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# FM 21-11

DEPARTMENT OF THE ARMY FIELD MANUAL

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# FIRST AID FOR SOLDIERS



DEPARTMENT OF THE ARMY • MARCH 1954

FIELD MANUAL } DEPARTMENT OF THE ARMY  
 No. 21-11 } WASHINGTON 25, D. C., 8 March 1954

## FIRST AID FOR SOLDIERS

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**\*This manual supersedes FM 21-11, 1 August 1946, including C 1, 18 February 1949, and C 2, 4 March 1949; DA Training Circular 15, 1952, and DA Training Circular 4, 1953.**

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*Figure 1. First Aid for Soldiers.*

# CHAPTER 1

## INTRODUCTION

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### 1. Purpose and Scope

The purpose of this manual is to provide the basic fundamentals of first aid care and treatment which you can apply to yourself or to another soldier before the arrival of trained medical personnel. It includes instructions in first aid measures to take for special injuries such as chest and belly wounds; common emergencies, such as snake bite and drowning; injuries resulting from contact with chemicals, such as war gases and propellant fuels and oxidizers; and how to transport the sick and wounded so as not to aggravate their condition or endanger their life.

### 2. General

*a.* First aid is the care given casualties before regular medical or surgical treatment can be administered by trained individuals. The Army Medical Service has the finest equipment available, and its personnel have been trained in the most modern methods of saving life and easing pain. However, trained personnel cannot be every place at once; there may be a time when **YOU** will have to depend on your own knowledge to save **YOUR OWN LIFE** or the **LIFE OF SOMEONE** else. You can save a life if you know what to do and what not to do, and if you act quickly and calmly. If you are injured,

don't lose your head and just call for help. Use first aid measures and then seek medical help as soon as possible. **KEEP CALM. BE GENTLE.**

*b.* Your job is to fight! Fighting is your primary mission. Anything you can do to keep yourself and others in fighting condition is part of that mission. It isn't all luck that most casualties return to their units to fight again. It is the result of correct first aid and excellent medical care. You can protect yourself and others by knowing first aid.

*c.* What equipment do you have to give first aid? You are issued a first aid pouch containing a dressing. Know *how* and *when* to use it. Have it with you at all times. A good soldier checks his rifle each day. He should be just as careful about checking his first aid pouch and packet (fig. 2).

*d.* Take a good look at the wounds, but keep your hands off (fig. 3)!

Wounds are the most common conditions needing first aid. Always look for more than one wound. The missile may have come out at the opposite side. Before you treat a wound, you must see all of it to find out exactly where it is, how large it is, and how much it is bleeding. Usually it is best to cut or tear the clothing along the seam from the wound. Pulling clothing over the wound always increases the danger of infection. Moving the wounded parts may make the wound worse and cause needless pain. **KEEP THE WOUND CLEAN.** Keep your hands away from the wound. Cover the wound with a dressing immediately to prevent infection.



*Figure 2. First aid pouch and packet.*

### **3. The Three Lifesaver Steps in First Aid**

The three lifesaver steps in first aid are: **STOP THE BLEEDING! PROTECT THE WOUND! PREVENT OR TREAT SHOCK!** You should memorize these three steps and learn the simple

methods of carrying them out. Now is the time to learn. Prompt and correct first aid for wounds will not only speed healing, but will often save a life—and *that life may be yours!*



*Figure 3. Keep your hands off!*

*a. Lifesaver Step One. Stop the Bleeding.*

- (1) (a) To stop bleeding, first apply pressure to the wound with a dressing. Uncontrolled bleeding causes shock and finally death. Place the opened dressing (fig. 4) against the wound and apply firm pressure. *Use the wounded man's dressing—not your own.* Use an additional dressing, if necessary, to cover the wound. Wrap the tails of the dressing around the wounded

part and tie the ends to hold the dressing firmly. If the wound is on the arm or leg and bleeding continues, raise the arm or leg.

- (b) Have the man lie down with his wounded arm or leg raised. If you think there is a broken bone, do not raise the arm or leg. Moving a broken arm or leg is painful



*Figure 4. Stop the Bleeding!*

and dangerous and will increase shock. When the arm or leg is raised, blood will not flow into it so fast; therefore, bleeding from the wound will be slowed. Of course, some blood will always flow through the arm or leg, so you will still have to use the bandage and pressure.

- (2) In the case of a wound or wounds of the arm or leg, **IF THE BLEEDING DOES NOT SLOW DOWN** considerably in a few minutes, it is time to try something else—a tourniquet. When pressure and elevation

fail to stop bleeding from a limb (arm or leg) or when blood is gushing from a wound, a tourniquet should be applied quickly. However, *never* apply a tourniquet unless blood is gushing from a wound or until all other methods of stopping bleeding have failed. A tourniquet should be tightened only enough to stop arterial bleeding. Veins will continue to bleed until the limb has been drained of blood already present in it, and this is not aided by further tightening of the tourniquet.

- (a) The tourniquet should always be placed between the wound and the heart, in most cases as low as possible above the wound; however, in case of bleeding below the knee or elbow, it should be placed just above these joints. When possible, protect the skin by putting the tourniquet over the smoothed sleeve or trouser leg.
- (b) Once a tourniquet has been applied, the wounded man should be seen by a medical officer as soon as possible. The tourniquet should not be loosened by anyone except a medical officer prepared to stop the hemorrhage or bleeding by other means and prepared to replace the blood volume adequately. *Repeated loosening of the tourniquet* by inexperienced personnel is extremely dangerous and can result in considerable blood loss and endanger the life of the patient. (See fig. 5 for instructions in applying a tourni-

quet.) Inspect the tourniquet frequently to see if it has slipped or if there is any sign of further bleeding. In extremely cold weather, extremities such as the arms or legs with tourniquets applied are subject to cold injury, and therefore should be protected from the cold.

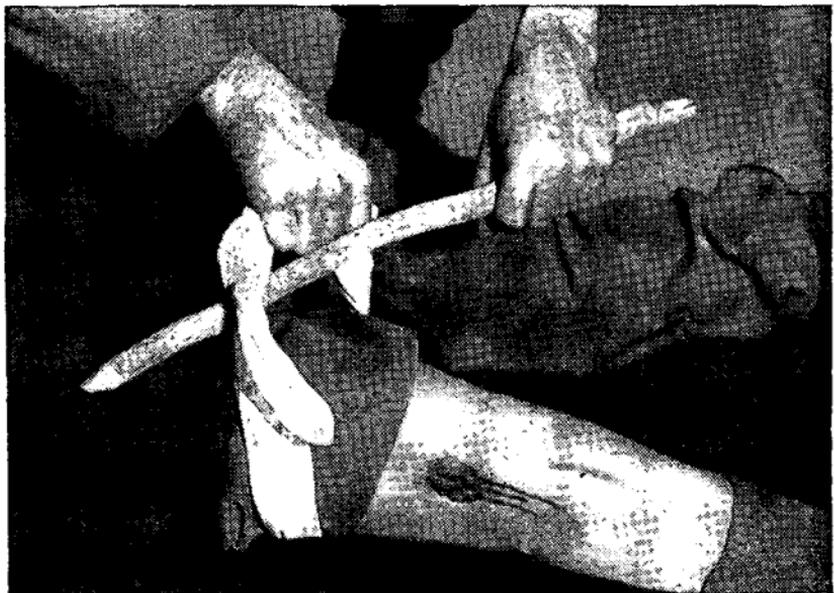
*b. Lifesaver Step Two. Protect the Wound.* The first-aid dressing protects wounds from the *outside*. It keeps dirt and germs out. It protects wounds from further injury (fig. 6). When applying the first-aid dressing, be careful to keep hands and foreign matter out of the wound.

*c. Lifesaver Step Three. Prevent or Treat Shock.*

- (1) Shock is a condition of great weakness of the body. It can result in death. It may go along with any kind of wound; the worse the wound, the more likely is it that shock will develop. Severe bleeding causes shock. A person in shock may tremble and appear nervous; he may be thirsty; he may become very pale, wet with sweat, and may pass out.
- (2) Shock may not appear for some time after an injury. *Treat the wounded man for shock before he has a chance to get it.*
- (3) To prevent or treat shock, make the soldier comfortable. Take off his pack and anything else he is carrying. Loosen his belt and clothes. Handle him very gently. Do not move him more than absolutely necessary. If he is lying in an abnormal position, make sure no bones are broken before

