FIRST AID
AND
FIELD SANITATION

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TABLE OF CONTENTS

SECTION 1

MILITARY HYGIENE AND SANITATION

SECTION 2

PREPARATION FOR THE MARCH

SECTION 3

THE MARCH

SECTION 4

FIRST AID

SECTION 5

REMOVAL OF WOUNDED FROM TANKS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

FIRST AID AND FIELD SANITATION

SECTION 1

MILITARY HYGIENE AND SANITATION

1. Responsibility for Sanitation.—a. Commanding officers of all grades are responsible for sanitation and for the enforcement of sanitary regulations within their organizations and the boundaries of areas occupied by them. Particular attention should be paid to the following:

(1) Instruction in personal hygiene of the command.

(2) The thorough washing of hands after visiting the head and before each meal.

(3) The proper sterilization of mess gear.

(4) Vaccination against small-pox and typhoid fever.

(5) The prevention of venereal disease.

(6) The proper ventilation of quarters, and provision of adequate space therein.

(7) The carrying out of anti-mosquito measures.

(8) The destruction of flies, lice, and other insects.

(9) The purification of non-potable water supplies.

(10) The proper disposal of human excreta and manure.

(11) The proper disposal of garbage.

b. The medical officer, under the direction of the commanding officer, shall supervise the hygiene of the command

and recommend such measures as he may deem necessary to prevent or diminish disease. He should investigate and make recommendations concerning the following:

(1) Training in matters of personal hygiene and military sanitation.

(2) The adequacy of the facilities for maintaining sanitary conditions.

(3) Insofar as they have a bearing upon the physical condition of the troops:

(a) The equipment of organizations and individuals.

(b) The character and condition of the buildings or other shelter occupied by the troops.

(c) The character and preparation of food.

(d) The suitability of clothing.

(e) The presence of rodents, vermin, and disease-bearing insects and the eradication thereof.

2. **Personal Cleanliness.**—a. Every member of the command should bathe at least twice weekly and as often at other times as is necessary to keep himself clean. The face should be washed each morning on arising, and the hands should be washed before each meal and immediately after visiting the head. Teeth should be brushed thoroughly at least once daily.

b. The hair should be kept short, combed and brushed, and the face shaven. Finger and toe nails should be kept short and clean. The toe nails should be cut square across; not rounded at the corners. Clothing and bedding should be kept clean. Soiled articles should not be stowed with clean clothing. Physical inspections should be held frequently and particular attention should be paid to the cleanliness of the men inspected.

3. **Footwear and Care of the Feet.**—a. The greatest single factor in determining the success or failure of a march is the condition of the feet. Shoes and socks must be properly fitted and the feet frequently inspected. The company commander is responsible for the following:

(1) That members of the command are trained in preventing foot disabilities.

(2) That members of the command are equipped with properly fitted shoes and socks.

(3) That periodical foot and footwear inspections are made by a company officer and that all defects are corrected before the command undertakes a march

b. **Methods of Fitting Footwear.**—(1) General.—Each shoe is fitted to the foot of the man so that there will be

no harmful constriction or pressure, or space permitting rubbing between the foot and shoe, when the foot is expanded by the weight of the man's body and equipment. Fitting must be done by actual test, either with or without a shoe fitting device. The inexperienced man, left to himself, almost invariably selects too small a shoe. As the man marches, the foot swells, and later the muscles develop; so that the shoe, at first apparently large enough, is soon too small.

(2) With Shoe Fitting Devices.—These are seldom used. The size of a man's foot is measured, a shoe of appropriate size selected, and a device placed inside to determine whether or not the man, with a pack on his back, can march while wearing the shoe with the device inside.

(3) Without Shoefitting Device.—(a) With the man wearing a light woolen sock, a shoe apparently the right size is selected and laced snugly, and the wearer, with a 40-pound weight on his back, places his entire weight on one foot. The leather in front of the instep above the ball of the foot is grasped between the fingers and thumb. As they are brought together, the leather should be loose enough to prevent the fingers slipping easily over the surface but not to produce a distinct wrinkle. If the leather is too smooth, the shoe is too tight; if it wrinkles, the shoe is too loose.

(b) With the man standing on one foot, and carrying the 40-pound weight on his back, the length of the shoe is tested by pressing in the leather of the cap between the end of the great toe and tip of the cap. This should be about ¾ inch, and the width of the average thumb is usually taken as the correct distance.

(c) Shoes should be thoroughly broken in before being used for marching. After donning light wool socks and the new shoes, the man should stand in about 2½ inches of water for five minutes, and then walk around until the shoes have dried on his feet. While the shoes are wet they will shape themselves to the feet, and if they dry on the feet, they will retain the shape. Later, when the shoes are well dried, preferably on the following day, the shoes may be rubbed with a thick suds of saddle soap, to which a little neatsfoot or castor oil has been added, to restore pliability. Much oil should not be used, as it will render the shoes impermeable to air and cause profuse perspiration of the feet, with softening and maceration of the skin.

c. Socks.—Socks that are too short will tend to cramp the toes, with resultant blisters and corns on the elevated parts of the toes. Socks that are too long will wrinkle and cause abrasions. Only woolen socks should be worn on the march; wool absorbs perspiration and still retains its resiliency; cotton wads down into a hard mass. Woolen socks should be about ½ size larger than cotton socks, to allow for

shrinkage. The following table indicates the correct size of wool socks for the corresponding shoes:

TABLE OF SOCK SIZES, WOOL SOCKS

SHOE SIZE	SOCK SIZE	SHOE SIZE	SOCK SIZE
5—5 ½	10 ½	9—9 ½—10	12
6—6 ½—7	11	10 ½—11—11 ½	12 ½
7 ½—8—8 ½	11 ½	12—12 ½—13	13

Until the feet are hardened to marching, it is advisable to use foot powder. This may be obtained from the sick bay. A standard formula is:

Salicylic acid	3 parts
Starch	10 parts
Talcum	87 parts

Socks that have been darned, or socks with holes are quite apt to cause blisters and abrasions on the march.

d. **Care of the feet.**—(1) Preventive Measures.—If the feet are normal and properly fitting shoes and socks are worn, the avoidance of corns, callouses, and blisters requires little more than the wearing of clean socks, proper care of the toe nails, and attention to the repair of the shoes.

(2) Foot Inspection.—(a) The feet of the men should be inspected periodically by a company officer, and a careful inspection should be made before engaging in a march of over a few hours duration. Particular attention should be given to reddened areas indicative of poorly fitted or defective shoes or socks. If a man is noticed limping on the march, the cause should be sought for at the first hourly halt, found, and corrected. A nail protruding through the bottom

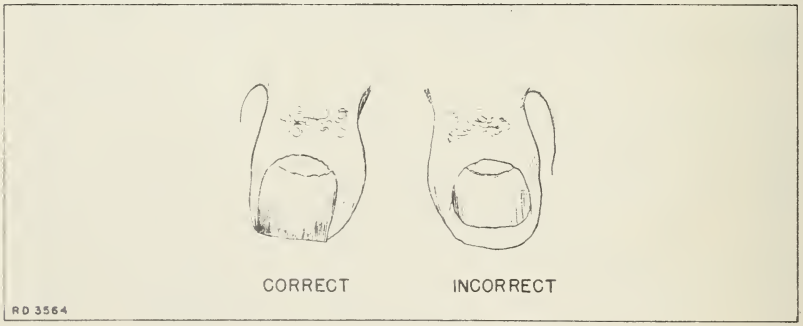

Figure 1.—Correct and incorrect method of cutting the nails of the toe in order to prevent ingrowing toe nails.

of a shoe, or a wrinkled or torn sock forming a blister or abrasion may cause a man to walk in such an abnormal manner as to stiffen him for days. Often the application of a small piece of adhesive and the use of a little foot powder is all that is necessary to prevent the development of a condition that might necessitate a man's discontinuing the march.

(b) At foot inspection look particularly for ingrowing nails, nails incorrectly cut, trichophytosis, callouses, corns, blisters, and abrasions.

(c) Ingrowing nails are usually due to poorly fitting shoes or short socks The nail of the great toe is the one commonly affected. Nails should be allowed to grow out flush with the end of the toe, and then cut square across, Figure 1, not rounded at the corners, as this permits the skin to grow up around the sides of the nail and predisposes to ingrowing nails. If there is a definite ingrowing nail, all pressure should be removed from it by wearing socks and shoes of adequate size, or by cutting out the part of the toe cap that presses on the nail. After soaking the feet in hot water, scraping, not cutting, the middle of the nail with a razor blade, may permit the sides of the nail to lift up.

(d) Callouses and corns likewise usually indicate pressure due to improperly fitting shoes and socks, and this should be corrected. The feet should be soaked in hot water, the corn or callous scraped off, without drawing blood, the feet dried, and the affected area covered with adhesive plaster.

(e) Blisters and abrasions should be washed off with alcohol. The blister should then be pricked by a needle sterilized in a match flame, and the fluid drawn off. Then cover the blister or abrasion with adhesive plaster, dust the feet with foot powder, and put on clean socks. Wool socks must always be stretched before being put on.

(f) Trichophytosis, "toe itch," "Athlete's Foot," is usually associated with sweaty feet, and tends to get well if the shoes are well ventilated. An emergency measure is to lather the feet well with ordinary laundry soap, and then wear only shoes, without socks. Better still is to soak the feet in 1:5,000 potassium permanganate, or paint them with 2% salicylic acid in alcohol, or 1% formalin.

(g) Bad smelling feet may be painted with the salicylic acid or formalin. Use foot powder afterward. If foot powder is not available, any good talcum powder will serve fairly well.

4. Barbers and Barber Shops.—a. Barbers.—Before any person, whether enlisted man or civilian, is employed as a

barber in camp or barracks, he should be required to read and understand the following:

(1) Barbers will be required to undergo a monthly physical inspection and will be given such other examinations and tests as may be necessary to insure freedom from communicable disease.

(2) Barbers will keep their clothing and persons clean, and while attending patrons will wear clean, washable outer clothing.

(3) They will wash their hands thoroughly with soap and water before attending each patron.

(4) Barbers will not sell or give away, without the approval of the medical officer, medical applications for the hair or skin to be used outside the barber shop.

(5) They will not attempt, under any circumstances, to treat pimples, moles, warts, or similar lesions of the skin or scalp.

(6) The application of styptic pencils or other solid styptics to arrest bleeding from cuts is prohibited.

b. Barber Shops.—Barber shops should be established only with the approval of the commanding officer. Before approving an application for the establishment of a barber shop, the commanding officer should assure himself that the proposed location is suitable and possesses the facilities necessary for compliance with the provisions of this paragraph. Barber shops should not be located in squad rooms or rooms where men sleep. They should be properly and adequately lighted and ventilated. The interior of barber shops should be kept thoroughly clean. The floors should be swept at such intervals as not to permit the accumulation of hair or trash. Provision should be made for an adequate supply of hot and cold water and for the disposal of waste water. A freshly laundered towel or sheet of clean paper should be used for each patron. Head rests should be covered with a clean towel or sheet of paper for each patron. All instruments should be thoroughly cleansed and sterilized after each separate use thereof. Sterilization should be accomplished by immersion in an antiseptic solution, preferably 5% compound cresol solution, for three minutes. The use of powder puffs, sponges and neck dusters and the use of shaving cups in common should be prohibited. Shaving soap in the form of cream or powder only should be allowed. The provisions of this paragraph should be posted in the barber shop.

5. **Water.**—See paragraph 26, Sterilization of Water.

6. **Foods and Drinks.** — Foods should be stored, issued, prepared, and served in a sanitary manner. They should, as far as practicable, be protected against sun, heat, dust,

insects, rodents, and other damaging or contaminating agencies. All food supplies received in a station or command, and the places where they are stored or handled, should be subjected to such inspection by the medical officer as the commanding officer may deem necessary. Animals should be inspected by the medical officer before purchasing and after slaughtering. Foods and drinks should not be sold in a command except through authorized exchanges or other agencies inspected and licensed by proper military authority. Men should be prohibited from eating in those places outside a military reservation which on inspection by medical officers have been found to be insanitary. Ice, bread, and fresh meats should be issued daily when practicable, preferably early in the morning.

7. **The Examination of Food Handlers.**—a. No one in the transmission stage of a communicable disease or who is a known carrier of the germs of a communicable disease should be detailed to duty as a food handler. Persons who have recently recovered from an attack of a diarrheal condition are particularly to be excluded, and all food handlers will be instructed that they will be relieved of duty immediately if they develop such a condition.

b. All men detailed to duty as food handlers, including cooks and their assistants, bakers, butchers, messmen, exchange attendants who dispense ice cream and drinks, and any other person who somes in constant and intimate contact with food in other than unbroken packages should be examined by the medical officer before being permitted to handle food, and once weekly thereafter. Mess officers are responsible that their men conform to the provision of this paragraph, and they should further cause food handlers in whom they notice the symptoms or signs of disease to report to the medical officer; pending his report these suspected individuals should not handle food.

8. **Kitchens, Mess Halls, and Bakeries.** — a. Scrupulous cleanliness should be observed in all rooms used for the cooking, storing or serving of food. Men working in such places should wear washable outer clothing, preferably white. Their hands should be inspected daily before going on duty to determine that the hands are clean, and the nails short and free from dirt. Facilities for hand washing and towels should be provided. All openings should be screened, screen doors should open only outward, should close automatically, and should fit tightly. Insects should be eradicated, and all dishes and food protected from dust. When tables are set, all dishes and cups should be faced down.

b. Roaches may be eradicated by cleanliness and care in placing all food and food scraps in places not accessible to

the roaches. A free use of sodium fluoride, drawn from the quartermaster, in all cracks and crevices will usually get rid of roaches. The powder is harmless to men, except when ingested in large quantities, and it is effective against roaches until it gets wet or caked.

c. Flies should be denied access to the galley and mess hall, by properly fitting screens. Those that have entered may be destroyed by fly swatters, poisons, traps, etc.

d. Fly Wires and Fly Paper.—These may be prepared by coating them with a mucilage made by heating together one part by weight of castor oil, and two parts of white rosin. The hot material is stirred until the mass is homogeneous. Care should be taken to prevent boiling. A good grade of white rosin should be used as the crude product renders it difficult to make a homogeneous mixture and produces an odor repellent to flies.

e. Fly Poison.—This consists primarily of 2% formalin in water, about three teaspoonfuls of formalin to a pint of water. Milk or fermented molasses will make the mixture more attractive to flies. The solution must be freshly prepared as the formalin readily evaporates, especially in warm weather. The solution is put around the mess halls in bowls, and small pieces of bread may be dropped in it for the flies to alight on.

f. Fly Sprays.—These must be used in a closed room in order to be effective, and the stunned flies should be swept up off the floor and burned. An effective spray consists of one pound of crude pyrethrum powder soaked in one gallon of kerosene for two to four days. This is used by a sprayer while the room is closed. The pyrethrum powder itself may be used as a dusting powder, sprayed into the room.

g. Fly traps consist of a cone of wire mesh projecting into a larger chamber, also of wire mesh. They should be placed, preferably in groups, near the places where flies breed and congregate, such as garbage stands, galleys, heads, and manure piles. It is important to protect the traps from wind, and to place them on a light surface. Different baits are effective, such as fish, especially shell-fish; two parts of molasses and one of vinegar; fermenting molasses; and brown sugar and sour milk. For details of construction of fly traps see Figure 2.

h. Ants are frequently a nuisance. The easiest method of ridding the galley of them is to locate the nest and pour kerosene or boiling water into it. Most ant poisons contain the highly poisonous arsenic and are unsafe for use around a galley or mess hall.

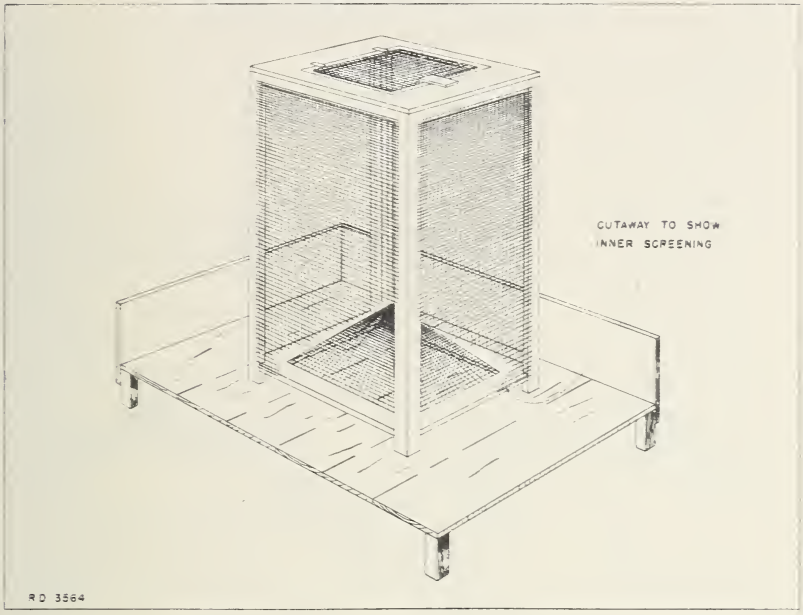

Figure 2.—Fly trap with shield to protect the trap from wind.

9. Cleansing of Cooking Utensils, Mess Gear, etc.—When it is practicable to assemble all dishes, mess gear, etc., this should be done immediately after each meal. The whole should then be washed in hot soapy water, thoroughly rinsed in boiling water, and then actually boiled for five minutes in large containers. When adequate boilers are not available, or when the water supply is inadequate, baking the dishes and mess gear at 212 degrees F. for 10 minutes will serve. Where it is impracticable so to treat dishes and mess gear, as on the march, the means referred to under "Sterilization of mess gear" under "Patrol Camps" should be used.

10. Garbage. — In large or permanent camps garbage is usually incinerated in a standard type of incinerator approved by the medical officer. Burying is the method of choice in most overnight camps.

11. Excreta.—a. A fly-tight box of approved construction (Figures 3 & 4) should be used over deep-pit heads (naval term for latrine). It is absolutely essential to maintain the fly-tight integrity of this box, as otherwise the head will soon

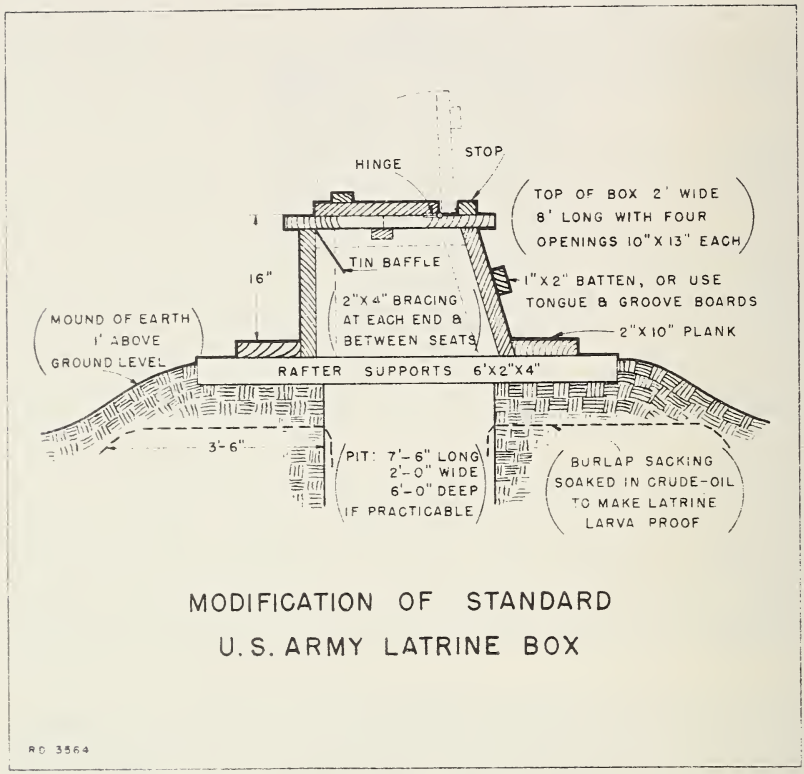

Figure 3.—The latrine in diagram is improved by raising on a mound a foot high. (Mound composed of earth removed from pit.) This mounding of earth prevents rain water from draining into pit from surface causing contents to overflow.

Latrines should be abandoned when filled to one foot from normal surface level.

They should be liberally sprayed with crude oil or covered with quick lime and mounded with earth. Each abandoned latrine should be labeled with a small wooden sign.

When dug in wet soil a foot or two of water often appears in the bottom of the pit. Such water aids in absorption of the contents into surrounding soil and many such latrines exhibit septic action.

