranged in the manner of a tent; this is a convenient method in the field.

To reduce fever we use either the *Brandt system* of cold tub baths, cold sponging, or the cold pack. There are also various extempo-

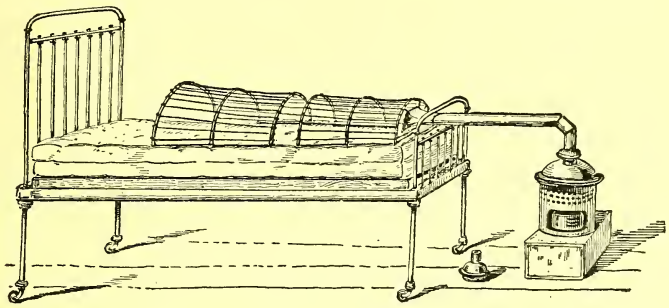


FIG. 88.—Arrangements for Hot-Air or Vapor Baths in Bed.

raneous methods for applying cold for this purpose. The general effect of cold baths, besides reducing the temperature, is to allay nervousness, quiet the circulation, increase excretion, and induce sleep.

The *Brandt system* of bathing is used chiefly in typhoid fever. A portable bath tub on wheels is generally employed. The tub is brought to the bedside half filled with water at a temperature of about 90° F.; the naked patient is lifted from the bed and lowered into the tub feet first, and gradually, so as not to produce too much shock; his head rests upon a circular air cushion and is kept covered with cold compresses; pieces of ice are added to the water so as to reduce the temperature gradually to about 70° F. To ascertain the temperature accurately a bath thermometer is employed. All the time the patient is in the bath the attendants

should keep up a vigorous rubbing of his body. The duration of the bath is ordinarily about twenty minutes, but it may be shortened if there is much shivering, and blueness of the lips and finger tips.

When it is time to take the patient out, the tub is covered with a dry sheet which is wrapped about the patient and he is lifted out, and placed on a dry blanket. If shivering persists a hot-water bag may be applied to the feet and a hot drink may be given internally, but he should not be wrapped in blankets. The temperature is taken in the rectum immediately after leaving the bath and again an hour later. Ordinarily the bath is repeated whenever the temperature goes above 102.5° to 103° F.

Cold sponging has already been described under the *sponge bath.*

When the patient does not stand the cold tub bath well or is too weak to bear the moving, the *cold pack* may be employed. In this method the bed is protected by a long rubber sheet, and two sheets folded one or more times and wrung out of water at 70° F. are used. One is placed under the patient and the other over him and tucked in closely about the body and neck; or a single sheet may be used enveloping the entire body except the head. The packs are changed about every 15 minutes, and three or four of them generally produce the effects of a single tub bath.

In the field when the folding field tub is not available, substitutes may be extemporized. An ordinary camp cot may be taken, the canvas bottom punched full of holes and a piece of rubber sheeting tacked across the frame below the canvas in such a way that it will form a gutter draining toward a pail placed at the foot. On this cot the patient is to be placed and cold water sprinkled or poured over him; or an upright frame may be made, to the sides and ends of which rubber sheeting may be attached in such a way as to form an extemporized tub.

Local Baths.—The *foot bath* may be given in bed. It is employed in sprains to control the hemorrhage about the joint, and in internal diseases to draw away the blood from the congested part. For the latter purpose mustard is usually added to the hot water.

To give a mustard foot bath in bed turn up the covers from the foot end of the bed, place a rubber sheet across it, and on this a pail or foot tub full of water as hot as can be borne. Dissolve a couple

of tablespoonfuls of mustard in a cupful of hot water until a uniform cream is formed and stir it into the pail of hot water. If the dry mustard is added to the pail of water without previous solution, particles of mustard will float around, adhere to the legs, and may produce blisters.

When all is ready the patient, lying on his back, should flex his legs and immerse them in the hot solution until the skin is quite red. The legs are then withdrawn, dried quickly, and wrapped in a blanket.

In the *Sitz bath* the patient sits in a tub or deep basin of hot water, the feet resting on the floor.

CHAPTER V.

ENEMATA, IRRIGATIONS, DOUCHES, CATHETERIZATION.

An *enema* is an injection of fluid into the bowels. When the injection is made into the rectum through a tube passed just within the anus it is known as a *low enema* or simply an enema; when the liquid is carried high up into the colon through a soft-rubber tube introduced fifteen or eighteen inches it is known as a *high enema.*

Enemata are further classified according to the purpose for which given, into laxative, nutrient, and medicinal or therapeutic enemata.

Laxative enemata are of various kinds according to the special indications of the case. The one most commonly used is composed of two or three pints of soap suds made with any good soap and water, either hot or cold. To give such an enema the patient is placed on his left side with the hips raised and resting upon a folded towel placed upon a rubber sheet for the protection of the bed. A bed pan or commode should be at hand, and also a towel to control the anus if necessary.

A rubber bulb or a fountain syringe may be used, the former being generally considered preferable on account of the intermittent pressure which it permits of; either, however, is effective and safe if properly used.

The nozzle, having been lubricated with vaseline, is gently introduced, first forward, then backward and upward; the fluid is made to pass in slowly, the bag in the case of the fountain syringe being raised or lowered as necessary so as not to cause any pain.

After the entire amount has passed in, the patient is directed to hold it for about fifteen or twenty minutes if possible, and may be assisted by pressing a towel firmly against the anus. The longer the fluid is retained the higher up the contractions of the bowel extend and the more complete the resulting evacuation. Should a more active enema be necessary thirty grammes of Epsom salts and fifteen Cc. of turpentine may be added to the soap suds, or sixty Cc.

of castor oil and fifteen Cc. of turpentine may precede the suds by half an hour. Fifteen Cc. of glycerin diluted with an equal amount of water, and given with a small hard-rubber syringe, makes a very effective enema.

The nutrient enema is always given high, as the rectum itself has very little absorbent power and still less digestive capacity; if the bowels are loaded they must first be emptied by a laxative enema. Nutrient enemata must not exceed one hundred and twenty-five Cc. in bulk so as not to cause peristalsis and lead to their own rejection; they must also be concentrated, nonirritant, and predigested or easily digestible. They should not be repeated oftener than once in four to six hours.

Among the food preparations most suitable for this purpose are peptonized milk with or without the addition of an egg, and beef juice or beef extract.

Water to relieve thirst is often given by high enema; for this purpose as much as a pint should be used, and it should be of body temperature so as to cause as little irritation as possible.

A nutrient enema is given through a rectal tube or large catheter, warmed, well oiled, and introduced for about twelve to fifteen inches; in the outer end of the tube a funnel is placed, and the liquid food slowly poured in from a pitcher. When nutrient enemata are given frequently the bowel should be gently washed out with warm water before each one; the tube and funnel are used for the washing, the latter being alternately raised and lowered before all the water has run out so as to secure siphon action.

Medicinal enemata may be given for their general effect as when chloral, opium, or stimulants are used, or for their local effect, on inflammation or hemorrhage, when astringents, emollients, or antiseptics are employed. The last class of medicines is, however, usually employed by irrigation instead of enema. The most common emollient enema is the well-known starch-and-laudanum mixture. To prepare it take a tablespoonful of ordinary laundry starch, add enough cold water to dissolve it, and then sufficient boiling water to form a thin paste; into this stir fifteen to twenty drops of laudanum, and inject while warm with a hard-rubber syringe.

An *irrigation* differs from an enema in that the liquid introduced

is allowed to flow away at once; a tube and funnel are always employed for the purpose, the latter being alternately raised and lowered in the manner already described for washing the bowel (Fig. 89). The irrigation may be given for cleansing purposes only, or disinfectants such as nitrate of silver or quinine may be employed. Before the funnel is lowered, enough fluid should be introduced to gently distend the bowel without causing pain; it is important to see that the funnel is lowered while some fluid is still visible; otherwise there is difficulty in starting the outward flow (Fig. 90).

FIG. 89.—Irrigation of the Bowels. First step.

The tubes and syringes used in giving enemata and irrigations must be kept thoroughly clean; for this purpose, after use a stream of water should be allowed to run over and through them, after which the syringe should be hung up to drip and the tubes and nozzles placed in an antiseptic solution. When the tubes or nozzles have been used in an infectious case they should be boiled before being employed for another patient.

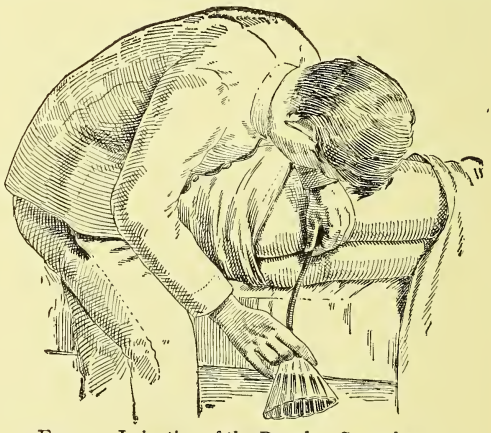


FIG. 90.—Irrigation of the Bowels. Second step.

Urethral injections are used in gonorrhea. In the hospital these

injections are given under the supervision of the nurse, who should instruct the patient how to give them correctly. Having placed a basin on a chair in front of him or standing in front of the urinal, he should first pass his water to wash all the pus out of the urethra. The syringe is then filled and the nozzle inserted in the meatus and held there firmly with thumb and forefinger of the left hand, after which the piston is driven slowly home, the syringe withdrawn, and the urethra firmly compressed for a couple of minutes in order to retain the injection. At least two syringefuls are used each time.

A *douche* is a stream or jet of water propelled with some force. Vaginal, nasal, and aural douches are employed, the latter being the most frequently used in military hospitals. The aural or *ear douche* is used for cleansing purposes or to remove foreign bodies, especially hardened wax. Either a fountain syringe with a straight glass medicine dropper as a nozzle, or a hard-rubber syringe is employed. The former is to be preferred, as the pressure can be more easily regulated.

FIG. 91.—Syringing the Ear.

To remove hardened wax a warm, one-per-cent solution of soda is employed; the coat and collar of the patient having been removed and a towel placed about his neck, he sits in a chair with the head inclined toward the affected side; a basin or bowl is held firmly against the neck just below but not touching the lobe of the ear; the ear is then drawn upward and forward to straighten the canal, and the tip of the nozzle placed against the upper wall, along which the jet of water is directed with the object of passing behind the plug of wax and washing it out in the return flow along the floor of the

ear (Fig. 91). A quart or more of water may be used at a time and repeated until the mass comes away in one piece or in fragments. When the wax is removed the ear should be dried out with a wisp of cotton, a little of which is left in the canal for a day or two until the sensitiveness has subsided.

Catheterization is the art of drawing off the urine from the bladder by the aid of a catheter. The dangers of catheterization are injury to the urethra from undue force, and cystitis or inflammation of the bladder caused by the introduction of germs on an unclean catheter. The precautions to be taken are absolute cleanliness of everything which may come in contact with the catheter and avoidance of all force in introduction. The catheter to be used should usually be of soft rubber only; failing with this a noncommissioned officer may use a silver instrument.

To introduce a soft-rubber catheter it is first washed in running water, then wrapped in gauze or a towel and boiled five minutes; the attendant washes his hands and the penis of the patient with hot water and soap, followed by an antiseptic solution, and surrounds the base of the penis with a clean towel; the catheter is then lubricated with sterilized oil and gently passed in until the escape of urine announces that it has reached the bladder. Should an obstruction be met with, the catheter is withdrawn a little, and again pushed on as before. After the flow of urine has ceased, the instrument is gently withdrawn, taking care to compress the end between the fingers as the last portion is withdrawn from the urethra in order to prevent the urine remaining in the catheter dripping out on the bed. After use the catheter should be thoroughly washed in running water and either hung up to dry or placed in a boric-acid solution.

CHAPTER VI.

EXTERNAL APPLICATIONS.

Among the external applications most commonly used are heat and cold, lotions, counter-irritants, and caustics.

The application of heat may be general or local; the general application has already been described in Chapter IV. The local effects of heat are to relieve pain, allay inflammation, and relax spasm. *Dry heat* is applied in the form of hot-water bags, bottles, or cans, salt bags and hop bags, hot bricks, etc. Bags, bottles or tins of hot water should be inclosed in a flannel cover or otherwise wrapped to prevent danger of burning; when used about unconscious or paralyzed patients especially, the greatest care and watchfulness should be employed to prevent accidents. Hot-water bags should be filled a little more than half full and all the air expelled before the top is screwed on; this makes them lighter and more easily adjusted. They should be examined closely before use to see that they do not leak. Hot bottles are not very safe, as they are apt to crack or burst. The great advantage of bricks is that they retain the heat a long time, but they are very heavy and awkward.

Moist heat is more penetrating and more relaxing than dry heat. It is applied in the form of poultices or fomentations or stupes.

Poultices are made of various materials; anything which will hold heat and moisture is adapted to the purpose; flaxseed meal is the time-honored basis for poultices, and where the skin is unbroken answers very well; but where a wound or abrasion exists such a poultice is a veritable culture-bed for bacteria, and should be replaced by layers of gauze wrung out of a hot antiseptic solution and covered by a layer of cotton batting and oiled silk.

To make a flaxseed poultice stir the meal slowly into boiling water until a thick paste is formed; boil for a few minutes, then beat briskly with a spoon until the admixture of air makes it light;

spread with a spatula or knife to the thickness of one-fourth or one-half inch upon strong muslin, leaving a free border of an inch all the way round. Then cover the face of the poultice with gauze, or oil it with vaseline, and turn over the edges. Apply, and cover with a layer of cotton and oil silk. Such a poultice should be changed once every two or three hours. The fresh poultice should be ready before the old one is removed, and they should never be used a second time. Oatmeal or cornmeal will do very well in the absence of flaxseed.

A *fomentation or stupe* consists of a couple of layers of flannel wrung out of hot water and covered with cotton and oil silk. A few

FIG. 92.—Application of Cold Compresses to the Eye.

drops of laudanum or turpentine are sometimes sprinkled upon the flannel after it is wrung out, or added to the hot water. To prepare a stupe dip the flannel in very hot water and wring it out quickly with a stupe wringer composed of a strip of muslin about eighteen inches square with a stick run through a hem at each end; any stupe which can be wrung out with the hands is not hot enough to be of much value. Stupes must be changed oftener than poultices —about once or twice an hour.

Cold is used locally to relieve pain and reduce inflammation. It may be applied in the form of compresses, the ice bag, or cold coils.

Cold compresses consist of a couple of layers of gauze dipped in

ice water or laid upon ice and afterward applied to the part; they must be renewed constantly before they get warm. A large piece of ice is placed in a basin upon a towel or piece of flannel; upon this the compresses, first soaked in water are placed; as a fresh one is taken the old one is put back upon the ice (Fig. 92).

The *ice bag* is filled about half full of finely crushed ice mixed with a little salt, and care taken to expel the air before it is closed. A layer of moist lint or cotton is placed between the bag and the skin to prevent pain or even frost-bite. Care must be taken to refill the bag before all the ice melts; nothing is more common than to see neglect of this necessary rule. To crush the ice conveniently a stout canvas bag and mallet should always be at hand.

Ice-water coils are made of rubber tubing sewed upon a piece of rubber sheeting of such size and shape as to fit the part to be kept cool; several feet of tubing are left free at each end to act as a siphon; one end is placed in a pail of ice water above the patient's head and the other in a basin on the floor, and the siphon started.

Lotions are medicated solutions used externally. Evaporating lotions are applied on a single layer or two layers of gauze and left exposed to the air. With other lotions several layers are used and covered with a protective.

Counter-irritants are substances used to produce irritation of the skin in order to relieve pain, congestion, or inflammation in a part beneath or even at a distance; they accomplish this by dilating the superficial blood-vessels, and at the same time by reflex action causing a contraction of the deeper ones, thus drawing the blood away from the affected part. Counter-irritants are classified as: *rubefacients*, those causing only redness of the skin; *vesicants*, those producing blisters; and the *cautery*.

Mustard, turpentine, iodine, liniments, and cups are rubefacients. Mustard is used in the form of foot bath, poultice, plaster, and leaves. The first two have already been described. A *mustard plaster* is prepared by mixing one part of mustard with one to five parts of flour according to the strength desired; sufficient tepid water is slowly added to make a smooth paste, which is then evenly spread on paper or muslin and covered with a layer of gauze or tissue paper. The plaster is applied to the part and held in place

by a bandage or adhesive-plaster strips. Hot water or vinegar should never be employed in making a mustard plaster, as either causes the evaporation of the volatile oil of mustard. The plaster should be left on for twenty minutes or a half-hour, the purpose being to produce redness of the skin. In old persons and children the effect should be closely watched to prevent blistering. After removal, any adherent particles of mustard should be wiped away and the surface dusted with starch or oiled with vaseline.

Mustard leaves are ready prepared and require only to be dipped in tepid water before use; the objection to them is that they have usually lost their strength.

Turpentine is used in the form of stupes above described.

Iodine in the form of tincture is painted on the part, one or two coats, with a camel's-hair brush. Where the skin is thin and moist as in the groin or in young children, it may blister. When the burning caused by it is excessive it may be stopped by washing off the iodine with alcohol. The stain may be removed by washing with ammonia or thiosulphate of soda.

The various stimulating *liniments* have some value as counter-irritants, though they are chiefly useful by virtue of the massage by which they are applied.

Dry cups act not only as a counter-irritant but they also leave an actual extravasation of blood beneath the skin; they cannot be applied over bony or irregular surfaces. The number is usually designated, from a dozen to a hundred; half a dozen or more may be in place at a time and they may be left on about five minutes unless they drop off sooner. To apply them we need a dozen cups or small tumblers, an alcohol lamp, a cup of alcohol, a swab, matches, and towels. The swab is prepared by wrapping tightly with cotton the end of a small stick, probe, or wire.

Dip the swab in the alcohol, light it, hold it for a moment inside the cup to exhaust the air, then quickly apply the cup to the part; repeat the motion as rapidly as possible. Be careful to avoid burning the patient by dropping burning alcohol upon him or by undue heating of the edges of the cup. To remove the cup hold it in one hand and with the index finger of the other press the skin just underneath the edge of the cup so as to admit the air, when the cup will

fall off. Before reapplying the same cups they must be wiped dry inside with a towel. Wet cupping is done in the same way as dry cupping only the skin is first scarified by means of a special instrument known as a scarifier.

Vesication or blistering is used when we wish a more decided effect than can be obtained from rubefacients. The principal vesicant is *cantharides* in the form of plaster or collodion. Before the application of a blister the skin should be washed, and shaved if necessary; a piece of plaster of the designated size is then moistened with a little alcohol, applied to the part, and held in place by a bandage; strips of adhesive plaster are objectionable because they may exert painful pressure on the blister as it rises.

The cantharides is left on until a blister forms, usually eight to ten hours; at the end of that time if there is still no blister the plaster should be removed and a poultice applied; this will usually raise the blister promptly. The cantharidal collodion is used by painting on a couple of coats and covering with cotton or oil silk. When a blister is required to be raised quickly it is done by soaking a piece of lint with ammonia or chloroform, applying it to the part and covering with a watch glass or cupping glass to prevent evaporation. A still more prompt effect may be obtained from the actual cautery.

After the blister is raised its management will depend upon the directions of the physician. It may be protected by a layer of cotton and left to be absorbed unbroken, or it may be punctured with a sterile needle and the fluid allowed to escape, or the whole of the raised cuticle may be cut away and the raw surface dressed.

The *actual cautery* is simply a hot metal instrument applied to the skin usually at a cherry-red heat; it is used to relieve pain, cause the absorption of effusion, and to control bleeding. The form used in the army is the *Paquelin cautery*, an instrument in which the platinum tips, first heated in an alcohol flame, are maintained incandescent by pumping into them the vapor of benzine; it is a valuable appliance, but requires care in handling, as it readily gets out of order. The benzine is poured into the reservoir until the lint or sponge which it contains is just saturated; any free liquid might get into the tube and cause an explosion.

Among the caustics in common use are nitrate of silver (lunar caustic), sulphate of copper (blue stone), and nitric acid.

Lunar caustic is kept in a caustic holder; it should be cleaned before use with a piece of moist cotton, and dried after use; it should not be allowed to touch the hands or linen, because it makes a black stain. To give a point to a stick of lunar caustic rub it on wet lint; never attempt to scrape it.

Blue stone is used especially for touching granulated lids; the crystal should be ground to a point on a fine stone.

Nitric acid is used for burning (disinfecting) chancroids. Dry the ulcer and drop on it a few drops of four-per-cent solution of cocaine; after a minute or two dry again, dip the wood end of a match in the nitric acid and touch thoroughly every point of the sore; then pour cold water over the part.

CHAPTER VII.

TEMPERATURE, PULSE, AND RESPIRATION.

The *normal temperature* of the human body is about 98.6° F. (37° C.), but the normal varies within certain limits according to the part of the body in which the temperature is taken, and according to the time of day. The temperature is ordinarily taken in the mouth, in the axilla, or in the rectum; the axillary temperature is about one-fourth of a degree lower than that taken in the mouth, while the rectal temperature is a fourth to a half a degree higher. The highest temperature is usually recorded about four o'clock in the afternoon and the lowest about two o'clock in the morning; the difference may be as much as a degree. A variation of temperature below 97.5° F. or above 99° F. may be regarded as abnormal and an indication of disease.

Abnormal temperature may be subnormal or elevated.

Subnormal temperatures are produced by anything which causes a general depression of the vital powers. Shock, hemorrhage, heat exhaustion, exhausting disease, may all cause subnormal temperature; when the depression of temperature is below 96° F. the condition is one of *collapse.*

Elevation of temperature, or *fever*, means either that more heat is being produced than usual or that it is not being gotten rid of promptly; usually both conditions are present. You will remember that the evaporation of perspiration is one of the most important provisions of nature for regulating temperature, and as a matter of fact in fever the skin will usually be found to be very dry. A fever of 100–103° F. is regarded as *moderate;* 103–105° F. as *high fever*, while temperatures above 105° F. are denominated *hyperpyrexia.*

A depression of temperature of several degrees is usually of much more importance than a corresponding elevation; thus a depression of three and a half degrees would give a temperature of 95° F., or

the temperature of collapse, a condition which means speedy death unless prompt reaction takes place. On the other hand an elevation of three and a half degrees would only give 102° F., a temperature by no means alarming. Hyperpyrexia, however, temperatures 106° to 109° F., is very dangerous, although recovery has often followed prompt remedial measures.

The instrument for measuring the temperature of the body is called a *clinical or self-registering thermometer.* The self-registering feature is secured by a break in the mercurial column corresponding to a constriction in the glass. When the mercury column has risen above the normal line, which is usually indicated by an arrow, it must be shaken down by a sweeping motion of the arm before the thermometer is used again.

The Fahrenheit scale is usually employed in this country, but the thermometers issued to the army are generally graduated in the Centigrade scale also. The normal in the Centigrade is 37°, 40° C. corresponding to 104° F. To convert Fahrenheit degrees into Centigrade subtract 32 and multiply by $\frac{5}{9}$. For example:

$$98.6 \text{ F.} = [(98.6 - 32) \times \tfrac{5}{9}] = 37^\circ \text{ C.}$$

Conversely, to convert Centigrade to Fahrenheit multiply by $\frac{9}{5}$ and add 32; example:

$$37^\circ \text{ C.} = [(37 \times \tfrac{9}{5}) + 32] = 98.6^\circ \text{ F.}$$

When in doubt about a thermometer compare it with one of known accuracy by simultaneous observations on the same patient.

Temperatures are ordinarily taken in the mouth, the bulb being placed under the tongue and the patient directed to close his lips, but not his teeth upon it. If the patient is very weak it may be necessary for the nurse to hold the thermometer in his mouth. With modern thermometers three minutes is ample for mouth temperatures. When the patient is delirious or unconscious, or is a child, it is not safe to take the temperature in the mouth.

In infants and children the temperature is usually taken in the rectum; the bulb well oiled is introduced for about an inch and a half; one or two minutes' time is sufficient.

To take a temperature in the axilla, the arm pit is first wiped dry, the bulb put in place and the arm carried across the chest so as to bring the opposing skin surfaces in close contact with the ther-

mometer; a little longer time is required than in the mouth or rectum —about five minutes usually.

Thermometers when not in use should be kept in an antiseptic solution and resting on a bed of cotton ; bichloride of mercury is objectionable for this purpose as it soon removes the markings on the glass. Before using for another patient the thermometer should be rinsed in clean water and wiped dry.

Fevers are classified as *continued, remittent, or intermittent. A continued fever* is one in which the temperature is continually above normal, and there is a difference of not more than about one degree between morning and evening ; typhoid fever in the second week is usually a continued fever. *In remittent fever* there is a decided drop some time in the twenty-four hours, but the temperature does not reach normal. *In the intermittent fevers* the temperature at certain intervals falls to or below the normal ; malarial fevers are apt to be remittent or intermittent.

In keeping a record of fevers *charts or thermographs* are employed. Temperatures are usually recorded morning and evening, but in typhoid fever and other serious fevers this is generally done every three hours or oftener. In marking charts a dot is placed on the point at which the temperature stands, and these dots are connected by straight lines drawn with the aid of a ruler.

The *normal pulse rate* in the adult is about seventy-two to the minute ; it varies, however, from about sixty-five to seventy-five. In children it is much more rapid. In fevers it rises considerably.

The condition of the pulse is very important, as it usually accurately indicates the condition of the heart and vital powers.

The pulse may be taken by laying the fingers gently on any superficial artery, but usually the radial artery is the most convenient; the temporal is also frequently used for the purpose. The points to be noted are *frequency, regularity, intermittence, fullness,* and *strength.* Frequency of the pulse is increased by exercise, food, excitement, and position ; the pulse is more frequent in the standing position than when lying down or sitting.

An *irritable pulse* is one which is easily excited ; an *intermittent pulse* is one which drops a beat now and then ; a *dicrotic pulse* occurs in extreme weakness, as in typhoid fever, and consists of two waves

to each beat so that the rate may appear twice as fast as the actual pulsations of the heart.

The normal respirations occur at the rate of about eighteen to the minute. In disease there occur marked variations in the frequency and character of the respirations; in narcotic poisonings the respirations are very slow, while in pneumonia and peritonitis they are very rapid.

In taking respirations one should notice their *frequency* and *regularity*, whether *difficult or easy*, *noisy* or *quiet*, *deep or shallow* and whether *symmetrical*, that is to say the same on the two sides of the chest.

Cheyne-Stokes respiration is that peculiar type of breathing which occurs in certain diseases of the heart and kidneys. The respirations gradually increase in frequency and intensity up to a certain point, then slowly decrease until they seem to entirely cease; after a short pause the same course is gone through with again.

In *stertorous breathing* there is a loud snoring noise with inspiration.

Dyspnea means difficult or painful breathing.

In taking respirations it must be remembered that they are in a measure under the control of the will; therefore, they must be taken without the patient's knowledge, and this is done by laying the arm across the chest in taking the pulse, and then without removing the fingers from the wrist taking the respiration while appearing to take the pulse. With a little practice a nurse should become so expert that he can take the pulse and respiration of a sleeping patient without arousing him.

In the normal condition, the pulse, temperature, and respiration rates have a definite relation to each other, and the three factors should always be considered together in disease, as disturbance in the normal ratio may have the most important meaning.

In health the pulse rate is about four times the respiration rate; when the respiration rate is increased to a third or a half of the pulse rate it is usually an indication of disease of the lungs such as pneumonia. In fevers, when the temperature rises the pulse becomes proportionally more rapid; if instead of rising with the temperature the pulse slowly falls, an important sign of yellow fever is present; if on the other hand the pulse rate becomes more rapid than that which is usual with a given temperature, it is an indication of weakness and diminished vital powers.

CHAPTER VIII.

SYMPTOMS AND CLINICAL RECORD.

One of the most important duties of a nurse is to cultivate the habit of observing symptoms accurately and reporting them clearly and intelligently.

The physician can only be with the patient a short time, and he must depend upon his nurse to inform him of everything that takes place in his absence; the nurse may thus obtain information of the greatest value in diagnosis and treatment. *Symptoms* may be divided into two classes: *subjective symptoms*, those which are only apparent to the patient himself, such as pain; and *objective symptoms*, those which are apparent to others, such as redness and swelling. Sometimes the symptoms are *feigned* when the patient is said to be *malingering;* it is always safer to assume, however, that the symptoms are real until the contrary is proved.

Not only must the nurse cultivate the habit of observing symptoms, but he must learn how to attach to them their relative importance. Emergencies continually arise when he must determine what is to be done; are the symptoms of sufficient gravity to cause him to call in the noncommissioned officer or send for the surgeon? Shall he loosen a bandage or give a stimulant on his own responsibility?

The observations should commence with the giving of the first bath or putting the patient to bed. Are there any scars, wounds, or eruptions upon the body? Is the patient emaciated or dropsical? Does he appear weak and ill? The *attitude and expression* are sometimes characteristic. In inflammation of one lung the patient usually lies on that side so as to give free play to the uninjured lung. In appendicitis or peritonitis he is apt to lie on the back with one or both legs drawn up.

Slipping down toward the foot of the bed means weakness and is therefore unfavorable.

With colic the patient often lies on the abdomen with a pillow

pressed against it; but when the pain is inflammatory he cannot stand the pressure.

When the patient cannot breathe while lying down there is usually trouble with the heart or lungs.

Great restlessness is often a bad sign.

An anxious look is unfavorable, while a tranquil expression is of the opposite import.

The pallor and pinched expression of sepsis are characteristic, but cannot well be described.

Rattling in the chest, with shortness of breath and a bluish tint of the lips, is a sign of edema of the lungs and often indicates approaching death.

The *mental condition* gives important indications: whether the patient is conscious or unconscious; rational or irrational; depressed or excited or muttering. The speech may be thick or clear or hoarse.

The *eyes* are to be observed; whether the pupils are dilated or contracted or unequal; whether there is any squinting; any yellowness or congestion of the conjunctiva.

The *hearing* may be painfully acute or it may be defective; there may be a discharge from the ear.

Bad taste may be complained of or offensive odors.

The *skin*, especially of the face, may give important indications; it may be pale, flushed, livid, or jaundiced; hot, cold, dry, or moist. A moist skin with high temperature is usually a bad omen. A peculiar red spot high up on either cheek is often indicative of pneumonia or consumption; pallor about the lips is a sign of nausea. Then we have the waxy hue of Bright's disease and the rashes of the eruptive fevers. Bluish spots about the size of a finger nail distributed about the trunk are a sure sign of body vermin.

The *tongue* offers many valuable indications; note whether it is dry or moist, clean or coated, large or small, bitten, or indented on the edges by the teeth. In malarial fevers and digestive disorders the tongue is apt to be heavily coated and indented by the teeth; in typhoid fever it is at first moist and coated, but soon becomes dry and cracked; when such a tongue becomes moist and begins to clean up from the edges it is a very favorable sign. In scarlet

fever the bright-red papillæ showing through the white fur produce the characteristic *strawberry tongue.* In yellow fever the tongue is small, red, and pointed.

Note at the same time the *condition of the mouth and teeth;* white slightly raised patches on the inside of the lips and cheeks, at the corners of the mouth, and in the throat are frequently mucous patches, a sign of syphilis. The dark accumulations which occur on the teeth in fevers are known as *sordes;* their presence indicates that the mouth has not been well cared for.

The state of the *appetite* is of importance; it is usually lost in acute diseases, but occasionally is excessive. Observe with care how much food the patient actually takes. Nausea is often present with or without vomiting. The frequency of the *vomiting*, whether it is painful, and the character of the matter vomited should be noted. Usually the vomitus consists of food at first, but this may be followed by bile, mucus, or blood. When blood has been retained in the stomach some time it becomes brownish in color, like coffee grounds; vomitus of this character is seen in yellow fever. Vomiting of fecal matter is a sign of great importance and indicates obstruction of the bowels. Great thirst is usually an indication of fever or hemorrhage.

The number and character of the *stools* should be noted. Blood, unless fresh, gives the stools a black, tarry appearance; in jaundice they are generally clay-colored; bismuth and iron color them black; they may be liquid or solid, and may contain mucus, pus, blood, or worms.

Tenesmus, a constant desire to evacuate the bowels, is present in dysentery.

Belching of gas, rumblings in the bowels, and distention of the abdomen are signs to be noted.

The *urinary functions* should be carefully noted, and in special cases the amount passed carefully measured. In both *suppression and retention* no urine is passed, but in the former, which is much the more serious condition, no urine is secreted; it may be distinguished from retention, which is caused by some obstacle to the escape of urine from the bladder, by the fact that in suppression the bladder may be shown to be empty by tapping with the finger

just above the pubis; a hollow sound is produced if there is no urine in the bladder.

Incontinence of urine, that is, the inability to hold it, may be associated with retention, so that the mere fact of constant dribbling does not preclude the possibility of the bladder being distended.

The quantity of urine should be measured and the frequency with which it is passed noted. Useful information may also be obtained fom observation of its color and odor. Blood gives it a smoky or red hue, pus a milky appearance, and mucus a stringy condition. Bile imparts a greenish tinge, as does carbolic acid, while santonin gives a bright-yellow color. Many drugs and vegetables impart a characteristic odor to urine.

Cough is an indication of some irritation of the air passages; the matters coughed up are called *sputa*. When there is no sputum the cough is said to be dry. The cough may be tight, loose, or painful. The character of the sputum varies; in *bronchitis* it is white or yellow and mucous; in *pneumonia* it is reddish and very sticky; in *tuberculosis* it is at first mucous and frothy, later it is purulent with cheesy nodules, and sometimes stained with blood.

In gangrene of the lung the sputum is unbearably offensive.

Hiccough when it is persistent in the later stages of acute diseases is often a very grave sign.

When a patient complains of feeling cold take his temperature; a chill is nearly always accompanied by fever. *Chills* frequently accompany the onset of acute disease; when they occur *in the course of inflammation* they often indicate suppuration; *in malaria*, while severe, they are not usually dangerous.

Hemorrhage from any part of the body is always significant; nose-bleed is often one of the early signs of typhoid fever.

Pain is one of the most valuable signs which we possess, as it often points toward the location of the disease. The kind of pain should be described and whether it is constant or intermittent, severe or slight. Exaggerated sensitiveness to touch is called *hyperesthesia* and diminished sensibility *anesthesia;* the latter is often associated with loss of muscular power or *paralysis;* paralysis of the lower half of the body is called *paraplegia;* of a lateral half *hemiplegia.*

Disorders of motion include picking at the bedclothes, always

a bad sign, twitching of the tendons (*subsultus*), slight spasms, and local or general convulsions. In convulsions always note the parts affected and whether the attack is attended with loss of consciousness.

Under *disorders of consciousness* are included *delusions* and *hallucinations, delirium, stupor, and coma.*

The character of the delusions should be noted, whether occasional or habitual, quiet or noisy; in stupor note whether the patient can be aroused; if he cannot, it is coma, a very serious condition. *Coma vigil* is a combination of sleeplessness with partial unconsciousness and is also a symptom of bad omen.

The amount and character of *sleep* should be recorded; patients' statements on this point must be accepted with caution.

That nothing concerning the patient's condition may be forgotten, *clinical records* are kept. In the army such a record at present includes four separate sheets. The first of these sheets is the chart on which may be shown graphically the temperature, pulse, and respiration. The second is the history sheet with outlines of the human body on the back of the sheet so that the position of wounds, location of diseased areas, etc., may be shown. The progress sheet is merely a blank sheet for notes during the progress of the case; while Sheet 4 is the treatment sheet.

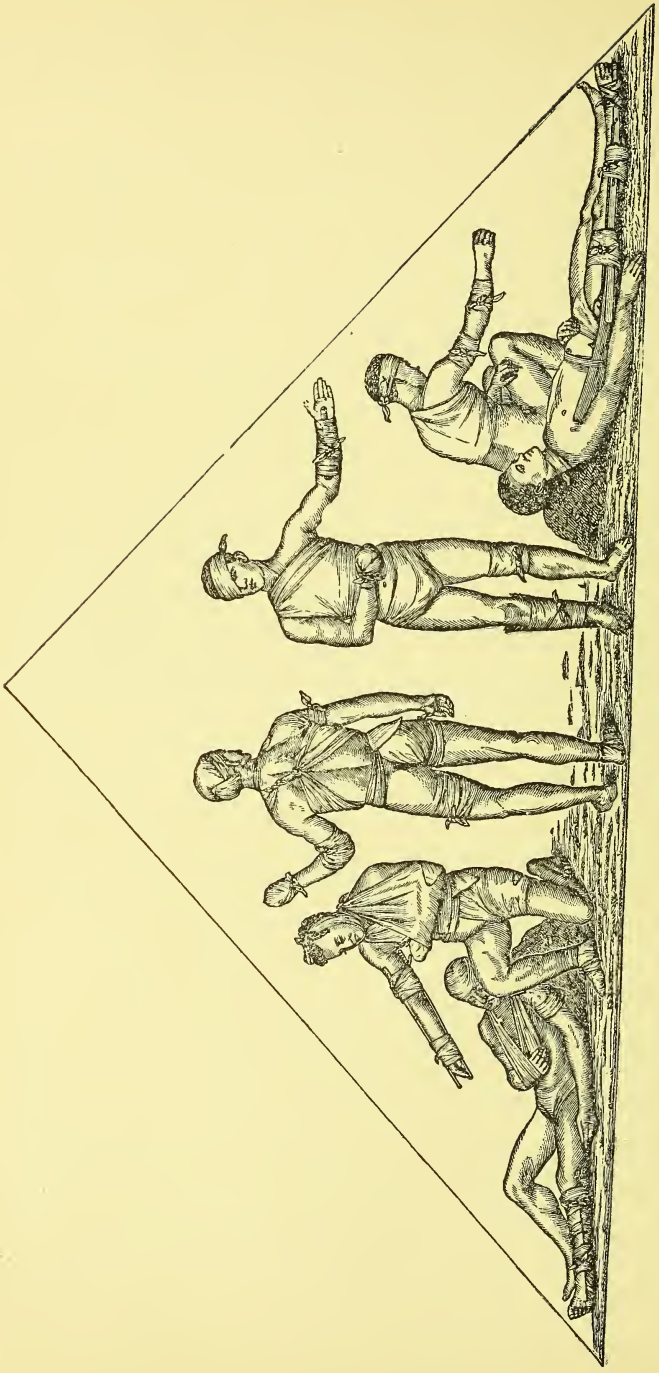


FIG. 93. Triangular Bandage.

CHAPTER IX.

BANDAGING.

BANDAGING must be taught practically, one-half of the class practicing on the other half. Three general types of bandages are used in the army: triangular, roller, and tailed bandages.

The triangular bandage possesses special advantages for the military service in that it is quickly and easily applied and removed. Each first-aid packet contains a triangular bandage with pictures printed on it showing the method of application to various parts of the body.

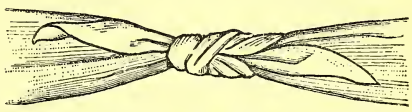


FIG. 94.—Reef Knot.

The triangles are made by taking a piece of cheese cloth 38 to 41 inches square and cutting it diagonally into halves (Fig. 93).

The bandage is used in three general forms: as an *open triangle*, folded twice from apex to base as a *broad cravat*, and folded three times as a *narrow cravat*.

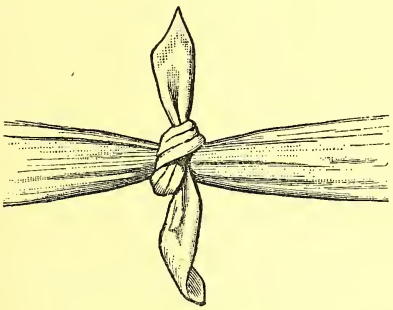


FIG. 95.—"Granny" Knot.

To fasten the ends together the reef knot (Fig. 94) is used, which is much more secure than the "granny" (Fig. 95).

Applications of the triangular bandage. Head: Place the base of the triangle just above the eyes and let the apex hang down over the occiput; cross the ends below the occiput, bring them to the front and tie (Fig. 96); bring the apex up over the crossed ends and pin (Fig. 97).

Eye: Use the narrow cravat, tying the ends behind (Fig. 98).

Chin or side of head or face: Use the narrow cravat, tying under the chin or on top of the head. Or apply middle of handkerchief over front of chin and tie back of neck (Fig. 99).

Neck: Use broad or narrow cravat. Place center of cravat over dressing, cross on opposite side and tie in front (Fig. 100).

Chest: Apply the center of the open triangle over the dressing; tie the ends on the opposite side, leaving one end long; bring the apex over the shoulder and fasten to the long end. If the end is

FIG. 96.—Triangle of the Head; front.

FIG. 97.—Triangle of the Head; rear.

FIG. 98.—Narrow Cravat of One Eye.

not long enough lengthen it by using a narrow cravat (Figs. 101 and 102).

Pelvis: Apply the center of the base of the opened triangle just below the navel; carry the ends around to the back and tie one end long; bring the apex over the perineum and between the legs to the rear and fasten to the long end (Fig. 103).

Buttocks: Apply the base of the opened triangle to the lower part

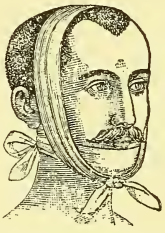


FIG. 99.—Narrow Cravat of Chin and Face.

FIG. 100.—Narrow Cravat of Neck.

of the back; bring the ends around the sides, crossing them in front, and pin; split the apex and fasten in front (Fig. 104).

Slings: The large arm sling is applied in three different ways. In the *first method* place one end of the triangle over the sound shoulder; the base should be in front and the apex in rear; bring

up the front end over the shoulder of the injured side and tie on the side of the neck; bring the apex forward and pin (Fig. 105). When the collar bone is injured the *second form* is used; it is applied in the same manner as the first except that the front end is carried under the arm pit instead of over the shoulder of the injured side (Fig. 106). *In the third form* the rear end is carried over the shoulder of the injured side; otherwise it is the same as the second (Fig. 107). For the small sling the narrow cravat is used, carried over the shoulders and fastened behind (Fig. 108).

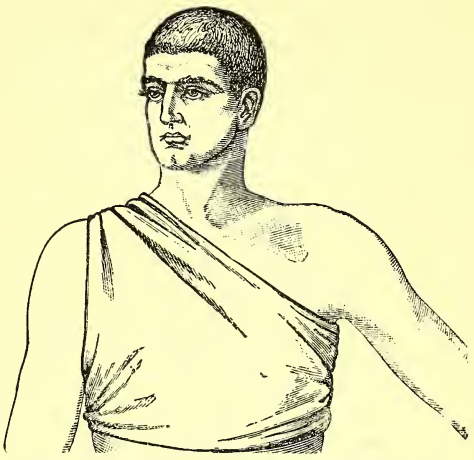


FIG. 101.—Triangle of the Chest; front view.

Shoulder: Place the apex of the triangle on the shoulder; carry the ends around the arm, crossing them and tying at the outside; fold the apex over a sling or neck cravat and pin (Fig. 108).

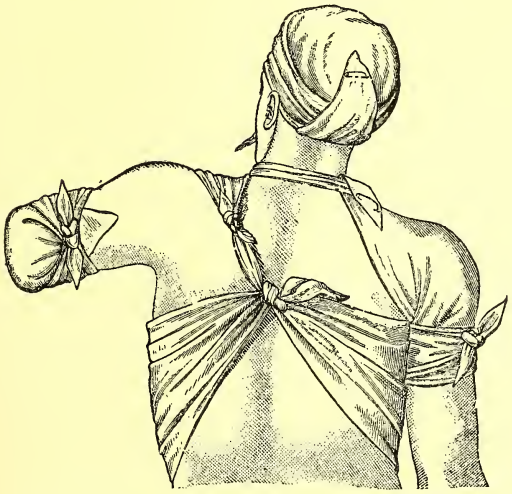


FIG. 102.—Triangle of the Chest; rear view.

Elbow: Use a broad cravat as shown in Fig. 108, or a large arm sling (Fig. 105).

Hand: Place the hand, palm up, on the triangle, ends of the fingers toward the apex; bring the apex up over the palm; pass the ends around the wrist over the apex, which is then folded toward the fingers and covered by another turn of the ends; tie the ends behind (Fig. 108).

Hip: Apply a narrow cravat around the waist. Carry the ends of the triangle, base down, around the thigh and fasten. Pass the apex under the cravat, fold over and tie (Fig. 109).

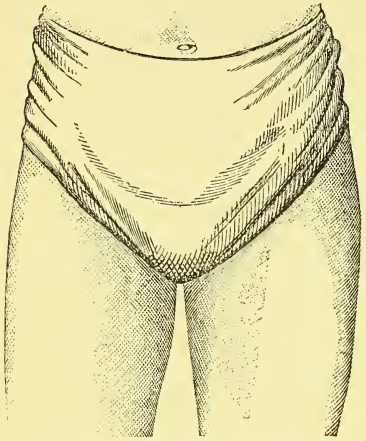


FIG. 103.—Triangle of the Pelvis.

Knee: Use the broad cravat; cross behind and knot in front below the knee-cap; or *vice versa* (Fig. 110).

Foot: Place the foot on the triangle, toes toward the apex; bring the apex up over the toes toward the ankle; cross the ends over the front of the ankle and over the apex of the bandage, then carry them back around the ankle, crossing them behind in such a manner as to catch the base of the triangle; next draw up the apex so as to tighten the bandage and fold it over toward the toes. Bring the ends forward and, crossing over the ankle and apex, carry them beneath the foot and tie on the inside (Fig. 111).

To fasten splints: Take a narrow cravat, double it upon itself; place the loop on the outside of the limb; carry the free ends around the limb and one of them through the loop; then tighten as much as necessary and tie (Fig. 66).

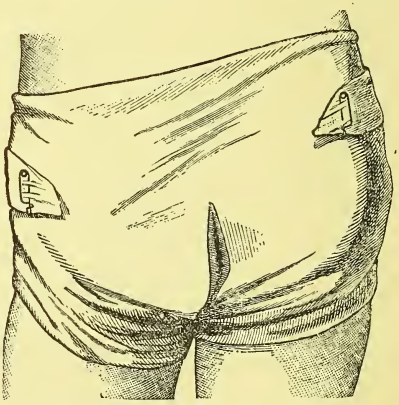


FIG. 104.—Triangle of the Buttocks.

Roller bandages consist of strips of cloth of variable length and width. To apply them properly requires care, time, and constant practice; hence they have considerable less value for first-aid purposes than has the triangular bandage.

The chief materials from which rollers are made are muslin, cheese cloth, gauze, flannel, and rubber; each has its own special qualities.

The most general useful sizes are as follows:

For the head, 2 inches wide and 5 yards long.

For the upper limb, $2\frac{1}{2}$ inches wide and 5 to 10 yards long.

For the trunk, 4 inches wide and 5 to 10 yards long.

For the lower limb, 3 inches wide and 5 to 10 yards long.

For the fingers, $\frac{3}{4}$ of an inch wide and 1 to 2 yards long.

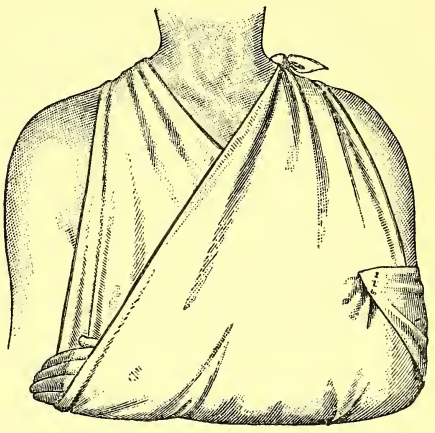


FIG. 105.—Large Sling No. 1.

Roller bandages should be torn, not cut. To prepare a number at one time take a piece of muslin of the required length, tear off the selvage, with the scissors split one end into the required widths, tear down for a couple of feet, separate the alternate strips, hand one set to one person and the other to another. Each now pulls firmly until the piece of cloth is torn through the entire length.

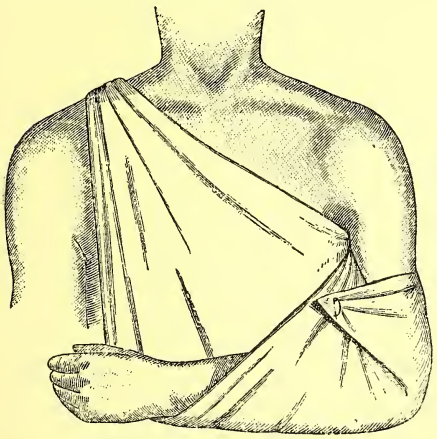


FIG. 106.—Large Sling No. 2.

Besides a machine for rolling bandages there are two methods of rolling by hand. Take a couple of feet of the end of the bandage and fold repeatedly upon itself until a firm mass is formed; then sitting in a chair cover the right leg, foot, and adjacent floor with a clean towel or sheet, place the small roll on the thigh, the loose part of the bandage extending down over the knee to the floor, and roll toward the knee; when the roll reaches the knee draw it up to the groin and then repeat the motions (Fig. 112).

After a firm roll is made in this manner it may be finished by hand

if desired; in this method the bandage is grasped as shown in Fig. 113 and rolled by alternate movements of pronation and supination of each hand.

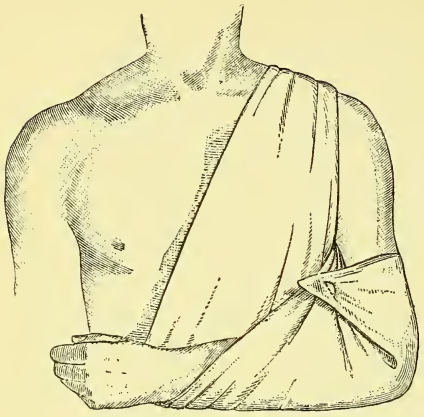


FIG. 107.—Large Sling No. 3.

Rules for bandaging: 1. Place the limb in the position it is to occupy. If the arm is bandaged in the straight position and then bent, the bandage will cut in at the bend of the elbow and stop the circulation.

2. Begin at the extremity of the limb, the ends of the fingers for the upper extremity, the tips of the toes for the lower; if this rule is not followed, the parts below the bandage will swell.

3. Place a layer of cotton between opposed skin surfaces, such as the fingers and toes.

4. Hold the roller in the right hand when bandaging the left limb, and *vice versa.*

5. Place the outer surface of the bandage on the inner side of the extremity and secure by making a couple of circular turns.

6. Bandage evenly and neither too tight nor too loose. Leave the tip of the extremities exposed to observe the state of the circulation in the part. If the blood when pressed out of the nails does not promptly return, the bandage is too tight and may cause gangrene.

FIG. 108.—Small Sling, Triangles of the Hand, Elbow, and Shoulder.

Roller bandages may be applied by *circular turns*, *simple spirals*, *reversed spirals*, *figure-of-8*, *spica*, and *knotted turns*.

Circular turns and *rapid spirals* are used chiefly to hold dressings in place; the method of using them is clearly shown in Fig. 114. The *slow spiral* (Fig. 115) is used where a limb is nearly cylindrical in shape; each turn is parallel with the turn below, which it envelops for about one-third of its width. For a limb increasing in size like the leg or forearm this bandage would not lie evenly, and it becomes necessary to resort to reverses.

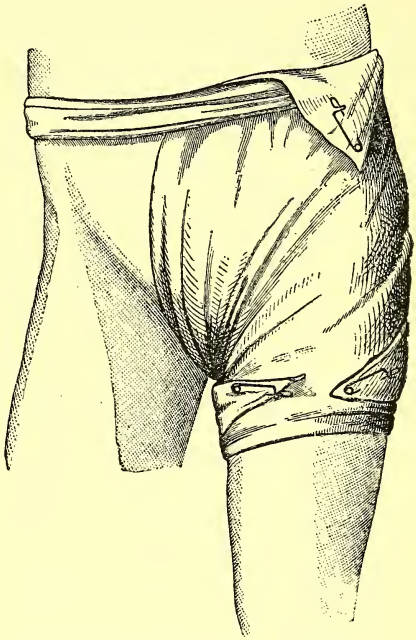


FIG. 109.—Triangle of the Hip.

The method of making *the reverse* is shown in Fig. 116; the bandage should be held loosely to give slack; the reverses should be in line and on the outside of the limb.

For covering the joints *the figure-of-8* bandage becomes necessary; as the name implies, figures-of-8 are made in alternate loops above and below the joint; each loop covering in one-third of that immediately below (Fig. 117).

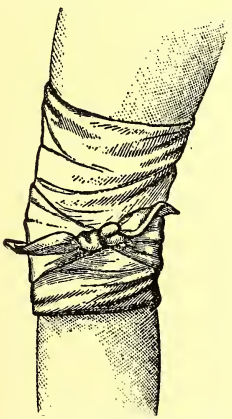


FIG. 110.—Broad Cravat of the Knee.

The *spica* is really a figure-of-8 with one loop much larger than the other, and is used especially at the hip and shoulder (Fig. 117).

The *knotted turn* is used where it is desired to make pressure, especially on the temple. Unroll about a foot of the bandage and hold it against the temple; then carry the roller around the forehead and occiput; on reaching the starting point, twist the

roller around to a right angle and carry it down under the chin and over the vertex; then fasten the ends (Fig. 55).

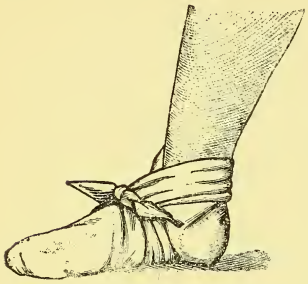


FIG. 111.—Triangle of the Foot.

Special applications of the roller bandage:

Recurrent of the head: Make a couple of circular turns about the forehead and occiput; reverse in front and carry the roller back to the occiput over the middle of the vertex; reverse again and bring forward, covering in one-third of the preceding turn, continuing to carry the roller backward and forward until the head is well covered, when all the reverses are held in place by circular turns and pins or sewing. Until the circular turns are made all the reverses must be held in place by an assistant (Fig. 118).

Recurrent of a stump: Made in the same manner as the recurrent of the head (Fig. 119).

Figure-of-8 of the eye: Place the end of the roller on the temple and make a couple of circular turns around the forehead and occiput, from right to left for the right eye, and *vice versa* for the left. Reaching the occiput, pass from under the right ear up over the right eye, across the opposite temple and down again to the occiput; make as many of these turns as necessary, and finally fix by circular turns (Fig. 120).

FIG. 112.—Rolling Bandage on the Knee.

Figure-of-8 of the jaw (Barton's bandage): Place the end of the roller below the occiput; pass obliquely up over the right parietal bone, across the vertex, down over the left temple in front of the ear, under the chin, up

over the right temple in front of the ear, across the vertex, and back to the starting point. Then pass forward along the right side of the jaw in front of the chin and back along the left side of the jaw to the starting point. These turns may be repeated as often as necessary (Fig. 121).

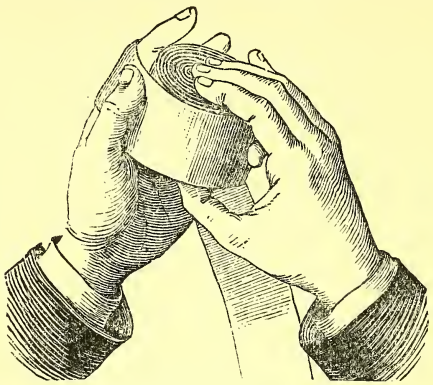


FIG. 113.—Rolling Bandage by Hand.

Spiral of the chest: Unroll about five feet of the bandage; let the free end drop down over the front of the chest to about the knees of the patient, carry the roller over the opposite shoulder to the base of the chest, then around the chest over the loose end, ascending by a slow spiral. When the chest is bandaged as high as necessary fasten

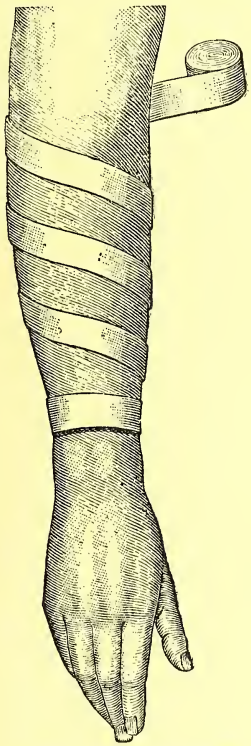


FIG. 114.—Rapid Spiral.

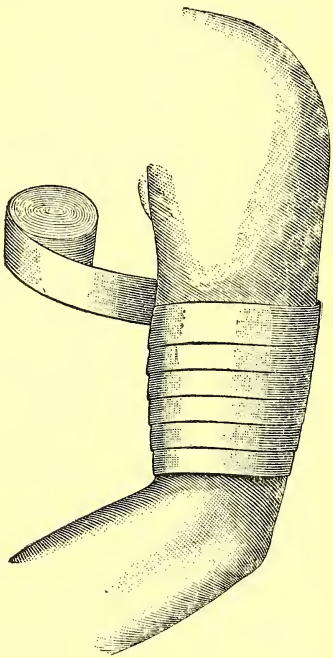


FIG. 115.—Slow Spiral.

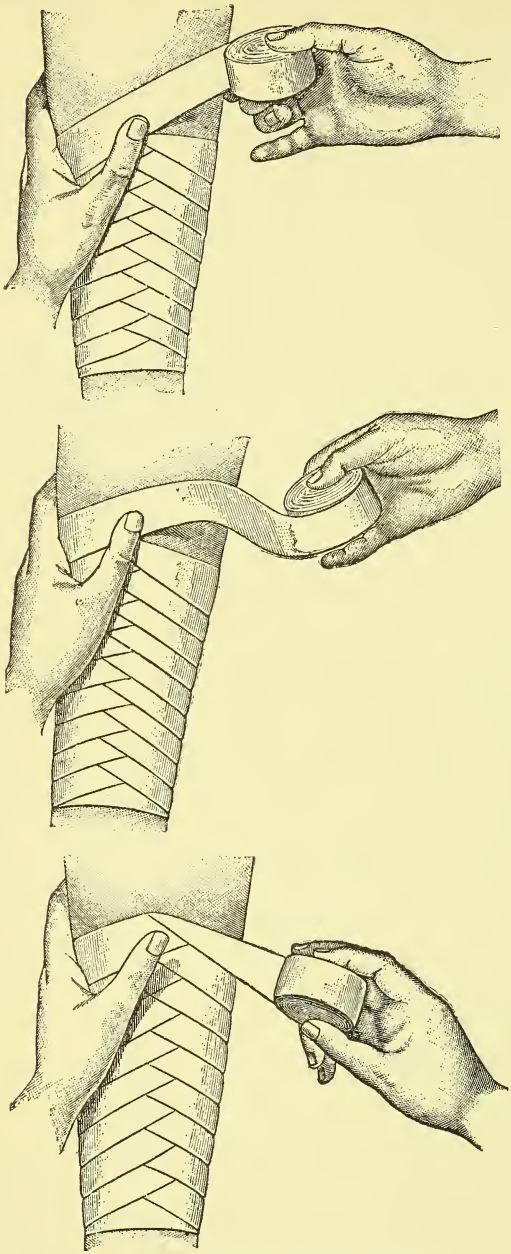


Fig. 116.—Steps in Making Spiral Reverses.

the last turn by a pin. Then bring up the loose end of the bandage over the other shoulder and down the back to the base of the chest and fasten to the lower and upper turns; this prevents the bandage from slipping down.

Velpeau (*for fractured clavicle*): Place the palm of the hand of the injured side on the sound shoulder, with padding between the arm and chest wall. Place the initial end of a roller in the axilla of the sound side, carry the bandage up across the back, over the shoulder of the injured side, down the *outside* of the arm, under the *outside* of the elbow, and across the front of the chest to the starting point; repeat this turn, but when the sound axilla is reached the second time make a circular turn around the chest and over the arm; then repeat the first and third turns alternately, each layer of bandage covering in about two-

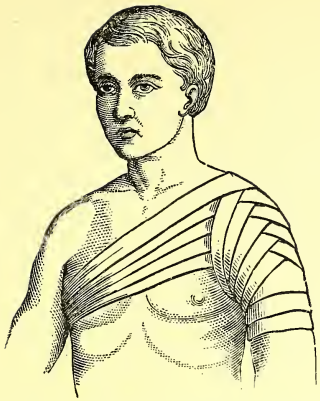


FIG. 117.—Figure-of-8, or Spica of the Shoulder.

FIG. 118.—Recurrent of the Head.

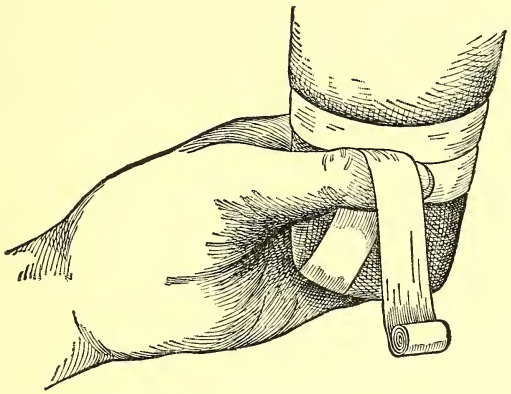


FIG. 119.—Recurrent of a Stump.

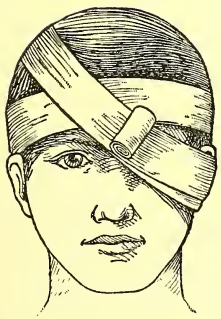


FIG. 120.—Figure-of-8 of One Eye.

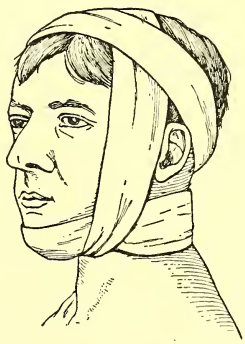


FIG. 121.—Figure-of-8 of the Jaw (Barton's Bandage).

thirds of its predecessor. Stitch or pin the points of intersection of the turns (Fig. 122).

Scudder's modification of Velpeau: Commence in the axilla of the sound side as in the ordinary Velpeau, but carry the first and second turns horizontally around the front of the chest, the first under and the second over the elbow. The third turn ascends over

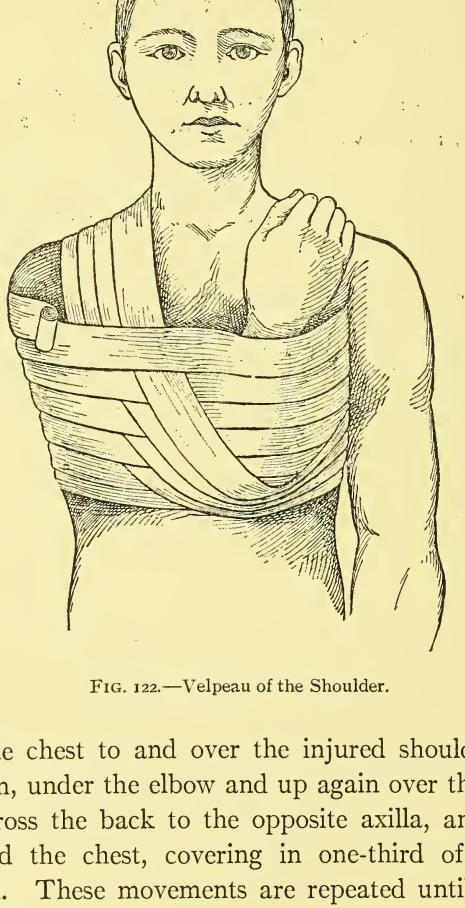


FIG. 122.—Velpeau of the Shoulder.

the front of the chest to and over the injured shoulder, down the back of the arm, under the elbow and up again over the same shoulder, thence across the back to the opposite axilla, and again horizontally around the chest, covering in one-third of the previous horizontal turn. These movements are repeated until the shoulder is reached (Fig. 123).

Finger bandage: Make two turns about the wrist, pass diagonally

over the back of the hand to the root of the finger, descend by spiral turns to the tip, make a circular turn, then ascend by slow spirals

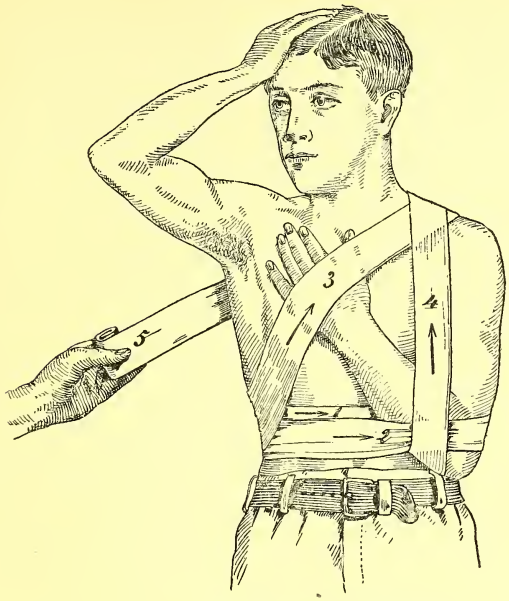


FIG. 123.—Modified Velpeau.

or reverses; on again reaching the base of the finger cross the back of the hand to the wrist and finish with a circular turn about the latter (Fig. 124)

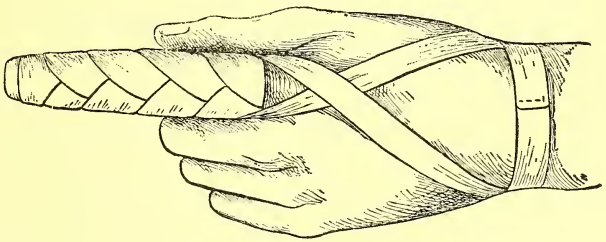


FIG. 124.—Finger Bandage.

Foot bandage: Make a couple of circular turns around the ankle; descend obliquely over the dorsum, under the sole, and back to the dorsum of the foot, up which the bandage must pass by several spiral turns, covering the instep; when this is reached, pass the

bandage under the point of the heel, thence to the dorsum, then down beneath the sole, then along the outer surface of the heel, next around the heel above its point to reach the instep, whence, passing to the sole, a turn is made around and above the point of

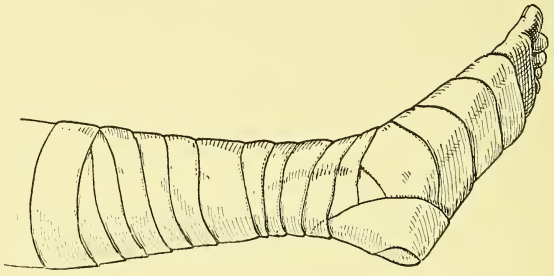


FIG. 125.—Foot Bandage.

the heel on the inner side, again to pass the instep, when the roller must be carried by spiral and reversed turns up to the knee (Fig. 125).

Tailed bandages: Bandages of various widths split at each end are called 4-tailed and are very useful about the head. The methods of their application are shown in Figs. 126 and 127.

The T-bandage is especially useful in confining dressings to the

FIG. 126.—Four-Tail Bandage for the Vertex.

FIG. 127.—Four-Tail Bandage for the Occiput.

perineum and pubic region; it is made by sewing a strip of bandage to the middle of another strip, the two forming a right angle.

Gauze bandages, sterilized, are usually employed in aseptic dressings.

Flannel bandages are used when it is desired to produce a moderate degree of elastic pressure, or where warmth is necessary. They lie more smoothly than non-elastic materials.

Rubber bandages are of special value when considerable pressure

and support are necessary. They must be used with care and frequently adjusted and washed with soap and water. They are also employed like a tourniquet to control bleeding and may be very quickly and effectually applied as follows: Make several circular turns about the limb above the bleeding artery, then lift up one of the turns and pass the unrolled part of the bandage under the turn and over the artery (Fig. 46).

Crinoline is used for fixed bandages, especially the *plaster-of-paris bandage;* gauze may also be used for this purpose, but a stiffer material is better. The bandages are prepared by placing on a paper a lot of freshly opened plaster and rubbing it into the meshes of the material with the hand while the bandage is being loosely rolled. When the bandages are not required for immediate use they should be wrapped separately in waxed paper and kept in a warm, dry place, preferably in tins. To apply, first cover the part with a flannel bandage or other protective, then place a plaster bandage, end down, in water sufficient to cover it; when bubbles cease to escape, squeeze the bandage gently and apply like any other bandage. Each time a bandage is taken out of the water place another in so as to have one always ready. Usually several thicknesses of bandage are required, especially over the joints; when necessary the dressing may also be stiffened by strips of tin incorporated in the bandage.

The floor should be protected by sheets or newspapers and the clothing of the patient and operator by the use of sheets.

To remove plaster from the hands after completion of the operation, sugar or carbonate of soda should be added to the water, or, better, rubbed on the hands.

To remove plaster dressings when they are no longer necessary is an operation requiring patience and care. If the dressing is thin plaster shears can be used, but if it is thick a strong knife or saw is necessary. The track of the knife or saw may be softened somewhat by dropping into it a little strong acetic acid or hydrochloric acid. The operation of removal is much facilitated if a strip of tin has been placed under the plaster, in the line of incision, while it was being applied; the strip may be cut down upon without fear of wounding the patient.

CHAPTER X.

INFECTION AND DISINFECTION.

Bacteria are the minute vegetable organisms, so small that they cannot be seen except with a microscope, many of which grow on or in the human body and cause disease. The terms *microbes* and *germs* are ordinarily used in the same sense as bacteria.

An *infectious disease* is one which is capable of infecting other persons, causing the same disease in them; small-pox and malarial fever are both infectious. A *contagious disease* is that form of infectious disease which is spread to others by *contact* with the person infected. Small-pox is a contagious disease. Malarial fever is not a *contagious* disease because no amount of simple contact with an infected person can produce the disease, the infection of which must be carried by a mosquito. *Disinfection* is the process of destroying the infectious germ or agent to prevent the spread of the disease.

Sepsis or putrefaction is a particular form of infection; *antiseptics* are those substances which prevent putrefaction either by destroying the germs or preventing their growth.

Sterilization is the process of killing disease germs; it has the same meaning as disinfection, but is usually limited to disinfection by heat.

The *disinfectants* commonly used by the medical department are dry heat, boiling water, steam, corrosive sublimate, phenol, cresol, quicklime, chlorinated lime, formaldehyde solution, and sulphur.

Dry heat is seldom used, as the high temperature necessary injures fabrics, and the heat has little penetrating power.

Flowing steam is used especially in the operating room for disinfecting dressings.

Boiling is a simple and effective method of disinfection for metallic

or earthen utensils, and for cotton or linen fabrics. Woolen and leather substances are injured by steam or boiling water. The addition of one-per-cent of carbonate of soda increases the disinfecting power of the boiling water and prevents instruments from rusting. Actual boiling for five minutes is ordinarily sufficient.

Corrosive sublimate in acid solution (0.2-per-cent hydrochloric acid) is one of the most effective chemical disinfectants; for this purpose solutions of corrosive sublimate 1 : 1000 are usually employed. Its disadvantages are that it is decomposed by albuminous matters,

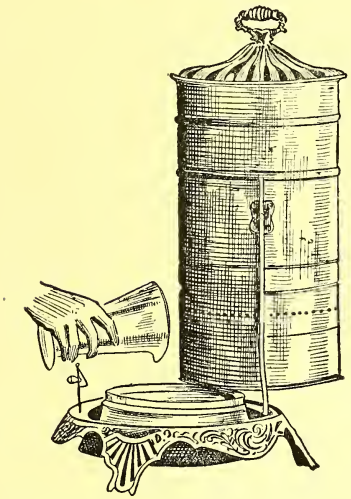


FIG. 128.—Kuhn Formaldehyde Generator. Filling.

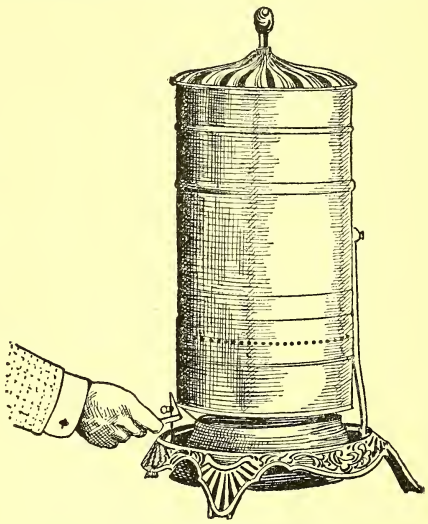


FIG. 129.—Kuhn Formaldehyde Generator. Lighting.

and by hard waters, and that it corrodes and rapidly destroys metals. Solutions should be freshly prepared, and in soft water, such as rain water or distilled water. When only hard water is available some other disinfectant should be used.

Phenol is a valuable disinfectant in five-per-cent solution. It, like corrosive sublimate, coagulates albumin and thereby to some extent protects the inclosed germs from its disinfectant action.

Cresol in one-per-cent solution has about the same value as phenol at five-per-cent. Albuminous fluids do not interfere with its action.

Quicklime is a somewhat uncertain disinfectant because of the fact that it is rapidly decomposed on exposure to the air and moisture.

Milk of lime, a ten-per-cent solution of quicklime, is ordinarily employed. To be effective the lime must have been freshly burned and unslaked.

Chlorinated lime is used ordinarily in four-per-cent solution in water. Its activity depends on the amount of chlorine it contains, and, as it is rapidly changed on exposure to the air, it should have been freshly opened and prepared in order to be effective.

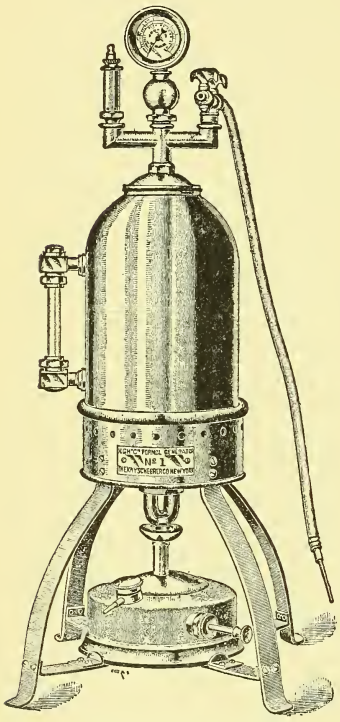


Fig. 130.—Autoclave Formaldehyde Generator.

Formalin is a solution of *formaldehyde gas* in water, its disinfecting powers depending on the dissolved gas. It is sometimes used in the form of a spray, but ordinarily the gas itself is employed. This gas is prepared in several ways, three types of apparatus being used for the purpose. In one form of apparatus, of which the Kuhn generator (Figs. 128 and 129) is a type, the gas is liberated from wood alcohol; in the autoclave type (Fig. 130) formalin is used; while in a third apparatus solid paraform pastils are vaporized.

With the Kuhn generator not less than a quart of wood alcohol must be used per 1,000 cubic feet of air space, and with the autoclave not less than 10 ounces of formalin per 1,000 cubic feet. The gas must be introduced as rapidly as possible into a tightly closed chamber, which is left unopened for 12 to 24 hours. In the field such a chamber may be extemporized by tightly calking a large box or using a large canvas bag painted on the outside. Formaldehyde gas is an efficient surface disinfectant and does not injure fabrics or destroy colors.

Sulphur is valuable as a disinfectant only by virtue of the sulphur dioxide liberated when it is burned. Like formaldehyde it is largely

a surface disinfectant, but, unlike it, it injures metals and fabrics and destroys colors. Unlike formaldehyde also it destroys the higher forms of life such as insects and vermin, for which purpose it is very effective.

Four pounds of rolled sulphur are required per 1,000 cubic feet of air-space. The room must be tightly closed and all cracks and openings sealed; the sulphur broken in small pieces is placed in a pan and a small quantity of alcohol poured over it; the pan is then placed on bricks in a tub of water and the alcohol ignited. The water serves two purposes: it increases the efficiency of the sulphur dioxide by virtue of the vapor liberated by the heat of the burning sulphur, and it also lessens the danger of fire (Fig. 131).

The *prevention of the spread of infectious diseases* requires absolute cleanliness, free ventilation, disinfection, and isolation. The infect-

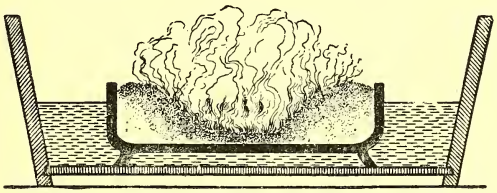


FIG. 131.—Burning Sulphur.

ing agent is usually contained in one or more of the excretions of the patient, depending upon the particular disease. As the bacteria cannot get into the air from moist excretions these should not be allowed to dry, but should be disinfected and removed at once.

The dust of the ward becomes infected from excretory particles which have accidentally become dried; hence every care should be taken to avoid raising dust.

Flies and other insects may carry the infection on their feet or other parts of their bodies, therefore the discharges should be carefully protected from insects.

Sputum should be received in covered cups containing a one-per-cent solution of cresol, or five-per-cent formalin. Sometimes paper cups are used, the cups and contents being burned together.

Feces are best disinfected with milk of lime, ten-per-cent, or solution of chlorinated lime, four-per-cent.

Urine should be sterilized by adding sufficient carbolic acid to make a five-per-cent solution, or enough corrosive sublimate to make a solution of 1:1000. In all cases the disinfectant solution employed should be equal in bulk to the material to be disinfected and should be thoroughly mixed with the excretion and allowed to stand at least an hour.

The vessels which have been used as containers should be boiled.

Infected clothing and bedding should be disinfected by steam, or formaldehyde gas in a tight chamber, but steam should not be used for woolens. If the infection is gross, as when the bed linen of a typhoid or cholera patient is soiled with feces, the articles should be soaked in a cold phenol or cresol solution containing two per cent of soft soap for several hours.

Boiling is applicable to linen or cotton fabrics.

Mattresses of which the hair is infected require steam under pressure, the ticking having been opened up.

Metal beds should be washed with five-per-cent solution of carbolic acid.

Disinfection of rooms: The contents of the room should not be removed. Articles of bedding and clothing should be hung on lines or the backs of chairs so as to expose as much surface as possible. The room must then be made practically airtight by sealing windows, doors, ventilating openings, and all other cracks and openings with strips of paper and ordinary flour paste. Formaldehyde gas or sulphuric-acid gas is then introduced in proper proportion (pages 186–7) and the room kept sealed for twenty-four hours. This preliminary disinfection kills a large proportion of the disease germs and renders them less liable to be scattered about during the subsequent steps of the process.

The treatment of the walls and ceiling will depend upon their nature; if hard-finished or painted they should be scrubbed with hot water and soap, and then with an acid solution of corrosive sublimate, 1:1000, and repainted; a preliminary scrubbing of the walls with slices of stale bread is very effective for mechanical cleansing; bread so used should be burned. If the walls are calcimined or whitewashed they should be washed with soap and hot water, followed by ten-per-cent solution of chlorinated lime or five per cent of phenol,

and recalcimined; sublimate should not be used because it is decomposed by the lime. If the walls are papered the paper should be removed, after which the treatment is the same as for calcimined walls. Especial attention should be given to the lower parts of the walls, the first six feet from the floor.

All woodwork is to be scrubbed with soap and hot water, followed by corrosive sublimate; painted or varnished wood work should be repainted or varnished. Floors with hard finish should have the old finish removed with turpentine and a new coat applied.

After the completion of the disinfection the room with all doors and windows open should be freely exposed to the action of sun and air for several days.

Disinfection of tentage: Everything should be removed from the tent for disinfection by the methods appropriate to each. The interior of the canvas, the poles, and the wooden floors, if any, should then be sprayed or washed with a two-per-cent solution of cresol or five-per-cent phenol. The tent is then removed to a new site, pitched inside out and exposed to the sun and air for twenty-four hours. The ground under the old tent floor should be policed and scraped, and sprinkled with a ten-per-cent solution of chlorinated lime or freshly slaked quicklime.

CHAPTER XI.

INSTRUMENTS AND APPLIANCES.

THE following is a brief description of those instruments and appliances which require explanation:

Explanation of Figs. 132 to 142.

Atomizer, hand: An instrument for producing a fine spray (Fig. 132).

Bistoury: A long, narrow knife, which is either straight or curved, sharp or blunt pointed (Fig. 133).

Bougie: An instrument used for dilating strictures (Fig. 134).

Bougie à boule: An instrument used to locate strictures (Fig. 135).

Bougie, filiform: A hairlike bougie for passing through tight strictures (Fig. 136).

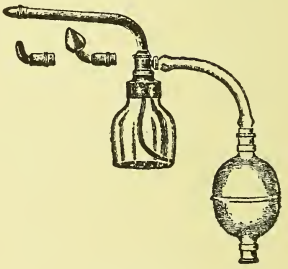


FIG. 132.

Catheter: A tube for passing through the urethra into the bladder to draw off the urine. Catheters are made of silver, webbing, or rubber, of various sizes, and sometimes contain a wire called a *stylet* (Fig. 137).

Catlin: A double-edged amputating knife (Fig. 138).

Caustic-holder: A little case for holding caustic, usually made of gutta-percha or silver (Fig. 139).

Curette: An instrument used for scraping unhealthy wounds (Fig. 140).

Cutting pliers: A strong scissors for cutting plaster bandages (Fig. 141).

Director: An instrument with a groove in which to guide the point of a knife (Fig. 142).

FIG. 134.

FIG. 133.

FIG. 137.

FIG. 135.

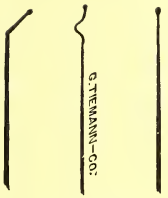


FIG. 136.

FIG. 139.

FIG. 138.

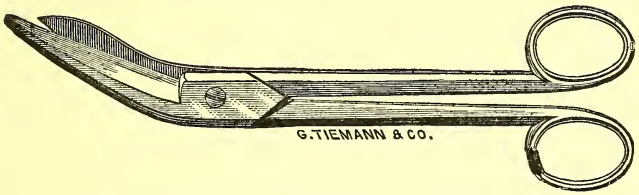


FIG. 141.

FIG. 140.

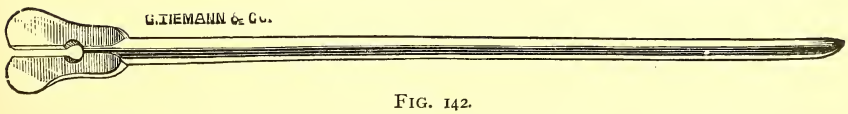


FIG. 142.

Explanation of Figs. 143 *to* 147.

Drill, bone: An instrument for boring holes in bone (Fig. 143).

Forceps, bullet: An instrument with separate blades used for extracting bullets (Fig. 144).

Forceps, dental: An instrument used for extracting teeth (Fig. 145).

Forceps, dissecting: Plain forceps used for dissecting purposes (Fig. 146).

Forceps, dressing: Forceps with scissor handles, used for removing old dressings from wounds and sores (Fig. 147).

FIG. 143.

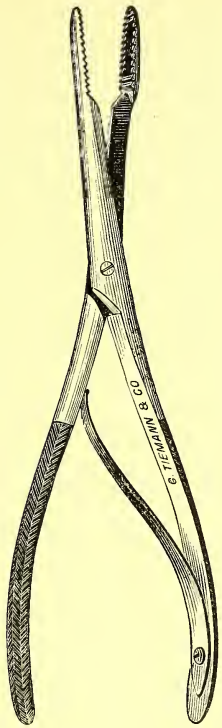


FIG. 144.