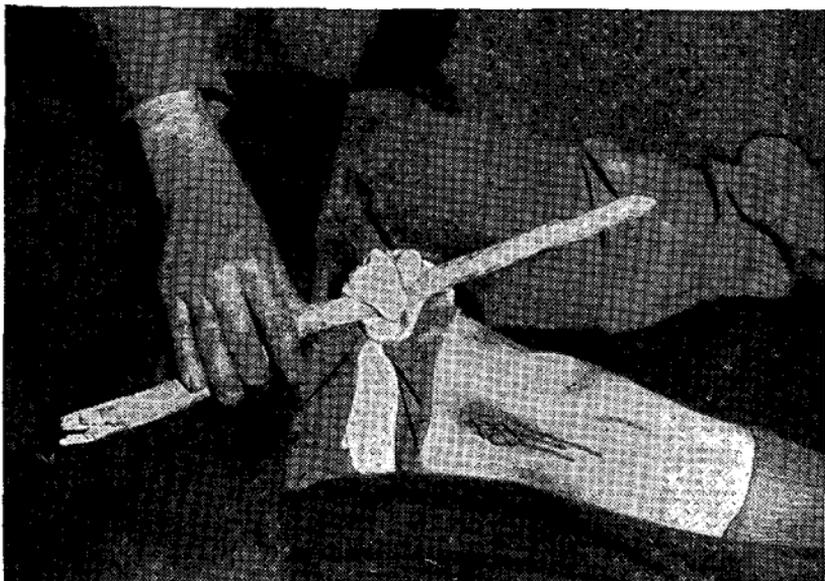


① Make a loop around the limb

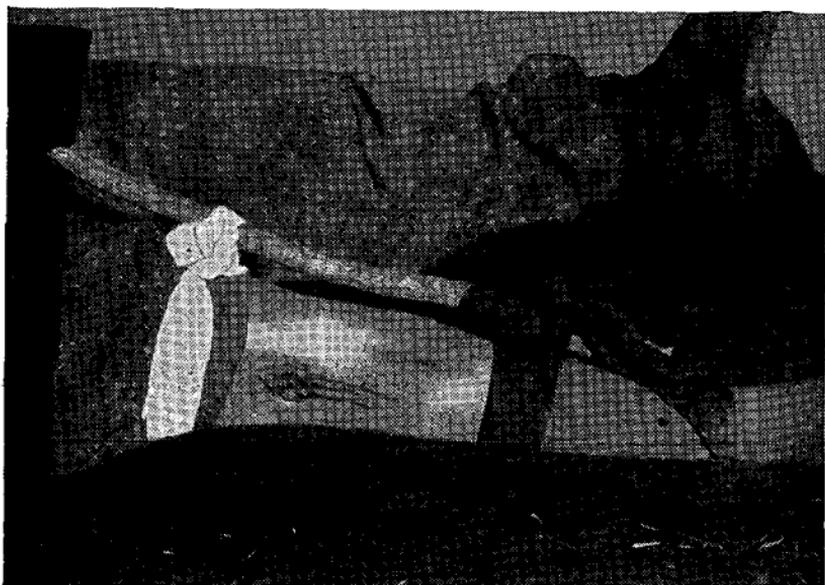


② Pass a stick, scabbard or bayonet under the loop

*Figure 5. Apply a tourniquet this way.*

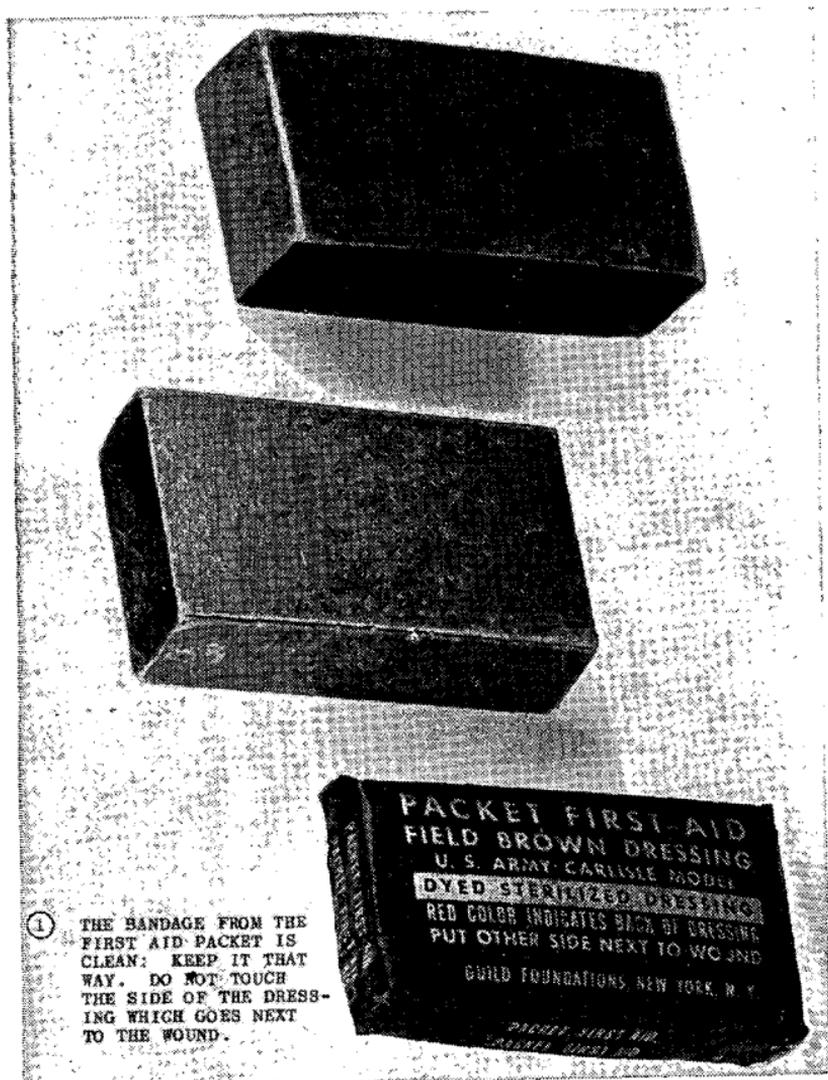


③ Tighten tourniquet just enough to stop bleeding



④ Bind free end to limb to keep tourniquet from unwinding

*Figure 5.*—Continued.



① THE BANDAGE FROM THE FIRST AID PACKET IS CLEAN: KEEP IT THAT WAY. DO NOT TOUCH THE SIDE OF THE DRESSING WHICH GOES NEXT TO THE WOUND.

Figure 6. Protect the wound.

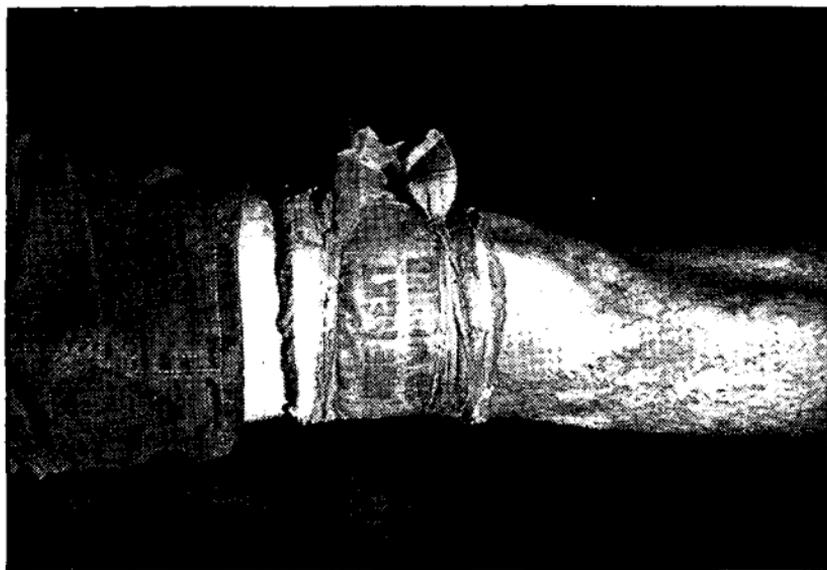


② Tear off paper and grab bandage by folded ends. Pull open.



③ Place soft thick center dressing on wound without allowing it to touch anything else

*Figure 6.*—Continued.



- ④ Wrap the bandage around the injured part and tie the ends securely

*Figure 6.*—Continued.

you straighten him out. If there is no head wound, lower his head and shoulders or if possible raise his legs to increase the flow of blood to his brain. Soldiers with head wounds are treated as described in paragraph 8. If the ground slants, turn him gently so that his feet are uphill and his head downhill. Keep the man warm by wrapping him with a blanket, coat, or poncho. Place something under him to protect him from the cold ground. If he is unconscious, place him face down with his head turned to one side, to prevent choking in case he should vomit (fig. 7). If he is

conscious, replace body fluids of the soldier by giving fluids by mouth. Warm stimulants such as coffee, cocoa, or tea are excellent. Do not give fluids to an unconscious soldier or to a soldier with a belly wound.



① MAKE THE MAN COMFORTABLE



② KEEP HIS HEAD LOW



③ KEEP HIM WARM



④ LAY AN UNCONSCIOUS  
MAN ON HIS SIDE OR  
FACE DOWN

Figure 7. Prevent Shock!

## CHAPTER 2

### INJURIES REQUIRING SPECIAL FIRST AID MEASURES

---

#### 4. General

The three lifesaving steps, which you have just learned, apply to the treatment of all injuries. However, there are certain types of injuries which, in addition, require special first-aid measures. These are *chest wounds, belly wounds, jaw and face wounds, burns, and fractures* (broken bones).

#### 5. Chest Wounds—Cover Up Airtight

*a.* Chest wounds through which air is being sucked in and blown out of the chest cavity are particularly dangerous. The chest wound itself is not as dangerous as the air which goes through it into the chest cavity. This air squeezes the lung, thereby collapsing it and preventing proper breathing (fig. 8①).

*b.* The life of the soldier may depend upon how quickly the wound is made airtight. Have the patient forcibly exhale (breathe out), if possible, and immediately apply a dressing which is large enough to cover the wound and stop the flow of air. Pack the dressing firmly over the wound (fig. 8②). Cover the dressing with a large piece of raincoat or other material to help make the wound airtight. Bind this covering securely with belts or strips of

torn clothing (fig. 8③). Encourage the man to lie on his injured side so that the lung on his uninjured side can receive more air. If he wishes, let him sit up. This position may ease his breathing.



- ① AN AIR SUCKING CHEST WOUND CAUSES THE LUNG TO COLLAPSE



- ② PRESS THE DRESSING FIRMLY OVER WOUND TO STOP THE FLOW OF AIR



- ③ COVER COMPLETELY WITH SOME MATERIAL AND BIND SECURELY

*Figure 8. Chest wounds.*

## 6. Belly Wounds—Cover Wound and Treat for Shock (fig. 9)

### *a. Do's.*

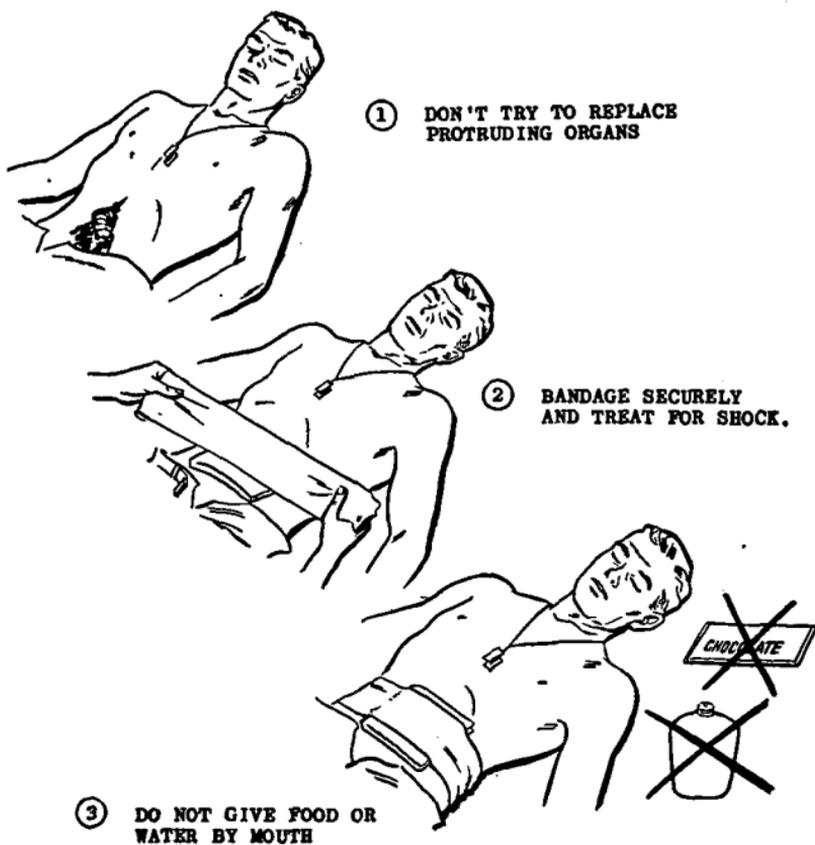
- (1) Cover the wound with the sterile dressing from a first aid packet and fasten securely.

(2) Treat the wounded soldier for shock.

*b. Do Not's.*

(1) Don't try to replace any organs, such as intestines, protruding from the belly. If you do, you will cause infection and severe shock. However, if it is necessary to move an exposed intestine onto the belly in order to cover the wound adequately, then do so.

(2) Don't give (or take) food or water. Anything taken by mouth will pass out from the intestine and spread germs in the belly. (If



*Figure 9. Belly wounds.*

evacuation is delayed, the lips may be moistened with a wet handkerchief.)

### **7. Jaw Wounds—Prevent Choking on Blood**

If a soldier is wounded in the face or neck, he will need special treatment to prevent his choking on blood. Bleeding from the face and neck is usually severe because of the many blood vessels in these parts. First, stop the bleeding by exerting pressure with a sterile dressing. Then bind the dressing so as to protect the wound. If the jaw is broken, place the absorbent part of the dressing over the wound and tie the tails over the top of the head to lend support. An additional dressing may be used to tie under the chin for added support, but allow enough freedom for free drainage from the mouth. The mouth should not be bandaged shut. To avoid choking on blood a man may sit up with his head held forward and down, or he may lie face down. These positions will allow the blood to drain out of his mouth instead of down his windpipe. Remember to treat for shock but do not use the face-up, head-low shock position (fig. 10).

### **8. Head Wounds—Do Not Give Morphine**

(fig. 11)

*a.* A head wound may consist of one of the following conditions or of a combination of them: a cut or bruise of the scalp, fracture of the skull and injury to the brain, and/or injury to the blood vessels of the scalp, skull, and brain. Usually, serious skull fractures and brain injuries occur together. It will be easy for you to discover a scalp wound because of the profuse bleeding. A scalp wound may need noth-

ing more than the treatment outlined in paragraph 3; however, if there is internal injury of the head, it will be more difficult for you to discover.

b. Check for head wounds if a soldier—

(1) Is now or has recently been unconscious.



① STOP BLEEDING BY EXERTING PRESSURE WITH A DRESSING.



② TIE A DRESSING TO PROTECT THE WOUND AND SUPPORT THE FRACTURE



③ KEEP THE FACE DOWN AND TREAT FOR SHOCK

*Figure 10. Jaw wounds.*



**DO NOT GIVE MORPHINE**

*Figure 11. Head wounds.*

- (2) Has blood or other fluid escaping from the nose or ears.
- (3) Has a slow pulse.
- (4) Has a headache.
- (5) Is vomiting.
- (6) Has had a convulsion.

c. Do not give morphine to soldiers with head wounds. Morphine hides signs or symptoms that medical officers should see in order to know what to do for the patient. It also causes breathing to slow down and may even cause it to stop. Do not place the soldier's head in a position lower than the rest of his body. A man with a head wound should be promptly evacuated on a litter. If the man is unconscious, he should be kept flat on his back. If the patient is unconscious, examination of the mouth should be made for false teeth or other objects which might cause choking. If he is unconscious, move him face down and lying on his abdomen or on his side to prevent his having any difficulty in breathing.

## 9. Severe Burns—Prevent Shock and Infection

Severe burns are more likely to cause *shock* than other severe wounds. Follow the procedure outlined in paragraph 3c (3) to prevent shock. There is also a great danger of *infection*. Do *not* pull clothes away from the burned area; instead, cut or tear the clothes and gently lift them off. Do *not* try to remove pieces of cloth that stick to the skin. Carefully cover the burned area with sterile dressings. If no sterile dressing is available, leave the burn uncovered. Never break blisters or touch the burn. It is especially important to treat for shock and to prevent infection. The victim should drink lots of water because severe burns cause a great loss of body fluids. There is also a great loss of the body salts. Therefore, if possible, add two salt tablets or  $\frac{1}{4}$  teaspoonful of loose salt to each canteenful of water. Three or more canteenfuls should be drunk in 24 hours (fig. 12).