BILL OF MATERIALS

	ONE BOX AND ENCLOSURE	TWO BOXES AND ENCLOSURES
TOP OF BOX	2 PCS 1"X12"X8'-0"	4 PCS 1"X12"X8'-0"
FRONT OF BOX	2 " 1"X8" X8'-0"	4 " 1"X8" X8'-0"
REAR OF BOX	2 " 1"X10"X8'-0"	4 " 1"X10"X8'-0"
ENDS OF BOX	1 " 1"X8"X8'-0"	2 " 1"X8"X8'-0"
SEAT COVERS	1 " 1"X12"X7'-0"	2 " 1"X12"X7'-0"
" "	1 " 1"X2"X7'-0"	2 " 1"X2"X7'-0"
BATTENS & STRIPS - (IF T AND G MATER-	8 " 1"X2"X8'-0"	16 " 1"X2"X8'-0"
FRAME FOR BOX IAL IS USED OMIT	1 " 2"X2"X4'-6"	2 " 2"X2"X4'-6"
" " " BATTENS)	2 " 2"X4"X9'-0"	4 " 2"X4"X9'-0"
FRONT PLANK UNDER BOX	1 " 2"X10"X8'-0"	2 " 2"X10"X8'-0"
REAR " " "	1 " 2"X6"X8'-0"	2 " 2"X6"X8'-0"
END PLANK	1 " 2"X6"X3'-0"	2 " 2"X6"X3'-0"
" "	1 " 2"X12"X3'-6"	2 " 2"X12"X3'-6"
" STRIP	1 " 1"X6"X2'-9"	2 " 1"X6"X2'-9"
POSTS	10 " 10'-0"	12 " 12'-0"
BOARDING - (1" BOARDS OR EQUIVALENT IN	48 " 1"X12"X6'-0"	66 " 1"X12"X6'-0"
BATTENS OTHER WIDTHS IF	48 " 1"X2"X6'-0"	66 " 1"X12"X6'-0"
PAPER BOARDING IS USED)	2 ROLLS	3 ROLLS
STRINGER - IF ROOF IS USED	1 PC 2"X6"X14'-0"	1 PC 2"X6"X12'-0"
" " " " "	2 PCS 2"X4"X14'-0	2 PCS 2"X4"X8'-6"
RAILS	8 " 2"X4"X12'-0"	2 " 2"X4"X8'-6"
NAILS	3 LBS. 20d	4 LBS 20d
"	8 " 10d	12 " 10d
"	4 " 8d	9 " 8d
STRAP HINGES	4 PR. 4 IN.	8 PR. 4 IN.
FLAT-HEAD SCREWS	4 DOZ. NO. 8	4 DOZ. NO. 8
GALVANIZED-IRON URINAL TROUGH	1 PC. 6"X6"X3'-0"	1 PC. 6"X6"X3'-0"
WROUGHT-IRON PIPE	1 " 1"X11/4"X1'-4"	1 " 1"X11/4"X1'-4"
" " " BENT AS SHOWN	1 " 1"X11/4"X4'-0"	1 " 1"X11/4"X4'-0"
I.C TIN	1 SHEET 20"X28"	2 SHEETS 20"X28"
LABOR-CARPENTER	20 HOURS	32 HOURS

LATRINE BOX AND ENCLOSURE

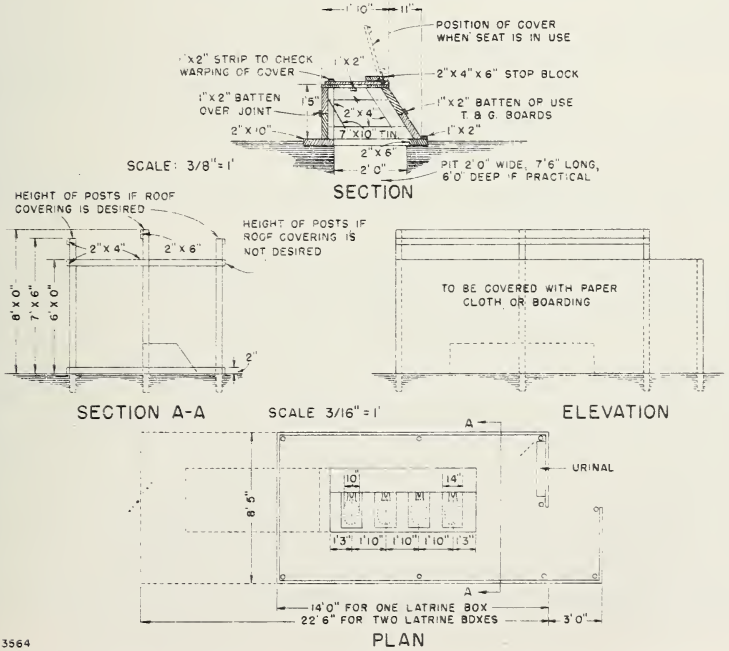

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Figure 4.—Bill of materials and plan for latrine box and enclosure.

become a menace to the command. All cracks should be tightly covered, preferably by strips of burlap or wire mesh. The bottom of the box should fit tightly against the ground.

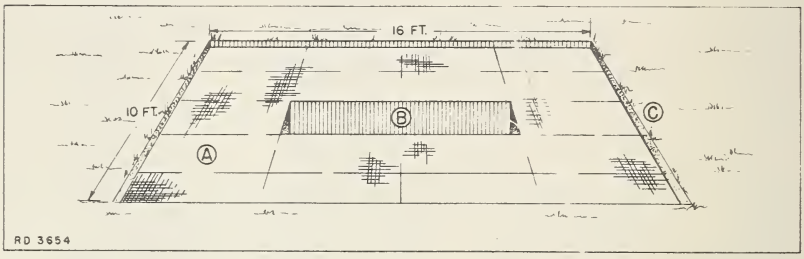


Figure 5a.—Method of flyproofing latrine pit. A—Oil soaked burlap extending completely around pit. B—Opening of pit. C—Side wall of excavation in which burlap is placed.

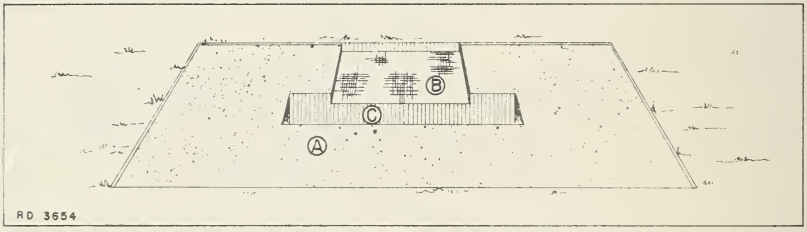


Figure 5b.—Method of flyproofing latrine pit with oiled burlap. A—Layer of earth replaced and tamped down over burlap. B—Oiled burlap exposed before replacement of earth. C—Opening of pit.

b. For details of constructing and flyproofing latrine boxes see Figure 5.

c. A screen should be erected around the head, and a trench six inches deep should be dug to drain off water. The head should be covered, usually by a tent fly. A head orderly should be assigned to keep the head in proper police. The pit should be burned out or sprayed daily. Burning is usually done with kerosene and hay, straw, or paper. Spraying is done with a spray pump and crude oil, spraying both the pit and the inside of the box. Seats should be scrubbed down with soap and water daily, and twice weekly with a solution of six ounces of compound cresol solution in a pail of water. After using the cresol solution, the seats must be thoroughly flushed with water, and men prevented from using the seats until this has been done, as it may cause a severe burn. The cresol should be drawn from the police tent as used, and on no account be permitted to remain in the head area.

d. If the pit becomes infested with flies, one of the seat covers should be kept up and a fly trap placed over the hole.

e. The head should be lighted at night.

f. A trough urinal, lined with tar paper or tin, or constructed of galvanized iron, is arranged to drain into each pit.

g. Facilities for hand washing are, when practicable, provided at each head.

h. Urinal cans are provided in each company street at night, emptied into the heads each morning and coated inside with crude oil, or burned out.

12. Manure. — a. Manure and refuse from corrals and picket lines are, except when used for fertilizer, hauled at least a mile from camp, and composted or burned. In general, burning is an economic waste of valuable fertilizer, but when necessary may be done by arranging the manure in windrows with or without the addition of crude oil.

b. Composting is done by dumping the manure in piles about three feet high and five feet wide at the base, and then covering with earth about six inches deep. The mass is beaten down firmly, care being taken to ramp up the sides where fly maggots chiefly breed. The edges of the pile should be sprayed with borax solution, (4 ounces to the gallon) using about one quart of solution to each square foot, and the ground around the pile should also be sprayed for a width of one foot. If borax is not available, crude oil may be substituted.

c. The principle of composting is that the manure pile develops sufficient heat to kill the fly larvae, and covering the layer with soil prevents the flies from depositing their eggs in the manure, at the same time preventing rain from washing away the soluble and valuable fertilizing ingredients.

d. The pollution of streams by waste or drainage from a camp is particularly to be guarded against when the stream may serve as a real or potential source of water supply to any other organization or to a civil population.

13. The Housing of Troops.—a. Air space and ventilation in barracks and tents.—(1) In squad rooms at least 60 square feet of floor space and 720 cubic feet of air space should be provided for each occupant. In the determination of air space any height of the room over 12 feet should not be considered. The man capacity of each squad room may be stenciled on the doors: "Authorized Capacity ____ Men." Beds should never be grouped. If the space between the side bars of adjacent beds is not as much as five feet, the men should be

required to sleep with the head of one man opposite the feet of the two adjacent men. When this alternating arrangement is used, the beds should be made up in this way for morning inspection, in order that the proper arrangement may be readily verified. This alternating or "head to foot" arrangement is particularly desirable in the presence of an unusual number of cases of respiratory infection as measles, common cold, influenza, etc.

(2) All squad rooms, and other places where men sleep should be adequately ventilated, day and night. Sleeping men should not be exposed to drafts. Tents may be adequately ventilated by opening the flaps or rolling up the sides when required. Good ventilation requires that the air contain a certain amount of moisture, and that it be cool, in gentle motion, and free from offensive body odors, poisonous and offensive fumes, and large amounts of dust. Organization commanders are responsible that all occupied barracks and tents are properly ventilated, particularly after midnight.

b. The Care of Floors.—The floors of all buildings, permanent and temporary, may, when such practice appears desirable, be treated with floor oil, wax, or similar preparation, but this in no way diminishes the necessity for scrubbing the floors with soap and water at such intervals as may be necessary to keep them free from dirt.

c. Tents.—Tent walls should be rolled up daily, weather permitting. Tents should be furled or struck at frequent intervals so that the sites may be sunned.

14. **Mosquitoes.**—a. In addition to the annoyance caused by their biting, these insects are instrumental in the transmission of certain diseases, namely malaria, dengue, yellow fever, and certain types of filariasis. Only the female mosquito bites, and it is during the act of biting that she injects the germs of the disease.

b. In their development, the mosquito eggs are deposited in water and there pass into the larval or "wiggler" stage and the pupal or "tumbler" stage. About 9 to 12 days in water is required for the development of the mosquito from the egg to the adult stage. The larvae of all mosquitoes are air breathers, and when they come to the surface of the water to breathe, a coating of oil on the water destroys them. (Figure 6.)

c. Different species of mosquitoes prefer different localities for breeding, but ditches, swamps, marshes, the edges of streams and ponds, cisterns, tin cans, hoofprints, and any other place where water may stand should be considered as possible breeding places.

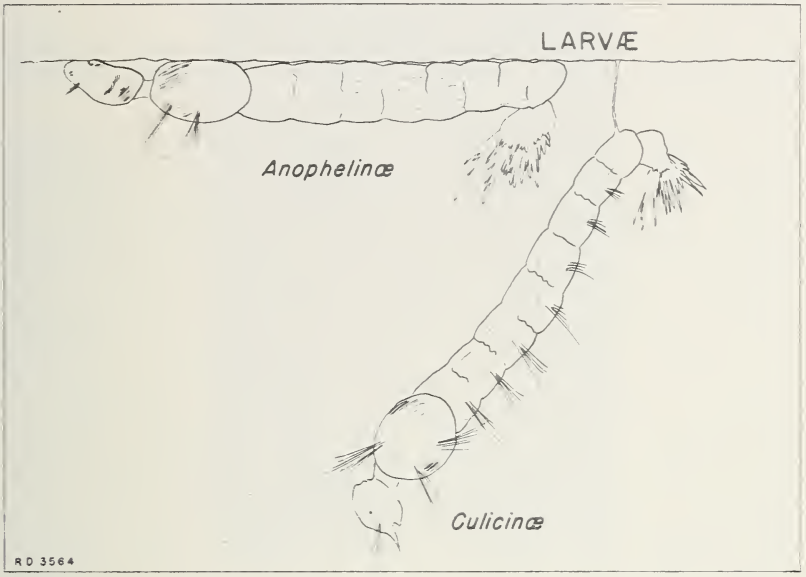


Figure 6.—The larvae (wiggle tails) of the malaria transmitting mosquito—**Anopheles**—lie parallel to the surface of the water.

The **Culicine** larvae possess a larger head, and hang away from surface of the water, being suspended by a prominent syphon, or breathing tube. (Manual of Military Hygiene, Royal Army Medical Corps.)

d. Mosquitoes may be exterminated by:

(1) The destruction of the breeding places by oiling, dusting, draining, or filling. Where these methods are impracticable, as in wells or cisterns of drinking water, stocking with small fish, "mosquito fish," is practiced.

(2) The destruction of the adult form by the removal of tall grass or underbrush in which the mosquitoes take refuge.

e. Protection of persons against mosquitoes is accomplished by:

(1) The screening of occupied buildings by wire, 18 meshes to the inch, and by frequent inspection and replacement of such screens as are broken or improperly fitted.

(2) Use of mosquito nets.—During the mosquito season, nets should be used over all bunks not in perfectly screened buildings. Nets should be slung and inspected for holes once weekly. During the day nets should be rolled tightly, and at night should be suspended from the rods, and the lower edges of the nets tucked in under the mattress or

pad. If mosquito borne disease is prevalent, a nightly inspection should be made to insure that mosquito nets are being properly used.

15. Flies. — a. General. — These frequently are of great importance in the transmission of disease to man. Flies breed in and feed upon filth. Flies are capable of transmitting the germs of dysentery, typhoid and para-typhoid fevers, epidemic diarrheas, worm infections, tuberculosis, and other diseases. The germs of these diseases are present in the excreta of infected individuals, and flies feeding on or breeding in such excreta become contaminated with the organisms and deposit them on food, mess gear, in water or in open wounds. The female fly usually lays about 500 eggs in batches of 75 to 200 each. These eggs are deposited in moist, fermenting material as human excreta, manure, garbage, moist paper, or other refuse. The eggs usually hatch in about 24 hours into the larval or "maggot" form. The larvae reach their full development in 4 to 8 days, migrate into dry earth and develop into pupae, a brown seed-like form slightly smaller than the larvae. In from several days to several weeks, the adult fiy emerges from the pupal case and makes its way to the surface of the earth. The adult fly does not increase in size after it emerges from the pupal case. Adult flies may be destroyed by methods previously described.

b. The elimination of food materials for flies.—All waste materials upon which flies commonly feed should be destroyed by burning or burying. Food supplies should be protected, and garbage, manure, and excreta disposed of as previously described.

16. Lice.—a. These are capable of transmitting the causative organisms of epidemic typhus fever, trench fever, and relapsing fever. The lice infecting man are of three common types, the body louse, the head louse, and the pubic louse or "crab."

b. Body lice (Figure 7), live and lay their eggs in the clothing, particularly along the seams of both underclothing and outer clothing. They are rarely present on the body except when feeding. The body louse is the most difficult to eliminate and the most important in the spread of disease. They readily pass from person to person when such persons sleep near each other or exchange clothing. Their spread is favored in places where persons are crowded together and have insufficient bathing and laundering facilities. The elimination of the body louse and its eggs may be accomplished by disinfecting the clothing, preferably by steam or hot air, or by pressing the garments with a hot iron, paying particular attention to the seams. Immersion in gasoline will destroy the lice, but

Figure 7.—Pediculus humanus corporis (body louse).

not the eggs. Maintaining a high standard of personal cleanliness by frequent and thorough bathing is deterrent to lice.

c. Head lice.—These live and lay their eggs on the scalp and the hairs of the head, the eggs being visible, attached to the hairs. Elimination is accomplished by clipping the hair short, applying a solution of vinegar, followed in a few minutes by the application of kerosene to the scalp. Several hours later the scalp is thoroughly shampooed and a search made for such eggs as may have escaped destruction.

d. Pubic lice. (Figure 8).—These live and breed on the skin and hairs of the body, especially around the genitals. The treatment used for head lice is effective, but the man should be disrobed until the kerosene has been washed off. A clean change of clothing should then be donned.

17. Bedbugs.—a. These have not been definitely incriminated as a carrier of disease in the United States, but their presence is indicative of a low standard of cleanliness. They

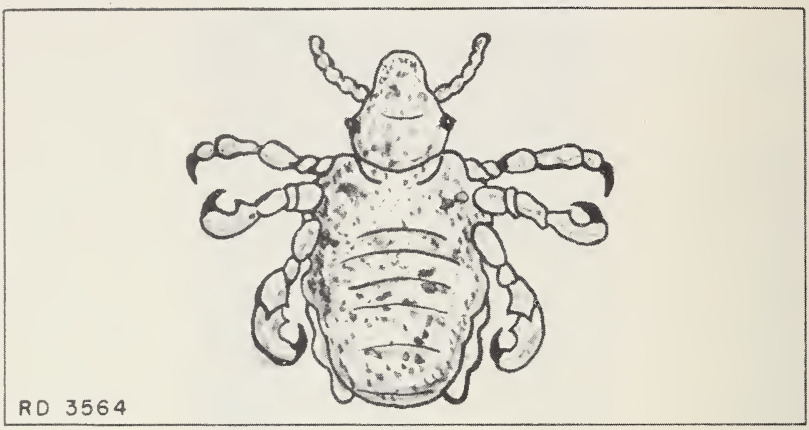


Figure 8.—Phthirius pubis (crab louse).

live in the cracks and crevices of buildings, in the joints and cracks of furniture, and in the seams and folds of mattresses. The bugs themselves are sometimes difficult to discover, but sheets may show spots of blood and excreta, and the body of the man may show evidence of biting. In inspecting a barracks, lifting the foot of the bunk and rapping it sharply on the deck is usually sufficient to dislodge a few bugs from an infested bunk and they may be seen lying on the deck.

b. Rooms infested by bedbugs should be disinfected with sulphur fumigation. This is properly a function of the Medical Department. All cracks and crevices in walls should be closed with mortar, cement, or putty. Metal work should be greased. Furniture and bunks may be disinfected by a liberal application of kerosene, followed by sunning for a few hours. Mattresses and bedclothes should be treated by steam disinfection. Where this is impracticable, on a hot sunny day the mattresses and bedclothes may be sprinkled with gasoline, piled up, and the pile covered with a tarpaulin. This should be left in the hot sun for several hours.

18. Ticks (Figure 9).—a. These are exclusively bloodsuckers, and, as far as is known, take no other food. Certain forms transmit tularemia and Rocky Mountain spotted fever. The importance of the tick in the transmission of the latter disease has become increasingly apparent in recent years. Formerly this disease was believed to exist only west of the Mississippi River, but now it has become recognized in all of the Eastern States except those of New England.

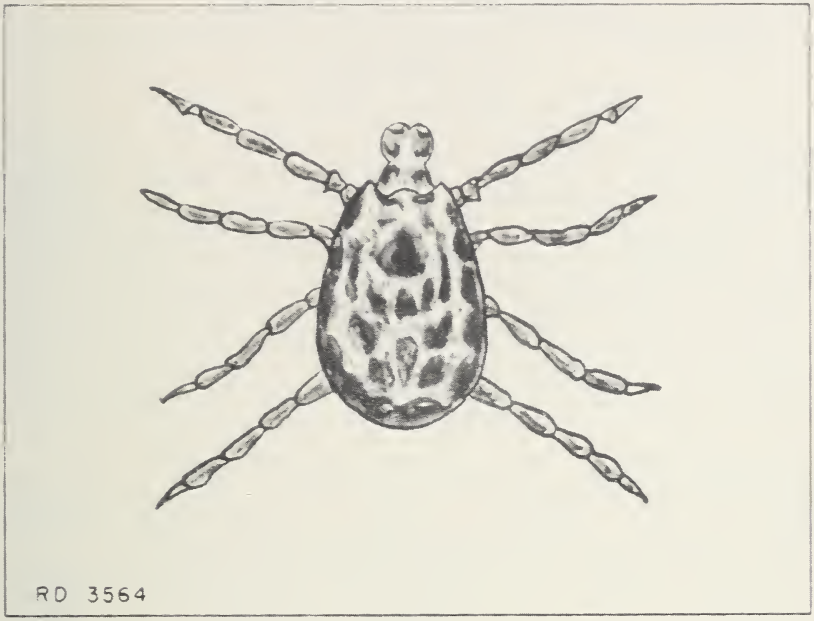


Figure 9.—Dermacentor andersoni (wood tick).

b. Men who work in a tick-infested area should examine their bodies immediately if they have a sensation of anything crawling on them, and should make a careful search of themselves each evening. Ticks which are firmly attached to the skin may usually be removed by painting them with kerosene. In pulling off the tick care should be taken not to break off the mouth parts in the skin. The wound made by the mouth parts of the tick may be sterilized by probing it with a needle dipped in pure carbolic acid.