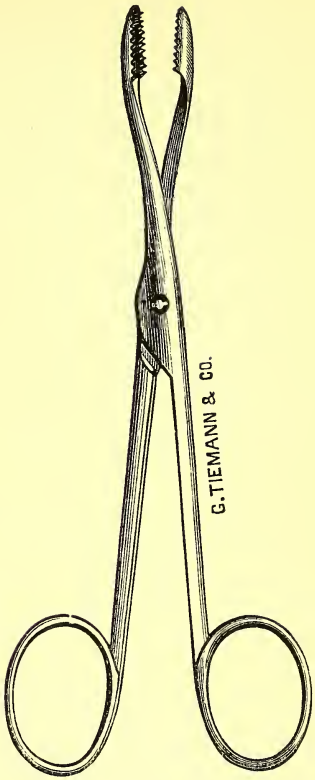
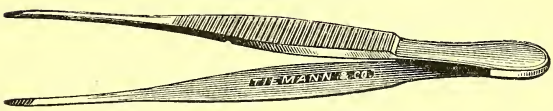


FIG. 147.



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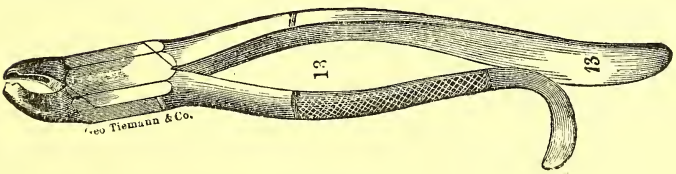


FIG. 145.

Explanation of Figs. 148 *to* 155.

Forceps, gouge: A strong forceps, cutting at the points, so as to gouge bone (Fig. 148).

Forceps, hemostatic: Forceps for taking up arteries (Fig. 149).

Forceps, Liston's bone: A strong bone forceps for cutting bone in operations (Fig. 150).

Forceps, mouse-tooth: Forceps with fine, sharp teeth, used in dissecting (Fig. 151).

Forceps, needle-holder: A forceps to hold the needle in sewing wounds (Fig. 152).

Forceps, sequestrum: A strong forceps for pulling away dead bone (Fig. 153).

Gag, mouth: An appliance for holding the mouth open (Fig. 154).

Gouge: A grooved shaped chisel for gouging bone (Fig. 155).

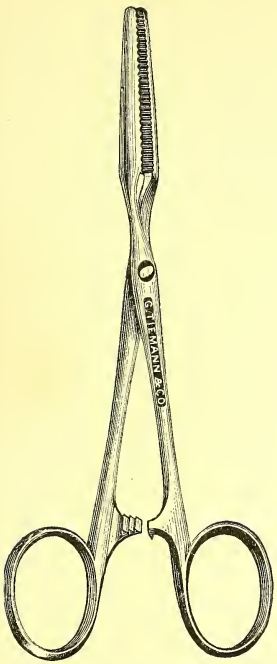
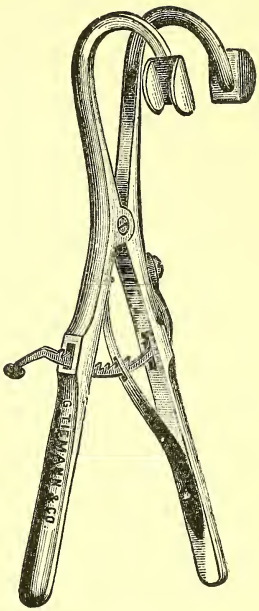


FIG. 149.

FIG. 150.



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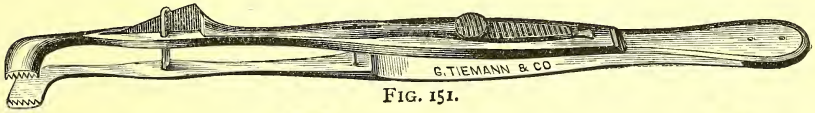

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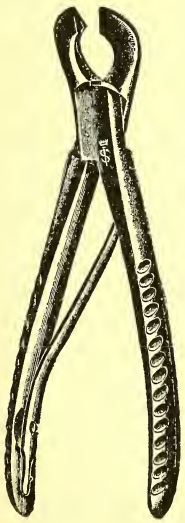
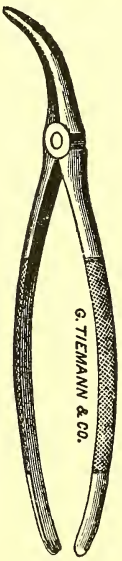


FIG. 148.

FIG. 155.



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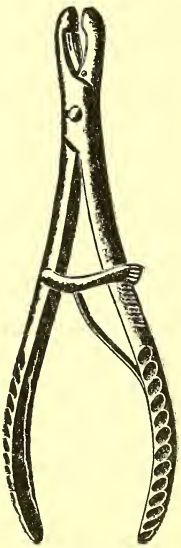


FIG. 152.

Explanation of Figs. 156 *to* 160.

Head mirror: A round mirror worn on the forehead in the examination of the throat and ear (Fig. 156).

Inflator, Politzer: A rubber air bag with nozzle used in inflating the ear (Fig. 157).

Inhaler, chloroform: A framework covered with gauze or flannel for administering chloroform (Fig. 158).

Inhaler, ether, Allis: An appliance for the administration of ether (Fig. 159).

Knife, amputating: Used for amputating a limb; a large one is used for amputating the thigh, a medium size for the leg, a small one for the arm (Fig. 160).

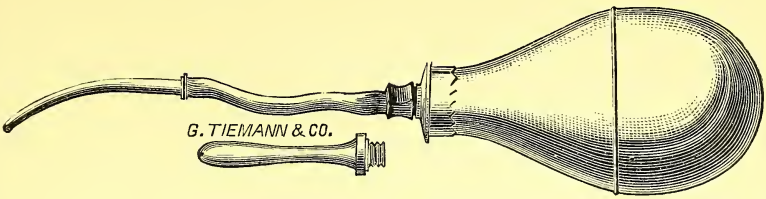
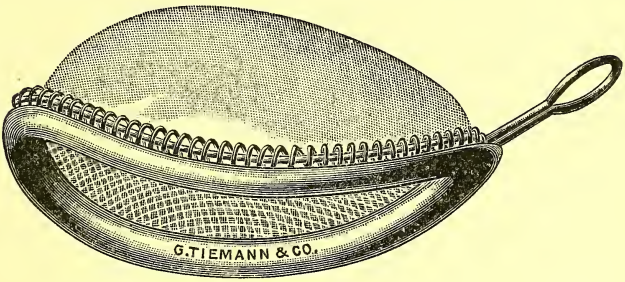


FIG. 157.



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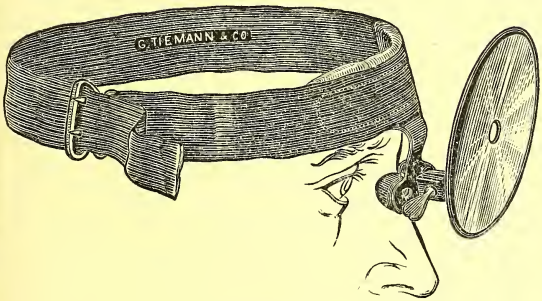

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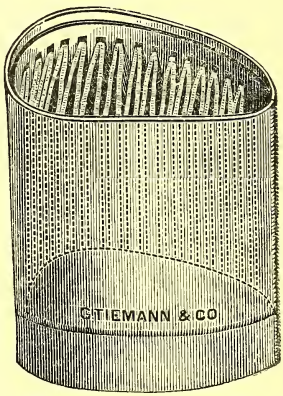


FIG. 159.

FIG. 160.

Explanation of Figs. 161 *to* 170.

Knife, tenotomy: A small narrow knife for cutting tendons under the skin (Fig. 161).

Lachrymal probes: Small silver probes for introducing into the tube or duct leading from the eye to the nose (Fig. 162).

Lachrymal styles: Button-headed silver instruments for passing into the duct leading from the eye to the nose (Fig. 163).

Lancet: An instrument used for bleeding, vaccinating, and opening boils or small abscesses (Fig. 164) .

Lavage tube, rectum: A large, soft-rubber tube for washing out the bowel (Fig. 165).

Lavage tube, stomach: A large, soft-rubber tube for washing out the stomach (Fig. 166).

Needle, aneurism: A curved, blunt instrument, with an eye near the end, used for passing a ligature under an artery (Fig. 167).

Needles, surgical: Curved and straight needles of various sizes (Fig. 168).

Needle, Hagedorn: A flat needle which makes a linear puncture (Fig. 168).

Periosteotome: An instrument for separating the periosteum from bone (Fig. 169).

Probe: A silver-wire instrument for probing wounds (Fig. 170).

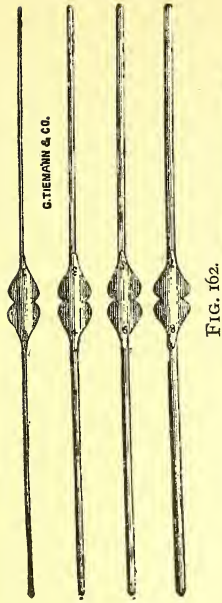


FIG. 162.

FIG. 161.

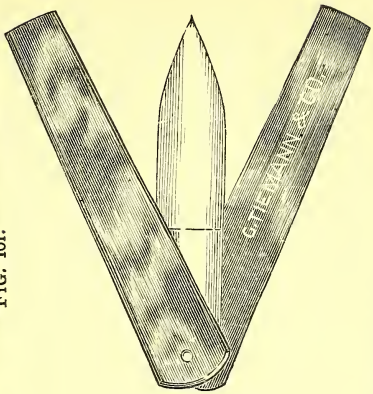
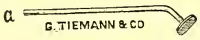


FIG. 164.



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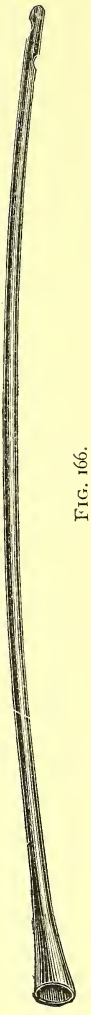


FIG. 166.

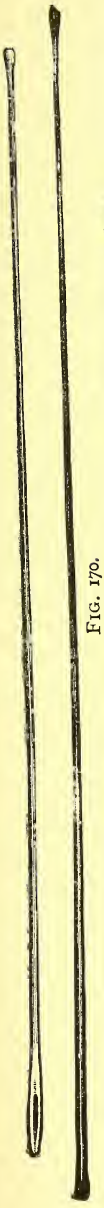


FIG. 170.

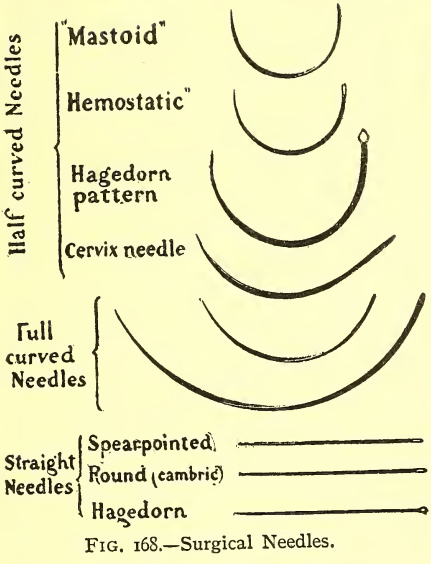


FIG. 168.—Surgical Needles.

FIG. 165.

FIG. 167.

FIG. 169.

Explanation of Figs. 171 *to* 176.

Retractor: An instrument for holding apart the edges of wounds in operating (Fig. 171).

Saw, amputating: A saw used for sawing the bone in amputations of the limb (Fig. 172).

Saw, Hey's: A small saw for cutting a piece out of a bone; used in operations on the skull (Fig. 173).

Saw, metacarpal: A small, straight saw for dividing the metacarpal bones (Fig. 174).

Scalpel: A short knife with a convex edge, made in different sizes and used for cutting and dissecting (Fig. 175).

Scissors, angular: Scissors having the blades at an angle with the handle (Fig. 176).

FIG. 171.

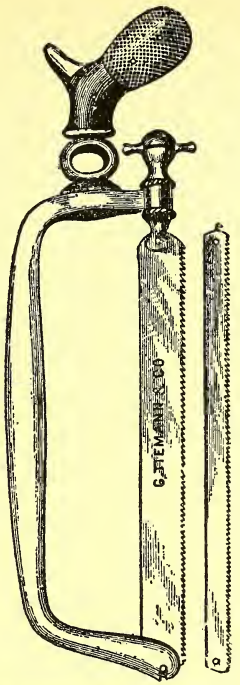
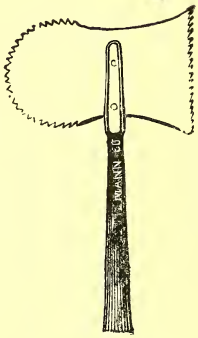


FIG. 172.—Saw, Amputating.

FIG. 174.



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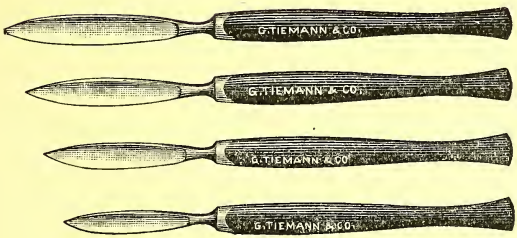

FIG. 175.

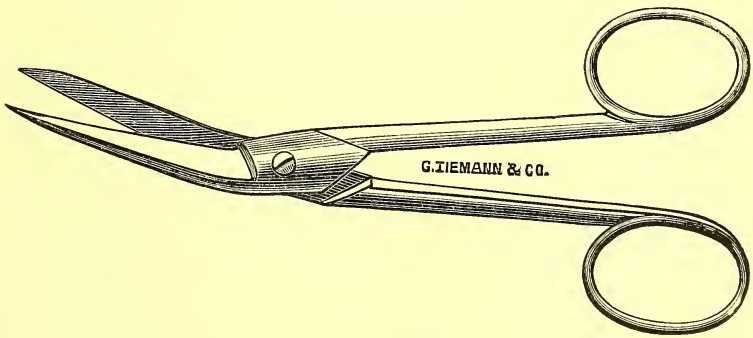

FIG. 176.

Explanation of Figs. 177 *to* 182.

Scissors, curved: Scissors having the blades curved (Fig. 177).

Sound: A metal instrument for dilating strictures or examining the bladder (Fig. 178).

Speculum, ear: A more or less conical cylinder for examining the ear. Usually in nests of different sizes (Fig. 179).

Speculum, eye: An instrument for holding apart the eyelids (Fig. 180).

Speculum, nose: A valved instrument for holding open the nostril (Fig. 181).

Sponge-holder: An instrument for holding sponges when operating in cavities (Fig. 182).

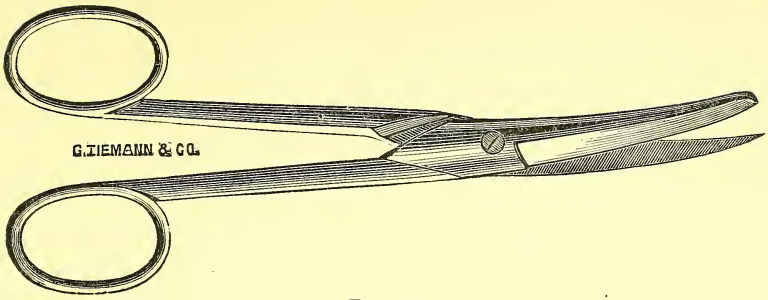

FIG. 177.

FIG. 178.

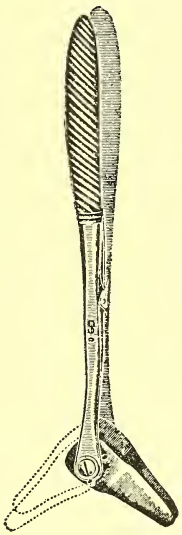

FIG. 181.

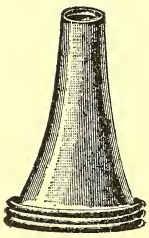

FIG. 179.

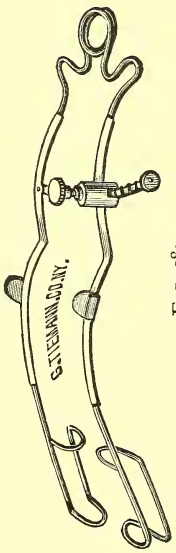

FIG. 180.

FIG. 182.

Explanation of Figs. 183 *to* 186.

Stethoscope: An instrument with which to listen to the sounds of the chest (Fig. 183).

Syringe, hypodermic: A graduated glass or metal syringe fitted with a hollow needle, employed in the injection of morphine and other medicines beneath the skin (Fig. 184).

Tenaculum: A sharp hook for taking up arteries or anything which may require hooking up during an operation (Fig. 185).

Thermo-cautery, Paquelin: A cautery in which the fuel is incandescent benzine (Fig. 186).

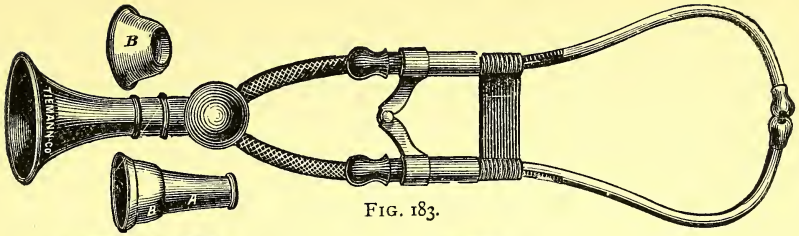

FIG. 183.

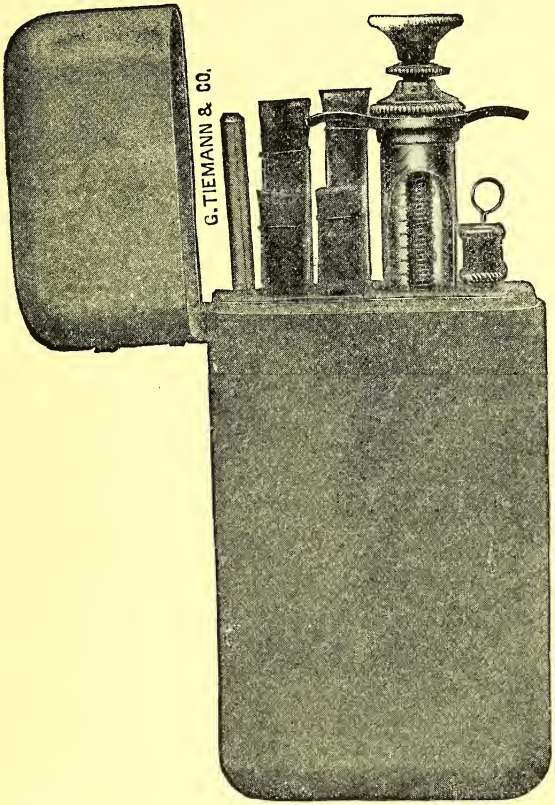

FIG. 184.

FIG. 185.

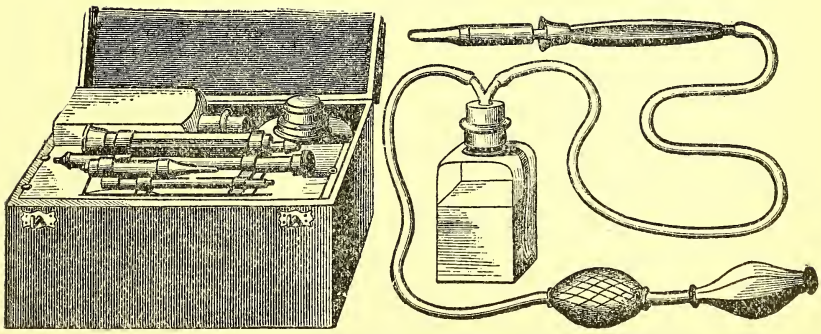

FIG. 186.

Explanation of Figs. 187 *to* 193.

Tongue depressor: An appliance for holding down the tongue in throat work (Fig. 187).

Tonsillotome: An instrument for removing the tonsils (Fig. 188).

Tourniquet: An instrument for making pressure on an artery to stop the flow of blood through it (Fig. 189).

Tracheotomy tubes: Two curved silver tubes, one fitting inside the other, used for putting into the wind-pipe when it has been opened by an operation called tracheotomy (Fig. 190).

Trephine: A circular saw used in operations on the skull (Fig. 191).

Trocar and cannula: A sharp pointed instrument and sheath for tapping collections of fluid (Fig. 192).

Truss: An appliance used in the treatment of rupture (Fig. 193).

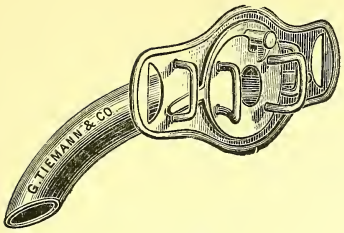

FIG. 190.

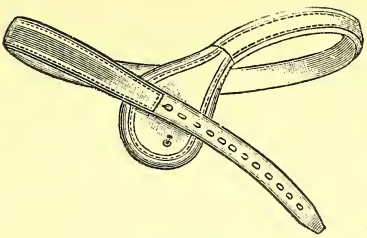

FIG. 193.

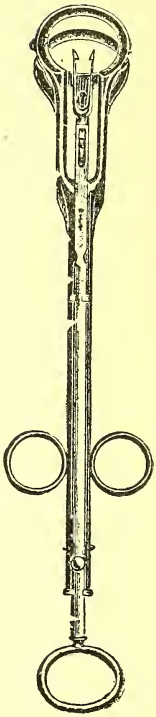

FIG. 188.

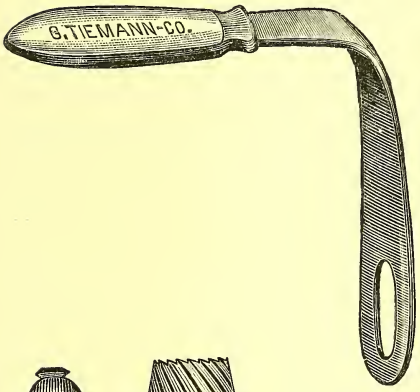

FIG. 187.

FIG. 192.

FIG. 191.

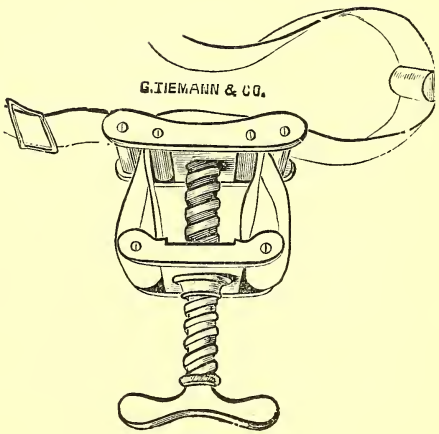

FIG. 189.

Explanation of Figs. 194 *and* 195.

Beside the above there are certain special apparatus and cases:

Apparatus, compressed air: This consists of a metal air container, a force pump for compressing the air, tubing for connections, a cut-off for controlling the escape of the compressed air, and a set of spray tubes (Fig. 194).

Apparatus, electric: This is issued in several forms. The essential parts are the cells, which generate the current, the electrodes by which it is applied, the conducting cords, and the *coil* and *interrupter* in the case of a faradic battery (Fig. 195).

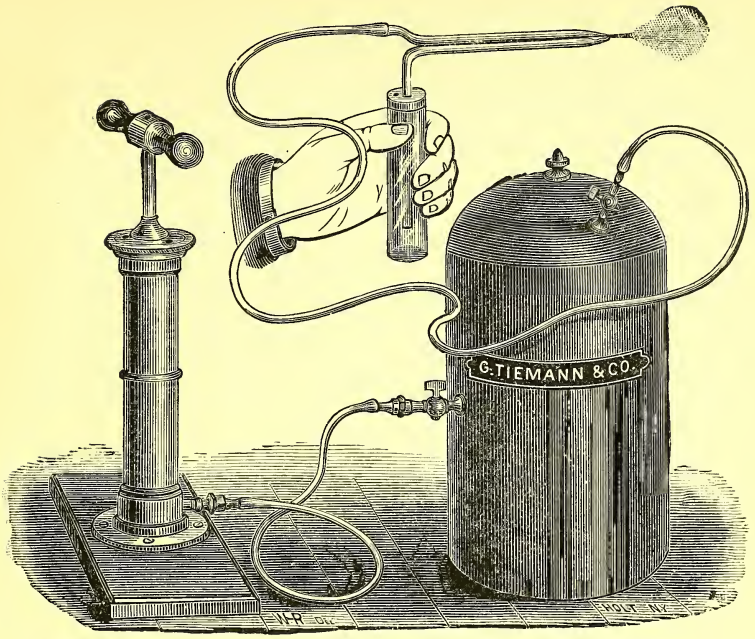

FIG. 194.

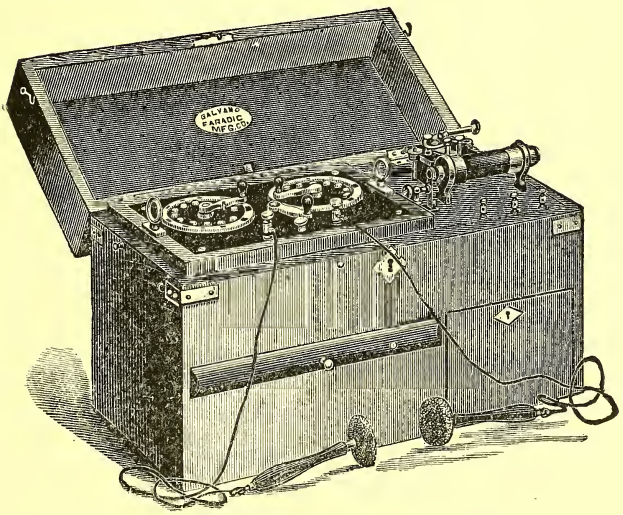

FIG. 195.

Explanation of Figs. 196 *to* 198.

Apparatus, restraint: This is contained in a locked wooden box, and consists of a bed strap which is firmly fastened to the bed before the patient is placed upon it; a breast strap which fastens the patient to the bed strap and bed, anklets, wristlets, a muff, and a set of keys, by which the buckles of the apparatus can be locked (Fig. 196).

Apparatus, steam sterilizing: This is furnished in several styles of which the Arnold sterilizer is the type. In using this form the articles to be sterilized should be placed in the chamber before the heat is applied and should be removed while steam is still flowing (Fig. 197).

Case, aspirating: This consists of a rubber stopper containing a double current metal tube with stopcocks, a pump, aspirating needles, trocar and cannula, and tubing attachments. To use it a bottle in which the rubber stopper fits tightly must be supplied; the double current metal tube is connected on one side with the pump and on the other with an aspirating needle. The air is pumped out of the bottle, creating a partial vacuum, after which the stopcock connecting with the aspirating needle is opened and the fluid drawn off into the bottle (Fig. 198).

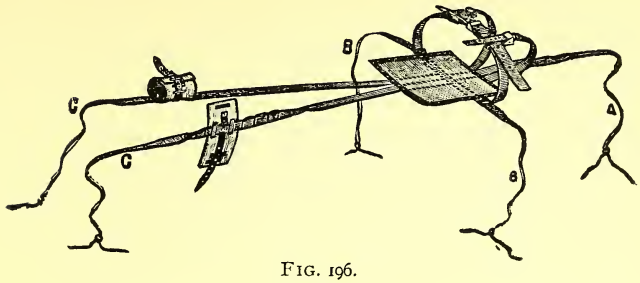

FIG. 196.

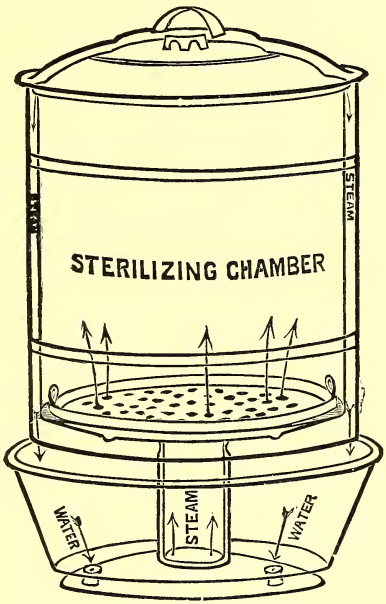

FIG. 197.

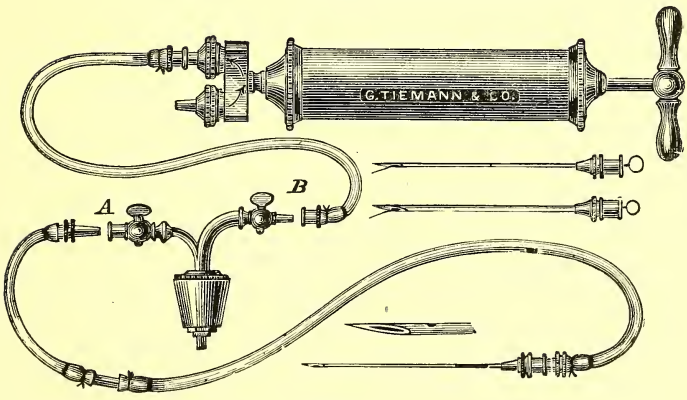

FIG. 198.

Case, emergency: This is a case for use of medical officers, containing a hypodermic syringe, clinical thermometer, a few simple instruments, and tablets of the most useful medicines.

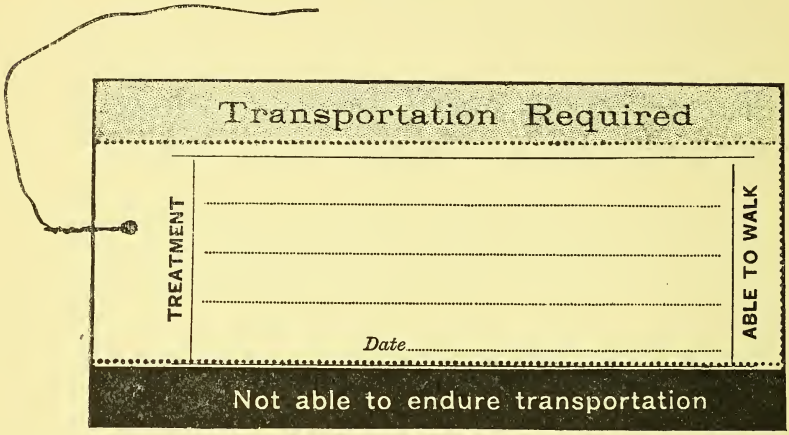

FIG. 199.—Diagnosis Tag.

Formaldehyde generator: This is furnished in several types which have been briefly described on pages 185 and 186.

In the field everything is made as light and portable as possible in order to reduce transportation. Appliances and equipment are packed in certain chests, cases, etc., which require some description.

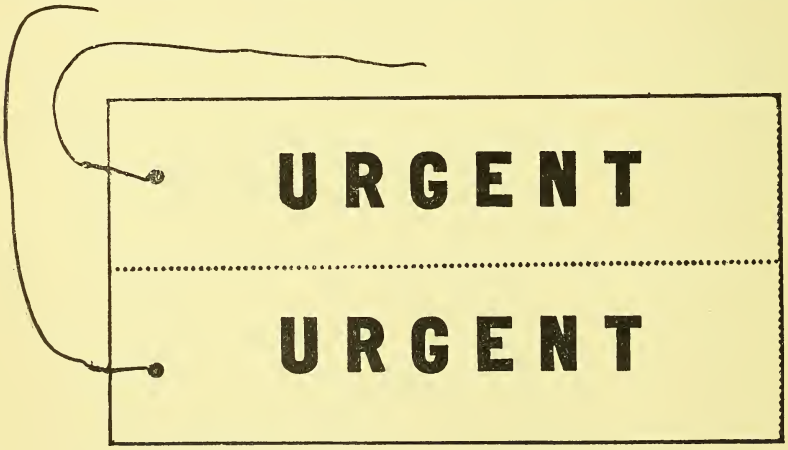

FIG. 200.—Urgent Tag.

Diagnosis tags: A book of diagnosis tags with a pencil attached is contained in each orderly pouch. These diagnosis tags consist of a strip of white muslin in the center and two detachable borders, one blue and the other red. On one side of the white center is space for the diagnosis of the case, and, on the other, space for the treatment. The book also contains other plain white tags printed with the word *Urgent* in blue letters. Each tag has a wire at one end by which it can be attached to the clothing of the wounded (Figs. 199 and 200).

Field desk: This is an iron-bound oak chest, with padlock, in a hinged case. It contains writing materials, blank books, and blank forms.

Food chest: Contains hospital stores and containers for the same.

Bedding, tent unit: A canvas case containing a complete outfit of bedding and clothing for six beds.

Bath-tub set: A chest containing two full-length folding tubs.

Commode chest: A box containing a bed pan, chamber pot, urinal, spit cup, and toilet paper.

Acetylene chest: A chest completely equipped with apparatus for illumination with acetylene gas.

The *regimental medical and surgical outfit* consists of a medical chest, surgical chest, sterilizer chest, box of dressings, and a Maignen filter. The chests are provided with canvas covers and contained in hinged crates.

Detached service chests: Two of these are also furnished to each regiment, and one to a separate battalion. They have a combined medical and surgical equipment, but no arrangement for sterilization by heat.

Mess chests: These are issued in two sizes, large and small, equipped respectively for 100 and for 25 patients.

CHAPTER XII.

THE OPERATING ROOM AND SURGICAL NURSING.

In the chapter on infection and disinfection we have already spoken of bacteria in relation to disease; here we must consider them with special reference to surgical infections.

Bacteria may be divided into two general classes, *bacilli* or *rods*, (Fig. 201), and *micrococci* or *spherical bacteria* (Fig. 202); it is these

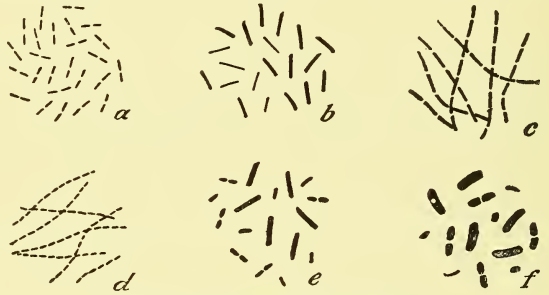

Fig. 201.—Various Types of Bacilli.

latter that are specially concerned in wound infections. Micrococci may also be divided into two classes; those which are grouped in clusters like grapes, called *staphylococci*, and those arranged in

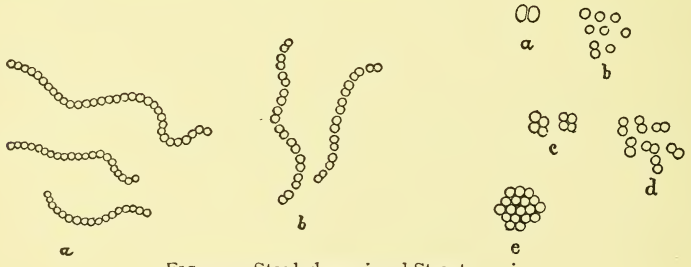

Fig. 202.—Staphylococci and Streptococci.

chains, *streptococci;* the former are concerned in ordinary suppurations such as boils and abscesses, while the latter are the active agents in septicemia and erysipelas.

We have already seen that *sepsis* means *putrefaction;* an *aseptic* wound is one that is *surgically clean,* that is free from all germs; antiseptics prevent putrefaction by destroying the germs or preventing their development. A wound offers just the conditions necessary for the growth of bacteria—heat, moisture, and abundance of nutritive material, and the bacteria are everywhere present, on the skin, on the clothes, instruments, and fingers, and in the air, so that if we are to avoid infection minute care is necessary. All disease germs in the process of their growth produce certain poisons, the nature and action of which vary with the particular germ. Yeast, which is really a mass of germs, in its growth in sugar solution produces alcohol, which when absorbed causes intoxication and, if in excessive amounts, death. The nux-vomica plant in its growth produces strychnine, one of the most powerful of all poisons. So with disease germs. The staphylococci in a wound cause inflammation and suppuration; if the poison is absorbed fever results, *toxemia* or *blood poisoning.* Streptococci have the same effect, and in addition frequently invade the blood themselves and grow there, producing *septicemia, pyemia,* and death.

Pyemia differs from septicemia only in that abscesses form at a distance from the original infection, especially in the joints, muscles, and lungs; the abscesses are caused by the pus cocci which reach those points through the blood.

The most important point in surgical nursing is absolute cleanliness on the part of the nurse; a nurse with dirty hands and finger nails is an abomination and should not be tolerated for a moment. It should be borne in mind that surgical infections are readily carried from one patient to another, and thorough cleansing and disinfection of the hands before dressing each case should be an invariable rule.

The *preparation of a patient for a major operation* usually begins the night before; first a general bath is given, then the seat of operation and surrounding parts are thoroughly scrubbed with soap and hot water and shaved; if the skin is thick or the person very dirty it may be well to apply a green-soap poultice for two or three hours before the shaving and washing; this softens the thick epidermis and permits its removal.

After the shaving a wet antiseptic dressing is applied and left

in position until the patient reaches the operating room. A laxative is given the night before and an enema early in the morning of the operation. If the operation is done in the morning no food is given after the light supper of the previous night, except perhaps an early cup of coffee. The urine is passed or drawn the last thing before going to the operating room; at the same time any false teeth are removed.

After-care: While the operation is being done the bed has been prepared in the manner prescribed (page 140); when the patient is in bed a nurse is detailed to remain by him until the effects of the anesthetic have passed off. This is necessary as in his unconscious condition he may fall out of the bed, tear off his dressings, get up, or choke while vomiting, and be unable to help himself. Sometimes the patient may be in a condition of extreme shock, with cold, clammy skin, shallow breathing, and weak rapid pulse; in such a case hot-water bottles should be freely used, stimulants given, and the foot of the bed raised. After shock the next dangers to be looked for are hemorrhage and infection. Infection usually first manifests itself by a rise of temperature and chilly sensations; even aseptic cases, however, often have a temperature of about 100° F. for the first day or two, constituting what is known as *surgical fever.* In aseptic cases there is little for the nurse to do beyond the administration of diets, as the first dressings are not changed for a week or ten days. The urine usually has to be drawn every six hours for the first twenty-four hours, or until the control of the bladder is regained.

In surgical rounds the duty of the nurse is to have everything ready for any necessary *change of dressings.* Dressings may be done in the ward, or there may be a special dressing room to which the patients are taken on a litter. In the former case a movable dressing table or ward carriage is usually employed. Besides a liberal supply of sterilized dressings in small packages there will be required bandages, safety pins, an irrigator, antiseptic and sterile normal saline solutions, scissors, dressing forceps, dissecting forceps, basins, and a covered pail for the soiled dressings, hot and cold water, soap, hand brushes, towels, and rubber sheeting.

Dressings are of two types, *dry dressings and wet dressings;* the

former are almost invariably used in aseptic wounds and consist of a pad of sterile gauze about half an inch thick, covered with a layer of absorbent cotton. *Wet dressings* are used in infected wounds and consist of a pad of sterile gauze soaked in a 1:2000 solution of corrosive sublimate or a two-per-cent solution of phenol; over this a layer of absorbent cotton, and then a piece of oil silk, rubber tissue, or waxed paper. Antiseptics are used in wet dressings because we wish to destroy the germs which we know are already present, and the whole dressing is covered by a *protective*, as we call the oil silk, because we wish to keep the dressing moist and so allow a more uniform diffusion of the discharges which always occur in infected wounds.

The operating room: The attendant in charge of the operating room must have a clear understanding of the technique of aseptic operating and must be a man of great carefulness and conscientious in details. He must remember always that surgical infections usually come from contact with something not surgically clean, and not from the air. The room itself must be clean and free from dust; it must be disinfected at frequent intervals and no dusting must ever be permitted there; instead the floors must be mopped and the walls wiped with cloths moistened with an antiseptic solution. The temperature of the room should be about 72° F., 80° F. in abdominal operations.

The operating table is prepared by covering it with a folded blanket, over which is placed a rubber sheet and over that a sterilized sheet, or a Kelly pad or surgical cushion may be used. On a small table by the head of the operating table are placed the appliances used in anesthesia.

The *instruments*, safety pins, and surgical needles pinned in towels are boiled five minutes in a one-per-cent solution of carbonate of soda; those instruments with cutting edges are protected by wrapping the blades with cotton.

Aluminum instruments are ruined by soda solution; they must be boiled in plain water.

Instrument trays, basins and pitchers, and rubber irrigators are boiled the same length of time in plain water.

Dressings cut in proper sizes, bandages and gauze, sponges, towels,

sheets, and operating gowns are wrapped in towels or sheets, pinned in small packages, and sterilized thirty minutes in flowing steam in the Arnold or other steam sterilizer. Besides the dry sterilized towels a number of damp towels sterilized by boiling should be ready to surround the field of operation and for other purposes.

Gauze sponges are prepared of four or five thicknesses of gauze about six inches square with the end sides folded in or stitched so that there will be no loose threads to be left in the wound (Fig. 203).

Iodoform gauze is frequently used, especially for packing suppurating wounds or abscess cavities; it is prepared as follows: Sterilize five yards of gauze; mix ten ounces of glycerin with an equal amount of water and boil fifteen minutes; add a half-ounce of iodoform to

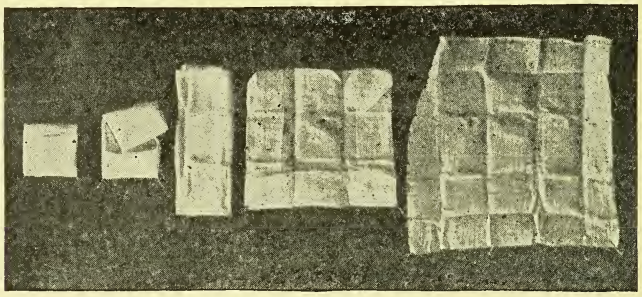

FIG. 203.—Preparation of Gauze Sponges.

three ounces of alcohol and mix with the water and glycerin; then, while stirring briskly, immerse the gauze in the mixture; wring out and keep moist in a closed glass jar.

The *sutures* and *ligatures* ordinarily used are catgut, kangaroo tendon, silk, silkworm gut, and silver wire; the three last named are sterilized by simple boiling in plain water. Catgut is not made from the gut of a cat, but from that of the sheep; kangaroo tendon is what its name implies; both being animal in nature they require thorough sterilization, but will not stand boiling in water. Catgut and tendon in the army medical service are usually issued already sterilized, but most surgeons prefer not to rely on trade processes, and prepare their own animal sutures. There are many different methods employed; nearly all include as the first step the removal of the fat from the catgut by soaking forty-eight hours in ether which is changed daily.

Among the methods are boiling in alcohol, the iodine method, and the cumol method.

A very satisfactory method is that of Surgeon-General W. H. Forwood, U. S. Army, retired, which is described as follows:

Use large, long test tubes, say ten inches by one inch, with pure rubber plugs and glass spools. Thoroughly clean and boil spools, tubes, and plugs. Wind catgut ligature on glss spools, make the kangaroo tendon into oval coils, and place them in the tubes according to size and kind. Immerse in ether, U. S. P., forty-eight hours, and then wash in ether. Immerse in alcohol with 1:1000 bichloride of mercury (C. P.); boil twenty minutes in a water or sand bath with plugs out; remove the tubes while boiling and plug immediately (so as to form a vacuum and remove air from ligatures) and then set aside for twenty-four hours. Renew alcohol with 1:1000 bichloride and add one per cent of tricresol and store away ready for use (if there is no sediment this renewal of alcohol is superfluous). The ligature should be kept at least three days, but it may remain any length of time in this solution before use.

Metal and glass syringes with rubber or asbestos packing may be boiled; if the packings are leather draw boiling water into the syringe, immediately force it out, wash out several times with five per-cent phenol, and soak in the same solution while full; the needles are boiled with the wires in place.

Rubber goods: Vulcanized rubber may be boiled for one minute; fountain and bulb syringes, drainage tubing, rubber bandages, rubber gloves and finger cots, soft-rubber catheters and bougies, may be boiled five minutes in plain water.

Hard rubber is spoiled by boiling; soak in five-per-cent phenol. Rubber tissue (gutta-percha) will not stand boiling; wash in cold water with green soap, rinse, immerse twenty-four hours in solution of corrosive sublimate 1:1000.

Web catheters and bougies will not stand heat; disinfect in an antiseptic solution.

Large quantities of *boiled water*, both hot and cold, will be necessary, also sterile normal saline solution, and freshly prepared antiseptic solutions — two per-cent phenol and 1:2000 bichloride of mercury.

Normal saline solution is a 0.9-per-cent solution of sodium chloride

(common salt) in water. It is called "normal" because it has the same specific gravity as blood serum, which fact renders it less irritating than plain water. It is prepared by dissolving nine grammes of salt in a liter of boiling water and sterilizing in a glass flask, which is exposed to flowing steam in a steam sterilizer for a half-hour at a time on three successive days. This method of fractional sterilization is more successful than a single sterilization for an hour and a half because, while a single exposure of half an hour will kill all the adult bacteria, the spores or seeds are more resistant; the intervals of twenty-four hours allow the development of the spores which are then killed by the next sterilization. The mouth of the flask is closed with nonabsorbent cotton which is drawn over the lip of the flask and held in place by a piece of gauze. In the absence of normal saline tablets or exact means of measurement, the proper amount of salt may be approximated by using a scant teaspoonful to a pint of water. In emergency the water is simply boiled five minutes instead of being subjected to fractional sterilization. When used for intravenous or subcutaneous infusion the solution should be filtered just before use.

Drainage may be tubular or capillary; for the former, rubber or glass drainage tubes are employed. Rubber drains are prepared for use by washing with soap and water, rinsing, boiling five minutes, and keeping in a three-per-cent solution of phenol frequently changed. Glass drains are boiled. For capillary drainage we use strips of gauze about an inch wide and free from any loose threads, or a few strands of silkworm gut may be employed.

The most important part of the whole preparation is the *disinfection of the hands and forearms* of the operator and his assistants. Many different methods have been recommended for this purpose, and, while none are capable of making the hands germ free, most of them give satisfactory results. In all the methods there are two steps: first mechanical cleansing; second, chemical sterilization; the first is by far the most important.

An excellent method of mechanical cleansing is as follows: After trimming the nails close remove all dirt from beneath them with a nail cleaner; anoint the hands with soft soap or a liniment of soft soap, and rub thoroughly with a mixture of equal parts of corn-meal

and powdered mustard; wash in running hot water and thoroughly scrub for five minutes with a stiff brush recently boiled; pay especial attention to the edges of the nails; again clean the nails with a sterile cleaner, rinse the hands in boiled water, immerse in alcohol, and scrub five minutes, using gauze sponges.

Most surgeons prefer to use freshly boiled rubber gloves, but even with the gloves sterilization must be done just as thoroughly, as gloves are often punctured or leaky.

The field of operation is prepared in the same way as the hands; only so much of the surface as is necessary is exposed, all the rest of the body being protected by a blanket covered with sterile sheets; immediately around the operating field wet antiseptic or sterile towels are used.

The sterilization of the hands is usually done after the operating gowns or suits are put on, and once done nothing should be touched which is not sterile; this is the rule which is most frequently broken by the inexperienced nurse; in his hurry or excitement he picks up something which is not sterile and then he must disinfect his hands again.

Frequently during the operation the surgeon will wish to wash his hands to remove blood, so that a basin of sterile water must be kept ready at hand.

After the operation the room must be immediately cleaned. All unused animal sutures which have been handled should be thrown away; soiled or bloody towels, sheets, etc., placed to soak in cold water and the instruments cleaned, counted, and put away.

To clean the instruments they are taken apart and washed in cold water to remove the blood, paying special attention to serrated parts; they are then washed in hot water and soft soap, rinsed, and thoroughly dried. *Scalpels* and other cutting instruments must be cleaned separately, taking particular care not to dull the cutting edge. Needles should be dipped in alcohol, thoroughly dried, and placed in a box with lycopodium.

Artery forceps which take apart usually have the same number stamped on the corresponding blades; if they do not, they should be cleaned one by one, so as not to get them mixed. Locks, screws, holes, and depressions must be carefully cleaned and dried with wisps of absorbent cotton.

Rouge and putz-pomade may be used to remove rust and stain.

The leather packing and washers of *syringes* must be kept moist by frequent use of water or glycerin, and such syringes should always be tested before use to see that they are in working order.

Fountain syringes after washing should be hung bottom up to dry, after which their mouths should be plugged with cotton to exclude dust.

Rubber catheters after drying are to be kept in talcum.

Rubber bandages in like manner are to be dusted with talcum and rolled up, tapes, if any, inside; they must be protected from the air by inclosure in a tin box with the top secured with a strip of rubber plaster.

Rubber gloves should be thoroughly dried with a towel, dusted with talcum inside and out, and protected from the air in tin boxes. Punctures may be closed with rubber cement, or patched with a piece of an old glove by the aid of the cement.

In the field many of the conveniences of the operating room in the post hospital are absent, yet very excellent results may be obtained. The work must be done in a tent, or even with no more shelter than a fly; under such circumstances dust is one of the greatest dangers to be guarded against. If possible no movement of troops or wagons should be allowed in the immediate vicinity; the floor of the tent and the grounds around it should be thoroughly sprinkled to lay the dust, and wet sheets may be hung up so as to afford further protection to the wounds. If no soda is available to boil the instruments, wood ashes may be used tied up in a bag to avoid clouding the water; when steam sterilizers cannot be had the dressings may be boiled, or, in the absence of fire, saturated with antiseptics. When the water is very hard, muddy, or full of organic matter, bichloride of mercury is so rapidly decomposed that it should not be relied upon as an antiseptic; phenol should be used instead. If there are no receptacles large enough to boil the trays they should be scalded with boiling water, and strong antiseptic solutions allowed to stand in them for a half-hour before use.

In the absence of other suture material *horsehair* answers very

well; it may be rendered aseptic by washing with soft soap and water, boiling ten minutes in 0.25-per-cent solution of soda and then ten minutes more in plain water, after which it is kept in a 1:1000 alcoholic solution of corrosive sublimate.

CHAPTER XIII.

NURSING IN THE INFECTIOUS DISEASES.

It is important that nurses should know something of the most common infectious diseases, especially how they are transmitted from person to person, the particular symptoms and special dangers of each, and how they affect the character of the nursing.

We have already defined infectious diseases as those which may be transmitted to others; it is the business of the nurse to prevent such transmission.

Among the more common infectious diseases are gonorrhea, chancroid, syphilis, typhoid fever, malaria, yellow fever, dysentery, cholera, diphtheria, tuberculosis, influenza, tonsillitis, mumps, erysipelas, and wound infections.

Typhoid fever: This disease is due to infection with the typhoid bacillus, which always gains entrance to the body through the mouth, and escapes from the body of the typhoid patient in the stools and urine and occasionally in the sputum. The germs are usually swallowed in infected water or food, but may get into the mouth indirectly as when one has been handling infected clothes, bedding, or other articles, and then handles food without washing the hands. The urine of the typhoid patient often contains typhoid germs for weeks after the patient is convalescent, hence the danger of urinating on the ground, where the germs grow readily and, getting on the shoes of the soldier, are carried into barracks.

The initial lesion of typhoid fever is usually ulceration of the lower end of the small intestine, and this ulceration causes diarrhea and may go deep enough to cause hemorrhage or even perforation of the bowel. Sudden collapse in the course of typhoid fever is usually caused by either perforation or hemorrhage.

The fever ordinarily lasts about four weeks and is treated by cold tub baths, such as those described on page 145.

For his own protection the nurse must be careful to thoroughly

wash and disinfect his hands every time after handling his patient, and again before eating. For the protection of others he must disinfect immediately all urine and stools, and everything which may have been soiled by them, such as bedding, towels, night-clothes, etc. Even the water which has been used in bathing the patient must be regarded as infected; it should never be emptied on the ground, but into a sink which is afterward flushed with a disinfectant solution.

Separate thermometers, feeding cups, etc., must always be used, but if this is not practicable they must be disinfected before use with other patients.

As flies carry the disease germs on their feet they must not be allowed to reach the patient or his discharges. Clothing and bedding must be disinfected.

Dysentery: This occurs in two principal forms, amebic or tropical dysentery, and bacillary or epidemic dysentery. In both forms the germs are swallowed with water or food, chiefly the former, and in both they are thrown off in the stools.

The disease is therefore spread much like typhoid fever, and the precautions to be taken are practically the same, except that the urine in dysentery is not infectious.

Cholera: This disease is spread in the same way as dysentery, but is of short duration and very fatal. The only safety lies in eating and drinking nothing which has not been recently cooked.

Clothing and bedding must be disinfected, and also of course the stools and vomited matter.

Malaria: In this disease the infection is in the blood and cannot be carried from one person to another except by mosquitoes (the *anophelina*), which, after biting the malarial patient, then bite a person hitherto well. Therefore, the sick must be protected against mosquitoes, so that the mosquitoes cannot get the disease, and the well must be also protected, so that if there are any infected mosquitoes about they may not do any harm.

Yellow fever: This disease resembles malaria in that the infection is in the blood, and can only be carried by the mosquito (*Stegomyia fasciata*); the precautions to be taken are the same. It is, however, a much more serious malady than malaria, and usually of much

shorter duration. A curious feature of the disease is that it is not infectious, that is, cannot infect the mosquito, after the end of the third day; but the mosquito once infected is capable of carrying the disease to man probably as long as she (the mosquito) lives.

Gonorrhea or clap: There is no danger of contracting this disease in its ordinary form except through sexual intercourse, but there is danger of getting some of the pus into the eyes and thereby inducing a very serious inflammation which often completely destroys vision. This may happen to the patient himself by bringing the unwashed hands, after handling the penis, in contact with the eyes, or more commonly to the nurse or other innocent person, from use of a towel on which the gonorrhea patient has managed to get some of the pus from his penis. Such a patient should be cautioned about the danger to his own eyes, and should not be allowed to use any toilet articles except his own.

Chancroid: While this disease is nearly always venereal, a nurse with a hang-nail or other abrasion may inoculate himself while dressing the sore or the resulting bubo.

Syphilis: Syphilis, though very contagious at certain times and under certain conditions, is not always so. The chancre, mucous patches, condylomata, and the blood during the first few years of the disease, are all contagious. The mucous patches, being often located in the mouth and throat where they are not visible, are especially dangerous. All the table ware, toilet articles, instruments and appliances, and bed linen used by syphilitics should be kept entirely separate from those used by others, and should be frequently disinfected. Should the nurse have any cut or abrasion on his hands he must be exceedingly careful in handling the syphilitic lesions, or the dressings which have been used on them.

Pulmonary tuberculosis: In this disease the infection is contained in the sputum. As long as the sputum is moist the germs cannot escape into the air, but they may be carried by flies which alight upon it. The danger is in the dry sputum which becomes pulverized and mixed with dust; hence it must be kept moist and always received in a disinfectant solution. If paper spit cups are used, these with their contents are burned. Clothing and bedding must be disinfected.

Pneumonia, like tuberculosis, is infectious through sputum which must be treated in the same way as that of the latter disease. Clothing and bedding must be disinfected.

Influenza; or "the Grip": In this disease the sputum is infectious and also the nasal discharge when there is any. The sputum is to be treated like that of pneumonia and tuberculosis, the nasal discharges are to be received on small pieces of gauze or toilet paper and immediately burned. Clothing and bedding must be disinfected.

In follicular tonsillitis the discharges from the nose and throat are infectious and should be handled in the same way as those of influenza.

The same remark applies to *diphtheria*, but this disease is very contagious through particles of the membrane which is present in the throat and often in the nose, and may be coughed into the face of the attendant; minute portions of the membrane lodged in the eye, nose, or mouth of the attendant may reproduce the disease in him. Patients with diphtheria should always be isolated. Clothing and bedding must be disinfected.

Measles belongs to the class of *eruptive fevers*, which includes also *scarlet fever*, *smallpox*, and *chicken pox*, all of which are contagious through the air, and in which the infectious agent is probably inhaled. Though there is reason to believe that they are all germ diseases, that supposition has not been proven for any of them. The fine particles of cuticle which are thrown off when the eruption is disappearing are highly infectious, as are also the discharges from the nose and throat. In these fevers complete isolation should be practiced, all discharges, including the urine and feces, disinfected; the room and everything which has been in contact with the patient should be put through the same process. During the peeling of the skin, which always occurs to a greater or less extent, inunctions of oil should be used to prevent the dissemination of the infection in the air. Before the convalescent is allowed to mix with well people he should be given an antiseptic bath, 1:2000 bichloride, and the hair and scalp thoroughly shampooed.

Mumps: Mumps is contagious through the air. The infectious agent is in the breath and in the secretions of the throat. Isolation and disinfection of the expectoration are necessary.

Erysipelas may be carried from one wound to another on the hands of the nurse, on instruments, dressings, etc., and possibly also through the air. So very contagious is it that an erysipelas patient should be isolated and his nurse should not go near any one with a wound.

Wound infections are readily carried from one patient to another in the same way as erysipelas is transmitted. A nurse who dresses infected wounds should not attend those whose wounds are aseptic.

As hospital corps men serving in the tropics occasionally have to nurse cases of *plague*, it is necessary that they should know something of that disease.

The most prominent symptoms of plague are great prostration, high fever, and the development of buboes, most commonly in the groin. The disease is due to a bacillus which is found in the blood and all the discharges, including the pus from buboes, the urine, feces, sputum, etc. It is contagious and everything about the patient becomes infected, especially the locality. It may be conveyed by dust, food, water and clothing, by rats, mice and flies, and probably by ants and mosquitoes. Often the infection occurs through some slight wound of the skin. Plague patients should be isolated and everything which comes in contact with them disinfected. Rats and vermin of every sort must be systematically destroyed, and the utmost cleanliness insisted upon. No one with a wound, sore, or even a scratch, should nurse plague patients or visit an infected locality. Nurses should wear leggins and should frequently disinfect their hands, mouths, and nostrils.

PART V.

MESS MANAGEMENT AND COOKING.

CHAPTER I.

MESS MANAGEMENT.

THE management of the hospital mess is one of the most important duties pertaining to the hospital corps, as upon its success depends not only the welfare of the patients but much of the contentment and happiness of the men themselves. The noncommissioned officer selected for this assignment must be not only a man of intelligence and business capacity, but also one who has had actual experience in the kitchen.

The sources from which the mess is supplied are the rations issued for the hospital corps and all the sick in hospital who are not too ill to be subsisted on the ration; special articles purchased under the authority of paragraph 1235, Army Regulations, not to exceed the value of thirty-eight cents per man per day for those who are too ill to be subsisted on the ration; the hospital fund; the products of the hospital garden, chickens, and cows, and, in the field, hospital stores.

A ratoin is the allowance for the subsistence of one person for one day and varies in components according to the station of the troops or the nature of the duty performed, being severally known as *the garrison ration, the field ration, the travel ration, the Filipino ration, and the emergency ration.* The *garrison ration* is issued to troops in garrison or permanent camps; *the travel ration* to troops traveling otherwise than by marching, or when for short periods they are separated from cooking facilities; *the field ration* to troops not in garrison or permanent camps; the *Filipino ration* for use of the Philippine Scouts, and the *emergency ration* to troops in active campaign for use on occasions of emergency.

The kinds and quantities of articles composing the garrison ration, the field ration, the travel ration, and the Filipino ration, and the quantities computed for one hundred rations are as follows:

1. Garrison Ration.

Articles.	Quantities per ration.		Quantities per 100 rations.		
	Ounces	Gills	Pounds	Ounces	Gallons
MEAT COMPONENTS.					
Fresh beef	20	.....	125	.....	.....
or fresh mutton, when the cost does not exceed that of beef	20	.....	125	.....	.....
or bacon	[a] 12	.....	75	.....	.....
or canned meat, when impracticable to furnish fresh meat	16	.....	100	.....	.....
or dried fish	14	.....	87	8	.....
or pickled fish	18	.....	112	8	.....
or canned fish	16	.....	100	.....	.....
BREAD COMPONENTS.					
Flour	18	.....	112	8	.....
or soft bread	18	.....	112	8	.....
or hard bread, to be ordered issued only when impracticable to use flour or soft bread	16	.....	100	.....	.....
or corn-meal	20	.....	125	.....	.....
VEGETABLE COMPONENTS.[b]					
Beans	2 2-5	.....	15	.....	.....
or pease	2 2-5	.....	15	.....	.....
or rice	1 3-5	.....	10	.....	.....
or hominy	1 3-5	.....	10	.....	.....
Potatoes	16	.....	100	.....	.....
or potatoes, 12 4-5 ounces, and onions, 3 1-5 ounces	16	.....	100	.....	.....
or potatoes, 12 4-5 ounces, and canned tomatoes, 3 1-5 ounces.	16	.....	100	.....	.....
or potatoes, 11 1-5 ounces, and other fresh vegetables (not canned), 4 4-5 ounces when they can be obtained in the vicinity or transported in a wholesome condition from a distance	16	.....	100	.....	.....
or desiccated vegetables,[c] when impracticable to furnish fresh vegetables	2 2-5	.....	15	.....	.....

ARTICLES.	Quantities per ration.		Quantities per 100 rations.		
	Ounces	Gills	Pounds	Ounces	Gallons
FRUIT COMPONENTS.					
Dried or evaporated fruits (prunes, apples, or peaches), 30 per cent of the issue to be prunes when practicable	1 3-5	.....	10	.....	.....
COFFEE AND SUGAR COMPONENTS.					
Coffee, green	1 3-5	.....	10	.....	.....
or roasted and ground coffee	1 7-25	.....	8	.....	.....
or tea, black or green	8-25	.....	2	.....	.....
Sugar	3 1-5	.....	20	.....	.....
SEASONING COMPONENTS.					
Vinegar	.....	8-25	.....	.....	1
or vinegar, 4-25 gill, and cucumber pickles, 4-25 gill	.....	8-25	.....	.....	1
Salt	16-25	.....	4	.....	.....
Pepper, black	1-25	.....	.....	4	.....
SOAP AND CANDLE COMPONENTS.					
Soap	16-25	.....	4	.....	.....
Candles[d] (when illumination is not furnished by the Quartermaster's Department)	6-25	.....	1	8	.....

[a] In Alaska, 16 ounces bacon or, when desired, 16 ounces of salt pork or 22 ounces salt beef.
[b] In Alaska, the allowance of fresh vegetables will be 24 ounces instead of 16 ounces.
[c] In Alaska, 3 3-5 ounces instead of 2 2-5 ounces.
[d] In Alaska, 8-25 ounce instead of 6-25 ounce.

2. Field Ration.

ARTICLES.	Quantities per ration.		Quantities per 100 rations.		
	Ounces	Gills	Pounds	Ounces	Gallons
MEAT COMPONENTS.					
Fresh beef or mutton, when procurable locally	20	.....	125	.....	.....
or canned meat, when fresh meat cannot be procured locally	16	.....	100	.....	.....
or bacon	12	.....	75	.....	.....

ARTICLES.	Quantities per ration.		Quantities per 100 rations.		
	Ounces	Gills	Pounds	Ounces	Gallons
BREAD COMPONENTS.					
Flour	18	.....	112	8	.....
or soft bread	18	.....	112	8	.....
or hard bread	16	.....	100	.....	.....
Baking-powder, when ovens are not available	16-25	.....	4	.....	.....
or hops, when ovens are available	1-50	.....	.....	2	.....
or dried or compressed yeast, when ovens are available	1-25	.....	.....	4	.....
VEGETABLE COMPONENTS.					
Beans	2 2-5	.....	15	.....	.....
or rice	1 3-5	.....	10	.....	.....
Potatoes, when procurable locally	16	.....	100	.....	.....
or potatoes, 12 4-5 ounces, and onions, 3 1-5 ounces, when procurable locally	16	.....	100	.....	.....
or desiccated potatoes	2 2-5	.....	15	.....	.....
or desiccated potatoes, 1 23-25 ounces, and desiccated onions, 12-25 ounce	2 2-5	.....	15	.....	.....
or desiccated potatoes, 1 23-25 ounces, and canned tomatoes, 3 1-5 ounces	5 3-25	.....	32	.....	.....
FRUIT COMPONENT.					
Jam, in cans	1 2-5	.....	8	12	.....
COFFEE AND SUGAR COMPONENTS.					
Coffee, roasted and ground	1 7-25	.....	8	.....	.....
or tea, black or green	8-25	.....	2	.....	.....
Sugar	3 1-5	.....	20	.....	.....
SEASONING COMPONENTS.					
Vinegar	.....	8-25	.....	.....	1
or vinegar, 4-25 gill, and cucumber pickles, 4-25 gill	.....	8-25	.....	.....	1
Salt	16-25	.....	4	.....	.....
Pepper, black	1-25	.....	.....	4	.....
SOAP AND CANDLE COMPONENTS.					
Soap	16-25	.....	4	.....	.....
Candles	6-25	.....	1	8	.....

3. Travel Ration.

ARTICLES.	Per 100 rations. Pounds.
Soft bread	112½
or hard bread	100
Canned corned beef or corned-beef hash	75
Baked beans	25
Canned tomatoes	50
Coffee, roasted and ground	8
Sugar	15

4. Filipino Ration.

ARTICLES.	Quantities per ration.		Quantities per 100 rations.		
	Ounces	Gills	Pounds	Ounces	Gallons
MEAT COMPONENTS.					
Fresh beef	12	.....	75	.....	.....
or bacon	8	.....	50	.....	.....
or canned meat	8	.....	50	.....	.....
or canned fish	12	.....	75	.....	.....
or fresh fish	12	.....	75	.....	.....
BREAD COMPONENTS.					
Flour	8	.....	50	.....	.....
or hard bread	8	.....	50	.....	.....
Baking-powder (when in field, and ovens are not available)	8-25	.....	2	.....	.....
VEGETABLE COMPONENTS.					
Rice	20	.....	125	.....	.....
Potatoes	8	.....	50	.....	.....
or onions	8	.....	50	.....	.....
or desiccated vegetables	1 1-5	.....	7	8	.....
COFFEE AND SUGAR COMPONENTS.					
Coffee, roasted and ground	1	.....	6	4	.....
Sugar	2	.....	12	8	.....
SEASONING COMPONENTS.					
Vinegar	.....	2-25	.....	.....	1
Salt	16-25	.....	4	.....	.....
Pepper, black	1-50	.....	.....	2	.....
SOAP AND CANDLE COMPONENTS.					
Soap	16-25	.....	4	.....	.....
Candles	3-25	.....	.....	12	.....

All articles of the ration (excepting those designated by the Commissary-General) due a company, bakery, or other military organization, and not needed for consumption, will, if public loss will not result, be retained for reissue by the commissary and will be paid for by him as savings at the invoice prices. Savings not needed by the commissary for reissue may be sold by companies, bakeries, or other organizations to any purchasers. As a rule the largest savings are made on bacon, flour, vinegar, salt, and pepper

As patients in the hospital subsisted on the ration are not doing any work they will not require the full ration, and considerable savings may be made, the articles being sold to the commissary or to private parties, according to which pays the best price. The revenue from this source as well as that from the post bakery (savings on flour), the post exchange, and the care of patients other than soldiers in hospital constitutes the *hospital fund*, which may be expended as far as desirable in giving greater variety and abundance to the mess of the hospital corps.

In the field no savings on the rations are permitted; therefore instead of spending all the hospital fund on the mess in garrison, a moderate surplus should always be kept to improve the mess in the field. The formation of hospital fund from articles purchased for special diet for enlisted men too sick to use the army ration, or the application of such articles to uses other than to those for which intended, is prohibited.

To meet emergencies and conditions sometimes obtaining in the field where there are no delicacies in the market to be purchased from the special diet allowance of the very sick, hospital stores are allowed; their use for well soldiers, hospital corps or others, is not allowed.

Variety in the mess is of much importance and may be obtained through the use of the alternative issues, by purchases from the hospital fund, and especially by variety in cooking. Usually bills of fare are prepared by the noncommissioned officer in charge of the mess and submitted to the surgeon for his approval, and variety should be insisted on. It is the duty of the noncommissioned officer also to see that the meals are properly and promptly served in both the dining-room and wards.

Wastage must be carefully avoided, grease and drippings should be preserved for use in cooking, and bones for the preparation of soup.

In the dining-room the rule should be small portions served as desired rather than large portions to be left on the plate.

Different classes of diet are necessary in hospital because of the great variety in the nature and severity of the diseases treated therein. The arrangement of the diet tables is based upon our knowledge of the relative digestibility of the different sorts of food, and the part which the different portions of the digestive tract take in the process of digestion.

The diets usually found in military hospitals are *full*, *light*, *liquid*, and *special*.

Full diet includes what is served at the table in the dining-room; the other diets are ordinarily served in the wards.

Light diet includes liquids and the simpler and more digestible articles of solid or semisolid food. Each surgeon usually has his own diet list; the following table, which has been used at the U. S. Army General Hospital, Presidio of San Francisco, California, may be taken as an illustration of full and light diets.

In addition to the regular diet tables a special diet list is provided for the use of ward surgeons for cases requiring this kind of diet.

Liquid diet: This includes *liquids only*, such as milk, strained soups, gruels, broths, albumen water, etc. The amount of each of these articles to be taken by a patient in twenty-four hours should always be stated.

Special diet: This is usually a list from which special articles of food are prescribed for particular cases. In the military service those sick soldiers who are not on full diet are said to be on *special diet* in the sense that the surgeon may expend thirty-eight cents or as much thereof as is necessary in purchasing food for them, in lieu of drawing rations; either liquid or light diet is *special* in this sense.

As to which diet shall be given to a particular patient depends upon the nature of the case. In all fevers and grave disorders, while there is increased necessity for food to repair the unusual waste, there is unfortunately also diminished power of digestion and assimilation.

Therefore we begin with liquid foods to save the digestive apparatus the labor of liquefying them, and we give them in small quantities and frequently.

If there is irritation of the stomach and bowels we give those foods which have the least indigestible residue to irritate the bowels. From liquids we go on to jellies, custards, ice-cream, light puddings, milk toast, lightly boiled eggs, chicken, rare steak, etc.

Full Diet.

Breakfast.	Dinner.	Supper.
Sunday.		
Oatmeal and milk. Ham and eggs. Bread and butter. Fruit. Coffee.	Vermicelli soup. Roast veal, sage-dressing, or turkey, or chicken and dressing. Stewed pease. Mashed potatoes. Farina pudding. Fruit. Bread and butter, coffee.	Veal stew or boiled ham. Apple sauce. Cake. Bread and butter. Tea.
Monday.		
Germea and milk. Beefsteak. Fried potatoes. Bread and butter. Fruit. Coffee.	Roast beef. Mashed potatoes. String beans. Tapioca pudding. Bread and butter. Fruit. Coffee.	Codfish balls or hash. Bread and butter. Pickles. Jam. Sweet crackers. Prunes. Tea.
Tuesday.		
Oatmeal and milk. Sausage. Fried potatoes. Bread, butter, coffee. Fruit.	Vegetable soup. Baked pork and beans. Baked tomatoes. Bread pudding. Bread, butter, cocoa, fruit.	Fried liver and bacon. Corn bread and syrup, or Biscuits. Bread, butter, tea. Fruit.
Wednesday.		
Milk-toast. Beefsteak. Bread, butter, coffee. Fruit.	Roast mutton with dressing. Mashed potatoes. Corn or fresh vegetables. Chocolate pudding, fruit. Bread, butter, coffee.	Mutton stew. Pickles. Sweet crackers. Bread, butter, tea. Peach cobbler.
Thursday.		
Germea and milk. Hash. Bread, butter, coffee. Fruit.	Oyster soup. Corned beef and cabbage. Boiled potatoes. Radishes. Rice pudding. Fruit. Bread, butter, coffee.	Sliced roast beef. Macaroni and cheese. Preserves. Bread and butter. Tea.
Friday.		
Oatmeal and milk. Bacon and eggs. Bread, butter, coffee. Fruit.	Baked fish with sauce. Plain boiled potatoes. Fresh salad. Farina pudding. Fruit. Bread, butter, cocoa.	Salmon salad. Potato salad. Apple sauce. Ginger crackers. Bread and butter. Tea.
Saturday.		
Germea and milk. Beefsteak. Fried potatoes. Bread, butter, coffee. Fruit.	Roast beef, veal, or pork. Mashed potatoes. Hot slaw. Cauliflower. Bread pudding. Bread, butter, coffee.	Baked hash or stew. Stewed prunes. Assorted cakes. Bread and butter. Tea.

Light Diet.

Breakfast.	Dinner.	Supper.
Sunday.		
Oatmeal and milk. Soft-boiled eggs. Milk toast. Coffee.	Rice soup. Farina pudding. Coffee.	Milk toast. Cup custard. Tea.
Monday.		
Germea and milk. Milk toast. Boiled eggs. Coffee.	Plain tomato soup. Bread pudding with lemon sauce. Coffee.	Farina mush and milk. Sweet crackers. Jelly. Toast. Tea.
Tuesday.		
Oatmeal and milk. Boiled eggs. Coffee.	Barley soup. Tapioca pudding. Cocoa.	Biscuits or corn bread. Maple syrup. Boiled rice. Milk toast and tea.
Wednesday.		
Oatmeal and milk. Soft-boiled eggs. Coffee.	Consommé vermicelli. Cornstarch pudding. Vanilla sauce. Coffee.	Sweet crackers. Jam. Milk toast. Tea.
Thursday.		
Germea and milk. Boiled eggs. Coffee.	Oyster soup. Rice pudding. Coffee.	Macaroni and cheese. Milk toast. Maple syrup. Tea.
Friday.		
Oatmeal and milk. Boiled eggs. Milk toast. Coffee.	Fish chowder. Farina pudding. Cocoa.	Tapioca pudding. Milk toast. Ginger crackers. Boiled eggs. Tea.
Saturday.		
Oatmeal and milk. Boiled eggs. Coffee.	Vermicelli soup. Sago pudding. Coffee.	Germea mush. Assorted cakes. Jelly. Milk toast. Tea.

CHAPTER II.

COOKING.

PRACTICAL cooking can only be learned in the kitchen, where each hospital-corps man must serve an apprenticeship, those who show aptitude being given an opportunity to develop into cooks. But the principles of cooking and diet cooking must be learned by all.

Nearly all food is capable of prompt putrefaction; putrefaction is due to the growth of germs, and requires the presence of heat, moisture, and organic matter; if any one of these conditions is absent putrefaction will not take place. Hence meats will keep indefinitely when frozen (absence of a suitable temperature); when dried (absence of moisture); canned (absence of germs which have been destroyed by heat); or when pickled (absence of germs which have been killed by antiseptics, such as salt, vinegar, and sugar).

A clean kitchen means the practical absence of germs; in such a kitchen foods do not spoil or putrefy.

The following extracts from an old work on "Camp Fires and Camp Cooking" are worth repeating here:

"Cleanliness is next to godliness, both in person and kettles: Be ever industrious, then, in scouring your pots. Much elbow grease, a few ashes, and a little water are capital aids to the careful cook. Dirt and grease betray the poor cook and destroy the poor soldier, whilst health, content, and good cheer should ever reward him who does his duty and keeps his kettles clean. In military life, punctuality is not only a duty, but a necessity, and the cook should always endeavor to be exact in time. Be sparing with sugar and salt, as a deficiency can be better remedied than an overplus.

"Remember that beans, badly boiled, kill more than bullets; fat is more fatal than powder. In cooking, more than anything else in the world, always make haste slowly. One hour too much is vastly better than five minutes too little, with rare exceptions. A big fire scorches

your soup, burns your face, and crisps your temper. Skim, simmer, and scour are the true secrets of good cooking."

Cooking improves the flavor of food and thereby increases the appetite; it destroys all parasites and disease germs; and it enables the food to be more thoroughly masticated and digested.

It lessens the toughness of muscular fibres, gelatinizes the connective tissue, coagulates albumin, breaks up the starch granules and practically converts them into glucose and dextrin, all of which permits of more thorough penetration of the digestive fluids and more rapid digestion.

The ordinary processes of cooking are *boiling*, *stewing*, *roasting*, *baking*, *frying*, and *broiling* or *grilling*.

In *boiling*, the object is to cook the food and at the same time retain in it all its natural juices. To do this with fresh meat and vegetables the water should be salted, and the food in large masses dropped at once in boiling water; this by coagulating the albumin in the outer layers forms a protecting coating which prevents the juices from escaping.

Active boiling is continued for five minutes, after which the process should be one of *simmering* or very slow boiling.

Salt meats, beans, and pease should be put on in cold water and the temperature slowly raised.

Potatoes should be boiled in their jackets, but if peeled the water should be salted to prevent the escape of the vegetable salts.

Fish and potatoes should be thoroughly drained after boiling. Beans, pease, rice, and other hard grains require a preliminary soaking; the two former cannot be cooked in hard water. Fresh meats require about fifteen minutes to the pound.

In *stewing* meats we do not mind the escape of the juices because the *broth*, as the water in which meat is boiled is called, forms a part of the food, all of which is to be eaten. Therefore the meat is cut in small pieces, placed in cold water, and the boiling done very slowly; vegetables are usually added. If the stew is made with meat which has already been cooked it is known as a *hash*.

In *soup making* the broth is the part used, hence we desire to get out of the meat and bones and into the water all that can be extracted of their nutritive ingredients, and especially the gelatin which is a re-

sult of a prolonged boiling of the bone and connective tissues. The meat is cut in small pieces and the bones thoroughly cracked, and all placed in cold water in a covered pot which should simmer slowly and be frequently skimmed. The product when finished constitutes *stock*, and the various soups are prepared by adding vegetables cut into small pieces, and cooking for an hour or so more or until the vegetables are done. Soup stock should not be kept in an iron pot because the iron gives it an unpleasant flavor.

In making *meat teas* or *extracts* by heat, the process is a little different from soup making; we do not wish any fat, hence lean meat is selected without bone, and all fat is removed after the broth is cold; the water should never come to a boil so as not to coagulate the albumin which we wish to retain.

Roasting is properly done in front of a clear fire with special arrangements for concentrating the heat and turning the joint. In this country the term *roast* is ordinarily applied to *baked meats*.

Baking is done in an oven, and as the fat acids developed by high temperature cannot escape, the flavor and digestibility are not so good as in roasting. As in boiling, our object is to expose the roast to a high temperature in order to coagulate the surface layer so that it may retain the juices; when that is accomplished the balance of the cooking is done more slowly at a lower temperature. Frequent *basting* with the melted fat and meat juices is necessary in order to prevent the surface becoming too tough and hard, and to secure better penetration of the heat into the interior of the joint. The oven must not be too hot; if the hand and arm can be held in the oven for fifteen seconds the temperature is about right. Baking ordinarily requires about fifteen minutes to the pound.

Broiling or *grilling* is practically the same as roasting only the cooking is done over instead of in front of the fire, and a larger extent of surface is exposed to the heat.

The meat is placed on a gridiron or broiler over a clear bright fire free from smoke. If the broiling is done before a fire instead of over it, the juices can be caught in a drip pan and used.

Frying is properly done by dropping the meat or vegetables in boiling oil or fat at a temperature of about 500° F. and in a frying pan deep enough to immerse the article to be cooked. If the fat

is hot enough the surface layer of the meat is at once coagulated as in boiling and roasting, and the grease does not penetrate.

Frying is usually improperly done, the bottom of the frying pan being only greased enough to prevent the meat from sticking to it; articles thus fried are saturated with grease and indigestible.

The object of *bread making* is to convert an indigestible, tasteless mass of flour into an appetizing, porous food capable of ready penetration by the digestive juices and known as *bread.*

The first step is to make the *dough*, which is done by thoroughly mixing or *kneading* the flour with salt and water; the next step is to impart the necessary porosity by the introduction of carbonic-acid gas into the mass; this is done by either generating it within the dough or forcing it in from without.

The first of the methods may be effected either by fermentation of *yeast* or by *baking powders;* the second constitutes the so-called *aerated bread*, a process little used in this country.

The carbonic-acid gas is held in minute bubbles by the tenacity of the *gluten*, the nitrogenous elements of flour, and the dough *rises*, becoming light and spongy. It is then kneaded over again, divided into loaves of suitable size, allowed to rise for about one hour in the forms, and then baked, by which the gas is still further expanded, the dough made lighter, and the porosity permanently fixed in the *bread.*

By *leavened bread* we mean that which has been made by fermentation; yeast may be used directly, or we may use a portion of old fermenting dough or leaven; the former is preferable.

In the growth of the yeast fungus a portion of the sugar of the dough is converted into alcohol and carbonic acid; the former is driven off by the heat in baking, and the latter is spread through the dough, making it porous. Usually a portion of the flour is first made into dough with yeast, salt, and water, and set aside in a warm place for a couple of hours, this constituting the *sponge* which is subsequently thoroughly kneaded with the remainder of the flour and water, and the fermentation allowed to proceed in the entire mass.

The important point is to know just when it has gone far enough; if it goes too far the bread becomes *sour;* if not far enough it is *heavy.*

The necessary carbonic acid may also be generated by the use of *baking powders;* these consist generally of bicarbonate of soda mixed

with cream of tartar, acid phosphate of lime, or alum; in the chemical reaction which takes place in the dough carbonic-acid gas is set free and certain more or less harmless salts remain in the bread. Alum baking powders are objectionable because the remaining salts are believed to cause indigestion.

CHAPTER III.

RECIPES.

THE following recipes are taken from the valuable pamphlet on "Emergency Diet for the Sick in the Military Service" by Captain Edward L. Munson, assistant surgeon, U. S. Army, and published with his permission. They will serve an excellent purpose in preparing foods for the sick and also in the instruction of the hospital corps in cooking and diet cooking:

LIQUID DIET.

Sterilized Milk.

Pour the milk into a granite saucepan (or a double boiler) and raise the temperature of milk to about 190° Fahrenheit. Keep it at this point for one hour. Do not boil the milk. Any utensil used for this purpose must be absolutely clean.

Milk Punch.

Three-fourths of a coffee cup of milk (six ounces).
Two tablespoonfuls of brandy or whisky.
One teaspoonful of sugar.
Grated nutmeg to taste.

Sweeten the milk (preferably sterilized) with the sugar. Stir into it the brandy. Shake it up well by pouring from one cup into another, or by the use of a milk-shaker, until a froth is formed. Grate a little nutmeg on top and serve.

The term "cup" in this recipe, as in all others, means the ordinary coffee cup, holding eight ounces.

Milk with Mineral or Aerated Waters.

Mix equal quantities of sterilized milk with seltzer, soda water, or lime water, and serve immediately.

Albumenized Milk.

Beat up the white of an egg till light. Add a good-size pinch of salt, and four ounces of fresh, cool milk which has been sterilized. A little sugar may be added if desired.

Peptonized Milk (Cold Process).

Into a clean quart bottle put the contents of one peptonizing tube, mixing it with four ounces of cold water. Add one pint of fresh cold milk, shake thoroughly, and place the bottle on ice. Use clean cotton to plug the bottle.

In place of the peptonizing powder, five grains of pepsin and fifteen grains of sodium bicarbonate, to be obtained from the dispensary, may be employed.

Peptonized Milk (Warm Process).

Into a clean quart jar or bottle put the powder contained in one of the tubes above mentioned, together with four ounces of cold water. Add one pint of fresh milk and shake the whole well. Place the bottle in a pan or kettle of hot water maintained at such a temperature that the hand can just be held in it without discomfort. Keep the bottle in the water for ten minutes. Put on the ice immediately after removing from the hot bath, to check further digestion. If ice is not available pour the milk into a saucepan and heat quickly to boiling.

Whey.

Warm one pint of milk to about blood heat, or about 100° Fahrenheit. Dissolve half a rennet tablet in one tablespoonful of cold water. Stir it into the milk and let it stand until the latter is curdled, which will be in a few minutes. Break up the curd with a fork and strain off the liquid (whey). This may be sweetened with sugar, and when cooled makes a refreshing drink for fever patients.