## 10. Fractures—Prevent Shock and Further Injury

A fracture is a broken bone.

a. *Signs.*

- (1) These are the signs of a broken bone—
  - (a) Tenderness over the injury with pain on movement.
  - (b) Inability to move the injured part.
  - (c) Unnatural shape (deformity).
  - (d) Swelling and discoloration (change in color of the skin).
- (2) A fracture may or may not have all these signs. If you aren't sure, give the wounded man the benefit of the doubt and treat the injury as a fracture.



- ① PROTECT THE BURN WITH A STERILE DRESSING OR LEAVE UNCOVERED.



- ② PREVENT SHOCK AND INFECTION. GIVE SALT



- ③ GIVE PLENTY OF WATER -- IF POSSIBLE WITH SALT

*Figure 12. Burns.*

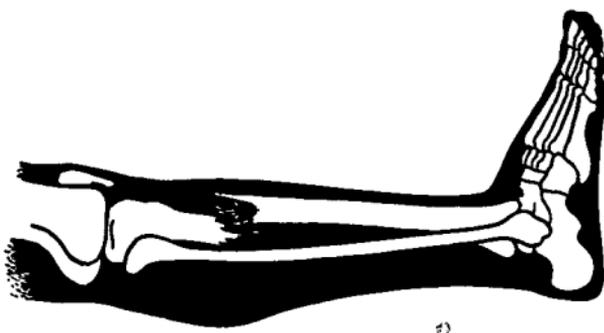
b. *Kinds.* There are two main kinds of fractures:

- (1) A closed fracture or a break in the bone without a break in the overlying skin.
- (2) An *open fracture* or broken bone that is exposed to contamination through a break in the skin. Open fractures may be caused by broken bones piercing the skin or by missiles which pierce the flesh and break the bone (fig. 13).

c. *Greatest Care.* If you think a person has a broken bone, handle him with a greatest care. Rough or careless handling causes pain and increases the chances of shock. Furthermore, the broken ends of the bone are razor-sharp and can cut through muscle, blood vessels, nerves, and skin (fig. 14). Remember—don't move a man with a fracture unless it is necessary. If you do, be gentle and keep the fractured part from moving. *If there is a wound with a fracture, apply a dressing as you would for any other wound.* If there is bleeding, it must be stopped. Stop bleeding as described in paragraph 3a. Do not apply a tourniquet over the site of the fracture.

d. *Splinting for Fractures.*

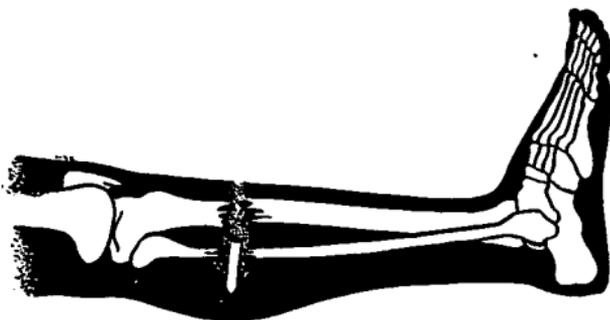
- (1) Most fractures require splinting. Persons with fractures of long bones should be splinted "where they lie" before any movement or transportation is attempted. Proper splinting greatly relieves the pain of a fracture and often prevents or lessens shock. Fixing the fragments of a broken bone by use of splints prevents the jagged edges of the bone from tearing blood vessels and nerves. In a closed fracture (one in



① CLOSED FRACTURE



② OPEN FRACTURE

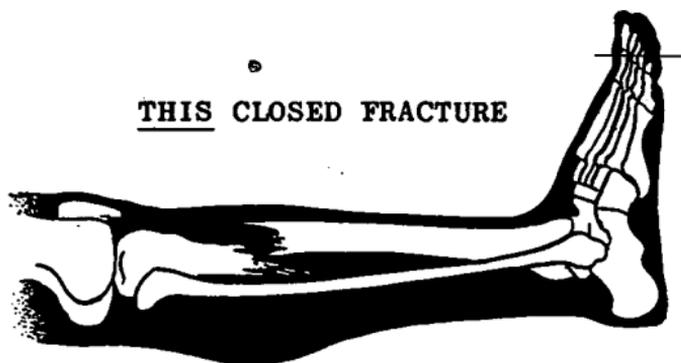


③ OPEN FRACTURE PRODUCED BY MISSILE

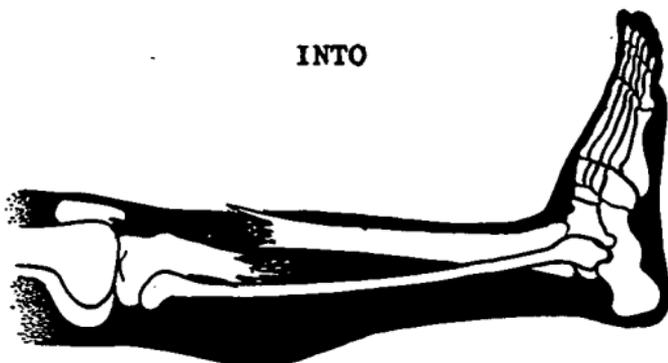
*Figure 13. Kinds of fractures.*

ROUGH HANDLING CAN CHANGE

THIS CLOSED FRACTURE



INTO

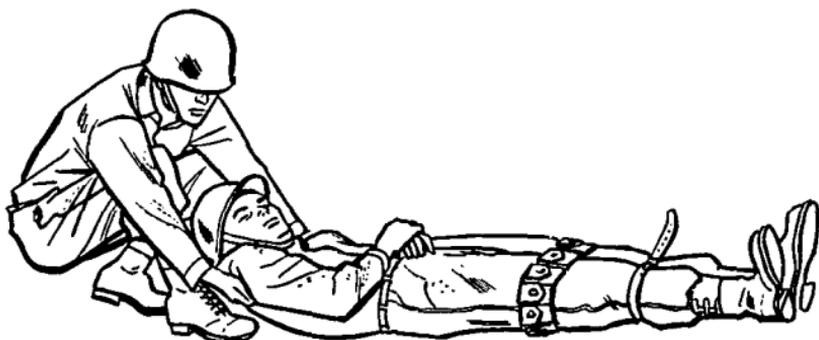


THIS OPEN FRACTURE

*Figure 14. Effects of rough handling.*

which there is no break in the skin), proper application of a splint will prevent the bone from piercing the skin and changing it into an open fracture. If the fracture is open, splinting will prevent further injury to the wound and the introduction of more infection.

- (2) First aid in the field may require improvising splints from any material that is handy. The following pages will describe the way to apply temporary splints.



*Figure 15. Broken leg.*

*e. Splints for Fractured Bones of Leg, Hip, or Thigh.*

- (1) The quickest way to splint the broken bone in a leg is to tie both legs together above and below the break (fig. 15). In this way, the uninjured leg will serve as a splint for the broken bone. You can use a belt, cartridge belt, rifle sling, strips of cloth, or handkerchiefs tied together. Do *not* move a man with a fractured bone of the leg unless it is necessary to get him off a road or away from enemy fire. If you must move him, tie his

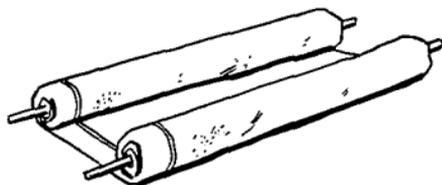
legs together first, grasp him by the shoulders and pull him in a straight line. Do not roll him or move him sideways.

- (2) If you have time, you can make a good splint for the lower leg by using two long sticks or poles (fig. 16). Roll the sticks into a folded blanket from both sides. This pads the leg and forms a trough in which the leg rests. Bind the splint firmly at several places. Splints for fractures of the bones of the leg should extend from a point above the knee to to a little below the foot. If the broken bone is in the thigh or hip, the inside splint should extend from the crotch to a little below the foot and the outside splint should extend from the armpit to a little below the foot. Always be sure that the ends of the sticks or poles are well padded.

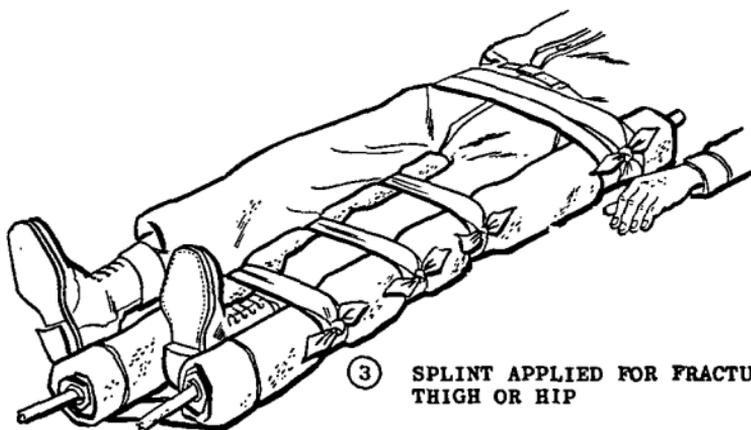
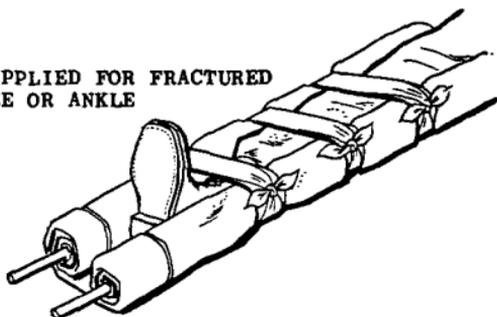
*f. Splints—for Fractured Bones of the Arm.*

- (1) When possible, keep the fractured bone of the arm from moving by supporting the arm with splints. This reduces pain and prevents damage to the tissues. Temporary splints can be made from boards, branches, bayonets, scabbards, etc. Splints should always be padded with some soft material to protect the limb from pressure and rubbing. Bind splints securely at several places above and below the fracture but not so tightly as to stop the flow of blood. It is well to apply two splints, one on either side of the arm. If an injured elbow is bent, do not try to straighten it; if straight, do not bend it.

- ① LEG SPLINT IMPROVISED WITH  
BLANKET AND POLES



- ② SPLINT APPLIED FOR FRACTURED  
LEG, KNEE OR ANKLE



- ③ SPLINT APPLIED FOR FRACTURED  
THIGH OR HIP

*Figure 16. Improvised leg splint.*

Figure 17 shows examples of splints correctly applied to the wrist or forearm, upper arm, and elbow to support the fractured bone and to prevent it from moving.

- (2) A sling is the quickest way to support a fractured bone of the arm or shoulder, a

sprained arm, or an arm with a painful injury. The arm should be bound snugly to the body to prevent movement. You can make a sling by using any material that will support all or a portion of the lower arm and hold it close to the body (fig. 18).



① SPLINTS FOR A BROKEN WRIST OR FOREARM



② SPLINTS FOR A BROKEN UPPER ARM

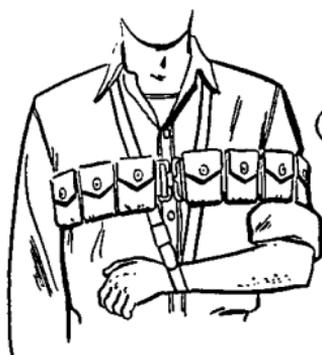
③ SINGLE STRAIGHT SPLINT FOR A FRACTURE NEAR THE ELBOW WHEN THE ELBOW CANNOT BE EASILY BENT



*Figure 17. Splints for a broken arm.*



- ① TURN THE JACKET OR SHIRT UP OVER THE INJURED ARM AND BUTTON IN PLACE.



- ② BINDING THE ARM TO THE CHEST WITH A BELT OR CARTRIDGE BELT GIVES ADDITIONAL SUPPORT.

- ③ SUPPORT THE FOREARM IN A SLING MADE FROM A BELT OR STRIPS OF CLOTHING AND BIND THE ARM TO THE CHEST.



*Figure 18. Slings for an injured arm or shoulder.*

*g. Broken back.*

- (1) It is often impossible to be sure a man has a broken back. Be suspicious of any back injury, especially if the back has been sharply struck or bent, or the person has

fallen. The most important thing to remember is that if the sharp bone fragments are moved, they may cut the spinal cord. This will cause permanent paralysis of the body and legs (fig. 19).