19. **Fleas.**—a. These are not only a source of annoyance to men, but some fleas transmit bubonic plague. Buildings frequently become infested with fleas from dogs, cats, or rats. Pet animals may be freed of fleas by washing in a three percent cresol solution. In rooms, fleas may be destroyed by sulphur fumigation, or by sprinkling the floor with crude naphthalene or powdered pyrethrum, using one pound to every 50 to 100 square feet of floor space and keeping all doors and windows closed for six hours.

b. A thorough scrubbing of a house with soapy water containing 10 to 15 percent kerosene will usually rid the house of fleas. All cracks and crevices must be cleaned, and dirt floors should be thoroughly wet down with the solution.

COMMON INSECTS CONCERNED IN DISEASE TRANSMISSION IN THE FIELD

Common Name	Species	Common diseases transmitted	Breeding Places	Life History	Range of flight
Flies	Musca domestica	Typhoid fever, Cholera, dysentery diarrhea, smallpox, Erysipelas.	Manure, garbage, decaying organic matter	Eggs hatch out in 12 to 24 hours in larvae; larvae grow rapidly and in 4 to 5 days become pupae (resting stage). In 2 to 4 days mature into adults.	Several miles.
Mosquitoes	Anopheles	Malarial Fever	Rural stagnant pools, among grass and rushes, swamps and marshes.	Ova deposited in mass of 250 eggs, 2 to 4 days hatch into larvae, and in a week reach pupae or wingless resting stage; in 2 or 3 days develop wings and become adult mosquitoes.	One-half mile, usually against wind.
Mosquitoes	Stegomyia	Yellow Fever	Domestic, develop in water in any container near a house or in gutters, cisterns, spouts, etc.	Female lays about 70 eggs, larvae hatch out in 2 days and develop into pupae in 1 week; then in 2 or 3 days become mature adults.	Maximum 75 feet. Usually hide in nooks away from wind.
Lice	Pediculus	Typhus Fever, relapsing fever.	Breed and spend their entire life on warm blooded animals, including man.	Eggs cling to hair or clothing of host (man); they hatch out in 3 to 4 days and mature in 10 to 15 days.	Do not travel much; keep close to one host

SECTION 2

PREPARATION FOR THE MARCH

20. **Elimination of the Physically Unfit.**—Usually some men may be eliminated by the organization commander, from his own knowledge of their physical condition. Doubtful cases should be referred to the medical officer, or in the absence of one, to the company hospital corpsman. The following classes, being particularly apt to break down and hinder the operation of an organization, should usually be left behind:

a. Those who have been recently ill, and especially those who have recently had malaria, dysentery, jaundice, or a venereal disease.

b. Those suffering from deformities or diseases of the feet, particularly flat-foot, hammer-toes, bunions, corns, or severe "Athlete's foot."

c. The old or fat, or those of obviously poor physique from any cause.

d. The neurotic or mentally unstable; and the alcohol addicts.

21. **Clothing and Equipment.**—a. Clothing should be inspected to determine its condition of repair and suitability for protection from the elements. Shoes should be given special attention to determine fit and condition. New shoes, though of the correct size, will usually give trouble on a march. Flannel shirts should always be worn in the field.

b. Ponchos, during the rainy season, should usually be taken on overnight patrols. In malarious countries mosquito nets are requisite, and should be kept in repair.

c. Canteens should be filled with potable water, and, in warm weather, the cover should be wet to cool the canteen by evaporation.

d. The Lyster bag, if carried, should be carefully inspected for leaks, particularly at the taps, and should be cleansed and dried. Sufficient ampoules should be carried for chlorination for the duration of the patrol. Four to six yards of muslin for straining trash from the water should be wrapped around the ampoules, and the package wrapped in the cover of the Lyster bag and placed inside the bag. Inspect the lines used to support the bag, and drop them inside. Then

roll up the bag and stow it so that it will not be chafed in carrying. Chafing will soon ruin the bag. Repairs to holes may be made when necessary with tire patches.

e. Water cans, for transportation of water, should be cleaned. When a patrol is going into unfamiliar country where the existence of an adequate water supply is doubtful, drinking water may be transported on pack animals, either by using specially constructed tanks, or by lashing 5-gallon cans on a pack-saddle.

f. Though flash lights and lanterns are carried, it is often advisable to carry a small reserve supply of candles and matches, the matches being wrapped in a water-proof container.

g. Canned goods should be inspected for swelling of the top due to deterioration of the contents with gas formation, for leaks, and for bad dents. Such cans should be rejected.

h. Dry stores that may be injured by water should be carefully protected during the rainy season. On long patrols an extra supply of salt, sugar, and jam should be carried. The body loses much salt from perspiration and there may be ill effects if this is not replaced. Much of the energy of the body comes from the oxidation of glycogen, "animal starch," and this is readily replaced by jam and sugar. Troops on the march rapidly become "salt-hungry" and "sugar-hungry." In countries where the water supply is poor it is advisable to include plenty of tomatoes.

i. On patrols to which a hospital corpsman is not attached, it is advisable to carry several additional first aid packets, tubes of iodine, and a small roll of adhesive. For at least 30 minutes after applying iodine to the skin, do not bandage over it or the iodine will burn the skin. If alcohol is available, the iodine may be washed off with it and the skin may be promptly bandaged. Never put iodine and a mercury preparation, as "santitube ointment" or "blue ointment," on the same skin area or a chemical reaction will occur, forming a new compound that is extremely irritating.

j. A few "sanitubes" should be carried, not only for the treatment of certain skin diseases but for prophylaxis.

SECTION 3

THE MARCH

22. General.—a. The conduct of marches must of necessity vary considerably with the condition of the men, their state of training, the condition of the roads, the climate, the weather, the tactical situation and various other factors. The men should not arrive at their destination in a state of exhaustion. They should be kept in condition for marching at all times and this is best done by practice marches. Practice marches should be on a graduated scale, the length of the march and the amount of equipment carried being gradually increased, until the men are able to march 15 miles a day with full packs and still arrive at their destination in good condition.

b. When practicable, marches should begin in the early morning after ample time has been allowed for the men to breakfast, for animals to feed and water, and for animals and vehicles to be packed. Breakfast should be light and easily digestible.

c. The march should begin and end slowly, warming up the troops slowly and cooling them off gradually.

d. Foot troops do not, as a rule, start before broad daylight, and troops accompanied by animals an hour later. Men and animals get their best sleep in the early morning. Usually animals will not water before daylight. During the heat of the day, especially in the tropics, the troops may halt from 11 a.m. to 2 p.m., when the march may be resumed, but generally troops prefer to finish a march as soon as possible. Arrival at a strange place after nightfall occasions difficulties otherwise avoidable.

e. The first halt should be made after marching ¾ of an hour, and should be of about 15 minutes duration, so that the men can adjust their equipment and attend to the calls of nature. For this reason the halt should not be made near any habitation unless there are ample toilets available. **Every man should carry a small supply of toilet paper.** Before

the men fall out, warn them that if they have anything to do, do it at once. Otherwise some men will delay until just before the expiration of the halt, and will delay the organization or straggle behind. Organization commanders should designate areas for use as heads, and the men should use only the designated areas, digging straddle trenches for their excretions, and filling in these trenches before the march is resumed. This is essential, as otherwise every good camp site on a route of march may soon become so fouled as to be unfit for use.

f. After the first halt, troops usually halt 10 minutes every hour. Halts of more than ten minutes allow the muscles to get stiff. During a halt, the men should unsling their packs, if carried, as otherwise they will receive little benefit from the opportunity to rest.

g. Intervals of marching may be modified slightly to take advantage of any good halting places, such as those with clean, dry sites, affording shade in summer or protection from the wind in winter.

h. Men should not be permitted to sit on cold or wet ground; if nothing else is available they should use their packs.

i. Long halts in good weather are not desirable unless the march be more than 15 miles. In such cases, a halt of an hour may be made at meal times on favorable sites.

j. Small patrols frequently omit the noon meal. In such cases it is well to allow a couple of extra hardtack at the morning meal and permit the men to eat these at noon.

k. The effects of exposure to the sun may be modified by wearing leaves or a moist handkerchief in the hat, and the use of smoked glasses.

l. If men are compelled to wear caps in a hot sun, the addition of a handkerchief so disposed as to cover the back of the neck will to some extent compensate for the absence of a hat brim.

m. If the temperature is high and the atmosphere humid, in order to prevent heat exhaustion the men should march in file on each side of the road, leaving the middle of the road open. Shirts and collars may be opened and the sleeves rolled up, but the danger of sunburn should be considered. Until they are well tanned, men should not expose their skin to sun for more than thirty minutes. Light complexioned individuals, especially those who are blue eyed or red haired, are very susceptible to the sun's rays.

n. The junior battalion medical officer marches at the rear of the column to render assistance when needed. At the

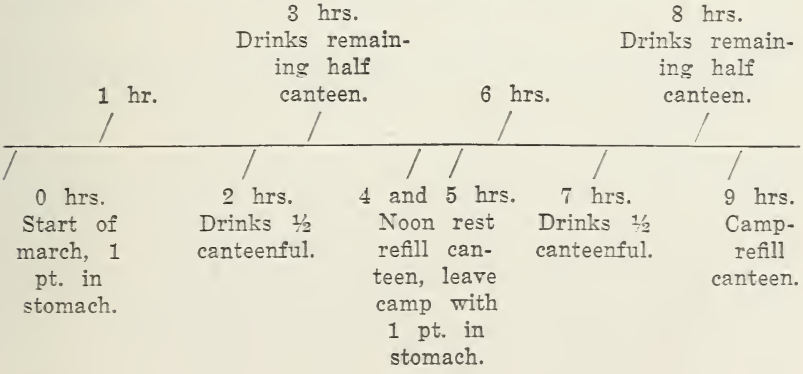
halts, the sick may be attended to, and when ambulances are accompanying the troops, the medical officer issues passes to allow sick or disabled men to ride.

o. Muscular activity creates heat, which is measured in calories. A calory is the amount of heat required to raise one liter (about one quart) of water one degree Centigrade. On a march of 15 miles, about 1300 Calories of heat are generated, and in order to keep the body temperature within normal limits, this heat must be dissipated. Unless the weather be cold, this dissipation of heat must take place largely through the evaporation of perspiration. The evaporation of one quart of water will remove about 600 Calories, so that on a 15-mile march, and at its end, a little over two quarts of water are necessary to replace the amount of water lost.

EFFECTS OF WATER LOSS.

Miles Marched	Quarts Evaporated	If water is not replaced. Soldier's condition.
7½	1	Habit thirst.
15	2	Thirst of necessity.
22	3	Marked inefficiency.
30	4	Danger.
45	6	Death.

p. Water should be drunk only at halts. Each man should drink one pint of water after marching three hours, and thereafter about ⅓ pint of water hourly. By this means, a steady supply fully adequate to meet the requirements is afforded and the amount of body fluids kept well within normal limits. This is applicable to moderate climates, but in hot climates a larger amount of water is necessary. Raw troops will often drain their canteens at the first halt unless they are kept under careful supervision. If tank trailers are used, post a guard over each to prevent waste.



q. Excepting the care of the feet there is no other element of the march which has so direct an influence upon the welfare of the troops as has the proper use of drinking water.

r. The normal body temperature is 98.6 degrees Fahrenheit, but on the march this may rise up to over 100 degrees. This is physiological; a warming up of the body machine.

23. **Bivouacs.**—a. When the location of the next bivouac is not definitely known, begin looking for a favorable site at least three hours before sundown. To delay longer may mean an uncomfortable night. In peaceful territory inquiries may be made of friendly natives as to the location of a good bivouac area, but this is inadvisable in a hostile region.

b. Search for a level or slightly rolling, cleared, dry, well drained field with firm turf free from stones, stubble, and brush, and ample in size to accommodate the command without crowding. Watch the drainage lines, as such a site is often found on the banks of streams, and water is essential to a good camp site. Fuel and forage should be in the bivouac area, or nearby, or, in inhabited territory they may be procured from natives.

c. The vicinity of swamps, marshes, and native houses should be particularly avoided because of the danger of insects and disease. Recently used areas are undesirable unless they have been left in good police by well trained troops.

d. Dry stream beds and ravines are undesirable because of warmth, poor ventilation, and the danger of floods.

e. In warm weather, an eastern exposure is desirable, and the prevailing winds should have full access to the area.

24. **Patrol Bivouacs.**—On approaching a bivouac area, working details should be assigned to procure water and fuel, to dig heads, to dispose of wastes, to sterilize water, and to sterilize mess gear. On a large patrol, these details should be in the advance guard before the halt, as this work must be begun immediately.

25. **Sanitation of a Temporary Camp.**—a. Procurement of Water.—(1) When the source of water is a stream, the water for cooking and drinking should be drawn upstream; next below this the animals should be watered; and below this the men should bathe and wash clothes. With a large or poorly trained patrol, it is usually necessary to mark the areas and establish a water guard to insure that water is used only in the authorized areas. (Figure 10.)

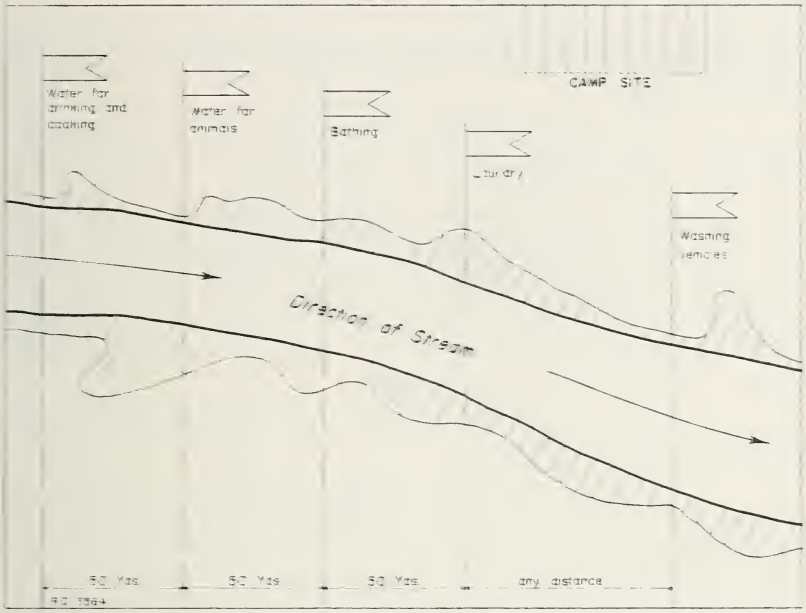


Figure 10.—Protection of water supply by proper use of stream from which water is taken for various purposes.

(2) Cans or buckets used to draw water should be rinsed and cleaned before using them to carry water. The water should not be roiled unnecessarily. It is usually best to draw the water from a place with a rocky or sandy bed.

(3) When water is drawn from a well, the containers used should be cleaned before dipping, and care should be taken not to dislodge dirt into the well, nor to soak the ground around the well or permit drawn water to run back into the well.

(4) The first water drawn should be used to fill the Lyster bag, and the next should be placed in vessels for boiling for galley use and sterilization of mess gear.

b. Procurement of fuel.—Suitable fuel should be procured and a galley fire started. Near the area designated for eating another fire should be started and water placed on it in cans suitable for sterilization of mess gear.

c. Digging of heads.—(1) To prevent soiling of the camp site, the digging of straddle-trenches should be begun immediately. The men should be cautioned to contain themselves until these trenches are ready for use. Often these trenches are called "1 - 2 - 3 trenches" as they are one foot wide, two feet deep, and three feet long. These trenches

are used for bivouacs and short temporary camps, and should not be confused with the deep-pit heads used in more permanent camps.

(2) One straddle-trench should be dug for each ten men. For esthetic reasons, separate trenches, each three feet long, are preferable to one long trench.

(3) The dirt that is removed should be piled at one end of the trench, leaving a firm foothold on each side. Put a can or shovel on each pile of dirt so that each man can cover the excrement and toilet paper as soon as he is through. If the excrement is left exposed, flies crawl on it, and then flock around the galley and crawl over the food, spreading disease throughout the command.

(4) An ample supply of toilet paper should be provided, and in the rainy season the paper should be protected by cans or canvas.

(5) Straddle-trenches are preferably located on the leeward side of camp, well away from the galley, and 50 to 100 yards away from the bivouac area. They should be on fairly high ground, with due regard for the danger of flooding in the rainy season. It is important to so locate the trenches that they will not drain into a stream or well and contaminate the water. In thickly inhabited regions they should be screened from vision with brush or fabric.

(6) Before breaking camp, heads should be filled and mounded over. Wise marines will also secure a supply of toilet paper and carry it on their persons for use along the trail.

(7) The proper use of heads cannot be stressed too greatly. Desirable camp sites are few, and a careless patrol may so contaminate a camp site that it will be unfit for further use for months. They may even be responsible for disease among other patrols who later may use the same camp site. "The line of march of today is the line of communication of tomorrow."

d. Waste Disposal.—Dry wastes are usually burned in the fires. Non-combustible wastes should be buried in pits. Cans should be beaten out flat and buried. Fill and mound over any pits before leaving camp.

26. Sterilization of Water.—a. This is ordinarily done by the action of chlorine contained in calcium hypochlorite dissolved in water contained in a Lyster bag, officially termed a "Bag, water." Eleven are allowed an infantry battalion. This bag is of waterproofed canvas, cylindrical in shape, and is of 36-gallon capacity. (Figure 11.)