Junket.

Heat one pint of fresh unboiled milk to about blood heat, or about 100° Fahrenheit. Dissolve a full tablespoonful of sugar in it. Add half a rennet tablet which has been dissolved in one tablespoonful of cold water. It will set the milk in about fifteen minutes. Put in a cool place till ready to be used. It can be served plain, or with cream, sugar, and a little nutmeg.

Farina Gruel.

One tablespoonful of farina.
One pint of water.
One teaspoonful of sugar.
One-half teaspoonful of salt.

Into one pint of water, raised to boiling, put a half teaspoonful of salt; then add the farina and cook for twenty minutes. Flavor with sugar and condensed milk, if fresh milk is not available. Strain and serve hot.

In this recipe, as in others, condensed milk is used in a strength of one teaspoonful to the half pint of gruel.

Rice Gruel.

Two tablespoonfuls of rice.
Or one tablespoonful of rice flour.
One pint of boiling water.
One-half teaspoonful of salt.
One teaspoonful of sugar.

Wash the rice thoroughly in two waters, after removing any specks that may be mixed in the grain. Have the cooking water boiling. Add the salt and then the rice. Boil for two hours, when the rice should be almost entirely dissolved. Strain. Add condensed milk and sugar, if desired. Some persons prefer the use of salt alone.

If ground rice or rice flour is used, it should be mixed with cold water before mixing with boiling water, and requires but thirty minutes' boiling. Flavor with sugar or condensed milk.

Hard-Bread Gruel.

Toast hard bread thoroughly and grind it into a powder. To one pint of boiling water, to which one-half teaspoonful of salt has been added, add two tablespoonfuls of hard-bread powder. Boil ten minutes and then strain. Flavor with one teaspoonful of sugar and one teaspoonful of condensed milk to each cupful of the gruel.

Koumyss.

Dissolve one-fourth cake of compressed yeast (Fleischmann's) in a little warm water. If Fleischmann's yeast is not obtainable, use one-fourth cake of ordinary compressed yeast or half a fluid ounce of bakers' yeast. Warm one quart of fresh milk to about 90° Fahrenheit, add one tablespoonful of sugar and the dissolved yeast; thoroughly mix and put into a stout bottle, tying a small piece of cloth firmly over the cork to hold it in place. Shake well, and allow to stand for six hours at a temperature of about 70° Fahrenheit. Then put the bottle on ice upside down, and allow to stand for three days before using. Condensed milk may be used with as good a result as fresh milk. Use five parts of water to one part of condensed milk, and omit the sugar.

Lemonade.

One small lemon or lime.
One tablespoonful of sugar.
Three-fourths of a coffee cup of water (six ounces).

Wash and wipe the lemon or lime. Squeeze the juice into a glass or bowl. Then add the sugar, pour on the water, and strain. Serve at once. Boiled or sterilized water should be used.

Orangeade.

One orange.
One teaspoonful of sugar.
Three-fourths of a coffee cup of water (six ounces).

Wash and wipe the orange. Squeeze the juice into the sugar. Add the cold water, previously boiled. Strain and serve.

Eggnog.

One egg.
Two teaspoonfuls of sugar.
Three-fourths of a coffee cup of milk (six ounces).
Salt to taste.

Beat the egg up till light. Add sugar and salt and then the milk, which is better when not too cold. With the addition of one or two tablespoonfuls of brandy this makes a very strengthening drink for convalescents.

Egg Lemonade.

One egg.
One small lemon.
Two teaspoonfuls of sugar.

Beat up the white and yolk of the egg separately; add sugar to yolk. When both are light, mix them together and add the strained juice of the lemon. Pour into a glass and serve with a spoon.

A little cold water may be added if the beaten egg is too foamy.

Sherry and Egg.

One egg.
One teaspoonful of sugar.
Two tablespoonfuls of sherry wine.

Break the egg into a bowl and add the sugar. Beat the two together until they are thoroughly mixed. Add two tablespoonfuls of sherry wine and an equal quantity of cold water. Mix thoroughly, strain, and serve immediately.

Toast Water.

Toast three slices of soft bread till very brown, and dry throughout. Break up fine, add one pint of boiling water, and set aside for fifteen minutes. Turn into a strainer or piece of gauze and strain. The water thus obtained may be used plain, or a little sugar or condensed milk may be added. It may be served either hot or cold.

Coffee.

To each cup of water allow one tablespoonful of coffee, freshly roasted and ground. Have the water boiling. Mix the coffee with a little cold

water and pour it into the boiling water. Let the whole come to a boil, and then set aside for five or ten minutes to steep and settle before using. If muddy it may be cleared by boiling with egg shells, or, in their absence, by a dash of cold water. Add sugar and fresh or condensed milk to flavor as desired.

Tea.

To each half pint of boiling water add one teaspoonful of tea. Let it steep or infuse for five minutes. Never let tea boil. Add sugar and fresh or condensed milk to flavor as desired.

Beef Juice.

Cut a lean piece of steak, from the round or other good portion, about one-half pound in weight. Remove all fat and fibrous tissue. Broil over a clear, hot fire so that the meat becomes pink and full of juice. It should not be merely done on the outside and raw inside. Cut into small pieces and squeeze out the juice. Add a little salt and it is ready to serve.

If it is needed warm, place the cup holding the juice in a bowl of warm water. Do not let the temperature of this water exceed 160° Fahrenheit.

Beef Juice (Bottled).

Choose a good, well-flavored piece of beef, half a pound in weight. Cut away the fat, leaving only the lean. Cut this up into small pieces. Put these into a clean glass jar and cover the latter. Set the jar in a deep saucepan of cold water and heat gradually for one hour. Then strain out the juice and press the meat. Add a little salt and serve.

If the temperature of the water exceeds 160° Fahrenheit the beef juice becomes brown and flaky. A half pound of beef should give from three to four tablespoonfuls of juice.

Beef Tea (Bottled).

Select and prepare the beef as for bottled beef juice, except that to each half pound of meat a cup of cold water should be added, pouring the water over the beef after it has been put in the jar. The liquid thus obtained will resemble the beef juice in every respect except strength. Add a little salt and serve.

Beef Tea with Hydrochloric Acid.

Select and prepare the beef as above. Put into a bowl and pour over it one cupful of cold water, to which five drops of dilute hydrochloric acid have been added. Let the whole stand for two hours in a cool place. Strain, add salt to flavor, and serve cold. This tea may be heated; but the albumin which coagulates and appears as brown flakes should not be strained out, for it is the nutritious portion of the tea.

Beef (or Mutton) Broth.

One pound of lean beef (or mutton).
One quart of water.
One teaspoonful of salt.

Soak the meat, previously chopped fine, in the cold salted water for at least two hours, in the vessel in which it is to be cooked, keeping it on ice or in a cool place during this time. Then expose to moderate heat. Keep the vessel covered and allow the broth to simmer, keeping up the original quantity of water, for three hours at least. Let it cool overnight, skim off the fat in the morning, and keep covered in a cool place until needed. Heat and serve as required.

Chicken Broth.

Fowls are better to use for broth than young chickens. Pluck and prepare by singeing with a blazing newspaper, straw, or dry grass. Remove all refuse—entrails, oil bag, crop, lungs, etc. Wash well in cold water, then cut up and disjoint. To each pound of chicken add a quart of cold salted water and simmer for two hours; then boil for two hours. Add rice or powdered hard bread or soft bread crumbs in the proportion of one tablespoonful to each quart of water. Vegetables, such as onions, garlic, carrots, celery, and parsley, may be also used, a tablespoonful to the quart, and should be put in when the broth is first put on to cook. Strain, remove the fat, and serve hot.

Canned Soups.

To render canned soups ready for eating, simply raise them to the boiling point by immersing the cans in boiling water for half an hour to thoroughly heat the contents; or empty and heat the contents in a granite saucepan. After diluting with the proper amount of water, following directions on the cans, they are ready to serve. Before heating any canned article a hole should be punctured in the upper end of the can.

Clam Broth (Canned).

This may be served hot or cold. If the broth is desired plain, add an equal quantity of water to the clam juice and heat to the temperature required. Do not boil. Clam broth can also be given iced. If fresh milk is available, equal parts of milk and clam juice may be heated up together.

SEMISOLID OR LIGHT DIET.

Poached Eggs.

Pour sufficient boiling water into a clean cooking utensil and add salt in the proportion of one teaspoonful to the quart of water. Place it on the

stove to boil. Break a fresh egg into a small dish, and when the water boils slide the egg gently into it. When the albumen or white is firm, or at the end of two minutes, lift the egg out of the water with a skimmer and place it on a piece of hot, nicely-browned toast or hard-tack. Sprinkle with a little salt and pepper and serve hot.

Soft Cooked Eggs.

Put into a saucepan as many eggs as are to be cooked. Pour over them water enough to cover. The water should have been brought up not quite to the boiling point. Let the eggs stay in the water from seven to ten minutes, and the result is an evenly cooked egg throughout. When the water is poured on the eggs do not set the pan on the fire. No further heating is required, but the water should not be allowed to cool down too rapidly.

Omelet.

Two eggs.
Two tablespoonfuls of milk, cream, or water.
One-fourth teaspoonful of salt.
Pepper to taste.

Beat up the yolks and whites of the eggs separately. Add the salt to the yolks. Mix the whites and yolks together with the milk, cream, or water. Place a small piece of butter or bacon fat in a pan or plate hot enough to melt it. Pour in the omelet, and with a sharp knife loosen the edges as they solidify and fold over the omelet into a half circle. When done, turn out on a plate and serve hot. When milk cannot be had, water may be used.

Spanish omelet has minced onion added to the above. An excellent addition to the plain omelet is a dressing made of canned tomatoes and boiled crumbled hard bread, strained, seasoned, and heated together. Never use flour in an omelet, as it cannot be cooked sufficiently in the short time that should be given to eggs.

Baked Custard.

One pint of fresh milk.
Two eggs.
One-third teaspoonful of salt.
Two tablespoonfuls of sugar.
Small piece of cinnamon.

Put the cinnamon in the milk and pour into a saucepan to heat. Break the eggs into a bowl with the sugar and salt, and beat until well mixed but not light. When the milk comes to a boil pour it over the eggs. Stir slowly to dissolve the sugar. Strain the mixture into cups, set them in a deep pan of boiling water, and bake for twenty minutes in a moderately hot oven.

Dry Toast.

Cut the bread in slices one-third of an inch in thickness. Toast may be made either by drying bread in an oven and then placing on a toaster over the fire, or the bread may be allowed to dry and brown in the oven. Toast that is moist and soft in the middle should never be given to an invalid. Have it dry, crisp throughout, and of a golden-brown color. Serve hot, either dry or buttered.

Milk Toast.

Put a cup of milk into a saucepan and let it heat to the boiling point. Have ready three slices of nicely browned toast. Put a little salt in the milk and pour it over the toast. A little butter may be spread on the latter, but it is a more delicate dish without it. Serve hot.

Oatmeal Porridge.

Three tablespoonfuls of oatmeal or rolled oats.
One pint of boiling water.
One-fourth teaspoonful of salt.

Dissolve the salt in the water, then add the oatmeal. Cook for two hours in a double boiler. Rolled oats require cooking only half an hour. Oatmeal is very appetizing when served cold in mold shapes, and it will frequently be eaten in this way when it would be refused if served in any other form. Variations may be made by using farina, browned rice (browned in the oven before steaming and molding), arrowroot, etc., giving further change by serving occasionally with sweetened fruit juices, fresh, dried, or canned, instead of cream or milk.

Farina Mush or Porridge.

Three tablespoonfuls of farina.
One pint of boiling water.
One-half teaspoonful of salt.

The water must be boiling before putting in the farina. Boil for half an hour. It may be served with fresh milk, or condensed milk diluted one to four parts of boiling water, or with stewed dried fruit, such as prunes, peaches, or apples. Cold farina mush may be sliced and fried for the use of convalescents.

Plain Boiled Rice.

One-half cup of rice.
Two cups of boiling water.
One-half teaspoonful of salt.

Pick the rice clean. Wash thoroughly in two waters, pouring off the last when ready to put the rice into the boiling water. Add the salt to the water. Pour in the rice and boil steadily for half an hour. In order to see if the rice is done, take out some of the grains and crush between the fingers.

If done, they will mash easily and feel perfectly soft. Do not stir the rice, as this will cause it to fall to the bottom and burn. Serve with sugar and fresh or condensed milk or with stewed fruits.

Steamed Rice.

Wash the rice thoroughly in two waters. Use in same proportions as are given for boiled rice. Use a double boiler. Have the water boiling in lower boiler. Place the above mixture of rice, boiling water, and salt in the upper chamber, and let cook for one hour. Do not stir. Keep the rice covered while steaming, and keep the lower boiler well supplied with boiling water. Serve as with boiled rice.

Milk Porridge.

The flour for milk porridge should be prepared in the following manner. Tie up in a muslin bag or a towel as much flour as desired and boil for four or five hours, then bake in an oven until dry. To make the porridge, grate two tablespoonfuls of the dried flour, mix it with cold water into a paste, and add to it one pint of boiling milk or boiling water. Boil for ten minutes. If water alone is used to make the porridge, condensed or fresh milk may be used in addition, in equal parts or diluted one-half with water.

Condensed milk used in this recipe is made in the strength of one part of condensed milk to four of water. Salt is added in proportion of one teaspoonful to the quart of boiling milk or water.

Lemon Jelly.

One-fourth box of gelatin (one-half ounce).

One-fourth cup of cold water.

One-fourth cup of fresh lemon juice (about the amount yielded by two lemons).

Three tablespoonfuls of sugar.

One and one-fourth cups of boiling water.

Put the gelatin to soak in the cold water, about twenty minutes being required for this process. When dissolved, pour on the boiling water. Add the lemon juice and sugar. Stir thoroughly and strain through a fine-meshed cloth into a china or granite-ware mold, cooling in a refrigerator or by placing in a pan of cold water. Never use tin molds for lemon jelly.

Coffee Jelly.

One-fourth box of gelatin (one-half ounce).

One-fourth cup of cold water.

One cup of boiling water.

One-half cup of strong coffee.

Two tablespoonfuls of sugar.

Soak the gelatin in the cold water for half an hour. Pour on the boiling water, then put in the sugar and coffee. Strain it through a cloth into a mold or dish in which it may be cooled, either in a pan of iced water or in a refrigerator. Coffee jelly may be served with cream and sugar.

Have the coffee strong, two tablespoonfuls of coffee to each cup of water. Where vanilla extract is available, one-half teaspoonful will be advantageously added to the above recipe.

Wine Jelly.

One-fourth box of gelatin (one-half ounce).
One-fourth cup of cold water.
One-half cup of sugar.
One-half cup of sherry wine.
One and one-fourth cups of boiling water.
One small piece of cinnamon.

Put the gelatin and cold water together in a dish large enough to hold the whole mixture. Let it soak for half an hour, then pour the boiling water (in which the piece of cinnamon has been simmering) over the softened gelatin. Add the sugar and wine, strain through a clean cloth into a china or granite-ware mold, and cool in a refrigerator or a pan of cold water.

Stewed Dried Apples, Apricots, or Peaches.

Wash the fruit thoroughly. Soak for four or five hours in the cold water it is to be cooked in, using only a sufficient quantity of water to cover. Heat in a covered granite-ware saucepan, simmering slowly for two hours. Do not boil. If the fruit is allowed to simmer it will not burn or need stirring, which breaks it up and makes it look unsightly. Apricots need plenty of sugar, but this should not be added until five minutes before taking off the fire. Lemon juice or lemon peel may be added to poorly flavored apples, a tablespoonful of the juice or the peel of half a lemon to the pound of fruit, or spices may be used for flavoring. The use of brown sugar in stewing dried fruit is to be preferred, because of the better flavor which it gives.

Baked Apples.

Select fair, sound, and preferably tart apples. Wash and wipe them and cut out the cores, removing all the seeds and husks. Cut off any dark spots on the outside. Put the prepared apples into a granite or earthenware dish. Put into each apple from one-half to one teaspoonful of sugar, according to the acidity of the fruit, and a bit of lemon peel. Pour boiling water into the dish about one-fourth inch deep, and bake in a moderately hot oven. When perfectly soft all through, the fruit is done. The time for baking varies, according to the species of apple, from half an hour to two hours.

Canned Fruit, Serving of.

Remove from cans several hours before using and put in porcelain or granite-ware dish to cool. Canned fruit is much improved by cooling, being more palatable and refreshing than if served direct from the can. Never allow fruit to remain in cans when once opened. This applies particularly to very acid fruit, and also to meats, fish, or vegetables.

Baked Potatoes.

Have the potatoes of a uniform size, so that all may be done at the same time. Wash them thoroughly and bake in a hot oven from forty-five to fifty minutes. They are recognized as being done by the soft, yielding sensation given on pinching.

Roasted Potatoes.

Bury under the hot ashes of an open fire (camp) for half an hour or more. The thoroughness of cooking is recognized as with baked potatoes. Break open by squeezing. Brush the ashes off first.

Boiled Potatoes.

Wash the potatoes well. Pare carefully so as not to waste. Put them on to cook in boiling salted water, enough to cover, and let boil for thirty minutes. It requires more time for large-size potatoes. When easily pierced by a fork they are done. Drain off the water, and dry them on top of the stove by moving the boiler back and forth for a minute or two. Serve as quickly as possible after they are cooked.

Mashed Potatoes.

Prepare as for boiled potatoes. When cooked, drain off the water and mash in the dish in which they were boiled. Add butter, pepper, and salt to taste, and lastly put in a little milk or cream. Whip up lightly and serve immediately. Keep the dish covered until served.

Scraped Beef.

Cut a piece of steak from the round, about half a pound in weight and about an inch thick. Lay it on a clean meat-board and with a dull knife scrape out the pulp until there is nothing left but stringy fiber. Season the scraped pulp with salt and make it into small cakes. Broil for two minutes either by direct heat over a clear fire, or by heating a clean pan or plate and, when hot, placing the meat on it. Have both sides cooked sufficiently. This is a safe food for a patient beginning to take solid nourishment. Scraped beef may be prepared very easily over an alcohol lamp.

Scraped Beef Sandwiches.

Place a piece of round steak on a meat-board and scrape out all of the

pulp with a dull knife; add to the pulp a little salt and pepper and enough raw beef juice to make it into a firm jelly. Have stale bread cut into very thin slices and spread the beef pulp on them; cut the sandwiches quite small. Never use butter in making beef sandwiches.

Broiled Beefsteak

Have a clear, hot fire, either coal or charcoal. Put the steak on a broiler, place directly over the fire for about a minute, then turn and do the same with other side. By applying greater heat at the outset the juices are kept in the meat. It requires from five to seven minutes over a clear fire to broil a steak an inch thick. Season both sides with salt and a little pepper, but no butter. Serve hot. A baked potato is a good vegetable to serve with the above, as is also boiled rice.

Another good way to broil steak is to heat a granite-ware plate on a stove till it is quite hot. Place the steak on it till one side is done, then turn it and do the same with other side.

Stewed Chicken.

Boil a chicken, prepared as for broth, until tender. Set it away till it is cool. Skim off the fat; take the meat and cut it up in cubes or small pieces, rejecting all skin, gristle, tendons, and bones. To one cupful of the meat add one pint of the broth, seasoning with salt and pepper. Mix one teaspoonful of flour with a little cold water, blend it thoroughly, and add it to the chicken. Let the whole stew for ten minutes, and serve with toast or boiled rice.

Minced Chicken on Toast.

Prepare the chicken as for broth. When cool, skim off the fat and mince up the meat fine, rejecting all skin, tendons, gristle, and bone. Season with salt and a little pepper. Add enough broth, or, better yet, cream, if available, to make it of the proper consistency, or about that of cream. Have ready some nicely-browned dry toast, pour the minced chicken over it, and serve hot.

THE HOSPITAL STORES.

Beef Extract (Liquid).

To four ounces of cold, sterilized water add half a teaspoonful to one teaspoonful of the liquid extract. Mix thoroughly; season with salt and pepper to taste, and, if obtainable, with celery salt.

Where a hot beef tea is required the above preparation may be heated, care being taken not to remove the nutritious curdy flakes produced by boiling.

Malted Milk.

Mix one or two tablespoonfuls of malted milk with a like quantity of warm, boiled water. Add more water to make up half a pint. Season with salt to taste.

Boiling water cannot be used to advantage in making up this preparation.

Chocolate.

Grate one ounce of chocolate. Have ready one pint of boiling milk. Mix the grated chocolate with some hot milk into a paste, add to it the boiling milk and boil five or six minutes. Flavor with sugar, one teaspoonful to the pint. The chocolate issued in the hospital stores is partly sweetened. If unsweetened chocolate is used, a tablespoonful of sugar is required. If fresh milk is not available, make the chocolate with boiling water and add one teaspoonful of condensed milk to each half pint of chocolate.

Arrowroot Blanc-Mange.

Two tablespoonfuls of arrowroot.

Two-thirds pint of hot water.

Two tablespoonfuls of sherry or brandy.

Two teaspoonfuls of sugar.

Mix the arrowroot into a smooth paste with three tablespoonfuls of cold water. Add this to the hot water. Bring to a boil, stirring constantly till well blended and free from lumps. Let boil for ten minutes. Add the sugar and sherry or brandy. Beat up quickly and pour into a bowl or mold to cool. Arrowroot blanc-mange may be made with fresh hot milk or condensed milk diluted. If boiling water is used it causes the starch of the arrowroot, when first poured in, to form into lumps. Hence it is best to have the water not quite at boiling point.

THE RATIONS.

Hard-Bread Toast Water.

Two tablespoonfuls of powdered hard bread.

One pint of boiling water.

One-half teaspoonful of salt.

Add the powdered hard bread, after toasting or parching in an oven, to the salted boiling water. Boil for ten minutes. Strain through gauze and serve hot or cold. The toast water may be flavored with sugar, condensed milk, or whisky.

Hard-Bread Mush or Porridge.

One cup of powdered hard bread.

Four cups of boiling water.

One teaspoonful of salt.

Mix and boil for ten minutes. The resulting mush may be eaten with condensed milk or stewed dried fruit.

Care should be taken to prevent scorching by frequent stirring, and the water should be boiling in all cases before adding the powdered bread.

Hard Bread as Milk Toast.

Toast two or three pieces of hard bread to a good brown color by placing in an oven or over a clear fire on a toaster. When done, pour enough boiling water over them to soften thoroughly. Dilute two tablespoonfuls of condensed milk in four times as much boiling water. Drain off the water from the toasted bread and pour on the milk. Serve hot.

Hard Bread and Dried Apples (Brown Betty).

Soak the dried apples for at least four hours. Grease a baking pan or dish and place in it first a layer of sliced apples, then a layer of hard-bread crumbs, or whole hard bread softened in boiling water for ten minutes, with small quantities of butter or fat pork and sugar, and a little ground cinnamon sprinkled over each layer. Continue till the dish is full, having bread crumbs for the top layer. Moisten with a cup of water, or fresh or diluted condensed milk, and bake three-quarters of an hour in a moderately heated oven. When a fork easily pierces the apples the pudding is cooked. It can be eaten hot or cold with butter and sugar worked up together and flavored with cinnamon or nutmeg; with a simple sirup of sugar and water, or with the following sauce:

Sauce for Hard-Bread Pudding.

One pint of boiling water.

One tablespoonful of flour.

One-half cup of sugar.

One lemon.

To the water add the flour, mixed into a paste with three tablespoonfuls of cold water. Boil for ten minutes. Add the sugar and lemon juice, strained; or other flavoring to taste.

Bacon Broiled.

Wash in cold water. Cut into thin slices and broil over clear coals, either on a broiler or with a fork. Serve immediately.

Bacon, Fried.

Cut into thin slices after washing, roll in hard-bread crumbs, and fry in a very hot pan which has been greased. Season with pepper and serve immediately. The bacon may be fried without the bread crumbs if preferred.

Bacon, Boiled.

Wash the bacon in cold water. Scrape and trim off any rusty or brownish spots, and, if very hard or dry, soak for a few hours in cold water. Put it on to cook in enough cold water to cover it well, let it come slowly to a boil, and then boil steadily until done. As the water evaporates or boils away, replenish it with more boiling water. When the bacon can be easily pierced with a fork in the thickest part, it is sufficiently cooked. Save the fat, it will be useful in frying; and if greens are to be cooked, leave enough in the water to season them.

Canned Roast Beef Soup.

One pound (one-half can) of roast beef.
One pint of cold water.
Salt and pepper to taste.

Cut the beef into small pieces and add it to the cold water. Let the whole come to a boil and then simmer gently for half an hour. Skim off the fat and strain, taking care to express all the meat juice and gelatin from the meat. Season with salt and pepper to taste. A little beef extract, when added to the above, improves the value and palatability of this soup. A tablespoonful of hard bread, powdered, may be added if rice and other grains are not available.

Canned Roast Beef Stew.

Two pounds of canned roast beef.
Six small potatoes.
One onion.
Salt and pepper to taste.

Wash, peel, and slice the vegetables. Cover them with sufficient boiling salted water. Put them on to boil, and when nearly done add the roast beef, well cut up. Season to taste with pepper and salt, and let the whole simmer ten or fifteen minutes before serving. If potatoes are not to be had, hard bread, crumbled and softened in boiling water, may be used with the meat. Canned tomatoes, in varying proportions, make a good addition to the stew, as already described. In the absence of any other vegetables, they may be added to the meat in the proportion of pound for pound.

Canned Roast Beef Hash.

Two pounds of canned roast beef.
Six boiled potatoes, small.
One onion.
Pepper and salt to taste.

Chop up the meat and vegetables thoroughly. Mix well. Season with pepper and salt and brown in a hot dish or frying pan, previously greased

with pork or bacon, in an oven or over the fire. When potatoes cannot be obtained, a very good hash may be made by the use of softened hard bread or boiled rice in their place.

Canned Salt Beef Stew.

Cut up the contents of a two-pound can. Cover with cold water and bring to the boiling point. Then add vegetables as directed for roast-beef stew. Season with pepper, but add no salt. Stew for three-quarters of an hour.

Canned Salt Beef Hash.

Two pounds (one can) of salt beef.
One cup of hard-bread crumbs.
One onion.
Bacon fat or beef fat (about the size of an egg).
Water, or soup stock.
Pepper and salt.

Chop up the beef. Add the bacon fat or beef fat, and add sufficient water or soup stock to moisten the whole. Season with pepper and a very little salt. Parboil the onion, chop it up, and add it to the mixture. Put into a frying pan or mess plate and brown on both sides. If desired, the onion may be fried before adding it to the hash.

Rice Pudding.

Two tablespoonfuls of rice.
One tablespoonful of sugar.
One pint of fresh milk.
Nutmeg or cinnamon as flavoring.

Wash the rice and cover with the milk, previously sweetened and flavored. Set in a moderately hot oven. Stir every fifteen minutes during the first hour and then once at the expiration of the next half-hour. Bake two hours and until the brown top forms. This gives a creamy, slightly brown pudding.

Baked Bean Soup.

Take cold baked beans, add twice as much water as beans, and let them simmer till soft. When done, add half as much canned tomatoes and strain. If too thick add more water. Season to taste with salt and pepper.

Pea-Meal Soup.

One-half pound of salt pork or bacon.
One and one-half pints of water.
Two tablespoonfuls of pea-meal.

Boil the bacon or pork in the water. When the meat is nearly cooked, add the pea-meal and let simmer until the meat is thoroughly done. Skim

off the fat, season with pepper and serve. Canned salt meat can also be used to make pea soup, but does not require so long to prepare, as the meat is already cooked. Season with pepper and very little salt. Serve hot.

Fried Pea-Meal Mush.

One pint of water.
One teaspoonful of salt.
Four tablespoonfuls of pea meal.

Add the pea-meal to the salted water. Boil for twenty minutes. Cool by pouring out into a plate or mess tin. Slice and fry quickly in hot bacon-fat (for convalescents).

Tomato Soup.

To one can of tomatoes add an equal quantity of water and let simmer for half an hour. Mix one tablespoonful of flour with an equal quantity of beef dripping or bacon fat. Add it to the tomatoes. Season with pepper and salt. If very acid, a teaspoonful of sugar may be added to disguise the acidity. Boiled rice or hard-bread crumbs make a very good addition to tomato soup. Serve hot.

Stewed Tomatoes with Hard Bread.

To each can of tomatoes add half an onion chopped fine, salt and pepper to taste, and if tomatoes are very acid, enough sugar to counteract the acidity. Cover, and stew for three-quarters of an hour. Hard-bread crumbs are added to thicken to the consistency desired.

Baked Tomatoes with Hard Bread.

Mix enough hard-bread crumbs with the canned tomatoes to absorb the greater portion of the juice; season with salt, pepper, and thin slices of bacon laid on top, and bake from three-quarters of an hour to an hour. Onions, either raw or fried, may be chopped up and added to the seasoning.

APPROXIMATE MEASURES.

Four teaspoonfuls of liquid are equal to one tablespoonful.

Three teaspoonfuls of solid material, as sugar or arrowroot, are equal to one tablespoonful.

One tablespoon contains one-half a fluid ounce.

One coffee cup, quartermaster's, contains ten fluid ounces.

One coffee cup, usual size, contains eight fluid ounces.

One glass tumbler, usual size, contains eight fluid ounces.

Two coffee cups, or glass tumblers, usual size, are equal to one pint.

One tin cup, soldier's field mess outfit, contains one and one-half pints.

PART VI.

MATERIA MEDICA AND THERAPEUTICS, AND PHARMACY.

CHAPTER I.

MATERIA MEDICA AND THERAPEUTICS.

Materia medica treats of the materials or drugs used in medicine; their origin, composition, physical and chemical properties, and their action.

Therapeutics is the art of applying the articles of the materia medica to the cure of disease.

Pharmacy is the art of preparing drugs and dispensing them.

MATERIA MEDICA.

Drugs or medicines are derived from the animal, vegetable, and mineral kingdoms.

The *active principles* of drugs are those constituents which are *active* in producing the effects of the drug; morphine, for example, is the active principle of opium.

Among active principles are *alkaloids* and *neutral principles*.

Alkaloids are usually very insoluble in water, but combine with acids to form soluble salts; they have powerful medicinal effects; their Latin names end in *ina* and their English names in *ine:* morphine, atropine, and quinine are some of the alkaloids of the supply table.

Neutral principles are neutral in character; they are distinguished by having their Latin names ending in *inum* and English names ending in *in*. Among neutral principles of the supply table is santonin.

Organic acids are found in organic substances. Examples: acetic acid, citric acid.

Mineral acids are obtained from the mineral kingdom. Examples:

sulphuric acid, hydrochloric acid. They neutralize alkalies and when concentrated act as caustics.

Alkalies or ant-acids neutralize acids and in some forms act as caustics. Examples: bicarbonate of soda, potassa.

Fixed oils are non-volatile, and are decomposed by boiling with water and an alkali, the resulting products being soap and glycerin. Examples: olive oil, castor oil.

Volatile or essential oils exist in plants from which they are extracted by distillation with water; they evaporate when exposed to the air and have penetrating aromatic odors. Examples: oil of cloves, oil of peppermint.

Medicines are sometimes classified according to their most noticeable effects, thus:

Anodynes are remedies which relieve pain. Examples: opium, acetphenetidin.

Anesthetics are agents which temporarily destroy sensation; they are subdivided into *General Anesthetics* and *Local Anesthetics*.

General anesthetics are volatile substances which, when inhaled, destroy consciousness and sensation. Examples: ether, chloroform.

Local anesthetics act directly upon the nerves of the part with which they are brought in contact, destroying sensation temporarily. Examples: cocaine, phenol.

Anthelmintics are agents used to expel worms from the intestines. Example: calomel.

Antidotes are remedies against poisons; thus alcohol is an antidote for phenol.

Antipyretics are agents which reduce fever. Examples: quinine, antipyrin.

Antiseptics are substances which prevent or retard septic decomposition by destroying or arresting the development of the bacteria of sepsis.

Astringents, of which alum is an example, are substances which cause a constriction of the tissues.

Carminatives are agents which cause the expulsion of gas; the essential oils are carminatives.

Cathartics, purgatives, and laxatives are medicines which increase the action of the bowels; rochelle salts is an example.

Diaphoretics are agents which increase the secretion of sweat. Dover's powder is a diaphoretic.

Disinfectants are substances which destroy the specific germs which infect people with disease. Phenol and corrosive sublimate are disinfectants.

Diuretics increase the flow of urine. Example: sweet spirits of niter.

Emetics cause vomiting. Ipecac and apomorphine are emetics.

Expectorants are agents which aid expectoration. Ammonium chloride is an expectorant.

Hypnotics produce sleep. Trional and chloral are hypnotics.

Narcotics are agents which produce stupor. Example: opium.

Styptics are substances which arrest bleeding. Alum is a styptic.

Certain drugs affect the skin, urine, or feces in a way that should be known to those charged with their administration:

Drugs which may produce an eruption on the skin: Arsenic, acetanilid, antipyrin, belladonna, bromides, chloral, copaiba, iodides, opium, acetphenetidin, quinine, salicylic acid, turpentine.

Drugs which color the feces: Iron—black; bismuth—slate color or black; calomel—green.

Drugs which color the urine: Carbolic acid—dark green; rhubarb—yellow; santonin—saffron color if the urine is acid, purplish-red if alkaline.

Drugs which have a tendency to become liquid on exposure to air, by the absorption of moisture, are said to be *deliquescent* or *hygroscopic*, while those which lose their water of crystallization and become dry and powdery are called *efflorescent.*

ADMINISTRATION OF MEDICINES.

Medicines are given by the mouth and stomach, by the rectum, by the skin, blood-vessels, and subcutaneous cellular tissues.

By the mouth and stomach is the method ordinarily employed. Medicines which are irritating to the stomach should be given well diluted and after meals.

The rectum is sometimes employed for the administration of medicines when the stomach will not retain them.

Remedies are injected into the veins direct only in case of great emergency.

The administration of drugs by the subcutaneous cellular tissue is called the *hypodermic method;* it is employed when prompt action is desired. Alkaloids like morphine and strychnine are especially suitable for this method, and large quantities of normal salt solution are frequently so employed.

Substances are also introduced into the circulation by simply rubbing them into the unbroken skin. Fats and oils and remedies incorporated with them are often used in this way. Syphilis is frequently treated by inunctions of mercurial ointment.

DOSAGE.

Doses are only relative and cannot be represented in exact figures, since they are subject to so many influencing circumstances. The principal of these are age, size and weight, habit, idiosyncrasy, interval between doses, time of administration, condition of stomach or (if externally applied) of skin, disease, climate, method of administration. form of drug used, etc.

Dosage in children: Doses ordinarily given are those for adults; to compute the suitable quantity for a child, either of the following rules may be made use of:

(1) Young's method: Divide the age by the age + 12; thus, suppose the child is 3 years old $\frac{3}{3+12}=\frac{3}{15}=\frac{1}{5}$: hence we give one-fifth of the adult dose.

(2) Cowling's method: Divide the number of the following birthday by 24; thus, child's age is 3, next birthday is $\frac{4}{24}=\frac{1}{6}$: hence dose is one-sixth that of adult (this gives a slightly smaller dose than does Young's rule).

Children bear *opium* badly, and hence the dose should be proportionately small. Comparatively *large doses* of belladonna, jaborandi, aconite, mercury, arsenic, quinine, and cathartics in general are borne by children.

When given *hypodermically*, the dose of medicines is *two-thirds* of that used by mouth. When given by rectum, it is *four-thirds* of the dose by mouth.

MEDICINES AND MEDICINAL AGENTS OF THE ARMY AND NAVY SUPPLY TABLES.

Acacia (Gum Arabic). A gummy exudation from *Acacia Senegal* and other species of *Acacia*. A glassy-looking substance in fragments; insipid taste, soluble in water, used as a vehicle. The powder is white.

Mucilago Acaciæ (acacia 340; lime water 330; water to 1,000).

Acetanilidum (Acetanilid). A derivative of aniline. A colorless crystalline powder, odorless, with a slightly burning taste, soluble in 179 parts water. Used in neuralgia.

Dose: ¼ Gm.

Acetphenetidinum (Acetphenetidin. Phenacetin). A phenol derivative. White scales or crystalline powder, odorless and tasteless. Soluble in 925 parts of water or 12 parts of alcohol. Antipyretic and antineuralgic. Dose: ½ Gm.

Acidum Aceticum (Acetic Acid). A clear, colorless liquid, having a strong vinegar-like odor and an acid taste.

Acidum Aceticum Dilutum (acetic acid 100; water 500).

Dose: 2 Cc.

Acidum Boricum (Boric Acid). Colorless scales or a light white powder; odorless and slightly bitter. Soluble in 18 parts of water. Used as a mild antiseptic. Dose: ½ Gm.

Acidum Citricum (Citric Acid). Usually prepared from lime or lemon juice. Colorless, odorless, acid-tasting crystals; efflorescent in dry air and deliquescent in moist air; soluble in 0.54 part water.

Dose: ½ Gm.

Acidum Gallicum (Gallic Acid). An organic acid usually prepared from tannic acid. Fawn-colored needles, astringent, slightly acid, permanent. Soluble in 83.7 parts water and 4.14 alcohol.

Used as an astringent. Dose: ½ Gm.

Acidum Hydrochloricum (Hydrochloric Acid). A colorless, fuming liquid which should be kept in glass-stoppered bottles.

Acidum Hydrochloricum Dilutum (Hydrochloric acid 100, water 219). Dose: 1 Cc.

Acidum Hydrocyanicum Dilutum. (Dilute Hydrocyanic Acid; Dilute Prussic Acid). A colorless liquid containing 2 per cent of absolute hydrocyanic acid, and having the odor of bitter almonds. As

it is very poisonous, it should not be tasted except with great caution. Should be kept in dark amber-colored bottles in a cool place.

Dose: 0.1 Cc.

Acidum Nitricum (Nitric Acid). A colorless, fuming liquid; very caustic; should be kept in glass-stoppered bottles.

Acidum Nitricum Dilutum (nitric acid 100, water 580).

Dose: 2 Cc.

Acidum Oxalicum (Oxalic Acid). Colorless crystals, very poisonous. Surgical use, externally only. Fatal results have followed mistaking this substance for sulphate of magnesia, which it resembles. The two may be distinguished by heating a few of the crystals to a red heat on the end of a spatula; oxalic acid will be completely dissipated, while sulphate of magnesia will not. Another distinction lies in the fact that oxalic acid decolorizes solution of permanganate of potash, while sulphate of magnesia does not.

Acidum Phosphoricum Dilutum (Dilute Phosphoric Acid). A colorless, odorless liquid, which should be kept in glass-stoppered bottles. (Phosphoric acid 100, water 750.)

Dose: 2 Cc.

Acidum Salicylicum (Salicylic Acid). An organic acid existing naturally in some plants, but generally prepared from phenol. Light, fine, white needles, or a crystalline powder, with a faint odor and sweetish taste. Soluble in 308 parts water. Used in rheumatic troubles. Dose: $\frac{1}{2}$ Gm.

Acidum Sulphuricum (Sulphuric Acid). A colorless, oily, very corrosive liquid. Should be kept in glass-stoppered bottles.

Acidum Sulphuricum Aromaticum (Aromatic Sulphuric Acid). Sulphuric acid 111, tincture of ginger 50, oil of cinnamon 1, alcohol to 1,000.) Dose: 1 Cc.

Acidum Tannicum (Tannic Acid). An organic acid obtained from nutgalls. A light yellow powder with a faint odor, and strongly astringent taste. Soluble in about 0.34 part of water. Used as an astringent. Dose: $\frac{1}{2}$ Gm.

Acidum Tartaricum (Tartaric Acid). An organic acid occurring in colorless crystals or a white powder; odorless and with an acid taste; soluble in 0.71 part of water.

Dose: $\frac{1}{2}$ Gm.

Aconiti Tinctura (Tincture of Aconite). 10 per cent strength. In the Pharmacopœia of 1890, the strength was 35 per cent. Used to quiet the heart.

Dose: ½ Cc.

Adeps Benzoinatus (Benzoinated Lard). (Benzoin 20, lard 1,000; in warm weather substitute 5 per cent of the lard by an equal quantity of white wax). Used as a basis for ointments.

Adeps Lanæ (Wool-Fat. Lanolin). The purified fat of the wool of sheep, freed from water. A light, yellowish, tenacious, unctuous mass; insoluble in, but miscible with large quantities of water. Used as a basis for ointments.

Adrenalini Hydrochloridum (solution of) (Solution of Adrenalin Chloride.) An active principle obtained from the adrenal glands, dissolved in a normal saline solution in the proportion of 1 to 1,000; ½ per cent of chloretone is usually added to preserve it.

Used locally to control bleeding from the nose and throat.

Æther (Ether). A transparent, colorless liquid, having a characteristic odor and a burning sweetish taste. Its vapor when mixed with air and ignited explodes violently.

Used chiefly as an anesthetic, by inhalation.

Dose internally 1 Cc.

Ætheris Spiritus Compositus (Compound Spirits of Ether. Hoffman's Anodyne). (Ether 325, alcohol 650, ethereal oil 25.)

Used as a stimulant and carminative.

Dose: 4 Cc.

Ætheris Spiritus Nitrosi (Spirits of Nitrous Ether. Sweet Spirits of Niter). A clear, volatile liquid of a pale yellowish tint, fragrant odor and burning taste. Used as a diuretic and carminative.

Dose: 2 Cc.

Æthylis Chloridum (Ethyl Chloride). An extremely volatile liquid kept in hermetically sealed glass tubes.

Used chiefly in the form of a spray as a local anesthetic by virtue of its freezing properties. Also sometimes used as a general anesthetic by inhalation.

Alcohol (Alcohol). A colorless volatile liquid containing about 95 per cent by volume of absolute alcohol. It is obtained by the distillation of grain.

Alcohol, Methyl (Wood Alcohol). A colorless, poisonous liquid of a disagreeable odor obtained in the destructive distillation of wood. It is used as an adulterant in cheap liquors and toilet preparations and as fuel, and when taken internally has caused many deaths.

Aloe (Aloes). The inspissated juice of the leaves of *Aloe vera* and other species of *Aloe*.

Aloes Pulvis (Powdered Aloes). A brownish-yellow powder of bitter taste, used as a laxative.

Dose: ¼ Gm.

Alumen (Alum). The powder is white, with a sweet, astringent taste; soluble in 9 parts water.

Used as an emetic and as an astringent.

Dose: ½ Gm.

Ammoniæ Aqua (Ammonia Water). A 10 per cent aqueous solution of ammonia gas. A colorless, volatile liquid, which deteriorates on keeping; should be kept in glass-stoppered bottles in a cool place.

A powerful stimulant.

Dose: 1 Cc. well diluted.

Ammoniæ Spiritus Aromaticus (Aromatic Spirits of Ammonia). (Ammonium carbonate 34, ammonia water 90, alcohol 700, aromatics q. s., water to 1,000). A yellowish liquid used as a stimulant.

Dose: 2 Cc. well diluted.

Ammonii Bromidum (Ammonium Bromide). Colorless crystals or a white crystalline powder, odorless and of saline taste; soluble in 1.2 parts of water; irritating to the stomach; should be administered in plenty of water.

Used as a sedative. Dose: 1 Gm.

Ammonii Carbonas (Ammonium Carbonate). White, translucent or opaque masses, having a strong odor of ammonia. Only the translucent portions should be dispensed.

Used as a stimulant. Dose: ¼ Gm.

Ammonii Chloridum (Ammonium Chloride). A white, odorless powder, with a cooling taste.

Used as an expectorant.

Dose: ½ Gm.

Amylis Nitris (Amyl Nitrite). A clear, yellow liquid of a pe-

culiar, penetrating odor. A powerful stimulant, used by inhalation only. Dose: 0.2 Cc.

Antimonii et Potassii Tartras (Tartar Emetic). Colorless crystals or a white granular powder; odorless and with a sweetish taste. Soluble in 15.5 parts of water.

Dose: as an expectorant, 5 milligrammes; as an emetic, 30 milligrammes.

Antipyrinum (Antipyrin). A colorless, almost odorless, crystalline powder obtained from coal tar, having a bitter taste; soluble in less than 1 part of water.

Dose: $\frac{1}{4}$ Gm.

Apomorphinæ Hydrochloridum (Apomorphine Hydrochloride). The salt of an alkaloid derived from opium. White crystals acquiring a greenish tint after exposure to light. Used hypodermically as an emetic. Dose: 5 milligrammes.

Aqua Hydrogenii Dioxidi (Solution of Hydrogen Dioxide. Peroxide). (10 per cent by volume.) A colorless, odorless liquid rapidly deteriorating upon exposure. Used chiefly externally to cleanse suppurating wounds.

Argenti Nitras (Silver Nitrate). Colorless crystals, soluble in 0.54 part of water, and decomposed by light.

Used externally principally.

Dose: 10 milligrammes.

Argenti Nitras Fusus (Lunar Caustic). White or gray pencils. External use.

Arseni et Hydrargyri Iodidi Liquor (Solution of Arsenous and Mercuric Iodides). (Donovan's Solution). Used in skin diseases and syphilis. Dose: 1-10 Cc.

Arseni Trioxidum (White Arsenic. The Acidum Arsenosum of 1890). An opaque, white, poisonous powder; odorless and tasteless. Soluble in about 100 parts of water.

Dose: 2 milligrammes.

Asafetida (Asafetida). A gum-resin from the root of *Ferula fœtida* and other species of *Ferula*. Yellowish-white masses.

Dose: $\frac{1}{4}$ Gm.

Aspidii Oleoresinæ (Oleoresin Aspidium). A thick, dark-green liquid, depositing a granular substance on standing; this

granular part should be well mixed with the liquid portion before dispensing. Used especially against tape-worms.

Dose: 2 Gms.

Atropinæ Sulphas (Sulphate of Atropine). The sulphate of an alkaloid obtained from *Atropa Belladonna* and other plants of the same family. A white, odorless, bitter powder; very poisonous.

Used especially to dilate the pupil.

Dose: 0.4 milligramme.

Balsamum Peruvianum (Balsam of Peru). A viscid, dark-brown liquid, of agreeable odor. Used as a wound dressing.

Belladonnæ Foliorum Extractum (Extract of Belladonna Leaves). Used chiefly externally.

Dose: 10 milligrammes.

Benzoini Tinctura Composita (Compound Tincture of Benzoin). Used chiefly by inhalation with the vapor of hot water.

Dose: 4 Cc.

Bismuthi Subgallas (Bismuth Subgallate. Dermatol). An amorphous, yellow powder, insoluble in water, odorless and tasteless; colors the stools black. Used in diarrheal diseases.

Dose: $\frac{1}{4}$ Gm.

Bismuthi Subnitras (Bismuth Subnitrate). A white powder, odorless, tasteless, and insoluble in water. Used in diarrheal diseases. Colors the stools black.

Dose: $\frac{1}{2}$ Gm.

Buchu Fluidextractum (Fluidextract of Buchu). A greenish-black liquid. Used as a diuretic.

Dose: 2 Cc.

Caffeina Citrata (Citrated Caffeine). A white, odorless, bitter powder. Used as a diuretic and heart stimulant.

Dose: $\frac{1}{8}$ Gm.

Calcii Phosphas Præcipitatus (Precipitated Phosphate of Calcium). An amorphous, white powder, insoluble, odorless, tasteless, and permanent. Used chiefly in tuberculosis.

Dose: 1 Gm.

Calx Chlorinata (Chlorinated Lime). A white powder with the odor of chlorine, and decomposing on exposure to air. Used as a disinfectant. Dose: $\frac{1}{4}$ Gm.

Camphora (Camphor). White masses, sparingly soluble in water, but readily soluble in alcohol and in oils. Used principally externally.

Dose: $\frac{1}{8}$ Gm.

Cantharidis Tinctura (Tincture of Cantharides). An alcoholic extract of powdered *Spanish Flies*. Used chiefly externally.

Dose: $\frac{1}{3}$ Cc. well diluted.

Capsici Pulvis (Powdered Capsicum. Red Pepper). A red powder. Dose: 65 milligrammes.

Capsici Tinctura (Tincture of Capsicum). Used chiefly externally. Dose: $\frac{1}{2}$ Cc. well diluted.

Capsici Fluidextractum (Fluidextract of Capsicum). Used in the same manner as the tincture.

Dose: 0.05 Cc.

Cardamomi Tinctura Composita (Compound Tincture of Cardamomum). Used chiefly as a bitter tonic.

Dose: 4 Cc.

Cera Flava (Yellow Wax).

Ceratum Resinæ (Rosin Cerate. Basilicon Ointment.) (Rosin 350, yellow wax 150, lard 500). External use.

Chloralum Hydratum (Hydrated Chloral. Chloral). Colorless, transparent crystals, with an aromatic odor and bitterish taste. Freely soluble in water and alcohol. Used as a hypnotic.

Dose: 1 Gm. dissolved in water or whisky.

Chloroformum (Chloroform). A clear, colorless liquid of characteristic odor and sweetish, burning taste. Should be kept in amber-colored, glass-stoppered bottles in a cool, dark place. Used chiefly as an anesthetic by inhalation. Dose: $\frac{1}{3}$ Cc.

Chromii Trioxidum (Chromium Trioxide. Chromic Acid). Should be kept in glass-stoppered bottles and great care taken not to bring it in contact with organic substances such as cork, sugar, alcohol, etc., as an explosion may result. Needle-shaped crystals of purplish-red color; corrosive, deliquescent, very soluble in water. Used solely as a caustic in crystals or solution.

Chrysarobinum (Chrysarobin). A neutral principle extracted from *goa powder*. An orange-yellow, crystalline powder, odorless, tasteless, and very insoluble. Used externally.

Dose: 30 milligrammes.

Cinchonæ Tinctura Composita (Compound Tincture of Cinchona). Used as a tonic and in malarial diseases.

Dose: 4 Cc.

Cocainæ Hydrochloridum (Cocaine Hydrochloride). A salt of an alkaloid obtained from several species of coca. A colorless, odorless, crystalline powder; soluble in 0.4 part water.

Used chiefly as a local anesthetic.

Dose: 32 milligrammes.

Codeina (Codeine). An alkaloid from opium. A crystalline powder, odorless, with a faintly bitter taste. Used as a sedative.

Dose: 30 milligrammes.

Colchici Seminis Fluidextractum (Fluidextract of Colchicum Seed). Used chiefly in gout.

Dose: $\frac{1}{5}$ Cc. well diluted.

Collodium (Collodion). A colorless, syrupy liquid, with the odor of ether. Used externally only.

Collodium Cantharidatum (Cantharidal Collodion). Cantharides 60, flexible collodion 85, chloroform to 100.

Used externally to blister.

Collodium Flexile (Flexible Collodion). Collodion 930, Canada turpentine 50, castor oil 30.

Copaiba (Copaiba). An oleoresin of a yellowish color, more or less transparent, viscid, having a peculiar aromatic odor.

Used chiefly in gonorrhea.

Dose: 1 Cc.

Creosotal (Creosote Carbonate). Contains 90 per cent creosote. A thick, oily, amber-colored liquid, with but little taste or odor. Insoluble in water; soluble in 95 per cent alcohol and in oils. Use and dose the same as creosote.

Creosotum (Creosote). A mixture of phenols and phenol derivatives obtained by the distillation of wood tar, preferably from the beech. A yellowish, oily liquid having a penetrating, smoky odor and a burning taste.

Used principally in phthisis.

Dose: $\frac{1}{5}$ Cc.

Cresol (Cresol. Tricresol). A mixture of three cresols obtained

from coal tar. A straw-colored liquid, having a phenol-like odor. Soluble in 60 parts of water.

Used externally as a disinfectant.

Dose: 0.05 Cc.

Creta Præparata (Prepared Chalk). A white powder; odorless, tasteless, insoluble, permanent.

Used in diarrheal troubles.

Dose: 1 Gm.

Cubebæ Oleoresina (Oleoresin of Cubeb). Used in gonorrhea.

Dose: ½ Gm.

Cupri Arsenis (Arsenite of Copper).

Dose: 0.65 milligramme.

Cupri Sulphas (Sulphate of Copper). Deep-blue crystals, odorless, efflorescent, soluble in 2.2 parts of water. Used as an astringent.

Dose: 10 milligrammes.

Digitalinum (Digitalin). A glucoside, and active principle of digitalis. Dose: 1 milligramme.

Digitalis Tinctura (Tincture of Digitalis). Used as a heart tonic.

Dose: 1 Cc.

Ergotæ Fluidextractum (Fluidextract of Ergot). Used chiefly to control bleeding. Dose: 2 Cc.

Ergotinum (Ergotin). An unofficial extract of ergot.

Dose: 130 milligrammes.

Eucaine-B. A synthetic preparation closely resembling cocaine, for which it is often used as a substitute in the production of local anesthesia. Dose: 30 milligrammes.

Eucalyptol (Eucalyptol). An oxide from the oil of eucalyptus. A colorless liquid of aromatic odor and pungent taste.

Dose: ½ Cc.

Ferri Chloridi Tinctura (Tincture of Ferric Chloride). A bright, brownish liquid, having an astringent, styptic taste. Injures the the teeth, should be taken through a glass tube and well diluted. Used as a tonic. Dose: ½ Cc.

Ferri et Quininæ Citras Solubilis (Soluble Iron and Quinine Citrate). Thin, greenish, odorless, deliquescent scales; completely soluble in water, partly soluble in alcohol. Used as a tonic.

Dose: ¼ Gm.

Ferri Iodidi Syrupus (Syrup of Ferrous Iodide). A syrupy, pale-green liquid, having a sweet taste. Used as a tonic.

Dose: 1 Cc.

Ferri Pyrophosphas Solubilis (Soluble Ferric Pyrophosphate). Thin, apple-green, odorless scales; decomposed by light; soluble in water, insoluble in alcohol. Used as a tonic.

Dose: $\frac{1}{4}$ Gm.

Ferri Sulphas Exsiccatus (Dried Ferrous Sulphate). A grayish-white powder, slowly but completely soluble in water.

Dose: 125 milligrammes.

Ferrum Reductum (Reduced Iron). A fine, grayish-black powder; odorless, tasteless, insoluble.

Dose: 65 milligrammes.

Gentianæ Tinctura Composita (Compound Tincture of Gentian). Used as a tonic. Dose: 4 Cc.

Glycerinum (Glycerin). A liquid obtained by the decomposition of fats or fixed oils; clear, colorless, odorless, sweet. Used externally. Dose: 4 Cc.

Glycerilis Nitratis Tabellæ (Nitroglycerin Tablets). Heart stimulant.

Dose: One tablet containing 0.65 milligramme.

Glycyrrhizæ Extractum Purum (*Pulvis*). (Pure Extract of Licorice). A brown powder used for flavoring.

Glycyrrhizæ Mistura Composita (Compound Licorice Mixture. Brown Mixture). Contains paregoric, wine of antimony, sweet spirits of niter, licorice, gum arabic, syrup and water. Eight Cc. contains about 1 Cc. of paregoric and $\frac{1}{2}$ Cc. of sweet spirits of niter. Used as cough mixture.

Dose: 8 Cc.

Glycyrrhizæ Pulvis Compositus (Compound Licorice Powder). Contains senna, sulphur, licorice, oil of fennel, and sugar; about $\frac{3}{4}$ Gm. of senna and $\frac{1}{3}$ Gm. of sulphur in each 4 Gms. Used as a laxative.

Dose: 4 Gms.

Guaiaci Tinctura Ammoniata (Ammoniated Tincture of Guaiac). Used especially in tonsillitis.

Dose: 2 Cc.

Guaiacolis Carbonas (Guaiacol Carbonate). One of the chief

constituents of creosote. A white powder, almost tasteless and odorless; insoluble in water. Used in tuberculosis.

Dose: 1 Gm.

Hamamelidis Foliorum Fluidextractum (Fluidextract of Hamamelis Leaves. Witch Hazel). Used chiefly externally.

Dose: 2 Cc.

Heroini Hydrochloridum (Heroin Hydrochloride). A morphine derivative. Used chiefly to control cough. A white powder, soluble in water.

Dose: 5 milligrammes.

Hexamethylenamina (Hexamethylenamine. Urotropin). Colorless, odorless crystals; soluble in 1.5 parts of water and 10 parts alcohol. Used as a urinary disinfectant.

Dose: $\frac{1}{4}$ Gm.

Homatropinæ Hydrobromidum (Homatropine Hydrobromide). An artificial alkaloid derived from atropine. Used to dilate the pupil. Soluble in 10 parts of water.

Hydrargyri Chloridum Corrosivum (Corrosive Chloride of Mercury. Corrosive Sublimate). Colorless, odorless, permanent crystals, soluble in 13 parts of water, 3 parts of alcohol. Used as an antiseptic and in syphilis.

Dose: 3 milligrammes, dissolved in abundance of water.

Hydrargyri Chloridum Mite (Mild Mercurous Chloride. Calomel). A white powder, insoluble, odorless, tasteless, permanent. Used as a laxative and in syphilis.

Dose: 65–125 milligrammes.

Hydrargyri Iodidum Flavum (Yellow Mercurous Iodide). A bright yellow powder, odorless, tasteless, insoluble; decomposed by exposure to air. Used in syphilis.

Dose: 10 milligrammes.

Hydrargyri Massa (Mass of Mercury. Blue Mass). A blue mass. Used as a laxative and in syphilis.

Dose: $\frac{1}{4}$ Gm.

Hydrargyri Nitratis Unguentum (Ointment of Mercuric Nitrate. Citrine Ointment). A bright yellow ointment. Used externally.

Hydrargyri Oleatum (Oleate of Mercury). A thick, yellowish liquid. Used externally.

Hydrargyri Unguentum (Mercurial Ointment. Blue Ointment). A blue ointment. Used externally in syphilis.

Hydrastis Fluidextractum (Fluidextract of Hydrastis). Used in coughs. Dose: 2 Cc.

Hyoscinæ Hydrobromidum (Hyoscine Hydrobromide). The salt of an alkaloid obtained from hyoscyamus or henbane. Colorless, odorless crystals; soluble in 1.5 parts of water. Used as a sedative. Dose: $\frac{1}{2}$ milligramme.

Hyoscyami Extractum (Extract of Hyoscyamus). Used as a sedative. Dose: 65 milligrammes.

Ichthyolum (Ihcthyol). A black, tarry substance, obtained from bituminous oil and containing about 15 per cent of sulphur. Used externally in skin diseases.

Iodoformum (Iodoform). A yellow powder with a peculiar, penetrating odor. Very insoluble in water. Used externally as a mild antiseptic.

Iodum (Iodine). Bluish-black crystals. Very insoluble in water; soluble in 10 parts alcohol. Used to make the tincture.

Ipecacuanhæ Pulvis (Powdered Ipecac). A yellowish powder. Used as an emetic. Dose as an emetic: 1 Gm.

Ipecacuanhæ et Opii Pulvis (Powder of Ipecac and Opium. Dover's Powder). (Powdered ipecac 10, powdered opium 10, sugar of milk 80). A yellowish-white powder. Used as a diaphoretic. Dose: $\frac{1}{2}$ Gm.

Ipecacuanhæ Fluidextractum (Fluidextract of Ipecac). Dose: 0.05 Cc.

Liquor Formaldehydi (Solution of Formaldehyde. Formalin). A solution containing 37 per cent of formaldehyde. A clear, colorless liquid having a very pungent odor. Used as a disinfectant by vaporization.

Lithii Carbonas (Lithium Carbonate). A white, odorless powder; permanent; soluble in 75 parts of water. Used in gouty troubles. Dose: $\frac{1}{2}$ Gm.

Lithii Citras (Lithium Citrate). A white, deliquescent powder, odorless and having a cooling, alkaline taste; soluble in about 2 parts of water; insoluble in alcohol. Uses and doses same as carbonate.

Lycopodium (Lycopodium). A very light, pale-yellow powder. Used as a drying powder in pill boxes.

Magnesii Carbonas (Magnesium Carbonate.) A white, insoluble, permanent powder. Used in acidity of the stomach.

Dose: 3 Gm.

Magnesii Oxidum (Magnesium Oxide. Magnesia). A white, bulky powder, odorless, and having an earthy taste. Almost insoluble in water. Used chiefly as an antidote to arsenic.

Dose: 2 Gm.

Magnesii Sulphas (Magnesium Sulphate. Epsom Salt). Small, colorless needles, odorless, efflorescent; soluble in 0.85 part of water. Used as a laxative. Dose: 15 Gm.

Menthol (Menthol). An alcohol obtained from oil of peppermint. Colorless crystals having an odor of peppermint. Only slightly soluble in water; freely soluble in alcohol. Used externally.

Morphinæ Sulphas (Sulphate of Morphine). The salt of an alkaloid obtained from opium. White, feathery crystals; odorless, permanent, and bitter. Soluble in 15.3 parts of water. Sometimes mistaken for quinine, which it closely resembles, with fatal results. May be distinguished by the action of nitric acid, which with morphine gives an orange-red color fading to yellow, and with quinine does not give the color reaction. Used to relieve pain.

Dose: 15 milligrammes.

Myrrhæ Tinctura (Tincture of Myrrh). Used chiefly in mouth washes. Dose: 1 Cc.

Nucis Vomicæ Tinctura (Tincture of Nux Vomica). Used as a tonic. Dose: ½ Cc.

Nucis Vomicæ Extractum (Extract of Nux Vomica). Used as a tonic. Dose: 15 milligrammes.

Oleum Caryophylli (Oil of Cloves). A pale-yellow, volatile oil, distilled from cloves. Dose: 0.2 Cc.

Oleum Gaultheriæ (Oil of Wintergreen). A volatile oil distilled from wintergreen leaves. Used in rheumatism.

Dose: 1 Cc.

Oleum Gossypii Seminis (Cottonseed Oil). A fixed oil expressed from cottonseed.

Oleum Menthæ Piperitæ (Oil of Peppermint). A volatile oil dis-

tilled from the leaves and flowers of peppermint. Used chiefly for flavoring. Dose: 0.2 Cc.

Oleum Morrhuæ (Cod-liver Oil). A fixed oil expressed from fresh livers of codfish. Used chiefly in tuberculosis.

Dose: 15 Cc.

Oleum Ricini (Castor Oil). A fixed oil expressed from castor beans. Used as a laxative; acts in 4 to 6 hours.

Dose: 15 Cc.

Oleum Santali (Oil of Santal). A volatile oil distilled from sandal wood. Used in gonorrhea.

Dose: 1 Cc.

Oleum Theobromatis (Oil of Theobroma. Cacao Butter). A fixed oil expressed from the roasted cacao seeds. A yellowish-white solid. Used chiefly as a basis for suppositories.

Oleum Tiglii (Croton Oil). A fixed oil expressed from the seeds of *Croton Tiglium.* A pale-yellow, viscid liquid, having an acrid, burning taste. Used as a powerful cathartic; acts in 1 to 2 hours.

Dose: 0.05 Cc.

Opii Tinctura (Tincture of Opium. Laudanum). Used to relieve pain and control diarrhea.

Dose: ½ Cc.

Opii Tinctura Camphorata (Camphorated Tincture of Opium. Paregoric). Contains opium, benzoic acid, camphor, and oil of anise, each 4, glycerin 40, alcohol 950.

Dose: 8 Cc.

Opii Pulvis (Powdered Opium). A brownish powder.

Dose: 65 milligrammes.

Pancreatinum (Pancreatin). A mixture of the digestive ferments of the pancreas. A cream-colored powder used to aid digestion. Dose: ½ Gm.

Pepsinum (Pepsin). A digestive ferment obtained from the hog's stomach. Yellowish scales or a white powder.

Dose: ¼ Gm.

Peptonizing Tablets. Contain pancreatin and bicarbonate of soda. One tablet is sufficient for 250 Cc. of milk.

Petrolatum (*Vaseline*). A petroleum product. Used externally as a basis for ointments.

Petrolatum Liquidum (Liquid Petrolatum. Liquid Vaseline). A yellowish, oily liquid, used externally, chiefly in sprays for the nose and throat.

Phenol (Carbolic Acid). Obtained by distillation from coal tar or prepared synthetically. A white crystalline mass sometimes acquiring a reddish tint. Soluble in 19.6 parts of water and liquefying in the presence of 13.6 per cent of water. In poisonous doses colors the urine dark green. Used chiefly as an antiseptic.

Dose: 65 milligrammes.

Phenylis Salicylas (Phenyl Salicylate. Salol). A white powder having a faint aromatic odor and a slight taste. Soluble in 2,333 parts of water. Used as an intestinal antiseptic.

Dose: ½ Gm.

Physostigminæ Sulphas (Sulphate of Physostigmine). A salt of an alkaloid obtained from physostigma or calabar bean. A yellow powder, deliquescent, odorless. Used in the eye.

Dose: 1 milligramme.

Pilocarpinæ Hydrochloridum (Pilocarpine Hydrochloride). A salt of an alkaloid obtained from pilocarpus or jaborandi. Used as a diaphoretic. Dose: 10 milligrammes.

Pilulæ Catharticæ Compositæ (Compound Cathartic Pills). Contain calomel, colocynth, jalap, and gamboge. Each pill contains 60 milligrammes of calomel.

Plumbi Acetas (Lead Acetate. Sugar of Lead). Colorless crystals; efflorescent, soluble in 2 parts of water; having a sweetish taste. Used as an astringent.

Dose: 65 milligrammes.

Podophylli Resina (Resin of Podophyllum). A grayish-white powder of peculiar odor and bitter taste. Used as a laxative; acts slowly in 6 to 12 hours.

Dose: 5 to 15 milligrammes.

Potassii Acetas (Potassium Acetate). A white, very deliquescent powder, soluble in 0.4 part of water. Used as a diuretic.

Dose: 2 Gm.

Potassii Arsenitis Liquor (Solution of Potassium Arsenite. Fowler's Solution). Used in malarial and skin diseases.

Dose: 0.2 Cc. well diluted.

Potassii Bicarbonas (Potassium Bicarbonate). A colorless, granular, permanent powder. Used in rheumatism.

Dose: 2 Gm.

Potassii Bromidum (Potassium Bromide). Colorless crystals, odorless, permanent; soluble in 1.5 parts of water; should be administered dissolved in plenty of water.

Dose: 1 Gm.

Potassii Chloras (Potassium Chlorate). Colorless plates or a white granular powder; odorless, permanent, soluble in 16 parts of water. Handle with care, as dangerous explosions are liable to follow trituration with organic substances like sugar, or oxidizable substances such as sulphur. Dose: $\frac{1}{4}$ Gm.

Potassii et Sodii Tartras (Potassium and Sodium Tartrate. Rochelle Salt). A white, odorless powder, soluble in about 1.2 parts of water. Used as a laxative. Dose: 8 Gm.

Potassii Hydroxidum (Potassium Hydroxide. Potassa). Fused, white masses; odorless, acrid tasting, deliquescent, caustic. Not used internally.

Potassii Iodidum (Potassium Iodide). A white, granular powder; deliquescent; soluble in 0.7 part of water; irritant to the stomach and should be given dissolved in plenty of water. Used especially in syphilis. Dose: $\frac{1}{2}$ Gm.

Potassii Permanganas (Potassium Permanganate). Slender dark-purple prisms, permanent, soluble in about 15 parts of water. Used chiefly externally as a skin disinfectant.

Dose: 65 milligrammes.

Protargol. A protein silver compound containing 8.3 per cent of silver, and non-irritating in character. A yellow powder soluble in water. Used externally in inflammation of mucous membranes. 1 to 5 per cent solutions.

Pruni Virginianæ Fluidextractum (Fluidextract of Prunus Virginianæ or Wild Cherry). Used in cough mixtures.

Dose: 2 Cc.

Quininæ Bisulphas (Quinine Bisulphate). A salt of an alkaloid from cinchona bark. White efflorescent crystals; odorless and bitter; soluble in 8.5 parts of water. Used in malaria, especially for hypodermic purposes. Dose: $\frac{1}{4}$ Gm.

Quininæ Sulphas (Quinine Sulphate). Has the same qualities as the bisulphate, but less soluble in water, 1:720. Used in malaria.

Dose: 1-10 to 1 Gm.

Rhamni Purshianæ Fluidextractum (Fluidextract of Cascara Sagrada). Used as a laxative; acts as such in 8 to 10 hours.

Dose: 1 Cc.

Rhamni Purshianæ Pillulæ (Cascara Pills). Each contains 130 milligrammes of extract of cascara.

Dose: 1 to 2 pills.

Rhei Pulvis (Powdered Rhubarb Root). An orange-yellow powder. Used as a laxative.

Dose: 1 Gm.

Saccharum Lactis (Sugar of Milk). A white powder from the whey of cows' milk.

Salophen (Salophen). A white powder containing about 50.9 parts salicylic acid. Almost insoluble in water. Used in rheumatism. Dose: ½ Gm.

Santoninum (Santonin). Obtained from Santonica flowers. Colorless crystals turning yellow on exposure to light, odorless, nearly tasteless, insoluble, permanent; colors the urine a greenish yellow or reddish purple.

Sapo Mollis (Soft Soap). A soft, unctuous, yellowish-brown mass. Used externally.

Scillæ Syrupus (Syrup of Squill). Used in cough mixtures.

Dose: 2 Cc.

Serum Antidiphthericum (Diphtheria Antitoxin). A fluid separated from the blood of a horse immunized through the inoculation of diphtheria toxin. Should be kept in sealed glass containers in a dark, cool place. A yellowish, transparent or slightly turbid liquid. It gradually loses its power.

Dose, hypodermically: 3,000 units. Immunizing dose: 500 units.

Sinapis Nigra Pulvis (Powdered Black Mustard).

Sodii Bicarbonas (Sodium Bicarbonate). A white, odorless powder, having an alkaline taste; soluble in 12 parts of water.

Dose: 1 Gm.

Sodii Boras Pulvis (Powdered Borax). A white, odorless, ef-

florescent powder, having a sweetish taste, soluble in 20.4 parts of water. Used as an astringent.

Dose: ½ Gm.

Sodii Bromidum (Sodium Bromide). A white, granular powder, odorless; soluble in 1.7 parts of water. Used as a sedative.

Dose: 1 Gm. well diluted with water.

Sodii Carbonas Exsiccatus (Dried Sodium Carbonate). A white, odorless powder having a strongly alkaline taste and absorbs moisture readily; soluble in 2.9 parts of water.

Dose: ¼ Gm.

Sodii Phosphas Exsiccatus (Dried Phosphate of Sodium). A white, hygroscopic powder. Used as a laxative.

Dose: 1 Gm.

Sodii Salicylas (Sodium Salicylate). White scales, or a colorless powder with a faint pink tinge; odorless and having a sweetish taste; soluble in about 0.8 part of water. Irritating to the stomach and should be dissolved in an abundance of water. Used in rheumatism. Dose: 1 Gm.

Sodii Thiosulphas (Sodium Thiosulphate. Hyposulphite). Colorless crystals, odorless and having a cooling taste; soluble in 0.35 part of water. Used chiefly externally in parasitic diseases of the skin. Dose: 1 Gm.

Spiritus Vini Gallici (Brandy).

Strophanthi Tinctura (Tincture of Strophanthus). Used as a heart tonic. Dose: ½ Cc.

Strychninæ Sulphas (Strychnine Sulphate). The salt of an alkaloid obtained from Nux Vomica. Colorless, efflorescent crystals, or a white powder, odorless, intensely bitter. Soluble in 31 parts of water. Dose: 1 milligramme.

Sulphonethylmethanum (Trional). Colorless, odorless scales, with a bitter taste; soluble in 195 parts of cold water, more readily in hot water. Used as a hypnotic.

Dose: 1 Gm.

Sulphonmethanum (Sulphonal). Colorless, inodorous and nearly tasteless crystals; soluble in 360 parts of cold or 15 parts of boiling water. Used as a hypnotic.

Dose: 1 Gm.

Sulphur Lotum (Washed Sulphur). A fine, yellow powder, odorless, tasteless, and insoluble. Used as a laxative.

Dose: 4 Gm.

Syrupus Hypophosphitum Compositus (Compound Syrup of Hypophosphites). Contains the hypophosphites of calcium, potassium, sodium, iron, magnesium; also quinine, strychnine, citrate of soda, and dilute hypophosphorous acid. Used as a tonic.

Dose: 8 Cc.

Terebenum (Terebene). Obtained by the action of sulphuric acid on oil of turpentine. A thin, colorless liquid with an agreeable odor; becomes resinified on exposure to air and light. Used as an expectorant. Dose: ½ Cc.

Thymol (Thymol). A phenol occurring in the oil of thyme. Colorless crystals having an aromatic odor and taste. Soluble in 1,100 parts of water, freely soluble in alcohol and in oils.

Dose: 125 milligrammes.

Tolutanum Balsamum (Balsam of Tolu). A yellowish-brown solid, readily soluble in alcohol, nearly insoluble in water.

Dose: 1 Gm.

Trinitrophenol (Picric Acid). Light yellow scales. Used chiefly externally for burns. The solution employed is 5 parts picric acid and 75 parts alcohol in 1,000 parts of water.

Valerianæ Fluidextractum (Fluidextract of Valerian). Used as a sedative. Dose: 2 Cc.

Vinum Xericum (Sherry Wine).

Zinci Oxidum (Zinc Oxide). A fine, white powder, insoluble, odorless, and tasteless. Used externally in ointments.

Dose: ¼ Gm.

Zinci Phenolsulphonas (Zinc Phenolsulphate. Sulpho-carbolate of Zinc). Colorless, odorless, efflorescent crystals; readily soluble in water or alcohol. Used chiefly as a local application.

Dose: 125 milligrammes.

Zinci Sulphas (Zinc Sulphate). Colorless, efflorescent crystals, odorless and having an astringent, metallic taste; soluble in 0.53 part of water. Used externally and as an emetic.

Dose as an emetic: 1 Gm.

Zingiberis Fluidextractum (Fluidextract of Ginger).

Dose: 1 Cc.

CHAPTER II.

PHARMACY.

Pharmacy is the art of preparing medicines for administration.

Official Pharmacy deals with the processes and preparations of the Pharmacopœia.

Extemporaneous Pharmacy describes the methods of preparing and dispensing physicians' prescriptions.

A *Pharmacopœia* is an *official list* of drugs and their preparation recognized by the medical profession of a certain country; such drugs and methods are known as *official*.

A *Dispensatory* is a private treatise on official and other drugs.

PHARMACEUTICAL OPERATIONS.

(Official Pharmacy).

Decantation is the pouring off of a liquid from the sediment.

Filtration is the process of straining through some material, such as filter paper, so as to separate the liquid from the solid particles.

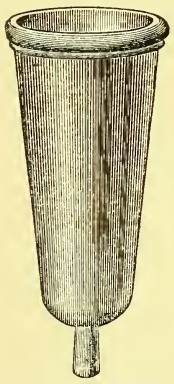

FIG. 204.—Percolator.

Maceration or Steeping is one of the processes of extracting the soluble principles of drugs by breaking them up and placing them in the *menstruum*, generally alcohol, for a certain length of time.

Percolation or Displacement is another process for obtaining soluble constituents from drugs by placing the powder in a vessel called a *percolator* and allowing the *menstruum or solvent* slowly to descend through it. The liquid coming from the percolator is called the *percolate* (Fig. 204).

Solution is the dissolving of a solid or gaseous substance in a liquid. The principal solvents are water, alcohol, glycerin, acids, and oils.

Trituration is the process of breaking a solid into powder by rubbing in a mortar with an inert gritty powder.

OFFICIAL PREPARATIONS.

Liquid:

Aqueous: Waters, solutions, infusions, decoctions, syrups, mucilages, emulsions, and mixtures.

Alcoholic: Fluidextracts, tinctures, spirits, elixirs.

Ethereal: Oleoresins, collodions.

Oily: Liniments, oleates.

Glycerins: Glycerites.

Solids:

Extracts, pills, suppositories, plasters, resins, powders, ointments, papers, masses, troches, cerates.

Aquæ, waters, are solutions of volatile substances in water. They do not keep well and should be freshly prepared.

Cerata, cerates, are ointments made stiff with wax.

Chartæ, papers, are medicated papers such as mustard paper.

Collodia, collodions, have as their basis a solution of gun-cotton in alcohol and ether.

Decocta, decoctions, are made by boiling vegetable substances in water; little used.

Elixiria, elixirs, are sweetened, aromatic, alcoholic preparations, serving as a pleasant vehicle for medicines.

Emplastra, plasters, are solid compounds, usually spread on muslin, and for external use. Example: Belladonna plaster.

Emulsa, emulsions, are suspensions of insoluble oily or resinous substances in water by means of some other substance, such as gum arabic or the yolk of egg known as the *excipient.*

Extracta, extracts, are semisolid preparations obtained by evaporating watery or alcoholic solutions of the active principles of drugs.

Fluidextracta, fluidextracts, are permanent, concentrated solutions (usually alcoholic) of vegetable drugs of such strength that 1 Cc. of the fluidextract represents 1 Gm. of the drug.

Glycerita, glycerites, are mixtures of medicinal substances with glycerin.

Infusa, infusions, are prepared by treating vegetable substances with hot or cold, but not boiling water.

Linimenta, liniments, are solutions or mixtures of various substances in alcoholic or oily liquids, and intended for external use, with rubbing.

Liquores, solutions, are solutions of non-volatile substances in water.

Misturæ, mixtures, are suspensions of insoluble substances in water by the aid of some viscid body.

Oleoresinæ, oleoresins, are liquid preparations consisting principally of natural oils and resins extracted by ether.

Pilulæ, pills, are spherical masses to be swallowed whole. They consist of the active ingredients and the *excipient*, the latter being the substance used to make the mass adhesive and plastic. Glycerin and acacia are excipients.

Spiritus, spirits, are alcoholic solutions of volatile substances.

Suppositoria, suppositories, are solid bodies containing drugs usually incorporated with cacao butter and intended for use in the vagina, rectum, or urethra.

Syrupi, syrups, are concentrated solutions of sugar in water with or without medicinal substances.

Tabellæ, tablets, consist of powdered drugs compressed into disc shape by machinery. They are extensively used in the field supply table because they are convenient for transportation and for accurate dosage without weights or measures. Their disadvantages are that they are so firmly compressed that if swallowed whole many of them pass through the gastro-intestinal tract unchanged, and that therefore they must be first reduced to a powder before being taken. Others are very irritating to the stomach and should be dissolved freely in water before being administered.

Tincturæ, tinctures, are solutions of non-volatile substances in alcohol. Tincture of iodine is an exception, iodine being a volatile substance. Potent tinctures are of 10 per cent strength and other tinctures usually 20 per cent.

Trochisci, troches or lozenges, are small cakes of medicines incorporated with a mass which usually has sugar for a basis. They are used by allowing them to dissolve slowly in the mouth.

Unguenta, ointments, are soft, fatty mixtures of medicinal agents usually with a basis of lard and wax or petrolatum.

Among the preparations which are most often made in the dispensary are emulsions, pills, ointments, powders, and suppositories; it is, therefore, necessary to consider these operations a little more in detail.

Emulsions. Milk and yolk of egg are natural emulsions, the fat in each case being divided into minute globules which are surrounded with a film of albumen or casein by which they are suspended in water; the artificial emulsions are imitations of those existing in nature.

The most commonly used excipients are acacia and yolk of eggs (vitellus), but emulsions made with the latter must be used within a few days, as they do not keep well.

FIG. 205.—Wedgewood Mortar and Pestle.

The method of preparing an emulsion which experience has shown to be the best is as follows: Add the oil, resin, etc., to a proper quantity of the excipient and mix both thoroughly in a mortar (Fig. 205). Then add enough water to equal one-half the weight of the previous mixture, and triturate the whole rapidly and unceasingly until the emulsion is homogeneous and of a whitish color. Next add the remainder of the water slowly, with continual stirring; finally incorporating the other ingredients, if any.

Pills. Pills should not exceed five grains in weight unless composed of a heavy substance such as calomel. The ingredients should be weighed out separately, commencing with that of which the smallest quantity is ordered, and thoroughly rubbed up in a mortar; the excipient is then added and the rubbing continued until the mass is of the proper consistence and does not show any particles of any one ingredient. If the mass sticks to the pestle it is removed with a spatula (Fig. 206) and may be kneaded a few minutes in the fingers. It should then be placed upon the pill tile, which has been previously dusted with a little lycopodium, and rolled into a long cylinder by the aid of a broad spatula until the mass is oi a length corresponding to the division on the tile scale which represents the number of pills to be made.

FIG. 206.—Spatula.

The mass should then be placed along the scale and a cut made

through it with the spatula at each division, the pieces being at once rounded separately into pills by the thumb and the two fingers of each hand. A pill machine may be used for the division of the portions (Fig. 207).

The pills are then left to dry while the label is being written, after

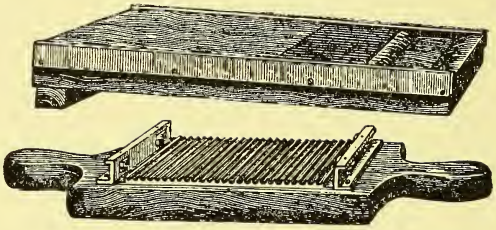

Fig. 207.—Pill Machine.

which they are placed in a pill box with a little lycopodium to prevent their sticking together.

The excipient to be used is usually left to the discretion of the compounder. Some substances such as the softer extracts and gum resins need no excipient, but may be made at once into pills.

Among the more generally used excipients are:

Glycerin: Valuable on account of its property of attracting moisture and thus preventing the pills getting too hard.

Syrup: Should not be used for metallic salts, especially calomel, which it reduces in a short time.

Mucilage of Acacia: For vegetable powders not adhesive.

Water: For vegetable powders containing mucilage.

Alcohol: For resinous substances.

Soap: Best for resinous and fatty substances and essential oils.

Ointments: Ointments are usually prepared by rubbing the ingredients together in a mortar, or thoroughly incorporating them on a pill-tile with the aid of a firm spatula. When resins or waxes are to be incorporated with fats, or medicines are used which are soluble in warm fats, melting is used. When extracts, powders, or gritty substances are ordered, the ingredients should first be finely powdered, then rubbed with a small quantity of the basis into a smooth, impalpable paste, the

remainder of the basis being added gradually until the whole is thoroughly incorporated.

Soluble salts should be triturated with a little water before adding the basis. Camphor needs a little alcohol to enable it to be pulverized. Volatile substances should be added last to allow of as little evaporation as possible.

Powders: Substances which are insoluble and too bulky to be prescribed in pills are often ordered in the form of powder. The ingredients are to be thoroughly mixed and accurately divided. The mixing is usually done in a mortar unless it is explosive, but may be effected on a pill-tile with the aid of a spatula. Substances such as alkaloids are very active and when employed in small doses require some inert substance to give them bulk sufficient for division and handling; sugar of milk is usually employed for the purpose. The active ingredient is placed in the mortar first and thoroughly mixed with a small quantity of the diluent, the addition being gradually continued.

Powders are dispensed in bulk when the dose is large, or in papers, *chartulas*, when the dose is small.

Hygroscopic and effervescent powders should be dispensed in waxed paper, others in ordinary white paper. The paper should be cut to fit the powder and folded to fit the box. It should be the rule to weigh out separately each dose of the active ingredients.

Suppositories: Rectal and vaginal suppositories usually have cacao butter as a basis, while glycerinated gelatin is commonly employed for the urethra. *Rectal suppositories* are cone-shaped and weigh from one to two grammes. *Urethral suppositories* are pencil-shaped, and either seven centimeters in length, weighing two grammes, or fourteen centimeters in length, weighing four grammes. *Vaginal suppositories* should be globular or egg-shaped and weigh about four grammes.