- ① **IN THIS POSITION, BONE FRAGMENTS CUT THE SPINAL CORD**



- ② **IN THIS POSITION, BONE FRAGMENTS ARE IN PROPER PLACE AND WON'T CUT THE SPINAL CORD**

*Figure 19. Broken back.*

(2) For a Broken Back.

(a) *Do.*

1. Place a low roll, such as a bath towel or clothing, under the middle of the back to support it and bend it backwards.
2. If the man must be moved, lift him onto a litter or board without bending his spine forward. It is best to have at least four men for this job (fig. 20).
3. If the man is in a face-down position, he

may be carried face down in a blanket (fig. 44).

4. Keep the patient's body alignment straight and natural at all times and keep the air passages free.



*Figure 20. Support a broken back.*

*(b) Don't.*

- 1 Don't move the patient unless absolutely necessary.
- 2 Don't raise his head even for a drink of water.
- 3 Don't twist his neck or back.
- 4 Don't carry him in a blanket face up.

*h. Broken Neck.* A broken neck is extremely dangerous. Bone fragments may cut the spinal cord just as in the case of a broken back. *Keep the patient's head straight and still.* Moving him may cause his death.

- (1) Keep the head and neck motionless by placing large stones or packs at each side of the head as support (fig. 21). Place a rolled blanket under the neck for support and padding. Raise the shoulders in order to place the roll under the neck. Don't bend the neck forward. Don't twist or raise the head at all.
- (2) A good way to keep the head in the right position is to immobilize the neck with a high collar. A high collar tends to lengthen the neck and raise the chin so as to arch the neck backward. A simple collar can be made from an artillery shell container. Cut the cardboard cylinder into a collar about five inches high. Split it on one side, pull it apart, and place it around the neck. Fasten the collar with adhesive tape. A similar type of splint can be made by wrapping a folded shirt, jacket, or newspaper around the neck. Use a belt, string, or strip of cloth to hold it in place, but be sure not to choke the patient (fig. 21).
- (3) If the man must be moved, get help. One person should support the man's head and keep it straight while others lift him. Transport him on a hard stretcher or board.
- (4) Never turn a man over who has a broken neck!



*Figure 21. Broken neck.*

## **11. Use of Morphine**

*a.* Few battle casualties have pain severe enough to warrant the use of morphine. Morphine when available and authorized for issue to non-medical personnel such as tank crews and patrols should be used only in case of severe pain. Use morphine with caution. Pain can often be relieved by simple measures such as keeping the casualty quiet and warm, splinting an injured arm or leg, and by carefully changing his position. If these measures fail and severe pain continues, give morphine. Morphine not only relieves pain, but helps decrease shock. It puts an injured man in better condition to be moved.

b. Caution—Don't Use Morphine (fig. 22) :

- (1) Within two hours of a previous injection.
- (2) When soldier is unconscious.
- (3) When soldier has a head injury.
- (4) When soldier is breathing less than 12 times a minute.
- (5) When soldier has a fractured neck.
- (6) When soldier is in shock.
- (7) When soldier has chest wounds and has difficulty with breathing.

c. (1) Morphine comes in small metal collapsible tubes with sterile needles called syrettes. (See fig. 23 for instruction in the use of morphine syrettes.) Inject the morphine

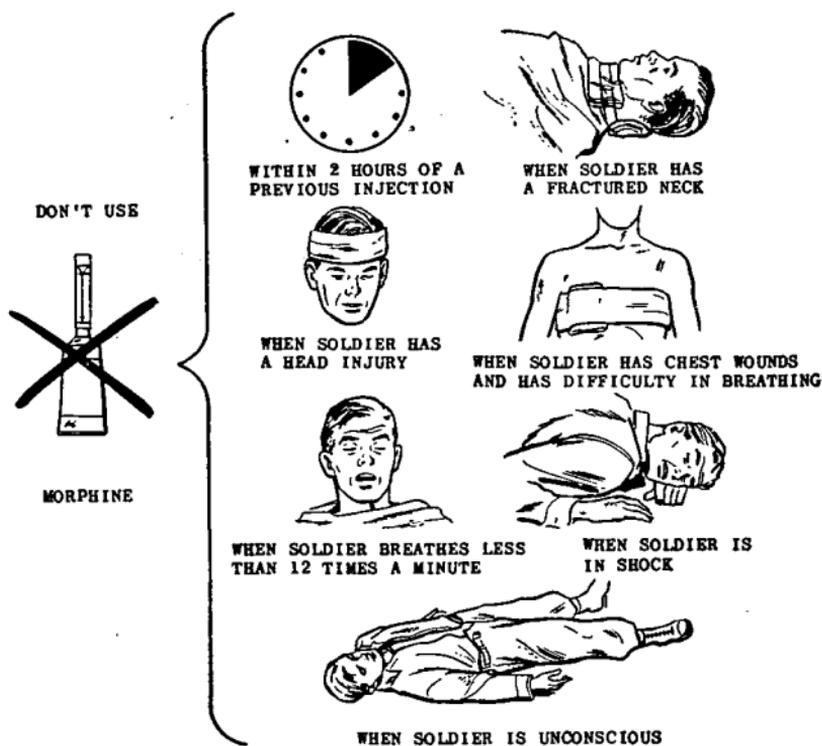
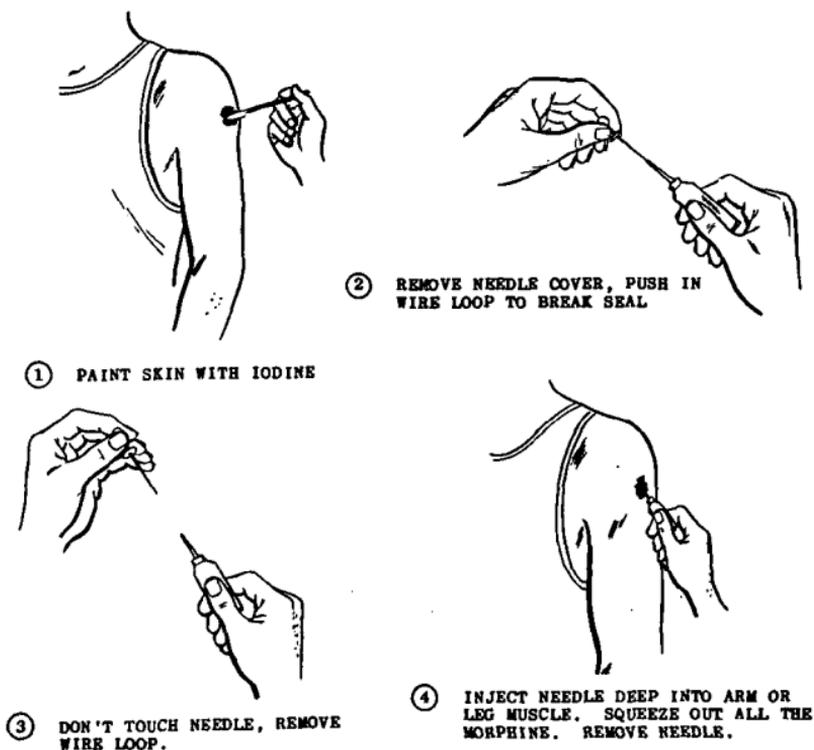


Figure 22. Don't Use Morphine.

under the skin at the wrist, abdomen, leg, ankle, or back, whichever area happens to be exposed. In cold weather, morphine should be given in a warm area of the body to speed absorption of the morphine by the body.



*Figure 23. Use of morphine syrette.*

- (2) If the syrette contains 30 mgm or  $\frac{1}{2}$  grain of morphine, give only one half of the syrette. If the syrette contains 16 mgm or  $\frac{1}{4}$  grain, give the contents of the whole syrette. In view of small stature or size of an individual, satisfactory relief of pain may be obtained in smaller dosages such as  $\frac{1}{8}$  or  $\frac{1}{6}$  grain (8 or 10 mgm).

## CHAPTER 3

### CHEMICAL INJURIES

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#### 12. General

*a.* Gasoline, ammonia, and nitroglycerin are all examples of common chemicals. A chemical may exist in the form of a liquid, a solid, or a gas. It may be a liquid which vaporizes into a gas, or it may be a solid which gives off vapors; for example, gasoline is a vaporizable liquid; ammonia is a gas; and TNT is a solid. Some chemicals are more injurious to the body than others. As liquid, they may irritate, inflame, burn, freeze, or destroy tissue. As vapors, they may irritate, inflame, and damage the skin, nose, lungs, or other parts of the respiratory tract. In either form, they may be absorbed into the blood stream and cause a general disturbance to the body's function.

*b.* You may come in contact with chemicals either through active combat with an enemy who uses war gases and/or through accidents in handling chemicals of one type or another during service support activities. You must be prepared both to protect yourself and others against the injurious effects of chemicals and to give first aid treatment if necessary.

- c.* (1) Alcohol should not be used in the presence of chemical poisons.
- (2) Water is the most useful single counter-measure for the great majority of chemical

contaminators with the possible exception of the risk of spreading liquid blister gas on the skin.

- (3) In decontaminating skin after contact with any chemical warfare agent, remove excess liquid (or solid) by gentle blotting with a handkerchief or suitable item and then flush the skin with water.

### **13. Protective Equipment**

*a.* You are provided with equipment that will protect you against poisonous gases. You are issued such equipment as the protective mask, protective ointment for the skin, and BAL eye ointment for the eyes (fig. 24). When considered necessary, you may also be provided with protective clothing, protective covers, and dubbing for your shoes; amyl nitrite ampules to counteract the effects of certain blood poisons; and atropine injection devices as an antidote for nerve gas poisoning.

*b.* Your protective mask is **THE** most important piece of protective equipment you will receive.

*c.* Know how to apply protective measures properly, how to use this equipment correctly, and how to prevent further contamination if the gas is still present. One good rule to follow is "Keep your protective mask on unless you are sure the area is clear of gas."

*d.* Protective ointment is used to neutralize liquid blister gases which have fallen on the skin. Protective ointment should not be used after symptoms of a blister gas burn appear, as it will only aggravate the burn. It may be used prior to exposure to blister



**USE PROTECTIVE OINTMENT FOR THE SKIN**



**USE BAL EYE OINTMENT FOR THE EYES**

*Figure 24. Protective measures.*

gases as a protective coating on exposed skin. *DO NOT* use protective ointment in the eyes.

*e.* BAL eye ointment is used only to remove lewisite (a blister gas) from the eyes, *DO NOT* use BAL in the eyes unless severe eye pain is present. Decontaminate the face before masking. Blister gases other than lewisite must be flushed out with WATER.

#### **14. Detection and Recognition**

You must know how to detect and identify poisonous gas. This subject is covered in detail in FM 21-40, Defense Against CBR Attack, and FM 21-41, Soldier's Manual for Defense Against CBR Warfare.

#### **15. War Gases**

War (poisonous) gases are produced by many different kinds and combinations of chemicals and may be classified according to the primary effect they produce, such as blister gases, choking gases, blood poisons, tear gases, vomiting gases, nerve gases, incendiaries, and screening smokes. The protective mask should be put on at once whenever any chemical warfare agent is detected, or as soon as symptoms produced by such an agent are recognized. If contamination of the eye has occurred, the eye should immediately be flushed with water and then the protective mask should be put on.

*a. Standard Decontamination Procedure.* Liquid blister gases and liquid nerve gases act on the skin extremely fast. Since most of these liquid war gases, as well as all other CBR agents (biological, radiological), have no special smell or color, IMMEDI-

**ATE ACTION** must be taken to remove them. You *cannot* wait for current slow detection devices to tell you which kind of gas it is. Use the following **STANDARD DECONTAMINATION PROCEDURE** until you are sure just what gas it is.

- (1) If agent is in the **EYES** and on the **FACE**:
  - (a) Rinse eyes and face with **WATER**.
  - (b) Blot off any remaining agent, and apply protective ointment.
  - (c) If **EYES** hurt, use **BAL**.
- (2) **MASK**.
- (3) Rinse exposed **SKIN** with **WATER**.
- (4) Blot off remaining agent, if any.
- (5) Apply **OINTMENT** (removes blister gas).
- (6) Tear away contaminated portions of clothing. Use above procedure wherever the agent has soaked through to the skin.
- (7) If symptoms of nerve gas poisoning appear, inject **ATROPINE**.

*b. Nerve Gases.* Nerve gases may be absorbed into the body's system through breathing, through the skin, or through the intestines (from eating contaminated food or drinking contaminated water).