Figure 11.—Water sterilizing bags may be improved by supporting the bag cover in the center by means of a wire to the apex of the tripod support. This gives a pitched roof effect, allows rain water to run off the top, prevents sagging and contamination.

b. This bag does not filter nor remove dirt from water, other than permitting dirt to settle into the bottom of the bag below the line of the five faucets. When chlorine, in the form of calcium hypochlorite, is added to the water in sufficient quantity and allowed to act the necessary time, it will rid the water of practically all germs except those of amoebic dysentery. On these, unfortunately, it appears to have no effect. As the germs of this very dangerous disease are contained in the bowel excreta of infected individuals, it becomes evident why the proper use of heads is so important, why men should wash their hands before eating, and why an individual with cramps or diarrhoea should be immediately relieved from duty involving the handling of food.

c. The water used in a Lyster bag should be as free from dirt as possible. Avoid roiling when drawing water from stream, well, or spring. Use a clean container to draw it in. Strain the water through a clean cloth into the Lyster bag. Fill the bag to within four inches of the top, and then place a clean stirring stick about four feet long in the bag.

d. There are three different kinds of ampoules used in purifying water. Two of these are cylindrical tubes, each about 2½ inches long and .3 inch in diameter, with rounded ends. These tubes are labelled "Calcium Hypochlorite" and "Sodium Thiosulphate," but as the paper labels are pasted on the outside of the tubes, they may become detached. The finely crystalline powder is the Calcium Hypochlorite, the more coarsely granular powder the Sodium Thiosulphate. It is essential to distinguish between the two, as the water will not be sterilized unless they are used in proper sequence. If you are in doubt, break a tube of each. The tube of calcium hypochlorite breaks with a distinct "pop" and gives off a strong odor of chlorine. The powder tastes hot and will irritate the tongue. The tube of sodium thiosulphate breaks almost noiselessly, has no odor, and tastes cool when the tongue is first touched to it.

e. The function of the calcium hypochlorite is to kill the germs by chemical action. The sodium thiosulphate is used to rid the water of the offensive chlorine taste and odor after the chlorine has acted long enough to kill the germs.

f. The third ampoule is about 2 inches long, has a pointed tip, and contains a colorless liquid, orthotolidin. This has no germicidal value, but is used to determine whether or not there is sufficient chlorine in the water to kill the germs.

g. The calicum hypochlorite acts more effectively when it is broken directly into the water in the Lyster bag. Handle the ampoule of calcium hypochlorite carefully as the warmth of the hand may cause it to explode and cause injury.

h. Wash the hands, wrap the ampoule in clean gauze, grasp one end of the ampoule in each hand and hold it about 6 inches under the surface of the water in the Lyster bag. Snap the ampoule, shake out the powder and drop the broken ampoule into the bag. With a clean stick, stir thoroughly for one minute.

i. Ten minutes later, using water drawn from the bag, fill a canteen cup to within half an inch of the top. With a knife, gently scratch a faint line in the groove between the upper and lower halves of an ampoule of orthotolidin, rap the tip, breaking it off, and shake the orthotolidin into the cup of water and stir it.

j. If the water contains the correct amount of chlorine, a deep yellow color will appear. Insufficient chlorine is indicated by an absence of color, or a light yellow, and another tube of calcium hypochlorite should be added and the orthotolidin test repeated. A reddish color indicates an excess of chlorine, but this will be corrected when sodium thiosulphate

is added. A bluish-green color indicates an alkaline or hard water; add a few drops of orthotolidin to the cup of water.

k. When a deep yellow or orange-red color has appeared, draw two cupfuls of water from each of the five taps, and pour them back into the bag. This is done to cleanse the taps. Then wait twenty minutes, add the contents of an ampoule of sodium thiosulphate to the water in the bag, stir thoroughly, and the water will be ready to drink.

l. Cover the bag and keep it covered to exclude dirt and insects. Allow no common drinking cups. The bag should hang in shade to keep the water cool.

m. While the water is being chlorinated, it should be guarded until the water is ready to drink.

n. At night the bag should be filled and the water chlorinated to provide pure cool water in the morning.

o. The water in the Lyster bag should be used only for drinking or filling canteens. The men should use only water from their canteens for brushing their teeth.

p. Half an hour before the bag is taken down, pass the word for the men to drink all they want and fill their canteens. Rinse out the bag, wipe it dry, and pack it as previously described.

q. It is essential to start out with a good bag and keep it in repair. If a tap leaks, this may be plugged with a piece of wood. If there is a leak around the base of the tap, tightening up the nut on the inside of the bag may occlude the leak. Leaks in the fabric may be repaired with tire patches.

27. Other Methods of Sterilizing Water.—a. One ampoule of calcium hypochlorite to each 36 gallons of water in a barrel, tank, storage basin or other container will effectively sterilize the water, using the same technique described in the foregoing.

b. One ampoule of calcium hypochlorite may be dissolved in a canteen of water and this used as a stock solution for chlorinating other canteens. This solution should not remain in the canteen over half an hour. Use one canteen cap full of this solution to each canteenful of water, shake well, and the water will be ready to drink in half an hour. Wetting the felt lining of the canteen cover helps cool the water.

c. Iodine may be used instead of chlorine. Ten cc. of 7% ticture of iodine may be used in a Lyster bag full of water. An empty .30 caliber shell holds 4.8cc. Note that 7% tincture of iodine is required. Use double the quantity with

3½% iodine. Two drops of 7% tincture of iodine will sterilize the water in one canteen. Allow half an hour for sterilization to be complete.

d. Boiling for five minutes will sterilize water more effectively than chlorination but is seldom practicable in the field. Vigorous stirring or pouring from one receptable to another will aerate the boiled water and get rid of the flat taste.

e. Potassium permanganate will sterilize water. One grain to the quart of water is the correct proportion. This should impart a faint but permanent pink color to the water.

f. Rainwater caught on a clean canvas or a roof may be used without chlorinating, after allowing ten minutes of heavy rainfall to clear the roof. If buzzards frequently roost on the roof, the water should not be used as buzzard droppings often contain the germs of amoebic dysentery.

g. Most small filters are unsatisfactory, unless they can be removed and boiled at least twice weekly. They are usually breeding places for germs, and contaminate the water rather than filter it.

28. **Sterilization of Mess Gear.**—At the completion of the meal, the men should file by a pit or garbage can, and scrape out the food remnants from their meat cans. Then they pass by a fire on which are three can of actively boiling water. To the first two cans, soap is added, the last can being plain boiling water. Mess gear is dipped into each of these cans of boiling water and thoroughly rinsed. The mess gear is dried by the heat of its own metal, towels being prohibited. When dry, the mess gear should be stowed to protect it from dust until the next meal.

29. **Breaking Camp.**—On breaking camp, the word should be passed to fill the canteens. Details are made to fill the straddle trenches and garbage pits and mound them over, and for general police of the camp. The Lyster bag should be taken down, cleaned and folded up, and packed with its contents as given in the section under Clothing and Equipment.

SECTION 4

FIRST AID

30. General.—First aid consists of the temporary emergency treatment given in case of sudden illness or accident before the services of a medical officer can be secured. This temporary care if intelligently given will often save a life. In all cases first aid, properly administered, will reduce mental and physical suffering and thereby place the patient in the medical officer's hands in better condition to receive further treatment. Very often the only first-aid care that is necessary is to prevent further injury to the patient by well-meaning but ignorant meddlers. Unit commanders are responsible that members of their units receive adequate training in first aid.

31. Immediate Action.—

a. Keep cool.

b. Make the patient lie down if he is not already doing so.

c. Examine the patient, removing such clothing as may be necessary for proper examination.

d. Control bleeding (Hemorrhage).

e. Summon medical assistance (doctor, hospital corpsman, ambulance) if you think it necessary.

f. Keep the patient warm, to avoid shock and pneumonia.

g. Do not force water, or other liquid on an unconscious patient.

h. Do not put anything into or over the wound except a clean dressing, preferably the compress of a first aid packet. New type packets include an envelope containing sulfanilamid powder. This should be sprinkled over the wound before applying the dressing.

32. First Aid Treatment for Wounds.—

a. Objective.

(1) Control Bleeding.

(2) Treat for shock if present.

(3) Prevent infection.

(4) Restore injured part to normal.

b. Control of Bleeding. — The symptoms of severe bleeding are similar to those of shock, except for early restlessness, fear and thirst. Treat as above plus the control of bleeding and give water slowly by mouth. **Fully expose bleeding area quickly. In all serious bleeding, think first of pressure.**

(1) Types of bleeding:

(a) Arterial bleeding.—The blood spurts from the end of the cut artery with every heart beat except where buried very deep, and then it may appear as a steady stream. It is bright red in color.

(b) Capillary.—This is bleeding from very small blood vessels and is manifested by oozing from the wound. It is the least dangerous.

(c) Venous.—This is bleeding from a vein. The blood flows in a steady stream and is dark red in color.

(2) Pressure of the fingers or hand. Immediately apply pressure with the fingers or hand upon the blood vessel between the wound and the heart. The following locations are well to remember. (Figures 12, 13, 14, 15, 16.)

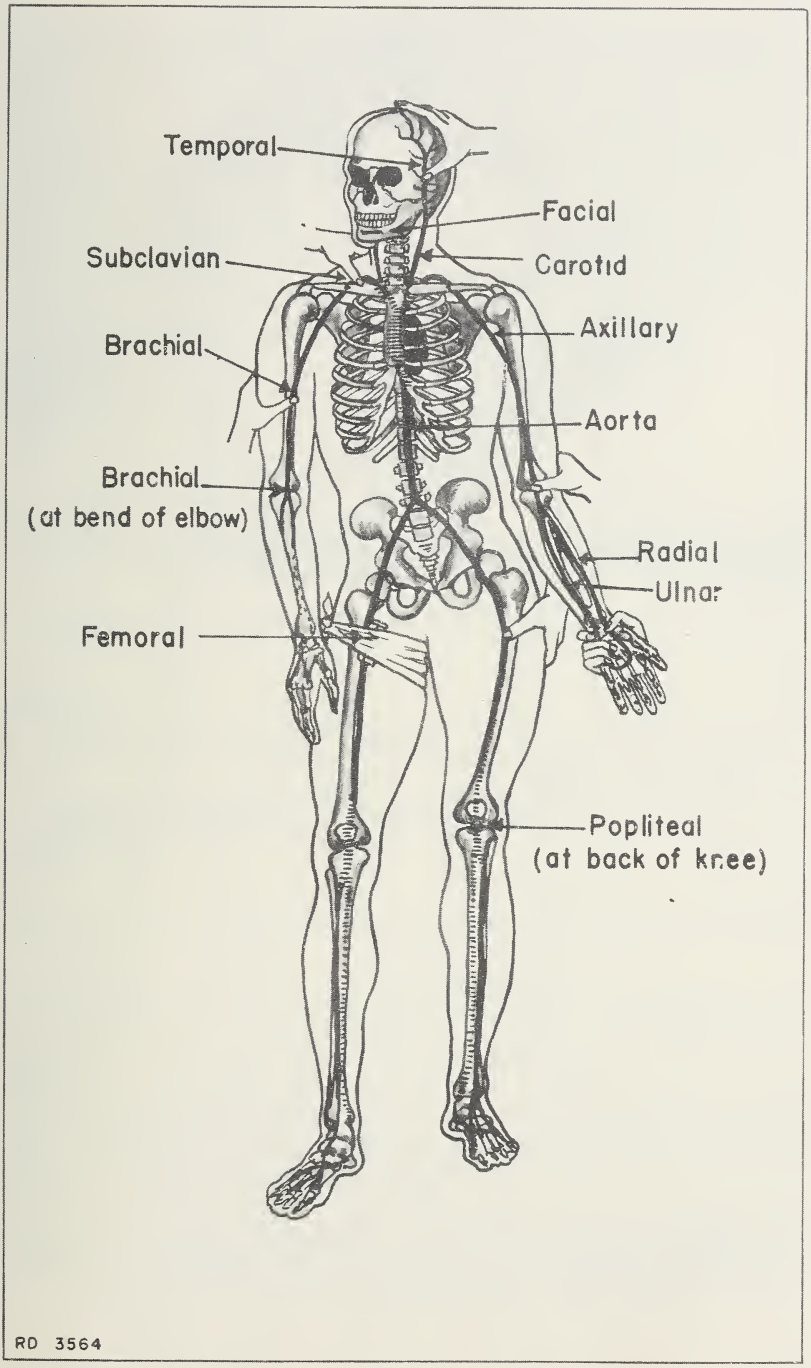


Figure 12.—Course of arteries and pressure points.

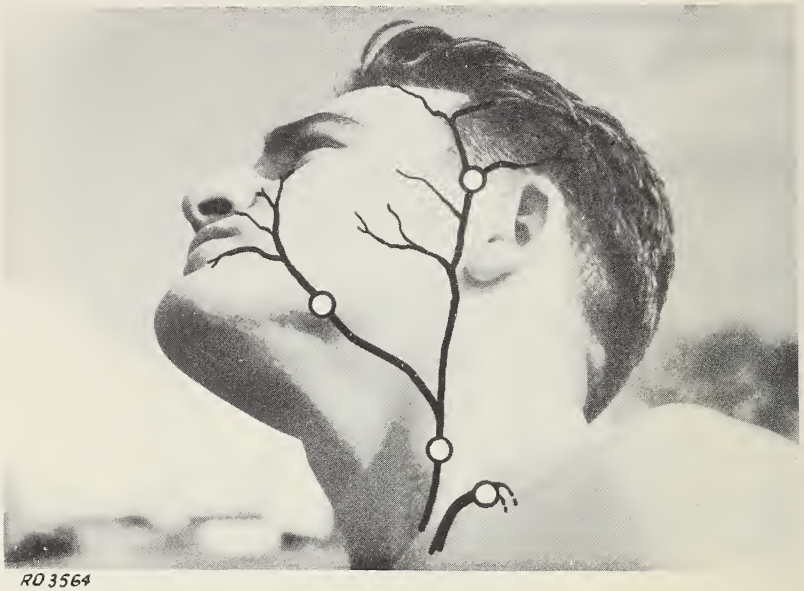


Figure 13.—Course of arteries and pressure points—head and neck.

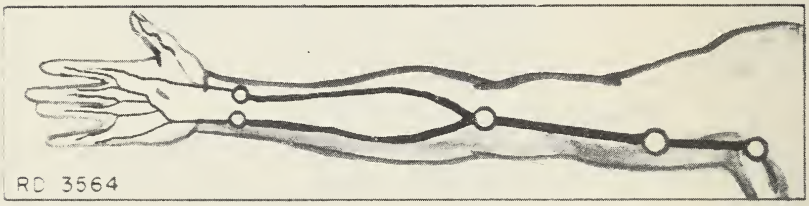


Figure 14.—Course of arteries and pressure points—upper extremity.

(a) Scalp Wounds: Pressure is applied by finger tips to the injured side in front of the ear just above where the lower jaw can be felt working in its socket.

(b) Neck and Head: Wounds of the face below the level of the eye may be controlled by pressure of the thumb and fingers deep in the neck in front of the large muscle which extends from the breast bone to behind the ear.

(c) Cut Throat: Place the fingers against the side of the wind pipe (not over it) and carry the thumb on around the back of the neck. Now apply pressure between the ends of the fingers and the thumb pressing the cut blood vessels against the spinal column.

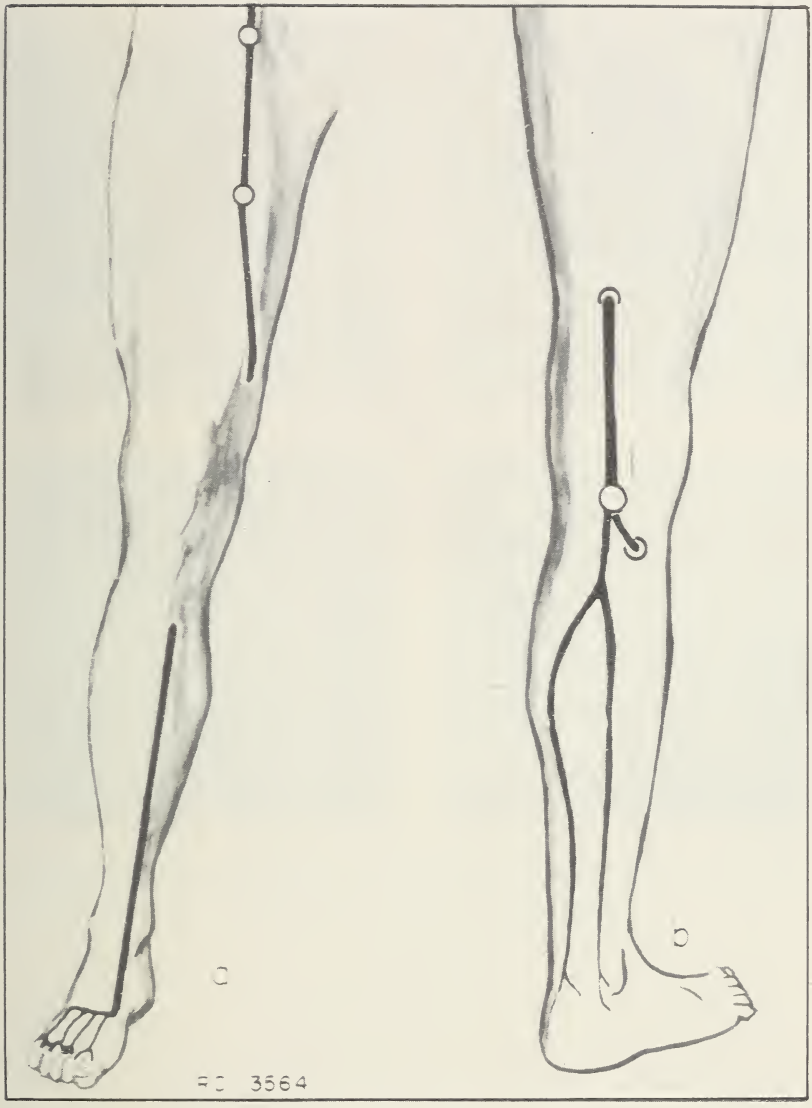


Figure 15.—Course of arteries and pressure points, lower extremity: A, front view; B, back view.

(d) Extreme upper part of arm, arm pit, or shoulder: Apply pressure in the hollow behind the inner third of the collar bone down against the first rib.

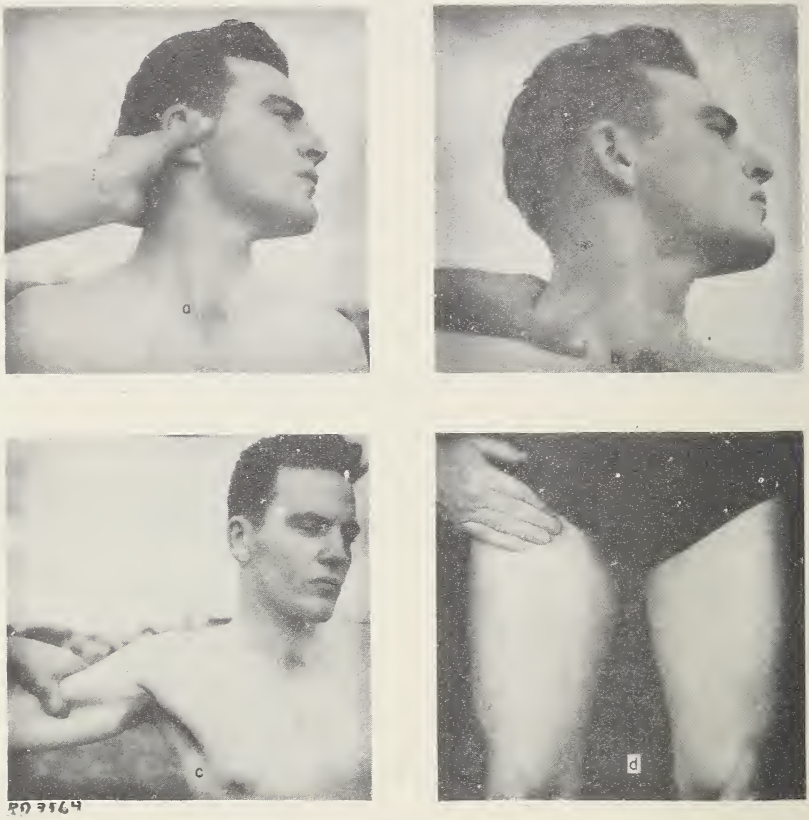
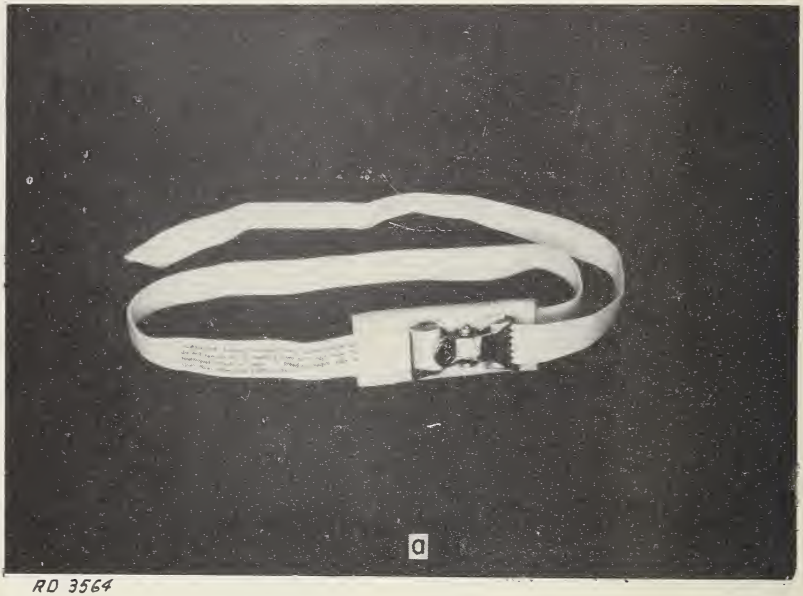


Figure 16.—Pressure points: A, temporal pressure point; B, cartoid pressure point; C, brachial pressure point; D, femoral pressure point.

(e) Hand, forearm, and upper arm: Grasp the arm about halfway between the shoulder and elbow, fingers well up on the inside of the arm and thumb on the outside. Apply pressure from the fingers to the thumb thus pressing the artery against the bone in the arm.

(f) Thigh, leg or foot: Apply pressure in the middle of the groin with the heel of the hand.