Cacao butter suppositories are prepared by reducing the medicine to a powder or softening it, and then rubbing it up in a mortar with an equal quantity of the finely grated excipient until a smooth paste is formed, after which the remainder of the excipient is slowly added. A little castor-oil or glycerin may be added to make the mass more plastic. Next roll the mass on a graduated tile until a cylinder of the proper length is formed, divide this into the required number of equal parts,

and with a spatula form them into the desired shape. Cacao butter suppositories may also be prepared by melting the ingredients together and molding them.

Gelatin urethral suppositories are prepared by dissolving or thoroughly mixing the medicine with a little water and sufficient glycerin to make the weight of the mixture one-half that of the finished product. Then carefully incorporate it with an equal weight of melted glycerinated gelatin, and pour it at once into suitable molds which have been greased with a small quantity of petrolatum. Cool the molds before removing the suppositories.

WEIGHTS AND MEASURES.

The *metric* or *decimal system* is prescribed for use in the medical department of the army. The name *metric* is derived from one of the units of the system, the *meter* or unit of length, which is the forty-millionth part of the earth's circumference around the poles.

The unit of capacity is the *liter*, which is equal to 1,000 cubic centimeters. The unit of weight is the *gramme*, which is the weight of one cubic centimeter of water at its maximum density. The prefixes which indicate multiplication are Deka (10), Hecto (100), and Kilo (1,000), while division is indicated by Deci (1-10), Centi (1-100), and Milli (1-1000).

The system resembles the United States money system, which is also decimal; in the latter the dollar is the unit, and there are mills (1-1000), cents (1-100), dimes (1-10), and eagles (10); like the money system too, only a few of the terms are used in pharmacy; thus we use cubic centimeters (Cc.), kilogrammes (Kilo), gramme (Gm.), and milligramme (Mgm.); also the term $\frac{1}{2}$ gramme and $\frac{1}{4}$ gramme may be employed. Fractional parts of a dollar may be written in several ways, thus: $0.50, 50 cents, and 500 mills, all mean the same thing, and so do grammes 0.50, 50 centigrammes, and 500 milligrammes; but while we use cents as applied to fractional parts of a dollar, we usually employ mills as applied to fractional parts of a gramme.

TABLES OF EQUIVALENTS.

Length.

Meters.	Inches.
1	39.37
0.1	3.93
0.01	.39

Capacity.

Liters.	Fluidounces.	Minims.
1	33.81	
0.01 (Cc.)		15

Weight.

Grammes.	Grains.	
1	15.43	(15½ approximately).
0.1	1.54	(1½ approximately).
0.01	.15	(⅙ approximately).
0.001	.015	($\frac{1}{65}$ approximately).

Domestic Measures.

1 teaspoonful = approximately 5 Cc.
1 dessertspoonful = approximately 10 Cc.
1 tablespoonful = approximately 15 Cc.

To convert metric weights and measures into those in ordinary use, and *vice versa*, multiply by the corresponding equivalents.

To convert:

Meters into inches, multiply by 39.370.

Example:

39.370
5

5 meters ..... 196.850 inches.

TABLE OF EQUIVALENTS.—*Continued.*

Liters into fluidounces, multiply by 33.815.

Example:

33.815
5

5 liters ..... 169.075 fluidounces.

Grammes into grains, multiply by 15.432.

Example:

15.432
5

5 Grammes ..... 77.160 grains.

Inches into centimeters, multiply by 2.539.

Example:

2.539
5

5 inches ..... 12.695 centimeters.

Fluidounces into cubic centimeters, multiply by 29.572.

Example:

29.572
5

5 fluidounces ..... 147.860 cubic centimeters.

Grains into grammes, multiply by 0.064.

Example:

0.064
5

5 grains ..... 0.320 gramme.

FILLING PRESCRIPTIONS.

(Extemporaneous Pharmacy).

This includes a variety of operations, and requires a knowledge of the meaning of the Latin words and abbreviations ordinarily used in prescription writing, as well as great care and accuracy in the various steps required.

Compounding means the preparation of the various drugs ordered, while *dispensing* includes putting them up and issuing them.

The prescription is usually written on a blank form furnished for the purpose. After the station, date, and name of the person prescribed for occurs the symbol "℞" meaning *Recipe: Take* of the drugs or preparations enumerated; after the list of drugs is usually placed "M," meaning *Misce* or mix, or other directions to the pharmacist; then follows the letter "S," *Signa* or label, and the directions to the patient.

Some of the abbreviations used are:

Ad lib., at pleasure.
Ana, āā., of each.
Bis in die, b. i. d., twice daily.
Numero, in number.
Octarius, O., a pint.
Pro re nata, as required.
Quantum sufficiat, q. s., as much as necessary.
Ter in die, t. i. d., three times a day.

To fill a prescription, first read it over carefully until it is thoroughly understood, then number it, and write the label; next measure out the ingredients, checking each one off to prevent duplication, compound them as directed, and dispense. Poisonous prescriptions should be plainly labeled *Poison*. The prescription should then be filed in the prescription book.

Prescriptions should not be refilled without an order from a medical officer in each case; the date refilled should be noted on the prescription and on the label.

INCOMPATIBILITY.

Incompatibility of drugs means unfitness for combination in the same prescription. Incompatibility may be chemical, pharmaceutical, or therapeutical.

In *chemical incompatibility* a chemical reaction takes place resulting in the formation of precipitates, explosives, or poisonous compounds. Combination of cinchona preparations with salts of iron forms an inky mixture; of nitric acid with glycerin an explosive substance; of dilute hydrocyanic acid with calomel a virulent poison.

In *pharmaceutical incompatibility* no chemical action takes place, but precipitation and an unsightly mixture often results; the addition of aqueous solutions to resinous tinctures illustrates this principle.

Therapeutical incompatibility arises when two agents which oppose each other in their action on the system are prescribed together, such, for example, as morphine and atropine. It is always to be borne in mind, however, that chemically or therapeutically incompatible drugs are often prescribed together intentionally to serve a definite purpose.

PART VII.

HYGIENE. POST AND CAMP SANITATION.

CHAPTER I.

WATER.

The amount of water needed by the average man daily for drinking purposes varies according to the amount of exercise he takes and the temperature of the atmosphere; a fair average is three or four pints in addition to that which he takes in food. On the march the amount is limited by the capacity of the canteen to about one quart, and this quantity should be very carefully husbanded.

The total daily allowance in the field is usually calculated at about two gallons per man; four and one-half quarts for drinking and cooking, two and one-half for washing, and one quart for wastage.

Waters are usualy divided into two classes; *surface waters* and *ground waters*. The former include rain, river, lake, and pond waters, and the latter well and deep spring waters.

A water is said to be *potable* when it is fit to drink. A potable water is an uncontaminated water; no matter how clear, bright, and sparkling a water may be, it is not potable if it is so situated that it can be fouled by fecal matter, urine, or the drainage from manured lands. There is a very common error that all spring water is pure; many springs, especially those which are not constantly flowing, draw their water from surface sources.

Water from *deep wells* is usually safe; from *shallow wells* suspicious. Whether a well is to be considered a deep or shallow well depends upon whether or not it passes through an impervious layer of rock or clay so that surface drainage cannot get into it; if it passes through such a layer it is a deep well; if it does not it is a shallow well.

Though *rain water* is originally pure, *cistern water* may be very impure; the impurities come from the washings of the roof from which

it is collected, from dust blown into it, and if it is an underground cistern, there may be a crack through which surface drainage may enter.

Hard water is water that will not lather well with soap; the hardness is due to lime salts and may be partially removed by boiling; well water, especially deep well water, is usually hard.

Ice has the same impurities as the water from which it is made; therefore natural ice is often impure. Ice made from distilled water is usually very pure.

Water may be purified in three ways: by chemical treatment, by boiling or distillation, and by filtration. The first two methods are usually applied to limited supplies, while the last is applicable on a large scale.

Chemical treatment: The simplest form of chemical treatment is the use of *alum*, about a third of a gramme to the gallon, thoroughly stirred in the water, which is then allowed to settle. The alum causes a bulky precipitate, which in falling carries down with it most of the suspended matter, including the bacteria.

The British use *permanganate of potash*, just enough being added to the water to give a slight pink tinge at the end of twenty-four hours.

Chlorine is a valuable sterilizer for water and tablets have been devised for the use of the individual soldier in sterilizing his drinking water in the field, these tablets being of such a nature as to set free the necessary amount of chlorine in a fixed quantity of water, and to neutralize any excess so as to prevent a disagreeable taste.

Ozone is now being successfully used in the chemical sterilization of water on a large scale, the ozone being generated by electricity.

Boiling is the method most applicable in the field. Five minutes' active boiling is sufficient to destroy all the bacteria of water-borne diseases; it does not, however, clear water nor remove dissolved organic matter.

As it removes the gases of water it becomes flat to the taste, and must be aerated before use, but this is easily accomplished by shaking it up, or pouring from one vessel to another. To make the water palatable it must also be cooled.

The Forbes water sterilizer which has been adopted for the use of our troops in the field fulfills all these indications and when properly

used delivers a safe, palatable drinking water only about 5° F. warmer than the water delivered to the apparatus.

The principle, action, and construction of the Forbes water sterilizer is given as follows by its inventor:

First. A source of water supply having a maintained level below that required for causing the water to pass entirely through the apparatus.

Second. The application of heat to a part of the water in the apparatus at the point reached by gravity until ebullition is produced, thereby causing the water to rise and pass on through the remainder of the apparatus.

Third. The transference of the heat from the hot water passing from to the cold water passing to the point where the heat is applied.

In order to illustrate easily the action of this principle, reference

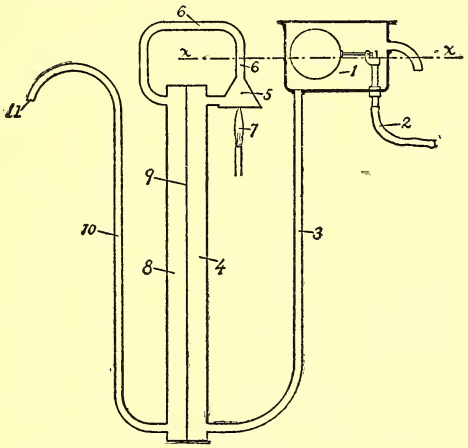

FIG. 208.—Diagram of Forbes Water Sterilizer.

should be made to the accompanying diagrammatic drawing (Fig. 208), 1, showing a water tank with a pipe, 2, through which water enters and is allowed to fill the tank up to the water level *x* and no higher, as it is restrained by the float-operated valve shown in the tank. The water to be treated passes from the tank 1 down through the pipe 3 into the compartment 4 of the heat exchange. Rising in the compartment 4, the water enters the heater 5 and rises in the pipe 6 to the level *x*. Heat is applied to the heater 5 by means of a flame 7, which causes the water

to boil over through the pipe 6 into the top of the compartment 8 of the heat exchange. When this compartment has been filled, the water runs off through the orifice 11 of the pipe 10. While passing down through the compartment 8 the heat of the water, which is boiling hot, is transferred, by conduction, through the partition or diaphragm 9, to the cold water passing up through the other compartment 4; so that the water which has been raised to boiling passes out of the apparatus

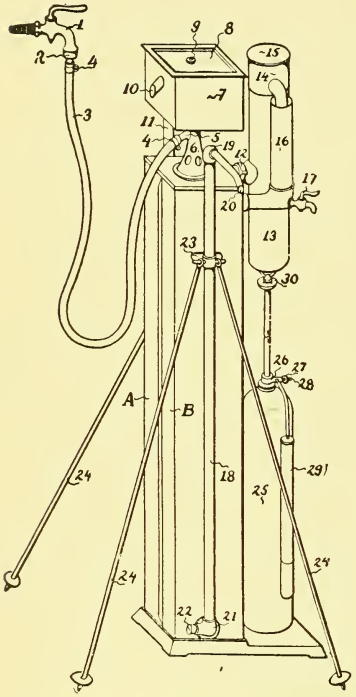

FIG. 209.—Forbes Sterilizer for Field Use.

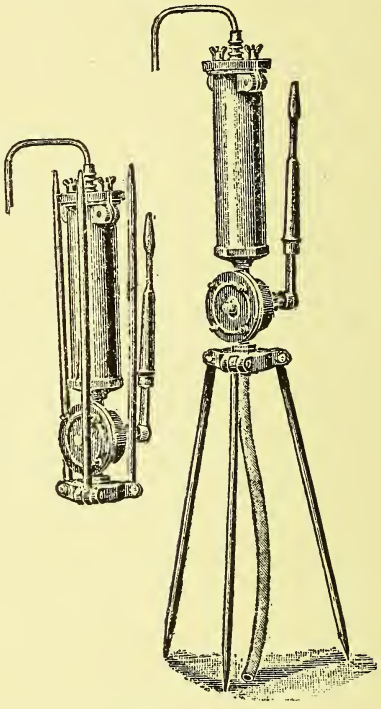

FIG. 210.—Berkefeld Filter.

nearly as cold as that entering the apparatus, while the entering cold water becomes heated as it passes toward the heater and reaches the latter in a very hot condition and nearly at the boiling point. Therefore the only heat to be applied is that necessary to bring the already heated water to the boiling point, and to cause it to rise above the normal level *x*, boil over through the pipe 6, and so pass on through the remainder of the apparatus to the discharge outlet 11. It will be observed that but little fuel is required to operate this apparatus for the

reason that the heat is conserved and used over and over again, whereas by the ordinary process of boiling water and allowing it to cool off, all the heat which is required for raising the temperature of the water to the boiling point is thrown away. For example, if water is discharged from a Forbes apparatus 5 degrees higher than on entering the apparatus, but five units of heat are lost for every pound of water treated; whereas by the ordinary method, assuming the water to have an original temperature of 62° F., it must be raised to 212° F. to reach the boiling point, and each pound of water treated, therefore, must have 150 units of heat put into it, all this being lost in cooling. It is apparent, therefore, that the Forbes system is 30 times more economical in fuel.

The latest type of Forbes sterilizer specially designed for field service is shown in Fig. 209.

Distillation is an efficient process for sterilizing water, but if the water is taken from a very polluted source offensive gases may pass over in sufficient quantity to cause a disagreeable taste and perhaps diarrhea.

Filtration in the military service cannot be depended upon except on a large scale as in post plants. Individual or barrack filters, while they clear the water, are liable to increase rather than diminish the number of bacteria. Unless such filters are in perfect condition and frequently sterilized the bacteria grow into the substance of the filter, which finally becomes a culture medium.

Two types of filters are provided by the medical department for special purposes, the Berkefeld and the Maignen. The essential feature of the *Berkefeld filter* (Fig. 210) is a hollow tube of infusorial earth enclosed in a tight metal jacket with a space between; the water is pumped into this space and forced through the earthen tube. The tubes should be removed and cleaned with a stiff brush whenever there is much sediment on them, and must be boiled from time to time. The *Maignen filter* is merely a strainer; it does not remove many disease germs. The filtering part consists of a central core of felted asbestos, surrounded by a layer of modified charcoal, and this by an asbestos bag; the core is placed in a can of water and the filtered water is conducted by siphonage from its interior to another can on the ground (Fig. 211).

Improvised filters intended only to clear muddy water are readily prepared. The simplest form is that so common in tropical countries, a small hole being dug in the sand near the edge of a stream, the water

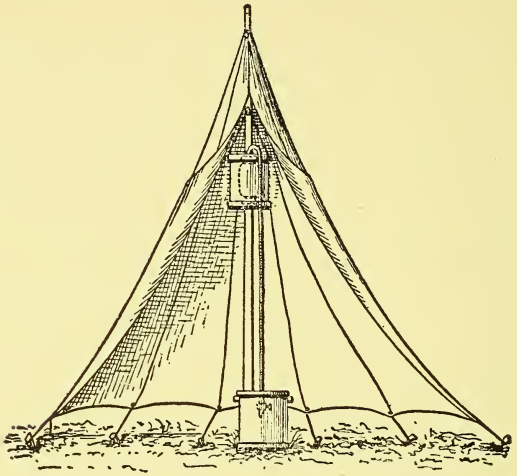

FIG. 211.—Maignen Filter in Operation.

filtering through the intermediate sand or being caught on its way to the stream.

Another simple method is to take two barrels of different sizes, bore holes in the bottom of the larger and near the top of the smaller, place the smaller barrel inside the larger, fill in the intervening space

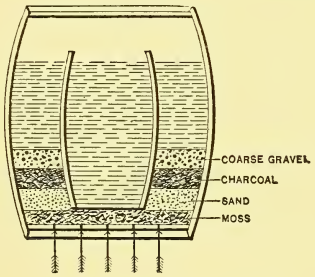

FIG. 212.—Improvised Filter.

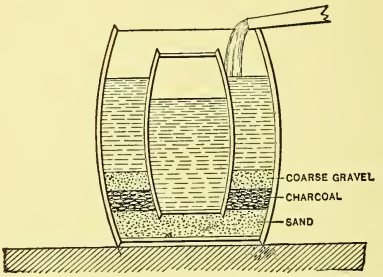

FIG. 213.—Improvised Filter.

with sand and sink both in the water (Fig. 212). Or the larger barrel may be left intact, holes being bored in the bottom of the smaller, and the water being poured in on the sand between the barrels (Fig. 213).

Sand used for such purposes should always be washed and if possible sterilized before use, and this process should be frequently repeated during use.

Impure water may cause disease in several ways. Hard water or water containing mineral salts often causes diarrhea, constipation, or indigestion in those unaccustomed to its use. Decomposing vegetable or animal matter in water or the presence of living algæ may also cause diarrhea and indigestion, but the great danger in the use of polluted water is the liability to swallow the germs of certain special diseases, notably typhoid fever, cholera, and dysentery. Great epidemics have been traced directly to the use of water fouled by the discharges from patients afflicted with those diseases.

A great many intestinal parasites, round worms, pin worms, etc., are also carried by impure water.

Hospital corps men should know how to take *samples of water* for analysis. For chemical analysis not less than a half of a gallon is necessary; for bacteriological test about 200 cubic centimeters are required. Samples should be collected in perfectly clean glass bottles stoppered with glass or clean new cork; if for bacteriological purposes, the bottle must be sterilized. If taken from a tap, water enough must be allowed to waste to empty the branch pipes; if from a pump the barrel must be emptied; if from a pond the sample must be taken from below the surface and at some distance from shore.

CHAPTER II.

AIR AND VENTILATION.

As we have already seen, air is a mixture of oxygen, nitrogen, carbonic acid, and watery vapor. Oxygen is the element that supports all animal life; it is being constantly withdrawn from the air in the processes of respiration and combustion, and returned to it, combined with carbon, as carbonic acid. Vegetable life takes up the carbonic acid and decomposes it, retaining the carbon and returning the free oxygen to the air, so that the equilibrium is maintained.

Watery vapor is a normal constituent of air and the higher the temperature of the air the more it is capable of holding; when it will hold no more the air is said to be *saturated*. If air so saturated meets with a cooler stratum the excess of moisture is precipitated as *rain or dew*. *Humidity* refers to the amount of watery vapor in air; *relative humidity* is the degree of approach to saturation at any given temperature, while *absolute humidity* is the actual weight of the moisture in a given quantity of air.

The impurities of air with which we have to deal in dwellings are dust and bacteria, organic matter, and undue proportion of carbonic acid. The organic matters are particles of epithelium and the volatile products from the lungs and skin, from unclean mouths, noses, and the intestinal tract; in hospitals there are also pus cells from suppurating wounds, and the bacteria of infectious diseases. The effects of overcrowding and vitiated air are well known; immediately they are headache, dizziness, and loss of appetite; when long continued, there is loss of bodily vigor and diminished resistance to disease.

Besides these indirect effects of vitiated air many diseases are directly caused by the inhalation of bacteria from the air; among the most important air-borne diseases are tuberculosis, pneumonia, erysipelas, and the eruptive fevers.

The pollution of air in dwellings is caused not only by the exhala-

tions from the human body, but also by the products of combustion in heating and lighting. It is estimated that an ordinary five-foot gas burner when in use adds to the air of the apartment fully as much carbonic acid, besides other impurities, as one man.

The process by which the vitiated air of dwellings is removed and replaced or diluted by fresh air is known as *ventilation.*

For the maintenance of the human body in a fair degree of health and vigor it has been found that about three thousand cubic feet of fresh air per hour must be supplied each person. The size of the air space which must be provided for each person depends upon the possibility of supplying this amount of air without causing draughts; if the entering air is warm, draughts of course are not felt so much as if it is cold.

As a matter of experience it has been found that even when warmed the air of a room under the most favorable circumstances cannot be changed more than five times an hour without causing a sensation of draught; so that the *minimum cubic air space per man* should be at least six hundred feet, which with five changes per hour will give the necessary three thousand cubic feet of fresh air. In computing the cubic air space in a room we multiply the length by the breadth and then by the height of the room, or by twelve if the height is greater than twelve feet. The reason we do not ordinarily count height above twelve feet is because above that height there is very little movement of the air in the room unless there are special arrangements for its change.

The floor space, therefore, should be not less than one-twelfth of the cubic space.

In hospitals, owing to the additional impurities from the sick, four thousand cubic feet of fresh air per man per hour should be allowed; the floor space should not be less than one hundred square feet and the cubic space not less than twelve hundred feet.

The agencies concerned in ventilation are diffusion, and gravity or weight. *Diffusion* is not of much value and cannot be relied upon alone; the important agent is gravity. Equal volumes of air of the same temperature and under the same pressure have equal weights; now if one of the volumes is heated it expands and becomes lighter, and being surrounded by heavier air, rises, or rather is forced up, by the sinking of the heavier air, and thus currents are produced. When the

air in a room is heated by fire, lights, or even the human body, it becomes lighter, and the heavier outside air forces itself in through all the openings and crevices, at the same time forcing the lighter air out, thus effecting a certain amount of ventilation.

Unequal temperatures in masses of air outside dwellings give rise to winds, and winds aid ventilation in two ways: First by *perflation*, or blowing through a room when the windows are open, and second, by *aspiration* when it blows across chimneys or flues.

Ventilation of a dwelling is said to be either *natural* or *mechanical;* natural when we trust to the forces of nature, merely providing the necessary entrance and exit openings, together with heat if required; mechanical when the air is forced in or drawn out by fans or other mechanical means.

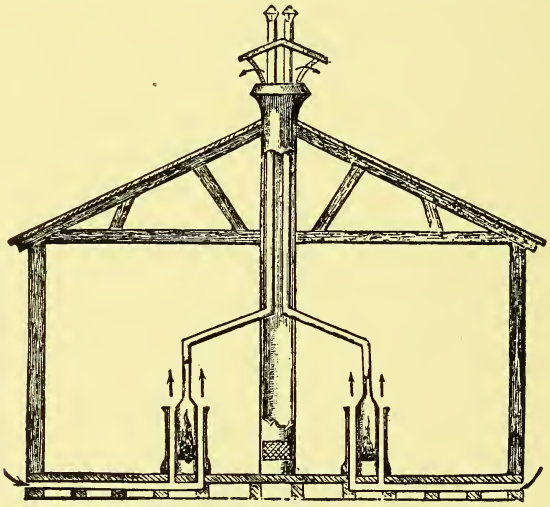

FIG. 214.—Heating and Ventilation by Jacketed Stove.

In any system it is necessary to remember that it requires two openings to secure ventilation; if only one opening is provided, the incoming and outgoing currents interfere with each other and ventilation fails. This is well illustrated by the familiar experiment of burning a candle inside of an unstoppered bottle; if the opening into the bottle is divided into two parts by a partition, the candle will burn, because the air currents pass up one side of the partition and down the other without interference; if the partition is removed the light goes out.

Ventilation in summer or in hot climates is largely a matter of the action of winds, because the temperature of inside and outside air is practically the same, so that we merely leave doors and windows open, and provide special openings in the ridge or under the eaves for the escape of the heated air in the upper parts of the building. Or fans are provided to keep the air in motion; and such devices as the punkah or electric fans.

In winter the subject of ventilation is so intimately connected with that of heating that it is well to consider the latter before going into details of the arrangements for ventilation.

In the military service the methods for heating are practically confined to stoves and furnaces in the older buildings, hot water in the new hospitals, and steam in the new barracks.

Stoves are of very little value in assisting ventilation unless special arrangements are made with that end in view. This may be done by partially surrounding the stove from the floor to the level of the top of the stove by a sheet-iron jacket, and admitting fresh air under the stove from an air-shaft; if in addition to this the stove pipe is made to heat an extracting shaft, opening preferably at the floor level, ventilation may be very materially assisted (Fig. 214). Heating stoves in use should always have a pan of water on them to maintain the proper moisture of the air.

Furnaces are very valuable ventilators; fresh air is brought to the dome of the furnace by an air shaft, heated, and delivered, where required, through tin tubes.

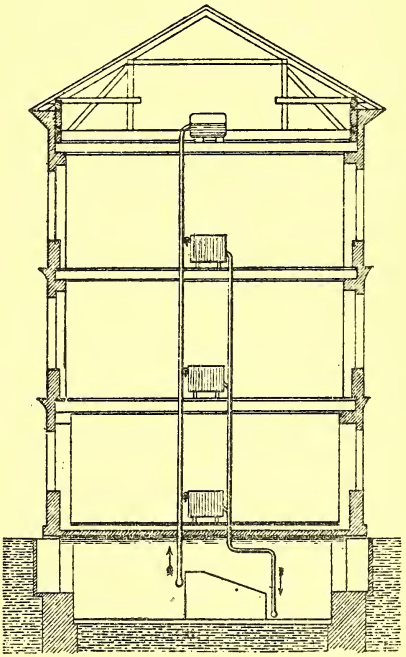

FIG. 215.—Heating by Hot Water. Low pressure.

In hot-water heating there are two systems, *low pressure* and *high pressure*. In the *low-pressure* system, which is that used in the army

hospitals, a small, open tank is provided at the highest point of the system to allow for expansion and the escape of gases. The circulation of the water is due to the difference in weight of the columns of hot and cold water. The water is heated in a boiler in the basement; from the top of the boiler rises a *main*, with branches to all parts of the building; these branches terminate in *radiators*, and from the bottom of each radiator a *branch return* comes off, the branch returns uniting to form a *main return*, which empties into the lower part of the boiler. As the water in the boiler becomes heated it grows lighter, and the heavier water in the returns falls and forces up the hot water, thus effecting a *circulation* (Fig. 215).

In the *high-pressure* system the pipes are completely closed; hence

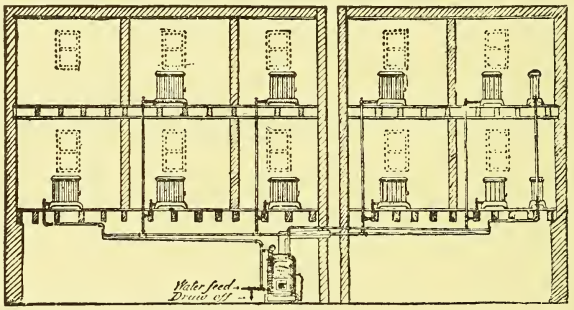

FIG. 216.—Heating by Steam. Low pressure.

there is some danger of explosion, but the water can be made hotter, and circulation is more rapid.

Steam heating is the same in principle as the low-pressure hot-water heating, only steam is used instead of water, and the pipes constitute a closed system (Fig. 216).

Radiators heated by either steam or hot water may be placed in the room to be heated without any connection with the outside air; this is known as the *direct system;* or they may be placed in the basement or some other room, enclosed in a sheet-iron box connected with a fresh-air shaft, the warm air being then conducted to the room, the *indirect system;* or the radiator may be placed in the room to be heated and the fresh air brought directly in under it and allowed to pass up between the

pipes so as to be warmed, the *direct-indirect system;* the last is that commonly used in hospitals and barracks (Fig. 217).

When no special arrangements have been made for ventilation a useful and simple device is to place a strip of board under the lower

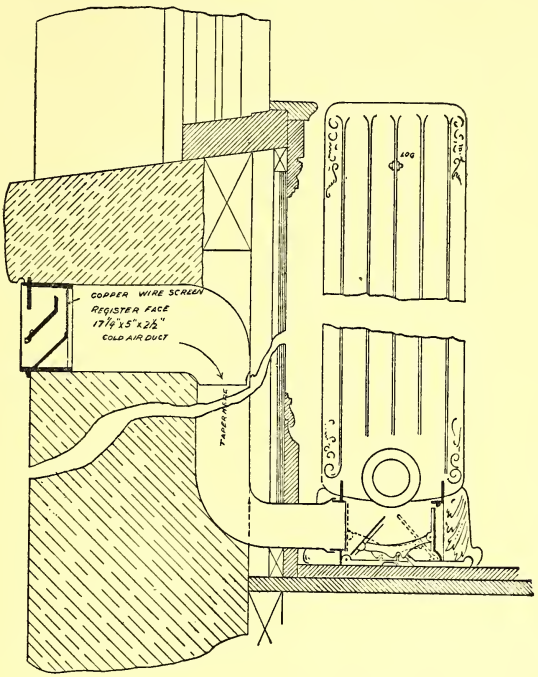

FIG. 217.—Heating by Direct-Indirect Method.

sash, so that air can enter between the sashes and be directed upward (Fig. 82); or to pull down the upper sash and place a board sloping down over the opening left above (Fig. 83); air will enter between the sashes and escape above.

The best simple test of the efficiency of ventilation is to notice the odor on coming into the room from the outside air; if it is stuffy and close, ventilation is imperfect.

CHAPTER III.

THE DISPOSAL OF WASTES.

THE organic, dangerous wastes which it is necessary to dispose of in such a manner as not to invite disease are *night-soil* (urine and feces), *slops*, and *garbage;* the first is by far the most dangerous, containing, as it often does, the bacteria of disease. The arrangements for the reception of the night-soil may be pits, pans, or water-closets.

Pits are the most objectionable because they pollute the soil, may infect the water supply, and permit the access of flies, which may carry disease germs on their feet and bodies from the pits to the kitchens and barracks and there infect the food and drink.

Pans, usually used in connection with dry earth to cover and deodorize the feces, are little better than pits. They are open to the same objections, except that soil pollution from accidental spilling is not so marked; in addition they have to be emptied, thus affording another opportunity for scattering infection and creating a nuisance.

Water-closets are best. They may discharge into cess-pools, or into sewers. *Cess-pools* are excavations in the ground which may or may not have a waterproof lining; if they do not have such a lining they are known as *leaching cess-pools*. Cess-pools are objectionable for the same reason as pits and pans.

Sewers are the pipes or channels which carry off the liquid wastes; the wastes themselves are known as *sewage*.

Water-closets and all plumbing fixtures in dwellings empty through short branches into a vertical iron pipe known as the *soil pipe*, and this in the basement empties into a more or less horizontal iron pipe called the *house drain*, and finally the house drain beyond the walls of the house terminates in the *sewer*. The arrangement of the house drainage system is well shown in Fig. 218.

Traps are used on all fixtures, and these traps are usually *vented* to prevent siphonage. The purpose of the trap is to supply a water seal

to prevent sewer gas from getting into the dwelling; the three-quarter S-trap is the type (Fig. 219). The *flask trap* used by the Quartermaster's Department for lavatories and sinks is practically the same as an S-trap in its interior arrangement. In yards and basements where the flow of water is intermittent a particular type of trap known as the *bell trap* is generally employed (Fig. 220); the objection to this trap is that in order to be efficient both the cover and the water seal must be in place, while as a matter of fact the one is often misplaced and the

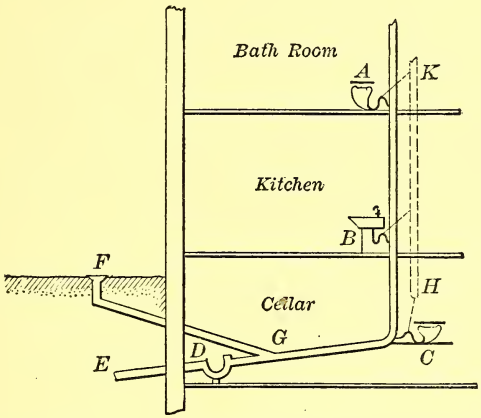

FIG. 218.—House Drainage. *A*, *B*, *C*, Plumbing fixtures; *D*, disconnecting trap; *E*, branch sewer; *F*, ventilation opening; *G*, house drain; *K*, *H*, vent pipes connected by dotted lines with each trap.

other soon lost by evaporation. The Quartermaster's Department has recently adopted for this purpose a much better type of trap, as shown in Fig. 221.

Sewage is disposed of by discharging into cess-pools, into running streams, upon sewage farms, and by the septic tank system.

The purpose of the *septic tank system*, which is now being used in the army to a considerable extent, is to liquefy and purify the sewage so that it may not unduly pollute the stream into which it is discharged. It consists essentially of two parts, a closed tank in which the bacteria which work in the absence of air liquefy the organic solid matters, and a series of filter beds in which the nitrifying or air-using bacteria continue the purification until the sewage should emerge as a clear, colorless liquid like water.

Garbage is best disposed of by burning in a crematory which is usually in operation in all the larger posts.

In the field the disposal of wastes, especially excreta, becomes a matter of the greatest importance and considerable difficulty.

Abundant experience has proven that whenever large bodies of

FIG. 219.—Different Forms of Traps. *A*, Running trap; *B*, S-trap; *C*, ¾ S-trap; *D*, ½ S-trap.

soldiers are collected together typhoid fever is sure to be introduced by some one, and that, unless proper disposal is made of excreta, it will spread through the agency of infected water, food, bedding, clothing, soil, dust, or flies.

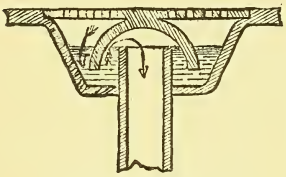

FIG. 220.—Bell Trap.

With marching commands moving every day the only practicable method of disposal is by pits; under such conditions the pits should not be more than two feet deep, one for each battalion or smaller command, and on the basis of one running foot for each five men.

The method of constructing sinks is shown in Fig. 222. They should be dug immediately on reaching camp to prevent fouling of the camp area by those whose necessities will not permit of delay. They should be located on the opposite side of the camp from the kitchens and at least one hundred yards from the nearest occupied tents, to leeward if possible, and in such a situation that they will not be flooded by water from high ground and will not themselves pollute the camp water supply.

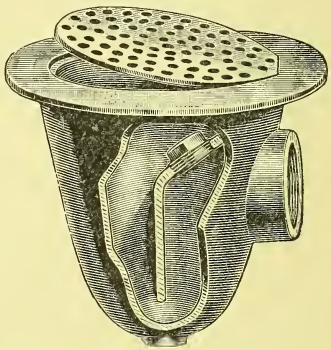

FIG. 221.—Improved Yard Trap.

Should the camp be of longer duration than two weeks sinks should be at once replaced by the *Reed trough system* or by *crematories*, should practicable ones be devised for field use. Meantime, however, new sinks should be dug on the same principles as for a one-night camp, but six to eight feet deep; they

should be thoroughly ditched to prevent flooding, and if possible a tent fly or other shelter put over and around them; the pit should be completely covered by a closely fitting box, with a proper number of holes covered by hinged lids, and with a bar running lengthwise above the seats to make the lids self-closing.

A long flap behind the box should be hinged so that it can be raised to throw in dirt or disinfectants. A metal trough emptying into the pit should be arranged at one end to prevent soiling the seats in urination.

To insure the deposits being kept covered and disinfected, a man should be constantly on duty in the sink whose sole work should be to cover with earth all deposits as soon as they are made, to use disinfectants as directed, and to see that the seats are kept covered and clean.

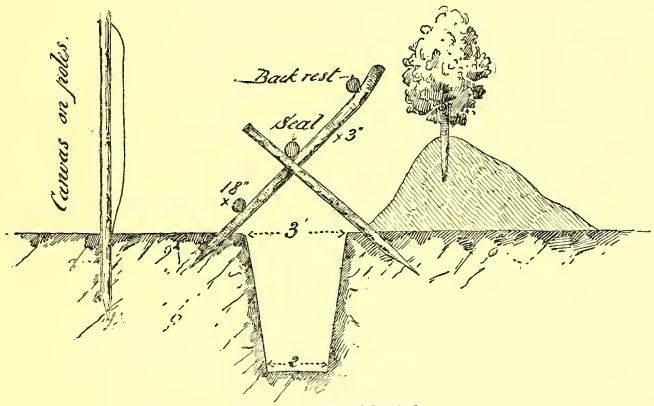

FIG. 222.—Field Sink.

Earth is used to cover the deposits and prevent access of flies; the purpose of the box is also to exclude flies, which we know carry the infection of typhoid fever and other diseases from the sinks to the kitchens and tents.

Disinfectants must be used whether any typhoid fever is known to be present in camp or not, because such cases are often not recognized until too late, and it is even possible for a man to have typhoid bacilli in his stools and urine though he himself is apparently well.

The *Reed trough system* includes a trough, urinal, latrine shed, and an excavating apparatus. It prevents soil pollution by excreta and disinfects them promptly. It is not, however, applicable for winter use in cold climates (Figs. 223 and 224). The disinfectant used is freshly made milk of lime.

The proper disposal of garbage and stable refuse in camps is also a matter of importance, otherwise they pollute the soil and become a breeding place for swarms of flies.

With moving commands the garbage must be disposed of in pits and the stable refuse piled and left.

In camps which are to be occupied longer than a few days but not longer than a week, pits should be dug, covered with boards and earth to exclude flies, and with a hole in the cover fitted with a strainer to separate the solids from the liquids, the latter going into the pits and the former being burned. The burning may be done in the kitchen fire, or the solid garbage may be mixed with more combustible matter

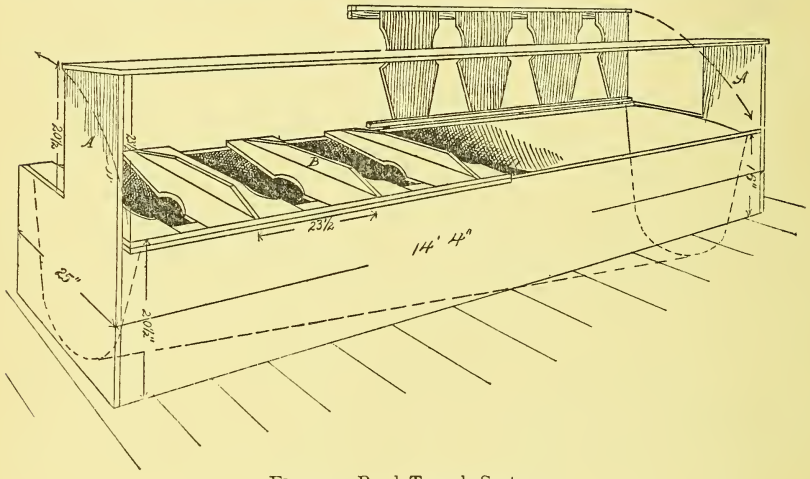

FIG. 223.—Reed Trough System.

such as straw or manure, saturated with petroleum and burned. Manure should be burned in the same way as far as practicable.

The following excellent recommendations from the section on "Sanitation of Camps" in the new Manual for the Medical Department sums up the whole subject:

(*a*) When practicable, camps should be established on high and well-drained ground not previously occupied.

(*b*) In camps of permanence where the command is expected to remain more than two weeks the sanitary-trough system adopted for the army should be used (see G. O. No. 170, A. G. O., 1899).

Sinks should be dug before a camp is occupied, or as soon after as

practicable. The surface of fecal matter should be covered with fresh earth or quick-lime or ashes three times a day. New sinks should be dug and old ones filled when contents of old ones are two feet from surface of ground. Every man who fails to make use of the sinks should be punished.

A sanitary sink should as far as possible conform to the following requirements:

1. It should be covered, either with canvas or lumber, and be ditched.

2. The pit should be dark to exclude flies. This is effected by boarding up and providing seats with hinged covers which are prevented from being raised more than 90 degrees by a bar running along a foot above the seats.

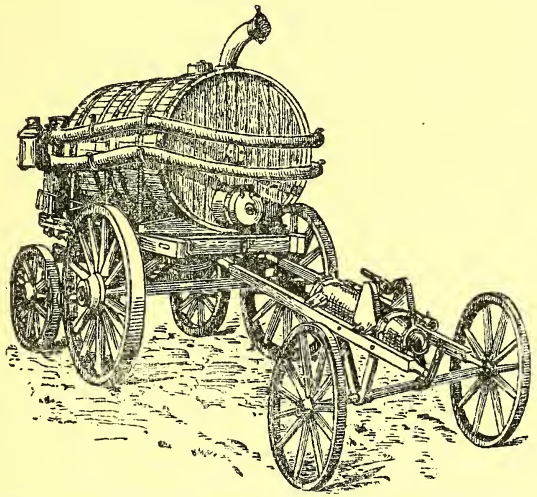

FIG. 224.—Odorless Excavator for Reed Trough System.

3. A separate place for urinating should be provided.

4. There should be a rain-tight bin for the storage of dry earth or lime. Access to the pit for the use of this material is given by a hinged flap behind the seats, which should open outward.

(*c*) All kitchen refuse should be promptly buried, and perfect sanitary police maintained.

(*d*) Troops should drink only boiled or filtered water and coffee or tea (hot or cold), except where water can be obtained which is pronounced to be wholesome by a medical officer.

(*e*) The discharges of patients with typhoid fever, camp diarrhea,

or cholera should always be disinfected at once with a solution of carbolic acid (5 per cent) or of chloride of lime (six ounces to the gallon of water), or with milk of lime, made from fresh quick-lime.

(*f*) The diseases just mentioned are frequently communicated to soldiers in camp through the agency of flies, which swarm about fecal matter and filth of all kinds deposited upon the ground or in shallow pits, and directly convey infectious material, attached to their feet or contained in their excreta to the food which is exposed while being prepared at the company kitchen or while being served in the mess tent. It is for this reason that a strict sanitary police is so important. Also because the water supply may be contaminated in the same way, or by surface drainage. Infection is also often carried on the hands and shoes.

(*g*) If it can be avoided, marches should not be made in the hottest part of the day.

(*h*) When called upon for duty at night or early in the morning a cup of hot coffee should be taken.

(*i*) It is unsafe to eat heartily or drink freely when greatly fatigued or overheated. If alcoholic drinks are used at all, such use should be postponed until after the day's march and preferably in conjunction with the evening meal.

(*j*) Ripe fruit may be eaten in moderation, but green or over-ripe fruit will give rise to bowel complaints. Food should be thoroughly cooked and free from fermentation or putrefactive changes.

(*k*) In decidedly malarious localities from three to five grains of quinine may be taken in the early morning as a prophylactic, but the taking of quinine as a routine practice should only be recommended under exceptional circumstances.

The best safeguard against malaria is, however, the protection of the body against the bites of infected mosquitoes. To this end mosquito nets should be used whenever available in malarial localities or seasons, and if not available the skin should be as far as possible covered during sleep.

(*l*) Light woolen underclothing should be worn, and when a soldier's clothing or bedding becomes damp from exposure to rain or heavy dews the first opportunity should be taken to dry it in the sun or by fires.

CHAPTER IV.

DISEASE PREVENTION.

In chapter XIII of the section on "Nursing" the infectious diseases have already been discussed as far as the prevention of their spread in posts is concerned.

While there are no diseases entirely peculiar to camp life, there are certain diseases which are specially apt to become epidemic under the more crowded conditions which necessarily prevail in camps.

Among the more notable of these diseases are typhoid fever and malarial fevers, diarrhea and dysentery, the eruptive fevers, bronchial troubles and rheumatism, and in certain climates yellow fever and cholera.

Typhoid fever. To prevent typhoid fever in the field *all* urine and feces must be disinfected; soil pollution must be prevented; flies must be destroyed; drinking water must be boiled; men must not be allowed to bathe in polluted water lest they get it into their mouths; in permanent camps the kitchens and messes must be screened against flies and all food protected from both flies and dust.

Flies breed in decayed organic matter, especially in stable manure, which should, therefore, never be allowed to accumulate in camp or garrison. In their reproduction flies pass through the stages of ovum or egg, larva or maggot, pupa, and adult. They carry not only typhoid fever but also cholera, tuberculosis, and probably other diseases. Besides the common fly which carries these diseases on its feet and body there is a biting fly, known as *tsetse*, which transmits *sleeping sickness* and other *trypanosome diseases*, by biting, in the same manner as a mosquito transmits malaria.

Malarial fevers. We have seen that malaria is spread in one way only, that is by the bites of the anophelina mosquitoes which have previously bitten a human being who has malaria. As protection against malaria involves mosquito destruction, it is necessary to learn something about the life history of mosquitoes.

Though all mosquitoes are annoying, only three kinds, as far as we know, carry disease; these are *the anophelina,* which carry malaria; *culex*, which in certain localities in the tropics carries a blood worm (*filaria*) which causes *elephantiasis*, and *stegomyia fasciata*, which carries yellow fever.

It is the female mosquito only that bites, and therefore the female only which conveys disease. *Stegomyia* (the yellow-fever mosquito) is especially a day biter, and where mosquitoes are found biting in the

FIG. 225.—Yellow-Fever Mosquito. Stegomyia fasciata (male).

daytime they are apt to be of that variety. Then again stegomyia is the blackest mosquito, and is beautifully marked with silver bands on the legs and body; a lyre-shaped silver mark on the back is characteristic and identifies stegomyia at once. This mosquito is of medium size (Fig. 225).

Anopheles (the malarial mosquito), Fig. 226, is of brownish color, and differs from culex and stegomyia in having palpi as long as the proboscis in the female; anopheles differs also from the other two in

that the body and proboscis of anopheles form one straight line, while the other mosquitoes are humpbacked. The resting position of anopheles is nearly vertical to the surface, while that of stegomyia and culex approaches the horizontal (Fig. 227).

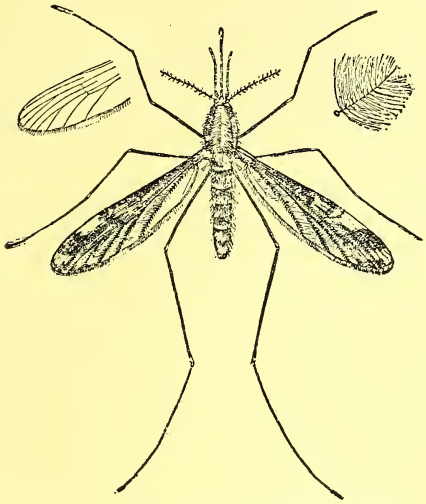

FIG. 226.—Anophelina, Malaria-Carrying Mosquito.

The males of all mosquitoes are distinguished from the females by the fact that the former have feathered antennæ (woolly heads), while the latter have not (Figs. 225 and 228).

The yellow-fever mosquito is essentially a domestic or house mosquito; that is to say, she breeds in small collections of water such as are found about a house, and does not stray far from home. *The malarial mosquito* is a rural or country insect; breeds in large pools, the still edges of running streams, irrigating ditches, etc., and is found far from human habitations.

When one of these mosquitoes bites a person afflicted with the disease which she is capable of carrying, she sucks a little blood and with

FIG. 227.—Resting Position Anopeles and Culex Compared. *A*, Culex; *B*, Anopheles.

it the germs of the disease. After a week or ten days these germs reproduce themselves in the mosquito, migrate to her salivary glands, and she then becomes capable of infecting other persons. If she now bites such a person, she injects into his blood with her saliva some of the germs, and after a variable period, known as the *period of incubation*, that person is usually taken down with the disease.

The measures to be taken to prevent such diseases are *destruction of mosquitoes, protecting the mosquitoes against infection by screening infected persons*—and in the case of malaria destroying the germs in their blood by the use of quinine; *protecting well persons from infection by the use of screens and nets*, and in the case of malaria, by the use of quinine to render the blood insusceptible to infection.

Mosquitoes breed only in water, but very little water is required for the purpose. The female deposits her *eggs* to the number of 40–400

FIG. 228.—Female Stegomyia.

upon the surface of the water, and after a period of twenty-four hours to two or three days they hatch, becoming *larvæ or wiggle-tails;* the larval stage lasts one or two weeks until the *pupæ* form; after two to five days more the pupal shells split and the *imagos or adult insects* emerge (Figs. 229 and 230).

The entire transition from egg to adult insect requires from ten days to two or three weeks (Fig. 231).

Any collection of water, provided it is moderately still, answers the

mosquito for breeding purposes. They breed in marshes, ponds, ditches, rain barrels, cisterns, gutters, watering troughs, hoof-prints, old tin cans, in fact anything capable of holding water. By allowing no unprotected water collections we prevent mosquito breeding. This is accomplished by draining and filling, and by removing all small articles capable of holding water. Collections of water that cannot be removed should be closely covered and screened, or else oiled with petroleum, about an ounce to each fifteen square feet of surface, the *petrolizing* being repeated about once a week.

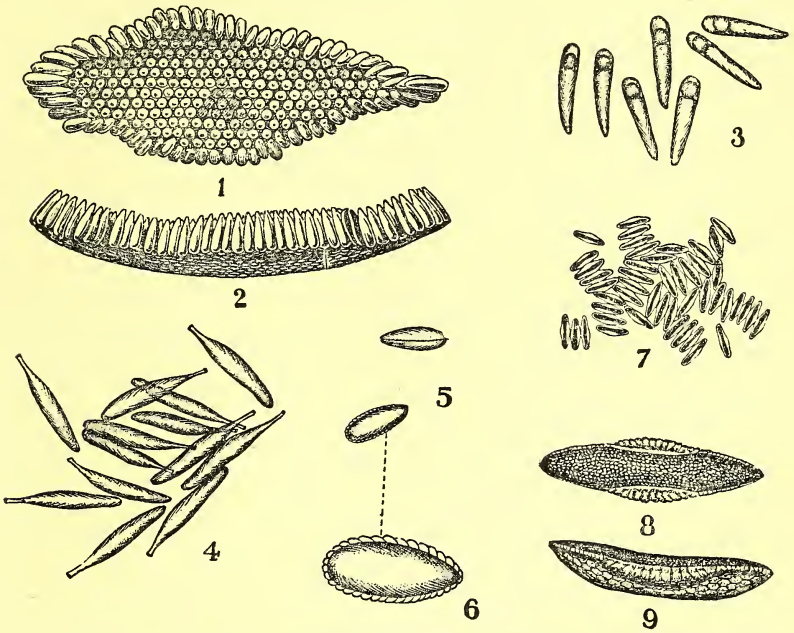

FIG. 229.—Mosquito eggs. (1), Egg-boat of *Culex* seen from above; (2), the same, side view; (3), separate *Culex* eggs; (4), eggs of *Panoplites;* (5), eggs of *Stegomyia;* (6), the same, more magnified; (7), group of *Anopheles* eggs; (8) and (9), eggs of *Anopheles maculipennis*, showing lateral floats.

Adult mosquitoes may be destroyed by fumigating with sulphur or pyrethrum in the closed apartment, using about one pound to the thousand cubic feet of air space; if pyrethrum is used the mosquitoes are only stupefied and must be subsequently swept up and burned.

Other measures for destroying mosquitoes are the clearing away of all vines, brush, tall grass, and undergrowth; such conditions do not breed mosquitoes, but they give them shelter against the winds, which would otherwise blow them away.

In the tropics the natives, especially the children, often carry malarial parasites in the blood, even though they show no sign of the disease, therefore camp should not be made in native villages and natives should not be allowed about the barracks.

In the field it is usually impracticable for soldiers to sleep under mosquito nets, but where malaria prevails a considerable degree of

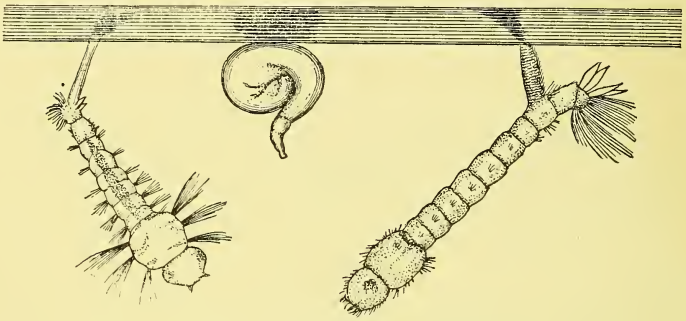

FIG. 230. – Larvæ and Pupa of *Culex*.

protection may be secured by requiring each soldier to wear gauntlets and a small head-net while asleep or on guard.

Yellow fever resembles malarial fever in its method of spread, and in the measures of prevention except that quinine has no value in prevention and is harmful in treatment. Yellow fever differs from malarial fever in that its course is always acute, the fever seldom lasting longer than five to seven days, and especially in that an attack affords

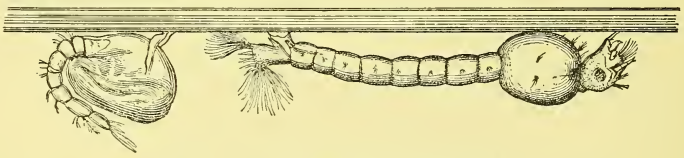

FIG. 231. – Larva and Pupa of *Anopheles*.

almost complete protection against a second, while in malaria one attack seems to predispose to others, and the infection of malaria may remain in the blood indefinitely.

Diarrheas which are so prevalent among troops in the field are due to a variety of causes. Faulty cooking, overeating, improper food, particularly that purchased from camp venders, exposure to chilling,

especially at night, and impure water are common causes. Many diarrheas are probably merely symptomatic of graver disorders such as typhoid fever or dysentery.

The proper preventive measures are the supply of proper food well cooked, the suppression of camp venders, the furnishing of sterilized drinking water, and the general use of woolen undershirts sufficiently long to cover the abdomen; such a shirt is much better than an abdominal band.

The *dysenteries* are of three types, the *catarrhal*, due to exposure and improper food; the *bacillary or epidemic* form, and the *amebic or tropical* form of dysentery; the last two forms are infectious and the measures of prevention are the same as in typhoid fever.

The *eruptive fevers* are especially apt to occur and become epidemic when large numbers of young men are brought into the intimate contact of the camp; the general method of preventing their spread has been discussed on page 227, but it is necessary to describe here in detail the special and most important preventive measure against *smallpox*, viz., *vaccination*.

Vaccination is the process of inoculating a person with *vaccine virus*, producing the condition known as *vaccinia*.

Vaccinia is an eruptive disease of the cow, the virus of which when inoculated in man produces a local pock with constitutional disturbance, and protects against smallpox; vaccinia is probably smallpox of the cow, but it has not been proven that such is the case.

Bovine vaccine virus, that is virus from the calf, is now used to the exclusion of human virus on account of the danger with the latter of transmitting human diseases.

Vaccine is usually provided either on bone points or in capillary tubes; in either case the virus is preserved by glycerin, but it gradually loses its power and becomes inert; it should always be kept in a dark, cool, dry place.

In performing vaccination it should be borne in mind that it is a surgical operation and that the same care must be taken to prevent infection as in any other operation. The hands of the operator, the surface operated upon, and everything coming in contact with either should be as nearly sterile as possible; at the same time it must be remembered that active antiseptics will destroy the vaccine.

Using vaccine points the appliances needed are soap, hot boiled water, sterilized towels, basins, sterile gauze or cotton sponges, alcohol, bichloride solution 1–1,000, vaccination shields, or in their absence gauze and adhesive plaster; if virus in capillary tubes is supplied, there will be needed in addition one or more scarificators and an alcohol lamp. An ordinary needle may be used as a scarifier, but the best appliance is made extemporaneously by splitting a good-sized cork and placing about ten sewing needles in the middle, side by side, and projecting uniformly about a quarter of an inch; the needles are held in place by binding the two halves of the cork tightly together with thread. This appliance should be boiled before use and the needles wiped off and sterilized in the flame of the alcohol lamp after each patient.

The operator, having sterilized his hands as for an operation, scrubs the area to be vaccinated, usually the outer side of the left arm, near the insertion of the deltoid, with a gauze sponge, soap, and hot water, then with alcohol, or in its absence with an antiseptic solution; the alcohol is allowed to evaporate or the antiseptic is washed off with sterile water. If a bone point is used, dip in sterile water, shake off the excess, and scrape or scratch a spot about a quarter of an inch square so as just to remove the cuticle or surface skin without drawing blood, and rub off all the vaccine on the raw surface; repeat this at two other points each about an inch from the first, using a fresh point each time. If capillary tubes are used, blow the contents of a tube on the point selected and scratch it in with a scarificator; repeat as before; now allow the abrasions to dry and then cover with a shield or a dressing of sterile gauze held by adhesive plaster strips.

It is better to vaccinate in three spots instead of one because it has been found that the degree of protection afforded is in proportion to the amount of vaccine introduced.

If a vaccination takes properly, about the third to the fifth day after the operation a small *papule* or pimple will be noticed at the spot scarified; by the seventh day the papule has become a *vesicle* or blister depressed in the center; by the eighth or ninth day the vesicle has become full size and an *areola* or red blush appears around it; at the same time the glands under the arm become a little swollen and painful, and there may be some fever and general discomfort; on the elev-

enth or twelfth day the redness and soreness begin to disappear, the contents of the blister becomes cloudy, and it begins to dry up, forming a scab which drops off about the twenty-fourth day, leaving a characteristic pit or pits which is the sign of a successful vaccination.

Vaccination does not always follow this typical course; sometimes the whole duration of the inflammation is much shorter, and the pit or pock is not so marked; this is especially apt to be the case in revaccination. Sometimes, especially when the operation has been carelessly done or the vesicle is prematurely broken, violent inflammation results, with sloughing and ulceration. Occasionally the vaccinia is generalized, vesicles forming at other points on the arm, or even over the entire body.

Cholera (*Asiatica*) runs its course very acutely in typical cases, oftentimes terminating fatally in twenty-four hours. It is characterized by violent vomiting and purging—the discharges soon becoming like water—by great prostration and muscular cramps. It must not be forgotten, however, that the only symptom may be an ordinary diarrhea, and that such cases are just as infectious as the severe type. The preventive measures are described on page 225.

CHAPTER V.

SANITATION IN THE FIELD.

The selection of a camp site will often depend upon military considerations; the essential requirements are wood, water, and grass, and from a sanitary standpoint dryness, elevation, and some protection from winds.

An old camp site should never be occupied because the soil is certain to be polluted and probably infected; outbreaks of typhoid fever and cholera have repeatedly followed the occupation of old sites.

Sites covered with rank vegetation should be avoided, as such vegetation indicates excessive moisture. Open woods are not unfavorable camp grounds, as they afford some protection from sun in summer and winds in winter, but dense woods should never be occupied on account of the dampness, stagnation of air, and decaying vegetation. All underbrush should be removed from camp, but sod should not be disturbed.

Tents, as soon as pitched, must be trenched; if the tent site is covered with grass the grass should be cut or pulled up, because it will die anyway and its decomposition will help to pollute the air; the soil should be well pounded and covered, if practicable, with a layer of ashes or gravel, also well pounded. In permanent camps the tents should be floored, but the floors should be in sections of such size that they can be readily removed for policing and sunning the ground underneath. No eatables should ever be allowed in tents other than the kitchen and mess. The interval between tents in the same row should be at least equal to the height of the ridge.

All tents are crowded, not more than about eighty cubic feet of air space being usually allowed; therefore the greatest attention should be paid to ventilation; dry canvas allows some penetration of air, but moist canvas is practically impervious. Tent walls should always be kept looped up in summer and even in winter whenever possible. Every

three or four days the tents should be removed to the adjoining area and turned inside out, so that the interior may be sunned at the same time as the tent floor. About once in ten days the entire camp should be removed to at least a sufficient distance to entirely clear the old site.

As the ground is always more or less damp and removes the heat of the body rapidly, a soldier should never sleep directly upon it if it can be avoided; if nothing else is available, his poncho should be placed under him, but if possible he should raise himself above the ground by the use of hay, straw, evergreen boughs, or improvised bunk. Bedding should be removed and aired daily, being hung upon lines if practicable.

The police of the camp within and without the tents should be thorough. The disposal of garbage has already been described, page 312; at night men who wish to urinate will often do so just outside the tent rather than go to the distant sink; therefore urine tubs containing a disinfectant solution should be placed in the company streets every night, and removed in the morning; their position should be indicated by a lantern; the position of the sinks should also be indicated by a lantern on dark nights.

The water supply of the camp is of the greatest importance; as a general rule all water supplies of inhabited regions in the tropics must be regarded as infected and require boiling before use; the same may be said of surface waters, and shallow wells in other climates.

As soon as a camp is occupied a guard is placed over the water and proper places designated for bathing, washing of clothing, watering animals, etc.

Among the minor but still important troubles incident to field service are foot-soreness, chafing, and occasionally body lice.

To avoid *foot-soreness* the first requisite is a properly shaped and fitted shoe; the next is clean feet and clean, dry socks. No other shoe than that supplied by the Quartermaster's Department should ever be worn. The feet should be carefully washed at the end of the march, thoroughly dried, and the socks changed, the used pair being washed or at least sunned and dried for the next day. Toe-nails should be cut square across and not too short; if there is a tendency to soreness, anointing the feet, especially between the toes, with vaseline, is effective; in the absence of vaseline, *foot powder* may be dusted on the feet and

into the socks; vaseline is better than powders. If there are blisters they should not be opened unless they are so large that they would break in walking; cover each with a small piece of adhesive plaster; if the blister must be opened make the smallest opening possible with a needle or pin and gently press out the fluid. If the skin is rubbed off cover with plaster. Hard corns should be trimmed close or scraped with a piece of glass; soft corns require treatment by a medical officer.

Chafing is especially apt to occur in the crotch or other joint flexures; the best preventive of chafing and body vermin is cleanliness. Take a bath daily, but if water is scarce at least wash the feet, hands, arm-pits, and genitals. Should chafing occur use vaseline or foot-powder.

When *lice* are found on the body cut the hair of the parts close and apply blue ointment, or solution of corrosive sublimate 1:500. The underclothes must be boiled, or washed in sea water.

CHAPTER VI.

PERSONAL HYGIENE.

THIS subject has been dealt with generally under other headings, but it is necessary to cover a few points here which have not been included elsewhere.

The first requisite for good health is *cleanliness of person and clothing;* the former is not usually difficult to obtain, but the latter often presents serious obstacles in the field. Every opportunity should be taken to wash the underclothing; if very dirty it should be soaked for awhile before scrubbing; woolen articles should be rinsed and scrubbed as little as possible, as such treatment renders them hard and causes shrinking. When water is not available the underclothing should be changed, dried in the sun, aired, and beaten.

In the tropics a contagious skin disease known as *dhobie itch* is of frequent occurrence; it is usually due to uncleanliness and infected underwear. Besides treatment of the disease it is necessary to boil the underwear to get rid of the infection.

Particular attention should be paid to the *teeth*, a tooth brush being used twice a day; ulceration of the gums, so prevalent in the tropics, may be thus avoided, but if it occurs the soldier should report to his medical officer for treatment.

The *hair* should be kept short and frequently washed.

The purpose of *clothing* is to protect the body from the vicissitudes of weather; from heat in summer, cold in winter, and from the chilling effects of rain and wind.

The fulfillment of these purposes depends upon the nature of the material, its texture, color, its heat-conducting and water-absorbing properties.

The materials of which clothing is made are wool, cotton, and linen.

Wool is a poor conductor of heat and a good absorber of moisture; hence it keeps in the heat of the body in winter and keeps out the heat

of the sun in summer; by its property of absorbing and condensing moisture, thus setting free its latent heat, it prevents chilling of the body when perspiring after exertion; these properties render it suitable for undergarments in both summer and winter, and for outer garments in winter.

Cotton and linen are good conductors and poor absorbers of moisture, qualities which adapt them for use in outer garments in hot weather.

The *color* of outer garments has no influence on the temperature of the body except in the direct rays of the sun; black and dark colors absorb the direct sun's rays the most, while white and yellow reflect them most.

Woodruff believes that dark colors have an important influence in excluding from the body certain injurious chemical elements of the sun's rays, and that therefore the undergarments should be of a dark color.

Besides color and material, *texture* has an important influence on the power of conducting heat; the more loosely woven a material is the more air there is in the texture, and as air is a very poor conductor, the warmer the material. Hence, the warmth of fur and feathers. Impervious stuff, such as rubber and to a less degree leather, keep out winds and are warm for that reason.

Venereal diseases constitute one of the greatest dangers to which the soldier is exposed; their hospital management is discussed on page 226; but it is necessary to look at them from the point of view of personal hygiene. Ordinarily regarded by the soldiers as matters of trivial importance, gonorrhea, chancroid, and syphilis are so far-reaching in their effects that these effects should be thoroughly understood.

Gonorrhea or clap, besides the immediate discomfort and inconvenience caused by it, is often followed by swollen testicle, stricture of the urethra, stricture of the spermatic ducts so that the semen cannot escape, and the man becomes sterile; by a very severe form of rheumatism, inflammation of the bladder and kidneys, and occasionally septicemia and death. Getting a little of the gonorrheal pus into the eye from unclean fingers or towels produces a destructive inflammation often resulting in blindness.

In *syphilis* the blood is infected, and while the disease is curable one can never be certain that the cure is permanent.

The first stage is the chancre, the second the skin eruptions and the mucous patches, while in the third we have the terrible destructive affections of the bones, internal organs, nervous system, and blood-vessels. Sometimes the nose is eaten away or caves in, the palate is destroyed, the voice lost, and paralysis, locomotor ataxia, and aneurism are among the later results. Add to this that if the syphilitic marries he is liable to infect his wife and very apt to beget syphilitic children, and the gravity of the disease may be seen.

The probability of contracting some form of venereal disease in illicit intercourse is very great; about a third of all women prostitutes are infected; *all* are certain to become so in course of time.

The only certain protection against venereal disease is absolute avoidance of impure intercourse. This involves continence in the unmarried soldier. There is a widespread impression that continence is harmful to the young and vigorous man; nothing is further from the truth. Nature has provided emissions for the discharge of an undue accumulation of seminal fluid, and their occasional occurrence does no harm.

As *alcoholism* leads to sexual indulgence the two conditions should be considered together. The healthy man does not require alcohol in any form; though it is occasionally taken habitually for long periods without any apparent bad results, there is no doubt that even in such cases there is a diminished resistance to disease. Though the temporary effect of alcohol is stimulating this effect is promptly followed by diminished resisting power to both heat and cold.

The weight of evidence is that alcohol is particularly harmful in the tropics, and many of the cheap native forms of crudely distilled liquors which are obtainable there have specially poisonous effects.

To guard against the special diseases of the tropics one of the most important general rules is to strictly avoid all native prepared foods and drinks; the method of their preparation is usually filthy in the extreme, and they are frequently infected with the germs of disease.

Native fruits, in good condition, neither unripe nor over-ripe, may be taken in moderation, but the outer skin should always be removed, or thoroughly washed in pure water.

The sun, in the heat of the day, should be avoided when possible, and when in the sun the back of the head and neck should be protected by a handkerchief or piece of muslin attached to the back of the cap or hat. The Japanese soldiers use such a flap in two pieces so as to allow free passage of air.

At night, and especially toward morning, chilling of the abdomen should be prevented by wearing a long undershirt or by throwing a blanket over the body.

PART VIII.

RIDING, PACKING, AND DRIVING.

CHAPTER I.

RIDING.

WAR Department orders provide that at posts where there are cavalry troops the necessary instruction of the hospital corps in riding shall be given by cavalry officers in connection with the instruction of their troops. At other posts, however, the instruction must be given under the direction of medical officers whenever the necessary animals are available. The following course of instruction is taken from the Cavalry Drill Regulations modified to meet the requirements of the hospital corps:

* * * * * * * *

270. The order of instruction indicated may be modified at the discretion of the officer superintending, care being taken to develop the confidence of the recruit by progress suited to his capacity, and which will exempt him as far as possible from falls or other accidents.

During the first few lessons the instructor will devote his attention chiefly to giving to the recruits the proper seat and carriage and to making them self-confident on horseback; he will quietly and patiently correct the faults of each individual as they occur, frequently passing from one to another, and will require by degrees the correct execution of his teachings; these understood and confidence imparted, the positions and motions will then be rigidly enforced.

* * * * * * * *

271. Each mounted drill begins and ends at the walk. *This rule is general.*

272. During the drills the recruits are taught the following rules for the care of horses, until the instructor is satisfied by means of questions that they are thoroughly comprehended:

Never threaten, strike, or otherwise abuse a horse.

Before entering a stall, speak to the horse gently and then go in quietly.

Never take a rapid gait until the horse has been warmed up by gentle exercise.

Never put up a horse brought in a heated condition to the stable or picket line, but throw a blanket over him and rub his legs, or walk him until cool. When he is wet, put him under shelter, and wisp him until dry.

Never feed grain to a horse nor allow him to stand uncovered when heated. Hay will not hurt a horse, no matter how warm he may be.

Never water a horse when heated unless the exercise or march is to be immediately resumed.

Never throw water over any part of a horse when heated.

Never allow a horse's back to be cooled suddenly, by washing or even removing the blanket unnecessarily.

To cool the back gradually, the blanket may be removed and replaced with the dry side next the horse.

The Equipment of the Horse.

273. The instructor indicates the different parts and uses of each equipment as a commencement of this instruction.

To Fold the Saddle Blanket.

274. The blanket, after being well shaken, will be folded into six thicknesses, as follows: Hold it well up by the two corners, the long way up and down; double it lengthwise (so the fold will come between the "U" and "S"), the folded corner (middle of blanket) in the left hand; take the folded corner between the thumb and forefinger of the right hand, thumb pointing to the left; slip the left hand down the folded edge two-thirds its length and seize it with the thumb and second finger; raise the hands to the height of the shoulders, the blanket between them extended; bring the hands together, the double fold falling outward; pass the folded corner from the right hand into the left hand, between the thumb and forefinger, slip the second finger of the right hand between the folds, and seize the double folded corner; turn the left (disengaged) corner in, and seize it with thumb and forefinger of the right hand, the second finger of the right hand stretching and evening the folds; after evening the folds, grasp the corners and shake the blanket well in order to smooth the folds, raise the blanket and place it between the chin and breast; slip the hands down half-way, the first two fingers outside, the other fingers and thumb of each hand inside, seize the blanket with the thumbs and first two fingers, let the part under the chin fall forward; hold the blanket up, arms extended, even the lower edges, seize the middle points between the thumbs and forefingers, and flirt the outside part over the right arm; the blanket is thus held before placing it on the horse.

To Put on the Blanket and Surcingle.

275. The instructor commands: BLANKET.

Approach the horse on the near (left) side, with the blanket folded and

held as just described; place it well forward on his back, by tossing the part of the blanket over the right arm to the off (right) side of the horse, still keeping hold of the middle points; slide the blanket once or twice from front to rear to smooth the hair, being careful to raise the blanket in bringing it forward; place the blanket with the forefinger of the left hand on the withers, and the forefinger of the right hand on the backbone, the blanket smooth; it should then be well forward with the edges on the left side; remove the locks of mane that may be under it; pass the buckle end of the surcingle over the middle of the blanket, and buckle it on the near side, a little below the edge of the blanket.

To Put on the Watering Bridle.

276. The instructor commands: BRIDLE.

Take the reins in the right hand, the bit in the left; approach the horse on the near side, slip the reins over the horse's head and let them rest on his neck; reach under and engage the snap in the right halter ring, insert the left thumb in the side of the horse's mouth above the tush and press open the lower jaw; insert the bit and engage the snap in the left halter ring. The bit should hang so as to touch, but not draw up, the corners of the mouth.

To Unbridle.

277. At the command, *unbridle*, pass the reins over the horse's head and disengage the snaps.

The Saddle and Bridle.

279. Greatest care will be taken in the fitting of the saddles; sore backs are generally occasioned by neglect, and the men must never be allowed to lounge or sit unevenly in their saddles.

To Saddle.

280. For instruction, the saddle may be placed four yards in rear or front of the horse. The stirrups are crossed over the seat, the right one uppermost; then the cincha and cincha strap are crossed above the stirrups, the strap uppermost. The blanket having been placed as previously explained, the instructor commands: SADDLE.

Seize the pommel of the saddle with the left hand and the cantle with the right, approach the horse on the near side from the direction of the croup and *place the center of the saddle on the middle of the horse's back*, the end of the side bar about three fingers' widths behind the point of the shoulder blade; let down the cincha strap and cincha; pass to the off side, adjust the cincha and straps and see that the blanket is smooth; return to the near side, raise the blanket slightly under the pommel arch so that the withers may not be compressed; take the cincha strap in the right hand, reach under the horse and seize the cincha ring with the left hand, pass the end of the strap through

the ring from underneath (from inside to outside), then up and through the upper ring from the outside; if necessary make another fold in the same manner.

The strap is fastened as follows: Pass the end through the upper ring

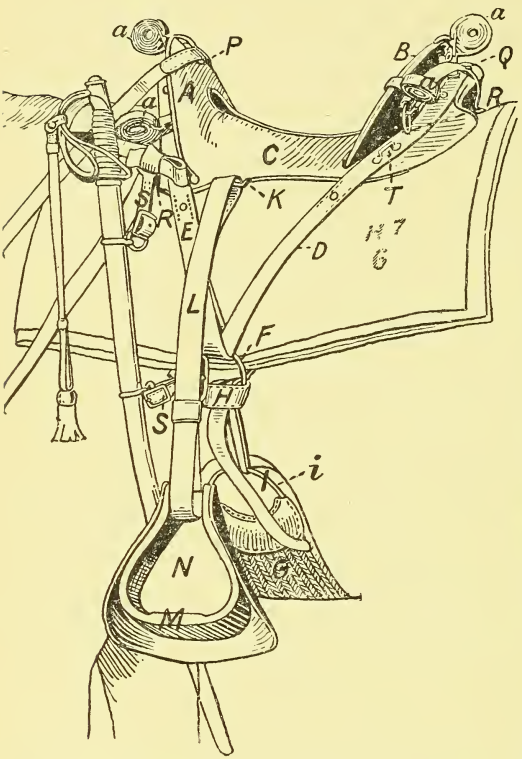

FIG. 232.—Nomenclature of the Saddle. *A*, Pommel; *B*, cantle; *C*, side bar; *D*, *E*, spider (quarter straps); *F*, spider (or girth-strap) ring; *G*, cincha; *H*, cincha strap; *I*, cincha ring; *i*, cincha-ring safe; *K*, stirrup loop; *L*, stirrup strap; *M*, stirrup tread; *N*, stirrup hood; *P*, shield; *Q*, stud; *R*, *R*, rings; *S*, *S*, saber straps; *T*, staple; *a*, *a*, *a*, *a*, coat straps.

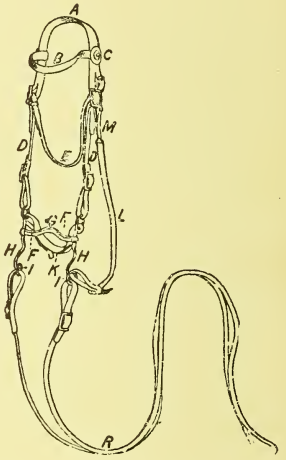

FIG. 233.—Nomenclature of the Bridle. Headstall: *A*, Crown-piece; *B*, brow band; *C*, ornament; *D*, *D*, cheek piece; *E*, throatlatch. Bit: *F*, *F*, Mouth piece; *G*, port; *H*, *H*, branches; *I*, *I*, rein rings; *K*, curb strap; *R*, reins. Link: *L*, Link strap; *M*, link snap.

to the front; seize it with the left hand, place the fingers of the right between the outside folds of the strap; pull from the horse with the right hand and take up the slack with the left; cross the strap over the folds, pass the end of it, with the right hand, underneath and through the upper ring back of the folds, then down and under the loop that crosses the folds and draw it tightly: weave the ends of the strap into the strands of the cincha.

Another method of fastening the cincha strap is as follows: Pass the end through the upper ring to the rear; seize it with the right hand, place the fingers of the left between the outer folds of the strap; pull from the horse with the left hand and take up the slack with the right; pass the end of the strap underneath and draw it through the upper ring until a loop is formed; double the loose end of the strap and push it through the loop and draw the loop taut. The free end should then be long enough to conveniently seize with the hand.

Having fastened the cincha strap, let down the right stirrup, then the left.

The surcingle is then buckled over the saddle and should be a little looser than the cincha.

The cincha when first tied should admit a finger between it and the belly. After exercising for a while the cincha will be found too loose and should be tightened.

281. To approximate the length of the stirrup straps before mounting, they are adjusted so that the length of the stirrup strap, including the stirrup, is about one inch less than the length of the arm, fingers extended.

To Unsaddle.

282. The instructor commands: UNSADDLE.

Stand on the near side of the horse; unbuckle and remove the surcingle; cross the left stirrup over the saddle; loosen the cincha strap and let down the cincha; pass to the off side, cross the right stirrup, then the cincha; pass to the near side, cross the cincha strap over the saddle; grasp the pommel with the left hand, the cantle with the right, and remove the saddle over the croup and place it in front or rear of the horse as may be directed, pommel to the front; grasp the blanket at the withers with the left hand and at the loin with the right, remove it in the direction of the croup, the edges falling together, wet side in, and place it across the saddle, folded edge on the pommel.

If in the stable, place the saddle on its peg when taken off the horse.

To Put on the Curb Bridle.

283. The instructor commands: BRIDLE.

Take the reins in the right, the crownpiece in the left hand; approach the horse on the near side, passing the right hand along his neck; slip the reins over his head and let them rest on his neck; take the crownpiece in the right hand and the lower left branch of the bit in the left hand, the forefinger against the mouthpiece; bring the crownpiece in front of and slightly below its proper position; insert the thumb into the side of the mouth above the tush; press open the lower jaw, insert the bit by raising the crownpiece, with the left hand draw the ears gently under the crownpiece, beginning with the left ear; arrange the forelock, secure the throat-latch, and then the curb strap, taking care not to set them too closely.

284. The mouthpiece, which should fit the width of the horse's mouth, rests on that part of the bars (the lower jaw between the tushes and molars) directly opposite the chin groove; the curb strap should then lie in the chin groove without any tendency to mount up out of it on the sharp bones of the lower jaw. This position of the mouthpiece will be attained for the majority of horses by adjusting the cheek straps so that the mouthpiece will be one inch above the tushes of the horse and two inches above the corner teeth of the mare.

The throatlatch should admit four fingers between it and the throat; this prevents constriction of the windpipe or pressure on the large blood-vessels.

The curb strap should fit smoothly the chin groove, and be loose enough to admit one or two fingers when the branches of the bit are in line with the check straps.

285. At the discretion of the instructor, the halter may be taken off before bridling, the reins being first passed over the neck; the hitching strap, if not left at the manger or picket line, is tied around the horse's neck; if the horse be saddled, in the near pommel ring.

To Unbridle.

286. The instructor commands: UNBRIDLE.

Stand on the near side of the horse; pass the reins over the horse's head, placing them on the bend of the left arm; unbuckle the throatlatch, grasp the crownpiece with the right, and assisting with the left hand gently disengage the ears; grasp the bit with the left hand, and gently disengage it from the horse's mouth by lowering the crownpiece; place the crownpiece in the palm of the left hand, take the reins in the right hand, pass them together over the crownpiece, make two or three turns around the bridle, then pass the bight between the brow band and crownpiece and draw it snug.

The bridle is hung up by the reins, or placed across the saddle on the blanket.

If the horse has no halter on, unbridle and push the bridle back so that the crownpiece will rest on the neck behind the poll until the halter is replaced.

To Mount (without saddle).

293. 1. PREPARE TO MOUNT. 2. MOUNT.

At the first command, drop the right rein, take two back steps, stepping off with the left foot, at the same time sliding the right hand along the left rein; face to the right. This should place the trooper behind the near shoulder of the horse. Take both reins in the right hand, aided by the left, the reins coming in on the side of the forefinger, forefinger between the reins, the loose end falling over on the off side; place the right hand behind the withers, holding the reins short enough to feel lightly the horse's mouth;

place the left hand near the withers, and grasp a lock of the mane, the lock coming out between the thumb and forefinger.

At the command *mount*, spring lightly from the ground and raise the body, keeping it erect, and supporting the weight on the hands; carry the right leg, knee bent, over the horse's back, the weight still borne on the hands; sit down gently on the horse's back, and take one rein in each hand, the reins bearing equally on the horse's mouth.

In the earlier lessons, the recruit may rest the right forearm on the horse's back to enable him to raise the body when mounting.

Position of the Trooper (without saddle).

294. Body balanced on the middle of the horse's back.
Head erect and square to the front.
Chin slightly drawn in.
Shoulders square and well thrown back.
Chest pushed out.
Back straight.
Elbows slightly to the rear of the points of the shoulders.
Forearms horizontal and close to the sides without pressure.

The right rein in the right hand, and the left rein in the left hand, coming in on the underside of the little finger, and coming out over the second joint of forefinger, on which the thumb firmly holds the rein; the other fingers closed on the reins, nails toward the body; reins bearing equally on the horse's mouth; bight (end) of reins falling to the front and on the right side of the horse's neck.

Hands about six inches apart, on a level with the elbows, backs straight up and down and outward.

Buttocks bearing equally on the middle of the horse's back, the seat being as flat as possible.

Legs stretched by their weight alone, the flat of the thighs and knees clasping the horse equally.

Legs from knees down vertical and free.

Feet parallel to the sides of the horse, or as nearly so as the conformation of the man will permit.

Remarks on the Position of the Trooper.

Body balanced on the middle of the horse's back, because that is the point where the motion of the horse is least communicated to the rider, and the best weight-bearing position for the horse.

Head erect and square to the front. If not, the body will incline forward or to one side and be unsteady.

Chin slightly drawn in. To prevent the head and shoulders from drooping to the front.

Shoulders square and well thrown back and the chest pushed out. If not, the chest will be contracted and the back curved to the rear.

Back straight. This gives an erect carriage and counteracts the tendency to slouch or droop the shoulders.

Elbows slightly to the rear of the shoulders. To assist in keeping the shoulders back.

Forearms horizontal and close to the sides without pressure. To prevent their being thrown out when the horse trots; if with pressure, the motion of the body will be communicated to the hand and rein.

Buttocks bearing equally, and seat as flat as possible. So that the body will preserve its steadiness.

Flat of thighs and knees clasping the horse equally. To give a firm steady seat.

Legs from knees down vertical and free. That they may be carried to the rear to aid in directing the horse without deranging the seat.

Feet parallel to the horse. To assist in holding the thighs in position.

The body from the hips up should be movable, and should, in a measure, yield to the motions of the horse; from the hips to the knees, immovable and close to the horse; from the knees down, movable.

The arms move freely at the shoulders to avoid communicating the motion of the body to the reins, the hands oscillate slightly with the motion of the horse, but otherwise they are stationary, except to direct the horse.

During the earlier lessons the position of the recruit is necessarily one of constraint.

No man can be said to be a good horseman who has not a firm, well-balanced seat; it is therefore of the utmost importance; it will assist the horse; the want of it will impede the horse's actions, make sore backs, etc.

To Lengthen or Shorten the Reins.

295. Bring the hands toward each other; grasp the right rein with the thumb and forefinger of the left hand a short distance from the right thumb; relax the grasp of the right hand, and allow the rein to slip through to get the proper bearing; then close the right hand and replace the hands. With the left rein the positions of the hands are reversed.

To Take the Reins in One Hand.

296. To relieve the constraint of the arms by changing their position, as well as to prepare the recruits for the use of the curb bridle, the instructor commands: 1. *In left* (or *right*) *hand.* 2. TAKE REINS.

At the second command, bring the left hand opposite the middle of the body; half open and place in it the right rein, holding both reins as explained for the left rein, except that the little finger separates the reins, the right rein coming in above the little finger; close the left hand and drop the right hand behind the thigh.

To Adjust the Reins.