- (1) Put on your protective mask at once if any of the following conditions are noticed:
  - (a) A feeling of tightness or constriction in your chest.
  - (b) Difficulty in breathing, either drawing in a breath or in exhaling.
  - (c) The light appears to be getting dimmer than usual, for no apparent reason.
  - (d) The eyes of other individuals in the vicinity have very small pinpoint-sized pupils.

- (e) A drawing, slightly painful sensation is felt in your eyes.
  - (f) There is a twitching of the muscles.
  - (g) A faint, sweetish, fruity odor, which cannot be accounted for.
- (2) If you are exposed to nerve gas and difficulty in breathing or twitching of your muscles develops, take an injection of atropine at once. If no other signs develop and the difficulty in breathing is relieved, one injection is enough. The atropine will not relieve the twitchings of your muscles, but these are not dangerous. If other signs develop, especially increased tightness of the chest or difficulty in breathing, take a second atropine injection. If you are not relieved in 10 minutes, take a third injection. **NEVER TAKE MORE THAN THREE INJECTIONS!** Additional atropine, if needed, will be given by medical personnel. Instructions for your use of either the atropine ampin or the atropine syrette are given in *h* and *i* below. Atropine ampins or syrettes and the protective ointment kit should be protected against freezing in cold weather by carrying these items in an inner pocket where body heat will prevent freezing.
- (3) If the atropine causes the breathing to become free and easy again, you may carry on with your duties. Dryness of the mouth is a good sign. This means that enough atropine has been taken to overcome the danger-

ous effects of nerve gas. Atropine injections do not relieve the effects of nerve gas *vapor* on the eyes. Such signs as hurting of the eyes, difficulty in focusing the vision on close objects, and headaches are annoying but not dangerous. You may carry on with your normal duties if there is no difficulty in breathing.

- (4) Remove at once liquid nerve gas that gets on your skin or clothing. Blot—do not rub—the excess liquid off the skin with one of the cloths found in the Protective Ointment Kit, a handkerchief, or a piece of outer clothing. Discard the contaminated cloth. Wash the area by pouring water from the canteen over the contaminated portion. The danger from nerve gas contamination of the skin is that it is absorbed by the skin. Nerve gas does not irritate the skin, and its presence may not be immediately noticed. Its principal hazard is absorption through the skin followed by poisoning the body. The breathing of vapor concentration of liquid nerve gas is also dangerous and the protective mask should be used while decontaminating the skin.
- (5) Liquid nerve gas in the eyes must be removed immediately since the absorption into the system of nerve gas from the eye is very rapid. Tilt your head back so that your eyes are looking straight upward, hold your breath, and slowly pour water into the contaminated eye to flush it out. Hold the eye

open and pour water into it slowly for at least 30 seconds. Have someone observe your eyes for one minute. If the pupil gets smaller, take an injection of atropine at once and follow the procedure outlined in (2) above if further signs of difficulty in breathing develop.

- (6) Never drink water from open sources in any area where a nerve gas attack occurred until it has been tested and certified safe to drink. Never eat food which has been under nerve gas attack unless in sealed metal cans or until tested and certified free of contamination. Taking food or water contaminated with nerve gas causes an increased flow of saliva in the mouth, and there may be colicky pains in the abdomen. If these symptoms or if tightness of the chest and difficulty in breathing occur, take an injection of atropine at once and follow the procedure outlined in (2) above if you are not relieved.
- (7) When wounded or severely poisoned by nerve gas, you may be unable to help yourself. In such case you will have to get someone else to help you in adjusting your protective mask, in decontamination, and in giving atropine. During nerve gas attacks you should always be on the alert for those who may have been overcome. When finding someone who has been overcome or is unable to help himself, take immediate first-aid measures as enumerated in preceding

subparagraphs. The victim's protective mask should be put on immediately. If the victim is having convulsions, three injections of atropine must be given at once with no delay between injections. Victims who are still alive but not breathing should be given artificial respiration, using one of the methods described in paragraph 29. Artificial respiration must be continued until spontaneous respiration begins. This may require from a half hour to an hour, or longer.

*c. Blister Gases.* Blister gases are of two main types, those which contain arsenicals and those which do not. Arsenicals cause burning pain on contact. The non-arsenicals, such as mustard, cause no pain. Both produce inflammation, blisters, and tissue destruction if permitted to remain unneutralized in contact with the skin. Blister gases can injure the lungs.

(1) If a liquid blister gas, such as liquid mustard, gets on your skin, *blot* off the liquid with the gauze which comes with each tube of protective ointment. Do not rub the mustard into your skin or spread it. Discard the gauze after using. Next, apply some protective ointment over the area and rub into your skin. Wipe off the excess ointment with clean gauze. Apply some fresh ointment and allow it to remain. This must be done within a few minutes after exposure, the sooner the better.

(2) Since arsenical blister gas is the only agent which causes immediate pain and is

also the only agent for which BAL is an antidote, the use of BAL should be based on the pain factor. If a blister gas should get in the eyes, the following self-aid procedure should be followed:

- (a) If there is no pain, flush the eye with water from the canteen for 30 seconds.
- (b) If the eye hurts, flush with water from the canteen for 30 seconds, then apply BAL. Apply the BAL ointment inside the lower lid, close the eye and gently rub the closed eye for 30 seconds to spread the ointment inside the eye. M5 protective ointment should never be applied to the eyes, and in decontaminating the face, care should be exercised to keep M5 protective ointment off the eyelids.

*d. Choking Gases.* If exposed to a choking gas such as phosgene, put on your protective mask at once and continue your mission unless there is difficulty in breathing, nausea and vomiting, or more than the usual shortness of breath on exertion. Then rest and wait for medical aid.

*e. Blood Poisons.* Blood poisoning can cause rapid, severe interference with respiration. Mask immediately upon detection. Blood gas effects are counteracted by amyl nitrite, an ampule of which should be crushed and placed under the mask. If soldier is unconscious, two ampules are needed. If respiration stops, artificial respiration should be given (as in par. 29).

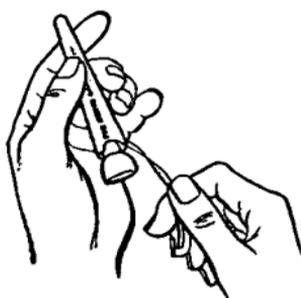
*f. Tear Gases.* Tear gases cause an increased flow of tears and intense eye strain. They may also irri-

tate the skin. Do not rub your eyes. The effects of tear gas are temporary and disappear when fresh air is reached or if a protective mask is put on. The mission you are performing should be continued.

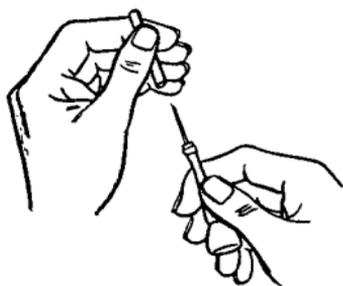
*g. Vomiting Gases.* The sneezing, nausea, salivating, and vomiting caused by these gases are not dangerous. If you are exposed, put on your protective mask. Lift the protective mask away from your face in order to vomit; then replace the mask immediately.

*h. Use of the Atropine Ampin.*

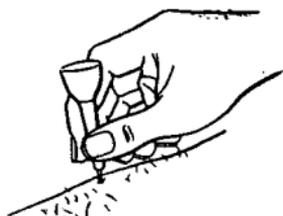
- (1) Remove the ampin from its plastic cone-shaped cover (fig. 25①).



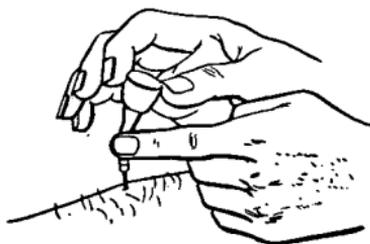
- ① REMOVE THE AMPIN FROM ITS PLASTIC CONE-SHAPED COVER



- ② TWIST AND REMOVE THE NEEDLE COVER



- ③ INJECT THE NEEDLE DEEP INTO A MUSCLE



- ④ KEEP BOTTOM OF AMPIN UP AND BREAK THE TIP OF THE AMPIN

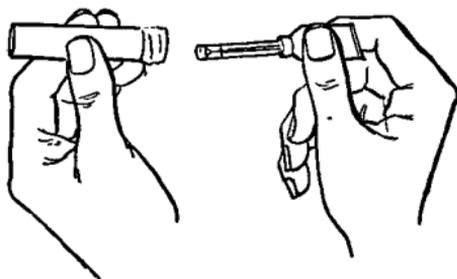
*Figure 25. Use of the atropine ampin.*

- (2) Twist and remove the needle cover (fig. 25②).
- (3) Tilt the needle vertical to the skin surface and plunge the needle straight into a thick muscle (buttock, thigh, upper arm, etc.) with a quick jab (fig. 25③). The needle should be inserted at least half its length under the skin surface. If possible open the clothing enough to expose the skin over the large muscle selected. If this cannot be done under conditions of extreme cold, give the injection through the clothing because speed is essential.
- (4) KEEP BOTTOM OF AMPIN UP and break the tip of the ampin (fig. 25④). After the solution has entered the muscle, remove the needle with a quick pull.

*i. Use of the Atropine Syrette.*

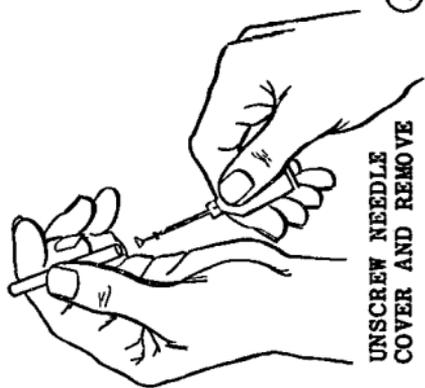
- (1) Remove the syrette from its plastic container (fig. 26①).
- (2) Unscrew and remove needle cover (fig. 26②).
- (3) Keeping needle end up and holding the syrette by the threads, push wire loop down firmly until the inner seal breaks. Before pulling wire out check the opening of the seal by gently squeezing until a small drop appears at the end of the needle. Then pull the wire out and discard (fig. 26③).
- (4) Tilt the needle vertical to the skin surface and plunge the needle straight into a thick muscle (buttock, thigh, upper arm, etc.) with a quick jab (fig. 26④). The needle

① REMOVE THE SYRETTETTE



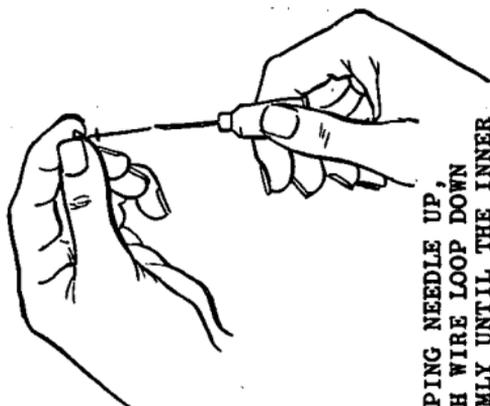
②

UNSCREW NEEDLE  
COVER AND REMOVE



③

KEEPING NEEDLE UP,  
PUSH WIRE LOOP DOWN  
FIRMLY UNTIL THE INNER  
SEAL BREAKS; THEN PULL  
WIRE OUT





SQUEEZE TUBE SLOWLY FROM  
SEALED END UNTIL EMPTY.

⑤



INJECT THE NEEDLE DEEP INTO  
A MUSCLE

④

*Figure 26. Use of the atropine syrette.*

should be inserted at least half its length under the skin surface. If possible open the clothing enough to expose the skin over the large muscle selected. If this cannot be done under conditions of extreme cold give the injection through the clothing because speed is essential.

- (5) Squeeze tube slowly from sealed end until empty (fig. 26⑤). The tube must be completely emptied. Use as many squeezes as necessary to empty the tube completely. Remove the needle from the muscle with a quick pull.

*j. Incendiaries.* The principal incendiaries from which you must learn to protect yourself are white phosphorus, thermite, magnesium, combustible oils, and napalm.