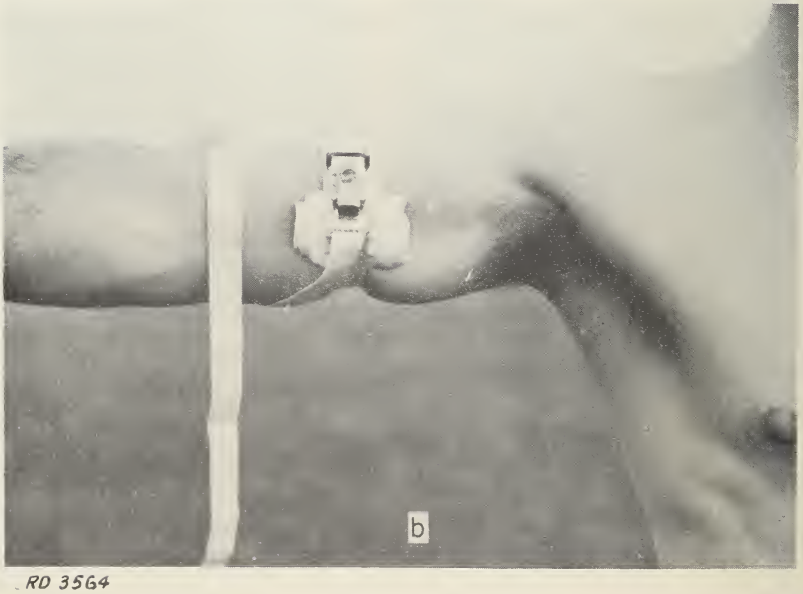
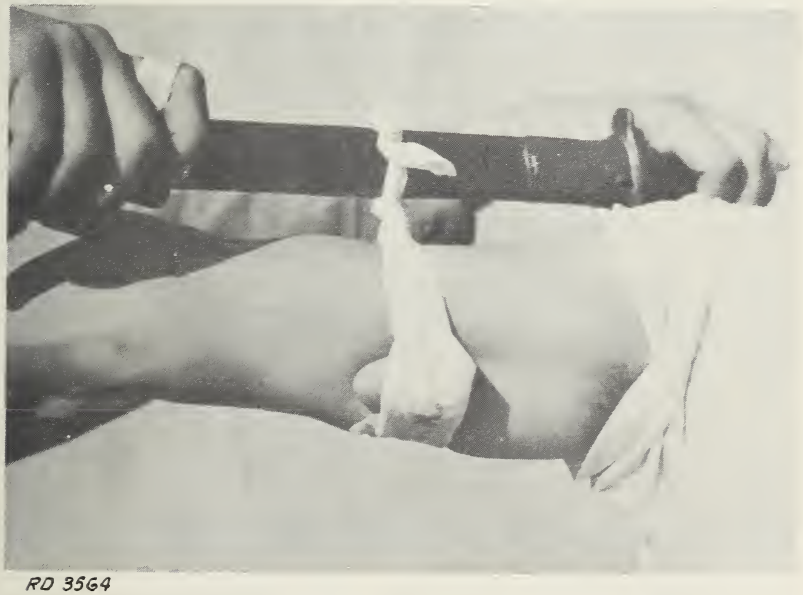


Figure 17.—Use of tourniquet application.

33. **Tourniquet** (Figure 17a & b).—a. If bleeding does not stop upon application of a first aid dressing firmly applied, it may be necessary to use a tourniquet. If you are already shutting off a vessel by finger pressure as described above, do not let go to apply a tourniquet, as to do so may let the injured man bleed to death. Get some one else, perhaps the injured man, to arrange the tourniquet.

b. The principle of the tourniquet is the collapse of the vein or artery walls by pressure of a constricting band around the injured limb. If an artery is opened, put the tourniquet above the wound, i.e., between the wound and the heart.

c. A belt, scarf, or bandage from a first aid packet may be wrapped around the limb, and tightened by twisting a stick or bayonet scabbard thrust between the limb and the belt. (Figure 18.) Twist just enough to stop the bleeding, then tie the stick in that position. **Do not cover up the tourniquet. Loosen it up in about thirty minutes, then watch for bleeding, and again tighten it if bleeding occurs. This is important, because if the tourniquet is left on over thirty minutes the limb below the tourniquet will almost certainly die.** If the injured man is conscious, instruct him to tell every medical officer who sees him that he has on a tourniquet.



RD 3564

Figure 18.—Adjusting an improvised tourniquet.

34. **Pressure by Compress.**—In most wounds, the firm application of a first aid dressing such as the compress of a first aid packet is all that is required. Moderate pressure is usually sufficient to stop bleeding from capillaries, small veins and arteries.

35. **Shock.**—a. In order to treat shock, one must be able to recognize it. Practically all serious injuries are accompanied by shock. The term "shock" means a condition in which all activities of the body are greatly depressed; i.e., when a man has been knocked down by an automobile, when he has been kicked by a horse, or when he has been shot in the abdomen. The face is pale, the expression anxious, the surface of the body covered with a cold sweat, speech broken, breathing shallow and rapid and pulse feeble. This man is in the state of shock. We may be in the field, having just made contact with the enemy and here is a casualty. The hospital corpsman may be unable to get to him and you may, by proper first aid measures, save his life.

b. Treatment: Only three measures are of value, namely:

(1) Heat.—Keep patient warm and dry with clothing, blankets and external heat such as canteens filled with hot water, hot stones, hot water bottle, etc. On the trail, one can at least put blankets, a poncho or a shelter half around him and this should be done even in the tropics.

(2) Position.—Lay patient on his back and with his head low. Keep the patient lying level. Do not raise head.

(3) Stimulants.—Frequently of value in mild cases but often valueless in severely shocked cases. Aromatic spirits of ammonia—teaspoonful in a glass of water. Hot coffee, tea, chocolate, etc. Do not give any fluid by mouth to an unconscious patient. Do not give stimulants when a patient has a fractured skull, apoplexy, sunstroke, or is bleeding profusely. Morphine is the sheet anchor in shock but is generally unavailable except to members of the medical department.

36. **Wounds; Prevention of Infection.**—a. General rules. Do not touch wound with anything unclean such as soiled linen, dirty hands, etc. Swab wound freely with iodine and let dry. Apply first aid dressing to wound. If delay is anticipated before treatment by medical officer, the parts around the injury may be cleansed, avoiding disturbance of first aid dressing over wound. Do not wash with soap and water where water may be unsterile. This may be done by the physician but is frequently unsafe when performed in the field. Do not disturb blood clots.

b. Wounds requiring additional consideration.—

(1) Punctured wounds. — Encourage bleeding. Work iodine well into the wound. Have patient seen by medical officer because of the danger of lock-jaw (Tetanus). These cases should be given tetanus anti-toxin.

(2) Powder burns.—Routine care **plus anti-toxin.**

(3) Gunshot wounds. — Routine care, treatment of shock, control of hemorrhage and proper transportation.

(4) Infected wounds. — See a medical officer if possible. While awaiting the arrival of the medical officer, apply hot compresses by putting 3 tablespoonful of common salt or 6 tablespoonful of Epsom salts in a quart of hot water previously boiled. Use as hot as can be borne comfortably. Place infected part in the solution, or apply to the part towels wrung out with this solution. For wounds near the eye, hot boric acid is better. Elevate part and keep compresses wet and hot. Do not burn part.

(5) Chest and Abdominal wounds. — Treat for hemorrhage and shock, and then apply sterile dressings after swabbing out with iodine. If a large gaping wound of chest, plug the chest well at once with bandage, handkerchief, short towel, or any similar material available. If an abdominal wound with intestines protruding, do not touch but cover with a first aid dressing and keep moist, preferably with warm water which has been boiled, to whch one teaspoonful of salt to a pint has been added.

37. Poisoned Wounds.—a. Dog or cat bite.—Wash wound with running water to remove saliva, dry with clean gauze; apply tincture of iodine, let dry and then dress. Applying fuming nitric acid or a cautery (piece of metal heated to red heat) to the wound is standard treatment. Have patient seen by a physician to determine the advisability of anti-rabies treatment.

b. Snake bite. — The four dangerous snakes of the United States are the coral snake, the rattlesnake, the copperhead, and the cotton-mouth moccasin. With the exception of the coral snake which is small, brightly-colored, and has a round head, they may be readily identified by the following characteristics: Pit or depression between the eyes and nostrils; heart-shaped heads; thick bodies; teeth arranged in two rows; and two fangs, one on each side, outside of the teeth in the front part of the upper jaw. If the bite shows wounds from two rows of teeth and two fangs, it is that of a poisonous snake (Figure 19). A single puncture usually means a fang prick. The teeth in the nonpoisonous snakes are arranged in four rows and the bite shows four punctures (Figure 20). Treat immediately as follows: Treat for shock. Apply a tourniquet above the bite between the bite and the heart. Loosen a few minutes every twenty

minutes. Make crosscut incision ½ by ½ inch with sharp knife or razor blade over each mark. It is preferable to connect the two fang punctures. Cut one half inch deep, or to the depth of the bite. Apply suction—by mouth (no danger if you have no cuts or sores in the mouth), by breast pump, or, having heated a bottle or small glass in hot water over a flame, or by burning a piece of paper or cotton soaked in alcohol in it, apply the mouth of the bottle tightly to the wound. As the swelling spreads, make cross incisions ¼ by ¼ inch through the skin in a ring around the bite chiefly above the bite within the swollen area and about 2 inches above the initial incisions. Apply suction to those cuts about 15 minutes out of each hour for ten to fifteen hours. The cross incisions and suction should be repeated as the swelling advances. Apply compresses of hot Epsom salts, four tablespoonsful to a pint of water when not using suction. Give a dose of Epsom salts by mouth, plenty of water by mouth and treat shock. If a medical officer is available, at least fifty cubic centimeters of anti-venom should be administered.

Figure 19.—Imprint of poisonous snake.

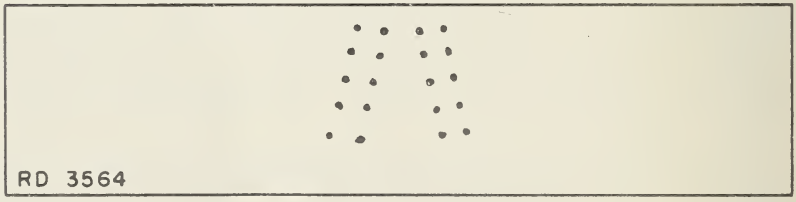


Figure 20.—Imprint of nonpoisonous snake.

c. Poisonous spiders. — Treat as for snake bite by treating shock; tourniquet, incision and suction. See above.

d. Ordinary insect bites such as bee sting, and bites.— The pain, which is usually caused by an acid, is frequently relieved by the application of ammonia water or sodium bicarbonate to the bite.

e. Jelly fish, Portuguese men-of-war, etc.—The local symptoms are frequently relieved by an alkali such as ammonia water or sodium bicarbonate. Where there are marked general symptoms, some form of sugar by mouth seems to help, such as corn syrup, candy, orange juice, or plain sugar and water. It may be necessary to treat for shock.

38. Wounds of and Foreign Bodies in the Eye.—

a. Foreign bodies such as particles of dust, cinders, pieces of steel, etc., may lodge under the lids or on the eye ball. Light a match, let it burn a moment and then blow it out; then with a clean handkerchief and a circular movement of the fingers, wipe off the charred end, leaving a soft, clean splinterless point with which to remove the foreign body. To examine the lower lid, draw it down with the fingers, at the same time letting the patient look up. If a foreign body is not found there, turn the upper lid by standing behind the patient with his head on your chest and telling the patient to look down; at the same time press the match or the end of your finger firmly against the upper lid about one 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. (Figure 21.) If the particle still is not visible, search the ball of the eye carefully for it, and when found, lift it off gently by a quick movement with the point of the match; now drop in some 5 to 10% silvol, or wash out eye with boric acid solution. Do not attempt to remove an imbedded body if the patient can be sent to a medical officer.

b. Wounds of the eye.—Cover closed eye with a cold compress wet with clean, preferably boiled water, bandage lightly and take patient to a doctor. Don't attempt to pull splinters out; let the medical officer handle this.

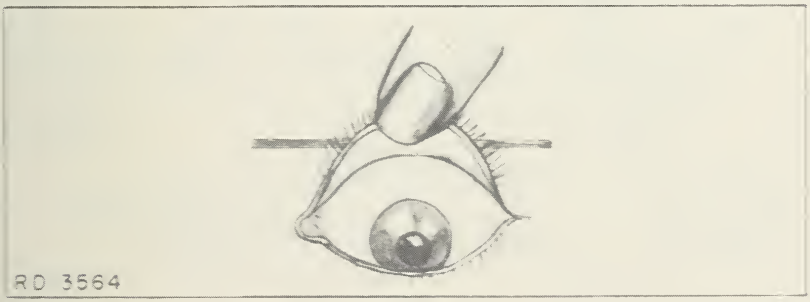


Figure 21.—Method of turning up the upper lid.

c. Chemical in the eye, such as lye, cement or acids. Wash out immediately with great quantities of water. If ammonia has been splashed in an eye, wash it out immediately with water and follow with boric acid; always send the patient to a doctor, preferably to an eye specialist.

39. **Internal Injuries.**—Observe general rules for treatment of shock and severe wounds.

40. **Internal Bleeding.**—For bleeding from stomach, lungs, or bowel, treat as for shock, namely: a. heat. b. keep patient quiet. c. do not give stimulants. d. try to reassure the patient that everything is going to be all right.

41. **Injuries to Bones, Muscles and Joints.**—a. Fractures may be simple which means there is no connecting wound between the skin and the broken bone, or compound where there is a break in the skin down to the broken bone. (Figure 22.)

b. General treatment. — Prevent further injury by proper handling of case. The patient should be placed in as comfortable a position as possible. If it is necessary to move the patient in order to treat shock, etc., the broken bone should be supported on either side of the break. This will

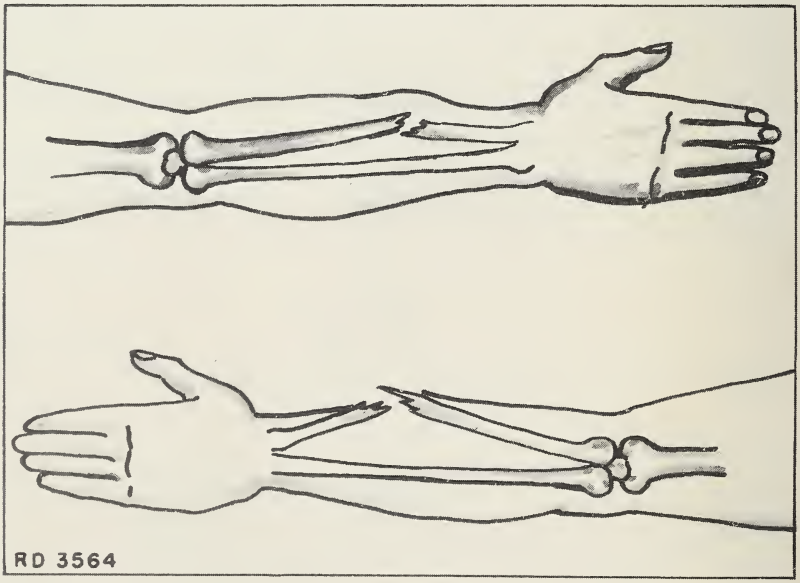


Figure 22.—Fractures, simple and compound.

tend to prevent further damage, especially to blood vessels and nerves, and puncture of the skin by the sharp, knife-like edges of the broken bones. Treat shock if present. If there is evidence of hemorrhage, remove or cut off clothing over the wound and examine. If there is hemorrhage, treat it. Do not attempt to set bone. Apply some type of splint before moving patient. The purpose of this splint is to make patient as comfortable as possible and to immobilize (keep parts from moving) the fracture. If bone is protruding do not attempt to push it back and do no attempt to pull limb. Merely place limb in as normal a position as possible. Treat wound with iodine and place on sterile dressing. Then immobilize in as comfortable and normal a position as is possible.

c. Splinting.—In an emergency, any material which has sufficient firmness to give support to the limb will answer for a temporary splint. (Swords, scabbard, bayonets, rifles, tent pegs, pillows, folded coats, bayonet scabbard, branch of tree, etc.) (Figure 23.) It should be well padded on the side next to the limb and secured in several places, care being taken never to place the bandage over the fracture, but rather above and below it. In a fracture of the leg, the opposite leg can be used as a splint for the injured one. (Figure 24.) Improvised splints should be stiff enough to keep the part in position; should be long enough to extend beyond the points between which the fracture lies and as wide as the limb to which applied. For padding, some soft material such as towels, blanket, cotton wool, oakum, straw, flannel, etc., should be used and extended over the edge of the splint.

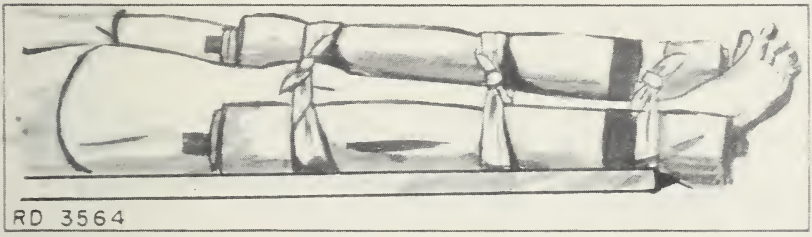


Figure 23.—Improvised splint of sticks and blanket.

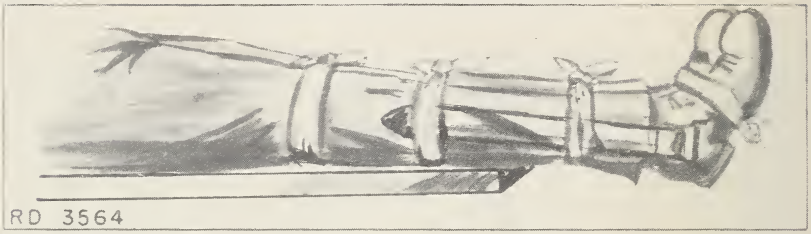


Figure 24.—Use of opposite leg and bayonet scabbard as splints.

d. Application of the splint.—(1) (Figure 25.) Fracture of forearm: Bend forearm to right angle, thumb up, apply splint on inner surface, extending to tip of fingers, and another on outer surface, extending to the wrist.

(2) Fracture of upper arm: Two splints are applied, one in front and one behind, if the lower part of the bone is broken; for fracture of the middle or upper part, apply to inner and outer sides. Support arm in sling.

(3) Fractured collar bone: Bend forearm to right angle in front of body and use sling.

(4) Fractured leg or ankle: Two splints extending from knee to beyond foot, one on outside and the other on the inside.

(5) Fractured thigh: Apply a long splint from armpit to beyond foot on the outside, and a short splint on the inside from the groin to the foot.

(6) Fracture of spine: Do not move the patient until a litter or board has been secured; then place patient on same with utmost care, taking precautions not to bend or move the spine. The patient should be transported with the minimum of jarring.

(7) Fracture of skull and concussion of the brain: Severe head injuries whether from an automobile accident, being hit on the head with a rifle butt, a black-jack, etc., frequently result in a fracture of the skull, unconsciousness, or both. If you are suspicious of a fracture of the skull, treat as such. Bleeding from the ears and nose are to be regarded with suspicion. So also should unconsciousness; unequal or very small pupils cause one to suspect fracture especially if there is a history of head injury. Treat as for shock with heat, keeping patient lying. Move very carefully and only in a lying position. Do not give stimulants. Treat wound as previously described by swabbing with half strength iodine and covering with a first aid bandage.