297. Seize the bight with the thumb and forefinger of the right hand; partly open the left hand so as to allow the reins to slip through it; raise the right hand until the reins bear equally; close the left hand upon them, letting the bight fall over the forefinger and right rein; drop the right hand.

To Retake the Reins in Both Hands.

298. The reins being in the left hand: 1. *In both hands.* 2. TAKE REINS.

Half open the left hand, seize with the right hand the right rein, and hold them as previously described.

To Drop and Retake Reins.

299. DROP REINS: Drop the reins on the horse's neck near the withers, and drop the hands behind the thighs.

TAKE REINS: The trooper retakes the reins and holds them as before dropping them.

To Dismount (without saddle).

300. 1. PREPARE TO DISMOUNT. 2. DISMOUNT.

At the first command, pass the right rein into the left hand, then seize both reins with the right hand in front of the left, forefinger between the reins, and place the right hand on the withers, the reins coming into the hand on the side of the forefinger; let go with the left hand and grasp a lock of the mane in front of the withers, the lock coming out between the thumb and forefinger.

At the command *dismount*, raise the body on both hands, carry the right leg, knee bent, over the horse's back without touching it; bring the right leg near the left and come lightly to the ground on the balls of the feet, bending the knees a little; face to the left, drop the right rein, step to the front, sliding the right hand along the left rein, and take the position of stand to horse.

To Dismount on the Off Side.

301. 1. *To the right.* 2. PREPARE TO DISMOUNT. 3. DISMOUNT.

The second and third commands are executed as in par. 300, but by inverse means, the trooper coming to the ground on the off side.

To Mount from the Off Side.

302. The trooper being dismounted and on the off side of his horse: 1. PREPARE TO MOUNT. 2. MOUNT.

The commands are executed as in par. 293, but by inverse means.

The Aids in Horsemanship.

311. The training of the new horse involves the infliction of more or less pain, the necessity for which becomes less as his intelligence is quickened into understanding the lightest pressure.

A horse is *bit-wise* when (the bit being correctly fitted and properly adjusted, par. 284) he obeys the lightest pressure upon either bar.

He is *rein-wise* when he obeys the lightest pressure of the rein on either side of the neck, the bit not being disturbed from its normal position.

He is *leg-wise* when he obeys the lightest correctly combined action of the rider's legs.

The most thoughtful care should be constantly exercised in the combined applications of the aids, that they may not be opposed to each other in their action, *i.e.*, one favoring the intended move, the other opposing it.

Preparatory to the movements, the instructor mounts the squad and explains the uses of the reins and legs.

The reins and legs, the application of which determines the movements and gaits of the horse, are called the *aids*.

The trooper should not only know when to apply a given aid, but he should also understand why he applies it.

The reins serve to prepare the horse to move, and to guide, support, and halt him; their action should be gradual and in harmony with that of the legs.

In using them the arms should have free action at the shoulder; when a light pressure will be sufficient to govern the horse, the action of the hand should be at the wrist; for greater pressure, the elbow should be carried back, *but without raising the hand.*

In riding, the bridle hand should be kept steady and ought not to move with the body; it should merely oscillate with the motion of the horse's head; at the same time it must be kept light, for the bit causes pain if pressed constantly on the mouth, destroys its sensibility, and makes the horse's mouth hard.

The hand is light when there is an almost imperceptible alternate feeling and easing of the hand in harmony with the motion of the horse, by which the delicacy of the mouth is preserved, and the horse made to carry himself light.

That hand is best which, by giving and taking properly and keeping constant touch of the bit, controls the horse with the least force, and will best preserve the mouth.

As a rule, it is recommended that recruits ride with one rein in each hand; this will prevent the bad habit of holding the left shoulder advanced.

The legs serve to assist, together with the reins, in controlling the horse. Closing the knees, without pressure by the lower part of the leg, tends to steady the horse in position. Carrying the lower legs slightly to the rear, closing them equally with slight pressure, prepares him to move, or, if moving, to keep him up to the hand. Closed with greater pressure behind the girth, they urge him forward.

Carrying the right (or left) leg to the rear, closing it with pressure, causes the horse to move his haunches to the left (or right).

The pressure of the legs must be an elastic muscular action, suited to the sensitiveness of the horse; a heavy, clinging pressure or dull thumping with the heels must not be permitted.

The reins act to direct the forehand; the lower legs incite to action and govern the movement of the haunches.

All changes of gait are made gradually. The horse should never be spurred to make a sudden start, nor should the reins be jerked.

To Trot.

332. Being at the walk: 1. *Trot* (or *Slow trot*). 2. MARCH.

At the command *trot*, gather the horse.

At the command *march*, yield the hands a little and close the legs by degrees until the horse obeys, then the hands are gradually replaced and the legs relaxed.

The gait is slow at first, and the instructor sees that the troopers feel lightly their horses' mouth *without bearing upon the reins*, and explains that the necessary ease and stability are acquired by sitting well down on the horse, or saddle, and partially relaxing the body, thighs and legs, the hands oscillating with the motion of the horse's head.

He requires the troopers to preserve their seats by balancing the body; that they avoid the common fault of leaning the body too far or curving the back to the rear; that they sit erect and keep the thighs close to the horse.

To Pass from the Trot to the Walk.

333. Being at the trot: 1. *Walk*, 2. MARCH.

At the command *walk*, gather the horse.

At the command *march*, rein in by degrees, and hold the legs close to prevent the horse from coming to the halt; as soon as he walks, replace the hands gradually and relax the legs.

To Mount (with saddle).

344. The horses equipped with saddles and curb bridles are habitually formed in line. The troopers standing to the horse, the instructor causes them to count fours, and commands: 1. PREPARE TO MOUNT. 2. MOUNT.

At the first command the odd numbers lead out.

All the troopers drop the right rein, take two back steps, stepping off with the left foot, at the same time sliding the right hand along the left rein; half face to the right; this should place the trooper about opposite the girth; with the aid of the left hand take both reins in the right, forefinger between the reins, and place the right hand on the pommel, the reins coming into the hand on the side of the forefinger, and held so as to feel lightly on the horse's mouth, the bight falling on the off side. (TWO.) Place a third of the left foot in the stirrup, with the assistance of the left hand if necessary, and support it against the forearm of the horse; rest

upon the ball of the right foot, grasp a lock of the mane with the left hand, the lock coming out between the thumb and forefinger.

At the command *mount*, spring from the right foot, holding firmly to the mane and keeping the right hand on the pommel; pass the right leg, knee bent, over the croup of the horse without touching him; sit down in the saddle; let go the mane, insert the right foot in the stirrup, pass the reins into the left hand and adjust them.

At the command: 3. *Form*, 4. RANK, the even numbers move up in their intervals.

Position of the Trooper (with saddle.)

345. Same as previously explained (par. 294), with the following exceptions: Buttocks bearing equally and as flat as possible upon the middle of the saddle; reins coming into the left hand on the side of the little finger, and leaving it between thumb and forefinger; little finger between the reins, right rein above it; the other fingers closed, thumb pointing to the right front in prolongation of the forearm and pressing the reins firmly on second joint of forefinger; the end of the reins falling to the front and outside of the right rein; left forearm horizontal and close to the body without pressure; the back of the hand nearly vertical; right hand behind the thigh, arm hanging naturally; feet inserted in the stirrups so that the ball of the foot rests on the tread of the stirrup, heel slightly lower than the tread.

Stirrups.

346. The stirrups should support the feet and the weight of the legs only, and be of such length that when the legs are in proper position, the feet out of the stirrups, the treads will be on a level with the lower part of the inner ankle bone.

The length depends somewhat on the formation of the man; a man with a thick heavy thigh requires a shorter stirrup than a man with a thin, flat one. For long distances at the gallop and trot, a shorter stirrup is required than at the walk.

When riding, the stirrups take up, in a measure, the weight of the body in its descent to the saddle, by a yielding of the ankles to prevent shock. This action is an easy, quick stiffening of the muscles which distributes the downward motion between the feet, thighs, and seat.

If, after the trooper has been exercised a short time at the slow trot, he has a close seat, his leg in proper position, with his heel down, but does not easily keep his stirrup, then the stirrup requires shortening.

Stable Duty.

995. A noncommissioned officer, designated *stable sergeant*, or *corporal*, is detailed in each detachment to take immediate general charge of the forage and stable. He is held responsible for the proper policing and sanitary

condition of the stable, picket line, and ground pertaining to them. One or more men, called *stable police*, are detailed for the purpose of policing, removing manure, feeding, etc., under the direction of the stable sergeant.

Usually horses are groomed twice daily, at morning and at evening stables, under the supervision of the stable sergeant and a commissioned officer. Under special circumstances, it may be advisable to groom only once a day.

The stable police, after grooming their own horses at morning stables, clean out the stalls and police the stable, under the direction of the stable sergeant. The bedding is taken up, that which is much soiled being separated for the manure heap, and the remainder put on the litter racks or spread upon the ground to dry.

At or before evening stables, the stable is policed; the bedding is laid down and fresh straw spread on top of it; the bed must be soft and even, with the thickest part toward the manger; where horses eat their bedding, the old litter should be placed on top of the new straw.

Grooming.

996. The grooming is always at the picket line, except in stormy weather. *Stable call* is the first call or warning call for stables after the assembly. The roll having been called, the men are marched to the horses or stables, and get to work as soon as the sergeant commands: COMMENCE GROOMING.

Each trooper grooms his own horse. Supernumerary horses are groomed under the direction of the sergeant.

At stables, each man examines and cleans his horse's feet. Horses requiring shoeing are reported to the noncommissioned officer in charge of the squad, who notifies the stable sergeant.

Each horse should be groomed not less than twenty minutes, and as much longer as may be necessary.

When the horses are sufficiently groomed, the sergeant reports to the officer in charge, who directs him to dismiss the detachment. The sergeant then commands: CEASE GROOMING; LEAD IN. The horses are led into their stalls and properly secured, under the supervision of the sergeant, who then forms the detachment, marches it to quarters, and dismisses it.

Should the officer wish to inspect the horses before they are led in, he notifies the sergeant, who commands: CEASE GROOMING; STAND TO HEEL. The officer, accompanied by the sergeant, inspects the horses, and if he finds them properly groomed, directs the sergeant to dismiss the detachment. If any of the horses are not properly groomed they will be left at the picket line and groomed under the supervision of a noncommissioned officer detailed for that purpose.

To Groom.

997. Take the currycomb in the right hand, fingers over back of comb; begin on the near side at the upper part of the neck, thence proceed to the

chest, arms, shoulders, back, belly, flank, loins, and croup in the order named. Then go to the off side, taking the comb in the left hand, and proceed as before.

The currycomb is applied gently and is used only to loosen the scurf and matted hair; it is not used on the legs from the knees or hocks downward, except to carefully loosen dried mud.

Next, take the brush in the left hand and change the currycomb to the right; begin at the head and then the neck on the near side, and proceed in the same order as in currying, brushing also the parts not touched by the comb; on the off side, take the brush in the right hand, the currycomb in the left. The principal working of the brush should follow the direction of the hair, but in places difficult to clean, it may be necessary to brush against it, finishing by leaving the hair smooth. After every few strokes clean the brush from dust with the currycomb.

Having finished with the brush, rub or dust off the horse with the grooming cloth, wipe out the eyes, ears, and nostrils, and clean the dock. The skin under the flank and between the hind quarters must be soft, clean, and free from dust.

Currycombs, cards, or common combs must never be applied to the mane or tail; the brush, fingers, and cloth are freely used on both.

The wisp is used when the horse comes in wet from exercise, rubbing against the hair until dry, from his hind quarters up to his head. If very wet, very hot, or very cold, blanket the horse, groom and hand-rub the legs; then remove the blanket and groom the body.

Feeding.

998. In garrison, it is recommended that grain be fed at first call for *reveille*. The grain, in a box on wheels, is rolled opposite the stalls, whence it is transferred to the feeding boxes by allowance measures. Grain is fed again at evening stables as in the morning, but not until after the hay has been distributed and the stable swept out and the dust thoroughly settled.

In camp, or on the march, grain is fed morning and evening. The men are marched to the forage wagons or other grain depository, where the noncommissioned officer in charge, with an allowance measure, issues to each in turn.

The sergeant then marches them back to the horses and commands: FEED. The men are to remain near their horses until they have done eating. Each man may be required to feed and groom as soon as he has received his grain.

In garrison, hay is usually fed in the evening, but when horses are kept in the stables during the entire day a portion is fed in the morning. The dust must be well shaken out of the hay before it is put in the mangers.

In camp, hay is fed at the picket line morning, noon, and evening; on

the march, or when the horses are grazed during the day, in the evening only.

The use of bran once or twice a week is important for stabled horses. In spring or early summer, they should be grazed. Two and a half to three ounces of salt should be given every week, preferably lumps of rock salt, secured in or near the manger.

When forage cannot be obtained, grazing should be allowed at every spare moment, both in camp and at halts on the march.

The daily allowance of oats, barley, or corn is 12 pounds to each horse; that of hay, 14 pounds; the allowance of straw for bedding is 100 pounds a month to each animal.

Watering.

1000. Horses must be watered quietly and without confusion; the manner in which this duty is performed is often a good test of the discipline of a mounted command.

Horses are to be led or ridden to and from water at a walk. At the drinking place, no horse should be hurried or have his head jerked up from the water.

In the field or on the march, the watering is from the most convenient running water; in garrison, it is usually from troughs, which should be cleaned each day. In warm weather, water drawn from a cold well or spring should stand long enough for the chill to pass off.

The horses are watered under the immediate direction of the sergeant, but, if they are liable to meet those of other commands at the watering place, a commissioned officer should supervise this duty.

Horses should be watered before feeding or not until two hours after feeding. Ordinarily, they should be watered twice a day; in hot weather, three times a day.

In very cold weather, once a day, about noon, is sufficient. A horse will rarely drink freely very early in the morning.

If a mounted command have to march a long distance without water, so that it will be necessary to encamp en route, the animals are fed, but denied water until just before starting, when they are permitted to drink freely. The command marches in the afternoon, and does not encamp until it has accomplished at least half of the distance, and moves early the next morning to reach water.

Watering the horses on the march depends in a great measure upon the facilities to be had. If nothing is known as to the country over which the day's march is to be made, water call should be sounded shortly before leaving camp and every horse given an opportunity to drink. As many animals, however, will not drink at an early hour or until after exercising, the horses should be watered again at the first opportunity. On severe marches, frequent watering is of great benefit.

The daily allowance of water for a horse at rest is about six gallons; when at work, from eight to twelve gallons; for a man, one gallon for all purposes. One gallon of fresh water weighs $8\frac{1}{3}$ pounds, approximately one pint to one pound.

General Rules for Stable Management.

1118. The following general rules are recommended:

The stable sergeant has immediate charge of the police and sanitary condition of the stable, picket line, etc., and is the custodian of the forage and stable property generally.

The stable is to be kept thoroughly policed, free from smells, and, except portions of stalls that horses can reach, should be well limewashed. There must be no accumulation of manure or foul litter inside, nor near the doors or windows without. The feed boxes are washed from time to time, and kept clean. The ground about the picket line is swept daily, and all dung, etc., carried to the manure heap.

Except at night, when the horses are bedded down, no manure or urine is to remain in the stalls; the stable police remove it as it accumulates.

If practicable, all woodwork within reach of the horses, and not protected with sheet iron or other metal, should be painted with thin coal tar to prevent it being gnawed. The same precaution may be followed with regard to troughs, picket posts, and picket line. It should be thoroughly dried before putting horses near it.

Smoking in stables, or in their immediate vicinity, is prohibited.

One or more lamps will be hung in each stable to burn during the night.

The horses are stalled according to their positions in the squads; their places at the picket line will be in accordance with the same rule.

Over each horse's stall is placed the name of the horse, under that of his rider.

Clay is the best for earthen floors. Gravel, or sandy earth, is not suitable.

The sloping of the floor of stalls from the manger to the heel post is injurious and uncomfortable for the animal, making him stand in an unnatural position, with the forelegs higher than the hind ones. When the earthen floors are level, the horse will paw a hollow for his forefeet unless he can elevate his hind quarters by backing out of the stall.

Whenever horses go out of the stable, the windows of their stalls are to be kept open, unless necessary to exclude rain or snow, or when cold drafts affect the animals in contiguous or opposite stalls.

Stable doors are never closed in the daytime, except to keep out wet, or to exclude cold winds that blow on the horses. If the doors be in a single piece, bars are put across the doorway; if divided into upper and lower halves, it will usually be sufficient to open the upper part. At night, the entrance to the stables should be secured in such manner as will prevent the escape of animals.

When circumstances permit, horses should be turned loose in the paddock during the daytime, or herded under charge of a guard. When neither is practicable, they should, except in very cold, windy weather, or in very hot weather where there is no shade, stand most of the day at the picket line, as they have better air and are less confined, while the stables become drier and more healthful.

In ordinary climates, cavalry stables must be kept as cool as possible. If the horses do not stand directly in the draft, the colder the stable the less will they suffer if called suddenly to take the field. For the same reason, horses should never be blanketed in the stable, except during very cold weather.

Treatment and Care of Horses.

1119. Horses require gentle treatment. Docile but bold horses are apt to retaliate upon those who abuse them, while persistent kindness often reclaims vicious animals.

A horse must never be kicked or struck upon or near the head with the hand, reins, or any instrument whatever.

At least two hours' exercise daily is necessary to the health and good condition of horses; they should be marched a few miles when cold weather, muddy ground, etc., prevent drill.

Horses' legs will be hand-rubbed often, particularly after severe exercise, as this removes enlargements and relieves or prevents stiffness.

In mild weather the sheath will be washed occasionally with warm water and castile soap, and then greased; in cold weather, when necessary, the sheath should be greased.

Horses used freely in snow and slush must not be placed in a warm stable with littered stalls.

CHAPTER II.

PACK SADDLE AND PACKING.

THE course in packing is also taken from the Cavalry Drill Regulations and is as follows:

Pack Trains.

1122. Active, short-coupled, short-legged, "blocky" mules, weighing from 800 to 1,000 pounds, are considered the best for pack animals.

Under favorable conditions each animal can carry a load of about 30 per cent of his own weight; the load should not be much in excess of 200 pounds when long or hard marches are to be made.

* * * * *

In camp or garrison, logs of wood, 26 inches long, and sacks of corn, double-sacked and lashed to avoid breaking sacks, having the weight it is intended the mules should carry, are kept on hand for drill purposes.

Each pack should be provided with two coils of $\frac{3}{8}$ inch rope, 18 to 28 feet long, for lashing side packs.

The pack saddle consists of the *saddle proper;* two *pads; crupper; corona; manta* or *pack cover;* two pieces of canvas, each 84 x 22 inches, stitched together on the long edges; *halter and strap; canvas cincha,* 10 inches wide; *sling rope,* $\frac{1}{2}$-inch best hand-laid manila whale line, 20 to 32 feet long; and *leather cincha,* with *lash rope* $\frac{5}{8}$-inch whale line 42 feet long. There should be one *blind* for every five packs.

The size of rope is given by the measurement of its diameter.

A "full-rigged" saddle has *sling straps* and *cargo cincha;* the sling and lash ropes are then dispensed with.

While saddling, loading, or readjusting the packs, the animals should be blinded. The mules should be trained to stand perfectly quiet while the blind is on; they should never be led or forced to move without first removing the blind.

To Fit the Saddle.

1123. The pack saddle is fitted to the animal in a manner similar to that of the riding saddle; it is so constructed that it can be placed one and one-half inches farther forward than the riding saddle.

If the pads are not square, draw the screws, unlace the pads from the

skirts, then square and fit them to the animal by placing the canvas cincha immediately around the animal's girth, the front edge touching the breast-bone (cartilages of true ribs), the middle of the cincha being exactly in the middle of the lower edges of the pads; then screw the pads to the saddle bars, keeping the cincha in place till the adjustment is made; then remove the cincha and replace the pads.

Adjust the canvas cincha so as to be long enough to go nearly around the girth of the mule, over the saddle.

Adjust the crupper by lengthening or shortening the lace strings that attach it to the saddle, taking care not to make it too tight.

To Saddle.

1124. Place the corona on the mule's back, about two to two and one-half inches in front of where the pommel end of the saddle is to rest; place the folded saddle blanket over the corona; take the saddle by both yokes and place it squarely in position, a little in rear of its proper place; place the crupper under the dock and gently move the saddle forward to position; pass the ring end of the canvas cincha over the saddle from left to right and under the belly; pass the latigo through the ring and tighten the cincha; when cinched, the ring end of the cincha should be above the lower edge of the near pad.

Cargoes.

1125. The rations should be carefully put up in 100-pound packs lashed solidly, and carried on the best pack mules; each pack is plainly marked with its contents and weighed.

Salt, sugar, coffee, and beans are double-sacked and lashed in 100-pound packages. Bacon, in 100-pound packages, is packed in from five to eight pounds of clean straw or hay, double-sacked, and lashed firmly.

The yeast-powder cases should be opened and hay or straw stuffed closely around the boxes to prevent shaking, and, with other articles, lashed in 100-pound packages.

Each cargo is in two side packs of about 100 to 125 pounds each, and should match in size, shape, and weight, as nearly as practicable, each side pack having, as nearly as may be, the following proportions: width one-half more than thickness, length nearly one-half more than width; *e.g.*, 12 x 18 x 25 inches.

All the salt, sugar, coffee, and beans should not be placed in one cargo. Ammunition should be in cargoes.

Pads or cushions of hay 26 x 44 inches may be placed under the cincha to keep long and rough packs from the animal's hips and shoulders.

To Load Cargo.

1126. The packers should work by threes, designated Nos. 1, 2, and 3. No. 1 is on the near side, No. 2 on the off side of the mule; when No. 3

works with No. 1, he is nearest the croup; when with No. 2, he is opposite the mule's shoulders.

The mule is placed near to, and with its left side next to, the cargo by No. 2, who then puts on the blind.

No. 1, on the near side, passes the center of the sling rope over the saddle to the off side far enough to allow the rope to pass over the off-side pack and

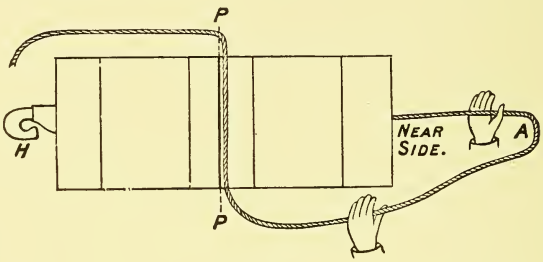

FIG. 234.

come back within his reach, the parts of the rope separated by six to twelve inches. Nos. 2 and 3 take the off-side pack, place it well up on the saddle; No. 2 grasps the loop of the sling rope with his right hand, brings the rope up against the pack, and lets the loop drop over his right shoulder, in readiness to pass it over the pack; No. 2 holds the pack in place. No. 3 passes to the near side and with No. 1 takes the near side pack and places it, flat side next the mule, well up on the saddle, lapping the upper edge well over the upper edge of the off-side pack. No. 1, with his back to the mule's

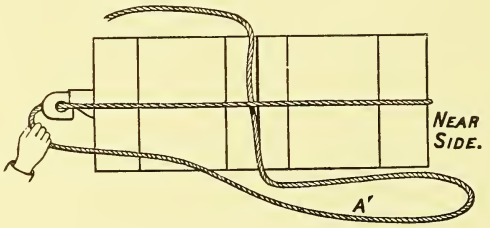

FIG. 235.

shoulder, takes the end of the front part of the sling rope, passes it from the outside through the loop, and pulls it down with the right hand; he now grasps the rear end of the sling rope with the left hand and ties the ends together in a square bowknot, the packs high up.

No. 1 calls out: *Settle;* Nos. 1 and 2 each grasps his side of the cargo by the lower corners, lifts upward and outward, settling the upper edges well together and balancing the load. If the packs are tied too high, they

are easily lowered, but if tied too low they must be lifted and placed as in the first trial.

While Nos. 1 and 2 are tying and placing the cargo, No. 3 takes the lash rope, throws the free end to the rear of the mule, convenient to No. 2, and places the cincha end in front of No. 1. No. 1 grasps the rope with the right hand, three feet from the cincha, and passes the hook end of the cincha

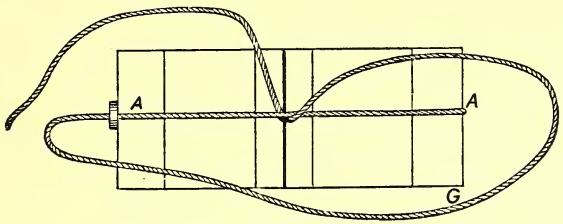

FIG. 236.

under the mule to No. 2, who takes the hook (H, Fig. 234) in the left hand; No. 1, with the left hand, grasps the rope three feet above the right, raises the rope, and lays it between the side packs from rear to front (PP), pulling it to the front, until a long enough loop (A) is formed to pass over the cargo and fasten in the cincha hook (H, Fig. 234). The right hand, back down, holds the cincha end of the rope, the loop (A) falling outward over the right forearm; the left hand, back up, holding the other part of the rope between the loop and the middle of the packs; No. 1 now throws the loop (A) over

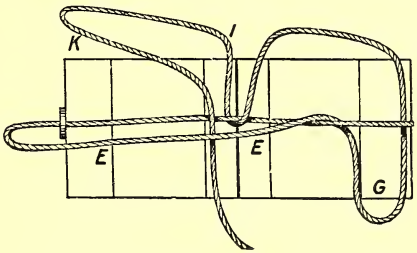

FIG. 237.

the pack, then lets the part in the left hand drop on the mule's neck, thus forming another loop (A′, Fig. 235); No. 2 passes the rope through the hook, pulls the cincha end of rope till the hook is drawn up so that, when tightened, the hook shall be near the lower edge of the off pad; No. 1 now grasps the rope at G, Fig. 236, and tucks a loop, from rear to front, under the part AA, Fig. 236, over the center of the near side pack (G, Fig. 237); No. 2 passes the free end of the rope under the part EE, Fig. 237, and throws it over on the near side of the mule's neck; No. 1 draws the tucked loop forward and forces the rope under the corners and lower edge of the near pad and hauls

it taut from above the rear corner; No. 2 grasps the rope at I, Fig. 237, with the left hand, and at K, Fig. 237, with the right, passes the rope under the corners and lower edge of off pad (K, L, Fig. 238), and hauls taut at the front corner, No. 1 taking in the slack at the free end of rope.

The lash rope is now ready for *final tightening*.

No. 2 removes the blind, leads the mule forward a few steps, No. 1, in rear, at the same time looking to see if the packs are properly adjusted. The mule is again blinded.

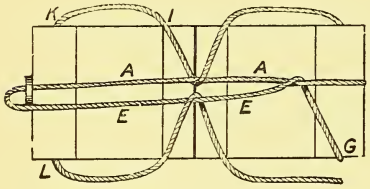

FIG. 238.

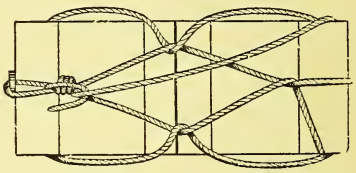

FIG. 239.

The object of the final tightening is to lash the load firmly to the saddle; pulling all the parts of the lash rope taut, and taking up the slack, commencing at the cincha, and continuing the process from part to part, until the slack is taken up at the free end of the lash rope. While No. 2 is pulling the parts taut, No. 1 takes up the slack or steadies the cargo, and *vice versa;* the pulling is done in such manner as not to shake the cargo out of position.

No. 2 grasps the lash rope above where it leaves the hook and below the edge of the pad, right hand below left, places the left knee against rear corner of pad; No. 1 grasps with the right hand the same part of the rope where it comes over the pack on the near side, and with the left hand at G, Fig. 238, places his right shoulder against the pack to steady it; he then says: *Pull.* No. 2 tightens by steady pulls, and, without letting the rope slip back through the hook, gives the slack to No. 1, who takes it up by steady pulls. When No. 2 thinks the cincha is sufficiently drawn, he says: *Enough.* No. 1 holds solid with the right hand, slips the left down to where the rope passes over the front edge of pad, and holds solid; the right hand then grasps the continuation of the rope at rear corner of pad and pulls taut; then, with both hands, placing his right knee against rear corner of pad, pulls the rope well home, No. 2 taking up the slack by grasping the rope (I, Fig. 238) where it comes over the rear end of off-side pack, with both hands. No. 1 steps to the front and steadies the pack; No. 2 then pulls taut the parts on his side, taking up the slack; this draws the part of the lash rope AA, Fig. 238, well back at the middle of the pack; he then with the left hand at the rear corner of pad (K) pulls taut, and holds solid, while with right hand at front corner of pad (L), he takes up slack; he

then with both hands at, and placing his knee against, the front corner of the pad, pulls well taut, No. 1 taking up the slack on his side, and then pulls solid, drawing the part EE, Fig. 238, of the rope coming out from the hook well forward at the middle of pack, then carries the free end under the corners and end of pad, draws taut and ties the end fast by a half hitch near cincha end of lash rope. If the rope should be long enough to reach over the load, after passing under the corners, it is passed over and made fast on the off side by tying around both parts of the lash rope above the hook and drawing them well together.

1127. To tighten the lash rope on the load it is necessary to take up and pass the slack as in the *final tightening*.

To slacken the rope on the load it is necessary to begin to slacken from the free end, and carry the slack by reversing the process of tightening.

When the pack cover is used, it is placed over the cargo before putting on the lash rope.

When the side packs are of unequal bulk or weight, the larger or heavier should be placed on the near side; it should then lap over the off side pack until the packs balance.

Top packs, i.e., small packages placed in the middle between the side packs, should be avoided.

When the sling rope is half hitched into the saddle yokes, the load is made more secure, but there is great danger of injury to the mule's back.

On the *full-rigged* saddle, the canvas cincha is attached to the saddle by the "spider"; the side packs are laid on the saddle as before, held by the sling straps and secured by the *cargo cincha*. The lash and sling rope are then dispensed with; but use of the lash and sling rope gives greater security to the cargo and greater comfort to the mule.

To Unload Cargo.

1128. Only two men, Nos. 1 and 2, are necessary; they work as when loading.

The mule is placed with the head toward the center of where the cargoes are piled. No. 1 puts on the blind; No. 2 unfastens the free end of the lash rope; then Nos. 1 and 2 slacken the rope; No. 2 with the left hand removes the part under the end and corners of the pad on the off side, and unhooks the cincha with the right hand; No. 1 removes the part under the end and corners of the pad on the near side, gathers the parts of the rope together on his side with both hands, coiling it, and lays the rope on the ground where he intends to place the cargo, the cincha and free end exposed on the side opposite where the rigging is to be placed. No. 1 unties the sling rope, casts it loose, takes his side pack and places it on the lash rope across the line of cargo; No. 2, at the same time, takes his side pack and lays it on top of near side pack and then, holding the sling rope at center

loop, doubles it and places it on top of load, loop exposed, for convenience when required.

The second load is placed end to end with the first and on the side next to where the rigging is to be placed; the end of the lash rope is coiled and placed on top of the last sling rope, and is used for tying the mule when reloading.

The saddle cinchas should be slackened and the mules allowed to cool before removing the saddles.

To Unsaddle.

1129. Unfasten the latigo and throw the end across the top of saddle; fold the cincha with latigo inside and place across top of saddle; push the saddle back, remove crupper from under dock, double it forward, with crupper above cincha on top of saddle, and remove the saddle; the saddles are placed in line, resting on the ends of pads.

CHAPTER III.

DRIVING.

THE wagons which the hospital corps man may have to drive and care for are the four-mule escort wagon, the six-mule army wagon, and the four-mule ambulance wagon.

The standard wagon is the four-mule escort wagon. The load should not exceed 3,000 pounds on good roads; for average conditions, 2,500 pounds is considered a fair load.

For the six-mule army wagon the load should not exceed 4,000 pounds on good roads; for average conditions, 3,500 pounds.

Wagons should always be supplied with a spare pole, an axe, a bucket for watering the animals, a hammer, a monkey wrench, spare bolts, a candle lantern, and a box of axle grease.

The ambulance is a four-wheeled vehicle, ordinarily drawn by two animals in garrison and four in the field. It provides transportation for eight men sitting or four recumbent on litters, or four sitting and two recumbent. It is fitted with four removable seats, which when not used as such, are hung, two against each side. The arrangements for supporting the upper tier of litters (upper berths) consist of two litter-supporting posts and four straps. The litter-supporting posts are two uprights, placed 73 inches apart. The one in front is stationary, being secured to the roof and floor; the one at the rear is hinged at the top, and when the upper berths are not to be used it is strapped to the roof. When the upper berths are to be used, it is unstrapped and swung into a vertical position, when its lower end is secured to the floor by a slot and bolt. Fastened to each of the litter-supporting posts, $27\frac{3}{4}$ inches from the floor, is a socket for the inside handles of the litter, and opposite each socket, attached to the side of the ambulance, is a strap to hold the outside handles. The floor is $7\frac{1}{2}$ feet long and 4 feet wide.

Under the body of the ambulance, in front of the rear axle, are

two ambulance boxes, which consist of two double tin boilers with fire grates. One box contains hospital stores and the other surgical dressings. (See Manual for the Medical Department.)

Spare parts and additional articles are also carried by each ambulance. (See Manual for the Medical Department.)

The art of harnessing and driving can only be taught practically.

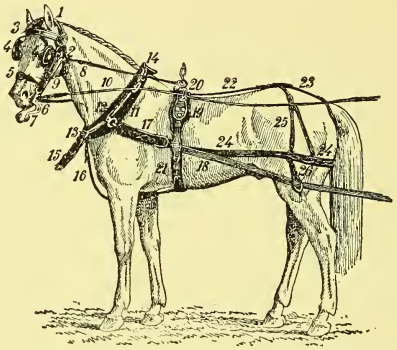

FIG. 240.—Harness. 1, Crown; 2, cheek piece; 3, front; 4, 4, blinds; 5 nose band; 6, bit; 7, curb; 8, check; 9, throatlatch; 10, rein; 11, collar; 12, hame; 13, hame link; 14, hame strap; 15, pole strap; 16, martingale; 17, trace-tug; 18, trace; 19, saddle; 20, terret; 21, belly-band; 22, turn-back; 23, crupper; 24, breeching; 25, hip-strap; 26, trace bearer.

Familiarity with the parts of the harness (Fig. 240) and the methods of harnessing and unharnessing should be imparted to the whole class, and one man should be detailed at a time as assistant to the ambulance driver and stable man in order that he may learn practically how to care for the animals and harness and how to drive.

IN THE FIELD.

Animals: Animals are rendered unserviceable by overwork, by neglect of regular feeding and watering, or by failure to discover and properly treat all slight injuries before they become serious.

In the field animals should be fed night and morning, the larger feed at night, when there is ample time to eat and digest the food. When hard worked, they should have their full ration of grain, and when the ration of hay is reduced or omitted they should have a chance to graze. Frequent watering is a necessity, particularly in hot weather, and always before feeding. When possible, a half-hour before reach-

ing camp animals should be allowed to drink all they wish. If the animals arrive in camp in a heated condition they should be allowed to cool before feeding and watering; otherwise they are in danger of being foundered. Feed the allowance of salt twice a week.

All animals should be groomed twice a day, and at each grooming their feet should be cleaned and examined. A loose shoe should be attended to at once by the blacksmith, either on the march or in camp. All animals should be shod at least once a month and as much oftener as necessary. The animals when turned out to graze should be herded by sufficient men to insure their safety. A bell mare with a mule herd keeps the animals from straying.

Dirt allowed to dry on the collars causes sore shoulders. To prevent this clean the collars thoroughly at night and oil slightly when the leather is nearly dry. Wash the chafed places on the animals with strong salt water. Collar pads are often serviceable in keeping the pressure from a chafed shoulder.

Wagons in the field should be inspected at the end of each day's march, and, if practicable, all necessary repairs made promptly. Particular attention should be given to discovering the loss of nuts and to replace the missing; a good supply of nuts and a few extra bolts should be carried in the tool box. The axles should be greased daily and care taken to remove the old before putting on fresh grease.

List of articles carried on each wagon:

	Number.
Axe, front of wagon	1
Axle nuts, in tool box	2
Bucket G. I., under rear of wagon	1
Sponge, in tool box	1
Currycomb and brush, in tool box	1
Cases axle grease, in tool box	2
Extra hames, in tool box	2
Lantern, in water bucket	1
Wagon wrench, in tool box	1
Open links, in tool box	3
Pole, on side of wagon	1
Reach, on side of wagon	1
Pickax, on side of wagon	1

	Number
Three-eighths or one-half inch rope, on side of wagon, ft.	150
Spade, on side of wagon	1
Hame straps, in tool box	3
Hame strings, in tool box	3
Shoe for each foot of each animal, previously fitted, in tool box	1
Horse-shoe nails, in tool box	
Singletrees, under wagon	2
Doubletree, under wagon	1
Ball strong twine for harness repairs	1

Harness: The harness should be examined daily, and any defect or weakness should be repaired at once. When removed from the animals at night, harness should be placed where it will dry and not be thrown upon the ground. The collars should be carefully wiped off and the dirt removed from the remainder as far as practicable. Harness should be thoroughly cleaned at least twice a month. For this purpose use a bucket, lukewarm water, sponge, harness soap, harness dressing, neat's-foot oil, and lampblack. For ordinary cleaning, the following should be observed: Provide a rack to hang the harness on. When no better arrangement is at hand, insert one end of the wagon pole between the spokes of one of the hind wheels, above the hub. Strap it to the axle and hang the harness on the pole. Dampen the sponge in water and pass it over the harness until the dirt has become soft. Rinse out the sponge as often as necessary, renewing the water when it is dirty. Then rub the sponge on the harness soap until a good lather is obtained, and give the harness a good heavy coating of it, and rub it until all dirt is removed. Then work up a thick soap lather, coat the leather part of the harness with it, and allow it to dry without further rubbing. When dry, put on a light coat of harness dressing with a clean sponge, touch lightly, only enough to spread the dressing, and do not rub. When harness is dry and hard from neglect, after cleaning as above, take a pint of neat's-foot oil for each single set of harness, pour the oil into a pan and mix it with lampblack in proportion of one teaspoonful to each pint of oil. Stir this mixture until it has a glossy black appearance. In cold weather the oil should be warm. Apply with a small sponge, rubbing it well in. When thoroughly dry, apply harness dressing as previously described.

PART IX.

ARMY REGULATIONS.

THERE are two courses in Army Regulations; a primary course for all hospital corps men, and a more advanced course for noncommissioned officers, and for privates first class who are candidates for promotion.

CHAPTER I.

PRIMARY COURSE.

ARMY REGULATIONS PROPER.

PARAGRAPHS 1, 4, 9, 27–29, 93, 94, 96, 133, 135–137, 167, 168, 170, 174, 176–178, 180–183, 185, 382, 383, 388–395, 872, 1374, 1388–1393, 1403–1407. These paragraphs are printed in the Soldiers' Handbook, of which every soldier has a copy, so they are not reproduced here.

MEDICAL DEPARTMENT.

THE HOSPITAL CORPS.

1431. The members of the hospital corps will be enlisted for and permanently attached to the medical department. In time of war the corps will perform the necessary ambulance service under such officers of the medical department and assistants as may be detailed for that duty.

1435. Sergeants first class, though liable to discharge, will not be reduced. Sergeants, corporals, lance corporals, and privates first class may be reduced by sentence of a court-martial, by the Surgeon-General, or by the chief surgeon of a division or department.

1436. To test the capacity of privates of the hospital corps for the duties of noncommissioned officers, the Surgeon-General and chief surgeons may appoint lance corporals, who will be obeyed and re-

spected as corporals; but no detachment shall have more lance corporals at a time than enough to make the proportion of all noncommissioned officers present for duty one to four privates of the hospital corps. Lance corporals are on the same footing regarding reduction as corporals.

1438. Enlistments for the hospital corps will be made in the grade of private. Sergeants first class, sergeants, corporals, lance corporals, and privates first class may be reënlisted in their respective grades and their warrants and appointments continued in force, provided their reënlistment takes place on the day following discharge. Each reënlistment and continuance may be noted on the warrant or appointment by the surgeon. Enlistments and reënlistments will, as a rule, be made by medical officers. Recruiting officers, stationed where there is no medical examiner, may make such enlistments or reënlistments upon the authority of the Surgeon-General. In such cases the recruiting officer in making the physical examination will be guided by instructions from the Surgeon-General. Applicants may be accepted who are subject to refractive errors of vision, provided these errors are not excessive ($\frac{10}{20}$), may be entirely corrected by glasses, and are not progressive or accompanied by ocular disease. Accepted recruits will be forwarded to a station to be designated by the Surgeon-General.

Enlisted men of the line, gunners artillery corps and musicians excepted, may be transferred to the hospital corps as privates by the commander of a division, separate brigade, or department, on the application of the surgeon of the post or command, forwarded through military channels. The application will state the age, character, physical condition, and habits of the soldier, date of expiration of current enlistment, and whether made for an existing or prospective vacancy. If the soldier be over forty years of age his special qualifications for transfer will be stated.

1441. Married men will not be enlisted as privates in or transferred to the corps, and no sergeant who is married shall be reënlisted without special authority.

1442. Members of the corps will not be required to perform any military duties other than those pertaining to their corps. They will be instructed in such drills, both foot and mounted, as are necessary

for their efficiency. They will not be required to attend ceremonies, except when directed by the commanding officer, and will ordinarily be inspected and mustered at the hospital. The forms of inspection will be in accordance with the prescribed drill regulations for the hospital corps.

1446. At every permanent military post there will be at least four privates of the hospital corps, six privates when the strength of the garrison is 200, and two privates additional for every additional 100 of strength. They will be assigned to the respective duties connected with the hospital service by the surgeon of the post.

1447. The number of noncommissioned officers and privates of the hospital corps to be stationed at general hospitals, arsenals, engineer stations, and independent posts will be determined by the Surgeon General under the direction of the Secretary of War.

1449. All men of the hospital corps will be instructed under the supervision of the surgeon of the post in the duties of litter-bearers and the methods of rendering first aid to the sick and wounded, and in the various subjects pertaining to the sanitary soldier.

GARRISON SERVICE.

Ambulances and Litters.

1456. Ambulances are vehicles provided for the service of the medical department. They will be used only for transportation of the sick and wounded, the recreation of convalescent patients, or to give instruction in the duties of the ambulance service. They will be furnished and repaired by the Quartermaster's Department, will always be subject to the call of the surgeon, and, when practicable, will be housed near the hospital.

1458. At each post, one or more of the privates of the corps will be designated by the surgeon as ambulance driver. In addition to his other duties, he will care for the ambulance, its equipment and harness, and see that they are always in readiness for immediate use. In the field, he will care for the animals. When it is necessary to use the ambulance for any transportation purposes, the commanding officer, on the application of the surgeon, will see that the requisite animals are provided by the quartermaster, and placed at the disposal of the surgeon.

FIELD SERVICE.

1463. On the march each medical officer will habitually be attended by a mounted private of the hospital corps. When practicable, horses will be furnished by the Quartermaster's Department, and horse equipments by the Ordnance Department for those members of the corps on duty in the field who are authorized to be mounted. When no horses are available, special application for authority to hire must be made.

1464. Ambulances will be used for the transportation of the sick and injured, the instruction of the hospital corps, and, in urgent cases, for the transportation of medical supplies, and all persons are prohibited from using them, or requiring or permitting them to be used, for any other purpose. It shall be the duty of the officers of the ambulance service to report to the commander of the troops any violation of the provisions of this paragraph.

1465. No person, except the proper medical officers or the officers, noncommissioned officers, and privates of the ambulance service, or such persons as may be specially assigned by competent military authority to duty therewith, will be permitted to take or accompany sick or injured men to the rear, either on the march or elsewhere.

1466. When members of the hospital corps are detailed for service in the field during Indian wars, or when left with the sick or wounded under circumstances which justify the expectation that their rights under the Geneva Convention will not be recognized, commanding officers will issue to members of the hospital corps revolvers or other available firearms.

SERVICE OF HOSPITALS.

1475. The senior surgeon is charged with the management and is responsible for the condition of the hospital, which will be at all times subject to inspection by the commanding officer. The senior surgeon of the post will inspect the hospital every morning, and on Saturday will also inspect the detachment of the hospital corps.

1478. Patients will, if possible, leave their arms and accouterments with their companies. (M. M. D., 303.)

1480. Sick or wounded soldiers, discharged while in hospital, will

be entitled to medical treatment in hospital, and to the usual ration during disability, or for the period considered proper for them to remain under treatment, but a discharged soldier who has left the hospital will not be readmitted except upon the written order of the commanding officer.

1481. Recently discharged soldiers, needing hospital treatment, who arrive in New York City, San Francisco, or other port on Government transports, may be sent to one of the military hospitals in the vicinity, and rations in kind drawn for them while undergoing treatment.

1482. Tents, clothing, hospital furniture, and other stores used in the treatment of contagious diseases, will be disinfected or burned upon the recommendation and under the supervision of a medical officer. (M. M. D., 321.)

1483. The Secretary of War may, on the recommendation of the Surgeon-General, order gratuitous issues of clothing to soldiers who have had contagious diseases, and to hospital attendants who have nursed them, to replace articles destroyed by order of the proper medical officer to prevent contagion.

1485. Civilian employés at military posts, including employés of post exchanges, may be furnished the medical supplies prescribed for them by a medical officer under such regulations as the Surgeon-General may establish in accordance with law.

1486. A civilian employé on duty at a station where other than army medical attendance cannot be procured is entitled, when necessary, to admission to hospital.

1489. The surgeon of the post will keep, account for, and expend the hospital fund, according to the instructions of the Surgeon-General, exclusively for the benefit of the sick in hospital and the enlisted men of the hospital corps serving therein.

MEDICAL ATTENDANCE.

1500. Medical officers and contract surgeons on duty will attend officers and enlisted men, and, when practicable, their families; and at stations, or in the field, where other medical attendance cannot be procured, civilian employés. Medicines will be dispensed to all persons entitled to medical attendance, and hospital stores to enlisted

men and hospital matrons, also to officers at posts or stations where they cannot be procured by purchase.

1501. Medical officers and contract surgeons at their stations will furnish medical attendance to officers and enlisted men on the retired list, but they will not be required to leave their stations for that purpose. Medicines, dressings, etc., will be supplied to retired officers and enlisted men from army dispensaries on medical officers' prescriptions.

MEDICAL SUPPLIES.

1514. The routine issue of disinfectants is prohibited. (M. M. D., 396–397.)

ARTIFICIAL LIMBS.

1517. Every officer, enlisted man, or employé of the military forces of the United States who, in the line of duty, or through disease contracted in service, shall have lost a limb, or the use of a limb, will receive once every three years an artificial limb or appliance, or commutation therefor, if he shall so elect, under such regulations as the Surgeon-General of the army shall prescribe. The money value allowed as commutation is, for a leg, $75; for an arm, foot, and apparatus for resection, $50.

1518. Necessary transportation, including sleeping-car accommodations, required for travel to place where artificial limbs may be fitted, will be furnished by the Quartermaster's Department, the cost to be refunded from any money appropriated for the purchase of artificial limbs.

ARTICLES OF WAR.

Articles 1, 2, 4, 11, 17, 19–22, 24–28, 30–34, 36, 38–40, 42–48, 51, 55, 57, 62, 66, 70, 88, 89, 98, 102, 103, 114, 126, 128. These articles will be found in the Soldiers' Handbook.

MANUAL FOR THE MEDICAL DEPARTMENT.

Examination of Recruits.

130. Every accepted (sworn) recruit will be vaccinated at the recruiting station. Vaccine virus is supplied by the Surgeon-General. As soon as the recruit joins any depot, regiment, or post he will be examined by the surgeons to ascertain whether vaccination is required.

In all cases where there is not unmistakable evidence of successful vaccination within a reasonable period the operation will be performed immediately (A. R. 876, 1904).

The following directions will be observed by medical examiners in carrying into effect these requirements:

(*a*) Sterilize the area to be vaccinated, usually the outer aspect of the left arm at or near the insertion of the deltoid, by thoroughly scrubbing with soap and water, using a scrub brush and following with alcohol. The skin should be permitted to dry by evaporation.

(*b*) Scarify the arm within the sterile area. This should be done with a sterile needle or lancet by making several fine parallel scratches and cross scratches. These should *only be deep enough to slightly redden the surface.*

(*c*) Apply the lymph from tube or point, spread it over the scarified surface with a suitable sterile instrument, allow to dry, and then cover with a sterile protective dressing.

THE HOSPITAL CORPS.

192. The hospital corps consists of sergeants first class, sergeants, corporals, lance corporals, privates first class, and privates.

195. A sergeant first class may be reënlisted at the expiration of his term of service on the authority of the Surgeon-General, provided he has passed successfully the prescribed examination. If he desires to reënlist he will report the fact, in writing, through military channels to the Surgeon-General sixty days before the expiration of his term of service (A. R. 1433, 1904).

215. In stating "character of the soldier, in detail," on the descriptive list of a member of the hospital corps transferred from one station to another, in addition to his general character as usually given, his habits as to sobriety and his attention to duty will be noted, adding in case of a noncommissioned officer: general character, intelligence, ability to command men, ability as pharmacist, ability as a clerk, ability as drill sergeant, habits as to sobriety, soldierly bearing, loyalty to his superiors; and in case of a private his special qualifications as nurse, cook, clerk, typewriter, stenographer, etc. A copy of this report will be sent to the chief surgeon. In noting physical condition on descriptive list, any prominent defects will be mentioned.

217. The hospital corps will receive the same allowance of clothing as mounted men of similar grades.

(*a*) Bleached cotton duck clothing issued by the Quartermaster's Department should be worn by men on duty in wards and dispensaries and by dental surgeon's assistants when on duty as such.

(*b*) To each enlisted man of the hospital corps who is entitled to wear service chevrons two pairs of such chevrons will be issued per annum free of charge.

220. All members of the hospital corps will be equipped with 1 waistbelt, 1 haversack (if dismounted), 1 set blanket roll straps (if dismounted), 1 first-aid packet (Medical Department), 1 canteen, 1 canteen strap (if mounted), 2 spurs (if mounted), 2 spur straps (if mounted), 2 canteen haversack straps (if mounted), 1 meat can, 1 cup, 1 knife, 1 fork, 1 spoon, 1 hospital-corps knife, 1 hospital-corps-knife scabbard, 1 shelter-tent half (Quartermaster's Department), 1 shelter-tent pole (Quartermaster's Department), 5 shelter-tent pins (Quartermaster's Department), and the privates first class and privates also with hospital corps or orderly pouch (Medical Department).

(*a*) The field kit for special arms and special grades of noncommissioned officers, if mounted, will consist of clothing, ammunition, and rations, as prescribed for cavalry; if dismounted, as prescribed for infantry, with the arms and equipments in each case, as prescribed for the special arm or grade. When armed with the revolver only the ammunition prescribed will be 20 rounds revolver ball cartridges.

Articles of personal equipment which a detached soldier carries with him will be noted on the soldier's descriptive list or descriptive and assignment card, and will be entered opposite the soldier's name on duplicate invoice blanks of the departments to which the property pertains, each invoice being signed by the officer accountable for the property mentioned thereon, or by the examining officer in his name. The soldier will sign in the body of the invoices acknowledgment that he has the property. One of these invoices signed by the soldier will be attached to the descriptive list or descriptive and assignment card. The invoices will when practicable indicate the destination of the soldier.

The accountable officer will drop from his return the articles thus turned over, which will be taken up by the officer to whom the soldier

reports. The officer dropping the property will forward one of the signed invoices with the return on which he drops the property. The officer who takes up the property will receipt for the same on the duplicate invoice and receipt attached to the soldier's descriptive list or descriptive and assignment card, which he will forward with the return on which he takes up the property. In change of station the shelter-tent half will not be taken by the soldier unless he is ordered to join a command for service in the field. See also A. R. 1564, 1904.

Course of Instruction for Hospital Corps Detachments.

246. The course of instruction will cover the entire year divided into two periods, the first period of thirty-four weeks from November 1 to about June 30, during which instruction will be given five hours per week; the second period from about June 30 to October 31, during which at least one hour per week will be devoted to drill and field work.

247. For troops in the field special attention should be given to field work, to include the care of animals, equitation, use of field appliances, camp sanitation, establishment of lines of aid in battle, etc. In the field no limit is to be placed on the amount of time to be devoted to this instruction.

248. In garrison three courses will be given:

Course No. 1, for privates first class and privates.

Course No. 2, for privates first class and selected privates.

Course No. 3, for noncommissioned officers and privates first class who are candidates for promotion.

249. These courses will cover the following subjects:

Course No. 1.

	Hours.
1. Discipline and duties of the soldier.	
2. Care of animals.	
3. Drill and field work.	
4. Anatomy and physiology	16
5. First aid	20
6. Nursing, bandaging, use of appliances, etc	36
7. Army Regulations	8
Total	80

Course No. 2.

	Hours.
1. Cooking, and diet cooking	12
2. Materia medica and pharmacy	24
3. Elementary hygiene	8
4. Clerical work	12
Total	56

Course No. 3.

1. Mess management	
2. Clerical work	10
3. Minor surgery	10
4. Army Regulations	10
5. Property responsibility and accountability	10
Total	40

Course No. 3 may be given at such time during the first period as may be deemed best; preferably it should be so timed as to terminate just before the annual examinations for sergeants first class and sergeants.

251. All members of the hospital corps (with the exceptions noted later) will be drilled at least one hour per week throughout the year. With the exception of drill, each subject of the courses will be taken up consecutively, and, when it is finished, an oral examination by a medical officer, under the direction of the surgeon, will be held. Members who pass a satisfactory examination will be classed as "qualified," and may be excused from further attendance in that subject; men who fail to pass will be required to take the course the following year, and, if after faithful effort they are deemed incapable of mastering the subject, their names will be reported to the Surgeon-General for his information.

252. "Qualified" men of a year's standing or more will also be examined at this time to determine whether they continue proficient.

253. Men who have previously qualified may on reënlistment be examined to determine their state of proficiency. No examinations are to be held in drill and field work. First cooks are required

to attend the courses in cooking and drill only; no others are to be excused except "qualified" men and the absolutely necessary attendants in the hospital, the "qualified" men being used for this purpose as far as practicable. Night nurses when on duty all night as such will be considered "necessary attendants" in the meaning of the paragraph.

254. The methods of instruction will be by demonstration and recitations from text-books. Reviews may be held when necessary, and will be included in the hours of instruction.

255. The sequence of the subjects will be determined by the chief surgeon, who will consider the climatic and other conditions in his department in his arrangement of the year's instruction.

256. Records of class work are to be kept and the daily mark of each man will be entered in a class-book, the record being based upon a scale of ten. At the end of each week the standing of all men in the class is to be determined, and at the end of the month the weekly marks are to be consolidated with the marks attained in the reviews and the relative standing of all men in classes made of record.

SERVICE OF HOSPITALS.

303. Patients will, if possible, leave their arms and accouterments with their companies. The commanding officer of a military hospital will promulgate and enforce such regulations as may be necessary for the custody and proper care of the effects of patients admitted to the hospital. Enlisted men are forbidden to receive money or other valuables from patients either for safe keeping or for any other purpose. Medical officers are directed to exercise particular care for the security of the money and other effects of insane and helpless patients. This is especially necessary when such patients are transferred from one hospital to another or from a hospital to a train or ship, or *vice versa* (A. R. 1478, 1904).

320. Hospital clothing will be worn by patients only during their stay in hospital. Each article will be marked as hospital property. When very sick soldiers are transferred from one hospital to another the hospital clothing necessary for their comfort may be sent with them, properly invoiced, and accompanied by a check list, giving the names of the men in whose possession it is. Under the provisions

of this paragraph, crutches and similar articles may, if necessary, be similarly transferred with the patient from one post or hospital to another.

321. Clothing and other articles which can be immersed in boiling water or a disinfecting solution, without material injury, should be disinfected and not destroyed by burning. Articles destroyed to prevent contagion must be accounted for by a certificate of the officer responsible, setting forth fully the circumstances necessitating such destruction (A. R. 1482–1483, 1904).

DISINFECTANTS.

396. Disinfectants are issued, as are medicines, to be used by medical officers when actually required for some specific purpose. Chlorid of lime, carbolic acid, and mercuric chlorid are issued by the medical department for use as disinfectants, properly so called. A solution containing four per cent of good chlorid of lime or five per cent of carbolic acid is suitable for disinfecting the excreta of patients with cholera or typhoid fever, or the sputa of patients suffering from diphtheria, scarlet fever, or tuberculosis. The floors, furniture, etc., in rooms occupied by patients suffering from an infectious disease may be washed with a two-per-cent solution of carbolic acid or with a solution of mercuric chlorid of 1 : 1000. Soiled bed linen, underclothing, etc., used by such patients should be immersed in one of the above-mentioned solutions before it is sent to the laundry. But in the absence of any infectious disease, these disinfecting agents are not required, and their expenditure for purposes of general post sanitation is not authorized (A. R. 1514, 1904).

397. The necessity for the use of antiseptics and deodorants is a reproach upon the sanitary police of a post, and should only be required under exceptional circumstances. The alvine discharges of healthy persons do not require disinfection and, when properly disposed of, do not require treatment with any chemical agent whatever. If water closets or earth closets are offensive, this is due to faulty construction, to insufficient supply of water or dry earth, or to neglect of ordinary cleanliness. The attempt to remedy such defects by the systematic use of antiseptics is expensive and unsatisfactory in its results. The same is true of foul drains, bad-smelling

urinals, accumulations of garbage, etc. The proper remedy for such conditions is cleanliness and strict sanitary police.

398. When accumulations of organic material undergoing decomposition cannot be removed or buried, they may be treated with an antiseptic solution or with freshly burned quicklime. Quicklime is also a valuable disinfectant, and may be substituted for the more expensive chlorid of lime for disinfection of typhoid and cholera excreta, etc. For this purpose freshly prepared milk of lime should be used, containing about 1 part by weight of hydrate of lime to 8 of water.

399. During the prevalence of an epidemic, or when there is reason to believe that infectious material has been introduced from any source, latrines and cesspools may be treated with milk of lime, in the proportions of 5 parts to 100 parts of the contents of the vault, and the daily addition of 10 parts per 100 parts of daily increment of feces.

400. Owing to a misapprehension of the technical meaning of the words "disinfection" and "sanitation," and to the fact that quicklime is more frequently used to prevent infection than to destroy it, in future quicklime shall as a rule be furnished by the Quartermaster's Department for all purposes, and only in exceptionally urgent circumstances by the medical department, when it will be used solely for disinfection under the immediate supervision of medical officers (G. O. No. 68, A. G. O., 1901).

PRESCRIPTIONS.

403. All prescriptions will be placed on file at the hospital; those for liquors will be placed on a separate file. Prescriptions for medicines furnished civilians will be kept on a separate file. See par. 314 (*c*).

MEDICAL FIELD SERVICE.

524. All of the sanitary personnel will wear the prescribed brassard. Dressing stations, ambulance stations, and field hospitals will be marked by the national and red-cross flags; at night by red lanterns (F. S. R. 660, 1904).*

MEDICAL OFFICERS IN THE FIELD.

529. The title of the senior medical officer of an army in the field is "chief surgeon"; of a corps, "chief surgeon"; of a division, "di-

* Read "F. R. S.—1905" wherever occurring in text.

vision surgeon"; of a brigade, "brigade surgeon"; of a regiment, "regimental surgeon"; the senior medical officer of a field, stationary, or base hospital, or ambulance company, "commanding —— hospital, No. ——," or "Ambulance Company No. ——."

GENEVA CONVENTION.

579. The convention between the United States and the principal European and other powers for the amelioration of the condition of the sick and wounded of armies in the field concluded August 22, 1864, and acceded to by the United States Government in March, 1882, commonly known as the Geneva Convention, is as follows:

Art. I. Ambulances and field hospitals shall be recognized as neutral establishments, and, as such, shall be protected and respected by belligerents as long as they contain sick and wounded. Such neutrality would cease if the ambulances or hospitals were held by a military force.

Art. II. The personnel of hospitals and ambulances, including the administrative and supply departments thereof, the medical service, the transport service for wounded, and likewise chaplains, shall participate in the benefit of neutrality while on duty, and as long as there remain any wounded to bring in or to succor.

Art. III. The persons designated in the preceding article may, even after occupation by the enemy, continue to fulfill their duties in the hospitals or ambulance which they serve, or may withdraw to rejoin the body of troops to which they belong. Under such circumstances, when these persons shall cease from their functions, the occupying army shall take care to deliver them to the enemy's outposts.

Art. IV. As the equipment of military hospitals remains subject to the laws of war, persons attached to such hospitals cannot, in withdrawing, carry away any articles except such as are their private property. Under the same circumstances an ambulance shall, on the contrary, retain its equipment.

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Art. VI. Wounded or sick soldiers shall be collected and treated, to whatever nation they may belong.

Commanders-in-chief are authorized to deliver to the enemy's outposts at once all soldiers wounded in combat, when circumstances permit and both parties consent to such action.

Those who, after their wounds are healed, are recognized as incapable of serving, shall be sent back to their country.

The others may also be sent back, on condition of not again bearing arms during continuance of the war.

Evacuations, together with the personnel conducting them, shall be protected by absolute neutrality.

Art. VII. A distinctive and uniform flag shall be adopted for hospitals, ambulances, and evacuations. It must on every occasion be accompanied by the national flag. A brassard for the neutralized personnel shall also be allowed, but the delivery thereof shall be regulated by military authority. Flags and brassards shall show a red cross on white ground.

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ADDITIONAL ARTICLES.[a]

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Art. III. Under the conditions provided for in Articles I. and IV. of the convention the name "ambulance"[b] applies to field hospitals and other temporary establishments which follow the troops on the field of battle to receive the sick and wounded.

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Art. V. In addition to Article VI. of the convention, it is stipulated that, with the reservation of officers whose detention might be important to the fate of arms, and within the limits fixed by the second paragraph of that article, the wounded who may fall into the hands of the enemy, even if not considered incapable of serving, shall be sent back to their country after they are cured, or sooner, if possible, on condition, nevertheless, of not again bearing arms during the continuance of the war.

a. The additional articles are now generally accepted and have acquired the force and effect of an international treaty.

b. This interpretation is of especial importance in the United States, where the term "ambulance" is generally applied to a vehicle for the transportation of the sick and wounded.

Art. VI. The boats which, at their own risk and peril, during and after an engagement, pick up the shipwrecked or wounded, or which, having picked them up, convey them on board a neutral or hospital ship, shall enjoy, until the accomplishment of their mission, the character of neutrality, as far as the circumstances of the engagement and the position of the ships engaged will permit.

The appreciation of these circumstances is entrusted to the humanity of all the combatants. The shipwrecked and wounded thus picked up and saved must not serve again during the continuance of the war.

Art. VII. The religious, medical, and hospital personnel of any captured vessel are declared neutral, and, on leaving the ship, may remove the articles and surgical instruments which are their private property.

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Art. XI. Wounded or sick sailors and soldiers, when embarked, to whatever nation they belong, shall be protected and taken care of by their captors.

Their return to their own country is subject to the provisions of Article VI. of the convention and of Additional Article V.

Art. XII. The distinctive flag to be used with the national flag, in order to indicate any vessel or boat which may claim the benefit of neutrality, in virtue of the principles of this convention, is a white flag with a red cross. The belligerents may exercise in this respect any mode of verification which they may deem necessary.

Military hospital ships shall be distinguished by being painted white outside, with green strake.

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Art. XV. The present act shall be drawn up in a single original copy, which shall be deposited in the archives of the Swiss Confederation.

THE HAGUE PEACE CONFERENCE.

580. The convention between the United States and certain powers for the adaptation to maritime warfare of the principles of the Geneva Convention, signed at The Hague, July 29, 1899, and published in G. O. No. 4, A. G. O., 1902, is as follows:

Art. I. Military hospital ships, that is to say, ships constructed or assigned by States specially and solely for the purpose of assisting the wounded, sick, or shipwrecked, and the names of which shall have been communicated to the belligerent powers at the beginning or during the course of hostilities and in any case before they are employed, shall be respected and cannot be captured while hostilities last.

These ships, moreover, are not on the same footing as men-of-war as regards their stay in a neutral port.

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Art. V. The military hospital ships shall be distinguished by being painted white outside with a horizontal band of green about a meter and a half in breadth.

The ships mentioned in Articles II. and III. shall be distinguished by being painted white outside with a horizontal band of red about a meter and a half in breadth.

The boats of the ships above mentioned, as also small craft which may be used for hospital work, shall be distinguished by similar painting.

All hospital ships shall make themselves known by hoisting, together with their national flag, the white flag with a red cross provided by the Geneva Convention.

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Art. VII. The religious, medical, or hospital staff of any captured ship is inviolable and its members cannot be made prisoners of war. On leaving the ship they take with them the objects and surgical instruments which are their own private property.

This staff shall continue to discharge its duties while necessary, and can afterward leave when the commander-in-chief considers it possible.

The belligerents must guarantee to the staff that has fallen into their hands the enjoyment of their salaries intact.

Art. VIII. Sailors and soldiers who are taken on board when sick or wounded, to whatever nation they belong, shall be protected and looked after by the captors.

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CHAPTER II.

ADVANCED COURSE.

THIS includes the primary course and the following additional paragraphs:

ARMY REGULATIONS.

Paragraphs 2, 3, 134, 169, 857, 858, 871, 1389. These paragraphs, being printed in the Soldiers' Handbook, are not reproduced here.

THE HOSPITAL CORPS.

1432. Sergeants first class will be appointed by the Secretary of War on the recommendation of the Surgeon-General, provided they have served a year as sergeant, or as hospital steward of volunteers or acted in that capacity during and since the Spanish-American war for more than six months. Sergeants will be appointed by the Secretary of War on the recommendation of the Surgeon-General; corporals, lance corporals, and privates first class will be appointed by the Surgeon-General or the chief surgeon of a division or a department. Before appointment, sergeants first class must pass a satisfactory examination under the direction of the Surgeon-General; and sergeants a satisfactory examination under the direction of the Surgeon-General or the chief surgeon of a division or department. These examinations will be conducted by a board composed of three commissioned medical officers of the station at which the applicant may be serving, or of such a number of medical officers less than three as may be present, and if no medical officer is there on duty the candidate will be sent for examination to the nearest station provided with such an officer. The report of the board will be forwarded direct to the Surgeon-General or the chief surgeon. Sergeants first class and sergeants are furnished with warrants signed by the Surgeon-

General; corporals with warrants signed by the Surgeon-General or by division or department chief surgeon. Promotions to the grade of corporal, lance corporal, and private first class may be recommended to the Surgeon-General or the chief surgeon by the medical officer commanding the detachment. The allowance of enlisted men of the hospital corps of each grade as fixed by regulations and orders will not be exceeded except by special authority of the Secretary of War. The proportion of privates first class to privates will not exceed two to one (M. M. D. 194).

1433. A sergeant first class may be reënlisted at the expiration of his term of service on the authority of the Surgeon-General provided he has passed successfully the prescribed examination. If he desires to reënlist he will report the fact, in writing, through military channels, to the Surgeon-General, sixty days before the expiration of his term of service (M. M. D. 195).

1434. A sergeant first class stationed at a place where no post return is made will make such personal reports as the Surgeon-General may direct.

1439. The enlistment paper for each recruit of the hospital corps will be forwarded with the form for physical examination direct to the Surgeon-General, who will render to The Military Secretary of the Army a monthly recruiting return accompanied by the enlistment papers pertaining to it (M. M. D. 201).

1443. To meet the requirements of epidemics or other emergencies and to fill vacancies, members of the hospital corps may be transferred by the department commander, the quota of each post, as prescribed by paragraphs 1445 and 1446, not being permanently exceeded. Such transfers will be reported to the Surgeon-General.

1448. Special instruction in the methods of rendering first aid to the sick and wounded will be given to all enlisted men of the line of the army by their company officers for at least four hours.

GENERAL HOSPITALS.

1473. The general hospital at Fort Bayard, New Mexico, is under the direction of the Secretary of War and is set apart as a sanitarium for the treatment of officers and enlisted men of the army suffering from pulmonary tuberculosis.

SERVICE OF HOSPITALS.

1479. When a soldier in hospital is detached from his company, his company commander will send to the hospital his descriptive list. The surgeon in charge will enter thereon all payments, stoppages, and the money value of all clothing issued, and when the soldier is returned to duty, transferred, discharged, dies, or deserts, a new descriptive list containing a complete statement of his accounts will be sent to his company or other commander, and the original will be retained by the officer in command of the hospital for his own protection. If the soldier is discharged from the service while in hospital, the surgeon will furnish him with final statements. If the soldier die in hospital, the surgeon will take charge of his effects and make the reports required in paragraph 160.

1488. Hospital charges will be as follows: For retired enlisted men and civilian employés of the army, and for enlisted men of the navy and marine corps, forty cents per day; for officers of the army, navy, and marine corps, warrant officers of the navy, civilian seamen, and river boatmen (admitted only on permit issued by a medical officer of the marine hospital service or a customs officer), and civilians admitted as provided in the preceding paragraph, one dollar per day. The money received will be accounted for with the hospital fund.

1493. When alterations of or additions to hospitals are necessary the surgeon of the post, after obtaining from the quartermaster an estimate of cost, will transmit plans and specifications, with proposed modifications, through military channels, to the Secretary of War. Similar action will be taken upon quarters for sergeants first class.

HOSPITAL BUILDINGS.

1495. The surgeon, after obtaining from the quartermaster necessary data as to the amount of labor, quantity of material, and cost, will forward on March 1st of each year, through military channels, to the Secretary of War, an estimate of repairs, alterations, or additions needed on hospitals and quarters of sergeants first class during the next fiscal year, with plans of the same, stating the conditions of the buildings and the necessity for repairs. The surgeon of the post

will prepare and sign estimates for hospital construction and repairs, one copy of which is required by the Surgeon-General. The number required at department headquarters is fixed by the department commander. When work is completed, the medical officer will report to the Surgeon-General whether it was performed according to the estimate, and the material and balance of allotment remaining. Approved plans or estimates for construction or repair will be altered only by authority of the Secretary of War (M. M. D. 189).

SICK CALL.

1498. At sick call the enlisted men of each company who require medical attention will be conducted to the hospital by a noncommissioned officer, who will give to the attending surgeon the company-sick-report book containing the names of the sick. The surgeon, after examination, will indicate in the book, opposite their names, the men who are to be admitted to hospital and those to be returned to quarters, what duties the latter can perform, with any other information in regard to the sick which he may have to communicate to the company commander. The senior medical officer of the command will make a daily report of the sick and wounded to the commanding officer.

MEDICAL SUPPLIES.

1515. Damaged or unserviceable medicines, medical books, surgical or scientific instruments and appliances, pertaining to the medical department, will not be presented to an inspector for condemnation until authority for so doing has been obtained from the chief surgeon of the division or department (M. M. D. 363).

ARTICLES OF WAR.

Articles 37 and 127 will be found in the Soldiers' Handbook.

MANUAL FOR THE MEDICAL DEPARTMENT.

Blank Forms and Records.

88. The standard blank forms used in army administration, with the notes and directions thereon, have the force and effect of army regulations. New forms or alterations will not be made with-

out the authority of the Secretary of War, and the date on which a form or alteration was authorized will be printed on the form itself. All notes or directions on these blanks will, prior to their issue, be approved by the Secretary of War. These forms and lists of them will be furnished by the chiefs of the various bureaus and offices of the War Department. Requisitions therefor will call for them by number and name. A. R. 1603, 1904.

89. Manuscript returns, rolls, certificates, and other documents are prohibited when the proper printed forms are on hand. A. R. 1604, 1904.

91. The report of record books pertaining to the medical department will be forwarded when an officer is relieved from duty or when a post is abandoned. The letter press book will be accounted for on this report. Orders, letters, letters received, and endorsements may be kept in separate books and substituted for the joint order and letter book and letters received and endorsement book. The letter press book may be used as an "official" record of letters and endorsements sent. In all record books a statement explanatory of the contents will be pasted on the inside of the front cover. Care must be taken that signatures are made in these books wherever necessary. Entries in the record books will be continuous until the books are filled; the date of commencement and of last entry to be noted on the report. In the column of remarks should be noted whether or not each book is in use, and, if not, the reason should be stated. If all record books are not on hand, requisition for a complete supply will be promptly made.

CERTIFICATES OF DISABILITY.

92. When an enlisted man is permanently unfitted for military service because of wounds or disease, he should, if practicable, be discharged on certificate of disability before the expiration of the term of service in which the disability was incurred. The certificate of disability will be prepared by the post surgeon and will be filled out in his own handwriting. Blank forms will be furnished by The Military Secretary of the Army, and the directions thereon will be strictly complied with. A. R. 157, 1904.

93. When an application for discharge is approved the post or

regimental commander will furnish to the surgeon by whom the certificate was given, or to the senior surgeon of the command to which the soldier was attached at the time of his discharge, a letter setting forth the full name and rank of the soldier, the company and regiment to which he belonged, the date of discharge, and the cause thereof as stated in the certificate. The surgeon, having made a true copy of the letter for the completion of his own records, will forward the original to the Surgeon-General direct. A. R. 158, 1904.

CONTRACT SURGEONS.

101. Contract surgeons and dental surgeons are entitled to the same protection in their positions and the same respect and obedience from enlisted men as commissioned officers. A. R. 1418, 1904.

EXAMINATION OF RECRUITS.

127. The physical examination of recruits will be conducted in accordance with the authorized manual for the examination of recruits. The enlistment paper of each recruit must show what indelible or permanent marks were found on his person. A. R. 873, 1904.

146. A completed examination form is required for file in the office of The Military Secretary in the case of every soldier who completes enlistment or reënlistment by taking the oath (including scouts and Indians). In the case of applicants who do not take the oath it may be destroyed after it has served its purpose in the conduct of the examination.

(*a*) No letter of transmittal is necessary.

160. When authorized by the War Department under A. R. 870, clause 4, recruiting officers may reënlist discharged soldiers who present themselves within the prescribed limit of time, notwithstanding they may have some physical disqualification which would cause their rejection as recruits: *provided*, they have no serious defect which would probably prevent the discharge of their duties as soldiers. In all cases the defects and the fact that they existed prior to reënlistment will be noted on the soldier's reënlistment papers and examination form.

(*a*) In modifying the requirements for reënlistment it is the intention of the War Department to provide for the continuance in

service of such faithful soldiers as have incurred disabilities during prior enlistments which will probably not unfit them for duty in the future; as, for example, hernia, for which the soldier agrees to submit to operation; piles; varicose veins; certain defects of vision, as near or far sight; the loss of certain fingers or toes; mutilations by gunshot or other wounds, etc.

161. Monthly reports of examination of recruits, Form 60, S. G. O., required by paragraph 135, to be sent to The Military Secretary of the army, are not called for in the case of volunteers nor are the entries of examinations of volunteer recruits to be included in the monthly report of regulars.

(*a*) A separate report is to be rendered for each place at which examination is made. No letter of transmittal is required.

(*b*) Each report will give a complete record of every applicant for enlistment or reënlistment physically examined during the month. It should not include the cases of applicants rejected before being stripped, nor the secondary examinations made after recruits are sworn in.

(*c*) If no applicant is examined during the month, a letter or information slip stating that fact will be forwarded in lieu of the report. This applies to regular posts and recruiting stations only.

(*d*) When there is a medical officer at the station the report will be rendered by him; otherwise by the recruiting officer.

HOSPITAL BUILDINGS.

188. New floors in hospitals will not be painted. They may be finished in oil and paraffin, or oil, wax, turpentine, etc., to which coloring matter may be added if deemed necessary. Floors of verandas and porches should be protected by paint.

189. When an allotment of funds for the repair of a hospital or quarters of a sergeant first class has been made, the officer in charge will be notified of the action by letter from the Surgeon-General, the receipt of which will be acknowledged by return mail. Estimates and other papers referring to a hospital must be prepared separately from those for quarters for a sergeant first class. On the last day of each month, until the work is completed and so reported, the surgeon in charge will advise the Surgeon-General, by information slip, of the

progress effected, or, if none, the cause of the delay so far as he can ascertain it (A. R. 1495, 1904).

THE HOSPITAL CORPS.

210. Applications for the position of sergeant first class and sergeant, hospital corps, must be accompanied by an affidavit that the applicant is not married, and be forwarded through military channels (A. R. 1432, 1904).

211. The examinations for the position of sergeants and sergeants first class, hospital corps, will be both oral and written. The board will investigate and report upon the following: (1) Physical condition; (2) character and habits, especially as to the use of stimulants and narcotics; (3) discipline and control of men; (4) knowledge of regulations; (5) nursing; (6) dispensary work; (7) clerical work; (8) principles of cooking and mess management; (9) hospital-corps drill; (10) minor surgery and first aid, including extraction of teeth. Candidates for the position of sergeants will be required to prepare a full set of papers pertaining to the medical department, and to drill a detachment of the hospital corps sufficiently to demonstrate their thorough knowledge of the drill regulations. The written examination will embrace the following subjects: (1) Arithmetic; (2) materia medica; (3) pharmacy; (4) care of sick and ward management; (5) minor surgery and first aid; (6) elementary hygiene. Ten questions will be asked in each subject. Proficiency in penmanship and orthography will be estimated from the papers submitted.

(*a*) The questions for use in the written examination for sergeant first class will be sent from the office of the Surgeon-General. Those in the examination for sergeant will be sent from the office of the Surgeon-General or the chief surgeon. Chief surgeons will prepare the questions for the candidates in their respective departments, and will forward to the Surgeon-General a copy of the questions for the written examination of sergeants and of the report of the board, together with their action noted thereon.

(*b*) In the examination for sergeant first class the replies certified to by the board as having been made without recourse to books, memoranda, or other sources of assistance will be forwarded with the report of the board direct to the Surgeon-General, in whose office

the papers will be marked. In the examination for sergeant the board will mark the papers before forwarding them to the chief surgeon or the Surgeon-General, as the case may be, submit the same certificate, and report as to the eligibility of the candidate. The examination for both grades will embrace the same subjects, but that for sergeant will be less difficult.

212. Medical officers will not make enlistments or reënlistments for the hospital corps without obtaining special authority from the Surgeon-General or chief surgeon. Chief surgeons are authorized to enlist for the hospital corps up to the regular allowance of their respective departments without reference to the Surgeon-General. They may also authorize reënlistments of privates, privates first class, lance corporals, corporals, and sergeants serving within their departments.

(*a*) Contract surgeons cannot make enlistments, as the oath should be administered by a commissioned officer.

(*b*) Note should be made on the enlistment paper of any special knowledge professed by applicants, as of cooking, gardening, or of a trade or other useful occupation. Those applicants who have graduated in pharmacy should submit proof thereof, by diploma or otherwise. Trained nurses or those who have served as such in civil hospitals should present certificates of their training or service (A. R. 1439, 1904).

213. The duties of noncommissioned officers of the hospital corps are to nurse or supervise the nursing of the sick; to compound and administer medicines; to look after and distribute hospital stores and supplies, to supervise the preparation and serving of food; to care for hospital property; to maintain discipline in hospitals and watch over their general police; to prepare reports and returns; to supervise the duties and assist in the instruction of the members of the hospital corps in the hospital and in the field, and to perform such other duties as may, by proper authority, be required of them.

214. A reëxamination before first reënlistment as sergeant first class may not be required if the surgeon of the post and chief surgeon state that the soldier has performed his duties efficiently, but will be held before second reënlistment. No subsequent reëxamination will ordinarily be required (A. R. 1433, 1904).

219. When a member of the hospital corps whose descriptive list has not been received is transferred elsewhere, or when request is made for the descriptive list of a former member of the hospital-corps detachment and no descriptive list has ever been received in the case, the medical officer will forward a transcript of the soldier's record from descriptive list, military record and statements of account sheet (Form 29, M. S. O.), stating the amount of clothing drawn, amount due for ordnance, stoppages by sentence of court-martial, and other facts, including payments made to the soldier, which should be known in order that the man's status may be thoroughly understood. If no clothing has been drawn, no ordnance charged for, no stoppage made by sentence of court-martial, the facts should be distinctly stated. If a transcript has been received instead of a descriptive list from the former commanding officer of the man, the facts contained in this should be embodied in the new transcript. In such cases the charges against the soldier should be entered separately for each period covered by transcripts. For purposes of identification, and to facilitate further inquiry, the man's own statement as to enlistment and as to his service and the pay and clothing drawn for the time not covered by transcripts will be briefly recorded. Transcripts will be prepared in duplicate; one copy will be forwarded to the officer requesting descriptive list and one copy to the Surgeon-General. In case inquiry for the descriptive list is made by the Surgeon-General one copy will be sufficient.

HOSPITAL FUND.

283. A quarterly statement of the hospital fund and return of durable property on the prescribed form (Form 49) with vouchers for receipts and expenditures will be forwarded by the surgeon at the end of September, December, March, and June, to the chief surgeon who, upon examination and approval, will forward the statement to the Surgeon-General. The vouchers will be returned to the surgeon and constitute a part of the retained records of the hospital. The hospital-fund accounts will be audited by the hospital council before the statement is forwarded to the chief surgeon.

284. In making out a statement of the hospital fund the amount on hand at the beginning, the amount received, the amount expended,

and the balance on hand for each month included in the period covered by the statement, will be given.

285. All indebtedness properly chargeable to the hospital fund will be recorded upon each quarterly statement; ordinarily there should be no indebtedness, but any that may occur must appear on the statement.

286. Should there be no hospital fund on hand and no durable property, an information slip will be forwarded instead of the blank form, reporting the fact.

288. Articles of durable property purchased with the hospital fund, worn out or unfit for use, may be dropped, destroyed, or sold by authority of the chief surgeon. The proceeds of sales of such property will be accounted for on the next statement of the hospital fund.

(*a*) Should no durable property be on hand, the words "No property on hand" will be written across the face of the return when forwarded.

(*b*) Invoices and receipts for durable property purchased or expended will not be required by the Surgeon-General. The transfer of fund property will be acknowledged by receipts written across the face of the last statement and return sent to the Surgeon-General.

HOSPITAL MATRON AND LAUNDRY WORK.

290. It is the duty of the hospital matron to mend and keep in repair the table, hand, and operating linen, the bedding, and the hospital clothing belonging to the medical department, including that of the dental surgeon's office; and to wash, iron, and fold the same, or so much thereof as possible up to and including a minimum of 500 pieces per month, from time to time, as the same may be required by the surgeon. The allowance from public funds of extra pay for performing any of the duties incident to her employment would be contrary to law and cannot be approved. If she is unable or unwilling to meet these requirements she should be discharged.

300. Vouchers for excess laundry at a hospital where there is a matron will be accompanied by a statement showing the kind and number of pieces laundered by the matron, and put to hire, respectively, during the period covered, and by a certificate that the excess

was more than the matron could do. These should be separate from the vouchers, which should contain no reference thereto.

CIVILIAN EMPLOYÉS, SALE OF MEDICINES TO.

314. Civilian employés of the army stationed at military posts may purchase medical supplies when prescribed by a medical officer. Charges will be as follows: In ordinary cases, 25 cents for each prescription; in the case of rare and expensive medicines, hospital stores, dressings, appliances, etc., at such increased rate, to be determined by the surgeon, as will reimburse the United States their cost.

(*a*) The responsible officer will at the end of each month without delay deposit the proceeds of such sales in the nearest United States depository, to the credit of the Treasurer of the United States, as "Miscellaneous receipts, proceeds of sales of medicines to civilian employés of the army." He will render to the Surgeon-General within ten days after the end of the month an account of sales, Form 15, accompanied by a detailed exhibit showing the name of each employé so purchasing, by whom the supplies were prescribed, the number of ordinary prescriptions at 25 cents each, the character and quantity, briefly, of other prescriptions, of hospital stores, of dressings, of appliances, with the special charge for each, and the total of the charges, being the amount collected.