- (1) Clothing that has been struck by pieces of burning phosphorus should be removed immediately before the phosphorus burns through to the skin. Burning pieces of phosphorus on the skin should be put out immediately with water from your canteen, a wet cloth, or urine and removed from the skin (fig. 27). To prevent further burning, wet a copper sulphate pad, if available, with water and apply it to the phosphorus. Wring the copper sulphate solution out of the pad onto the phosphorus. Remove the phosphorus particles by gently rubbing them with the copper sulphate pad. If copper sulphate pads are not available, keep the phosphorus submerged in water or cov-



*Figure 27. Extinguish burning phosphorus.*

ered with wet material to exclude the air until you can remove the phosphorus particles. You can use your knife, bayonet, stick, or other available object to remove the phosphorus particles. *Get medical treatment as soon as possible.*

- (2) Particles of thermite on the skin should be cooled immediately with water from your canteen and removed. Thereafter, use same first-aid treatment as for other heat burns (see pars. 9 and 20).
- (3) Particles of magnesium on the skin burn quickly and deeply and usually must be removed by trained personnel using local anesthesia. *Get medical treatment immediately.*
- (4) If a soldier is burned by the combustible oils in flame throwers, oil incendiary bombs, or napalm, you should use the same first-aid treatment for burns as that for other heat burns (see pars. 9 and 20). The heat and irritating gases given off by these combustible oils may cause lung damage which must be treated by medical personnel.

*k. Screening Smokes.*

- (1) Exposure to high concentrations of screening smokes, such as HC mixture, may cause irritation of the nose and throat, coughing, choking, and suffocation. Put on your protective mask as soon as any of these sensations start. Long exposure to low concentrations of these smokes may also cause headache, fever, and chest and muscular pains. If nausea, vomiting, or difficulty in breathing occurs, get medical aid as soon as combat conditions permit. Take aspirin to ease general discomfort.
- (2) If a liquid smoke screen agent gets on the skin, wash it off with water. If liquid

splash or spray gets into the eye, hold the eye open and flush out with water.

- (3) Exposure to petroleum oil smoke or white phosphorus smoke is harmless.

*1. Caution:* The protective mask should not be used in smoke for long periods, especially in smoke from oil fires. In all instances in which the protective mask has been used in smoke concentrations the canister should be replaced before reusing the mask. The protective mask will provide only limited protection against smoke dependent upon the type and concentration of the smoke. The canister of the protective mask does not generate oxygen but filters smoke out of the air.

## 16. Incidental Gases

*a. Hydrogen Sulfide.* This gas has the odor of rotten eggs. Exposure to this gas in low concentration chiefly affects the eyes, causing swollen eyelids, itchiness, smarting, pain, photophobia (eye sensitivity to light), and blurring of the vision. Exposure to high concentration of hydrogen sulfide may cause serious damage to the respiratory organs. Very high concentrations cause unconsciousness, convulsions, and cause breathing to cease. If you are exposed to this gas, get out of the area to fresh air immediately. If you cannot leave the area, put on the protective mask. When a man is unconscious and not breathing, give artificial respiration (par. 29). Other first-aid measures include keeping the victim lying down and quiet, massaging the arms and legs, keeping the victim warm, and giving stimulants (coffee or tea). In all cases of severe exposure, get medical attention as soon as possible.

*b. Ammonia.* This gas causes violent, burning pain in the eyes and nose, tears, sneezing, nausea, vomiting, pain in the chest and abdomen, choking sensation, and cough. Get fresh air immediately. To remove eye irritation wash eyes thoroughly with water for at least 5 minutes. Drink diluted citrus fruit juice for abdominal pain. Give artificial respiration for unconsciousness or severe breathing difficulty, and get medical aid immediately.

## **17. Oxidizers**

### *a. Red and White Fuming Nitric Acid.*

- (1) Solutions of red and white fuming nitric acid cause severe chemical burns when in contact with skin or eyes. Remove the acid immediately by washing skin and eyes with large amounts of clean water for at least 15 minutes, and follow by application of a weak solution of bicarbonate of soda and water or use the bicarbonate of soda and water solution without washing the skin and eyes. Troops exposed to a known hazard of this acid should obtain the first-aid item from a medical installation such as a dispensary or an aid station and keep the item constantly and readily available. After neutralizing or washing the contaminated skin, treat acid burn as stated for any other burn (pars. 9 and 20), and secure medical attention.
- (2) If solution of red and white fuming nitric acid is swallowed, immediately, dilute the acid by drinking large amounts of water.

Try not to vomit. Get medical treatment immediately.

- (3) The fumes of the nitric acids (the nitrogen oxides) are in many ways more dangerous than obvious liquid skin contact because after inhalation their harmful effects may show up long after the exposure has occurred; also, amounts not immediately irritating may cause serious illness later. A soldier should leave the area without delay, if possible, or put on the protective mask at once. The fumes of nitric acid may cause irritation of the eyes, choking burning in the chest, violent cough, spitting of yellow spit, headache, and vomiting. These symptoms may be relieved by getting to fresh uncontaminated air immediately, following which you may continue with your normal duties. However, seek immediate medical attention in the presence of continued difficulty in breathing, nausea and vomiting, or more than the usual shortness of breath on exertion. If medical attention is not available, rest quietly until help arrives.

*b. Hydrogen Peroxide.*

- (1) Solution of hydrogen peroxide in contact with skin and eyes will usually cause irritation but it will be temporary if skin and eyes are quickly cleansed and rinsed with water. Additionally, affected skin may be covered with vaseline or vaseline gauze.
- (2) Hydrogen peroxide vapors irritate the mucous membranes of the nose and throat,

causing coughing and excessive nasal and throat secretion. Fine droplets (mists) of strong hydrogen peroxide solution may be injurious to the nose, throat, and especially to the eye. The damaging effects on the eye may develop long after the exposure. Get fresh air immediately or put on an approved type protective breathing apparatus.

- (3) First-aid treatment for severe skin burns caused by hydrogen peroxide is the same as that for an ordinary thermal burn (par. 9 and 20).

c. *Liquid Oxygen.*

- (1) Liquid oxygen is nontoxic and does not produce irritating fumes. When it comes in contact with the skin, it freezes the tissues, producing an effect very similar to a burn or a scald. Remove from the skin immediately. Rinse the skin with water. If possible use warm water. If contamination is sufficient to cause a burn, first remove the liquid oxygen and then treat as any ordinary thermal burn (see par. 9 and 20). Severe skin exposure usually requires medical attention.
- (2) Remove contamination from the eyes by immediately washing with large amounts of clean water. Get prompt medical attention.
- (3) Remove contaminated clothing immediately.
- (4) Remove body contamination by taking a long shower, for at least 15 minutes.

## 18. Propellant Fuels

### *a. Aniline.*

- (1) Aniline is a flammable, colorless, oily liquid which darkens on exposure to light or air. It has a burning taste and a characteristic odor. It is a poisonous liquid and also gives off toxic vapors.
- (2) Contact with the skin causes severe irritation. If allowed to remain, it will be absorbed into the blood stream through the skin. The vapor causes irritation of the throat and lungs, leading to sore throat and deep cough. Taken internally, it will cause poisoning. A sense of well-being is often experienced in the early stages of exposure. As the amount of exposure increases, the lips burn blue, and bluish tinges appear on the fingernail beds, the tongue, the mouth, and lining of the eyelids. This is followed by headache and drowsiness, sometimes with nausea and vomiting. Stupor and unconsciousness may follow. Recognition of the bluish tinge in dark-skinned races can best be accomplished by examination of the tongue and the lining of the mouth and eyelids.
- (3) If you are exposed to this chemical, take immediate action. Wash liquid aniline from the skin with large amounts of water or a 5-percent solution of acetic acid or vinegar. Troops exposed to a known hazard of aniline should obtain these first-aid items from a medical installation such as

a dispensary or an aid station and keep the items constantly and readily available. If aniline vapors are present, evacuate the area immediately or remove them by ventilation. If the vapors cannot be removed by ventilation or the area cannot be evacuated, put on your protective mask immediately.

- (4) Remove eye contamination by washing with large amounts of clean water. If aniline gets into the ear, flush it with 3 percent acetic acid solution or vinegar. Remove contaminated clothing immediately and soak them in a diluted acetic acid solution or vinegar. If acetic acid solution or vinegar is not available, use clean water. In all cases of severe exposure, or if aniline is accidentally swallowed, get immediate medical attention.
- (5) If any of the symptoms of aniline poisoning occur, such as severe headache, drowsiness, nausea, and vomiting; remove the victim to fresh air, keep quiet, give a mild stimulant such as black coffee (never alcohol), and keep warm. Give artificial respiration to victims who are not breathing.

*b. Ethyl Alcohol. Do Not Drink.*

- (1) Ethyl alcohol is a highly intoxicating liquid which evaporates quickly and is flammable. Like water in appearance, ethyl alcohol cannot be distinguished from other more poisonous alcohols, such as methyl alcohol, by its odor and burning taste. It may con-

tain certain toxic substances which have been added to it to make it unfit for human consumption.

- (2) The vapors of this liquid cause severe irritation to the eyes and upper respiratory tract. Wear an approved form of respiratory protective equipment in areas where there is likely to be a high concentration of these vapors.
- (3) If ethyl alcohol is spilled into the eyes, wash it out immediately with large amounts of clean water. If the symptoms persists, get medical attention.
- (4) This liquid has little effect on the skin. However, remove contaminated clothing and bathe contaminated skin areas because prolonged contact causes irritation of the skin.

*c. Furfuryl Alcohol. Do Not Drink.*

- (1) Furfuryl alcohol is a straw yellow to dark amber liquid with a brine-like odor and bitter taste. It is poisonous if absorbed from prolonged skin contact or taken internally. *Drinking this alcohol is very dangerous.*
- (2) If furfuryl alcohol is spilled on the skin or in the eyes, it will cause irritation. Remove immediately by washing with large amounts of clean water.
- (3) Although it does not vaporize quickly in closed spaces at high temperatures, troublesome concentrations of vapor may gather or collect which cause irritation to the throat and lungs.

- (4) Remove contaminated clothing and rinse affected skin areas with water.

*d. Methyl Alcohol. (Wood Alcohol) Do Not Drink.*

- (1) Methyl alcohol is a *highly* poisonous chemical. It is colorless like water. It has an odor very much like ethyl alcohol, and the sense of smell should not be relied upon to distinguish between these two alcohols. It evaporates quickly and is flammable.
- (2) This chemical may enter your body by your breathing the vapors, by absorption through the skin, or by drinking it; and, in small amounts, it will cause headache, nausea, vomiting, and irritation of the mucous membranes. Larger amounts in the blood cause dizziness, staggering walk, severe cramps, sour stomach, *blindness*, convulsions, coma, and death. *Swallowing a small amount of this chemical may cause death.*
- (3) When working in closed spaces with this chemical, provide adequate ventilation or use some approved form of respiratory protective equipment.
- (4) Wash contaminated skin areas with large amounts of clean water. Remove contaminated clothing.
- (5) If this chemical is accidentally swallowed, get medical attention immediately. If medical attention cannot be obtained at once, large amounts of epsom salts with large large amounts of water may be taken in order to assist in the elimination of as much

as possible of the chemical from the stomach. Troops exposed to a known hazard of this chemical should obtain this first-aid item from a medical installation such as a dispensary or an aid station and keep the item constantly and readily available. Get medical attention as soon as possible.

*e. Hydrazine.*

- (1) Hydrazine is a colorless, alkaline, fuming liquid which is odorless or may have the odor of ammonia. It is flammable, highly explosive, and corrosive. Hydrazine is poisonous to humans by breathing, by skin contact, and if taken internally. Skin contact results in an intense burning sensation. If you are exposed to moderate or heavy concentrations of vapors, they will cause immediate violent irritation of the nose and throat, itching, burning, and swelling of the eyes; and prolonged exposure may cause temporary blindness. If you are exposed to mild concentrations of these vapors, signs may not appear until 3 to 4 hours later in the form of the same eye and nose effects as described above.
- (2) Remove skin contamination by washing with large amounts of clean water, followed by an application of boric acid paste. Troops exposed to hydrazine should obtain this first-aid item from a medical installation such as a dispensary or an aid station and keep the item constantly and readily available.

- (3) In any concentration of vapors, use a closed breathing apparatus. Remove victims overcome by poisonous fumes from the area. Give artificial respiration to those not breathing.
- (4) Remove eye contamination by washing with large amounts of water or 3 percent boric acid solution if available.
- (5) Remove contaminated clothing and bathe the skin area with clean water or 5 percent acetic acid solution.
- (6) Remove whole body contamination by taking a long shower for at least 15 minutes.
- (7) In all cases of exposure to hydrazine, receive medical attention promptly.