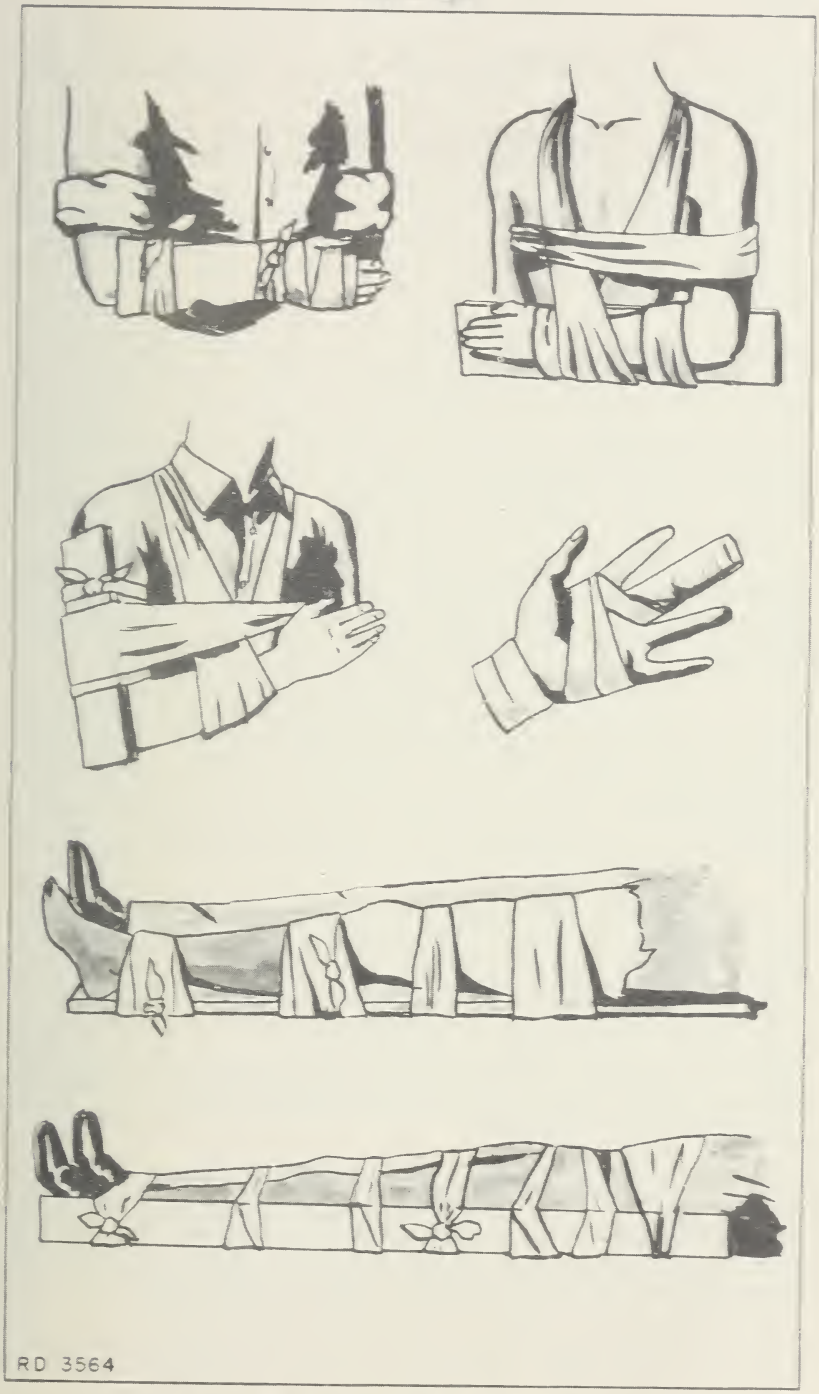


Figure 25.—Splints and their application.

(8) Fracture of lower jaw: Gently raise lower jaw to upper, using the latter as a splint. Then apply a four-tailed bandage.

(9) Fracture of ribs: If adhesive tape is handy, strap the side, applying same with air out of lungs. If on the trail, apply a broad binder pinned with safety pins such as a towel, pillow slip, torn shirt, etc. If patient is coughing blood, indicating a punctured lung, do not apply bandage or binder but treat for hemorrhage. Keep him quiet, warm and lying down.

42. **Sprains and Dislocations.**—a. Sprains: Sprains are stretching or tearing of ligaments of a joint or tendons of the muscles that are attached close to the joint. Treat by resting and elevating that part and applying compresses, either cold or hot, whichever gives the most comfort. Strapping with adhesive tape or applying an elastic bandage may be very helpful. After application of adhesive, if it be a sprained ankle, the patient may try walking in an uncomplicated case.

b. Strain: This is the overstretching of a muscle or tendon with rupture of some of its fibers. Treat by strapping with adhesive, rest and application of heat or cold by compresses. Heat tends to relieve pain, cold tends to limit swelling. See which gives the patient the most comfort.

c. Dislocations: Dislocation means the slipping away from each other of the bones which form a joint, frequently locking the bones in the new position. In most cases, there is damage to the capsule surrounding the joint. If away from medical help for several days, you may try to reduce (return joint to its normal position), by strong steady pull. Major dislocations may produce shock. If so, treat the shock.

d. Lower jaw: A dislocation of the lower jaw may be reduced by the following manipulations. The first aid man stands in front of the sitting patient. With his thumbs wrapped with several layers of gauze, a handkerchief, etc., to protect them from being bitten, the operator places them in the patients's mouth on the back teeth. The fingers are under the chin. Press steadily down and back with the thumbs on the back teeth and pull upward with the fingers under the chin. This should reduce the dislocation. Now put on a four tailed bandage.

e. Dislocation of finger or toe: Pull slowly the end of the finger in a straight line with the hand until it slips back in place. If unsuccessful, do not repeat; also, do not attempt to reduce a dislocation of the second joint of the thumb. Let the medical officer handle these cases.

f. Dislocation of shoulder: This is one of the commonest of dislocations. In some persons it occurs so frequently that it is called an habitual or recurrent dislocation, and these men can usually diagnose their trouble. The head of the bone of the upper arm may be felt for, both in the armpit and on the outside, and it will be noted that the head of the bone is absent from its usual location and is in a new site. Always compare with the sound shoulder. A strong steady pull, maintained for 10 to 15 minutes, may be necessary, the arm being held just above the wrist. The head of the bone may be felt to snap back into place. The pain is often so extreme that an anesthetic is necessary, and the only emergency anesthetic that may be available in an outpost is alcohol in some form. Administration of large doses of an alcoholic liquor may relax the patient's muscles to such an extent that the head of the bone may be slipped back into place. If there is a medical officer available, no treatment other than making the patient comfortable is advisable.

43. **First Aid Packet.**—The Navy supplies a first aid packet which is an hermetically sealed waterproof tin can containing a sterile dressing. Every officer and enlisted man of the Navy and Marine Corps is required to carry one of these packets when going into action or when engaged in field operations. The tin container is very much like a sardine can and is readily opened by pulling a ring attached to the can. This pulls the metal case apart. The dressing is composed of two compresses made of folds of gauze and two safety pins. These are wrapped in wax paper. The new type packet contains sulfanilamid powder in an envelope, a standard battle dressing without safety pins, and full directions for use. Every man should be familiar with them.

44. **Fainting.**—This condition may result from injury, slight or severe bleeding, exhaustion, emotional disturbances, etc. It is directly caused from too little blood in the brain. The treatment is to place the patient upon his back, with the head lowered and the feet elevated. Fresh air should be provided by preventing crowding around the patient, by opening the doors and windows, or by taking the patient into the open. Apply cold water to the face and let him inhale smelling salts (ammonia).

45. **Poisoning.**—If there is no evidence of caustic action, an effort should be made to empty the stomach and bowels by the free use of emetics and laxatives. A tablespoonful of mustard or of common salt in a cup of warm water may serve to produce vomiting. Salts or castor oil may be used as a cathartic. The cathartic should not be given until the vomiting resulting from the emetic has subsided. After the poison has been evacuated, give stimulants, apply heat, and rub externally.

46. **Drowning.**—a. General.—Being under water for four or five minutes is generally fatal, but an effort to revive the apparently drowned should always be made unless it is known that the body has been under water for a long time. It is very important that artificial respiration be begun at the earliest practicable moment, as soon as the patient is on shore or in a boat, and it must be continued an hour and a half or two hours before the case is considered hopeless. After the patient begins to breathe, watch carefully to see that he does not stop again, and when he breathes faintly assist him with artificial respiration. Do not attempt to raise the patient nor allow him to rise until breathing has become regular. As soon as the patient is removed from the water, lay him face down and, grasping him around the waist, raise his hips so that any water may drain out of the air passages while the head remains low. Use only a few seconds for this procedure, then proceed with artificial respiration.

b. Artificial respiration (Schaefer method).—(Figures 26, 27, 28.)

(1) The man is laid on his belly, his face turned to one side so that the mouth and nose do not touch the ground, his arms extended above his head. In this position the tongue does not obstruct the air passage but falls forward of its own

RD 3564

Figure 26.—Artificial respiration, ready to apply pressure.

Figure 27.—Artificial respiration, pressure applied.

weight, and the removal of any foreign body from the throat is facilitated. To insure that the throat is not obstructed, the tip of the tongue may be pulled forward out of the mouth.

(2) The operator kneels, straddling one or both of the patient's thighs, facing the patient's head, and places his hands, with the thumb nearly parallel to the fingers, so that the little fingers curls over the end of the lowest rib. The lower margin of the hand must be free from the pelvis and resting on the lowest rib. The ribs can be more easily located and the pelvis avoided by operating on the bare back of the patient.

(3) The farther from the back bone the heels of the hands can be placed without sliding off, the better the position. Thus the hands are several inches from the spine and the fingers nearly out of sight. The fingers help some, but the chief pressure is exerted by the heels of the hands, the weight coming straight from the shoulders. The operator's arms should be held straight and pressure exerted from his shoulders by bringing his body and shoulders forward. This weight is gradually increased until, at the end of three seconds of vertical pressure on the lower ribs of the patient, the force is felt to be sufficient to compress the parts; then the weight is suddenly removed. If there is danger of not

Figure 28.—Artificial respiration, pressure released.

returning the hands to the right position they may remain lightly in place, but it is usually better to remove the hands entirely.

(4) With a heavy patient a light operator can utilize over 80 percent of his weight by raising his knees from the ground and supporting his weight entirely on his toes and the heels of his hands, if the latter are properly placed on the ribs of the patient. Due care should be observed to prevent fracture of the ribs by bearing too violently on them.

(5) A feather or a few fibers of absorbent cotton held near the patient's nose will indicate whether or not air passes with each forced expiration and spontaneous inspiration. The rate of compression should not exceed 12 or 15 per minute, the lungs being thoroughly emptied by three seconds of pressure and allowed two seconds to refill. Recoveries after two hours or more of unconsciousness are on record.

(6) Aromatic spirits of ammonia on a handkerchief may be placed continuously within three inches of the nose; no liquid should be given while unconscious; apply warm blankets and hot water bottles as soon as practicable.

(7) **Resuscitation by artificial respiration** is also required in cases of failure of respiration from inhalation of gas, from electric shock, or from opium poisoning.

47. **Treatment of Gas Poisoning.**—If poisoned by gases met with in civil life (illuminating, charcoal, motor exhaust, mines), patient should be moved to the open air and artificial respiration and warmth applied.

48. **Treatment of Gas Injuries.**—a. In the treatment of injuries from gases used in warfare, the following rules apply:

(1) Wear mask, impregnated clothing and gloves, if possible when handling a gassed man. If gloves are not worn, wash the hands with soap and water following the handling of such cases, or better, rub them with dry lime.

(2) Remove the patient's equipment; but not his mask if the air is permeated with gas.

(3) If possible, remove all gassed cases from woods or low ground to knolls or hillsides. Do not carry them into dugouts or cellars; gas being heavier than air, seeks the lower levels.

(4) Do not allow badly gassed cases to walk.

b. In rapid advance or retreat, where elaborate aid stations are impracticable, only the most urgent life saving measures should be attempted.

(1) At the aid station:

(a) Rest.

(b) Warmth, shelter, clothing, hot drinks, external heat.

(c) Removal of contaminated clothing and equipment.

(d) Shaving hairy parts.

(e) Removal of gas from skin with water and green soap, kerosene or alcohol.

(f) Neutralization of gas on skin by the use of:

1. Bicarbonate (baking soda) solution.
2. Bleach paste.
3. Ferrichydrate cream.
4. 5% solution sodium hydroxide solution.

(g) Attention to eyes.—Washing with 2% sodium bicarbonate, normal saline (2 teaspoonful of salt to a quart of water), or saturated boric acid solution.

(h) Cleansing nose and throat.—Irrigation with 2% bicarbonate (baking soda) solution.

(i) Stimulants.—Coffee and brandy and, by a medical officer, the use of Caffine-sodium benzoate, and Strophantin.

(j) Venesection (bleeding) in blue cases of lung casualties but not in ashen white cases.

(k) Administration of oxygen.

(l) Postural treatment of lung oedema.

(m) Glucose intravenously.

(n) Washing out stomach.

(o) Of possible value.—The inhalation of weak ammonia vapor may be tried when available.

c. Detailed treatment. — (1) Screening smokes: Treatment usually unnecessary but if so, removal to fresh air is usually sufficient. If severe, wash eyes, nose, and throat with boric acid solution (baking soda) one teaspoonful of the powder to a glass of water; bathe skin with laundry soap, or one of the above solutions.

(2) Lacrimators (Tear Gas).—Same as for screening smokes. Do not rub the eyes. Face the wind, and shake all clothing and equipment to release trapped gas.

(3) Toxic smokes.—Inhale vapor from calcium hypochlorite (Bleach), wash nose and throat with boric acid solution or weak sodium bicarbonate solution (1 teaspoonful of powder in a glass of water).

(4) Lung irritants (Chlorine, Phosgene, or Chlorpicrin).—Remove patient to pure air. Keep him warm and **absolutely quiet, lying down.** If possible give cup of cream or milk. Give light stimulants such as hot coffee or aromatic spirits of ammonia (one teaspoonful) in a little water. Evacuate to hospital as soon as possible, **as an absolute litter case.**

(5) Vesicants (Mustard and Lewisite).—If gas has been breathed, treat as for Chlorine and Chlorpicrin. Wash eyes, nose and throat with boric acid solution, or with weak sodium bicarbonate solution (1 teaspoonful of powder to a glass of water). For skin effects of vapor or liquid, **first aid must be immediate.** Remove contaminated clothing, swab the contaminated skin several times with fresh applications of kerosene, or carbon tetrachloride, or with a freshly prepared solution of calcium hypochlorite (Bleach) (1 teaspoonful of powder in a glass of water), then scrub thoroughly with soap and water using gauze and scrubbing hard. For Lewisite burns follow the above treatment and then apply ferric hydrate paste.

(6) Phosphorus burns.—Immerse parts in water or cover with sopping wet cloths (or even mud), until further aid is available. Then apply for two or three minutes, cotton gauze soaked in copper sulphate solution; sopping the solution freely on the phosphorus particles; remove phosphorus

particles with forceps; apply wet dressing of the same copper sulphate solution, and evacuate to hospital if burns are at all serious. Hot water, as hot as bearable, will melt the phosphorus and the particles can be swabbed off if the copper sulphate is not available.

(7) Carbon monoxide.—If the patient does not breathe or breathes with difficulty, begin artificial respiration immediately by the Schaefer prone method. Persist for at least three hours, or until patient breathes normally. Meanwhile, occasionally dash cold water on the face and chest and have the patient breathe an oxygen-carbon mixture (5 to 7% Carbon dioxide), or pure oxygen, if the mixture is not available. Keep the patient warm. Watch for relapse, and immediately renew artificial respiration and inhalation of carbon dioxide-oxygen as before.

(8) Hydrocyanic acid.—If patient does not breath or breathes with difficulty, institute artificial respiration at once, and persist for at least three hours, or until the patient breathes normally. Dash cold water on the face and chest. As soon as the patient breathes, he is probably out of danger. Inhalation of amyl-nitrite (pearls crushed in handkerchief) three minutes out of every fifteen minutes. Continue artificial respiration for several hours and continue to observe for twenty four hours.

(9) Nitrous fumes.—Same as for Chlorine, Phosgene, and Chlorpicrin.

d. The following supplies and equipment should be available in advanced aid stations:

(1) Aromatic spirits of ammonia.
(2) Boric acid solution.
(3) Calcium hypochlorite (Bleach).
(4) Copper sulphate solution, 5%.
(5) Carbon tetrachloride.
(6) Kerosene or gasoline.
(7) Sodium bicarbonate.
(8) Tubes filled with ferric hydrate paste (for Lewisite burns).
(9) Eye cups.
(10) Laundry soap.
(11) Amyl nitrate (pearls).

49. **Freezing.**—a. The symptoms of frostbite are cold in the part, pain, then loss of sensation; the part affected becomes white or bluish white. The affected part should not be warmed before the fire but rub it with snow, or with a cloth dipped in cold water, and wrung dry. After the part has been rubbed well, dry it thoroughly and smear it with grease.

If the symptoms continue, the part will become swollen and change color. If this occurs it is dangerous and medical attention is necessary.

b. When a man becomes unconscious from cold, carry him, if possible, into a room without fire, remove the clothing and rub vigorously with snow or with a wet cloth until signs of returning circulation are observed. If necessary, when warmth and consciousness return, give him warm tea, cover him up warmly and let him remain quiet.

50. **Sunstroke.**—The face is flushed, skin hot and dry, breathing labored, pulse rapid, the heat of the body great. The patient may be unconscious. Place him in the shade, loosen clothing and try to lessen heat of body by liberal cold applications and fanning. Suspect malaria or disease of heart or brain in all cases of apparent sunstroke.

51. **Heat Exhaustion.**—Heat may also cause a form of exhaustion without fever or insensibility. In this case the skin is cold. Wrap the patient in blankets and give him a pinch of table salt followed by water or coffee.

52. **Burns and Scalds.**—a. Do not pull the clothing from the burned part, but rip or cut it off. Do not break the blisters or prick them even if large. When possible, protect the burn quickly with a dressing preferably from first aid packets, soaked with one of the following liquids:

(1) Solution of tannic acid.
(2) Linseed, olive, or cottonseed oil.
(3) Solution of picric acid.
(4) Solution of soda.

b. Take steps to prevent shock or treat it if present.

53. **Blisters.**—Should a foot blister occur while marching, it is better to protect it immediately. Remove the shoe and sock and if the blister is unbroken, prick it with a pin, previously sterilized by holding it in the flame of a match, and allow the fluid to escape. Then cover the entire blister with adhesive plaster.

54. **Electric Shock.**—a. Symptoms.—Persons suffering from such injuries are usually unconscious; the pulse is feeble and irregular, and the breathing slow and faint. The parts of the body that have come in contact with the live wire are burned and blistered.

b. Treatment.—The most important thing to do is to remove the person from contact with the wire or electrical machinery. This is always dangerous and should not be attempted until some means of insulation is available. The

hands should be protected with rubber gloves, a rubber blanket, a mackintosh coat, or several thicknesses of silk or dry clothing. The rescuer should be further insulated by standing on a rubber mat or pane of glass or dry board.

c. The treatment of electric shock is the same as ordinary shock following an injury or accident. (See Par. 34). The heart and respiration should be stimulated, the body kept warm by the application of heat, and artificial respiration used if indicated. Patients who are likely to recover will show signs of life within 25 minutes. However, the patient should be given the benefit of the doubt.

d. The treatment of electric burns is the same as for ordinary burns.

55. **Foreign Bodies in the Throat.**—a. Symptoms.—As the result of sudden interference with the breathing, the person clutches at his throat and gasps for air. There may be violent coughing or attempts to vomit, the face becomes blue, and the eyes stick out of their sockets.

b. Treatment.—If another person is at hand, have him go or telephone for the nearest physician, notifying him of the nature of the accident so that he may bring the proper appliances. In the meantime attempt to dislodge the foreign body by slapping the back violently between the shoulder blades. If this is not successful, hold the patient by his feet with the head down and have some one slap his back between the shoulder blades.

c. Treatment for swallowed foreign bodies. — When dangerous bodies have been swallowed, do not give an emetic or cathartic, for such treatment would only make matters worse. Make patient eat freely of bread and potatoes, in order that the foreign body may be surrounded by a mass of soft material and in that way be carried safely through the bowels.

56. **Epileptic Fits.**—The patient frequently utters a peculiar cry before falling, immediately becomes unconscious, and falls into convulsions, jerking the arms, legs and body. The face becomes deathly pale, the eyes roll and are turned upward. There may be foaming at the mouth, and if the tongue is bitten the foam is bloody. Nothing can be done to stop the fit after it has begun. The patient should be placed flat on his back, preferably on a mattress or some other soft material so that he can not injure his head or limbs by striking them against anything hard. Place a rolled handkerchief between the teeth in order to prevent him from biting his tongue. Do not use any force or struggle with an epileptic. Following the convulsion, the patient is usually drowsy and sleeps for several hours, but may become maniacal and require restraint.

57. Concussion of the Brain. — The patient is pale, feels weak and dizzy and sometimes loses consciousness. He may be sick at the stomach. The patient should be kept absolutely quiet, the head slightly raised and heat applied to the extremities of the body; the head should be kept cool by cold cloths or cracked ice. Do not give stimulants.