(*b*) At isolated posts where issues to civilians become necessary to save life or prevent extreme suffering, medical officers will make such issues, and at the end of each month will report the circumstances to the Surgeon-General, or, in the Philippines Division, to the chief surgeon. Unless the patient is destitute, charges will be made and the proceeds disposed of and accounted for as in the case of employés.

(*c*) Original prescriptions for civilians will be kept on a separate file and retained as a part of the hospital records. They will be subject to inspection at all times by inspectors and post commanders.

ICE FOR HOSPITALS.

326. Members of the hospital corps and patients subsisted on the ration are entitled to the allowance of ice mentioned in A. R. 1242, 1904.

(*a*) For patients subsisted under the provision of A. R. 1235, ice may be purchased as provided therein for special articles of diet.

(*b*) At stations where the Quartermaster's Department operates ice machines, the hospitals will be furnished ice by that department.

(*c*) The following is an extract from G. O. 117, War Department, June 28, 1904, regulating the issues of ice produced by machines operated by the Quartermaster's Department:

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6. The product of the ice machines operated by the Quartermaster's Department will be issued to the hospitals, the Subsistence Department for the preservation of subsistence stores, the different organizations, noncommissioned staff officers, offices, post schools, and workshops. After these uses are met any surplus ice may be sold at average cost price to officers and their families, to post exchanges, and to civilian employés, and the proceeds of such sales will be deposited to the credit of the Treasurer of the United States. The quantity of ice issued to hospitals, organizations, noncommissioned staff officers, offices, schools, and workshops will be regulated by the post commander and based upon the product obtained from the plant by judicious and economical operation. The supply for hospital use and for the preservation of subsistence stores will be paramount to all other uses and will be given preference in all cases where a reduction of issue becomes necessary. Post commanders will give their personal attention to the management of the ice machines and take care that expenses of every kind incident to their operation are limited to actual requirements, and that waste or unauthorized issues of the ice are prevented.

7. At posts or stations where ice machines are operated the Subsistence Department will not supply ice.

INFORMATION SLIPS.

327. Information slips are intended for use by medical officers in cases where formal letters can be dispensed with, viz.: personal reports of medical officers, changes in the status of hospital-corps members and of hospital matrons; requests for authority for the reënlistment of sergeants and privates; acknowledgments of receipt of Surgeon-General's Office circulars; requests for and acknowledgments of receipt of blank forms, clinical thermometers, typewriter ribbons, and vaccine virus; requests for special expenditures of the

hospital fund; acknowledgments of receipt of funds for construction and repair of hospitals and puarters of sergeants first class, and monthly reports of progress of work; explanations concerning reports of sick and wounded. They should not be used in any case requiring action by another bureau. Letter forms, such as "Sir: I have the honor," and "Very respectfully," will not be used. Endorsements should follow in sequence in the usual form. If neither remark nor action is required by the chief surgeon, his receiving stamp will take the place of an endorsement, to which may be added the words "contents noted," if deemed necessary. A memorandum will be entered on the stub, with the signature of the officer, to verify the record.

RETURNS OF MEDICAL PROPERTY.

351. In all returns, requisitions, invoices, and receipts pertaining to medical supplies, the nomenclature, order of entry, and classification of the supply table will be strictly followed, and all copies will be carefully compared. They will be forwarded without letters of transmittal.

358. Officers in charge of medical property will prepare annually, on December 31, unless another date is fixed by the Surgeon-General, or when relieved from the charge thereof, returns of medical property (Form No. 21 or 22) in duplicate, showing those articles on hand at last return, those received, expended, issued, and sold, and those remaining on hand. The original of this return will be promptly transmitted to the Surgeon-General. The duplicate with a complete set of vouchers will be retained for the protection of the officer responsible for the property.

(*a*) In exceptional cases a certified invoice may be offered by the issuing officer, in the absence of a receipt, as a substitute for the proper voucher, together with such additional evidence as he may possess in regard to the issue.

(*b*) No interlineations or erasures will be made on the returns, and all articles not provided for in the printed headings will be entered in proper order under the heading of "additional articles."

(*c*) In invoicing or accounting for broken packages, such as bottles, jars, etc., fractions will be given as $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$.

TRANSFER OF MEDICAL SUPPLIES.

359. In ordinary transfer of medical supplies the issuing officer will prepare invoices (Form No. 23, 24, or 25) in duplicate, and will forward them at once, one to the Surgeon-General and one to the receiving officer. The latter will prepare receipts (Form No. 26, 27, or 28) in duplicate, and will upon completion of the transfer promptly forward them, one to the Surgeon-General and the other to the issuing officer. A packer's list (Form No. 32) will, if necessary, be furnished by the issuing officer. All supplies shipped will bear the name of the consignor as well as that of the consignee.

360. In cases in which complete transfer of property occurs the receiving officer, instead of giving separate receipts as above provided, may make direct entry over his signature on the final return (both original and duplicate) of his predecessor, acknowledging the receipt of all property thereon enumerated as on hand and transferred to him. The transferring officer will, in that event, furnish an invoice to the receiving officer which may be made on the first line of Forms No. 21 and 22. The transferring officer will thereupon at once forward his final return, bearing the receipt above prescribed, to the Surgeon-General, or notify the Surgeon-General by letter that he has transferred all the medical property for which he was accountable to the officer, naming him, to whom the transfer was made.

361. Great care should be exercised before receipting for cases of instruments, microscopes, and other property of similar character, not enumerated on the property papers in detail, to ascertain that the full contents of such cases are present and in good order. Incomplete cases will be receipted for as such, and a list of the missing instruments, etc., will accompany the receipt in order that the proper officer may be held accountable for the deficiency.

UNSERVICEABLE PROPERTY.

363. Applications to submit unserviceable instruments, books, etc., for the action of the inspector will be forwarded in duplicate to chief surgeons of departments, who are authorized to act upon them (A. R. 1515, 1904).

364. When medical property is sold the officer responsible there-

for will prepare an account of sales (Form 15) in duplicate. He will also prepare an inventory of property sold (Form 16) in triplicate. One number of the account, and two numbers of the inventory accompanied by a copy of or suitable extract from the inventory and inspection report, will be sent at once to the Surgeon-General. The duplicate account and the triplicate inventory will be retained by the officer. Should it be necessary to incur any expenses in connection with such sales they will be paid out of the total receipts before depositing the latter, in which case the necessary vouchers, properly prepared and receipted, covering said expenses, will be forwarded with the account.

ANNUAL REQUISITIONS.

367. The senior medical officer of every post will make annual requisition for medical supplies for the year commencing January 1, unless another date is fixed by the Surgeon-General. The requisition will be made in triplicate and forwarded to the chief surgeon; or, in the case of independent posts, in duplicate, to the Surgeon-General. Before forwarding an annual requisition each copy will be carefully examined and compared with the supply table to see that it has been correctly made out in strict accordance with existing regulations. Great care will be exercised in this matter to avoid delay occasioned by the return of the requisition for correction.

(*a*) Requisitions for dental instruments, appliances, and supplies will be made on Form No. 36 by the dental surgeon and transmitted through the post surgeon, who will carefully examine them, and, by endorsement thereon, express his opinion as to the necessity for the amounts asked for. Chief surgeons may authorize post surgeons to fill requisitions for such expendable supplies required by dental surgeons as may be on hand at the hospital, post surgeons will report such issues to the Surgeon-General by information slip, the dental surgeon acknowledging the receipt of the articles mentioned by his signature thereon.

369. Annual requisitions will be forwarded to the chief surgeon within twenty days before the date at which the period they cover begins. They will be made only for articles that are or probably will be needed during the year; will state the quantity of all articles

on hand as verified by a medical officer in accordance with paragraph 397, and will give the total number of persons entitled by regulations to medicines.

(*a*) The quantities asked for will be computed on the basis of original packages.

370. Quantities on hand will be deducted from the quantities allowed by the supply table on the annual requisition, except when such deductions would cause the breakage of bottles or original packages. Fractional parts of a bottle or package must not be required for.

371. Those articles only of which a definite allowance is given in the supply table will be required for on the annual requisition.

372. Whenever articles are required to replace unserviceable property the exact number and condition of such unserviceable articles on hand will be stated on the requisition.

373. No remark will be made opposite the name of any article on the annual requisition that a special kind or special make or pattern is wanted, as the annual requisition is intended to include only such articles as are on the supply table, and which officers in charge of supply depots are authorized to issue, and not articles that are required to be specially purchased; the latter must be asked for on special requisition.

375. The smaller posts will not require all the articles included in the supply table, and the local prevalence or rarity of certain diseases, as well as the quantity or number on hand of each article, will be considered in the preparation and approval of requisitions.

376. Sterilized dressings will not be issued for post use. Their preparation is so simple and so well understood that they should be prepared as needed. First-aid packets will be reserved exclusively for field use, except those issued for instruction.

377. When medical supplies are absolutely necessary before the annual requisition is made, they will be asked for upon a special requisition, in triplicate, giving a list of the articles needed, and the quantity of each on hand, and the reason for the necessity for such requisition. They will be transmitted through the chief surgeon, who will keep one copy and will forward two to the Surgeon-General.

(*a*) Chief surgeons will personally and carefully scrutinize these

requisitions and will make such changes as they deem proper. They will in all cases make a recommendation as to the action to be taken.

(*b*) When articles not on the supply table or quantities in excess of the regulation allowance are needed they will be asked for on special requisition. The latter should follow the nomenclature, classification, and alphabetical arrangement of the supply table. Articles not on the supply table should be placed together in alphabetical order at the end of the requisition under the heading "additional articles," and explanation of the necessity for them should be made in column of remarks.

378. When window curtains and fixtures, portable book cases, and cabinets for blanks are required the requisition therefor will be special and should be accompanied by an estimate of the cost of making suitable articles at or near the post. Wire netting will be furnished to repair such window and door-screens as have become unserviceable.

379. Until further orders, microscopes, typewriters, bacteriological sets, formaldehyde generators, and skeletons in cabinets will be asked for on special requisition.

380. When no allowance is stated and the articles are issued "as required" special requisition will be made except for typewriter ribbons, impression strips, ribbon shields, and clinical thermometers. These articles will be obtained on request by information slip addressed to the chief surgeon.

381. Requests for vaccine virus will be made direct to the Surgeon-General, or in the Philippines Division to the chief surgeon, by information slip. On account of its liability to become inert from various causes, especially from heat, it will be asked for in such quantities only as are needed for early use.

382. In cases of emergency, as sudden epidemics, not admitting of delay, chief surgeons are authorized to act upon special requisitions, forwarding one copy, with their action, to the nearest medical-supply depot, one to the Surgeon-General with an endorsement stating the circumstances, and retaining one; but requisitions for articles not on the supply table must in all cases be forwarded to the Surgeon-General for his action.

(*a*) When, as a result of the prevalence of an epidemic, or for

any other reason, necessary supplies are likely to be exhausted, timely requisition must be made for additional supplies. Medical officers will be held accountable for any suffering which may result from their failure to ask for supplies when it is evident that they will be needed.

383. Subposts and camps will, in the absence of orders to the contrary, obtain such medical supplies as may be required by special requisition upon the senior medical officer of the post to which they are subsidiary, who will issue them after approval by the chief surgeon.

386. Blankets not in use should be frequently examined, and occasionally shaken and hung out of doors. When stained and soiled but otherwise in good condition, they should be washed and continued in service. When deemed necessary, authority will be given to have them washed at a steam laundry if one is near the post.

387. Rubber matting one yard wide is allowed, when necessary, for strip down middle of the ward, and for halls of the hospital, including sufficient quantity for stair treads. It should be required for on special requisition giving the area of each space to be covered. Linoleum is issued for office and dispensary only.

388. Rubber and flexible catheters and bougies will be kept in the catheter box, using talc (French chalk) or glycerin to preserve them.

389. Pieces of canvas of the proper size for litters will be issued as required, to replace pieces that may become torn or unserviceable. If soiled, the canvas will be removed from the litter, washed, and replaced.

390. Surgical instruments and appliances that require and are considered worth repairing will be reported to the Surgeon-General through the chief surgeon, with a statement of the repairs needed, giving the name of the maker.

392. Officers will report to the Surgeon-General such articles of furniture as may need and are considered worth repair or renovation by painting, varnishing, etc. This should be done by post labor if practicable, request being made for authority to purchase necessary material. If this is not practicable, the officer will obtain one or more estimates in detail of the cost of repair or renovation of such

furniture, and forward them through the chief surgeon for the action of the Surgeon-General.

393. Field furniture will not be used at posts, except when required for instruction of men of the hospital corps.

(*a*) Medical, surgical, and other field chests and appliances will be frequently inspected and kept in perfect order for immediate field use. Under no circumstances will their contents be used at posts.

394. For purposes of instruction first-aid packets (par. 616) will be obtained by the surgeons of posts, upon special requisitions, and will be supplied by them to company commanders. The allowance for this purpose will be twenty packets for each company of infantry, battery of artillery, or troop of cavalry. The dressings contained in these packets can be used repeatedly for the practical instruction of officers and enlisted men, and after being used for this purpose they should be repacked in the original form.

(*a*) First-aid packets are expendable, but care should be exercised to prevent any unnecessary expenditure; officers will be held strictly accountable for their proper and economical use.

REGISTER CARDS OF PATIENTS.

404. Separate sets of register cards will be kept for regular and volunteer troops.

406. The register cards will be made day by day as the cases are admitted, and will be in sequence, *i.e.*, without break from day to day, month to month, or year to year. The file of register cards should be kept in the serial order of their register numbers. At the larger posts it will be found convenient to have an additional file of cards, carrying names and numbers only, to be thrown alphabetically as an index.

408. The cases of retired officers and enlisted men, and of civilians including general prisoners, taken into hospital for treatment, should be entered on the register cards. When the status of a soldier while sick in hospital becomes changed to civilian the case of the soldier should be closed and a new card made for the civilian.

410. A transfer card should be used for cases sent from one hospital to another, by change of station of company, for the sake of better accommodations, for benefit of climate, for observation by

the chief surgeon, or when moving commands passing near a post desire to leave their sick and wounded for treatment. This card should be headed "Transfer Card," should be a duplicate of the patient's register card at the transferring hospital, except that it should also contain such details of the case as will probably be of value to the receiving officer, should be signed by the medical officer making the transfer, and be forwarded with the patient. The officer of the receiving hospital will carefully record the information received on the "Transfer Card," note thereon the admission of the patient into his hospital, and forward the card with the next report of sick and wounded to the Surgeon-General.

(*a*) In transfers to the Government Hospital for the Insane, the "Transfer Card," with a copy of the certificate that accompanied the soldier attached, should be sent to the Surgeon-General. When more space is required to perfect entries on the "Transfer Card" an extension slip should be used as directed under "Entries on Cards," par. 426.

426. Entries on the cards will be made with the typewriter when available, using ink which is strictly indelible, and giving sufficient space to prevent crowding or misconstruction. When sufficient space is not provided on front of card to complete an entry it will be continued on the back of the card, or, if still more space is required, an extension slip will be pasted to the lower margin of the back of card, using about one-half inch for the seam; this will fasten the two cards at the back of the front top of card and will place the seam at the top of card when filed. When an entry is continued it shall be connected by cross reference, using, preferably, a small letter placed in parenthesis thus: (*a*), so that the entry can be readily followed. Corrections should be authenticated by the initials of the surgeon, who will also place his initials in the space for signature on the bottom of each card.

REPORT OF SICK AND WOUNDED.

430. The report of sick and wounded will be made on blank sheet and cards, Forms 51 and 52, Medical Department. The report sheet provides for general information and numerical tabulations concerning the command and its civilian attachés; the report cards, for the details of sickness of individuals and should contain full and

exact transcripts of the register cards of all cases completed in the month and of such cases as are remaining at the end of the same month in which admitted and for which no other card will be required until completion, except that for the month of December cards shall be furnished for all cases remaining on the last day as well as for those completed in the month.

431. This report (one copy only) is required monthly from every post, separate command, and general hospital, and will be rendered separately for regular and volunteer troops, that of regulars to embrace all data pertaining to civilians. It should be forwarded from general hospitals direct to the Surgeon-General, unless otherwise ordered, and from other organizations and hospitals to the Surgeon-General through the chief surgeon.

(*a*) Chief surgeons of military departments will require from each post or separate command such numerical statements of sick and wounded as they may deem necessary to enable them to prepare their annual reports.

432. If there has been no case on sick report, either remaining from last report or admitted during the month, the report of sick and wounded will nevertheless be forwarded. It will give the name and strength of the command, etc., with such remarks as the circumstances may suggest as of interest to the chief surgeon or the Surgeon-General.

(*a*) When a hospital is closed or an organization is broken up, a report covering the unreported period of service, giving the beginning and end thereof, should in like manner be forwarded within five days after the breaking up of the organization.

(*b*) If a hospital is opened or closed during the month, the orders directing it should be stated in the report. In either of these cases an information slip should be sent immediately to the chief surgeon and the Surgeon-General; and in the event of closure or abandonment, etc., the medical records should be sent to the Surgeon-General (see par. 570).

433. Entries on the report and its cards should be made with a typewriter when possible; should be plainly and carefully written, using permanent black ink, the black record ribbon being preferred. Corrections should in every instance be authenticated by the initials of the medical officer.

FIELD MEDICAL SERVICE.

Charges.

528. In the field, hospital charges for the subsistence of officers and contract surgeons will be 50 cents per day in regimental and field hospitals, and $1 per day in all other hospitals. In cases where officers or civilians are unable to pay hospital charges, collection will be made in the manner provided by the Manual for the Medical Department.

When a soldier is admitted to a base, stationary, or general hospital, and no descriptive list has been received, the regimental commander will be notified of the fact by the commanding officer of the hospital. The former will cause the soldier's descriptive list to be sent to the hospital by the man's company commander. F. S. R. 664, 1904. (See par. 170 *b*.)

REGISTER CARDS OF PATIENTS.

Field Register.

570. Register cards will be made and reports of sick and wounded furnished for detached commands temporarily in the field on scouting expeditions, practice marches, or in summer camps. When all the cases have been completed by transfer to the stations to which the troops of the field command are ultimately assigned, and have been so reported on the final report of sick and wounded from the said field command, the register cards will be forwarded to the Surgeon-General by the surgeon of the command, if he has transferred his cases by use of the transfer cards, or by the surgeon of the receiving station if the register cards have been turned over to him to effect the transfer of the incompleted cases to his records.

571. In time of war medical officers on duty with such organizations as battalions, regiments, batteries, etc., will enter their cases on register cards and will make up their report of sick and wounded (par. 430) in accordance with regulations. Separate register cards should be kept and reports of sick and wounded (par. 404) made for regular and volunteer troops. A case transferred for treatment or better accommodation to the field hospital of the command will

be regarded as completed on the records of the command from which transferred.

572. When those who are unable to march are to be sent from the command to some hospital other than the field hospital, the surgeon of the command will enter on his register cards the names, etc., of those who are to be sent away; and when he has furnished a list of these to the officer who is to take charge of the sick on their journey, he will complete the record of their cases by *transfer en route* to the hospital which is understood to be their destination.

573. To prepare a list of wounded (see A. R. 824) the medical officer will enter on his register cards the required data for all of those of the command who are officially known to him as having been killed or wounded. As a member of the battalion or regimental staff the medical officer coöperates with company commanders in providing the materials for the field report of killed, wounded, and missing sent by the commanding officer to The Military Secretary as the official record of the losses. The information gathered for this purpose at the dressing stations in the field, and subsequently by inspection of the wards and records of the field hospitals, will enable him to perfect his register cards by completing thereon by transfer to the field hospital all those cases that have already been taken up on the register cards of the latter, and retaining as incompleted only those that remain under his personal care with the regiment or detachment. From the records thus perfected the list of wounded above mentioned will be prepared.

575. In all cases of transfer the medical officer in charge of the train of sick and wounded should, if possible, be provided with a nominal list of the patients intrusted to his care. He should verify this list personally, or, if the train be large, by his subordinates; and when arrived at his destination should turn it over to the medical officer of the receiving hospital. Should any of his cases be lost *en route* by death, capture, etc., he will note the facts on the list of transfers against each case so lost and report these facts and names to the Surgeon-General.

576. If the military conditions are such that it is impossible for the officer in charge of the records of the field hospital to furnish a list of the sick and wounded that are to be transferred, the medical

officer in charge of the train should verify the number of men turned over to him, and have the nominal list made out while *en route.* Should he be unable to accomplish this, the names of those who seem to be in danger of death should be taken, so as to be able, if the events should require it, to make report to the Surgeon-General.

577. The senior surgeon in charge of men sent direct from military commands in the field (see par. 572) will report the losses which occur during the period of his responsibility; so, also, when patients are left behind by the advance or retreat of a field hospital, the senior surgeon left with them will take measures, if he has not been furnished with a nominal list, for the identification of his patients, for their subsequent transfer, and for the notification of losses by death or other causes.

GENEVA CONVENTION.

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Art. V. The inhabitants of a country who may assist the wounded shall be respected and shall remain free. It shall be the duty of the commanding generals of the belligerent powers to notify the inhabitants of the appeal addressed to their humanity and of the neutrality resulting therefrom.

Any wounded man received and nursed in a house shall act as a safeguard thereto. Any inhabitant who shall have entertained wounded men in his house shall be exempt from the quartering of troops, as well as from a part of the contributions of war which may be imposed.

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ADDITIONAL ARTICLES.

Art. I. The persons designated in Article II. of the convention shall continue, after the occupation by the enemy, to take the necessary care of the sick and wounded in the ambulance or hospital which they serve. When they request to withdraw, the commander of the occupying troops shall fix the time of departure, which he shall not be allowed to put off for more than a brief period, in case of military necessity.

Art. II. Arrangements shall be made by the belligerent powers to insure to neutralized persons fallen into the hands of the enemy's army the enjoyment of their entire salary.

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Art. X. Every merchant vessel, to whatever nation it may belong, loaded exclusively with sick and wounded being removed, is protected by neutrality, but the mere fact, noted on the ship's books, that the vessel has been visited by one of the enemy's cruisers, renders the sick and wounded incapable of serving during the continuance of the war. The cruiser shall even have the right of putting on board an officer to accompany the convoy and thus verify the good faith of the operation.

If the merchant ship also carries a cargo, her neutrality will still protect it, provided that such cargo is not of a nature to be confiscated by the belligerent.

The belligerents retain the right to prohibit to neutralized vessels all communication and any course which they may deem prejudicial to the secrecy of their operations. In urgent cases special conventions may be entered into between commanders-in-chief, in order to neutralize temporarily and in a special manner the vessels intended for the removal of the sick and wounded.

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Art. XIII. The hospital ships which are equipped at the expense of the aid societies recognized by the governments signing this convention, and which are furnished with a commission emanating from the sovereign, who shall have given express authority for their being fitted out, and with a certificate from the proper naval authority that they have been placed under his control during their fitting out and on their final departure, and that they were then appropriated solely to the purpose of their mission, shall be considered neutral, as well as the whole of their personnel. They shall be respected and protected by the belligerents.

They shall make themselves known by hoisting, together with their national flag, the white flag with a red cross. The distinctive mark of their personnel, while performing their duties, shall be a

brassard of the same colors. The outer painting of these hospital ships shall be white with red strake.

These ships shall bear aid and assistance to wounded and shipwrecked belligerents, without distinction of nationality.

They must take care not to interfere in any way with the movements of the combatants. During and after the battle they will act at their own risk and peril.

The belligerents shall have the right of controlling and visiting them; they may refuse to coöperate with them, order them to depart, and detain them if the gravity of the circumstances demand such action.

The wounded and shipwrecked picked up by these ships cannot be claimed by either of the combatants, and they will be required not to serve during the continuance of the war.

Art. XIV. In naval wars any strong presumption that either belligerent takes advantage of the benefits of neutrality, with any other view than the interest of the sick and wounded, gives the other belligerent, until proof to the contrary, the right of suspending the Convention as regards such belligerent.

Should this presumption become a certainty, notice may be given to such belligerent that the convention is suspended with regard to him during the whole continuance of the war.

THE HAGUE PEACE CONFERENCE.

* * * * * * *

Art. II. Hospital ships equipped wholly or in part at the cost of private individuals, or officially recognized relief societies, shall likewise be respected and exempt from capture, provided the belligerent power to whom they belong has given them an official commission and has notified their names to the hostile power at the commencement of or during hostilities, and in any case before they are employed.

These ships should be furnished with a certificate from the competent authorities, declaring that they had been under their control while fitting out and on final departure.

Art. III. Hospital ships equipped wholly or in part at the cost

of private individuals or officially recognized societies of neutral countries shall be respected and exempt from capture, if the neutral power to whom they belong has given them an official commission and notified their names to the belligerent powers at the commencement of or during hostilities, and in any case before they are employed.

Art. IV. The ships mentioned in Articles I., II., and III. shall afford relief and assistance to the wounded, sick, and shipwrecked of the belligerents independently of their nationality.

The Governments engage not to use these ships for any military purpose.

These ships must not in any way hamper the movements of the combatants.

During and after an engagement they will act at their own risk and peril.

The belligerents will have the right to control and visit them; they can refuse to help them, order them off, make them take a certain course, and put a commissioner on board; they can even detain them if important circumstances require it.

As far as possible the belligerents shall inscribe in the sailing papers of the hospital ships the orders they give them.

* * * * * * *

Art. VI. Neutral merchantmen, yachts, or vessels having or taking on board sick, wounded, or shipwrecked of the belligerents cannot be captured for so doing, but they are liable to capture for any violation of neutrality they may have committed.

* * * * * * *

Art. IX. The shipwrecked, wounded, or sick of one of the belligerents who fall into the hands of the other are prisoners of war. The captor must decide, according to circumstances, if it is best to keep them or send them to a port of his own country, to a neutral port, or even to a hostile port. In the last case prisoners thus repatriated cannot serve as long as the war lasts.

* * * * * * *

Art. XI. The rules contained in the above articles are binding

only on the contracting powers in case of war between two or more of them.

The said rules shall cease to be binding from the time when, in a war between the contracting powers, one of the belligerents is joined by a noncontracting power.

PART X.

CLERICAL WORK.

NOT all hospital-corps men will make good clerks, but all privates first class and selected privates are required to take the course.

The nature, objects, and methods of preparation of the following reports and records are to be explained to the class and copies prepared and criticised. Each member of the class should be required to prepare the reports printed in italics. The list is believed to include all reports and records ordinarily required to be kept or prepared in military hospitals.

Daily.

1. Morning sick report, numerical. To commanding officer.
2. Morning report of detachment of hospital corps. To commanding officer.
3. Detachment sick report.
4. Current work:
   - Letters sent and received.
   - Change of status, hospital corps, information slip.
   - Enlistment papers.
   - Physical examination of recruits.
   - Outline figure cards.
   - Descriptive and assignment cards.
   - Descriptive list, military record, and statement of accounts.
   - Efficiency reports.
   - Deposit books.
   - Notification to paymaster of deposits.
   - Report to paymaster-general of transfer of men having deposits.
   - Allotments of pay.

Clothing requisition.
Clothing abstract.
Discharges and final statements.
Notification to paymaster of discharge.
Statement of service.
Deserter's descriptive list.
Reports of survey proceedings.
Deposition before a summary court.
Charges and specifications.
Furloughs.
Transfer cards.

5. Record-books, etc..
Register cards of patients.
Order and letter book.
Letters received and indorsement book.
Letter press book.
Soldier's handbook.
Record of physical examination of recruits.
Register of hospital-fund account.
Record of deaths and interments.
Medical history of post.

Every Ten Days.

1. *Ration returns of detachment and of patients subsisted on the ration.* One copy of each to post adjutant.

Monthly.

1. *Sick and wounded report* (Form 51); one copy to the Surgeon-General with transfer cards.

2. *Return of hospital corps* (Form 47), triplicate; one copy retained, one copy to the Surgeon-General, one copy to the chief surgeon.

3. Sanitary report (Form 50); one copy to commanding officer, then to the Surgeon-General through military channels.

4. Vouchers for laundry (Form 5), triplicate; one copy retained, two to chief surgeon.

5. Personal report of medical officers; one copy on information

slip to the Surgeon-General through chief surgeon; one copy in letter form direct to The Military Secretary.

6. Report of examination of recruits; one copy to The Military Secretary direct (Form 60, or information slip).

7. Ration return of patients not subsisted on the ration (Form 69, S. D.), duplicate; both to post commissary.

8. Pay rolls, triplicate; one copy retained, two to paymaster.

9. Report of meteorological observations (special form), triplicate; one copy retained, two copies to chief of weather bureau. (Required from certain designated posts only.)

10. Report of repairs to hospital (information slip); one copy to the Surgeon-General through chief surgeon.

11. Report of repairs to sergeants' first class quarters (as 10).

12. Ration return for those rationed separately.

13. Requisition for fuel, forage, and straw; one copy to post adjutant.

Bimonthly.

1. Muster rolls, duplicate; one copy retained, one copy to The Military Secretary.

2. Report of changes in detachment for preceding month; one copy rendered to post commander on last of each month on which no muster roll is rendered. (Not required in all departments.)

Quarterly.

1. *Statement of hospital fund* (Form 49); one copy to the Surgeon-General through the chief surgeon.

Semiannually.

1. Ordnance returns, June 30 and December 31, duplicate; one copy retained, one copy to chief of ordnance with vouchers for period.

Yearly.

1. Return of medical property (Forms 21 and 22), duplicate; one copy retained, one copy direct to Surgeon-General.

2. Estimate of repairs to hospital, and to quarters of sergeants first class; separate estimates (three or four copies) and letter of transmittal, one copy to Surgeon-General through chief surgeon.

3. Requisition for medical supplies (Forms 33, 34, and 35), four copies; one copy retained, three copies to chief surgeon. Due December 10.

Occasionally.

1. Report of epidemic diseases (letter), one copy; to the Surgeon-General through the chief surgeon.

2. List of patients suffering from epidemic diseases (Form 54), duplicate, to the Surgeon-General and chief surgeon.

3. Report of record books (Form 61), duplicate; one copy retained, one copy direct to Surgeon-General.

4. List of wounded (Form 53), duplicate; one copy retained, one copy to the Surgeon-General through the chief surgeon.

5. Report of death of officers or sergeants first class, letter in duplicate; one copy to Surgeon-General, one copy to chief surgeon.

6. Report of deaths and interments, to post adjutant.

7. Inventory and inspection reports, triplicate; all copies to inspecting officer.

8. Report of sales at public auction, four copies; one copy retained, one copy with return, one copy to Inspector-General, one copy to chief of bureau.

9. Report of change of combination of office safe (letter); to chief surgeon.

10. Special requisitions, invoices, and receipts.

11. Memorandum receipts for quartermaster's property.

At Breaking Up of Hospital.

1. Report of sick and wounded. (See Monthly reports.)

2. Return of hospital corps. (See Monthly reports.)

3. Report of record books. (See Occasional reports.)

4. Personal report. (See Monthly reports.)

5. Letter reporting discontinuance of hospital; one copy to the Surgeon-General through chief surgeon.

In addition to the class instruction those men who show special aptitude for clerical work are detailed in rotation for duty in the office, and here they should not only assist in making out the papers and keeping the records, but should be given regular instruction and practice in the use of the typewriter.

PART XI.

MINOR SURGERY.

THE noncommissioned officer of the hospital corps must very frequently act as the surgeon's assistant, performing such duties as in civil life are assigned to a physician. He may have to take entire charge of the anesthetic, or act as the first, second, or other assistant. Indeed, the occasions are not infrequent when a small detachment is in the field without any medical officer, and the noncommissioned officer himself may have to do minor operations and permanently arrest hemorrhage.

CHAPTER I.

ANESTHESIA, GENERAL AND LOCAL.

AN anesthetic is an agent that abolishes sensation. It may be general or local. The former affects the whole system and produces unconsciousness and muscular relaxation. The latter affects only the part to which it is applied, destroying the sensation of the local nerves.

The principal *general anesthetics* are *ether*, *chloroform*, and *nitrous-oxide gas*, the latter being used almost exclusively by dentists.

Before commencing the administration of any anesthetic everything should be made ready; the patient should not have had any food, except perhaps a cup of coffee or bouillon, for five or six hours before commencing anesthesia. His head should rest on a low pillow covered with a towel, and the skin of the face, around the mouth and nose, which is liable to be irritated by the anesthetic, should be protected by vaseline.

On a small table to the right of the anesthetizer should be placed the appropriate articles, ether or chloroform, a screw gag, lever

gag, tongue forceps, sponge-holder and sponge, towel, teaspoon, sterile water, a hypodermic syringe charged with two milligrammes of strychnine, hypodermic tablets of morphine, digitalis, and strychnine, nitrite of amyl pearls, vaseline, and a basin for vomitus.

Pure sulphuric ether is generally considered the safest and best anesthetic for general purposes. It should be kept in tin cans in a cool, dark place. It is about two and a half times heavier than air and inflammable; therefore lights should not be brought near the inhaler, but gas jets four or more feet from the patient's head are safe. Throughout the anesthesia the body must be kept warmly covered.

The Allis inhaler (Fig. 159) is supplied by the Medical Department, but an inhaler may be readily extemporized by folding a newspaper twice across its width, laying it on a towel, the edges of which are turned in, then folding the whole into a cylinder, and closing the top with pins; some cotton or gauze may be pinned in the top.

The arms of the patient must not be brought above his head nor allowed to hang over the edge of the table, as paralysis has followed the undue pressure in such cases; the forearms should be flexed and folded over the base of the chest, being rolled in the undershirt to confine them.

Assistants must be careful not to interfere with respiration by leaning on the chest.

About half an ounce of ether having been poured upon the inhaler, it is held at about a foot from the patient's face and he is requested to breathe quietly but deeply; go very slowly at first, being careful not to excite fear, coughing, or strangling. More ether is poured on as necessary and the inhaler brought gradually closer until it completely covers mouth and nose; very little admixture of air is required with ether.

Usually there is a stage of excitement marked by flushed face, increased heart action, some struggling, perhaps tremor and general rigidity of the body; all these symptoms are more marked in alcoholics.

The state of complete anesthesia is marked by relaxation so that the arm drops when lifted, snoring respiration, and the absence of winking when the eyeball is touched.

The anesthetizer must closely watch the pulse, respiration, and color of the patient, as well as his pupils and the conjunctival reflex. In complete anesthesia the pulse and respiration ratio should be about normal, the pupils should be contracted and should react to light.

Danger signals are marked—especially sudden—weakness and rapidity of the pulse, stopping of respiration, cyanosis, dilatation of the pupils, and absence of their reaction to light. The return of the conjunctival reflex—winking on touching the eyeball—indicates that the patient is "coming out" of the anesthetic.

Sudden cessation of repiration is often due to the falling back of the tongue over the opening of the larynx; in such a case the lower

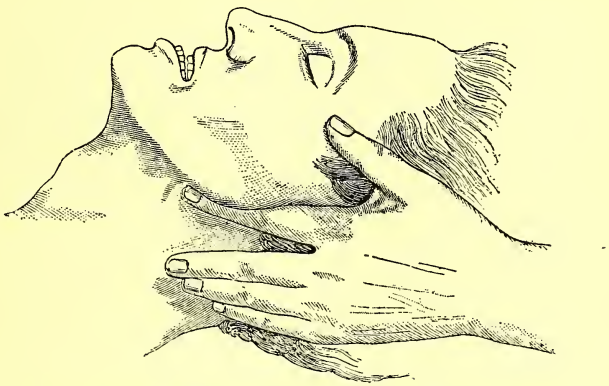


FIG. 241.—Pushing Forward the Jaw for Treatment of Asphyxia.

jaw should be thrown forward by the thumbs behind the angles of the jaw, and if this does not suffice the teeth must be forced apart, and the tongue drawn forward with tongue forceps (Figs. 241 and 242). If the respiration is not at once resumed artificial respiration must be resorted to.

Failure of the pulse is an indication for the use of stimulants and perhaps discontinuance of the ether.

Efforts at vomiting may usually be controlled by giving more ether, but if it cannot be prevented the head should be turned on the side to allow the escape of the vomited matter.

Accumulation of mucus in the throat should be removed by a sponge on a sponge-holder.

Chlorojorm is given by the open or "drop method" so as to secure a free admixture of air; it is four times as heavy as air and not inflammable.

The *Esmarch inhaler* is supplied in the army, but a small handkerchief or a piece of lint folded once answers the purpose very well. In the absence of a chloroform bottle with dropping attachment, one can be extemporized by cutting a V-shaped trough on the opposite sides of the cork.

The same precautions must be observed as in ether anesthesia, remembering that while ether is a heart stimulant chloroform is a heart depressant and that the great danger with chloroform is heart failure.

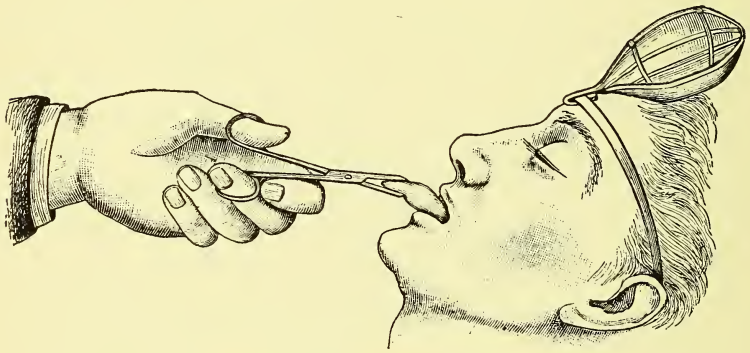


FIG. 242.—Drawing Out the Tongue for Treatment of Asphyxia.

A few drops of chloroform are placed on the inhaler, which is at first held some distance from the mouth and gradually approached, but never brought close enough to exclude the air. A few drops are added from time to time as the chloroform evaporates, but progressively less after anesthesia becomes complete.

The relative advantages of ether and chloroform may be summed up as follows: Ether is slower, requires much larger quantities, is less pleasant to take, causes much more irritation and costs more; it is usually safer.

In the field chloroform is preferable because of the much smaller quantity which it is required to transport and the shorter time necessary for anesthesia.

In the tropics ether, on account of its greater volatility, is hard to keep, and much more is required to produce anesthesia.

Local anesthesia is very useful in opening boils and abscesses, splitting inflamed piles, and in any operations on the fingers or toes.

There are two general classes of local anesthetics, those which destroy the sensibility of the nerves by freezing and those which must be injected hypodermically into the part.

Of the freezing agents the best is *ethyl chloride*, which is furnished in metallic tubes arranged so as to throw a fine spray upon the part; the tube should be held at a distance of ten or twelve inches, and when the part suddenly turns white sensation is destroyed. The objection to freezing agents is that the pain in freezing and thawing is almost as great as it would have been from the incision, and that sloughing may follow undue freezing.

The most generally useful local anesthetic is cocaine hydrochloride in solutions of two to ten per cent in water. In the mucous membranes the anesthesia is produced by the surface application, but in other tissues it must be used hypodermically. The anesthesia commences in a minute or two and lasts about fifteen minutes. If the cocaine is confined to the part so that the blood cannot carry it away, as when a ligature is thrown around the base of a finger or toe, the effect may be maintained indefinitely.

The objection to cocaine is its depressing action on the heart and the danger of contracting the habit. The maximum quantity to be used subcutaneously is thirty to forty milligrammes. The solutions do not keep well and should always be freshly prepared and made with sterile water; the solutions themselves cannot be sterilized by heat, as heat decomposes the cocaine.

Eucaine-B is sometimes used as a substitute for cocaine, in solutions of the same strength and in the same manner. It is slower in its action than cocaine, but not so depressing to the heart, its effects last longer, and its efficiency is not impaired by heat sterilization.

In *Schleich's method* very dilute solutions are used, but the tissues, especially the skin, are infiltrated with them. Schleich used three solutions of different strengths. The medium solution is prepared as follows:

℞ Cocain. hydrochlorid..... ǀ100
Morphin. hydrochlorid..... ǀ025
Sodii chlorid..... ǀ200
Aq. destill 100 ǀ000

Sterilize solution and add gtt. ij. of five-per-cent phenol.

The stronger solution contains twice as much cocaine and the weaker one-tenth as much cocaine and one-fifth as much morphine.

To anesthetize the skin it is necessary to inject the solution *into* not *under* it.

In *spinal anesthesia* a solution of cocaine or eucaine is injected into the spinal canal between the fourth and fifth lumbar vertebræ, after withdrawing a small portion of spinal fluid; anesthesia without loss of consciousness is produced in all parts of the body below the seat of the injection.

The method has not met with general acceptance on account of its uncertainty, and because of the severe and even fatal accidents which have attended its use.

CHAPTER II.

ASSISTING AT OPERATIONS.

Minor Operations.

In an operation the duty of the noncommissioned officer may be to prepare and hand instruments, to sponge, to assist in the operation, or to help in all three ways. He must watch the operation and operator closely and endeavor to anticipate the wants of the surgeon.

The sterilized instruments should all be laid out beforehand, as much as possible in the order in which they will be needed and those of the same kind grouped together. Needles should be placed in a shallow glass dish of alcohol and a few should always be threaded ready for use. In threading, the suture should be held in the right hand and the needle held in the left and passed over it; catgut or tendon may be cut obliquely and flattened between the handles of a pair of scissors to facilitate threading, but silk must always be cut square across to avoid unraveling.

Iodoform dusters or other unsterilized articles must be wrapped in sterile gauze.

When the sutures are in sealed glass tubes, the tubes must be sterilized in an antiseptic solution, broken in a sterile towel, and the contents dropped in alcohol.

Ligatures should be about nine inches long and sutures twelve inches.

A complete dressing should be ready in a sterilized towel.

When the intestines are to be exposed hot towels will be needed; to have them ready, sterile water is kept hot and the towels are dipped in when necessary.

Rubber drains usually have a safety pin passed through one end to prevent them from slipping in; gauze-wick drains are pre-

pared by rolling a narrow strip of gauze into a wick about the size of a cigarette and covering it with a layer of rubber tissue.

Instruments should always be handed to the operator with the handle toward his hand, and in such a position that they may be used at once without loss of time; they should not be allowed to accumulate unnecessarily upon the patient's body, and soiled and bloody instruments should be replaced by clean ones.

Sponging must be done quickly in the intervals of the surgeon's work; the sponge should be used with a firm wiping movement in the direction from the bottom of the wound toward the surface.

Retractors are held in such a position that they and the hands of the assistant may be as little in the way as possible; sharp retractors should be used with care.

In suturing, the needle properly threaded and held in the bite of the forceps should be handed to the surgeon; the assistant then holds the edges of the wound in the proper position for suturing, and is ready with scissors to divide the sutures at the proper time.

When there is no surgeon present with the troops and none is available, the senior noncommissioned officer of the hospital corps detachment must himself undertake necessary minor operations.

Wounds. Clean, incised wounds, the edges of which cannot be brought together by the dressing and bandage, should be sutured or sewed up. Silkworm gut, silk, or catgut may be used, the pref-

FIG. 243.—The Interrupted Suture.

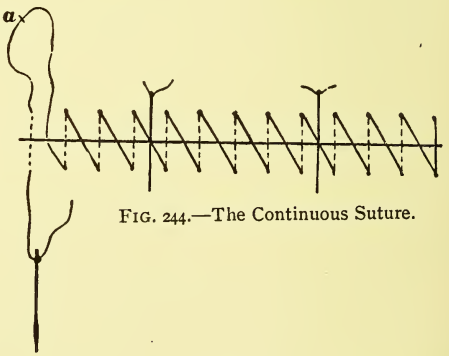


FIG. 244.—The Continuous Suture.

erence being in the order named; sutures of the first two materials must be taken out after four or five days; catgut will be absorbed.

Sutures may be interrupted or continuous. In the interrupted

suture (Fig. 243) the needle is passed through the skin and subcutaneous tissues about an eighth of an inch from the edge of the wound, and then tied with a reef knot; care should be taken not to draw the suture tight enough to contract and pucker the skin; the remaining sutures are then placed about a quarter of an inch apart. The interrupted suture is the one ordinarily used.

The *continuous suture* (Fig. 244) is applied by continuously passing the needle through the skin without cutting the thread.

If there is any doubt about the cleanliness of the wound or if there is much oozing from it, the lower angle should be left open for drainage.

If the wound is in a hairy part the surrounding skin must be shaved or the hair clipped close, shaving always away from the wound and being careful not to get any dirt or hair into it. The wound having been protected temporarily by a narrow fold of sterile gauze while the shaving is going on, this is kept in place while the surrounding skin is thoroughly scrubbed with green soap and hot water and afterward in antiseptic solution. The same precautions as to instruments and the hands are observed as in operation wounds. If the wound is small and not infected, all the dressing needed may be a few shreds of cotton sprinkled with iodoform and held in place by collodion.

Should the wound contain dirt or other foreign bodies they should be washed away with sterile water or removed with sterile forceps; as such wounds are sure to be infected a free opening must be left for drainage.

Contused or lacerated wounds, unless the contusion is very severe, should also be sutured, but not so closely as incised wounds nor should the sutures be made so tight, as much tension and swelling are sure to ensue.

Before any wound is sutured all bleeding should be controlled permanently; if the bleeding is capillary this may be done by exposure to the air, hot water, or pressure; if the hemorrhage is from an artery the spurting point must be found, seized with a pair of artery forceps and twisted, or a catgut ligature may be slipped over the forceps and the vessel tied.

In *furuncle or boil* there is a hard painful swelling with a central pustule overlying a small slough or *core*. The occurrence of

a number of boils in the same neighborhood is usually due to infection from the first one.

If a boil is seen early enough it may sometimes be aborted by dipping a sharpened stick in pure phenol and carrying it down into the core through the central pustule. If seen later the only thing which will give prompt relief is a free cross cut; the cuts must be deep enough and long enough to go entirely through the hardened part, otherwise they will fail. Use a very sharp scalpel and make each cut at one quick sharp stroke. Local anesthesia may be used. After the incision apply wet antiseptic dressings (page 217). To prevent a succession of boils the skin about the first one should be kept thoroughly clean and disinfected, the hands should be disinfected, and the underclothing frequently changed.

Carbuncles differ from furuncles in being more extensive and severe and in having several openings or *heads;* the treatment is the same.

Felon is an abscess below the fascia or periosteum in the end of the finger; it is due to infection through a hang-nail or some small wound. The tendency is to spread deeply and not to come to the surface. The pain is intense and throbbing. The treatment consists in making a free incision down to the bone and gives prompt relief; unless this is done necrosis of the bone may result. Apply a wet dressing.

Abscesses when near the surface may be detected by the soft fluctuating center surrounded by a hard ring. They should be opened with a sharp-pointed curved bistoury thrust through the skin over the top of the abscess and cutting from within outward. After opening, a drainage tube should be inserted and a wet dressing applied; the drainage tube may be left in as long as pus continues to flow.

Alveolar abscess or gum boil is an abscess starting at the root of the teeth and usually making its way out at the junction of the cheek and gum. The symptoms are toothache, pain, and often great swelling of the face; on opening the mouth pressure on successive teeth will show by the pain produced which one is affected, and often swelling may be seen at the base of the gum. With a straight bistoury a puncture should be made straight downward at the base of the gum and over the softest point.

Ulcers are what are commonly called *sores*. They require wet antiseptic dressings and often the support of a rubber bandage.

An *inflamed hemorrhoid or pile* is an extremely painful affection which may be promptly relieved by a very simple operation. The patient complains of a painful swelling at the anus, and on examination a red or purple, hard swelling is found; this is due to the formation of a blood-clot in the pile. With or without cocaine anesthesia run a sharp curved bistoury through the base of the tumor and cut from within outward; this frees the clot and the pain now ceases.

CHAPTER III.

MINOR OPERATIONS, CONTINUED.

Subcutaneous saline infusions are frequently given in hospitals for shock, hemorrhage, suppression of urine, and other conditions. The appliances needed are a graduated infusion bottle or a fountain syringe, a large-size aspirating needle, and sterile *normal saline solution* (page 219). In the absence of an infusion bottle or fountain syringe a large funnel may be used ; a piece of glass tubing inserted in the length of the rubber tubing will enable the operator to observe the flow of the infusion. All the appliances must be clean and freshly sterilized by boiling.

The bottle or other container is hung up at a height of about three feet above the patient's body, and while the solution is flowing from the needle it is thrust quickly into the subcutaneous tissues and held there (Fig. 245).

The part selected is usually the back between the shoulders, the axilla, or the buttock. The hands of the operator and the site of the operation are carefully disinfected in the usual manner.

The amount injected is usually one or two pints distributed in two or three places.

After the withdrawal of the needle the skin of the puncture is pinched up, dried with a gauze sponge, and dabbed with collodion; a small gauze dressing is then applied.

Injections of antitoxin for diphtheria are usually given between the shoulders; the procedure is the same as for hypodermic injections, the syringe used being of the same type, only much larger. The usual antiseptic precautions are observed.

Syphilis is now frequently treated by subcutaneous injections of *metallic mercury* in the form of "gray oil." The appliances

needed are a hypodermic syringe with a large caliber needle, the gray oil, an alcohol lamp, and collodion, or adhesive plaster.

The injections are usually made in a vertical line on either side of the spinal column and about an inch and a half from it and an inch and a half apart. The syringe used should preferably be of a half or one Cc. capacity, and graduated in fiftieths of a cubic centimeter.

The needles should screw on, as friction needles are forced off by the pressure necessary to push out the thick preparation of mer-

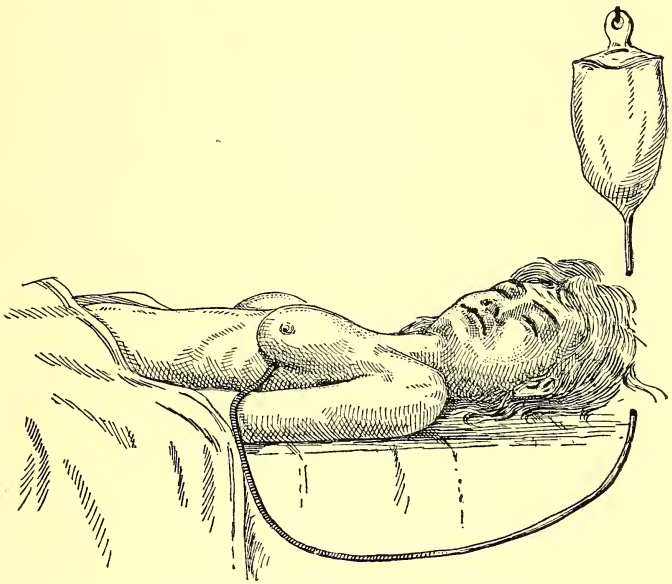


FIG. 245.—Subcutaneous Saline Injection.

cury. After the preliminary sterilization the syringe and needles are kept immersed in a wide-mouth bottle of liquid petrolatum. The gray oil is kept in a wide-mouth bottle of about fifteen Cc. capacity, and the bottle is protected from dust and dirt in a tin box; the box is kept in a cool place, preferably on ice.

The skin of the patient and the hands of the operator having been disinfected, the gray oil is warmed over the alcohol lamp until it will just flow freely, and then drawn into the syringe. The syringe is next turned point up, and the piston compressed until a drop of gray oil emerges; the set-screw of the piston rod is so placed that

the syringe can only deliver the required dose, usually 0.05 Cc.; a fold of skin is pinched up vertically between the thumb and finger, the needle plunged in obliquely, and the dose given. The puncture is compressed by the finger for a moment and then sealed with collodion or adhesive plaster. No rubbing of the spot is necessary or desirable.

The *stomach tube* is used to remove poisons from the stomach, to wash it out, and to introduce food.

For the first-named purpose a tube about five feet long is required, for the last purpose one two and a half feet long will suffice.

FIG. 246.—Washing Out the Stomach. First step.

FIG. 247.—Washing out the Stomach. Second step.

The patient sits in a chair with his head thrown back; the tube having been warmed and dipped in glycerin is passed, together with the operator's left forefinger, into the back of the throat; the finger guides the tube past the epiglottis to the back of the pharynx, whence it is pushed slowly and gently into the stomach, its passage being aided by attempts to swallow.

Sometimes the patient prefers to take the tube into his mouth, swallow the end and then push it down himself.

Food is introduced through a funnel in the end of the tube.

To remove poisons or wash out the stomach, siphonage must be secured; to do this pour water into the funnel held above the patient's head until the tube and funnel are full; then before all the water has run out of the funnel lower it below the level of the stomach; this movement may be repeated as often as necessary (Figs. 246 and 247).

When the patient is unconscious the operator must be sure that the tube has not entered the patient's larynx before he introduces any fluid.

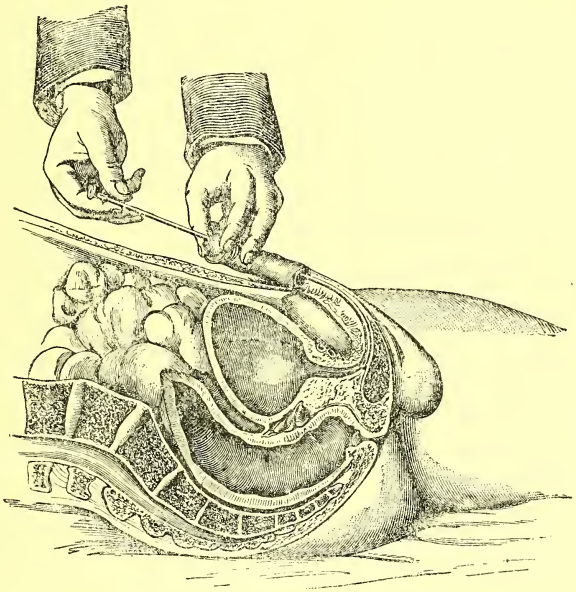


FIG. 248.– Introduction of Metallic Catheter. First step.

In *forced feeding*, when the patient resists, it is better to pass a smaller tube along the floor of the nose and thence into the pharynx.

To introduce a metallic catheter or sound into the bladder, place the patient on his back with the shoulders raised, and the legs drawn up and rotated slightly outward so as to relax the abdominal muscles; having sterilized, warmed, and lubricated the instrument, stand on the left side of the patient, grasp the penis in the fingers of the left hand and draw it vertically upward with its back toward the abdomen, hold the catheter lightly in the right hand and introduce

the tip into the meatus. The instrument and penis should now be carried close to the body over and parallel with the groin (Fig. 248).

The penis is then drawn up over the instrument which is at the same time pushed gently in or allowed to pass by its own weight; at the same time the handle of the catheter is slowly carried toward the median line and, after about four or five inches have disappeared in the urethra, elevated to the vertical position, when, the tip passing under the arch of the pubis, the handle is depressed between the thighs (Fig. 249). No force should be used under any circumstances.

Hernia or rupture is a condition in which some part of the contents of the abdomen, particularly the intestine, escapes and

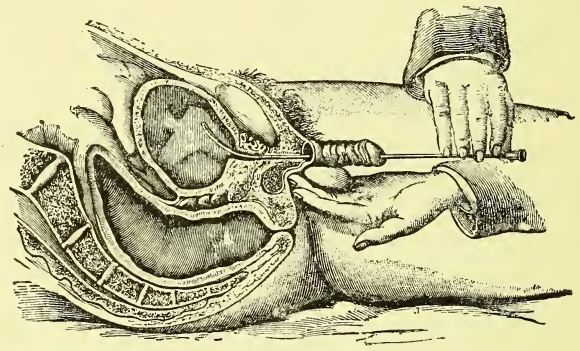


FIG. 249.—Introduction of Metallic Catheter. Second step.

forms an external tumor. It is usually caused by violent muscular effort or straining, and is especially apt to occur in the tropics as a result of loss of flesh and general muscular relaxation. Though it develops gradually, its appearance is often sudden.

Inguinal hernia appears as a swelling just above the fold of the groin, which may pass on down alongside the testicle, becoming *scrotal.*

In *femoral hernia* the swelling is just below the fold of the groin, and usually much smaller than in the inguinal form.

The swelling is soft and elastic and at first goes back when the patient lies down, or can be pushed back; sometimes it will not go back and is then said to be *irreducible;* if the hernia becomes so

tightly caught in the ring through which it passes that the circulation is arrested it is said to be *strangulated.*

The temporary treatment of a hernia consists in the application of a truss. Before the truss is applied, however, the hernia must be put back or *reduced;* if this is not done the truss will press on the delicate intestine and cause severe pain and inflammation.

To reduce a hernia that will not go back of itself, place the patient on his back with a pillow under his hips, and the hips and knees flexed, and tell him to breathe quietly through the mouth, and not to strain. Then grasp the tumor with the fingers and squeeze it gently as you would a sponge, in a direction upward, backward, and outward; a sudden slip will be felt as the intestine returns. The truss should now be applied with the patient lying down.

A *truss* (Fig. 194) consists of a pad to cover the ring and inguinal canal, and a spring to make the pressure and hold the pad in place; there is usually also a strap from the end of the spring back to the pad and sometimes also a perineal strap for additional security in large hernias. After a truss is adjusted, its efficiency should be tested by seeing whether it will hold up the hernia when the patient stands, sits, lies down, bends over, descends stairs, etc.

To measure for a truss place the end of the tape over the point where the hernia escapes, and carry it around the pelvis midway between the anterior superior spine of the ilium and the great trochanter, and back to the starting point.

Toothache: When there is a cavity it should be cleaned out with a little absorbent cotton on the end of a probe or match, and the cavity then plugged with a bit of cotton dipped in phenol, creosote, or oil of cloves.

The tooth should not be extracted unless there is no chance of obtaining the services of a dentist for a considerable time and meanwhile the pain is unbearable.

To extract a tooth see that a forceps is selected which is adapted to the particular tooth; in the sets of forceps furnished the army the particular forceps for each tooth is indicated on a card. Forceps of which the bite has a plain curve on each side are adapted to teeth with a single root, such as the incisors and canines; those of which the bite has a projection on the outer side are for the upper

molars, the projections being intended to fit between the outer roots; and those with a projection on both sides are for the lower molars.

The gum should be separated from the neck of the tooth with a lancet, and the forceps pushed down between the gum and the tooth until they reach but do not grasp the border of the alveolus. In order to avoid breaking off the crown, the pressure of the forceps must be only sufficient to keep them from slipping. The tooth is then loosened a little by a rotary motion for the incisors and canines, and an inward and outward rocking motion for the other teeth, and extracted by a steadily increasing pull as nearly as possible in the direction of the axis of the tooth.

The head and jaw of the patient should be steadied by the left arm and fingers of the operator.

Two kinds of *electric batteries* are usually furnished in the army medical department; a *galvanic or continuous-current battery*, and a *faradic or interrupted-current* apparatus; sometimes the two are combined (Fig. 196).

To care for batteries properly it is necessary that their mechanism should be studied. After use the elements or poles should always be lifted out of the liquid, and care should be taken not to spill the liquid in handling.

With dry-cell batteries it is only necessary to see that the circuit is open when the battery is not in use, but electrodes should be dried or wrapped in some protective before they are put away lest they cause swelling of the box or rusting of the connections.

The essential parts of a galvanic battery are the *cells* which contain the liquid, the *elements* which dip into the liquid, the *cords* which conduct the electricity, and the *electrodes*, usually covered with sponges, through which the electricity is applied; faradic batteries have in addition a *coil* and an *interrupter*.

The sponges should be well moistened with water before use.

To exercise muscles in paralysis the faradic current is usually given about ten minutes at a time. One of the moistened sponges is placed at any part of the limb and the other is moved about with a massaging motion; the skin also should be well moistened.

The galvanic current is given as directed by the surgeon.

CHAPTER IV.

ADHESIVE PLASTER, STRAPS AND STRAPPING.

As many of the uses of adhesive plaster are so important, it is thought best to devote a chapter of minor surgery to a detailed consideration of its various applications.

To hold splints in place, especially in the upper extremity, it is much superior to bandages, as it allows the fractured parts to be

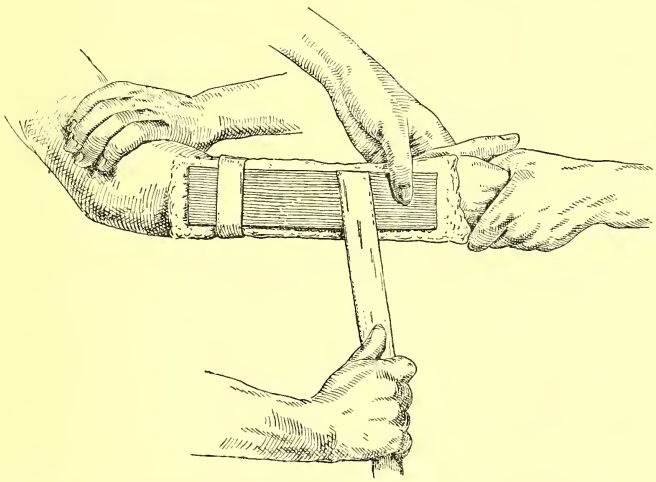


FIG. 250.—Application of Adhesive-Plaster Strips to Retain Splints.

seen; for this purpose two or three strips about an inch wide are used, and applied as shown in Fig. 250.

In the lower extremity webbing straps with buckles are better than adhesive straps to hold the splints in position; but the adhesive plaster is used for purposes of *extension in fractures of the thigh*. For this purpose there should be provided two strips of plaster, each two inches wide and long enough to reach from the seat of the fracture to the malleolus; to each strip is sewed a webbing strap

of the same width as the plaster and six inches long; three strips, each an inch and a half wide and long enough to encircle the limb, just above the malleoli, just above the knee, and just below the fracture respectively; and two strips an inch and a half wide, and long enough to encircle the limb spirally from just above the malleoli to just below the fracture. After the limb has been washed, shaved, and dried, the first two straps are applied to the middle of each side of the limb from just below the fracture to the malleoli; then the last two straps are applied spirally in opposite directions to keep the first from slipping, and lastly the three remaining straps are applied in a circular manner as indicated (Fig. 251). A bandage is applied over all.

A spreader of wood, about two inches wide and sufficiently long to clear the malleoli, is attached to the webbing straps; the

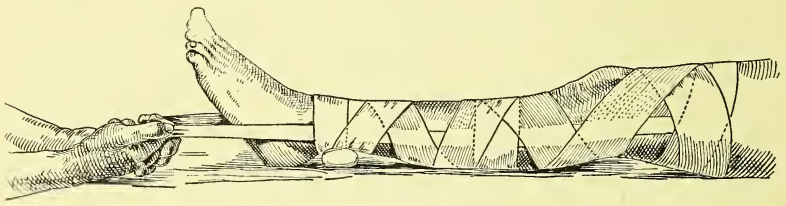


FIG. 251.—Strapping for Extension in Fracture of the Thigh.

spreader has a hole in the middle through which passes a cord which plays over a pulley; to the outer end of the cord is attached a weight.

In *fractures of the ribs* a broad swathe of plaster is used, wide enough to extend about six inches on each side of the fracture and long enough to reach three-fourths of the distance around the chest (Fig. 252).

The patient standing or sitting, with his hands on top of his head, one end of the swathe is fastened just over the spinal column; with the other end in his hands the surgeon walks around the patient applying the swathe smoothly and very firmly. Or strips of plaster about four inches wide may be used, each strip overlapping the previous one about one-third.

In fracture of the clavicle a Sayre dressing (Fig. 253) is especially useful in the field. Prepare three strips of plaster, each three

or four inches wide and long enough to go one and one-half times around the body. Encircle the upper arm just above the middle with a strip of bandage wider than the plaster; place a folded towel in the axilla, and a couple of layers of gauze sprinkled with talcum wherever the skin surfaces would come in contact. Pin a loop of one of the plaster strips, sticky side out, around the upper arm over the bandage; then, while an assistant holds the shoulders back, carry the other end of the strip across the back, under the sound

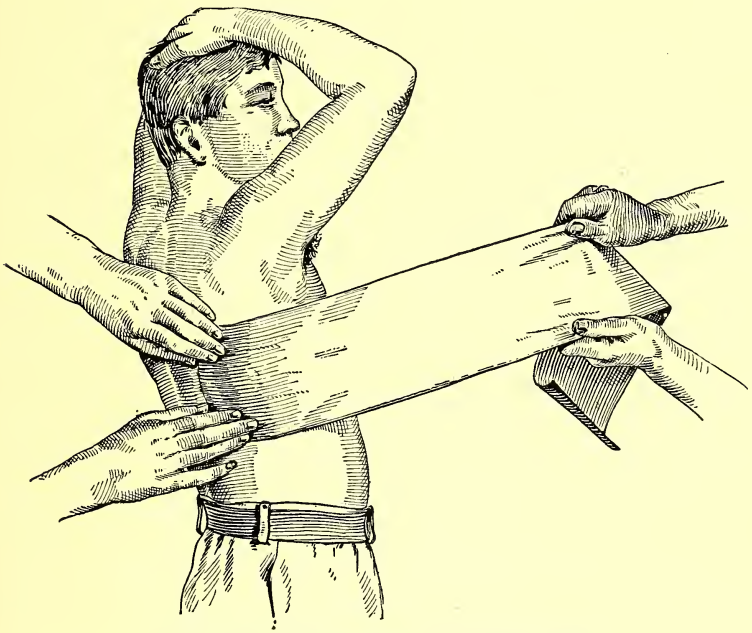


FIG. 252.—Strapping the Chest for Fractured Ribs.

axilla, and over the front of the chest back to the starting point. Now place the hand of the injured side on the sound shoulder; take the second strip and, starting at the back of the sound shoulder, carry it obliquely across the back, under the elbow of the injured side, supporting it, and up over the injured forearm and hand to the starting point.

The third strip is carried circularly around the body holding the arm to the side.

Where the second strip crosses the elbow a slit should be made

in the strip to secure the elbow, which must here be protected from cutting by the edges of the plaster with a little cotton batting. Over the whole a Velpeau bandage may be applied.

Strapping a sprained ankle has already been fully described, page 90.

A swollen testicle after the acute inflammation has subsided is best treated by strapping. The straps should be a half-inch wide and ten or twelve inches long; the operator isolates the affected testicle by encircling its upper part with the thumb and index fingers

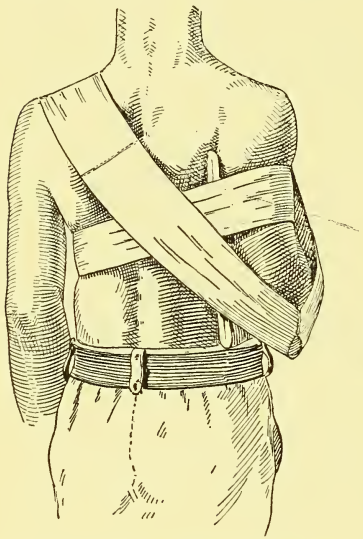


FIG. 253.—Sayre's Strapping for Fracture of Collar-bone. Back view.

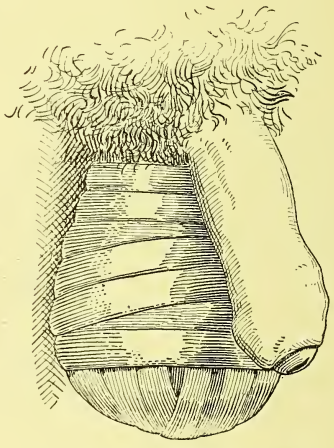


FIG. 254.—Strapping the Testicle.

of the left hand, and replacing the encircling fingers with a strap of plaster. He then covers the testicle with a series of recurrent strips, and reënforces the latter by circular strips (Fig. 254).

To bring the edges of a wound together in the absence of sutures, straps of plaster one-fourth to one-half an inch wide may be used. As the plaster is not aseptic the wound itself must be protected from contact with the plaster by a narrow strip of sterile gauze.

To remove plaster straps from a wound, both ends of the strap must be detached simultaneously so as not to tear apart the edges of the wound.

When a good deal of plaster has to be removed, especially if the part is hairy, a little ether or alcohol should be dropped under the edges of the plaster as it is raised; this will cause it to come away without any pulling. Any remaining plaster may be washed off with ether or alcohol, and the skin then dusted with talcum.

PART XII.

DRILL REGULATIONS FOR THE HOSPITAL CORPS, U. S. ARMY.

DEFINITIONS.

Alignment.—A straight line upon which several men or bodies of troops are formed, or are to be formed.

Base.—The element on which a movement is regulated.

Center.—The middle point or element of a command.

Column.—A formation in which the elements are placed one behind the other.

Deploy.—To extend the front.

Depth.—The space from head to rear of any formation, including the leading and rear elements.

Disposition.—The distribution of the fractions of a body of troops, and the formations and duties assigned to each, for the accomplishment of a desired end.

Distance.—Space in the direction of depth.

Drill.—The exercises and evolutions taught on the drill ground.

Echelon.—A formation in which the subdivisions are placed one behind another, extending beyond and unmasking one another, either wholly or in part.

In battle formation, this term is also employed to designate the different lines. Example: The *first echelon*, the firing line; the *second echelon*, the support.

Element.—A file, squad, platoon, detachment, company, or larger body.

Evolution.—A movement executed by several battalions, or larger units, for the purpose of passing from one formation to another.

Facing distance.—Fourteen inches, *i.e.*, the difference between the front of a man in ranks including his interval, and his depth.

File.—Two men; the front-rank man and the corresponding man of the rear rank. The front-rank man is the *file leader*. A file which has no rear-rank man is a *blank file*. The term "files" applies also to individual men in single-rank formation.

File closers.—Officers and noncommissioned officers posted in rear of the line.

Flank.—The right or left of a command in line or column; also, the element on the right or left of a line.

In speaking of the enemy one says, "his right flank," "his left wing," to indicate the flank or wing which the enemy would so designate.

Flank attack.—A movement made against the enemy's flank.

Flankers.—Men so posted or marched as to protect the flank of a column.

Flank march.—A march, whatever the formation, by which troops move along the front of the enemy's position.

Formation.—Arrangement of the elements of a command. The placing of all fractions in their order in line, in column, or for battle.

Front.—The space, in width, occupied by a command, either in line or column.

Front also denotes the direction of the enemy.

Guide.—An officer, noncommissioned officer, or private, upon whom the command or fraction thereof regulates its march.

Head.—The leading element of a column.

Interval.—Space between elements of the same line.

Left.—The left extremity or element of a body of troops.

Line.—A formation in which the different elements are abreast of each other.

Maneuver.—A movement made according to the nature of the ground with reference to the position and movements of the enemy.

Order, close.—The normal formation in which soldiers are regularly arranged in line or column.

Order, extended.—The formation in which the soldiers, or the subdivisions, or both, are separated by intervals greater than in close order.

Pace.—Thirty inches; the length of the full step in quick time.

Ploy.—To diminish front.

Point of rest.—The point at which a formation begins.

Rank.—A line of men placed side by side.

Right.—The right extremity or element of a body of troops.

Scouts.—Men detailed to precede a command on the march and when forming for battle, to gather and report information concerning the enemy and the nature of the ground.

Tactics.—The art of handling troops in the presence of the enemy.

Turning movement.—An extended movement around the enemy's flank for the purpose of threatening or attacking his flank or rear.

Wing.—The portion of a command from the center to the flank; the battalion is the smallest body which is divided into wings.

GENERAL PRINCIPLES.

1. The interval between men in a rank is 4 inches; the distance between ranks is 40 inches in both line and column.

The allowance for the front of a man is taken at about 26 inches, including the interval; the depth, about 12 inches.

To secure uniformity of interval between files, when falling in and in alignments, each man places the palm of the left hand upon the hip, fingers pointing downward. In the first case the hand is dropped by the side when the man next on the left has his interval; in the second case, at the command *front.*

2. Distance is measured from the back of the man in front to the breast of the man in rear.

The distance between subdivisions in column is measured from guide to guide.

The distance between commands in column is measured from the rear guide of the preceding to the leading guide of the following command.

3. The interval between men is measured from elbow to elbow; between companies, detachments, squads, etc., from the left elbow of the left man, or guide, of the group on the right to the right elbow of the right man, or guide, of the group on the left.

4. Movements that may be executed toward either flank are explained as toward but one flank, it being necessary to substitute the word "left" for "right," and the reverse, to have the explanation of the corresponding movement toward the other flank.

The commands are given for the execution of the movements toward either flank. The substitute word of the command is placed within parentheses.

5. In movements where the guide may be either right, left, or center, it is indicated in the command thus: *Guide* (*right*, *left*, or *center*).

6. Any movement may be executed either from the halt or when marching, if not otherwise prescribed.

7. Any movement not specially excepted may be executed in double time. If the movement be from the halt, or when marching in quick time, the command *double time* precedes the command *march;* if marching in double time, the command *double time* is omitted.

To hasten the execution of a movement begun in quick time, the command: 1. *Double time*, 2. MARCH, may be given; only those units that have not completed the movement take up the double time.

8. There are two kinds of commands:

The *preparatory* command, such as *forward*, indicates the movement that is to be executed.

The command of *execution*, such as MARCH, HALT, or ARMS, causes the execution.

Preparatory commands are distinguished by *italics*, those of *execution* by CAPITALS.

Where it is not mentioned in the text who gives the commands prescribed, they are to be given by the instructor.

The *preparatory* command should be given at such an interval of time before the command of execution as to admit of its being properly understood; the command of *execution* should be given at the instant the movement is to commence.

The tone of command is animated, distinct, and of a loudness proportioned to the number of men under instruction.

Each *preparatory* command is enunciated distinctly and pronounced in an ascending tone of voice, but always in such a manner that the command of *execution* may be more energetic and elevated.

The command of *execution* is firm in tone and brief.

When giving commands to troops it is usually best to face toward them.

Indifference in giving commands must be avoided, as it leads to laxity in execution. Commands should be given with spirit at all times.

9. To secure uniformity, officers and noncommissioned officers should be practiced in giving commands.

10. The signals should be frequently used in instruction, in order that the officers and men may readily recognize them.

11. In the different schools the posts of the officers and noncommissioned officers are specified, but as instructors they go wherever their presence is necessary. As file closers it is their duty to rectify mistakes and insure steadiness and promptness in the ranks.

12. To revoke a preparatory command, or, being at a halt, to begin anew a movement improperly begun, the instructor commands: AS YOU WERE, at which the movement ceases and the former position is resumed.

13. To stay the execution of a movement, when marching, for the correction of errors, the instructor commands: 1. *In place*, 2. HALT, when all halt and stand fast. To resume the movement he commands: 1. *Resume*, 2. MARCH.

14. The instructor always maintains a military bearing, and by a quiet, firm demeanor sets a proper example to the men.

15. Short and frequent drills are preferable to long ones, which exhaust the attention.

SIGNALS.

16. *Forward.*—Raise the arm until horizontal, extended to the front; at the same time move to the front.

Right oblique.—Raise the arm until horizontal, extended obliquely to the right; at the same time move in that direction.

Left oblique.—Same to the left.

By the right flank.—Raise the arm until horizontal, extended to the right; at the same time move to the right.

By the left flank.—Same to the left.

To the rear.—Face to the rear, raise the arm until horizontal, extended to the rear; at the same time move to the rear.

To change direction to the right (left).—Raise the left (right) arm until horizontal, extended toward the marching flank, carry the arm to the front; at the same time turn and move in the direction to be taken.

Halt.—Raise the arm vertically to its full extent.

Assemble.—Raise the arm vertically to its full extent and slowly describe small horizontal circles.

SCHOOL OF THE SOLDIER.

17. The instructor briefly explains each movement, at first executing it himself if practicable.

He requires the recruits to take by themselves the proper positions and does not touch them for the purpose of correcting them, except when they are unable to correct themselves; he avoids keeping them too long at the same movement, although each should be understood before passing to another. He exacts by degrees the desired position and uniformity.

18. As the instruction progresses the recruits are grouped according to proficiency, in order that all may advance as rapidly as their abilities permit. Those who lack aptitude and quickness are separated from the others and placed under experienced drill masters.

19. A few recruits, usually not exceeding four, are placed in a single rank, facing to the front and about four inches apart, arranged according to height, the tallest man on the right.

20. To teach the recruits to assemble, the instructor requires them to place the palm of the left hand upon the hip, below the belt when worn; he then places them on the same line so that the right arm of each man rests lightly against the left elbow of the man next on his right, and then directs the left hands to be replaced by the side.

21. When the recruits have learned how to take their places, the instructor commands: FALL IN.

They assemble rapidly, as above prescribed, at attention, each man dropping the left hand as soon as the man next on his left has his interval.

POSITION OF THE SOLDIER, OR ATTENTION.

22. Heels on the same line, and as near each other as the conformation of the man permits.

Feet turned out equally, and forming with each other an angle of about 60 degrees.

Knees straight without stiffness.

Body erect on the hips, inclined a little forward; shoulders square and falling equally.

Arms and hands hanging naturally, backs of the hands outward; little fingers opposite the seams of the trousers; elbows near the body.

Head erect and square to the front; chin slightly drawn in without constraint; eyes straight to the front.

THE RESTS.

23. Being at a halt, the commands are: FALL OUT; REST; AT EASE; and, 1. *Parade*, 2. REST.

At the command *fall out*, the men may leave the ranks, but remain in the immediate vicinity. They resume their former places at attention, at the command *fall in*.

At the command *rest*, each man keeps one foot in place, but is not required to preserve silence or immobility.

At the command *at ease*, each man keeps one foot in place and preserves silence, but not immobility.

1. *Parade*, 2. REST. Carry the right foot 6 inches straight to the rear, left knee slightly bent; clasp the hands without constraint, in front of the center of the body, fingers joined, left hand uppermost, left thumb clasped by thumb and forefinger of right hand; preserve silence and steadiness of position.

24. To resume the attention: 1. *Squad*, 2. ATTENTION.

The men take the position of the soldier and fix their attention.

TO DISMISS THE SQUAD.

25. Being in line at a halt: DISMISSED.

EYES RIGHT OR LEFT.

26. 1. *Eyes*, 2. RIGHT (LEFT), 3. FRONT.

At the command, *right*, turn the head to the right so as to bring the left eye in a line about two inches to the right of the center of the body, eyes fixed on the line of eyes of the men in, or supposed to be in, the same rank. At the command *front*, turn the head and eyes to the front.

FACINGS.

27. To the flank: 1. *Right* (*Left*), 2. FACE.

Raise slightly the left heel and right toe, face to the right, turning on the right heel, assisted by a slight pressure on the ball of the left foot; place the left foot by the side of the right. Left face is executed on the left heel.

"To face in marching" and advance, turn on the ball of either foot and step off with the other foot in the new line of direction; to face in marching without gaining ground in the new direction, turn on the ball of either foot and mark time.

To the rear: 1. *About*, 2. FACE.

Raise slightly the left heel and right toe, face to the rear, turning to the right on the right heel and the ball of the left foot; replace the left foot by the side of the right.

Officers execute the about face as follows:

At the command *about*, carry the toe of the right foot about 8 inches to the rear and 3 inches to the left of the left heel without changing the position of the left foot.

At the command *face*, face to the rear, turning to the right on the left heel and right toe; replace the right heel by the side of the left.

Enlisted men out of ranks may use the about face prescribed for officers.

SALUTE WITH THE HAND.

28. 1. *Right* (*Left*) *hand*, 2. SALUTE.

Raise the right hand smartly till the tip of the forefinger touches the lower part of the head-dress (if uncovered, the forehead) above the right eye, thumb and forefingers extended and joined, palm to the left, forearm inclined at about 45 degrees, hand and wrist straight. (TWO) Drop the arm smartly by the side.

The salute for officers is the same; the left hand is used only when the right is engaged. Officers and men, when saluting, look toward the person saluted.

Pl. 1, Par. 28.

SETTING-UP EXERCISES.

29. All soldiers are reguarly practiced in the following exercises, which may be supplemented by those in authorized calisthenic manuals.

The instructor places the men three paces apart. In these exercises it is advisable to remove blouses and caps.

As soon as the exercises are well understood, they may be continued without repeating the commands. For this purpose the instructor gives the commands as prescribed, then adds: *Continue the exercise*, upon which the motions to be repeated are continuously executed until the command *halt*.

At the command *halt*, given at any time, the position of the soldier is resumed.

First Exercise.

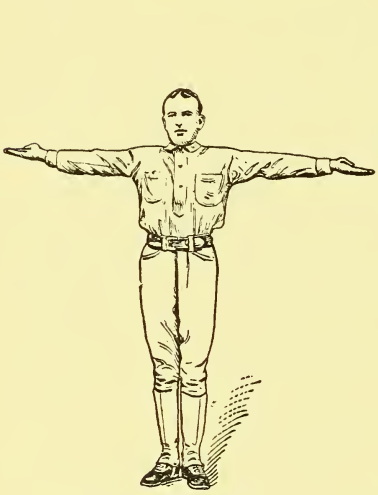
1. *Arm*, 2. EXERCISE, 3. HEAD, 4. UP, 5. DOWN, 6. RAISE.

At the command *exercise*, raise the arms laterally until horizontal, palms upward. HEAD: Raise the arms in a circular direction over the head, tips of fingers touching top of head, backs of fingers in contact their full length, thumbs pointing to the rear, elbows pressed back. UP: Extend the arms upward their full length, palms touching. DOWN: Force the arms obliquely back and gradually let them fall by the sides. RAISE: Raise the arms laterally as prescribed for the second command. Continue by repeating, *head*, *up*, *down*, *raise*.

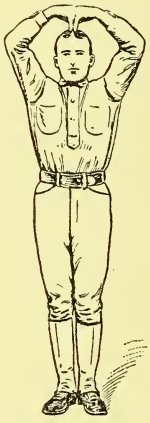
Second Exercise.

1. *Arms vertical, palms to the front*, 2. RAISE, 3. DOWN, 4. UP.

At the command *raise*, raise the arms laterally from the sides, extended to their full length, till the hands meet above the head, palms to the front,



Pl. 2, Par. 29, 1 Ex.



Pl. 3, Par 29, 1 Ex.

Pl. 4, Par. 29, 1 Ex.

fingers pointing upward, thumbs locked, right thumb in front, shoulders pressed back. DOWN: Bend over till the hands, if possible, touch the ground, keeping the arms and knees straight. UP: Straighten the body and swing the extended arms (thumbs locked) to the vertical position. Continue by repeating *down*, *up*.

Third Exercise.

1. *Arm*, 2. EXERCISE, 3. FRONT, 4. REAR.

At the command *exercise*, raise the arms laterally until horizontal, palms upward. FRONT: Swing the extended arms horizontally to the front, palms touching. REAR: Swing the extended arms well to the rear, inclining them slightly downward, raising the body upon the toes. Con-

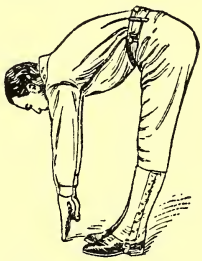
tinue by repeating *front, rear,* till the men, if possible, are able to touch the backs of the hands behind the back.

Fourth Exercise.

1. *Leg,* 2. EXERCISE, 3. UP.

At the command *exercise,* place the palms of the hands on the hips, fingers to the front, thumbs to the rear, elbows pressed back. UP: Raise

Pl. 5, Par. 29, 2 Ex.



Pl. 6, Par. 29, 2 Ex.

the left leg to the front, bending and elevating the knee as much as possible, leg from knee to instep vertical, toe depressed. UP: Replace the left foot and raise the right leg as prescribed for the left.

Pl. 7, Par. 29, 3 Ex.

Pl. 8, Par. 29, 4 Ex.