*f. Hydrocarbon Fuels.*

- (1) Hydrocarbon fuels are flammable compounds (gasoline, jet propulsion fuels, kerosene, heptane, butane, octane, pentane, etc.). All of these fuels produce essentially the same effects in varying degrees. They give off vapors at normal temperatures which, when mixed with proper air mixtures, are ignitable by spark or flame. The vapors given off are heavier than air and, therefore, tend to collect in storage areas. Hydrocarbons are poisonous, both in inhalation and absorption through the skin. In addition to the poisonous qualities due to hydrocarbon content, aviation gasoline contains tetraethyl lead and jet fuels contain aromatics, both of which are also poisonous by inhalation, skin absorption, or if taken internally.

- (2) If you do not immediately remove hydrocarbon fuels which have come in contact with your skin, it will become red and irritated and later will blister. Long exposure of the skin to hydrocarbon fuel can result in death of the tissue with scarring and deformity. Contact with the eyes causes immediate irritation, redness, and large amounts of tears.
- (3) Whenever any of these hydrocarbons come in contact with the skin or eyes, wash them out with large amounts of water. Keep areas where concentrations of hydrocarbon vapors are likely to gather well ventilated or use some form of self-contained breathing apparatus.
- (4) When hydrocarbon poisoning is apparent, get medical attention immediately. In the meantime get the victim into fresh air, keep warm, quiet, and lying down. If he is unconscious or having breathing difficulty, give him a few sniffs of aromatic spirits of ammonia and apply artificial respiration (par. 29). When consciousness has been regained, give stimulants (coffee or tea).

*g. Solid Propellants.*

- (1) Solid double base propellants contain nitrocellulose and nitroglycerin. Nitroglycerin causes unpleasant and serious effects upon exposure, such as flushing of the face, moderate to severe headache, rapid pulse, nausea and vomiting, colicky pains, diarrhea, irregular breathing, and unconsciousness.

Not all of these symptoms will appear. Any one or several may appear, but the most common is headache. In cases of severe poisoning, victims may be delirious, may have convulsions, or collapse.

- (2) If any of the above signs occur after exposure to these chemicals, keep the victim lying down with the legs raised and the head lowered, provide plenty of fresh air, give stimulants (coffee or hot tea), and alternate hot and cold applications to the chest. If the victim is having breathing difficulty, apply artificial respiration. *Get immediate medical attention.*
- (3) *If exposed to either of these chemicals, do not drink even the smallest amount of alcohol. Alcohol makes the signs more severe and dangerous.*
- (4) After handling these materials, wash the hands thoroughly before eating, smoking, or drinking, to prevent taking the chemical into the stomach.

## CHAPTER 4

### COMMON EMERGENCIES

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#### 19. Special First-Aid Kits

In addition to the first-aid pouch with packet which every soldier carries, special *first-aid kits* will often be available. These are for use in common emergencies like small burns, cuts, and eye injuries. First-aid kits supplied to many motor vehicles (fig. 28) contain tourniquets, iodine swabs, adhesive plaster, sterile petrolatum gauze, eye ointment, and dressings. Learn to use them correctly and efficiently. Directions are included with each kit.

#### 20. Minor Wounds and Burns

- a. (1) Small wounds such as cuts, usually do not bleed very much and will stop bleeding once a dressing has been applied. Infection is the principal danger, so any break in the skin should be protected. Do not touch a wound with your fingers or allow clothes to touch it. Keep it clean.
- (2) Apply a dressing over the wound. There are various sized dressings in motor vehicle and other first-aid kits. Pick out a size which is large enough to cover the wound completely. Be careful not to touch the inside of the dressing with your fingers.

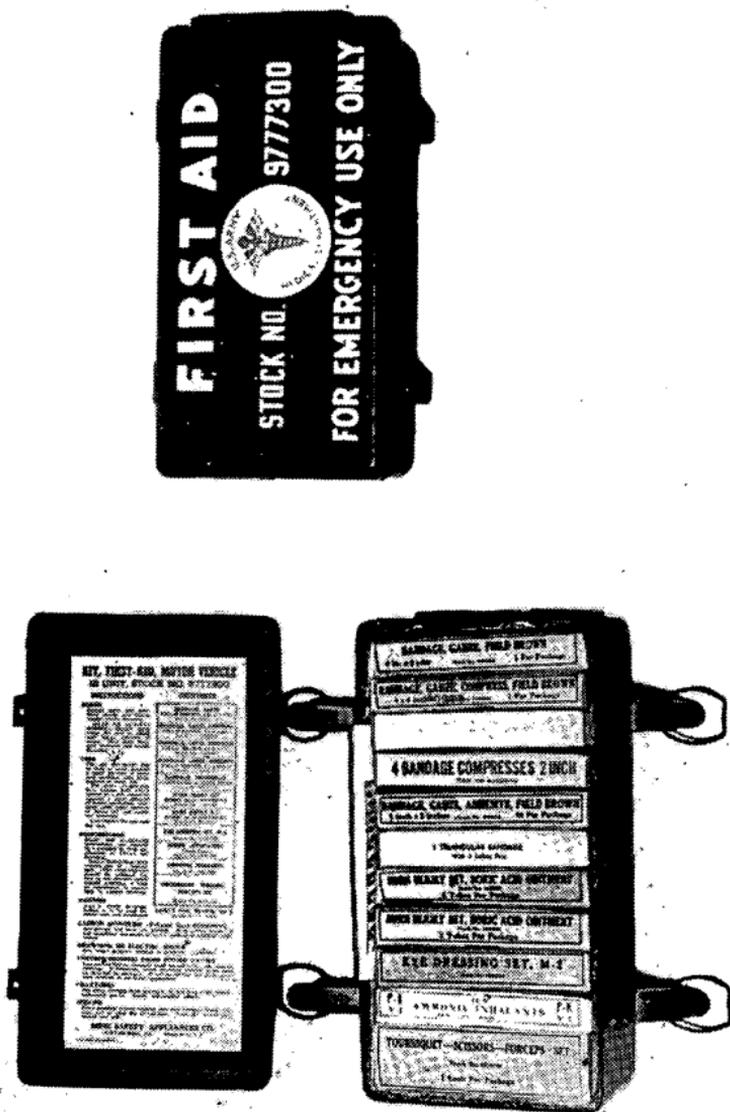


Figure 28. First-aid kit, motor vehicle, 12 unit.

*b.* Small burns are a frequent injury; and such burns, unless properly protected, often become infected. Burns may be caused by dry heat, hot liquids, chemicals, radiation (sunburn), or electricity. Severe sunburn requires the same first-aid measures as other burns. If a first-aid kit containing sterile gauze is available, apply the gauze over the burn as a dressing. Cover the burned area with an additional dry dressing of suitable size. If no sterile gauze is available, cover the burn with the dressing from your first-aid packet. If no sterile dressing is available, leave the burn uncovered.

## **21. Foreign Body in the Eye**

If a particle gets in your eye, do not rub the eye. Close it for a few minutes and tears may wash away the object. If not, have someone examine the eye and remove the particle as shown in figure 29.

## **22. Foreign Body in the Ear, Nose, or Throat**

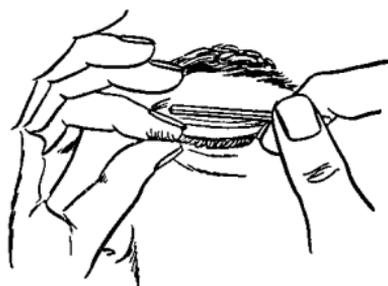
*a.* Never probe with a pin, wire, or stick for an object in your ear. Let the medical officer get it out. An insect in the ear may be removed simply by means of attracting it with a flashlight held to the ear or it may be killed with a few drops of oil or water. Many other objects may be flushed out that way. However, if the object is something which swells when wet (such as a bean), do not put water into the ear (fig. 30①).

*b.* Probing into the nose will merely jam a foreign body tighter. Try to loosen it by gently blowing your nose (fig. 30②). If this doesn't work, wait until you see a medical officer. Objects in the nose are usually not dangerous.

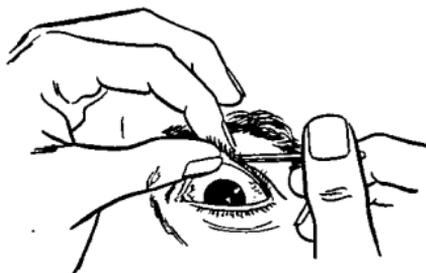
c. If you can reach a foreign body in your throat with your finger, you may pick it out. Hold your head down when you do this. Be careful not to push the object farther down (fig. 30③).



① INSPECT THE EYEBALL AND LOWER LID. GENTLY REMOVE OBJECT WITH A MOIST CLEAN CORNER OF HANDKERCHIEF.



② IF THE OBJECT IS NOT IN THE LOWER LID, INSPECT UPPER LID. GRASP THE EYELASHES WITH THUMB AND INDEX FINGER. PLACE A MATCH STICK OR SMALL TWIG OVER THE LID.



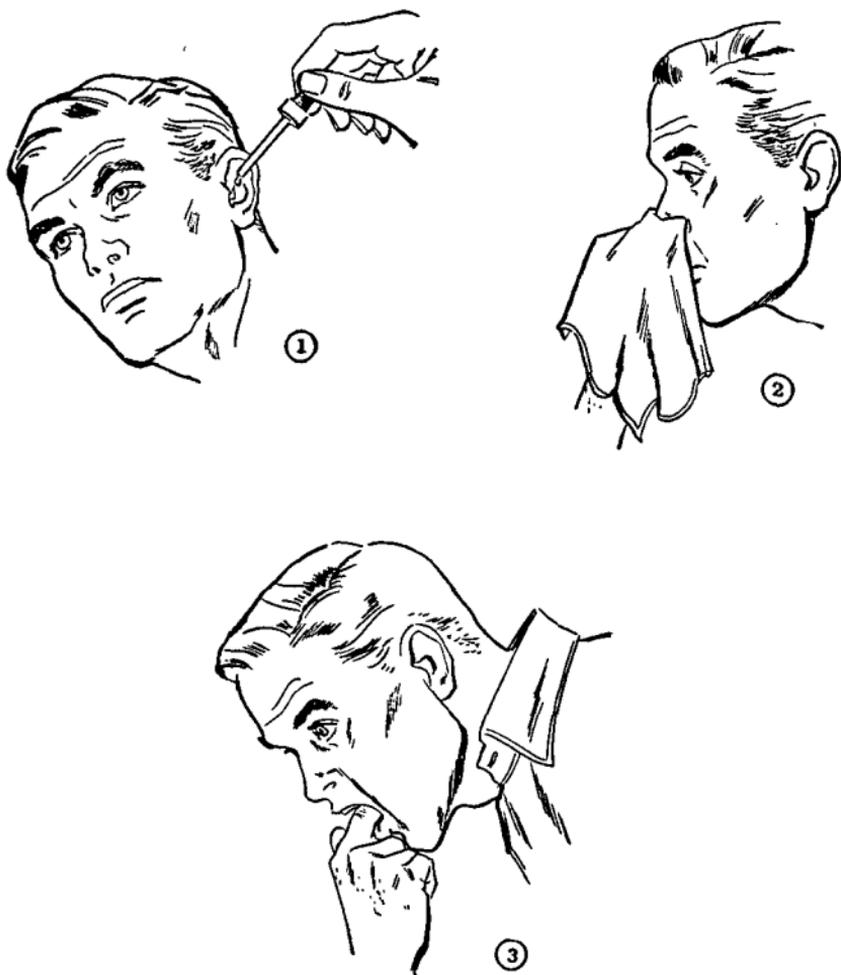
③ PULL THE LID UP OVER THE STICK. EXAMINE INSIDE OF LID WHILE THE MAN LOOKS DOWN. GENTLY REMOVE THE PARTICLE WITH A CLEAN CORNER OF A HANDKERCHIEF.

Figure 29. Removing an object from the eye.

### 23. Care of Feet

a. Soldiers have to use their feet constantly. Prevention of foot trouble is the best first aid for feet.

b. Keep your feet clean. After a bath, thoroughly dry the feet and especially between the toes to prevent "athlete's foot." For itching or redness be-



*Figure 30. Removing foreign bodies from the ear, nose, or throat.*

tween the toes, apply GI foot powder twice daily (fig. 31).

If it does not improve, see your medical officer. Don't try to treat it yourself. Don't cut a callus or corn as this may cause a serious infection. Report to your medical officer instead.

c. To avoid ingrown toenails, keep your toenails clean and short; *cut them straight across*.

d. Dust your feet with GI foot powder after bathing and before a march. Foot powder absorbs perspiration and prevents chafing.

e. Put on clean socks every day, if possible. Don't wear socks that have holes or poorly darned spots in them or socks that don't fit properly.



Figure 31. Prevent athlete's foot.

- f.* Break in shoes before wearing them on a march.
- g.* If a blister develops and medical care is not available, follow the directions given in figure 32.