58. Apoplexy and Head Injuries with Unconsciousness.—

a. Apoplexy.—The person suddenly becomes unconscious. The face is flushed, one or both pupils dilated, the breathing is abnormal and the cheeks puff out with each expiration. There is usually paralysis of one side of the body; this may be determined by lifting up the hands and legs, allowing them to fall slowly to the side. The one that is paralyzed will be cold and lifeless and will drop like a dead weight.

b. Compression of the brain.—This results from head injuries. The patient can not be roused. There may be bleeding from the nose and ears. The breathing is deep and snoring and there is usually paralysis as in apoplexy.

c. Treatment.—Send for a medical officer. Raise the head, loosen tight clothing, and keep the patient warm. Stimulants must not be given.

59.—Alcoholic Intoxication.—An ordinary case of intoxication does not require any particular treatment. Always remember the possibility that a person may be suffering from apoplexy. Try to produce vomiting by giving a teaspoonful of salt or mustard in a cup of warm water. Aromatic spirits of ammonia is useful to help sober a drunken person, one teaspoonful in a cup of water.

60. Wood Alcohol Poisoning. — When you suspect that a patient has taken wood alcohol send for a medical officer. Meanwhile keep the patient warm and cause him to vomit, if you have any ordinary means at hand. Give him several teaspoonsful of baking soda. This poison may cause total blindness.

61. Methods of Removing Wounded with Litter.—

a. Transportation.—The carriage of patients for moderate distances is best done with the service litter, (Figure 29) and when that can not be procured, by some improvised substitute which secures the comforts and safety of the disabled.

b. Improvisation of litter.—Many things can be used for this purpose: Camp cots, window shutters, doors, benches, ladders, etc., properly padded.

(1) Litters may be made with sacks, bags, or bedticks, by ripping the bottom or snipping off the corners,

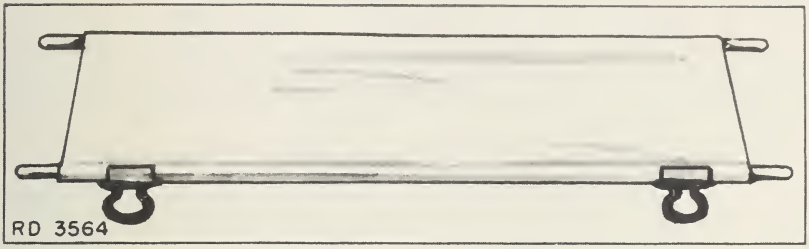


Figure 29.—Service litter.

passing two poles through them and tying crosspieces to the poles to keep them apart.

(2) A shelterhalf, a blanket, piece of matting or carpet may be fastened to poles by tacks or twine, or slits may be made and poles passed through.

(3) Hay, straw, or leafy twigs, over a framework of poles and cross sticks, make an efficient litter.

(4) Rope, wire, or raw hide may be woven between poles and this network covered with a blanket.

(5) The usual military improvisation is with blankets or shelter tents, and poles about 7 feet long. The blanket is spread on the ground. One pole is laid across the center of the blanket, which is then folded over it. The second pole is placed across the center of the new fold and the blanket is folded over the second pole as over the first. (Figure 30.)

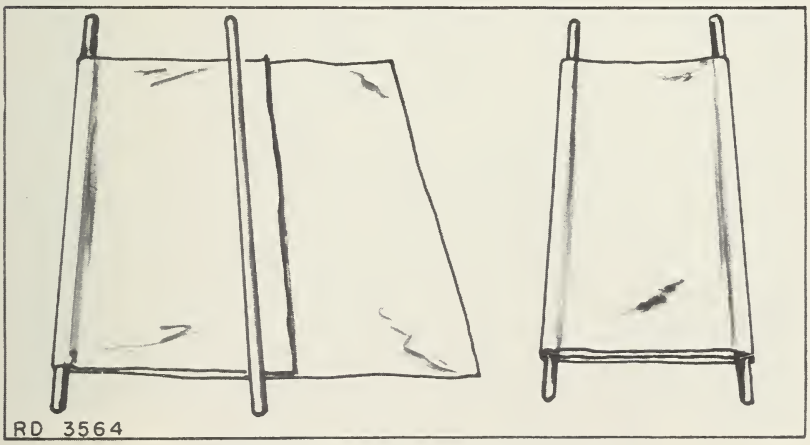


Figure 30.—Improvised blanket litter.

(6) A litter also may be prepared by turning two or three blouses inside out and buttoning them up, sleeves in, then passing poles through the sleeves; the backs of the blouses form the bed.

62. Methods of Removing Wounded without Litter.—

a. Rifle seat. (Figure 31).—A good seat may be made by running the barrel of a rifle through each sleeve of an overcoat, turned inside out and buttoned up, sleeves inside, 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 the butts, trigger guard up.

b. Rifle blanket seat.—A blanket is 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.

Figure 31.—Rifle coat seat.

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.

Figure 32.—Patient carried in arms.

Figure 33.
Pickaback carry.

c. One bearer.—A single bearer may support a slightly injured man, or carry a patient in his arms, (Figure 32) or on his back, (Figure 33) or across his shoulders. If the patient is helpless, the last named is best. This is effected as follows:

(1) (Figure 34.) The bearer, turning patient on his face, steps astride his body, facing toward the patient's head and, with hands under his armpits, lifts him to his knees, then clasping hands over abdomen, lifts him to his feet; next he seizes the right wrist of the patient with his left hand and draws the arm over the head and down upon his left shoulder; (Figure 35) he now shifts himself in front, stoops, passes his right arm between the legs and grasps the patient's right wrist; lastly, (Figure 36) with his left hand he grasps the patient's left hand and steadies it against his side, when he rises.

(2) In lowering the patient, 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.**

Figure 34.—Completion of first step, across-shoulders carry.

Figure 35.—Completion of second step, across-shoulders carry.

Figure 36. Final position, across-shoulders carry.

Figure 37.—Completion of first step, tied-hands crawl.

Figure 38.—Completion of second step, tied-hands crawl.

(3) One bearer, tied-hands crawl or carry.—Enemy observation and resultant fire may render all of the above methods of carry impracticable, in which case the following methods should be used:

Lay the man on his back and place yourself upon your back by his left side, your head in the same direction as his. Grasp his right arm above the elbow from its underside with your right hand. With your left hand grasp his same arm below the elbow, from the top side. (See Figure 37.) Then, keeping the right side of your body slightly upon the man's body and entwining your legs around his own, roll over to the left onto your stomach, pulling the man with you. The man is now lying face down on your back, with his left arm free and his right arm over your right shoulder. (See Figure 38.) After assuming this creeping or crawling position, draw the man's left arm under your left armpit. Secure both wrists of the man with any available material (cloth, bandage, handkerchief, etc.). You may then crawl with the man in this position (See Figure 39), or, when necessary, rise erect and climb ladders, or, if it is desired to carry him pickaback, reach behind and support his legs.

This method may be varied by tying the man's wrists together first and then lying down on top of him and inserting your head and shoulders through the loop formed by the man's tied wrists. Should the man's right arm be injured, place yourself on your back by his right side and grasp his left arm instead of his right, substituting your right arm or hand where the left is indicated in the text, and vice versa.

d. Two bearers.—(1) (Figure 40.) The bearers take position at patient, one man between patient's legs and one at his head, both facing toward his feet. The rear bearer, having raised the patient to a sitting posture, clasps him from behind around the body under the arms, the front bearer passes his hands from the outside under the flexed knees; both rise together.

(2) This method requires no effort on the part of the patient, but is not applicable to severe injuries of the extremities.

e. Horseback.—(1) 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, is to be held by an attendant.

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Figure 39.—Final position, tied-hands crawl.

RD 3564

Figure 40. Two-bearer carry.

(2) Once mounted, the patient should be made as safe and comfortable as possible. A comrade may be mounted behind him to 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 is 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.

SECTION 5

REMOVAL OF WOUNDED FROM TANKS

63. General.—Although it is desirable that wounded be moved only by qualified medical personnel whenever possible, knowledge on the part of others of the various methods of removing casualties from the vehicles with the least disturbance of the injured part of the body will not only lessen suffering but also help to prevent trumatic shock.

The contents of this chapter are based upon British methods of removing tank casualties. Initial emergency treatment and evacuation is accomplished by the vehicle's crew. It is usually desirable that casualties be removed from the vehicle by the exit most readily accessible and the one which will necessitate the least movement of the wounded soldier. These exits, in U.S. light tanks, are the driver's hatch and the belly trap door, or in U.S. medium and heavy tanks, the side doors. Both exits admit a litter upon which a casualty may be placed and removed with a minimum amount of lifting and moving. However, because of damage to these exits, or for other reasons, methods of removing wounded through the turret are important.

Removal from the turret ordinarily requires some apparatus and considerable training. The simple British method described requires no new equipment. The litter straps can be kept inside the tanks, and the litter fastened to the outside of the tank. Maximum use of the litter is desirable but tanks may not always be equipped with litters, and when the use of a litter is not practicable, the methods utilizing litter straps are obviously less fatiguing for the bearer and more comfortable for the casualty than other methods. Company aid men of other units may find considerable use for the methods of employing litter straps, as described herein.

64. First Aid.—When a soldier is wounded in a tank his morale is higher if he knows that his companions in the tank are capable of rendering first aid and evacuating him from the tank so that he may be collected and receive further necessary treatment from medical personnel. A wounded man should be

extracted from the tank as early as practicable in order to reduce shock and to prevent further injury from the movement of the tank. A trained crew needs only a few minutes to apply first aid and evacuate the casualty from the tank to the ground.

First Aid must be applied to the injured man immediately. This includes applying a first-aid dressing correctly, arresting bleeding, immobilizing a broken limb, administering morphine if necessary, and carefully evacuating the injured man from the tank.

65. Evacuation.—a. General.—Many methods of removing casualties from tanks have been tried, but the most satisfactory and the one requiring the minimum of equipment is the two-stretcher-sling method. This method has several obvious advantages:

(1) The apparatus is simple and easy to produce and may be replaced quickly in the field.

(2) The slings may be stored easily by rolling them into a small bundle and stowing them away in a corner of the tank.

(3) The two-sling method causes the minimum increase in wound shock or injury and no increase in the internal abdominal and chest pressures, whereas apparatus consisting of jacket, buckles, straps, and hoists may cause increased injury and shock as well as increase of internal pressure.

(4) Instruction in the two-sling method requires only a few minutes.

(5) The method is practicable even when, because of the severity of his wounds, the casualty is unable to assist.

b. Types of Armored Vehicles.—The two-stretcher-sling method has been successfully tried with the following types of U.S. armored vehicles: Light tanks, M2A4 and M3 (General Stuart), Medium tanks, M3 (General Lee), and M3 with British turret (General Grant). This simple method adheres to the principle that any method used must be capable of extracting any casualty from any type tank.

c. Removal from the Tank.—(1) Classification of Injuries.—Injuries are divided into wounds above the waist and wounds below the waist. On this simple classification is based the application of the stretcher-sling method.

(a) Injury below the Waist Line (armpit-shoulder method).—To remove a casualty injured below the waist line, the slings are used separately. A loop is made at the end of each sling, and passed up the arms and adjusted to the shoulders and armpits, one on either side. (Figure 41a.)

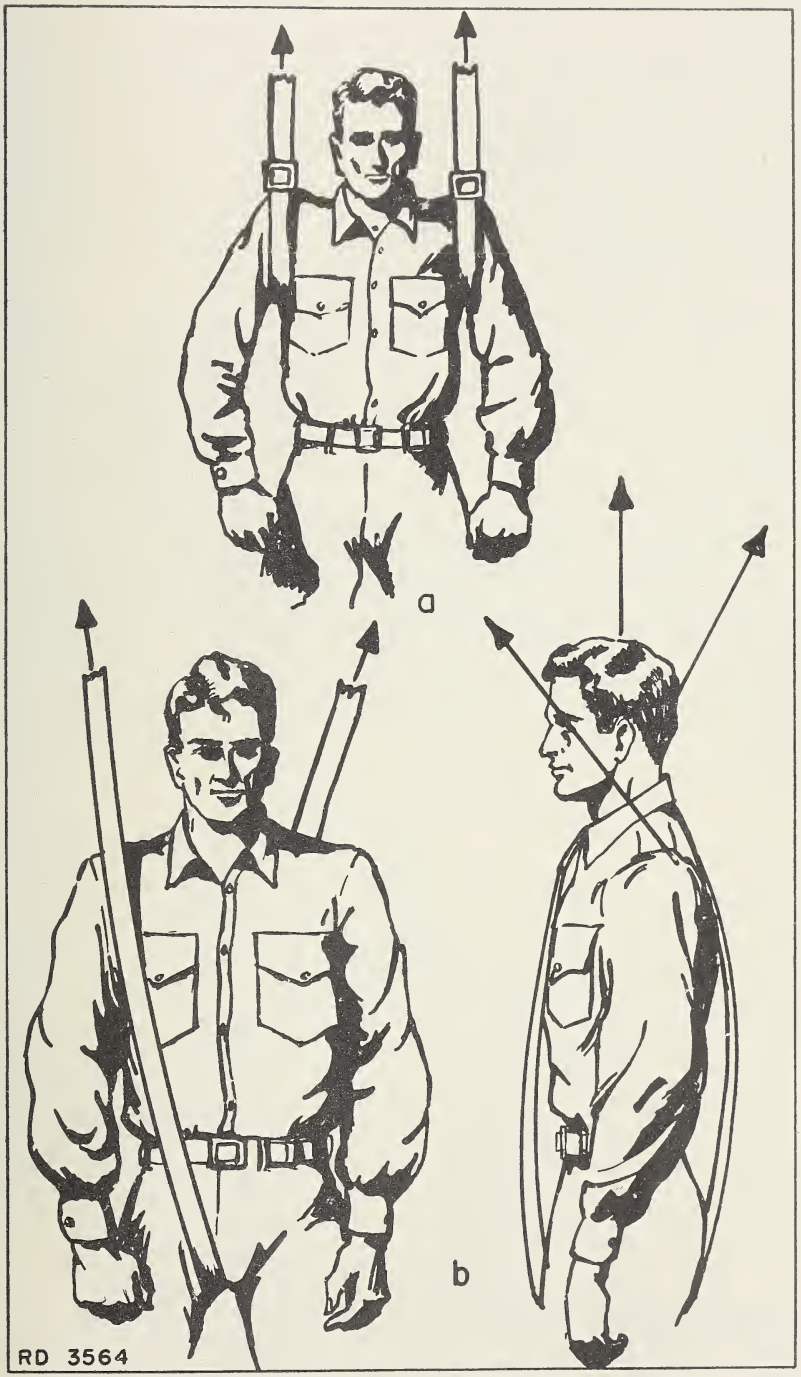

Figure 41.—Adjustment of Slings: A, injury below the waist; B, injury above the waist.

The free ends of the slings are taken by two men standing outside the turret and, with a gentle, steady pull, the casualty is lifted from the main compartment. If a third man is available, he will control the movement of the injured man's body as it is being raised to the turret. When the injured man is raised sufficiently to rest outside the turret, his legs are taken clear of the turret opening and he is lowered to the ground or to a stretcher placed on the tank. Two men can complete the entire procedure, although three are desirable.

(b) Injury above the Waist (groin-buttock method).—The two slings are so joined as to form one long sling. One free end is gently inserted from front to back, or vice versa, so that the sling lies between the cleft of the buttocks and under the crotch (Figure 41b). This now forms a firm seat. The injured person is raised and supported in a sitting position, and the free ends of the sling are passed up to the turret opening. It is important that the casualty should come out erect, not bending forwards, backwards, or sideways. To accomplish this, one man takes a position in rear of the casualty, pulls on the sling end which passes up the front of the injured man, while the other man, from a position in front of the casualty, pulls on the sling which passes up behind the casualty. It should be noted that the free ends of the sling pass up to the opposite shoulders of the injured man. By steady pulling, the casualty is hoisted clear of the turret, his legs are clear from the tank, and he is then brought to the ground.

(2) Summary of Removal Exits:

Light U.S. tank M2A4—Driver's hatch or turret.

Light U.S. tank M3 (General Stuart)—Driver's hatch or turret.

Medium U.S. tank M3 (General Lee)—Side doors, gunner's hatches, or turret.

Medium U.S. tank M4 with British Turret (General Grant)—Side doors, hatches or turret.

(3) Specific Cases.—(a) General.—The driver and front gunner are evacuated through their own hatches from tanks which are equipped with such hatches and when these hatches can be opened. Where this is impossible, they can be manhandled into the main compartment and then evacuated. This is accomplished by traversing the turret, moving and adjusting shells and shell racks, and other movable equipment as may be necessary.

In U.S. tanks, where there are one or more side entrances to the driver's or front gunner's compartment, the casualty can be manhandled through the side door (Figures 42, 43), even if he is a casualty in the upper compartment,

Removal of Wounded from Tanks

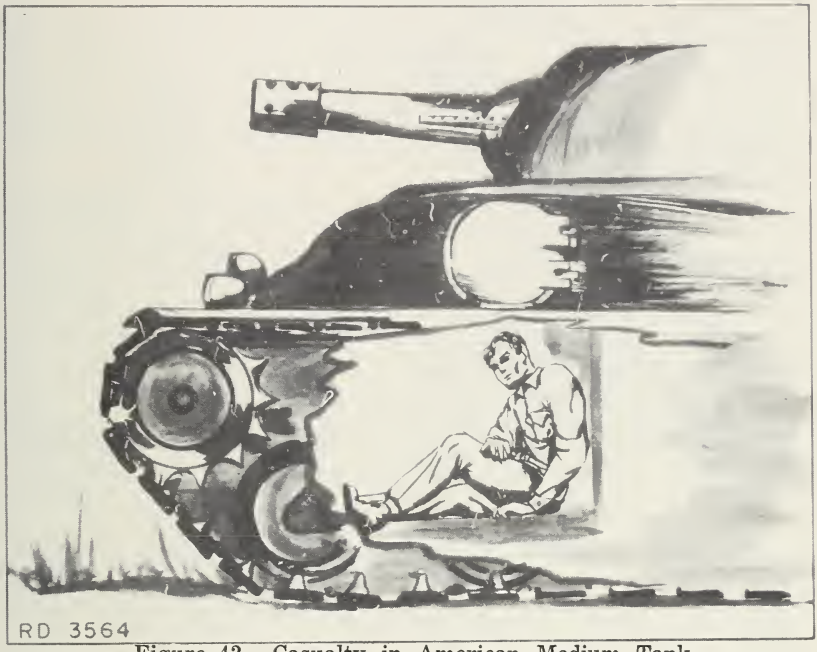

Figure 42.—Casualty in American Medium Tank.

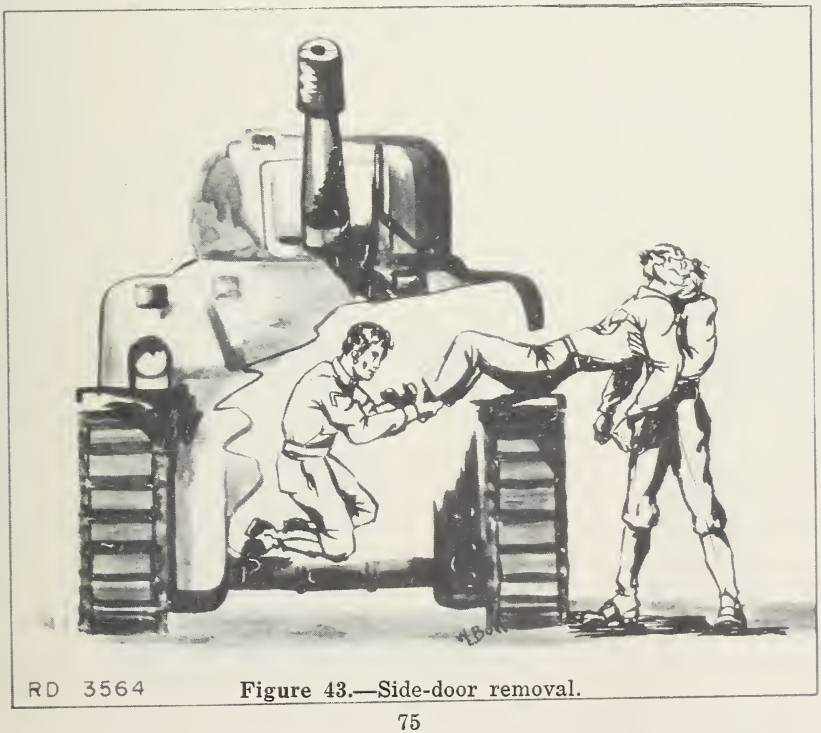

Figure 43.—Side-door removal.

since both compartments intercommunicate. The reverse also holds true, that is, when side doors cannot be opened, the casualty can be manhandled to the upper compartment and evacuated through the turret from the upper fighting chamber. The driver and front gunner may also be removed through their respective hatches.