Execute slowly at first, then gradually increase to the cadence of double time. Continue by repeating *up* when the right and left legs are alternately in position.

Fifth Exercise.

1. *Leg*, 2. EXERCISE, 3. *Left* (*Right*), 4. FORWARD, 5. REAR; or, 5. GROUND.

At the command *exercise*, place the hands on the hips, as in fourth exercise. FORWARD: Move the left leg to the front, knee straight, so as to advance the foot about 15 inches, toe turned out, sole nearly horizontal, body balanced on right foot. REAR: Move the leg to the rear, knee straight, toe on a line with the right heel, sole nearly horizontal. Continue by repeating *forward*, *rear*.

When the recruit has learned to balance himself, the command *forward* is followed by GROUND: Throw the weight of the body forward by rising on the ball of the right foot, advance and plant the left, left heel 30 inches from the right, and advance the right leg quickly to the position of *forward*. Continue by repeating *ground* when the right and left legs are alternately in the position of *forward*.

Sixth Exercise.

1. *Lung*, 2. EXERCISE, 3. INHALE, 4. EXHALE.

At the command *exercise*, place the hands on the hips, as in fourth exercise. INHALE: Inflate the lungs to full capacity by short, successive inhalations through the nose. EXHALE: Empty the lungs by a continuous exhalation through the mouth. Continue by repeating *inhale*, *exhale*.

STEPS AND MARCHINGS.

Quick Time.

30. The length of the full step in quick time is 30 inches, measured from heel to heel, and the cadence is at the rate of one hundred and twenty steps per minute.

31. To march in quick time: 1. *Forward*, 2. MARCH.

At the command *forward*, throw the weight of the body upon the right leg, left knee straight.

At the command *march*, move the left foot smartly, but without jerk, straight forward 30 inches from the right, measuring from heel to heel, sole near the ground; straighten and turn the knee slightly out; at the same time throw the weight of the body forward and plant the foot without shock, weight of body resting upon it; next, in like manner, advance the right foot and plant it as above; continue the march.

The cadence is at first given slowly, and gradually increased to that of quick time.

The arms hang naturally, the hands moving about 6 inches to the front and 3 inches to the rear of the seam of the trousers.

32. The instructor, when necessary, indicates the cadence of the step

by calling *one, two, three, four;* or *left, right,* the instant the left and right foot, respectively, should be planted.

This rule is general.

Double Time.

33. The length of the full step in double time is 36 inches; the cadence is at the rate of one hundred and eighty steps per minute.

34. To march in double time: 1. *Forward,* 2. *Double time,* 3. MARCH.

At the command *forward,* throw the weight of the body on the right leg.

At the command *march,* raise the hands until the forearms are horizontal, fingers closed, nails toward the body, elbows to the rear; carry forward the left foot, knee slightly bent and somewhat raised, and plant the foot 36 inches from the right; then execute the same motion with the right foot; continue this alternate movement of the feet, throwing the weight of the body forward and allowing a natural swinging motion to the arms.

If marching in quick time, the command *forward* is omitted. At the command *march,* given as either foot strikes the ground, take one step in quick, and then step off in double time.

To resume the quick time: 1. *Quick time,* 2. MARCH.

At the command *march,* given as either foot strikes the ground, advance and plant the other foot in double time, resume the quick time, dropping the hands by the sides.

Recruits are also exercised in running, the principles being the same as for double time.

When marching in double time and running, the men breathe as much as possible through the nose, keeping the mouth closed.

Distances of 100 and 180 yards are marked on the drill ground and noncommissioned officers and men practiced in keeping correct cadence and length of pace in both quick and double time.

35. To arrest the march in quick or double time: 1. *Squad,* 2. HALT.

At the command *halt,* given as either foot strikes the ground, advance and plant the other foot; place the foot in rear by the side of the other. If in double time, drop the hands by the sides.

The halt, while *marking time,* and marching at the *half step, side step,* and *back step,* is executed by the same commands.

To Mark Time.

36. Being in march: 1. *Mark time,* 2. MARCH.

At the command *march,* given as either foot strikes the ground, advance and plant the other foot; bring up the foot in rear, and continue the cadence by alternately raising and planting each foot on line with the other. The feet are raised about 4 inches from the ground and planted with the same energy as when advancing.

To resume the full step: 1. *Full step,* 2. MARCH.

Half Step.

37. Being in march: 1. *Half step*, 2. MARCH.

At the command *march*, given as either foot strikes the ground, take steps of 15 inches.

To resume the full step: 1. *Full step*, 2. MARCH.

The length of the half step in double time is 18 inches.

Side Step.

38. Being at a halt: 1. *Right (Left) step*, 2. MARCH.

Carry and plant the right foot 10 inches to the right; bring the left foot beside it and continue the movement in cadence of quick time.

The side step is used for small intervals only and is not executed in double time.

Back Step.

39. Being at a halt: 1. *Backward*, 2. MARCH.

At the command *march*, step back with the left foot 15 inches straight to the rear, then with the right, and so on, the feet alternating.

At the command *halt*, bring back the foot in front to the side of the one in the rear.

The back step is used for short distances only, and is not executed in double time.

To March by the Flank.

40. Being in march: 1. *By the right (left) flank*, 2. MARCH.

At the command *march*, given as the right foot strikes the ground, advance and plant the left foot, then face to the right in marching, and step off in the new direction with the right foot.

To March to the Rear.

41. Being in march: 1. *To the rear*, 2. MARCH.

At the command *march*, given as the right foot strikes the ground, advance and plant the left foot; then, turning on the balls of both feet, face to the right about and immediately step off with the left foot.

If marching in double time, turn to the right about, taking four steps in place, keeping the cadence, and then step off with the left foot.

Change Step.

42. Being in march: 1. *Change step*, 2. MARCH.

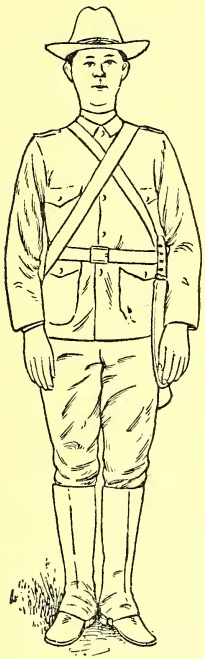
At the command *march*, given as the right foot strikes the ground, advance and plant the left foot; plant the toe of the right foot near the heel of the left and step off with the left foot.

The change on the right foot is similarly executed, the command *march* being given as the left foot strikes the ground.

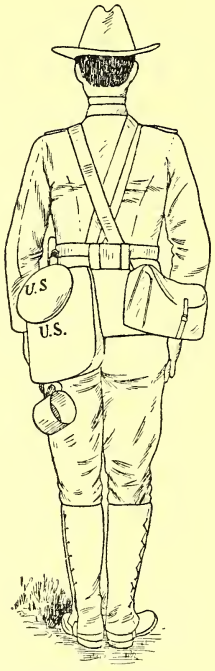
Covering and Marching on Points.

43. The instructor selects two points and requires the recruits, in succession, to place themselves upon the prolongation of the straight line through these points and then to march upon them in both quick and double time.

It should be demonstrated to the recruits that they cannot march in a straight line without selecting two points in the desired direction and keeping them covered while advancing.



Pl. 9, Par. 44.*



Pl. 10, Par. 44.*

A distant and conspicuous landmark is next selected as a point of direction; the recruit is required to choose two intermediate points in line with the point of direction and to march upon it by covering these points, new points being selected as he advances.

EQUIPMENT.

44. *Hospital Corps, personal equipment:*

For privates first class and privates.

Hospital Corps pouch.

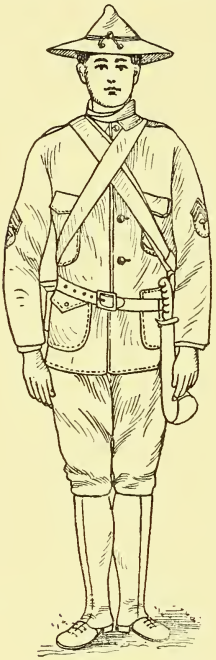
Waist belt and knife, first-aid packet.

* Blanket roll not shown.

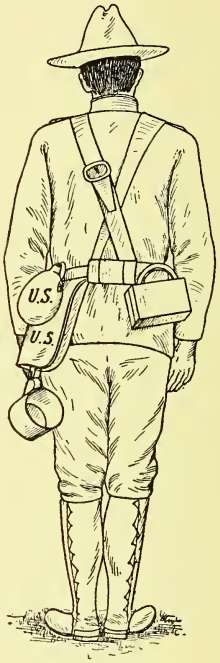
Canteen.
Haversack and field mess furniture.
Shelter half, poles and pins.
Blanket roll.

Pouches are worn with all uniforms, suspended from left shoulder to the rear over the right hip. In the field, medical officers' orderlies carry orderlies' pouches, and not hospital corps pouches.

The rear sling of the pouch is passed under the belt.



Pl. 11, Par. 44.*



Pl. 12, Par. 44.*

The field equipment includes all the articles listed above. The haversack and canteen are suspended from the right shoulder to the rear over the left hip, and the tin cup hung from the flap strap of the haversack. The knife is hung from the belt on the left side. The first-aid packet is attached to the belt. The blanket is worn over the shoulder.

If required, a revolver is carried at the belt on the right and a cartridge pouch on the left.

The field equipment for noncommissioned officers is the same as that of privates first class and privates, except that they carry emergency cases instead of pouches.

* Blanket roll not shown.

BLANKET ROLL.

45. The following articles, together with the overcoat, are packed in the blanket roll, which is carried in the manner used by the infantry. When desirable the rolls may be carried in a wagon. When the soldier is mounted, the saddle is packed as described in par. 49.

Contents.—One flannel shirt, one undershirt, one pair drawers, two pairs socks, one towel, piece of soap, comb, hair-brush, tooth-brush, five shelter-tent pegs, two shelter-tent poles.

The roll is packed as follows:

Each man with his shelter half smoothly spread on the ground, with buttons up and triangular end to the front, folds his blanket once across its length and places it upon the shelter half; fold toward the bottom, edge ½ inch from the square end, the same amount of canvas uncovered at the top and bottom. He then places the parts of the pole on the side of the blanket next the square end of the shelter half, near and parallel to the fold, end of pole about 6 inches from the edge of the blanket; nests the pins similarly near the opposite edge of the blanket and distributes the other articles carried in the roll; folds the triangular end and then the exposed portion of the bottom of the shelter half over the blanket.

The two men in each squad roll and fasten first the roll of number one and then of number two. The file closers work similarly, two and two. Each pair stands on the folded side, rolls the blanket roll closely and buckles the straps, passing the end of the strap through both keeper and buckle, back over the buckle and under the keeper. With the roll so lying on the ground that the edge of the shelter half can just be seen when looking vertically downward, one end is bent upward and over to meet the other, a clove hitch is taken with the guy rope, first around the end to which it is attached and then around the other end, adjusting the length of rope between hitches to suit the wearer.

METHOD OF PACKING PERSONAL EQUIPMENT ON SADDLE.

To Roll the Overcoat.

46. Spread the overcoat with the inside down, fold the sleeves square across, the cuff touching at the back seam; turn the tail under about 9 inches, the folded edge perpendicular to the back seam; fold over the front edges of the coat and skirt, to form a rectangle no more than 34 inches across, according to the size of the coat; roll tightly from the collar with the hands and knees, and bring over the whole roll that part of the skirt which was turned under, thus binding the roll.

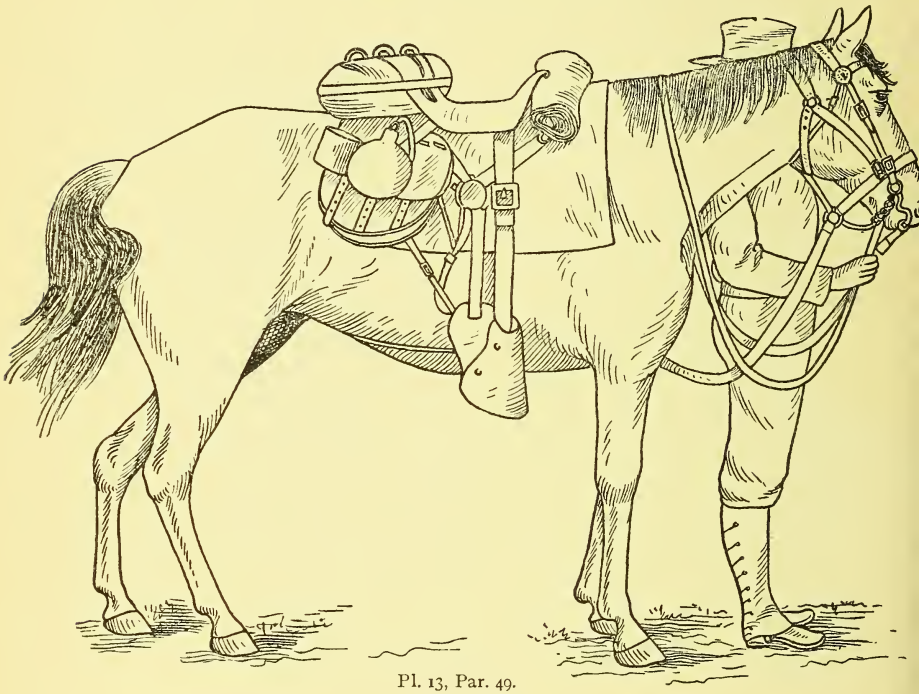
To Roll the Bed Blanket and Shelter Tent.

47. The blanket measures 72 by 84 inches.

Spread the shelter tent and turn under one end about 10 inches.

Fold the blanket to three thicknesses across the shorter edge; the fold then measures 24 inches wide; place the blanket thus folded across the middle of the shelter tent, the end of the folded blanket about one inch above the folded edge of the tent; fold the side parts of the tent over the blanket; roll tightly from the exposed end of the blanket with the hands and knees and bring over the whole roll the part of the tent that was turned under, thus binding the roll.

On account of the inelasticity of the canvas it will be found necessary,



Pl. 13, Par. 49.

just before turning over the part which binds the roll, to spread the canvas a little where it folds inside, at the end of the roll.

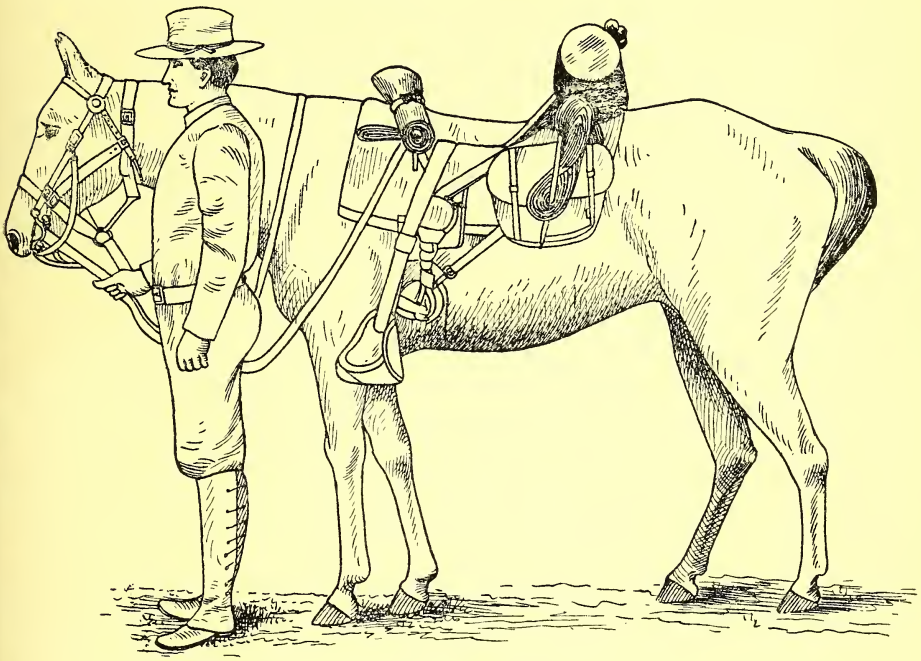
Articles of Horse Equipment.

48. Saddle, curb bridle, watering bridle, halter, saddle blanket, saddle-bags, curry-comb, horse brush, surcingle, picket pin, lariat, lariat strap, horse cover, nose-bag, spurs, link straps, and hook.

To Pack the Saddle.

49. Overcoat rolled as prescribed, and strapped on the pommel: *blanket*, with change of underclothing inside, is rolled in the shelter tent (the

roll not to be less than 24, nor more than 28 inches in length, according to bulk); *nose-bag* slipped over the roll outside of the shelter tent on the near end and the strap buckled over the off end; *side lines* when carried, to be spread over the blanket roll, the leather ends being brought together and the whole secured by the cantle straps; *lariat* rolled around the picket pin and snapped into the near cantle ring; *canteen* with *cup* on strap attached to off cantle ring; *tin plate* or *meat can*, *knife*, *fork*, and *spoon* in near saddle-bag; *curry-comb*, *brush*, and *watering bridle* in off saddle-bag.



Pl. 14, Par. 49.

Rations to be divided so as to equalize the weight in the saddle-bags; also extra horseshoes (fitted) and nails (pointed) when on active service and separated from transportation. When the haversack is carried, the change of clothing may be placed in the saddle-bags, and the haversack, with the rations, meat can, etc., will be carried on the near side and secured by passing the haversack strap over the blanket roll and under the off end; in this case the tin cup will be attached to the haversack.

For field service, the lariat should be coiled and fastened with a thong to the near cantle ring (passing under the left stirrup strap), the free end snapped into the halter ring.

Generally in field service, especially when the horse is low in flesh, the bed blanket should be folded and placed over the saddle blanket.

MANUAL OF THE SABER FOR OFFICERS.

50. 1. *Draw*, 2. SABER.

At the command *draw*, unhook the saber with the thumb and first two fingers of the left hand, thumb on the end of the hook, fingers lifting the upper ring; grasp the scabbard with the left hand at the upper band, bring the hilt a little forward, seize the grip with the right hand, and draw the blade 6 inches out of the scabbard, pressing the scabbard against the thigh with the left hand.

At the command *saber*, draw the saber quickly, raising the arm to its full extent to the right front, at an angle of about 45 degrees with

Pl. 15, Par. 50.

Pl. 16, Par. 50.

Pl. 17, Par. 50.

the horizontal, the saber, edge down, in a straight line with the arm; make a slight pause and bring the back of the blade against the shoulder, edge to the front, arm nearly extended, hand by the side, elbow back, third and fourth fingers back of the grip; at the same time hook up the scabbard with the thumb and first two fingers of the left hand, thumb through the upper ring, fingers supporting it; drop the left hand by the side.

This is the position of carry saber dismounted.

Officers unhook the scabbard before mounting; when mounted, in the first motion of *draw saber*, they reach with the right hand over the

bridle hand and, without the aid of the bridle hand, draw the saber as before; the right hand at the *carry* rests on the right thigh.

On foot, officers carry the scabbard hooked up.

51. When publishing orders, the saber is held suspended from the right wrist by the saber knot; when the saber knot is used, it is placed on the wrist before drawing saber, and taken off after returning saber.

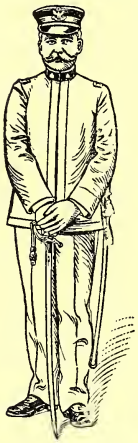
52. Being at the order or carry:

1. *Present*, 2. SABER (or ARMS).

At the command *present*, raise and carry the saber to the front, base of the hilt as high as the chin and 6 inches in front of the neck, edge to the left, point 6 inches farther to the front than the hilt, thumb extended on the left of the grip, all the fingers grasping the grip.

Pl. 18, Par. 52.

Pl. 19, Par. 53.



Pl. 20, Par. 55.

Pl. 21, Par. 56.

At the command *saber* (or *arms*), lower the saber, point in prolongation of the right foot, and near the ground, edge to the left, hand by the side, thumb on left of grip, arm extended. If mounted, the hand is held behind the thigh, point a little to the right and front of the stirrup.

In rendering honors with troops, officers execute the first motion of the salute at the command *present*, the second motion at the command *arms;* enlisted men with the sword execute the first motion at the command *arms* and omit the second motion.

53. Being at a carry:

1. *Order*, 2. SABER (or ARMS).

Drop the point of the saber directly to the front, point on or near the ground, edge down, thumb on back of grip.

Being at the *present saber*, should the next command be *order arms*, officers *order saber;* if the command be other than *order arms*, they execute *carry saber.*

When arms are brought to the order, the officers or enlisted men with the saber or sword drawn *order saber.*

54. The saber is held at the *carry* while giving commands, marching, at attention, or changing position in quick time.

When at the order, sabers are brought to the carry when arms are brought to any position except the present or parade rest.

55. Being at the order:

1. *Parade*, 2. REST.

Pl. 22, Par. 58.

Take the position of parade rest, except that the left hand is uppermost and rests on the right hand, point of saber on or near the ground in front of the center of the body, edge to the right.

At the command *attention*, resume the order saber and the position of the soldier.

56. In marching in double time, the saber is carried diagonally across the breast, edge to the front; the left hand steadies the scabbard.

57. Officers on all duties under arms draw and return saber without waiting for command. All commands to soldiers under arms are given with the sabre drawn.

58. Being at a carry:

1. *Return*, 2. SABER.

At the command *return*, carry the right hand opposite to and 6 inches from the left shoulder, saber vertical, edge to the left; at the same time unhook and lower the scabbard with the left hand, and grasp it at the upper band.

At the command *saber*, drop the point to the rear and pass the blade across and along the left arm; turn the head slightly to the left, fixing the eyes on the opening of the scabbard, raise the right hand, insert and return the blade; free the wrist from the saber knot (if inserted in it), turn the head to the front, drop the right hand by the side, hook up the scabbard with the left hand, drop the left hand by the side.

Officers mounted, return saber without using the left hand; the scabbard is hooked up on dismounting.

59. At inspection, enlisted men with the sword drawn execute the first motion of *present saber*, and turn the wrist to show both sides of the blade, resuming the carry when the inspector has passed.

SCHOOL OF THE DETACHMENT.

60. The senior medical officer of the detachment is held responsible for the theoretical and practical instruction of the officers, noncommissioned officers, privates first class, and privates when their instruction is not otherwise provided for by Army Regulations and General Orders. He requires the officers and noncommissioned officers to study and recite these regulations so that they can explain thoroughly every movement.

The detachment, when formed, is in single rank, graduated in size, the tallest man on the right.

Companies of instruction may be formed, maneuvered, mustered, and inspected in accordance with Infantry Drill Regulations.

POSTS OF OFFICERS AND NONCOMMISSIONED OFFICERS.

61. The medical officer commanding is three paces in front of the center of the detachment; the junior medical officers, according to rank from right to left, are two paces in rear of the rank, in the line of file closers, and at equal intervals; if only one, he is opposite the center; if two, one is opposite the center of each half of the detachment; if three, one is opposite the center, the others as with two.

The senior noncommissioned officer is two paces in rear of the second file from the right, on the right of the line of file closers.

The second noncommissioned officer is on the right of the rank and is right guide of the detachment.

The third noncommissioned officer is on the left of the rank and is the left guide.

The remaining noncommissioned officers are distributed along the line of file closers from right to left, according to rank.

If necessary, a suitable private may be designated to act as right or left guide.

TO FORM THE DETACHMENT.

62. At the signal for the *assembly*, the senior noncommissioned officer takes his position six paces in front of where the center of the detachment is to be, and facing it, commands:

FALL IN.

The second noncommissioned officer, or a designated private, places himself, facing to the front, where the right of the detachment is to rest, and at such a point that its center will be six paces from and opposite to the senior noncommissioned officer. The men assemble rapidly at attention, securing the proper interval between files, as described in par. 20.

The other noncommissioned officers then take their posts.

The senior noncommissioned officer calls the roll, each man answering "Here," as his name is called.

TO SIZE THE DETACHMENT.

63. The men being in line as described, the senior noncommissioned officer faces them to the right and arranges them according to height, tallest man in front; he then faces them to the left into line. The detachment being sized, habitually forms in the same order.

64. The senior noncommissioned officer commands:

1. *Count*, 2. TWOS.

At the command *twos*, all except the right file execute *eyes right*, and beginning on the right the men count *one*, *two;* and so on to the left. Each man turns his head and eyes to the front as he counts. The guides do not count. An odd man is ordinarily placed in the line of file closers.

The senior noncommissioned officer then faces about, salutes the officer commanding, and reports, "*Sir, all present or accounted for*," or the names of the unauthorized absentees, and without command takes his post, passing around the right flank. The officer commanding places himself twelve paces in front of the center of and facing the detachment in time to receive the report of the senior noncommissioned officer, whose salute he returns. The junior medical officers take their posts when the senior noncommissioned officer has reported.

ALIGNMENTS.

65. The officer commanding having received the detachment, commands:

1. *Right* (*Left*), 2. DRESS, 3. FRONT.

At the command *dress*, the men place the palm of the left hand upon the hip, execute *eyes right*, and dress up to the line; the officer commanding verifies the alignment. At the command *front*, each man turns the head and eyes to the front and drops the left hand by his side.

In all alignments, excepting of the file closers, the left hand is placed upon the hip, and at *front* dropped to the side. The detachment is aligned whenever necessary.

To Take Intervals.

66. Being in line at a halt:

1. *To the right* (*left*) *take intervals*, 2. MARCH, 3. DETACHMENT, 4. HALT.

At the first command, the file closers step back to four paces distance from the rank; at the command *march*, all face to the right and the leading man of each rank steps off; the other men step off in succession so as to follow the preceding man at four paces.

At the command *halt*, given when all have their intervals, all halt and face to the front.

To Assemble.

1. *To the right* (*left*) *assemble*, 2. MARCH.

The front rank man on the right stands fast, the file closer on the right closes to two paces. The other men face to the right, close by the shortest line and face to the front.

MARCHINGS.

To March in Line.

67. Being in line at a halt:

1. *Forward*, 2. *Guide right* (or *left*), 3. MARCH.

The men step off, the guide marching straight to the front.

The instructor sees that the men preserve the alignment and the intervals toward the side of the guide. The men yield to pressure from that side and resist pressure from the opposite direction; by slightly shortening or lengthening the step they gradually recover the alignment, and by slightly opening out or closing in they gradually recover the interval, if lost; while habitually keeping the head to the front, they may occasionally glance toward the side of the guide to assure themselves of the alignment and interval, but the head is turned as little as possible for this purpose.

To change the guide:

Guide left (or *right*).

To March Backward.

68. Being at a halt:

1. *Backward*, 2. *Guide right* (or *left*), 3. MARCH.

To March to the Rear.

69. Being in march:

1. *To the rear*, 2. MARCH, 3. *Guide right* (or *left*).

To March Faced to the Flank.

70. Being in line at a halt:

1. *Right* (*Left*), 2. FACE, 3. *Forward*, 4. MARCH.

If marching:

1. *By the right* (*left*) *flank*, 2. MARCH.

The leading man is the guide. The other men follow at facing distance.

To halt the detachment:

1. *Detachment*, 2. HALT;

and to face to the front:

3. *Left* (*Right*), 4. FACE;

or, to march again to the front without halting:

1. *By the left* (*right*) *flank*, 2. MARCH, 3. *Guide right* (or *left*).

The Oblique March.

71. Being in line.

1. *Right* (*Left*) *oblique*, 2. MARCH.

Each man steps off in a direction 45 degrees to the right of his original front. He preserves his relative position, keeping his shoulders parallel to those of the man next on his right, and so regulates his steps as to make the rank remain parallel to its original front.

At the command *halt*, the men halt, faced to the front.

To resume the original direction:

1. *Forward*, 2. MARCH, 3. *Guide right* (or *left*).

The men half face to the left in marching and then move straight to the front.

At half step or *mark time* while obliquing, the oblique march is resumed by the commands:

1. *Full step*, 2. MARCH.

In the oblique march the guide is, without indication, always on the side toward which the oblique is made. On resuming the direct march in line, the guide is announced.

These rules are general.

The column of files obliques by the same commands and means.

To March in Double Time.

72. Being in line at a halt:

1. *Forward*, 2. *Guide right* (or *left*), 3. *Double time*, 4. MARCH.

To Pass from Quick to Double Time and the Reverse.

73. 1. *Double time*, 2. MARCH.

To resume quick time:

1. *Quick time*, 2. MARCH.

Marching in Line, to Effect a Slight Change of Direction.

74. The command is:

INCLINE TO THE RIGHT (LEFT).

The guide gradually advances the left shoulder and marches in the new direction; all the files advance the left shoulder and conform to the movements of the guide, lengthening or shortening the step, according as the change is toward the side of the guide or the side opposite.

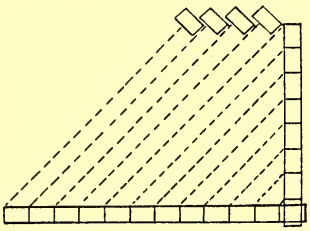
TURNINGS.

To Turn on Fixed Pivot.

75. Being in line at a halt:

1. *Detachment right* (*left*), 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

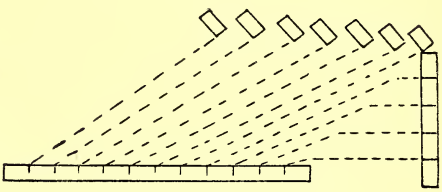
At the second command, the right guide stands fast; the right file marks time turning to the right in his place; the other men by twice obliquing to the right place themselves successively abreast of the pivot and mark time.



Pl. 23, Par. 75.

At the third command, the right guide places himself on the right of the rank.

The fourth command is given when the last man arrives in his new position; the command *halt* may be given at any time after the movement begins; only those halt who are in the new position. All align themselves to the right without command.



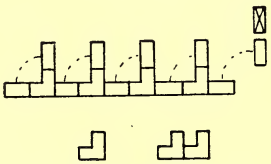
Pl. 24, Par. 76.

Being in march, the movement is executed by the same commands and in the same manner; the right guide halts and stands fast at the second command.

To Turn on Moving Pivot.

76. Marching in line:

1. *Right* (*Left*) *turn*, 2. MARCH, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).



Pl. 25, Par. 77.

At the second command, the right guide faces to the right in marching and takes the half step; the other men oblique to the right until opposite their places in line, execute a second right oblique and take the half step when abreast of the right guide. All take the full step at the fourth command, which is given when the last man arrives in his new position.

Being at a halt, the movement is executed by the same commands and in the same manner. At the second command, the right guide faces to the right as in marching and steps off, taking the half step.

Right (*Left*) *half turn* is executed in a similar manner. The right guide

makes a half change of direction to the right and the other men make quarter changes in obliquing.

Being in Line, to Form or March in Column of Twos to the Right or Left.

77. 1. *Twos right (left)*, 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH.

Each two executes the right turn on fixed pivot.

The distance between the sets of twos is 40 inches.

The right and left guides place themselves 40 inches in front and rear respectively, of the left file of the leading and rear twos; the file closers face to the right and maintain their relative positions.

The officer commanding in column of twos and files is by the side of the leading guide on the flank opposite the file closers.

The leading and rear guides in column of twos are, respectively, in front of the leading file and in rear of the rear file, on the side opposite the file closers.

Privates and musicians, when in the line of file closers, conform to the movements prescribed for the latter.

In all changes by twos from line into column, column into line, or from column of twos to files, or the reverse, and in all turns about by twos, either in line or column, the guides and file closers take their proper places in the most convenient way as soon as practicable after the command *march*.

In column of twos, the dress is toward the side of the guide.

These rules are general.

Marching in Column of Twos, to Change Direction.

78. 1. *Column right (left)*, 2. MARCH.

The leading two executes right turn on moving pivot and takes the full step, without command, when the man on the marching flank is abreast of the pivot. The other twos execute the right turn on moving pivot on the same ground and in the same manner as the leading one. The guides and file closers conform to the movement.

Column half right (left) is similarly executed, each two making a right half turn on moving pivot.

To Put the Column of Twos in March and Change Direction at the Same Time.

79. 1. *Forward*, 2. *Column right (left)*; or, 2. *Column half right (left)*, 3. MARCH.

Executed as in the preceding paragraph; the pivot of the leading two faces to the right, as in marching and steps off.

Being in Line, to Form Column of Twos and Change Direction.

80. 1. *Twos right* (*left*), 2. MARCH, 3. *Full step, Column right* (or *left*), 4. MARCH.

Execute twos right, and then change direction.

Being in Column of Twos, to Change the File Closers, from one Flank to the Other.

81. 1. *File closers on left* (*right*) *flank*, 2. MARCH.

At the first command the file closers close in to the flank of the column and at the command *march* dart through the column. The officer commanding and guides change to their proper positions.

To Oblique in Column of Twos, and to Resume the Direct March.

82. 1. *Right* (*Left*) *oblique*, 2. MARCH.

To resume the direct march:

1. *Forward*, 2. MARCH.

To Face or March the Column of Twos to the Rear.

83. 1. *Twos right* (*left*) *about*, 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH.

At the second command each two twice executes *twos right;* the man on the marching flank moves at full step and without pause to his position abreast of the pivot. The fourth command is given upon the completion of the about. The file closers face about and take their normal positions in the column.

To Form Line from Column of Twos.

84. To the right or left:

1. *Twos right* (*left*), 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

At the second command each two executes the turn on fixed pivot.

If the line be formed toward the side of the file closers, they close in to the flank of the column at the first command, and at the second command dart through the column.

85. On right or left:

1. *On right* (*left*) *into line*, 2. MARCH, 3. *Detachment*, 4. HALT, 5. FRONT.

At the command *march* the leading two executes right turn on moving pivot and takes full step without command when the man on the marching flank is abreast of the pivot; the leading guide places himself on the right of the two.

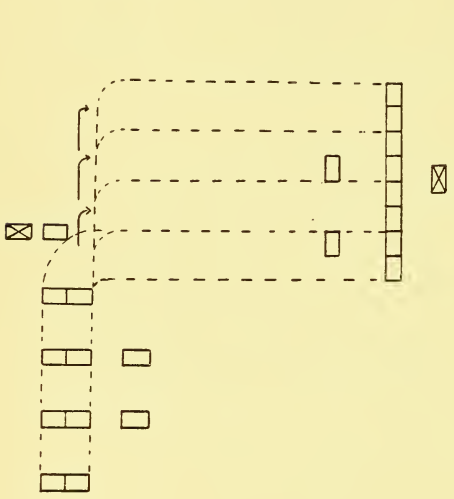
Each of the other twos moves forward until opposite its place in the new line, when it changes direction as explained for the leading two; the rear guide takes his place on the left when the rear two arrives on the line.

At the command *halt*, given when the leading two has advanced detachment distance in the new direction, it halts and dresses to the right; the other twos successively halt and dress upon arriving in line.

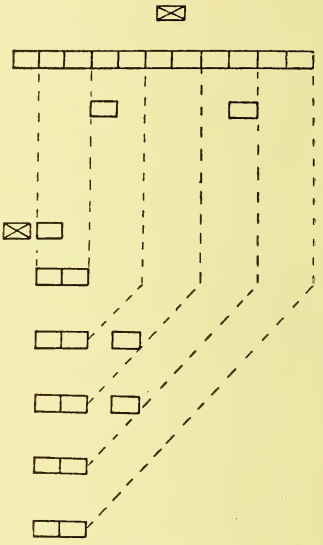
The command *front* is given when all are aligned.

If the movement is executed toward the side opposite the file closers each follows the two nearest him, passing in front of the following two.

86. To the front:



Pl. 26, Par. 85.



Pl. 27, Par. 86.

1. *Right (Left) front into line*, 2. MARCH, 3. *Detachment*, 4. HALT, 5. FRONT.

At the command *march*, the leading two moves to the front, dressing to the left; the guide in front places himself on its left; the other twos oblique to the right until opposite their places in line, when each marches to the front.

At the command *halt*, given when the leading two has advanced detachment distance, it halts and dresses to the left. The other twos halt and dress to the left upon arriving in line; the rear guide takes his place on the right when the rear two arrives on the line.

The command *front* is given when all are aligned.

If the movement is toward the side of the file closers, they dart through the column as the oblique commences.

If marching in double time, or in quick time and the command be *double time*, the command *guide left* is given immediately after the command *march;* the leading two moves to the front in quick time; the other twos move in double time, each taking the quick time and dressing to the left upon arriving in line.

Being in Line, to Face or March to the Rear.

87. 1. *Twos right* (*left*) *about*, 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

Each two executes the about, par. 83; the file closers dart through the nearest intervals.

88. The detachment at a halt may be moved a few paces to the rear by the commands:

1. *About*, 2. FACE, 3. *Forward*, 4. *Guide right* (or *left*), 5. MARCH.

No other movement is executed until the line is faced to the original front.

Marching in Column of Twos to Form Column of Files.

89. 1. *Right* (*Left*) *by file*, 2. MARCH.

At the command *march*, the right files move forward; the left files mark time until disengaged, when they oblique to the right in full step and each follows the right file of his two at facing distance; the guides taking the same distance.

A column of twos or files at a halt may be faced to the rear, or flank, and marched a short distance. No other movement is executed until the column is faced to the original front. The officers and file closers face with the column and maintain their relative positions.

Marching in Column of Files to Form Column of Twos.

90. This movement is always executed away from the file closers.

1. *Twos*, 2. *Left* (*Right*) *front into line*, 3. MARCH, 4. *Full step*, 5. MARCH.

At the third command, the leading file of each two takes the half step; the rear file of each two obliques to the left in full step until uncovered, moves up abreast of the leading file of his two, and takes the half step. At the fifth command all resume the full step.

To Dismiss the Detachment.

91. Being in line at a halt, the officer commanding directs the senior noncommissioned officer: *Dismiss the detachment*, and returns his salute. The officers fall out; the senior noncommissioned officer salutes, steps

three paces to the front and two paces to the right of the detachment, faces to the left, and commands: *Dismissed.*

MOVEMENTS BY PLATOONS.

92. Movements by platoons may be used by large detachments. This formation is often required for Hospital Corps detachments appearing in parades and reviews, and on the march. If the rank is composed of less than twenty files the division into platoons is usually not necessary.

When platoon movements are to be executed, the senior noncommissioned officer makes the division into platoons immediately after twos are counted. The guides are assigned as follows: The second noncommissioned officer is the right guide of the first platoon, the third noncommissioned officer is the left guide of the second platoon, the fourth noncommissioned officer is the left guide of the first platoon, and the fifth noncommissioned officer is the right guide of the second platoon.

If more than two platoons are formed, the third noncommissioned officer is the left guide of the platoon on the extreme left of the detachment, and the necessary number of noncommissioned officers are posted as guides, according to rank from right to left.

The division is so made that the platoons may be of nearly equal strength. At the formation of the detachment the platoons are numbered consecutively from right to left; these designations are permanent and do not change when, by any movement, the right becomes the left of the line, or the head becomes the rear of the column.

The senior noncommissioned officer always remains with the first platoon; when in line he is in rear of the second file from the outer flank, taking a corresponding position when the platoons unite in columns of twos.

In movements by platoons, each chief repeats such preparatory commands as are to be immediately executed by his platoon; the men execute the commands, *march* and *halt*, if applying to their platoons, when given by the commanding officer. Each chief repeats the commands prescribed for him so as to insure execution of the movement by his command at the proper time.

These rules are general.

Being in Line, to Form or March in Column of Platoons to the Right or Left.

93. 1. *Platoons right* (*left*), 2. MARCH. 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

Executed by each platoon; the right man of each platoon is the pivot. The left guide of the right platoon places himself on the left of his platoon as soon as practicable. At the first command, each chief of platoon

cautions, *Platoon right;* at the second command takes his post two paces in front of the center of his platoon, passing around the right flank.

At the third command, the right guide of each platoon places himself on the right of the pivot man of his platoon.

The guide of the rear platoon preserves the trace, step, and a distance equal to the front of his platoon.

When a detachment is formed in line of platoons in column of twos, the guides in the line of file closers take their new posts as soon as practicable; when platoons are about to unite in line or in column of twos, guides at the center take their posts in the line of file closers.

In column of platoons, the officer commanding is three paces in front of the chief of the leading platoon.

These rules are general.

The column of platoons is put in march, halted, obliques, and resumes the direct march by the same commands as a detachment in line.

Marching in Column of Platoons, to Change Direction.

94. 1. *Column right* (*left*), 2. MARCH.

At the first command, the chief of the leading platoon commands: *Right turn.*

At the command *march*, the leading platoon turns to the right on moving pivot; its chief commands:

1. *Full step*, 2. MARCH, on completion of the turn.

The rear platoon marches squarely up to the turning-point and changes direction by command of its chief.

Column half right (*left*) is similarly executed; each chief gives the preparatory command:

Right (*Left*) *half turn.*

To Put the Column of Platoons in March and Change Direction at the Same Time.

95. 1. *Forward*, 2. *Guide right* (*left*), 3. *Column right* (*left*); or, 3. *Column half right* (*left*), 4. MARCH.

At the third command, the chief of the leading platoon commands:

Right (*Right half*) *turn.*

The movement is executed as in the preceding paragraph.

96. In changing direction in column of subdivisions, each chief, on the completion of the movement by his subdivision, announces the guide on the side it was previous to the turn.

This rule is general.

Being in Column of Platoons, to Face or March to the Rear.

97. 1. *Twos right* (*left*) *about*, 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

Each set of twos executes the about. If one platoon be smaller than the other, the guide of the rear platoon regains the trace and distance on the march.

To Form Line from Column of Platoons.

98. Before forming line to the right or left, or on the right or left, the officer commanding requires the guide of the rear platoon on the flank toward which the movement is to be executed to cover; if marching, he announces the guide on that flank, if not already there.

99. To the right or left:

1. *Platoons right* (*left*), 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

Each platoon executes right turn on fixed pivot.

At the second command, each chief of platoon takes his post in rear of his platoon, passing around its left flank.

100. On right or left:

1. *On right* (*left*) *into line*, 2. MARCH, 3. *Detachment*, 4. HALT, 5. FRONT.

The chief of the leading platoon commands: *Right turn*. The leading platoon turns to the right on moving pivot.

The command *halt* is given when the leading platoon has advanced detachment distance in the new direction; its chief commands: *Right dress*, and passes around the right flank to his post.

The rear platoon marches straight to the front, changes direction by command of its chief, when opposite the right of its place in line, and, when the right file has arrived on the line, is halted by its chief, who also commands: *Right dress*, and passes around the left flank to his post.

The officer commanding verifies the alignment and commands: FRONT.

Being in Column of Platoons, to March by the Flank.

101. 1. *Twos right* (*left*), 2. MARCH, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

Each platoon marches in column of twos to the right; each chief of platoon takes post on the left of his leading guide; the leading guide of the platoon on the flank announced is the guide of the detachment; the leading guide of the other platoon marches abreast of him and preserves the interval necessary to form front into line.

The post of the officer commanding is three paces in front of the line of leading guides and opposite the center of the interval between the platoons.

To Form or March Again in Column of Platoons.

102. 1. *Twos right* (*left*), 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

Being in Line of Platoons in Column of Twos, to Form Line to the Front.

103. 1. *Platoons*, 2. *Right (Left) front into line*, 3. MARCH, 4. *Detachment*, 5. HALT, 6. FRONT.

Each platoon forms right front into line; each chief of platoon takes post in rear of his platoon, passing around its left flank.

The command *halt* is given when the leading twos have advanced detachment distance.

If the movement is executed in double time, the officer commands: *Guide left* (or *right*), after the command *march*.

Being in Line of Platoons in Column of Twos, to Form Column of Twos, to the Right or Left.

104. 1. *Platoons*, 2. *Forward, column right (left)*, 3. MARCH.

The chiefs of platoons take their posts, passing around the heads of their platoons, as they are about to unite in column of twos. If marching, the command *forward* is omitted.

Being in Column of Twos, to Form Column of Platoons.

105. 1. *Platoons*, 2. *Right (Left) front into line*, 3. MARCH, 4. *Detachment*, 5. HALT.

At the second command each chief of platoon places himself near the head of his platoon.

At the command *march*, each platoon forms right front into line.

The command *halt* is given when the leading two has advanced detachment distance; each chief of platoon verifies the alignment of his platoon, commands: FRONT, and takes his post.

If marching in double time or in quick time, and the command be *double time*, the command: *Guide left (right)*, is given after the command *march*.

Being in Column of Twos, to March in Line of Platoons in Column of Twos to the Right or Left.

106. 1. *Platoons*, 2. *Forward, column right (left)*, 3. MARCH, 4. *Guide right* (or *left*).

Each platoon changes direction to the right; each chief of platoon takes his post by the side of his leading guide.

If marching, the command *forward* is omitted.

LITTER DRILL.

107. The purpose of this drill is to teach the most useful methods of handling sick and wounded, to secure concerted action, and for the disciplining effect which follows drill in prompt obedience to the word of

command. When the men have thoroughly mastered it, litter squads should work independently as in actual service.

108. The regulation hand litter consists of a canvas bed 6 feet long and 22 inches wide, made fast to two poles $7\frac{1}{2}$ feet long, and stretched by two jointed braces. The ends of the poles form the handles, 9 inches long, by which the litter is carried. The fixed iron legs are stirrup-shaped, 4 inches high and $1\frac{3}{4}$ inches wide. On the left front and right rear handles a half-round iron ring is fixed, $4\frac{1}{2}$ inches from the end; between this and the canvas plays the movable ring of the sling. Two cross straps, each with a ring at one end and a snap at the other, play through staples fastened to the bottom of each pole beneath the canvas, and near its free edges. When the litter is open the straps lie transversely under the canvas; when the litter is closed they are passed around it, through the free loop of the slings and fastened to the snaps, thus securely closing the litter.

One pair of regulation slings is permanently attached to each litter. They are made of khaki-colored webbing, $2\frac{1}{2}$ inches wide, with a leather-lined loop at one end and a leather strap (with buckle) at the other, the strap passing through a steel swivel, itself attached to the movable ring of the handle.

109. When the detachment is formed for drill or instruction, officers, if in service uniform, wear belts. The instructor will require that the clothing of the men be clean and neatly adjusted; that the privates first class and privates of the Hospital Corps fall in equipped with pouch, belt, knife, and first-aid packet. Noncommissioned officers wear the belt, knife, first-aid packet, and emergency case.

110. For purposes of litter drill each set of two is a litter squad. The litter squad is marched by the commands applicable to a set of twos, substituting "litter" for "two." No. 2 is the squad leader. He commands his squad and is responsible for it. When practicable he should be a private first class.

111. The litter is said to be *strapped* when folded, the canvas doubled smoothly on top, the slings placed parallel to each other thereon, and all secured by the cross straps. It is said to be closed when unstrapped, the two loops of the front sling upon the left handle, and of the rear sling upon the right, the bight of each sling embracing the opposite handle.

MANUAL OF THE LITTER.

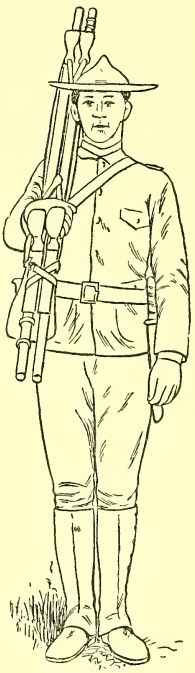
112. Having assigned the medical officers and the noncommissioned officers to appropriate duties, the instructor commands:

1. *Count*, 2. TWOS. 1. *Count*, 2. SQUADS. 1. *Procure litter*, 2. MARCH.

At *march* the Nos. 2 step one pace to the front and proceed by the nearest route to the (strapped or closed) litters. They each take one,

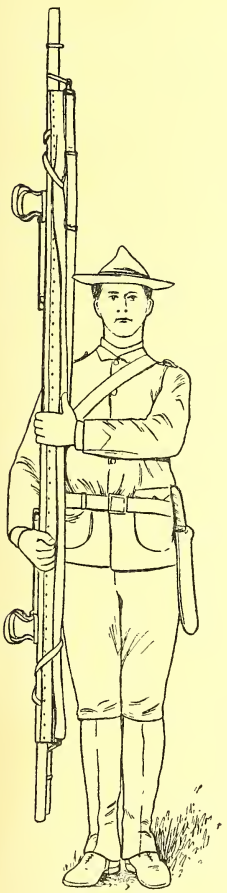
placing it on the right shoulder at a slope of at least 45 degrees, canvas down, and promptly return, each man resuming his place by passing through his interval one pace to the rear, facing about, and stepping forward with the left foot into line.

The march may be supervised by a noncommissioned officer and may be executed in double time.



Pl. 28, Par. 113.

113. At the *shoulder* the litter is held canvas down upon the shoulder supported by the right arm, the right hand grasping the left pole; the left hand is dropped to the side.



Pl. 29, Par. 114.

114. In all motions from the *shoulder*, or to the *shoulder*, the litter should invariably be brought to the *vertical position* against the right shoulder, one pole in front of the other, canvas to the left, both hands grasping the front pole, the left above the right, and the left forearm horizontal.

This position should be taken by the bearer when passing through his interval to resume his place in the line (par. 112), and in any formation or movement in which there may be danger of the lower or upper handles of the litter striking neighboring men; after which the *shoulder* is resumed without command.

115. A stack consists of three litters, to which more may be added.

Being in line at the *shoulder* the instructor designates the center squad or squads, and commands:

1. *Stack*, 2. LITTERS.

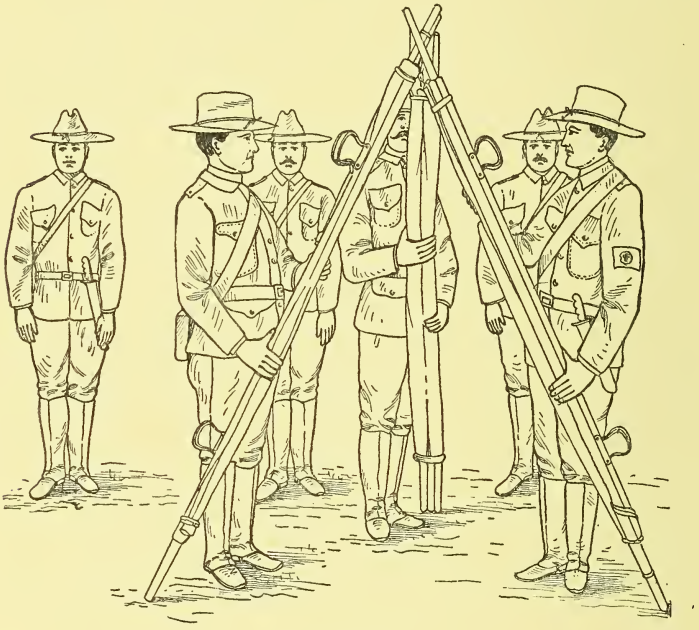
At *litters*, each No. 2 brings his litter to the vertical position; No. 2 of the designated squad steps one pace to the front and stands fast; the Nos. 2 next to the right and left step two paces to the front, and, facing each other, close in and lock the handles of their litters together; No.

2 of the designated squad locks the upper handles of his litter between those of the other two squads, when all lower stack to the ground, spreading its feet sufficiently to make it stand securely. As soon as the stacks are formed any additional litters are laid on, and the bearers take their posts.

116. Being at the stack:

1. *Take*, 2. LITTERS.

At *litter*, the Nos. 2 close in on the center as in the previous paragraph,



Pl. 30, Par. 115.

advancing to the stack, and grasping their respective litters, break the stack and resume their position in line.

117. Being in line, litters at the *shoulder:*

1. *Carry*, 2. LITTER.

At *litter*, each No. 2 brings his litter to the vertical position; he drops the upper handles forward and downward until the litter is in a horizontal position, canvas to the left; meanwhile No. 1 steps directly to the front until he is opposite the front handles, which he seizes with his left hand. Nos. 1 and 2 take hold by passing the left and right hands, respectively, outside the handles and grasping the lower one, the handles resting

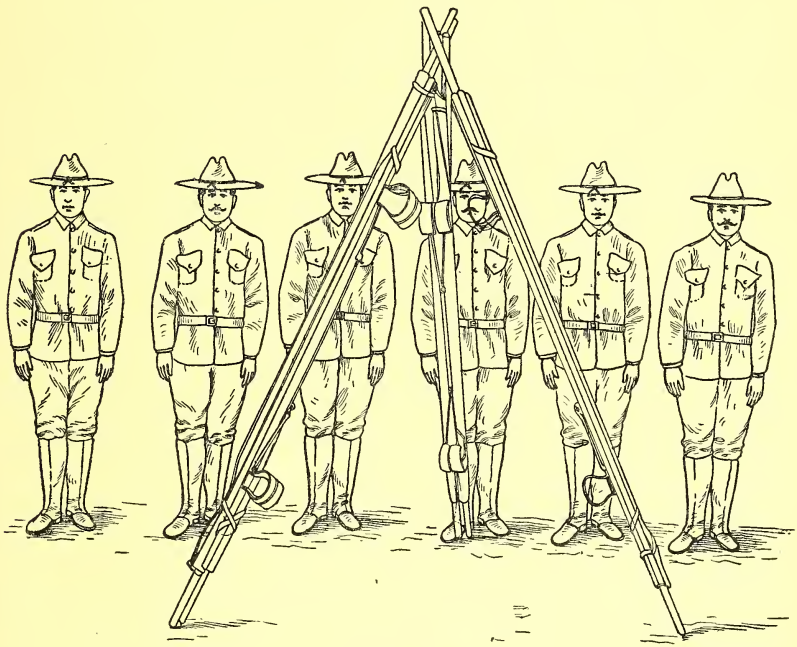
against the hip. The guides step forward and place themselves in line with the front bearers.

118. Being at the carry:

1. *Ground*, 2. LITTER.

At *litter* the bearers face inward, grasping the handles with both hands; they stoop and lower the litter to the ground, canvas up, and standing erect, face to the front.

119. Being at the ground:



Pl. 31, Par. 115.

1. *Carry*, 2. LITTER.

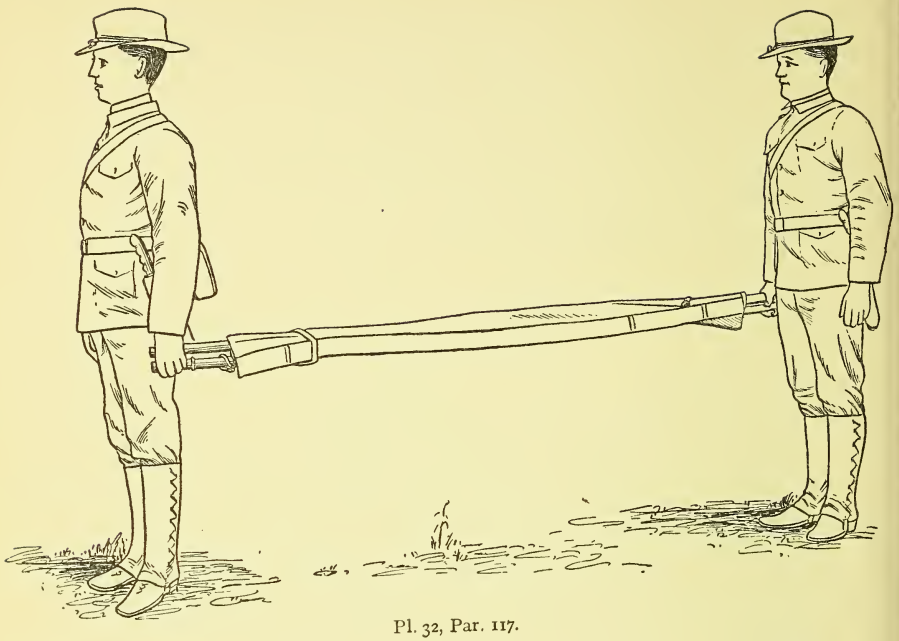
At *litter* the bearers face inward, stoop, grasp the handles with both hands, and raise the litter from the ground to carry.

120. Being at the *carry:*

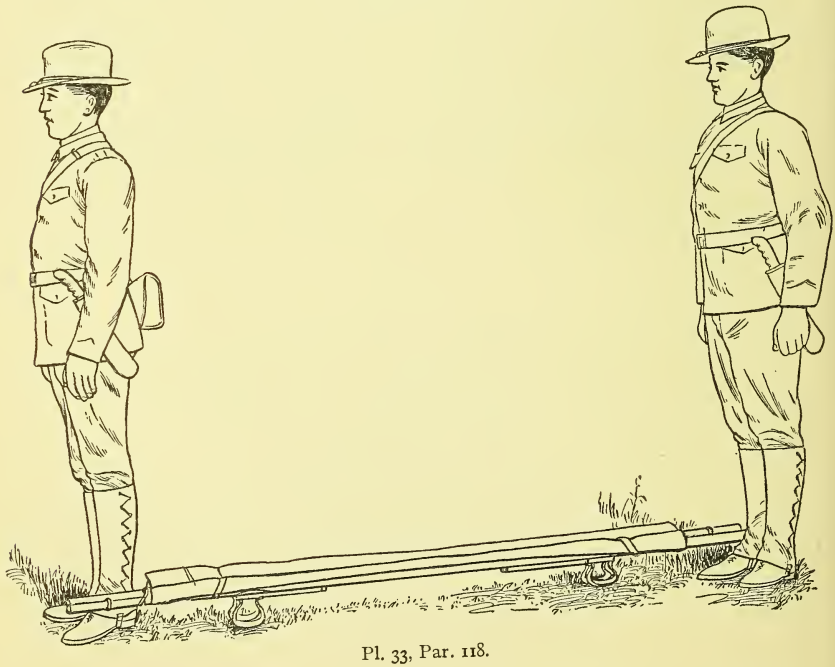
1. *Shoulder*, 2. LITTER.

At *litter*, No. 2 reaches forward with his left hand and, grasping the litter near its center, brings it to the vertical position and then to the shoulder; meanwhile No. 1 steps backward and aligns himself upon No. 2.

121. Being at the *carry*, litter *strapped:*



Pl. 32, Par. 117.

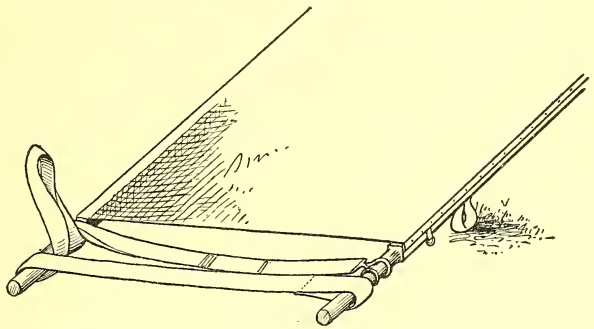


Pl. 33, Par. 118.

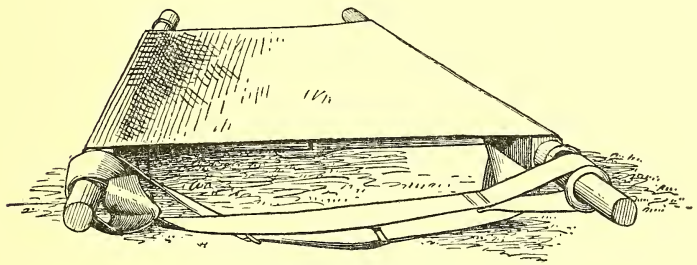
1. *Open*, 2. LITTER.

At *litter*, both bearers face the litter, unfasten the straps, and slip the free loop of each sling upon the ring handle, the bight embracing the opposite handle; they grasp the right (upper) handles with their right hands. This leaves the litter suspended longitudinally, canvas to the left. They then extend the braces, and supporting the litter horizontally by the handles, canvas up, lower it to the ground and resume the attention, standing between the handles, facing the front.

If the litter be merely closed, at *litter*, the bearers face the litter and



Pl. 34, Par. 122.



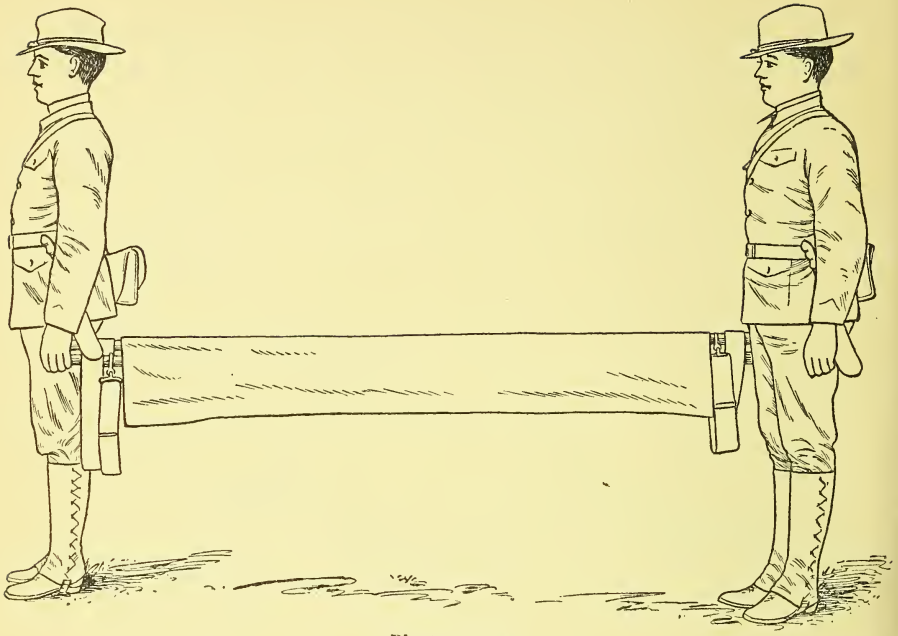
Pl. 35, Par. 122.

grasp the upper handles with the right hands. They drop the left pole, extend the braces, lower the litter, and take positions as before.

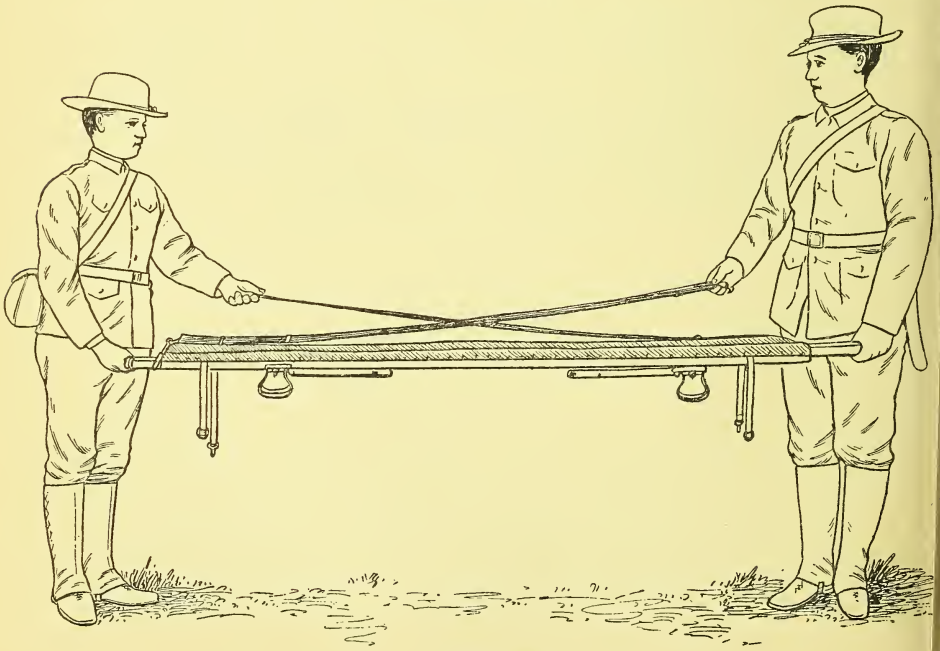
122. To *secure slings*, the litter being *lowered:*

1. *Secure*, 2. SLINGS.

At *slings*, each bearer slips off the bight of his sling, drops the doubled end over the free handle and brings it up around the handle, slipping the doubled end through the sling and over the end of the handle. The slings will be secured when it is desired to prevent them from dragging on the ground, or from being in the way when passing obstacles, loading ambulances, etc.



Pl. 36, Par. 123.



Pl. 37, Par. 124.

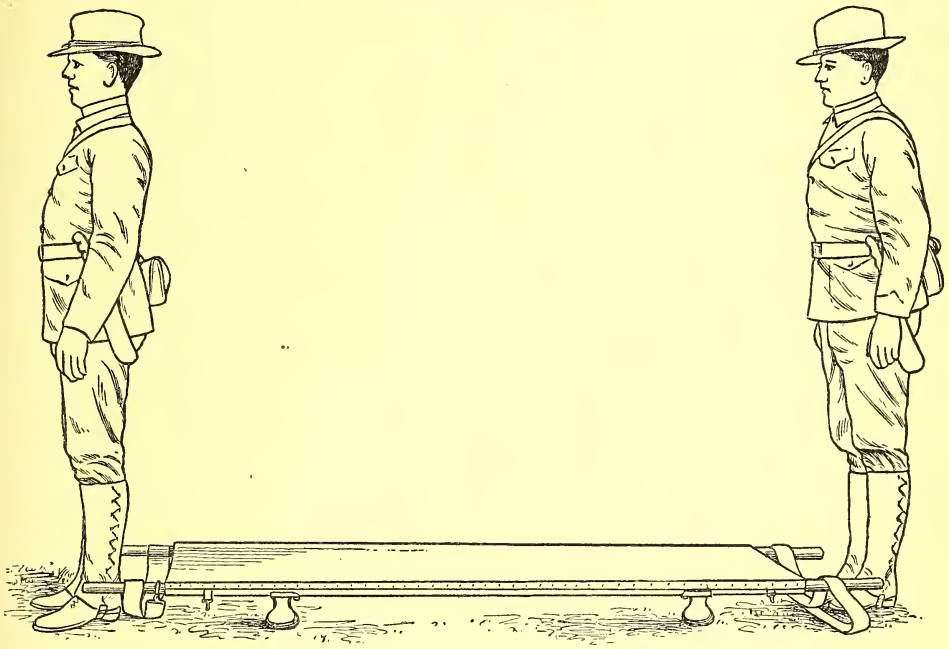
123. Being at the *open:*

1. *Close*, 2. LITTER.

At *litter*, Nos. 1 and 2, respectively, step outside the right front and left rear handles and face inward; they stoop and with their right hands raise the litter by the right handles; they then fold the braces, and bringing the lower pole against the upper, face to the front and support the litter at the *carry*.

124. The litter being *closed:*

1. *Strap*, 2. LITTER.



Pl. 38, Par. 126.

At *litter*, the bearers face the litter, fold the canvas by doubling it smoothly on the poles, release free loops of slings, and place slings lengthwise of the litter on the canvas, buckles out, and neatly secure all by the cross strap at each end, passed around poles and through loops of slings, when all take posts at the *carry*.

In the field the litter should habitually be carried *strapped* or *closed*, and only opened on reaching the patient.

The litter may in like manner be *closed* and then *strapped*, being at the open, at the command *strap litter*, when the motions begin with those described under *close litter*.

125. To bring the squad into line, the litter being at the *ground*, or the *open*, with the men at *litter posts:*

1. *Form*, 2. RANK.

At *rank*, No. 1 advances one pace and No. 2 aligns himself upon No. 1. Original positions at the litter are resumed at the command *litter posts* (par. 126).

This movement permits the marching of the squad, without litter, to any desired point.

126. Posts at the litter may at any time be recovered by the commands:

1. *Litter*, 2. POSTS.

If at the ground, the numbers take posts, No. 1 on the right of the front handles, No. 2 on the left of the rear handles and close to them, facing the front (Pl. 33). If at the *open*, Nos. 1 and 2 take posts between the front and rear handles, respectively, facing the front.

127. The foot, or front, of a grounded or opened (unloaded) litter is the end farthest from the approaching squad, unless otherwise designated. The foot of a loaded litter is always the end corresponding to the feet of the patient.

128. Being at the open:

1. *Prepare to lift*, 2. LIFT.

At the first command Nos. 1 and 2 stoop and seize each the free loop and bight of sling, No. 1 with the left and right hands, No. 2 with the right and left hands respectively; slip them off the handles, change hands, retaining hold, and each places the sling over the shoulders, slips the loop upon the free handle, and grasps both handles. They adjust the slings, lengthening or shortening them as necessary, and at *lift* rise slowly erect.

129. At the command:

1. *Forward*, 2. MARCH,

the bearers step off, No. 1 with the left and No. 2 with the right foot, taking short, sliding steps of about 20 inches, to avoid jolting and to secure a uniform motion to the litter. The cadence is at the rate of about 100 steps per minute.

130. Being at the lift:

1. *Lower*, 2. LITTER.

At *litter* the bearers slowly lower the litter to the ground. Each number then seizes the free loop and bight of his sling, No. 1 with the right and left hands, and No. 2 with the left and right hands. Each slips off loops and removes slings from shoulders and places the loop upon the ring handle, avoiding any twist in the sling.

131. When the litter is to be moved but a few paces, it may be lifted

and marched without slings by prefixing *without slings* to the commands: *Prepare to lift*, LIFT.

132. The open litter should be lifted and lowered slowly and without jerk, both ends simultaneously, the rear bearer moving in accord with the front bearer, so as to maintain the canvas horizontal. In fact the open litter should be handled for purposes of drill as if it were a loaded litter, and as soon as the men are familiar with its manual the drill should, whenever practicable, be with loaded litter.

133. Being in line at the shoulder:

1. *Return litter*, 2. MARCH.

At *march*, the Nos. 2 bring the litter to the vertical position and step one pace to the front, bringing the litter to the *shoulder;* they then proceed by the nearest route to the place designated for the litters, where they leave them, resume their positions by passing through their intervals, one pace to the rear, facing about, and stepping into line.

This movement may be supervised by a noncommissioned officer, and may be executed in double time.

MARCHINGS WITH LITTER.

134. The interval between litters in line is four paces. In column the distance is one pace.

135. Being in line of litters at the carry:

1 *To the left* (or *right*) *take intervals*, 2. MARCH, 3. FRONT.

At *march* the right squad stands fast. The other squads side step to the left until they have gained the proper intervals. All dress to the right and at *front*, turn the head and eyes to the front.

136. Being in line of litters at the *carry* with intervals taken:

1. *To the right* (or *left*) *close intervals*, 2. MARCH, 3. FRONT.

At *march* the right squad stands fast. The other squads side step to the right until the interval between litters is two paces and at *front*, cast their eyes to the front.

137. To align a line of litters at a halt, the litters being at the *carry* or *lift*, the commands are:

1. *Right* (*Left*), 2. DRESS, 3. FRONT.

At *dress*, all execute *eyes right*, the Nos. 1 aligning themselves on the right guide, or on No. 1 of the first squad; all promptly recover their intervals, if lost. At *front*, all turn the head and eyes to the front.

138. The line or column of litters is marched by the commands already given (par. 67 and following), substituting *litters* for *twos*. Whenever the squad is marching the litter should be at the *carry*.

The following movements require special notice or description:

To Turn on Fixed Pivot.

139. 1. *Detachment right* (*left*), 2. MARCH, 3. *Detachment*, 4. HALT; or, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

The first litter halts and, taking the short step, wheels to the right on its own ground; the other litters half wheel to the right and place themselves successively upon the alignment established by the right litter (par. 75).

To Turn on Moving Pivot.

140. 1. *Right* (*left*) *turn*, 2. MARCH, 3. *Full step*, 4. MARCH, 5. *Guide right* (or *left*).

The first litter takes the short step and wheels to the right on a movable pivot, followed by the others as in par. 76.

Being in Line of Litters, to March by the Flank in Column of Litters.

141. 1. *Litters right* (*left*), 2. MARCH.

At the command *march*, No. 1 steps off to the right and No. 2 to the left, each describing a quarter of a circle, so as to make the litter revolve horizontally on its center until both face to right, when they take the full step in the new direction. The right guide places himself one pace in front of the first litter and the rear guide one pace in rear of the last litter.

Being in Line or Column, March to the Rear.

142. 1. *Litters about*, 2. MARCH.

At *march*, Nos. 1 and 2 step off as in par. 141, but continue the movement until both face to the rear. The about with the litter is always to the right.

143. A platoon of litters consists of four litter squads in line with intervals taken. The distance between platoons of litters in column is equal to the front of a platoon.

144. The line or column of platoons is marched by the commands already given (par. 92 and following), substituting *litters* for *twos*.

145. The advantage of this formation is that it permits the shortening of the column at the carry without increasing its front by the commands: 1. *Platoons*, 2. *Close*, 3. MARCH, when the platoons close up to one pace, and the litters oblique toward each other until there is an interval of one pace between litters. In this formation each chief of platoon takes post on the left of his left guide.

146. The normal formation is resumed by the commands:

1. *Platoons*, 2. *Extend*, 3. MARCH.

Line is re-formed by the same commands used to form column.

ROUTE STEP.

147. The column of strapped litters at the *carry* is the habitual column of route. The rate is 3 to $3\frac{1}{2}$ miles per hour.

Marching in quick time:

1. *Route step*, 2. MARCH.

The men are not required to preserve silence, nor keep the step. The litter squads preserve their distance.

148. If from a halt:

1. *Forward*, 2. *Route step*, 3. MARCH.

149. To resume the cadence step:

1. *Detachment*, 2. ATTENTION.

At the command *attention*, the cadence step in quick time is resumed.

Upon halting while marching in route step, the men come to the rest at the ground (par. 118).

150. To march at ease:

1. *At ease*, 2. MARCH.

The detachment marches as in route step, except that silence is preserved.

THE LOADED LITTER.

TO LOAD AND UNLOAD THE LITTER.

151. For drill in loading the litter, the "patients" are directed to lie down at suitable intervals near the line of litters, first with head and later with feet toward it, and lastly in any position. Each squad may be separately exercised under its leader, or an instructor, or several squads simultaneously.

152. The litter being at the *open*, the patient, with two bearers, must always be carried to it. This may be done in either of two ways.

153. (*a*) The litter being at the open, the instructor commands:

1. *Right* (*Left*) *side*, 2. POSTS.

If the command is *right side*, *posts*, the bearers go to right side of patient and take positions, No. 1 at the right thigh and No. 2 at the right shoulder, facing the patient. If the command is *left*, they take similar positions on the left side.

1. *Prepare to lift*, 2. LIFT.

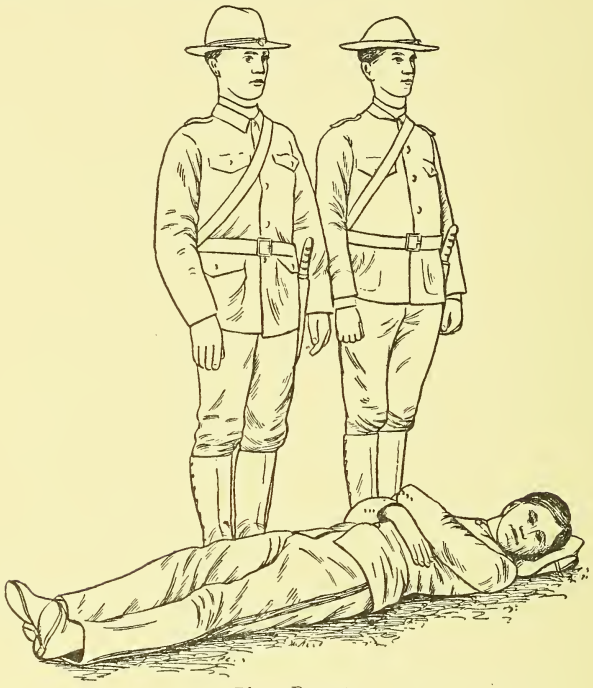
At the first command the bearers kneel on the knee nearest the patient's feet. No. 1 passes one arm under the hips and the other beneath the knees; No. 2 passes one hand under the patient's shoulders to the further armpit, and the other arm beneath the small of the back.

At *lift*, they lift together, slowly and carefully, raising the patient upon

their knees, then readjusting their hold, rise to their feet and carry the patient by the shortest route to the side of the litter, when the squad is halted and the commands are given:

1. *Lower*, 2. PATIENT.

At *patient*, the bearers kneel and place the patient on their knees;

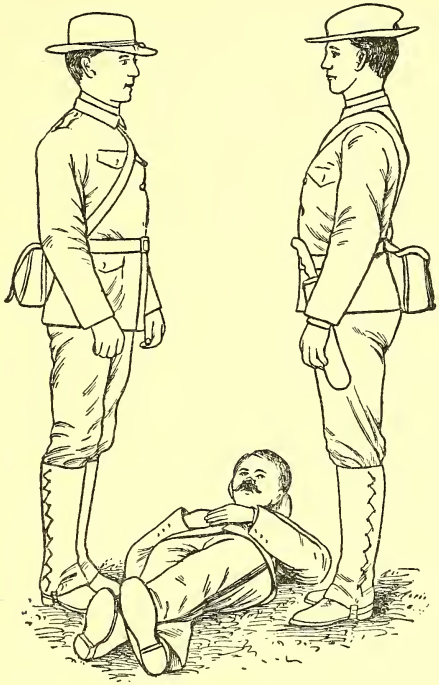


Pl. 39, Par. 153.

Pl. 40, Par. 153.

they stoop forward and lower him gently upon the litter; they then rise, and at once resume their positions at *litter posts*, without command.

Should it be necessary in emergencies to use three bearers, this may be done with similar commands, by having the third bearer placed at the patient in such a way that he may support the knees and legs.



Pl. 41, Par. 154.

154. (*b*) 1. *Hips*, 2. POSTS.

At *posts*, No. 1 proceeds to the patient's right hip and No. 2 to the left hip, facing the patient.

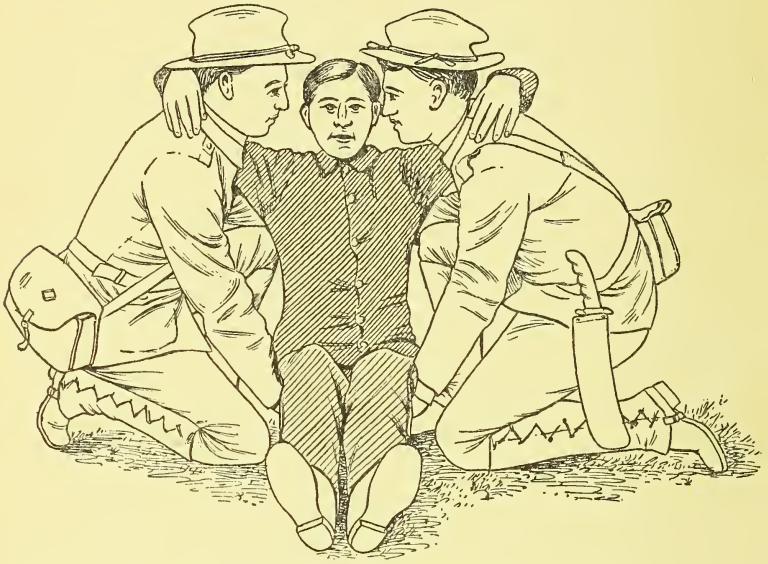
1. *Prepare to lift*, 2. LIFT.

At the first command, the bearers kneel on the knee nearest the patient's feet, they then raise him to a sitting position, pass each one hand and arm around his back, while the other hands are passed under the thighs, grasping each other. The patient, if able, clasps his arms around the bearers' necks. At *lift*, they lift the patient, both rising together, patient's legs remaining unsupported, and carry him over the near end of the litter, when the squad is *halted* and the commands are given:

1. *Lower*, 2. PATIENT.

At *patient*, the bearers stoop and carefully lower the patient upon the litter and, without command, resume position at *litter posts*.

155. To *unload*, posts are taken and the patient lifted in the same way and by the same commands. The bearers move backward if at *side posts*, and sidewise if at *hips posts*, until clear of the litter, when they *halt* and *lower patient*.



Pl. 42, Par. 154.

156. In the field, the squad having reached the patient and its numbers having taken positions on their respective sides, secure his arms and accouterments, loosen his clothing and examine him to determine the site and nature of the injury, applying such first-aid treatment as may be necessary.

The drill should be made as nearly as possible like service in actual warfare. For this purpose, a diagnosis tag having been attached to the clothing of the "wounded" indicating the site and character of the injury to be dressed before loading, they are directed to take positions at variable distances, in or out of sight, such as they would occupy on the battle-field.

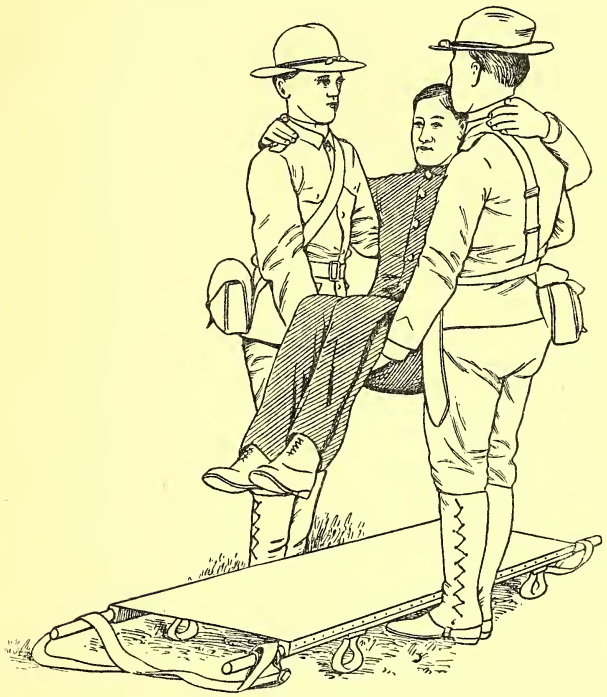
The litter being at the *carry*, at the command *Squad leaders take charge of squads*, each No. 2 assumes charge of his squad, which proceeds independently. When a patient is discovered the litter is halted and opened (by No. 2's commands) in the most convenient position, near the patient. The injury having been dressed, No. 2 commands: 1. *Right* (*Left*) *side*, 2. POSTS; or, 1. *Hips*, 2. POSTS, as may be most convenient, and the

patient is lifted and lowered upon the litter, as described in pars. 154–5. The arms and accouterments of the patient are carried on the litter when practicable.

At the signal or order for assembly, the squads re-form in line, lower litters and come to rest, when the patients, if still upon the litters (the dressings, if any, having been removed), are directed to rise and resume their posts, after which the litters are strapped.

POSITION OF PATIENT ON THE LITTER.

157. The position of a patient on the litter depends on the character of his injury. An overcoat, blanket, or other suitable and convenient article should be used as a pillow to give support and slightly raised position to the head. If the patient is faint the head should be kept low. Diffi-



Pl. 43, Par. 154.

culty of breathing in wounds of the chest is relieved by a sufficient padding underneath. In wounds of the abdomen the best position is on the injured side, or on the back if the front of the abdomen is injured, the legs in either case being drawn up, and a pillow or other available object placed under the knees to keep them bent.

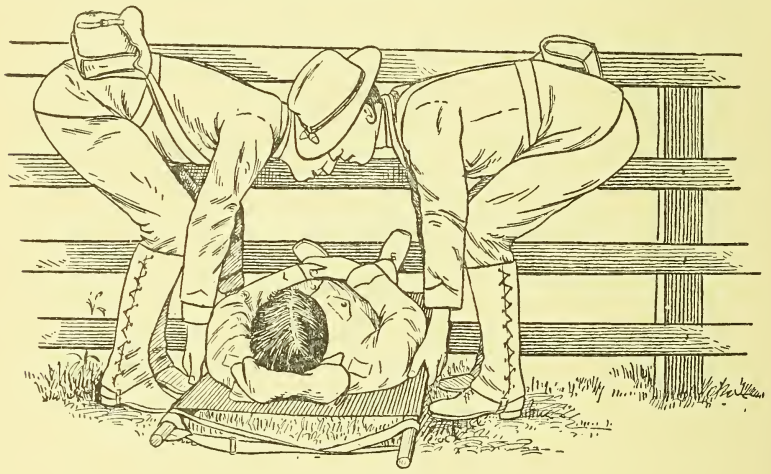
In an injury of the upper extremity calling for litter transportation, the best position is on the back with the injured arm laid over the body or suitably placed by its side, or on the uninjured side with the wounded arm laid over the body. In injuries of the lower extremity the patient should be on his back, or inclining toward the wounded side; in case of fracture of either lower extremity, if a splint cannot be applied, it is always well to bind both limbs together.