(b) Lowering the Casualty to the Ground.—In some tanks the injured man may be manhandled to the ground, but in others the slings are necessary. The slings can be used in the armpit-shoulder or groin-buttock positions, depending upon the location of the injury. The casualty is eased over the edge of the tank and is then lowered by two men using the slings. When the wounded man is close to the ground, one man takes both sling ends and holds him in position while the second man climbs off the tank and gets ready to receive the casualty. When the man on the ground receives the casualty, he steadies him against the side of the tank (Figure 44a) until the other man comes down to his assistance (Figure 44b). They then carry the casualty away, a man on either side, facing each other, one supporting the thigh and legs and the other supporting the trunk and the head (Figure 44c). Since the men face one another, the casualty cannot roll off their arms, particularly while he is being lowered to the ground.

Removal of Wounded from Tanks

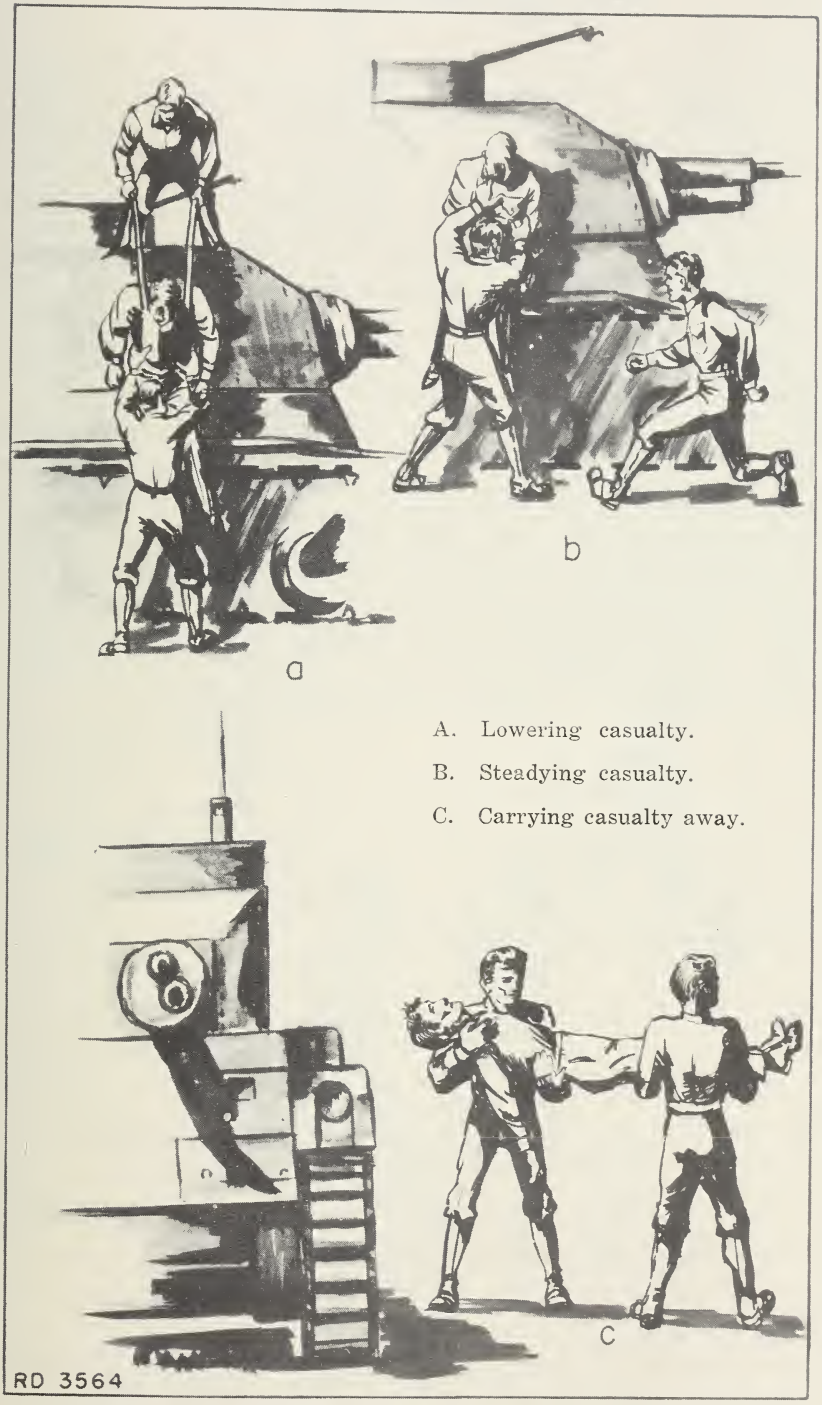

Figure 44.—Removal of Casualty.

66. Further Uses of the Stretcher-Sling Method.—a. General.—In addition to the uses described, the two-sling method in the arm-pit shoulder (Figure 45a) or groin-buttock adjustments (Figures 45b and 45c) can be used for moving the casualty from the ground over walls or other obstructions.

b. One-Man Carriage.—(1) Lying Casualty.—(a) The casualty is laid on his back on the ground, the loop made from a single sling is placed below the injured man's thighs (Figure 46a) and his legs are spreadeagled. Sitting between the casualty's legs, the bearer slips his right arm and head through the loop, adjusting it tightly (Figure 46b). Taking the casualty's right wrist in his left hand, the bearer pulls the casualty's right arm over his right shoulder, and then slips his right leg under the casualty's right knee and crooks his foot over to the inner sole of the casualty's foot (Figure 46c). The bearer now has the casualty strapped to his back with firm control of his right arm and leg. He slowly rolls over on his left side, bringing the casualty over to lie face downwards on his, the bearer's back (Figure 46d). The bearer now raises himself to the erect position with the casualty sitting in the sling, his arms over the bearer's shoulders (Figures 46e and 46f). This type of carriage is ordinarily less fatiguing to the bearer and more comfortable for the casualty, than the fireman's carry or the two-man four-handled seat.

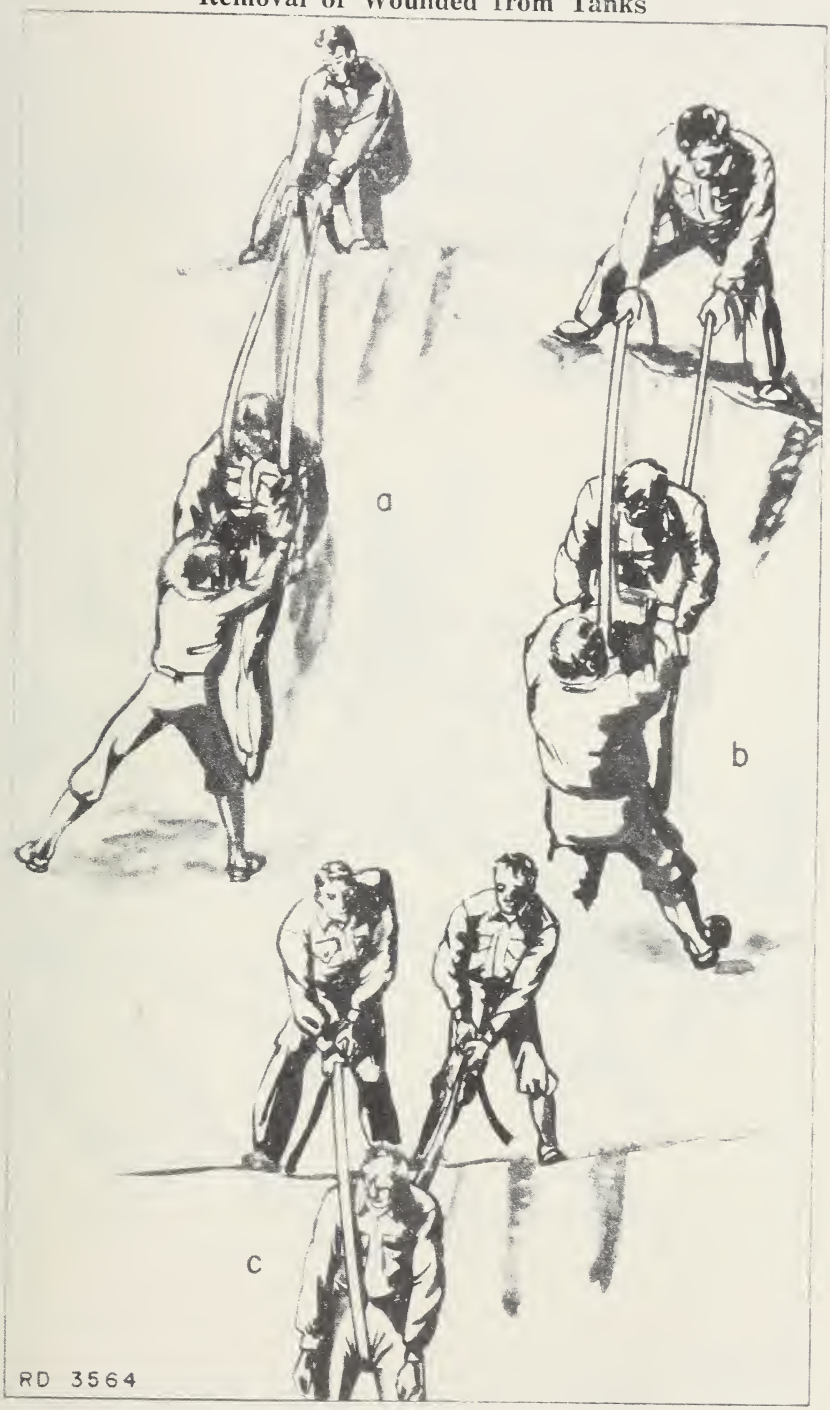

Figure 45.—Further Uses of Stretcher-Sling Method: A, armpit method; B, groin method; C, groin method—two-man.

Figure 46.—Removal of Lying Casualty: A, placing sling on casualty; B, adjusting sling; C, sling adjusted, bearer ready to turn.

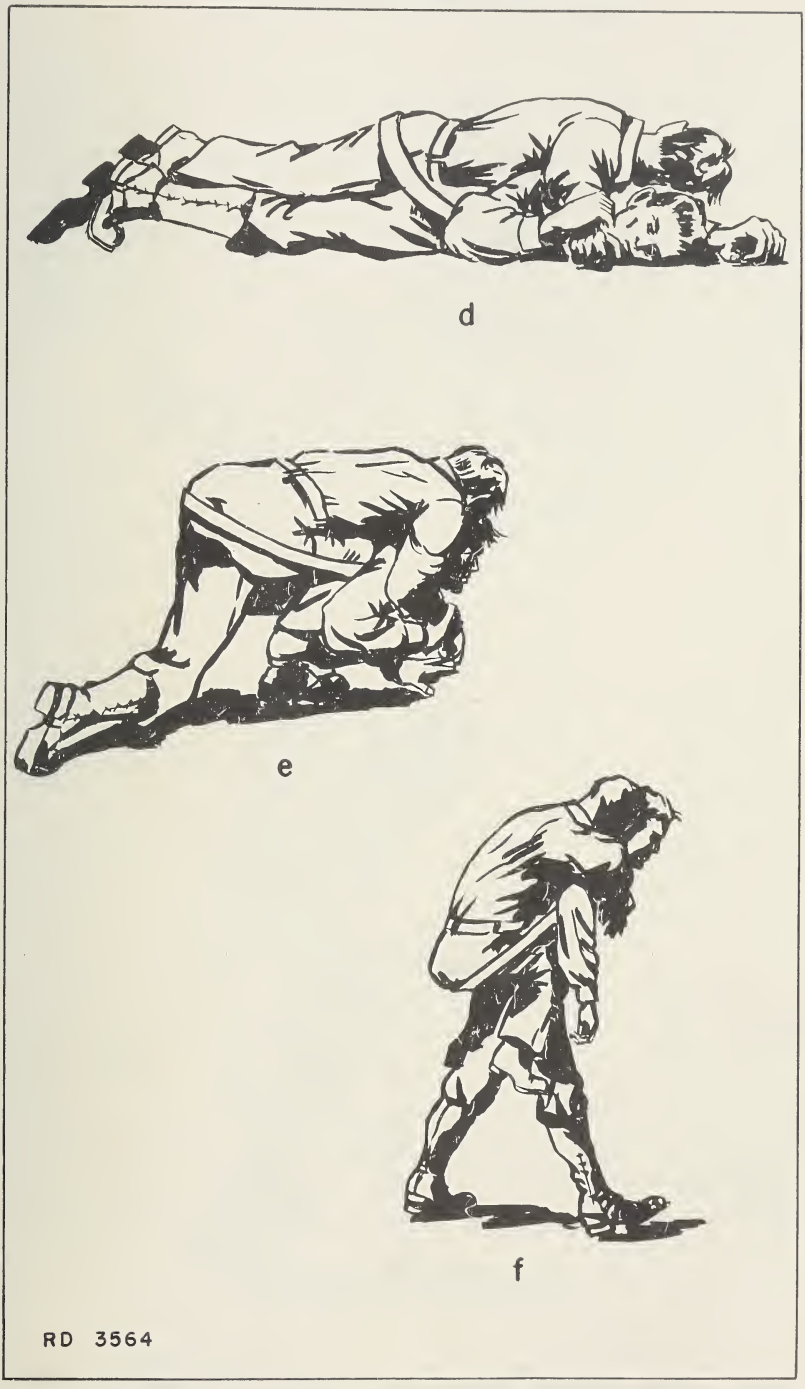

Figure 46.— D, turning casualty; E, raising casualty; F, carrying casualty.

(b) Another method for raising and carrying a lying casualty is particularly popular in the Russian Army. One continuous loop is made of two slings and is adjusted to the patient as shown in Figure 47a. The bearer then eases himself full length upon the patient, face uppermost, bearing most of his own weight on his feet and arms. He slips his arms through the loops, tightens the loops, grasps them firmly, and then rolls over on his face, bringing the patient with him bound to his back by the sling. Finally, the bearer carefully raises himself so that he has the patient supported by the sling seat on his back (Figure 47b).

Figure 47.—Russian Method: A, adjusting slings; B, carrying casualty.

Figure 48.—Removal of Sitting Casualty: A, sling adjustment; B, adjusting casualty; C, raising casualty; D, carrying casualty.

(2) Sitting Casualty.—(a) To hoist a sitting casualty into carrying position, a single sling is joined to make a continuous loop, which is passed up the casualty's legs to his buttocks (Figure 48a). The bearer then kneels on his right knee, his back close to the casualty and passes his right arm and head through the loop. Next, the bearer leans backwards and tightens the sling until the casualty is held close to his back. The bearer now bends forward, holding the arms of the casualty over his shoulder (Figure 48b); and when well forward, with the greater part of the casualty's weight well up on his shoulders he raises the casualty (Figure 48c) and carries him away (Figure 48d).

(b) In another method of moving a sitting casualty, the two slings are joined to form one continuous loop. This loop is twisted to form two loops. The casualty's feet are slipped through the two loops and they are passed up the casualty's legs to his thighs (Figure 49a). The carrier brings the loops over his shoulder and carries the man upon his back, bearing the weight on the sling seat with a pull on the loop round his shoulders (Figure 49b).

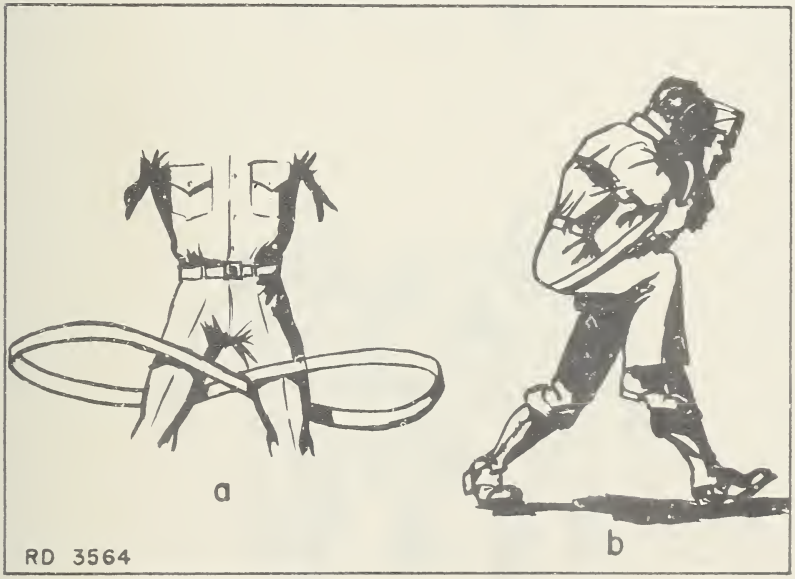

Figure 49.—Two-Loop method: A, sling adjustment; B, carrying casualty.

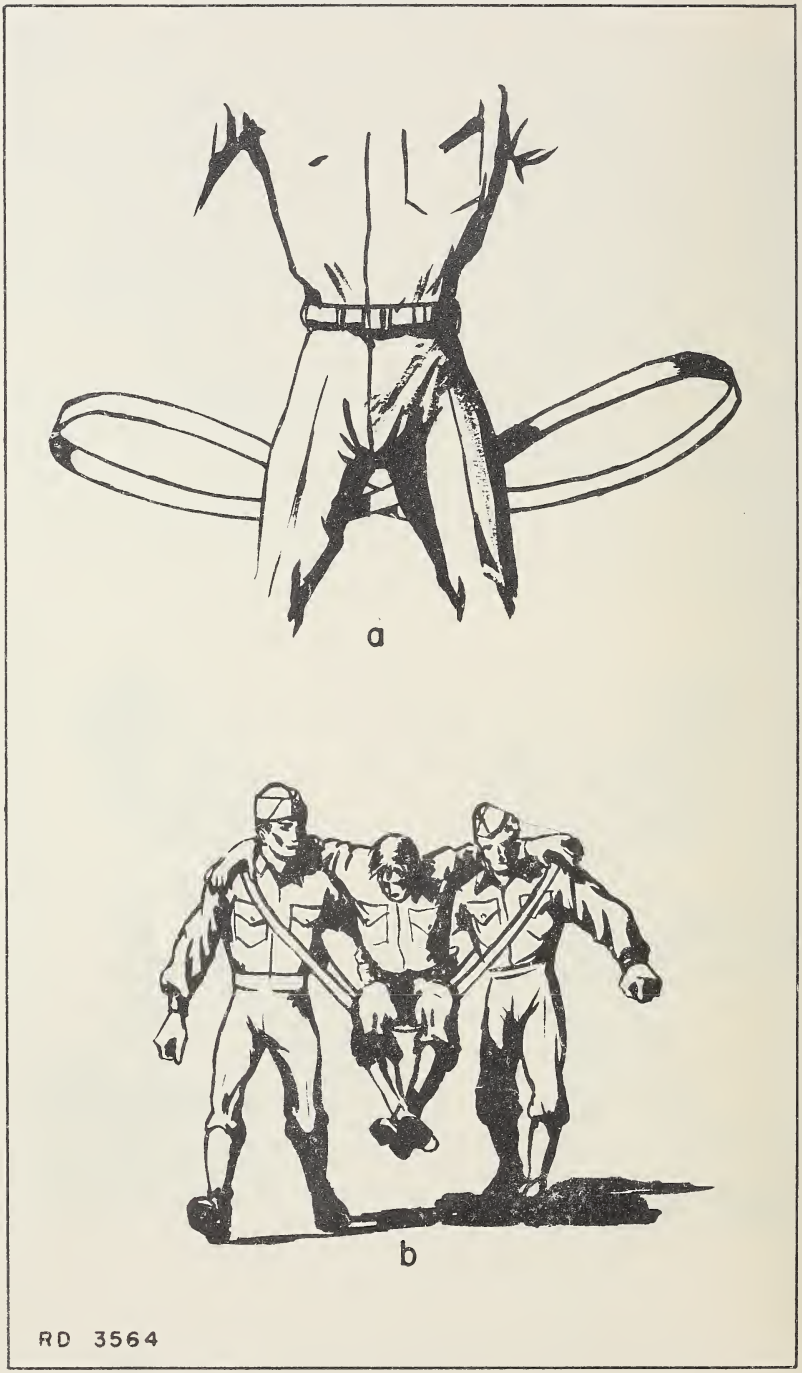

Figure 50.—Two-Man method: A, sling adjustment; B, carrying casualty.

c. Two-Man Carriage.—Two slings are adjusted to form one continuous loop which is applied to the patient as shown in Figure 50a. Each man places a loop over his head and shoulder and the patient is carried with the bearer's inside arms supporting him (Figure 50b).

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