GENERAL DIRECTIONS.

158. In moving the patient either with or without the litter, every movement should be made deliberately and as gently as possible, having special care not to jar the injured part. The command *steady* will be used to prevent undue haste or other irregular movements.

159. *The loaded litter should never be lifted or lowered without orders.*

160. The rear bearer should watch the movements of the front bearer and time his own by them, so as to insure ease and steadiness of action.



Pl. 44, Par. 165.

161. The number of steps per minute will depend on the weight carried and other conditions affecting each individual case.

162. The handles of the litter should be held in the hands at arm's length and supported by the slings. Only under most exceptional conditions should the handles be supported on the shoulders.

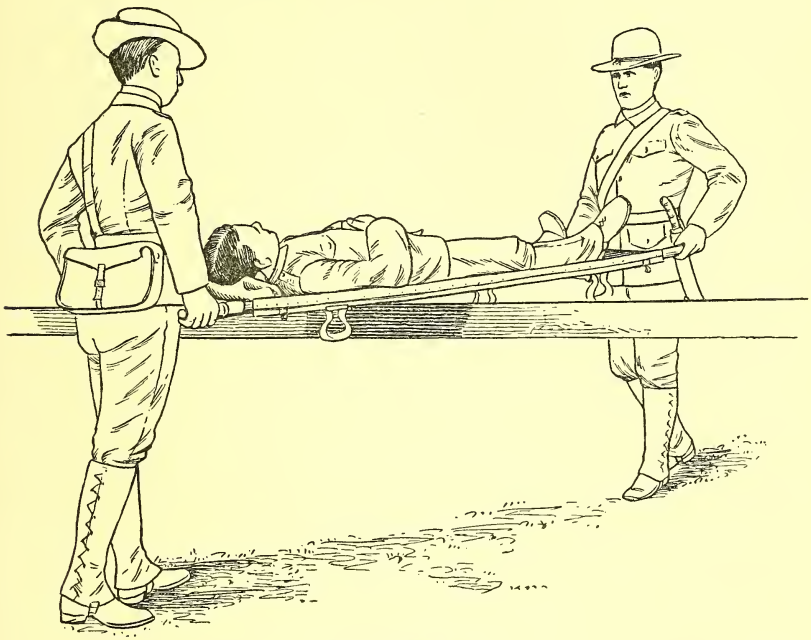
163. The bearer should keep the litter level notwithstanding any unevenness of the ground.

164. As a rule, the patient should be carried on the litter feet foremost, but in going uphill his head should be in front. In case of fracture of the

lower extremities, he is carried uphill feet foremost and downhill head foremost to prevent the weight of the body from pressing down on the injured part.

TO PASS OBSTACLES.

165. A breach should be made in a fence or wall for the passage of the litter. If there is no gate or other opening, or should it be necessary to surmount the obstacle, the latter being not over three feet high, the



Pl. 45, Par. 165.

litter is *halted* and *lowered* and *slings secured*, when the commands are given:

1. *At sides of litter*, 2. POSTS.

At *posts*, Nos. 1 and 2 take posts on the right and left of the litter, respectively, at the center and facing it.

1. *Prepare to lift*, 2. LIFT, 3. MARCH.

At the first command the bearers stoop and seize their respective poles with both hands; at *lift*, the litter is lifted, and at *march*, it is advanced to the obstacle and passed over until the front legs have cleared it. The litter is there rested, while No. 2 steps around between the rear handles which he supports, No. 1 getting over the obstacle; No. 1 takes

the front handles facing the litter and together the bearers pass the litter over until the rear handles rest on the obstacle, when No. 2 gets over, taking left front handle, and both resuming *at sides of litter posts*, move the litter forward until free of the obstacle, when they *halt* and *lower litter*, and resume *litter posts* without command.

166. The passage of a cut or ditch not over three feet deep is effected in a similar manner, but without special command. The litter being *halted* and *lowered* at its edge, No. 1 descends into the ditch and takes hold of the front handles, facing the litter. Both bearers then support and

Pl. 46, Par. 165.

advance the litter until only the rear feet or handles rest upon the edge, when No. 2 descends and the litter is carried across.

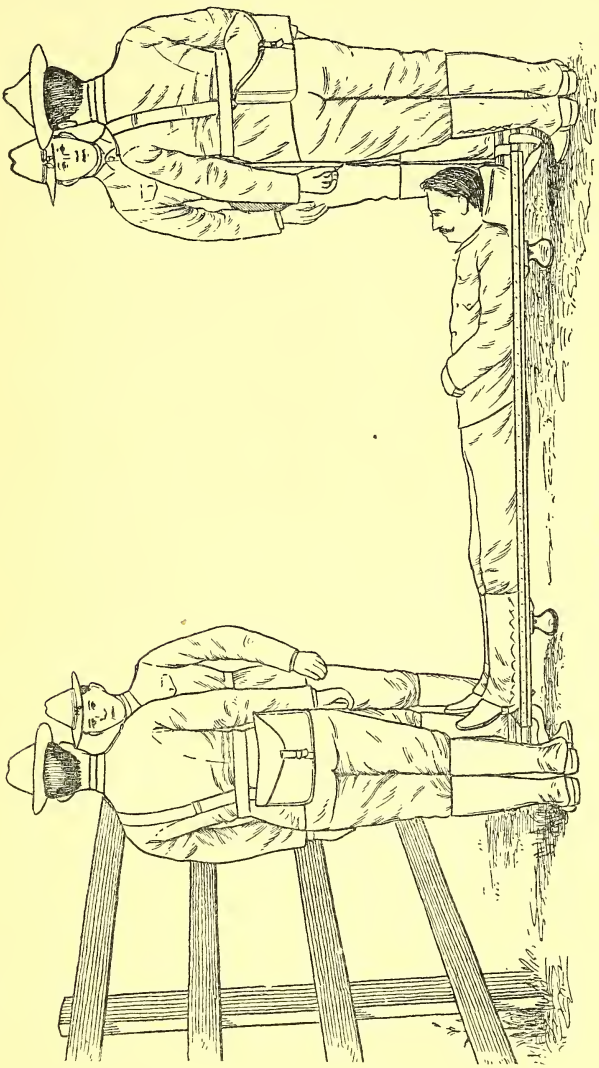
These directions are general.

BEARER WORK WITH INCREASED NUMBERS.

167. Under exceptional circumstances, as in ascending or descending stairs, when the patient is very heavy, the ground difficult, or an obstacle over three feet high has to be surmounted, it may be necessary to use additional bearers.

168. When three bearers are available, the third bearer gives aid where most needed; in loading and unloading he usually places the lit-

ter under the patient or removes it, but he may assist in supporting a fractured limb. In litter bearing he acts as a relay, or assists in supporting either end of the litter as directed.



Pl. 47, Par. 171.

169. When necessary to use two squads, the first squad being at litter posts, the commands are given:

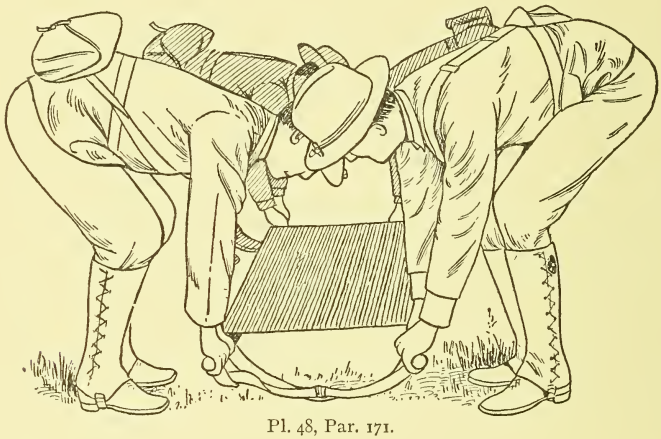
1. *Second squad*, 2. *Litter*, 3. POSTS.

The posts of the second squad are on the left of the litter; one pace from it and facing to the front, No. 1 at the front handle and No. 2 at the rear handle. No. 2 of the first squad is in command. If the first squad is at *posts*, litter at the *carry* or *ground*, No. 2 steps to the right side of the litter when the second squad takes *posts*.

170. To change bearers, the litter being *lowered:*

1. *Change*, 2. POSTS.

At *posts* the free squad relieves the bearers, No. 1 relieving No. 1 and No. 2 relieving No. 2.



Pl. 48, Par. 171.

171. To carry the litter by four bearers, the litter being *lowered* and the squads at *litter posts:*

1. *Four bearers*, 2. POSTS.

At *posts*, the first squad takes position outside the handles on the right and the second squad outside the handles on the left, all facing the litter.

1. *Prepare to lift*, 2. LIFT.

At the first command all stoop and, grasping their handles with both hands, at *lift* they slowly rise.

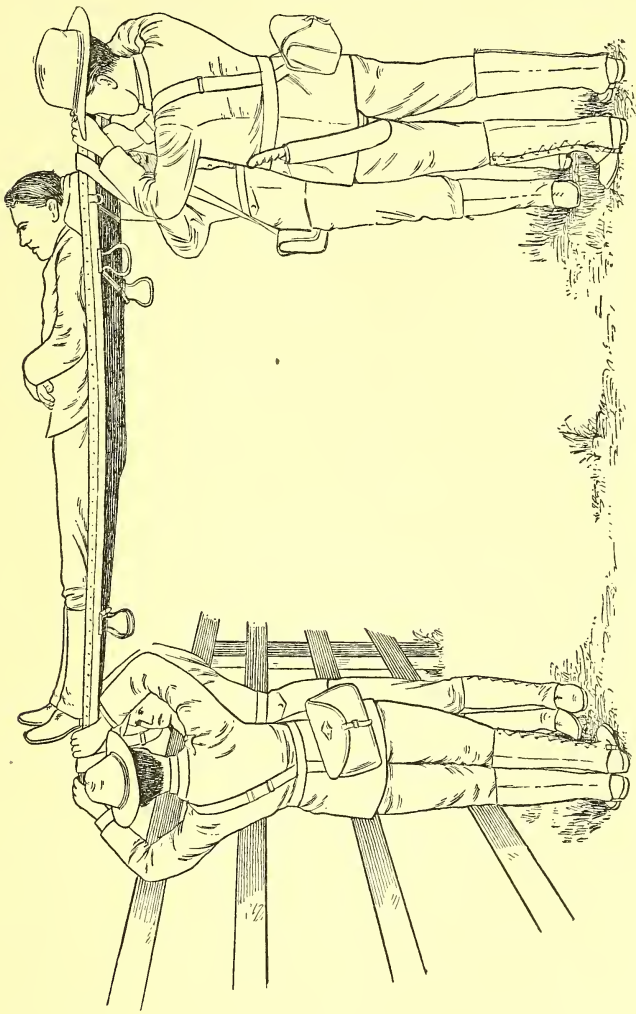
Four bearers, *posts*, may also be taken from position in line, the bearers going directly to their posts.

172. To surmount an obstacle over three feet high, the litter being lifted by *four* (two squads), the commands are given:

1. *Raise*, 2. LITTER, 3. MARCH.

At the second command the litter is carefully raised to the level of the obstacle, and at *march* it is carried over until the front legs have cleared, where it is rested. The front bearers cross the obstacle and resume hold

of the handles on the other side; the litter is then advanced until only the rear handles rest on the obstacle, when the rear bearers get over and resume hold of their handles; the litter is then *halted* and *lowered*.



Pl. 49, Par. 172.

TO CARRY A LOADED LITTER UPSTAIRS.

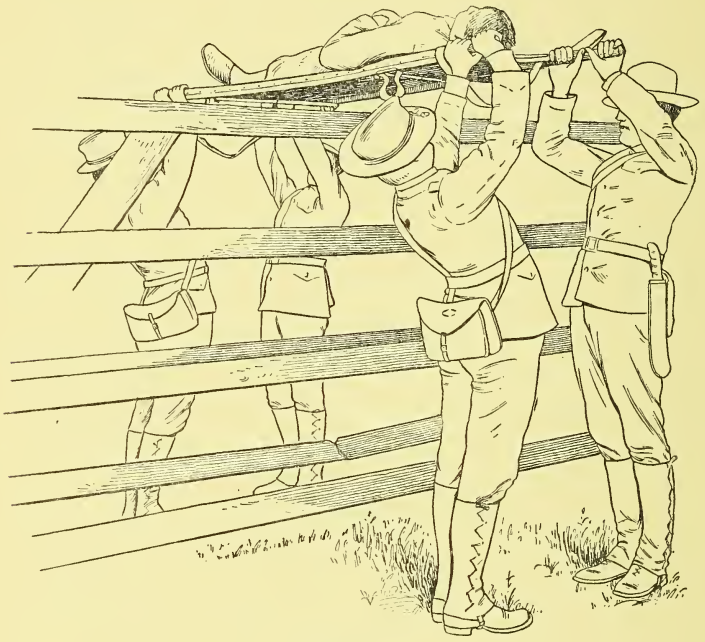
173. The loaded litter is usually carried upstairs head first, and downstairs feet first.

To carry loaded litter upstairs: Two squads are required for this movement. The litter is marched to the foot of the stairs in the usual

manner, *wheeled about, halted, lowered*, and *slings secured.* It is then lifted by four bearers (par. 171) and carried up, the rear bearers keeping the litter as level as possible by raising it. They must carefully watch the patient.

TO CARRY A LOADED LITTER DOWNSTAIRS.

174. The litter is carried downstairs in the same manner as it is carried upstairs, except that it is not wheeled about.



Pl. 50, Par. 172.

175. When for any reason it is necessary to use three bearers, the commands 1. *Three bearers, prepare to lift,* 2. LIFT, are used. At the first command the additional bearer takes post outside the left handle at the foot of the litter, opposite No. 1, who steps outside the right handle. Both face the litter, stoop, and grasp their respective poles. No. 2 faces about, stoops, and grasps his handles. At *lift,* the litter is lifted and carried up (or down) the stairs. If the litter is to be carried downstairs by three bearers, No. 2 does not face about.

FROM LITTER TO BED.

176. The litter is placed at the foot of the bed, as nearly as possible in line with it, and the patient is transferred to the bed, as described in

par. 153. Often it is simpler, after the patient is lifted, to roll the bed in front of the bearers, who then lower the patient upon it. If there is no fracture or other contra-indication, the litter may be brought to the side of the bed and level with it and held there, while the patient is directed to roll over onto the bed. If a third man is available, as he usually is in hospitals, the litter may be *halted* and *lowered* at the side of the bed when, after the patient is lifted, the litter is drawn out by the third bearer, the other two stepping forward and lowering the patient upon the bed.

177. From *litter* to *litter* is executed in the same manner as from *litter* to *bed.*

Pl. 51, Par. 173.

IMPROVISATION OF LITTERS.

178. Many things can be used for this purpose: Camp cots, window shutters, doors, benches, ladders, etc., properly padded.

Litters may be made with sacks or bags of any description, if large and strong enough, by ripping the bottoms and passing two poles through them and tying crosspieces to the poles to keep them apart; two, or even three, sacks placed end to end on the same poles may be necessary to make a safe and comfortable litter.

Bedticks are used in the same way by slipping the poles through holes made by snipping off the four corners.

Pieces of matting, rug, or carpet trimmed into shape may be fastened to poles by tacks or twine.

Straw mats, leafy twigs, weeds, hay, straw, etc., covered or not with

Pl. 52, Par. 175.

a blanket, will make a good bottom over a framework of poles and cross sticks.

Better still is a litter with bottom of ropes or rawhide strips, whose turns cross each other at close intervals.

179. But the usual military improvisation is by means of rifles and blankets. Each bearer should be supplied with a rifle carried at the order.

They assure themselves that the rifles are unloaded. The blanket rolled up is carried by No. 2 over the right shoulder.

1. *Prepare*, 2. BLANKET LITTER.

At the second command the bearers lay their rifles on the ground and face each other; No. 2 slipping off his blanket roll, gives one end of the blanket to No. 1, and together they spread it out lengthwise on the ground. No. 1 then places his rifle across the center of the blanket, the butt toward the original front of the squad and trigger guard in. Both bearers (No. 1 at the left front, No. 2 at the left rear corner) fold the blanket over the rifle. No. 2 then places his rifle over the center of the new fold and the blanket is folded over the second rifle, as over the first. The bearers then take position at *litter posts*, without command. When available, four bearers should be used for carrying this litter.

180. When no longer required, the commands are given:

1. *Take apart*, 2. BLANKET LITTER.

At the second command the litter is taken apart, the blanket rolled up and placed over the right shoulder of No. 2, after which the bearers take their rifles and resume their original positions in line.

181. Should it be desirable, the following method may be used:

One-half of the blanket is rolled lengthwise into a cylinder, which is placed along the back of the patient, who has been turned carefully on his side. The patient is then turned over upon the blanket and the cylinder unrolled on the other side. The rifles are then laid down, and rolled tightly in the blanket, each a like number of turns, until the side of the body of the patient is reached, when they are turned trigger guards up.

182. A litter may also be prepared with two rifles and two or three blouses, by turning the blouses lining out and buttoning them up, sleeves in, when the rifles are passed through the sleeves, the backs of the blouses forming the bed.

METHODS OF REMOVING WOUNDED WITHOUT LITTER.

BY THE RIFLE SEAT.

183. A good seat may be made by running the barrels of two rifles through the sleeves of an overcoat, buttoned as in paragraph 182, so that the coat lies back up, collar to the rear. The front bearer rolls the tail tightly around the barrels and takes his grasp over them; the rear bearer holds by the butts, trigger guards up.

184. A stronger seat is secured in the following manner: A blanket being folded once from side to side, a rifle is laid transversely upon it across its center, so that the butt and muzzle project beyond the edges; one end of the blanket is folded upon the other end and a second rifle laid upon

the new center, in the same manner as before. The free end of the blanket is folded upon the end containing the first rifle, so as to project a couple of inches beyond the first rifle. The litter is raised from the ground with trigger guards up.

BY ONE BEARER.

185. A single bearer may carry a patient in his arms or on his back.

In instructing a detachment in these movements, the detachment being in line, the patients having been directed to lie down in front of the bearers:

186. 1. *In arms*, 2. LIFT.

At *lift*, each bearer, turning patient on his face, steps astride his body, facing toward the patient's head, and with hands under his armpits lifts

Pl. 53, Par. 186.

Pl. 54, Par. 187.

him to his knees; then clasping hands over abdomen, lifts him to his feet; he then with his left hand seizes the patient by the left wrist and draws left arm around his (the bearer's) neck and holds it against his left chest, the patient's left side resting against his body, and supports him, with his right arm about the waist.

From this position the bearer with his right arm upon the patient's back presses his left under thighs and lifts him into position, carrying him well up.

187. 1. *Across back*, 2. LIFT.

At *lift*, the patient is first lifted erect as described in previous paragraph, when the bearer with his left hand seizes the right wrist of the patient and draws the arm over his head and down upon his left shoulder, then shifting himself in front, stoops and clasps the right thigh with his right arm passed between the legs, his right hand seizing the patient's right

Pl. 55, Par. 187.

Pl. 56, Par. 188.

wrist; lastly the bearer with his left hand grasps the patient's left and steadies it against his side, when he rises.

188. 1. *Astride of back*, 2. LIFT.

At *lift*, the patient is lifted erect (as described), when the bearer shifts himself to the front of the patient, back to patient, stoops and grasping his thighs, brings him well upon his back.

As the patient must help himself by placing his arms around the bearer's neck, this method is impracticable with an unconscious man.

189. In lowering the patient from these positions the motions are reversed. Should the patient be wounded in such a manner as to require these motions to be conducted from the right side instead of the left, as

laid down, the change is simply one of hands—the motions proceed as directed, substituting right for left and *vice versa*.

BY TWO BEARERS.

Besides the methods (already described) for carrying patient to litter.

190. By the extremities:

1. *Head and feet*, 2. POSTS.

At *posts*, bearers take position at patient, No. 1 between the patient's legs and No. 2 at his head, both facing toward his feet.

1. *Prepare to lift*, 2. LIFT.

Pl. 57, Par. 190.

At the first command, the rear bearer, having raised the patient to a sitting posture, clasps him from behind around the body under the arms, while the front bearer, standing between the legs, passes his hands from the outside under the flexed knees. At *lift*, both rise together.

This method requires no effort on the part of the patient; but is not applicable to severe injuries of the extremities.

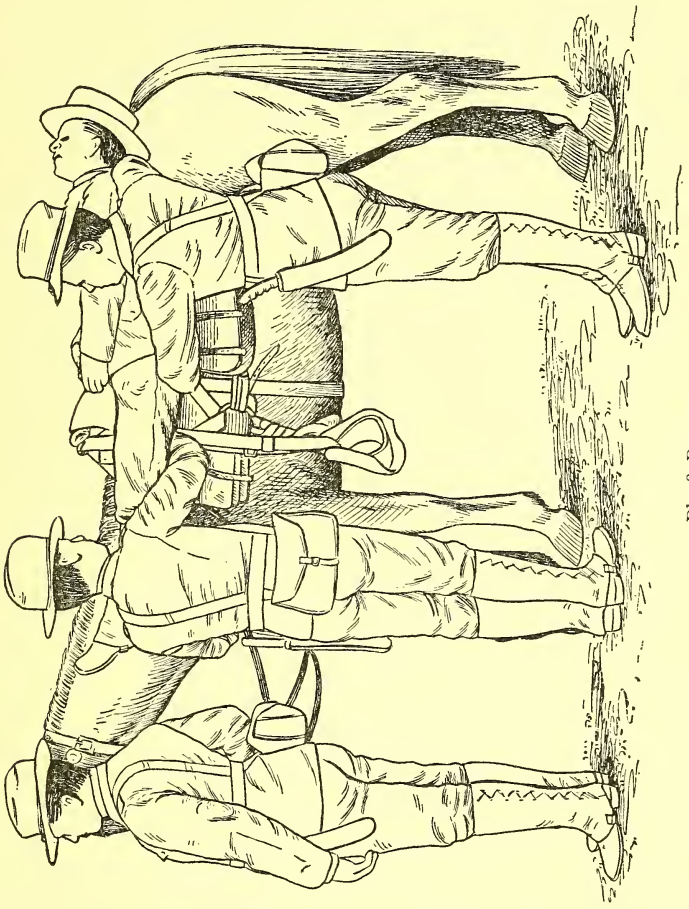
TO PLACE A PATIENT ON HORSEBACK.

191. The help required to mount a disabled man will depend upon

the site and nature of his injury; in many cases he is able to help himself materially. The horse, blindfolded if necessary, to be held by an attendant.

To load from the near side, the commands are:

1. *Left side*, 2. POSTS. 1. *Prepare to lift*, 2. LIFT, 3. MOUNT.



Pl. 58, Par. 191.

The patient having been lifted, at *mount*, is carried to the horse, patient's body parallel to that of the horse and close to its side, his head toward the horse's tail. He is then carefully raised and carried over the horse until his seat reaches the saddle, when he is lifted into position. No. 1 goes to the off side and puts the patient's right foot into the stirrup. No. 2 puts the left foot in the stirrup. When necessary to load from the off side, the bearers take posts *right side*. When a patient is entirely

helpless two squads may be used, three bearers on one side, while the fourth goes to the off side of the horse.

192. To dismount the commands are:

1. *Left side*, 2. POSTS. 1. *Prepare to dismount*, 2. DISMOUNT.

At *prepare to dismount*, the patient's feet are disengaged from the stirrups and his right leg swung over the pommel, No. 1 going to the off side for the purpose and then resuming his post at the left side. At *dismount*, the patient is brought to a horizontal position, gently lifted over the saddle, and carried backward until free of the horse, when the squad *halts* and *lowers* patient.

193. The patient once mounted should be made as safe and comfortable as possible. A comrade should be mounted behind him and guide the horse; otherwise a lean-back may be provided, made of a blanket roll, a pillow, or a bag filled with leaves or grass. If the patient be very weak, the lean-back may be made of a sapling bent into an arch over the cantle of the saddle, its ends securely fastened, or of some other framework to which the patient is bound.

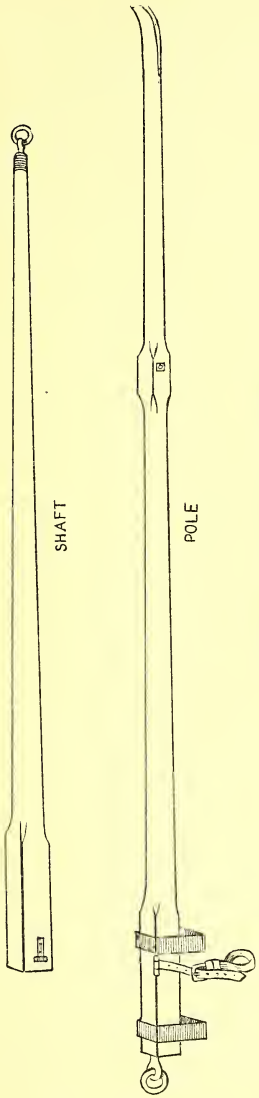
THE TRAVOIS.

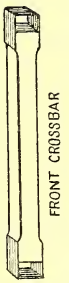
194. The travois is a vehicle intended for transporting the sick or wounded when the use of wheeled vehicles or other means of transportation is impracticable. It consists of a frame, having shafts, two side poles, and two crossbars, upon which a litter may be rested and partly suspended. When in use, a horse or mule is attached to the shafts and pulls the vehicle, the poles of which drag on the ground. One pole is slightly shorter than the other, in order that in passing an obstacle the shock may be received successively by each and the motion distributed.

195. *To assemble the travois.*—Pass each shaft through the collar on the travois pole from rear to front, pulling until snugly home. Then pass the front crossbar over the ironed ends on the front of the travois poles, driving it home until its collars strike the front collar of each pole, after which pass the rear crossbar (keeping uppermost the surface on which are the flat bolts) over the rear ends of the poles, pushing it forward until it reaches the squared places beyond the bolt slots, when the front bolts are thrown into place.

196. *To harness the travois.*—The animal is placed between the shafts. If he has an ordinary wagon harness the rings on the front end of the shafts are put over the iron hook on the hames, and the toggle of each trace chain is fastened to the ring of the corresponding travois pole. If he is saddled the rings on the front of each shaft are fastened to that on the pommel of the saddle by means of the straps that belong there, and the shafts are secured by a surcingle passed over all.

197. *To place the litter on the travois.*—If the litter is loaded it is wheeled so that the head of the patient is toward the rear of the travois and two paces from it; it is then halted and lowered. The flat bolts on the rear

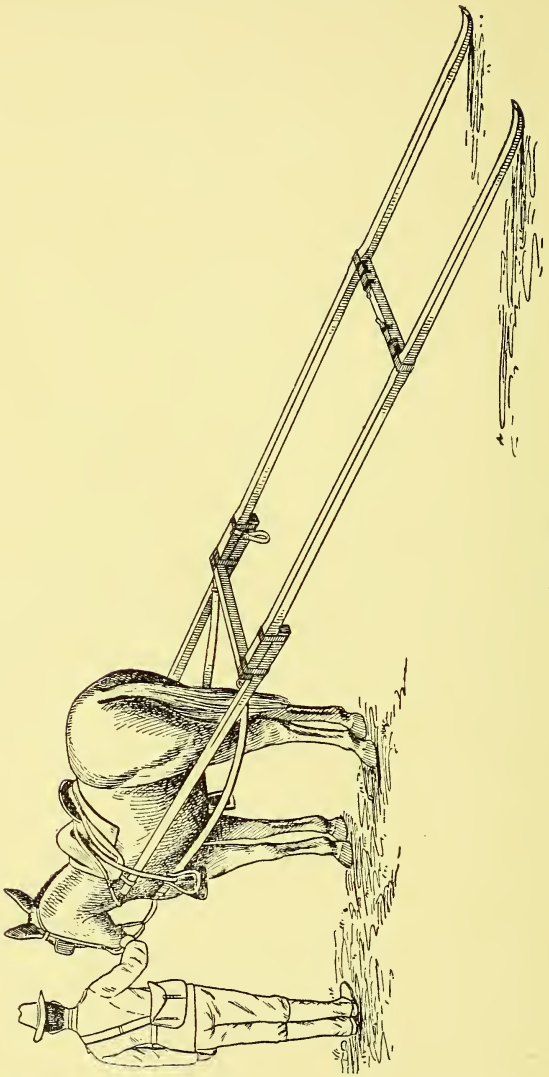




Pl. 59, Par. 194.

travois bar are thrown back and slings are secured. The squad takes posts at the side of the litter, as in loading ambulance, and the litter is then carried lengthwise over the travois until the front of the litter rests upon the

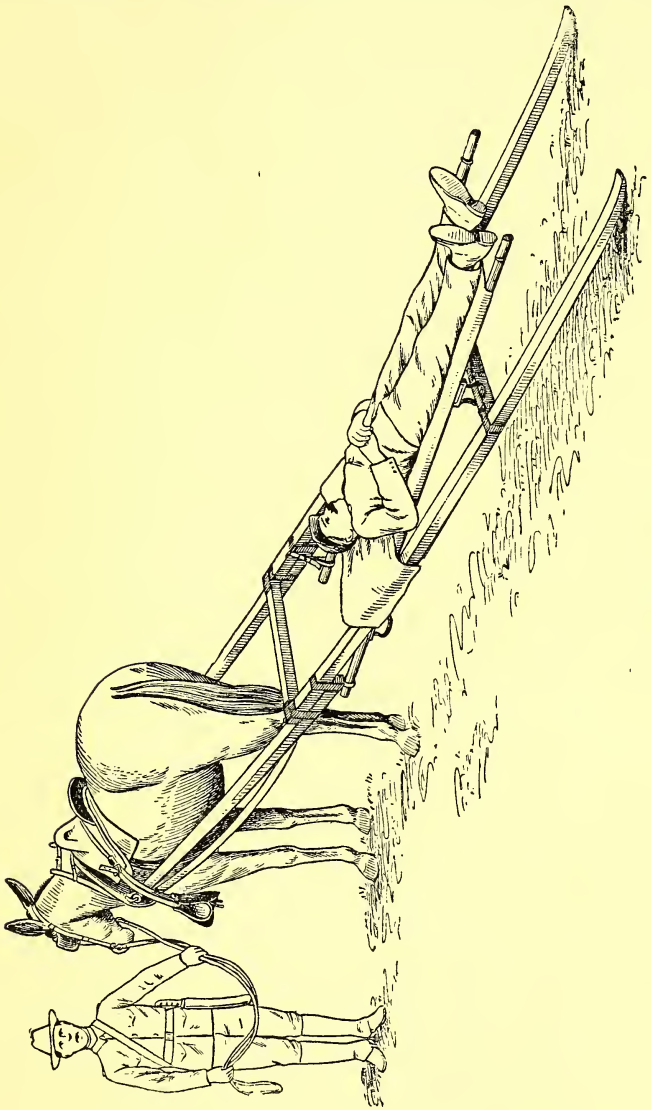
rear crossbar, when the handles are passed through the leather loops, the legs set in the mortises and secured by the bolts.



Pl. 60, Par. 195.

198. A travois may be improvised by cutting poles about 16 feet long and 2 inches in diameter at the small end. These poles are laid parallel to each other, large ends to the front, and 2½ feet apart; the small ends about 3 feet apart, and one of them projecting about 8 or 10 inches beyond

the other. The poles are connected by a crossbar about 6 feet from the front ends and another about 6 feet back of the first, each notched at its ends and securely lashed at the notches to the poles. Between the cross-pieces the litter bed, 6 feet long, is filled in with canvas, blanket, etc.,



Pl. 61, Par. 197.

securely fastened to the poles and crossbars, or with rope, lariat, rawhide strips, etc., stretching obliquely from pole to pole in many turns, crossing

each other to form the basis for a light mattress or an improvised bed; or a litter may be made fast between the poles to answer the same purpose. The front ends of the poles are then securely fastened to the saddle of the animal. A breast strap and traces should, if possible, be improvised and fitted to the horse. On the march the bearers should be ready to lift the rear end of the travois when passing over obstacles, crossing streams, or going up hill.

THE AMBULANCE.

199. The ambulance is a four-wheeled vehicle, ordinarily drawn by two animals in garrison and four in the field. It provides transportation for eight men sitting or four recumbent on litters, or four sitting and two recumbent. It is fitted with four removable seats, which, when not used as such, are hung, two against each side. The arrangements for supporting the upper tier of litters (upper berths) consist of two litter-supporting posts and four straps. The litter-supporting posts are two uprights, placed 73 inches apart. The one in front is stationary, being secured to the roof and floor; the one at the rear is hinged at the top, and when the upper berths are not to be used it is strapped to the roof. When the upper berths are to be used, it is unstrapped and swung into a vertical position, when its lower end is secured to the floor by a slot and bolt. Fastened to each of the litter-supporting posts, $27\frac{3}{4}$ inches from the floor, is a socket for the inside handles of the litter, and opposite each socket, attached to the side of the ambulance, is a strap to hold the outside handles. The floor is $7\frac{1}{2}$ feet long and 4 feet wide.

Under the body of the ambulance, in front of the rear axle, are two ambulance boxes, which consist of two double tin boilers with fire grates. One box contains hospital stores and the other surgical dressings. (See Manual for the Medical Department.)

Spare parts and additional articles are also carried by each ambulance. (See Manual for the Medical Department.)

In the field there should be an orderly with each ambulance, who rides on the seat beside the driver. When the orderly is present, it is his duty to open and close the tail gate, raise and lower the curtain (when necessary), and as far as practicable, to prepare the interior of the ambulance before the patients arrive. He may also assist in loading and unloading.

AMBULANCE DRILLS.

200. The litters are said to be *packed* when they are strapped and placed upon the brackets. The seats are said to be *prepared* when they are horizontal, supported by the legs; and *packed* when they are hooked against the sides of the wagon.

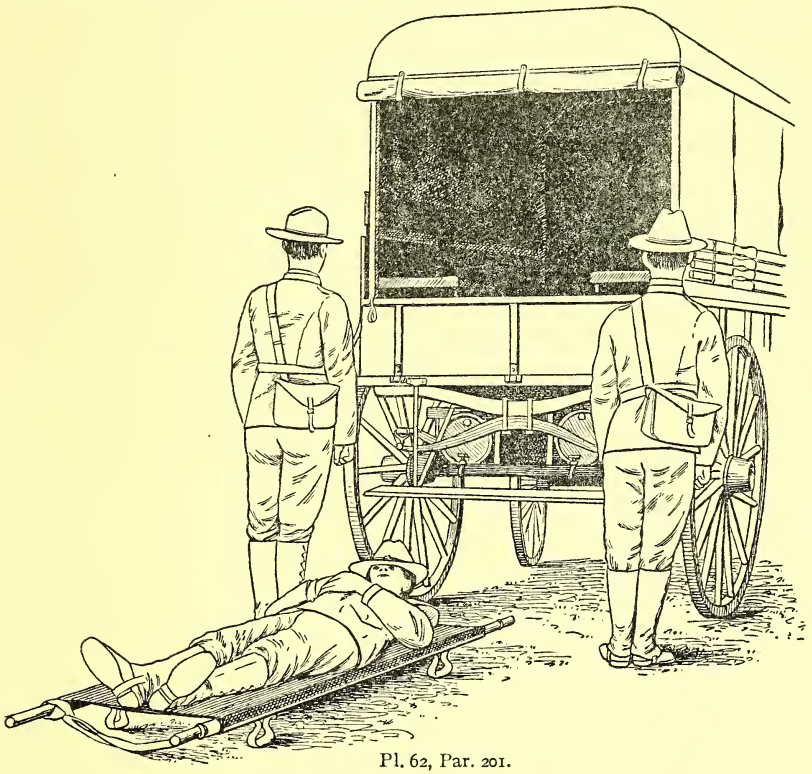
TO TAKE POSTS AT AMBULANCE.

201. The squad being in the vicinity of the ambulance:

1. *Ambulance*, 2. POSTS.

At *posts*, No. 1 takes position one pace behind the left rear wheel, and No. 2 one pace behind the right rear wheel, both facing the ambulance.

In case of a litter lowered in rear of an ambulance preparatory to loading, head of patient toward it, at the command *posts* each bearer faces about and proceeds directly to his post.



Pl. 62, Par. 201.

This is the invariable position of the squad at *ambulance posts;* it may be taken from any position (the litter, if used, being *grounded* or *lowered*), and when disarranged from whatever cause the squad may be reassembled by these commands for service at the ambulance.

202. The ambulance having seats packed and the squad being at *ambulance posts:*

1. *Prepare*, 2. SEATS.

At *seats*, Nos. 1 and 2 raise the curtain, if necessary, open the tail gate, and

enter the ambulance, No. 1 facing the front and No. 2 the rear seat of their respective sides. Each man seizes the lower edge of his seat about 6 inches from the ends with both hands and lifts it to free the hooks from the upper slots and then slips them into the lower slots; he then lowers the legs and adjusts them to the floor, and tries the seat for firmness before leaving it. He then prepares in like manner the opposite seat. No. 2 unfastens the litter-supporting post and swings it to the front of the ambulance, where it is grasped by No. 1, who lifts it to its place and straps it. Nos. 2 and 1 now resume their positions at *ambulance posts* and close the tail gate.

203. The ambulance having seats *prepared*, the squad being at *ambulance posts:*

1. *Pack*, 2. SEATS.

At *seats*, Nos. 1 and 2 raise the curtain, if necessary, and open the tail gate. (In case of a litter lowered in rear of the ambulance preparatory to loading, the tail gate is not closed.) They then enter the ambulance and face the front and rear seats of their respective sides; each man releases the legs and secures them against the seats, then seizing the front of the seat with both hands raises the seat to clear the hooks from the lower slots and slips them into the upper slots; he then lowers the seat to the side of the ambulance and packs in like manner the opposite seat. No. 1 unfastens the strap which holds the litter-supporting post to the roof of the ambulance and swings it to No. 2, who places it firmly in its socket. Nos. 2 and 1 now resume their positions at ambulance posts and close the tail gate.

204. Seats may be *prepared* or *packed* on one side only (leaving room on the packed side for two recumbent patients) by the commands:

1. *Right* (*Left*) *prepare*, 2. SEATS.

TO LOAD THE AMBULANCE.

205. The litter, being *lifted*, is marched to the rear of the ambulance, wheeled about so that the head of the patient is toward the step and one pace from it, when the litter is *halted* and *lowered*. If it be necessary to prepare the ambulance before loading, the squad by command takes positions at *ambulance posts*.

1. *At sides of litter*, 2. POSTS.

The tail gate having been opened, at *posts* Nos. 1 and 2 take positions on the right and left, mid-length of the litter, facing it.

1. *Lower* (or *upper*) *berth, prepare to load*, 2. LOAD.

At the first command the bearers stoop and each grasps a pole firmly with both hands. At *load*, the litter is lifted and pushed into the ambulance. No. 1 places the arms and accouterments of the patient in the ambulance, when both close the tail gate.

If the upper berth is to be loaded, the tail gate is left open, No. 1 runs to the front of the ambulance, climbs in, stepping over the seat, faces the litter, and grasps the head handles. No. 2 mounts the rear step and grasps his handles. The litter is then lifted, the inside handles being placed in the receiving sockets first, the outside handles then being secured by the straps. No. 1 steps over the front seat, jumps to the ground, and the squad takes position at *ambulance posts* and closes the tail gate, unless the ambulance is to be unloaded at once.

Pl. 63, Par. 205.

TO UNLOAD THE AMBULANCE.

206. The squad being at *ambulance posts:*

1. *Lower* (or *upper*) *berth, prepare to unload,* 2. UNLOAD.

The tail gate having been opened, at the first command each bearer grasps the handles nearest him. At *unload,* the bearers partly withdraw the litter, then shifting their hands to their respective poles and facing each other, they continue to withdraw it until the head reaches the rear of the ambulance, when they lift the litter out, *halt* and *lower* it to the ground one pace in rear of the tail gate.

The bearers, having closed the tail gate, take positions at *litter posts* without command.

If the upper berth is to be unloaded, at the first command, No. 1 runs to the front of the ambulance, climbs in, stepping over the front seat, and stands between the handles of the litter facing the rear; No. 2 mounts the rear step, facing the front. Each bearer grasps his handles. At *unload* the handles are lifted and freed from their fastenings, first from the straps and then from the sockets. The litter is then lowered to the floor of the ambulance, from which position it is withdrawn as in the previous paragraph. The tail gate having been closed, the squad takes position at *litter posts* without command.

207. When for any reason it is necessary to use three bearers in loading or unloading, the commands *at sides of litter, posts* are not given. At the commands *three bearers, upper* (or *lower*) *berth, prepare to load*, the additional bearer takes post outside the left handle, at the head of the litter opposite No. 2, who steps outside the right handle. Both face the litter, stoop and grasp their respective poles. No. 1 faces about, stoops, and grasps his handles. At *load* the litter is lifted and pushed into the ambulance. If the upper berth is to be loaded the additional bearer now mounts the step with No. 2 and assists in lifting the litter into position. In unloading, these movements are reversed.

208. The right side of the ambulance is always loaded or unloaded first, unless otherwise ordered. With but two recumbent patients, the lower berths only are loaded.

209. When necessary to load feet first, the litter is *not* wheeled about when it reaches the rear of the ambulance, but is halted and lowered with feet toward the tail gate, when the movements proceed as in previous paragraphs.

210. At the conclusion of the drill with ambulances the detachment is re-formed in line.

TO PREPARE AND LOAD ORDINARY WAGONS TO TRANSPORT WOUNDED.

211. In active service the use of ordinary army or other wagons for transporting the sick and wounded is of everyday occurrence, and it is important that bearers should be practiced in preparing, loading, and unloading such vehicles. Patients may be laid on straw or other like material spread thickly over the bottom of the wagon, or on hand litters placed on the bottom, or suspended by ropes or straps. The movements heretofore fully described, to *load* and *unload*, will, if thoroughly understood, meet the requirements of any emergency of this character. It must, however, always be remembered that such work demands a far greater amount of care on the part of the bearers for the safety and comfort of their patients than when the proper appliances are at hand.

INSPECTION AND MUSTER.

Inspection of Detachment.

212. Inspection is in such uniform as may be prescribed. The Hospital Corps pouch is worn with all uniforms, suspended from the left shoulder to the rear over the right hip.

213. The detachment should frequently be inspected in field equipment (par. 44).

214. The detachment being formed, the senior noncommissioned officer salutes, reports, and takes his place on the right of the line of file closers (par. 62). The junior officers take their posts and draw sabers as soon as the senior noncommissioned officer has reported.

The officer commanding, standing in front of the center of the detachment, then draws saber and commands:

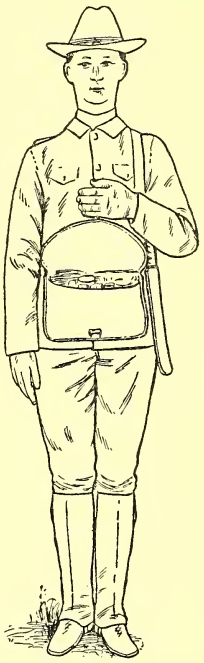
1. *Prepare for inspection*, 2. MARCH, 3. FRONT.

At the first command the junior officers place themselves on the right and left of the rank; the officer commanding then places himself facing to the left, three paces in front of the right of the detachment, and commands, *march*. At this command the junior officers take posts three paces in front of the detachment, distributing themselves equally along the line, in order of rank from right to left; the rank (the left hand upon the hip) dresses to the right.

The officer commanding aligns the officers and the rank; the senior noncommissioned officers the file closers.

The officers and file closers cast their eyes to the front as soon as their alignment is verified.

At the command *front*, the men turn their heads and eyes to the front and drop the hands by the side.



Pl. 64, Par. 215.

215. The officer commanding takes post facing to the front, three paces in front of the right guide, and as the inspector approaches he faces to the left and commands:

1. *Inspection*, 2. POUCHES,

and facing to the front salutes him.

At the second command the pouches are shifted under the right arm to the front, the flap opened and strap held by the left hand (fingers extended and joined, palm of hand and elbow against the body), so that the flap strap covers the line of buttons, right hand at side.

As soon as inspected, the officer commanding returns saber and accompanies the inspector. When the latter begins to inspect the rank, the junior officers face about and stand at ease, saber at the order.

Commencing on the right, the inspector now proceeds to minutely inspect the pouch of each soldier in succession.

After the inspector has passed, each man closes and replaces the pouch.

Accouterments and dress are then carefully inspected. The presence and serviceable condition of the first-aid packet is always verified.

If the pouches are not inspected they are replaced by the commands:

1. *Close*, 2. POUCHES.

216. The inspection being completed, the junior officers come to attention, carry saber, and face to the front; the officer commanding again takes his post on the right, and directs that the detachment be *dismissed.*

217. If the inspection is to include an examination of the blanket rolls the officer commanding, before dismissing the detachment and after inspecting the file closers, directs the junior officers to remain in place, takes intervals (par. 66) and commands:

1. *Unsling*, 2. PACKS, 3. *Open*, 4. PACKS.

At the second command, each man unslings his roll and places it on the ground at his feet, rounded end to the front, square end of shelter half to the right.

At the fourth command, the rolls are untied, laid perpendicular to the front with the triangular end of the shelter half to the front, opened, and unrolled to the left; each man prepares the contents of his roll for inspection and resumes the attention.

The officer commanding then returns saber, passes along the rank and file closers as before, inspects the rolls, returns to the right, draws saber, and commands:

1. *Close*, 2. PACKS.

At the second command, each man packs his roll as in par. 45.

As soon as a squad completes its two rolls each man places his roll in the position it was after being unslung, and stands at attention.

All the rolls being completed, the commanding officer commands:

1. *Sling*, 2. PACKS.

At the second command, the rolls are slung, the end containing the pole to the rear.

The commanding officer then assembles the detachment and completes the inspection as before.

INSPECTION OF LITTERS AND AMBULANCES.

218. The detachment being in line with strapped litters at the *carry*, and intervals taken, the commands are given:

1. *Litters left*, 2. MARCH, 3. HALT. 1. *Inspection*, 2. LITTERS.

At *litters*, the litters are opened, held suspended until both sides are inspected, and then lowered, when the squads take positions at *litter posts* without command.

219. The ambulances being in line at intervals of ten paces, with seats *packed*, an orderly on each seat beside the driver, the commands are given:

1. *Inspection*, 2. AMBULANCES.

At the second command the orderly jumps down, runs to the rear of the ambulance, opens the tail gate and raises the curtain, if necessary, and then comes to *attention* two paces in rear of the center of the step, facing the ambulance. The inspector first examines the animals and harness, then the ambulance and contents, after which he directs the seats to be prepared, or such other work to be done as he desires executed.

The inspection being completed, the orderly closes the tail gate and resumes his position on the seat beside the driver.

MUSTER.

220. All stated musters of the detachment are, when practicable, preceded by a minute and careful inspection. The detachment being in line prepared for inspection, the officer commanding, upon intimation of the mustering officer, commands: *Attention to muster.*

He then returns saber and hands a roll of the Hospital Corps detachment, with a list of absentees, to the mustering officer. The mustering officer or the officer commanding calls over the names on the roll, each man, as his name is called, answers "Here" and steps forward one pace. The muster completed, the detachment is dismissed.

After mustering, the presence of the men reported sick in hospital or on duty elsewhere is verified by the mustering officer, who is accompanied by the officer commanding.

TENT DRILL.

221. The canvas of a field hospital consists of hospital tents, wall tents, and common tents. The hospital tents are intended for use as wards, dispensary, storage, and mess; the wall tents for noncommissioned officers and the common tents for the privates of the Hospital Corps. Conical wall tents and shelter tents are also used by the Hospital Corps.

222. Tentage for medical officers is not included in that for field

hospitals. Each medical officer is allowed one wall tent. In the field the allowance is regulated by the commanding officer of the troops.

HOSPITAL TENT.

223. A hospital tent is 14 feet 4 inches long, 14 feet 6 inches wide, and 11 feet to ridge, the wall being $4\frac{1}{2}$ feet high; it furnishes comfortable accommodations for six patients, and requires to pitch it a ridge-pole and two upright poles, seven long tent pins on each side for the guy ropes, and two on each side for the long guys, eighteen in all. Twenty-four small pins are needed for the front, rear, and walls.

224. The hospital tents should always be pitched first in a field hospital.

225. The tents, having been pitched, should at once be ditched, unless otherwise directed. In setting or removing wall pins the work should commence at the corners of the tent, working first on the sides and then on the ends.

226. Two squads (four men) numbered from 1 to 4 consecutively, pitch each tent.

Nos. 1 and 2 place the ridge-pole perpendicular to the company street, with one end against the position pin; Nos. 3 and 4 drive a pin at the other end of the ridge-pole. Nos. 1 and 2 mark the positions of the four corner guy-rope pins by placing the ridge-pole parallel to the company street, to the right (facing the tent) of the position pin; Nos. 3 and 4 drive a large pin one pace in front of the outer end of the ridge-pole. The other three corner guy pins are set in succession in the same manner, going first straight to the rear, then across the tent, and then to the front. All four then spread the tent on the ground it is to occupy; Nos. 1 at the front and 2 at the rear insert the uprights. The ridge-pole and uprights are joined, the pole pins inserted in the eyelets of the tent and fly, and the tent raised to a vertical position with the poles at the pins. Nos. 1 and 2 hold the tent in position, No. 3 places the front guy ropes of tent and fly, No. 4, the rear, on their pins, and tighten the same so as to hold the poles vertical. The wall pins are then driven through the loops, walls hanging vertically. The other pins are then driven on line with the corner pins and in prolongation of the seams of the tent.

THE MUNSON TENT.

227. The Munson hospital tent has the same dimensions as the ordinary hospital tent, except that the fly is supported by a jointed ridge-pole, below which the tent is suspended by a ridge-rope, so as to give an air space of 1 foot between the tent ridge and the fly. The fly has a width of 18 feet, equal to the length of the jointed ridge-pole, and projects over the ends of the tent, front and rear, for a distance of 2 feet. In addition to

the jointed ridge, two upright poles are required to pitch he tent; and there are also needed nine long tent pins on a side for the fly guys, and seven long tent pins on a side for the tent guys, or 32 in all. If necessary, the tent can be pitched with nine long pins on a side, or 18 in all, by attaching the fly guys and tent guys to the same pins; but it is preferable to use two rows of long tent pins, so as to create as large an air space as possible between the tent roof and the fly. As with the common hospital tent, 24 small tent pins are needed for the front, rear, and walls. No long (ridge) guys are required.

The positions for the corner guy-rope pins for the fly are marked by stepping outward one pace and to front (or rear) one pace from the corner guy-rope pins of the tent. When the tent is spread on the ground it is to occupy, the ridge-pole is withdrawn from under the tent and placed on the outside about a foot from the ridge. For hot weather, the flap covering the ventilating netting in the roof of the tent is fastened down, so as to leave the ventilating space open. The loop of the ridge-rope is slipped over the pin of one of the uprights and the pins of both uprights passed through the holes in the end of the tent ridge and into the sockets provided for them in the ridge-pole. The free end of the ridge-rope is then passed around the pin of the second upright, pulled taut, and tied in position. The three short rope supports are then hooked over the ridge-rope through the meshes of the ventilating netting, or through the perforations in the flap closing the ventilating opening, if this flap be used.

NOTE.—In the latest model of the Munson tent the ridge-rope is replaced by a strip of canvas running the length of the tent ridge and to which the rope supports are attached by snap hooks. This model has shouldered upright poles which pass through the tent ridge, and short pins to support the tent-fly ridge-pole.

228. The wall tent or common tent is pitched in the same manner as a hospital tent.

CONICAL WALL TENTS.

229. The conical wall tent is pitched by four squads (eight men), one of the eight, selected to supervise the work, numbers the others from 1 to 7, and himself takes the number eight.

Upon the hood lines of the tent are placed three marks; the first about 8 feet 3 inches, the second about 11 feet 3 inches, the third about 14 feet 2 inches from the hood ring; the first marks the distance from the center to the wall pins, the second to the guy pins, and the distance between the second and third is the distance between guy pins. These distances vary slightly for different tents and should be verified by actual experiment before permanently marking the ropes. To locate the position of guy pins after the first, the hood ring being held on the center pin, with

the left hand hold the outer mark on the pin last set, with the right hand grasp the rope at the center mark and move the hand to the right so as to have both sections of the rope taut; the center mark is then over the position desired; the inner mark is over the position of the corresponding wall pin.

To pitch the tent, No. 1 places the tent pole on the ground, socket end against the door pin, pole perpendicular to the company street. No. 2 drives the center pin at the other extremity of the pole. No. 3 drives a wall pin on each side of and 1 foot from the door pin. No. 4 places the open tripod flat on the ground with its center near the center pin. The whole detachment then places the tent, fully opened, on the ground it is to occupy, the center at the center pin, the door at the door pin.

No. 8 holds the hood ring on the center pin, and superintends from that position. No. 1 stretches the hood rope over the right (facing the tent) wall pin and No. 2 drives the first guy pin at the middle mark. No. 1 marks the position of the guy pins in succession and No. 2 drives a pin lightly in each position as soon as marked. At the same time No. 5 inserts small pins in succession through the wall loops and places the pins in position against the inner mark on the hood rope, where they are partly driven by No. 6. No. 4 distributes large pins ahead of Nos. 1 and 2; No. 7, small pins ahead of Nos. 5 and 6; No. 3 follows Nos. 1 and 2 and drives the guy pins home. No. 7, after distributing his pins, takes an ax and drives home the pins behind Nos. 5 and 6. No. 4, after distributing his pins, follows No. 3 and loops the guy ropes over the pins.

Nos. 1, 2, and 3, the pins being driven, slip under the tent and place the pin of the pole through the tent and hood rings while No. 8 places the hood in position. Nos. 1, 2, and 3 then raise the pole to a vertical position and insert the end in the socket of the tripod; they then raise the tripod to its proper height, keeping the center of the tripod over the center pin; while they hold the pole vertical Nos. 4, 5, 6, and 7 adjust four guy ropes, one in each quadrant of the tent, to hold the pole in its vertical position, and then the remaining guy ropes. As soon as these are adjusted the men inside drive a pin at each foot of the tripod if necessary to hold it in place.

230. The conical wall tent may also be pitched by two squads (4 men). No. 4 holds the hood ring and superintends. After the tent is in position on the ground it is to occupy, the pins are distributed by Nos. 2 and 3. No. 3 takes the place of Nos. 5 and 6 in placing the wall loop pins. After all the pins are placed they are driven home, all assisting.

SHELTER TENTS.

231. The litters having been stacked, the detachment commander dresses it back to four paces from the line of stacks and commands: *Form for shelter tents.*

The officers fall out, the first sergeant falls in on the right of the right guide; file closers fall in on the left.

1. *To the left (right) take shelter-tent intervals*, 2. MARCH, 3. *Detachment*, 4. HALT, 5. FRONT, 6. PITCH TENTS.

At the command *march*, all face to the left and move off in succession; as the line is being extended, each man grasps with his left hand the right wrist of the man in front.

If intervals are taken to the right, each man grasps with his right hand the left wrist of the man in front.

At the command *halt*, given as the second man from the right has his interval, all halt, face to the front, dress to the right, and correct their intervals by moving to the left until the arms are fully extended.

At the command *front*, all drop their hands.

At the command *pitch tents*, each No. 2 moves back to four paces in rear of his No. 1; all unsling and open the blanket rolls and take out the shelter half, poles, and pins; No. 1 places one pin in the ground at the point where his right heel, kept in position until this time, was planted. Each then spreads his shelter half, triangle to the rear, flat upon the ground the tent is to occupy, No. 1's half on the right. The halves are then buttoned together. Each No. 1 joins his pole, inserts the top in the eyes of the halves, and holds the pole upright beside the pin placed in the ground; No. 2, using the pins in front, pins down the front corners of the tent on the line of pins, stretching the canvas taut; he then inserts a pin in the eye of the rope and drives the pin at such distance in front of the pole as to hold the rope taut. Both then go to the rear of the tent; No. 2 adjusts the pole and No. 1 drives the pins. The rest of the pins are then driven by both men, the Nos. 1 working on the right.

As soon as the tent is pitched, each man arranges the contents of the blanket roll in the tent, and stands at attention in front of his own half on line with the front guy-rope pin.

The guy ropes, to have a uniform slope when the shelter tents are pitched, should all be of the same length.

DOUBLE SHELTER TENTS.

232. The double shelter tent is formed by buttoning together the square ends of two single tents. Two complete tents, except one pole, are used. Two guy ropes are used at each end, the guy pins being placed in front of the corner pins.

The double shelter tents are pitched by two squads; the men falling in on the left are numbered, counting off if necessary.

The detachment commander gives the same commands as before, inserting *double* before *shelter* in the first command, and before *tents* in the last command.

The commands are executed in the same manner as when pitching single shelter tents, with the following exceptions:

Only the odd-numbered squads grasp wrists; the even-numbered squads cover the odd at six paces distance.

The first sergeant places himself on the right of the right guide and with him pitches a single shelter tent.

Only the Nos. 1 of the front squads mark the line with the tent pin.

All the men spread their shelter halves on the ground the tent is to occupy. Those of the front squads are placed with the triangular ends to the front. All four halves are then buttoned together, first the ridges and then the square ends. The front corners of the tent are pinned by the front-squad men, the odd numbers holding the poles, the even numbers driving the pins. The rear-squad men similarly pin the rear corners.

While the odd numbers steady the poles each even number of the front squads takes his pole and enters the tent, where, assisted by the even number of the rear squad, he adjusts the pole to the center eyes of the shelter halves in the following order: First, the lower half of the front tent; second, the lower half of the rear tent; third the upper half of the front tent; fourth, the upper half of the rear tent. The guy ropes are then adjusted.

The tents having been pitched, the triangular ends are turned back, contents of the rolls arranged, and the men stand at *attention*, each opposite his own shelter half and facing out from the tent.

TO STRIKE SHELTER TENTS.

233. Everything having been removed from the tents:

1. *Strike tents*, 2. DOWN, 3. *To the right (left) assemble*, 4. MARCH.

At the first command the side pins are removed; No. 1 steadies the front pole, No. 2 the rear pole, and all remaining pins are removed.

At the second command, or last note of *the general*, the tents are lowered, blanket rolls packed and slung, and the men stand at *attention* in front of the places lately occupied by their tents and at their original places after extension.

At the fourth command they close in to the right and re-form detachment.

TO STRIKE COMMON, WALL, HOSPITAL, AND CONICAL WALL TENTS.

234. 1. *Strike tents*, 2. DOWN.

The men first remove all pins except those of the four corner guy ropes, four quadrant guy ropes in case of the conical wall tent. The pins are neatly piled or placed in their receptacle.

One man removes each guy from its pin, and all hold the tent in a

vertical position until the command *down* or the last note of *the general*, and then lower it to the indicated side.

The canvas is then folded, or rolled, and tied, the poles, or tripod and pole, fastened together, and the remaining pins collected.

TO FOLD TENTS.

235. *Wall tents.*—Spread the tent flat on its side and place all guys but two over on the canvas; fold the triangular ends over so as to make the canvas rectangular; fold both ends over so that they meet at the center, and then fold one end over on the other; fold the bottom and ridge over so that they meet at the center of the strip, and then fold one end over on the other.

Fold the fly into four folds, parallel to its length, then in a similar manner across its length, making a rectangle with dimensions about the same as the folded tent.

Place the fly on the tent, cross the two free guys, and tie them so that they pass over the ends and across the sides.

The hospital and common tent are folded in the same manner as the wall tent.

Conical wall tents.—Spread the tent flat with the door up; holding the ring vertical, fold the two edges in so they meet at the center, and again fold in the same manner; place the hood on one half and fold the other half over on it; turn wall over toward ring, fold coming at about middle of height of wall, two men working together, then roll from the ring down, placing knees on each fold to make bundle compact and flat.

Tie the bundle with the two free guys as in case of the wall tent.

GENERAL REMARKS.

236. As soon as the lines of company streets are established, the positions of the tents should be marked from the flank nearest the officers' tents by pins. The front pole of the wall and common tent and the door pins of the conical wall tents occupy the points so marked. The distance between pins may be determined by pacing or by a light cord with the distances marked upon it. These distances are: For wall tents, eight paces; common tents, six paces; conical wall tents, ten paces; hospital tents, twelve paces. The pins marking the position of the tents are, when practicable, set on a straight line, and the detachment officers verify and correct the alignment of such pins in the quickest and most convenient manner.

237. Wall pins are so driven as to slope slightly away from the tent; guy pins, so as to slope slightly toward the tent.

238. Each tent, its fly, hood, poles, and tripod, should have the same number.

239. The hospital tent complete consists of one tent, 100 pounds; one fly, 32 pounds; one set of poles, 60 pounds; 18 large and 24 small pins, 20 pounds; total weight, 212 pounds. Its dimensions are: Length of ridge, 14 feet 4 inches; width, 14 feet 6 inches; height, 11 feet; height of wall, 4 feet 6 inches; packed, contains 6 cubic feet.

240. The conical wall tent complete consists of one tent and hood, 76 pounds; one tent pole and tripod, 32 pounds; forty-eight pins, about 20 pounds; total weight, 128 pounds. Its dimensions are: Diameter, 16½ feet; height, 10 feet; height of wall, 3 feet; packed, contains 13 cubic feet.

241. The wall tent complete consists of one tent, 43 pounds; one fly, 15 pounds; one set of poles, 25 pounds; 10 large and 18 small tent pins, about 15 pounds; total weight, 98 pounds. Its dimensions are: Length of ridge, 9 feet; width, 8 feet 11 inches; height, 8½ feet; height of wall, 3 feet 9 inches; packed, contains 6 cubic feet.

242. The common tent complete consists of one tent, 26 pounds; one set of poles, 15 pounds; 24 small tent pins, weight about 9 pounds; total weight, 50 pounds. Its dimensions are: Length of ridge, 6 feet 11 inches; width, 8 feet 4 inches; height, 6 feet 10 inches; height of wall, 2 feet.

243. The shelter tent equipment for each enlisted man consists of the following:

(*a*) One shelter half, weight 3 pounds.

(*b*) One pole in three joints, 47 inches long; weight, 10½ ounces.

(*c*) Five tent pins, 9 inches long; weight, 10 ounces.

The shelter tent is pitched by two men, whose combined equipments make a complete tent. The tent, when pitched, occupies a space 5 feet 4 inches deep and 6 feet 4 inches wide; the two triangular parts, when pinned to the ground, inclose an additional triangular ground space 20 inches deep.

244. In striking tents, common and wall tents are, unless otherwise directed, lowered to the right facing out from the tent door; conical wall tents, away from the door.

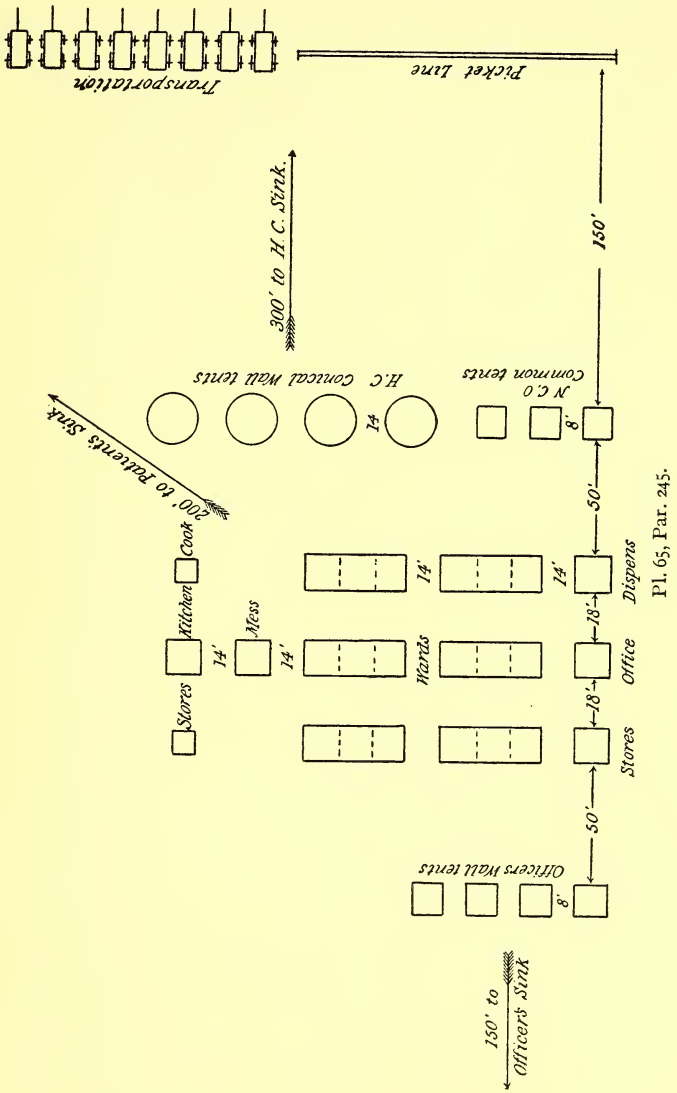
SCHEME FOR PITCHING FIELD HOSPITAL.

245. Field hospitals will habitually be pitched in accordance with the following plan. Because of conformation of site, lack of sufficient space, or temporary status of the camp, it may at times be desirable to modify the plan, or to reduce the distances between tents.

246. The location of the sinks and of the picket line and transportation will depend upon peculiarities of site, prevailing winds, etc. Their distances from the tents should be those specified in the plans should circumstances permit.

TO MARK OUT THE CAMP.

247. The site having been chosen and base line (front) decided upon, the hospital will be marked out as follows:



Mark the right end of the base line (base point) with a flag or otherwise and measure off the distance required for the front of the camp, viz.: for the field hospital, 200 feet, or 80 paces; mark the left end of the

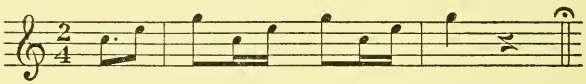
base line. The front of the camp being thus determined, the rear of the ground will now be marked. Place a flag or a man on the base line and 6 feet from the base point; place another flag or man 8 feet from the base point toward the rear and 10 feet diagonally from the first flag or man; the angle thus formed will be a right angle. Place a third marker in the same straight line as the 8-foot side of the triangle and distant from the base point 200 feet, or 80 paces.

The rear line of the camp will be equal in length and parallel to the base line and will be similarly marked. The tents will now be pitched. The position of the door of each tent should be marked by pins properly aligned. The positions of these pins may be determined by pacing or by using a cord or tape with distances marked on it.

Ordinarily it will be found most convenient to pitch first the center line of tents, including the office and the kitchen. With these tents pitched, the work of the hospital can proceed while the remainder of the tents are being pitched and the camp put in order.

HOSPITAL CORPS BUGLE CALL.

248.



Pl. 66, Par. 248.

POSITION OF THE MEDICAL DEPARTMENT ON THE MARCH AND IN CAMP.

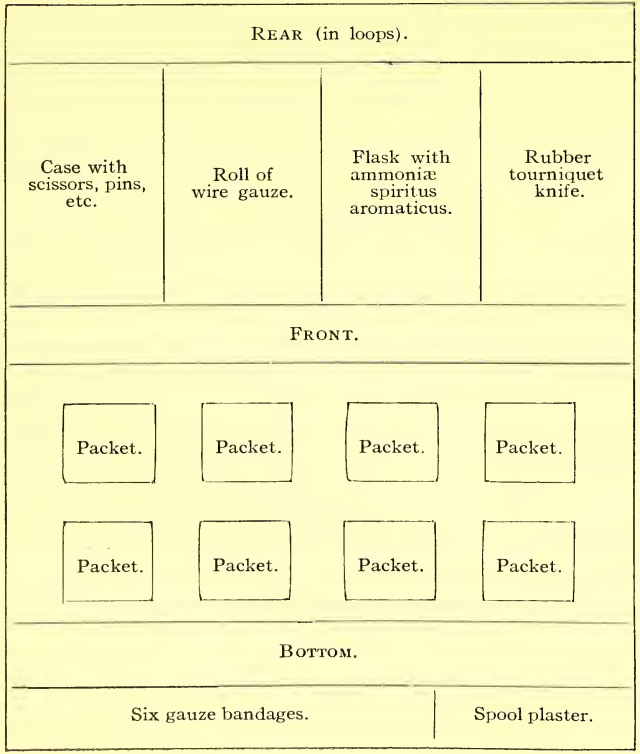
249. The position of the medical department of a marching command is immediately in rear of the rear company, troop, or battery of the organization to which it pertains, and in front of the rear guard.

With each ambulance is a driver and an ambulance orderly.

In camp the ambulances and medical department wagons are parked near the field or regimental hospitals and not with the wagon train.

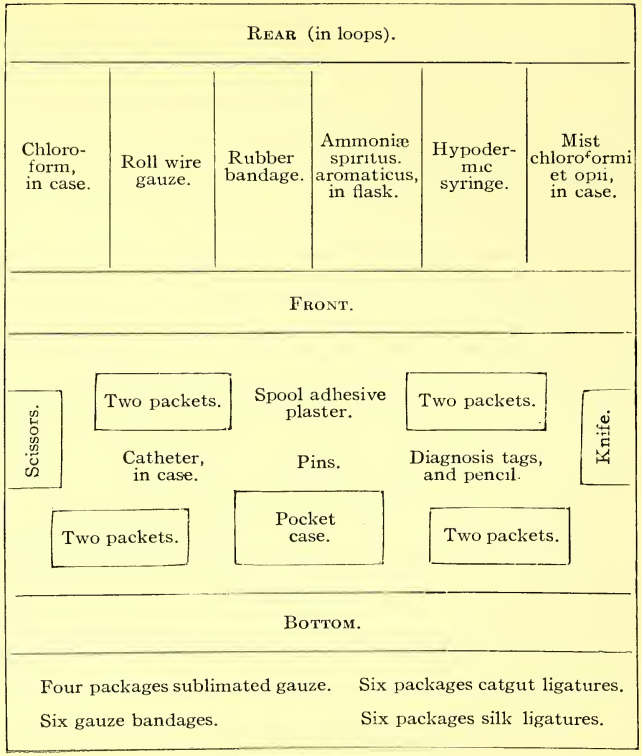
250.

SCHEME FOR PACKING HOSPITAL-CORPS POUCH.



251.

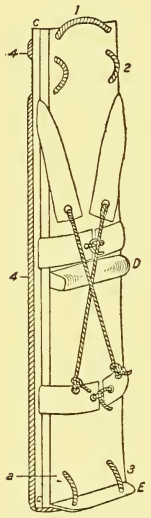
SCHEME FOR PACKING ORDERLY POUCH.



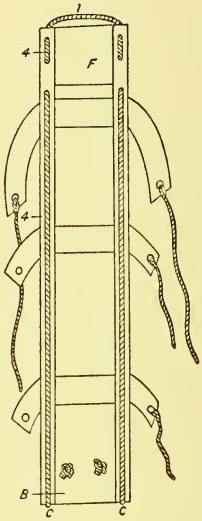
Extract from Drill Regulations for the Hospital Corps United States Navy.

DRILL FOR TRANSPORTATION OF WOUNDED ON SHIPBOARD.

For this drill the board constructed after the following specifications is used:



Front and Side View.



Back View.

Construction of the Board for Transportation of Wounded on Shipboard.—*A*, Pine board, 76 by 14 by 1 inch; *B*, back of same, showing straps beneath board and ends of rope; *C*, pine runners, 76 by 2 by 1 inch, grooved for ¾-inch rope; *D*, pine buttock block, 14 by 3 by 3 inches; *E*, pine foot rest, 14 by 4 by 1 inch; *F*, pine brace, head end, between wooden runners, 10 by 8 by 1 inch; canvas straps, 5 inches broad, to fasten by buckle or lashing; slide between board and runner which is cut for them; reeving rope ¾-inch manila; 1, end loop, for hoisting, dragging, and sliding; 2 and 3, handles for lifting and carrying; 4, buffers and runners: buttock block, foot rest, brace, and runners, screw on to board.

In conditions on shipboard to which the stretcher or bearer methods are not adapted, this board may be used, under the following regulations:

136. Squad in formation; Nos. 2 and 3 procure board and place it on deck, rear of squad, and prepare it for reception of patient; Nos. 1 and 4 prepare patient for removal, and secure him to the board. Board is loaded in accordance with the drill for the stretcher. Then Nos. 2 and 4 take post at the head, 2 at the right becket, 4 at the left; Nos. 1 and 3 at the foot, 1 at the right, 3 at the left; all facing forward.

Board being loaded: 1, *Prepare to lift*, 2. LIFT.

At the first command all the bearers stoop, seize the beckets at which they are stationed, and at the second command slowly rise together: 1. *Forward*, 2. MARCH.

At the second command, No. 2 and No. 1 step off with the left, Nos. 3 and 4 with the right foot.

TO CARRY THE LOADED BOARD THROUGH A NARROW DOORWAY.

137. On approaching a doorway too narrow for the above formation: 1. *Halt*, 2. *Prepare for doorway*, 3. MARCH.

At the first command, the squad halts, at the second, No. 4 assists No. 2 to shift his position to the head of the board, where he faces it and grasps it underneath at the corners. Nos. 1 and 3 perform a similar movement at the foot, No. 1 assisting No. 3. At the third command, No. 4 precedes the board through the doorway, and steadies No. 2 as he backs over the sill, then eases the board as it passes through. No. 1 eases the board through the doorway from his side and steadies No. 3 as he passes over the sill; he then follows.

1. *Halt*, 2. *Resume posts*, 3. MARCH.

At the first command, the squad halts. At the second, No. 4 assists No. 2 to resume his former position. No. 1 performs a similar office for No. 3; Nos. 1 and 4 take their posts and, at the third command, the squad steps off as before.

TO HOIST THROUGH A HATCHWAY WHERE THERE IS NO LADDER SHIPPED.

138. On arriving at hatchway: 1. *Halt*, 2. LOWER BOARD.

At the first command the squad halts. At the second they slowly lower the board to the deck, in position best adapted for hoisting.

1. *Prepare to hoist*, 2. HOIST.

At the first command, Nos. 1 and 4 make their way to the deck above and send down a rope's end prepared for the purpose, which is attached by No. 2 to the head sling.

At the second command, Nos. 1 and 4 pull on the rope from the deck above. As soon as the head begins to rise, Nos. 2 and 3 take hold of the foot of the board on their respective sides, keeping it in as nearly a horizontal position as possible while assisting in lifting. As soon as the head sling can be reached from the deck above, Nos. 1 and 4 draw the board over the combings of the hatch, until the foot of the board rests there, when Nos. 2 and 3 make their way on deck and all resume their posts for *carry*.

TO LOWER THROUGH A HATCHWAY, NO LADDERS BEING SHIPPED.

139. Loaded board halted at *carry* at the hatchway: 1. *Prepare to lower*, 2. LOWER.

At the first command, the board is swung perpendicular to the side of

the hatch, the foot is rested on the combings, and Nos. 1 and 3 release their hold on their beckets and assist in sliding the board over the combing until it rests on its middle. No. 3 then fastens the rope's end to the head becket; Nos. 1 and 4 make their way to the deck below and No. 2 supports the head.

At the second command, Nos. 2 and 3, with one hand on the sling and the other under the corner of the board, on their respective sides, slide it over the combings, allowing the foot to slowly drop until it can be reached by Nos. 1 and 4. Then Nos. 2 and 3 lift the head clear of the combings by the attached rope and lower slowly, Nos. 1 and 4 meanwhile steadying and keeping the board in as nearly a horizontal position as possible, easing it to the deck below, where it rests; Nos. 2 and 3 then go below and all resume their posts for *carry*.

TO TRANSPORT FROM BELOW TO UPPER DECK, THROUGH HATCHWAY OVER LADDER SHIPPED.

140. Loaded board halted at *carry* at foot of ladder: 1. *Prepare to hoist up ladder*, 2. HOIST.

At the first command, the board is swung around until it is in line with the ladder, and the board is raised by Nos. 2 and 4, until it rests on the highest step that they can reach. No. 3 shifts his position to the end of the foot, and grasping both beckets, supports it, being assisted by No. 1; Nos. 1 and 4 now make their way to the deck above and send down the rope's end, which is attached to the head sling by No. 2.

At the second command, Nos. 1 and 4 pull up on the rope, No. 2 keeps the head from getting caught under the steps and assists in lifting, No. 3 gradually lowering the foot until the entire length of the board rests on the ladder. No. 2 now proceeds on deck and assists in hoisting; No. 3 follows the foot up the ladder, and, as the head is lifted from contact with it, prevents the foot from bumping on the steps. As the head reaches the hatch combings, the board is drawn over it by Nos. 2 and 4 at the side, and No. 1 on the rope, No. 3 lifting the foot and assisting in easing it, until it rests on the combings; No. 3 makes his way on deck, No. 1 unbends the rope's end, and all resume their posts for *carry*.

TO TRANSPORT THROUGH A HATCH TO DECK BELOW, LADDERS BEING SHIPPED.

141. Loaded board halted at *carry* at head of ladder: 1. *Prepare to lower*, 2. LOWER.

At the first command, the board is swung around until it is perpendicular to the hatch with the foot at the head of the ladder, Nos. 1 and 3 rest the foot on the hatch combings, and assist in sliding the board until it rests nearly on its middle. No. 3 then fastens the rope's end to the head sling, Nos. 1 and 4 make their way to the deck below, and No. 2 supports the head.

At the second command, Nos. 2 and 3, with one hand on the sling and the other on the corner of the board on their respective sides, slide it over the combings, allowing the foot to slowly drop; Nos. 1 and 4, on the ladder below, steady the foot, and assist in lowering the board until it lies flat on the ladder, in which position it is slid to the deck below, Nos. 2 and 3 easing it, by means of the rope, and following it; Nos. 1 and 4 seize the foot by the beckets and slightly raise it, as it slides over the deck; Nos. 2 and 3 ease the head, as it descends, preventing bumping. When the board lies flat on the deck the squad resume their posts for *carry*.

APPENDIX.

Recent changes in General Orders, made since this book went to press, necessitate the following corrections and additions :

Page 19.—BRASSARD.

General Orders No. 84, War Department, May 5, 1906, specified the dimensions of the brassard as follows: Three (3) inches broad and with the cross three (3) inches in height and width, and with arms one (1) inch broad.

Page 76.—FIRST-AID PACKET.—The following description takes the place of that given on page 76 :

Each soldier in the field is issued a *first-aid packet* for his individual use; it has a hermetically sealed metal cover, and contains two compresses of absorbent sublimated gauze, each sewed to the center of a sublimated-gauze bandage, each bandage being wrapped in parchment or waxed paper, and two safety pins wrapped in waxed paper. The metal case is provided with hooks or loops for attachment to the cartridge belt.

Page 77.—THE LARGER PACKET.—The following takes the place of the second paragraph on page 77 :

The larger or "shell-wound dressing" is wrapped in tough paper with directions for application printed thereon, and each contains 1 square yard of absorbent sublimated (1 :1,000) gauze so folded as to make a pad six by nine inches; stitched to the back of each end of this compress is a piece of gauze bandage three inches wide by forty-eight inches long. The dressing also contains one absorbent sublimated-gauze bandage three inches wide by five yards long, and two safety pins.

APPENDIX.

Page 212.—Diagnosis Tags.—Fig. 200 is to be omitted, and the illustration Fig. 199 is replaced by the following new figure 199.

Diagnosis Tags: A book of diagnosis tags with a pencil attached is contained in each orderly pouch. The diagnosis tags are made according to the following specifications:

Size $2\frac{1}{2}$ by $5\frac{1}{2}$ inches, provided with a copper wire four (4) inches long for fastening to the clothing.

Material to be linen, faced with paper.

All inks and colors used to be "*fast.*"

Twenty-five (25) or fifty (50) to be bound in a book with pasteboard covers.

Form to be as follows:

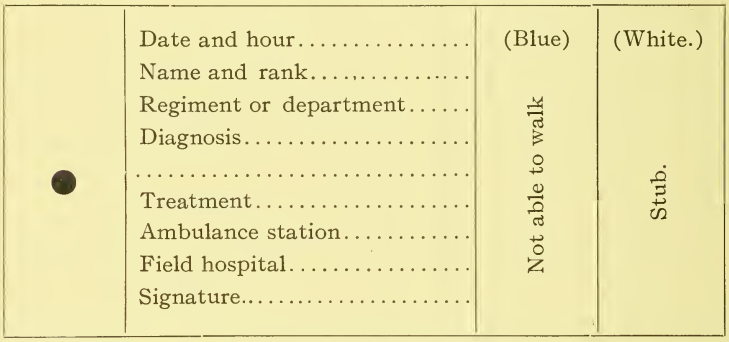


Fig. 199.

The following directions should be printed on the inside of the cover:

1. In any wound or disease not rendering the patient unable to walk, detach the white body of the tag, leaving the colored border attached to the stub. In a wound or disease rendering the patient unable to walk, detach the entire tag, including colored border.

It will thus be always possible to ascertain by the number of colored borders left with the stubs how many of the patients treated were or were not able to walk.

2. Under "Diagnosis" note all essential facts, character of injury, parts involved, fracture, etc.

3. Under "Ambulance Station" and "Field Hospital" note any additional treatment applied. If at either place it is deemed best not to evacuate a desperately sick or wounded patient any further, write the words "not transportable," or the initials "N. T."

4. Under "Remarks" on the back may be noted any important fact for which there is no room on the face, whether operation or treatment is urgently needed, the amount of stimulant or anodynes already administered, etc.

5. Fasten to button on clothing of patient over sternum or as near it as possible (Fig. 199).

Page 466.—THE LITTER.

General Orders No. 84, War Department, May 5, 1906, provide that the litter shall hereafter have attached to it a body strap of webbing to secure the patient to the litter; also that a certain proportion of the litters shall have a light, movable, folding frame to support a light cover.

Page 500.—THE RAPID-TRANSIT GALLOPING AMBULANCE.

The rapid-transit galloping ambulance has been adopted especially for use with cavalry and light artillery. This ambulance is a very light two-wheeled vehicle with shafts; it is provided with springs and is very comfortable. The patient rests in the ambulance on a litter and can be securely strapped in. [It has a substantial top provided with curtains and a hood, thus protecting the patient from rain, wind, and sun.] Any cavalry horse broken to pull by a breast collar can be used to draw it, and it is used with the ordinary cavalry saddle, the driver riding the horse. One man can manage it and load and unload the patient. [The tread is narrow, thus permitting its use in rough and bushy country, and having only two wheels it can be turned about easily. It can be used as a rapid and easy means of taking dressings and supplies near to the dressing stations.]

Page 517.—CONTENTS OF POUCHES.

Note: The following changes in the contents of these pouches have been adopted since this book went to press: Number of packets of gauze increased from four to eight; first-aid packets reduced from eight to four. Number of packages of ligatures in orderly pouch reduced from twelve to six, and a case containing three vials for alkaloidal solutions, and a folding lantern added. A webbing tourniquet is substituted for the rubber bandage in the hospital-corps pouch.

Page 518.—STRETCHERS.

The "Stokes splint stretcher" has been adopted for use by the Navy and also by the Army for use on transports, hospital ships, and batteries at seacoast artillery stations.

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