## 24. Snake Bite

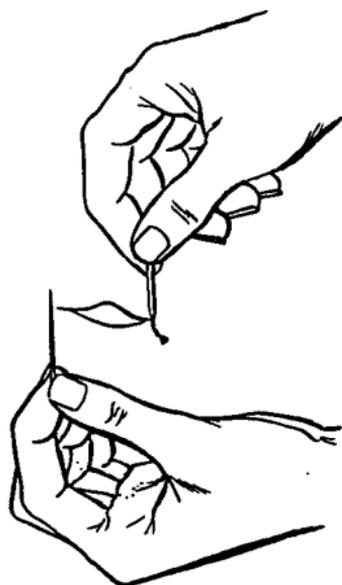
*a.* Poisonous snake bites must be given immediate attention. The person who is bitten should be as quiet as possible and not walk or run about. If you can, kill and keep the snake so that it can be identified and so that proper medicine can be given the victim by a medical officer. However, giving first aid immediately and avoiding overexertion is the most important thing to do.

*b.* (1) If a person is bitten on arm or leg, apply a loose tourniquet (constricting band) as directed in paragraph 3*a*(2) (*a*). Tighten the tourniquet (constricting band) just enough to make the veins stand out prominently under the skin. After the first hour the band may be loosened for approximately 1 minute in every 30 minutes.

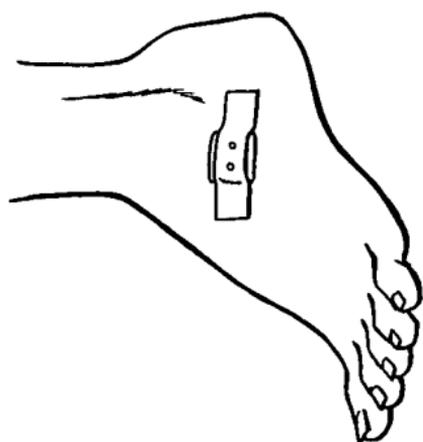
(2) Make a cross-cut over *each* fang mark long enough and deep enough to allow free bleeding—about  $\frac{1}{4}$  inch long and  $\frac{1}{4}$  inch deep. Suck the poison from the wound, spitting it out frequently. Snake poison is harmless in the mouth unless there are cuts. Suction should be kept up for at least 1 hour with the constricting band on. A snake-bite victim can do all these things for himself (fig. 33) if he can comfortably reach the fang marks with his mouth. If not, he must have assistance.



① WASH THE BLISTER WITH SOAP AND WATER



② STERILIZE A NEEDLE BY HEATING IT IN A FLAME



④ COVER WITH BAND-AID  
OR ADHESIVE PLASTER



③ OPEN THE BLISTER BY STICKING IT AT THE  
LOWER EDGE

*Figure 32. Care of blisters.*

c. If the bite is on a part of the body where it is impossible to apply a band, make the cross incisions and apply suction just the same. After giving first aid, obtain medical help as soon as possible.

d. If a snake bite kit is available, the suction device in the kit may be used to suck poison from the crosscuts.



① APPLY TOURNIQUET



② MAKE CROSS INCISIONS



③ SUCK OUT POISON

Figure 33. First aid for snake bite.

## 25. Poison Plants

Poison ivy, poison oak, and poison sumac cause skin irritation. Learn to recognize these plants, so you will know when you have touched them and can start first aid before a rash appears. The sooner you give first aid for exposure, the milder the effects will be. Poison ivy is a creeper having three leaves on each stem. The leaves are shiny and pointed and have prominent veins. Poison oak and poison sumac are shrubs or small trees. If you discover that you have been exposed to a poison plant, wash the affected parts of your body promptly and thoroughly with water and strong soap. GI soap is very good. The rash starts with redness and intense itching. Later little blisters appear. If a rash has already developed, do not wash it. Avoid scratching, for it will make the condition worse. Get medical attention.

## 26. Unconsciousness

*a.* It is often impossible to find out the cause of unconsciousness. Bleeding, heatstroke, or head injuries may have been the cause. Give the victim the first aid which this manual indicates for such conditions (pars. 3*a*, 8, and 27).

*b.* If you aren't sure of the cause, keep the person lying down. Do not move him unless it is absolutely necessary, and then do so very carefully. If he is cold, see that he gets warm. If he has suffered the effects of excessive heat, give him first aid according to paragraph 27. Do not pour liquids into the mouth of an unconscious person. If you do, you may choke him. Remove from his mouth false teeth, chewing gum, or other objects which might choke him. Take

off his equipment. Loosen his clothing. Get a medical officer.

*c.* If the man has merely *fainted*, he will regain consciousness in a few minutes. Let him lie quietly. Loosen his clothing. Apply a wet, cool cloth to his face. If he is about to faint or has actually fainted while sitting up, lower his head between his knees so that blood may flow to his head. Hold him so that he does not fall and injure himself.

## **27. Effects of Heat**

The effects of heat can often be prevented by keeping living and working quarters as cool as possible, by keeping the head and body covered when in the sun; by wearing light, loose-fitting clothes; by taking plenty of salt with food; and by drinking enough water to which salt tablets have been added.

*a.* **HEAT EXHAUSTION** results from excessive loss of water and salt by the body. This condition is caused by heavy sweating. Paleness, dizziness, and faintness are symptoms of heat exhaustion. For first aid, remove the soldier to a shade, loosen his clothing, and give him salt and water if he is conscious.

*b.* **HEATSTROKE**, a very serious condition with a high death rate, is characterized by very high body temperature and unconsciousness. In hot surroundings a stoppage of sweating with hot dry skin should serve as a warning. The person is bright pink in color and may become delirious: Treat him by lowering his body temperature, using shade, removing clothing and immersing him in or sprinkling him with cool or cold water and fanning him with his



*Figure 34. Heatstroke.*

shirt (fig. 34). Get the aid of a medical officer immediately.

*c.* **HEAT CRAMPS** occur when a person has been sweating a great deal and hasn't been taking extra amounts of salt. He may be seized with muscle cramps, especially of the intestines, abdominal wall, arms, or legs. Frequently he vomits and is very weak. Give him large amounts of salt water.

*d.* If a Man is **Knocked Out by Heat**—

- (1) Carry him to a cool shady place and remove his clothing.
- (2) Sprinkle him with lots of cool water.
- (3) Keep fanning him with his shirt (fig. 34).
- (4) When he becomes conscious, give him cool salt water to drink. (Make this by dis-

solving two salt tablets or  $\frac{1}{4}$  teaspoon of table salt in a canteen of water. He should drink three to five canteensful in 12 hours.)

e. While first aid is being given, get medical help or arrange to get the victim to medical help.

## 28. Effects of Cold

a. Trench foot is a serious condition resulting from cold and moisture. It is so named because it often follows prolonged standing in cold wet trenches or foxholes. Merely wearing wet socks and footgear for a long time will also cause it. Trench foot may be so serious that the feet have to be amputated. *You can prevent trench foot.* This is the way:

- (1) Avoid standing in water, snow, or mud-soaked areas as much as possible. If the trench or foxhole contains water, bail it out or put some stones or branches at the bottom on which to stand. If you lie down, try to prop your feet up on a large rock or your pack. This position will keep your feet dry and will help remove congestion due to long periods of standing.
- (2) Exercise your feet and legs whenever possible. If you can't do anything else, move your toes and ankles about in your shoes. Avoid cramped positions.
- (3) Massage your feet at least once every day. Do it yourself or "pair off" with another soldier and massage each other's feet. A gentle massage for several minutes will help warm your feet and restore the flow of blood. Put on dry socks.

- (4) Clean and dry your feet and socks at least once daily. You should carry an extra pair of dry woolen socks and put them on as soon as you can after your feet become wet and cold. Dry your feet thoroughly, especially between the toes, and dry your socks and the inside of your shoes or boots as much as possible (fig. 35).
- (5) Avoid tight shoes, socks, and combat shoe straps, for these will interfere with blood circulation. It is important that footgear be loose fitting and waterproof. Socks should be large enough not to bind your feet.

*b.* Frostbite, or freezing of a part of the body, can be avoided by wearing warm and loose clothing and keeping dry. Proper footgear and mittens are especially important. If any part of your clothing becomes wet, dry it or change it at once. Remember that you can get overheated and perspire in cold climates, and that this perspiration will freeze inside your clothes later on. Avoid this by wearing lighter clothing when you are exercising, or by opening your clothing to allow air circulation, so that the moisture will escape. Do not touch cold metal, such as your mess gear or canteen, with your bare hands or lips. Skin immediately freezes to such surfaces; to release it, warm the metal.

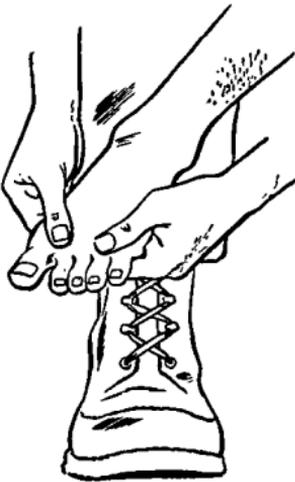
- (1) If a part of your body gets frostbitten, it becomes grayish or white and loses feeling. Frequently there is no pain, so keep watching your face and hands and those of your companions for signs. The face, hands,



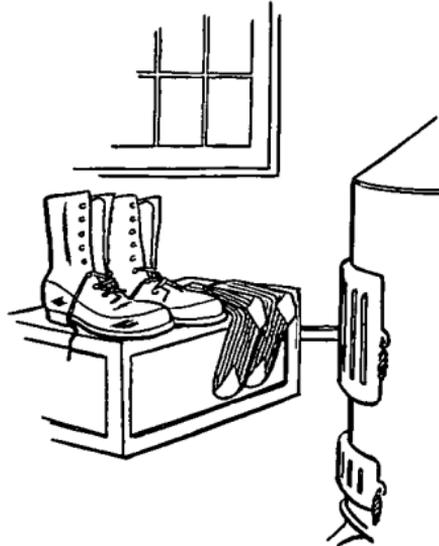
① AVOID STANDING IN WATER, SNOW OR MUD,  
WHENEVER POSSIBLE



② EXERCISE YOUR FEET



③ MASSAGE YOUR FEET  
ONCE DAILY



④ DRY YOUR SHOES OR BOOTS AND SOCKS AS  
OFTEN AS POSSIBLE.

Figure 35. Prevent trench foot.

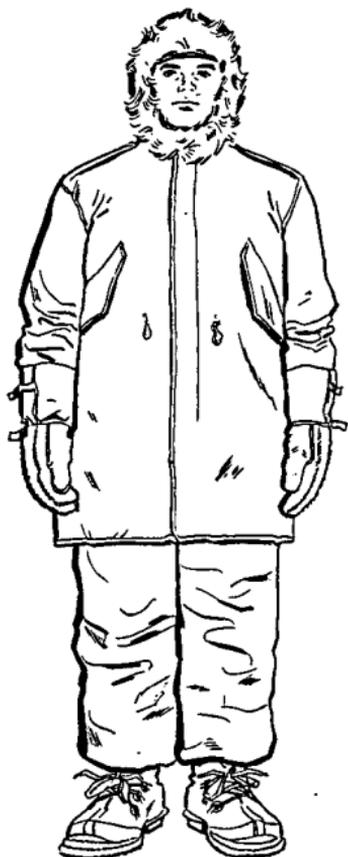
and feet are the parts most frequently frost-bitten.

- (2) To thaw a frostbitten part, put it next to a warm part of your own body or next to the warm part of someone else's body. For example, put your left hand under your right armpit; then cover the part with extra clothing or blankets.
- (3) If pain becomes too severe while a part is thawing, slow the thawing by exposing the part to cool air.
- (4) *Do not* rub or bend a frostbitten part of the body. *Do not* rub it with snow or ice. *Do not* dip it into warm water or bring it close to a fire.
- (5) A room into which a frostbitten person is brought should be only moderately warm. Wrap the person in blankets and give him warm drinks.
- (6) After the part has thawed, wrap it in sterile dressings. Put it in an elevated position (arm in a sling), and keep it at rest. Do not open blisters. Get a medical officer (fig. 36).

## 29. Drowning

*a. General Principles of Artificial Respiration.*  
In performing any method of artificial respiration, you must always keep certain general principles in mind.

- (1) Time is of prime importance. *Seconds count.* Begin at once. Do not take time to move the victim to a better place; do not delay artificial respiration to loosen cloth-



① WEAR WARM DRY CLOTHING



② THAW A FROZEN PART NEXT TO A WARM AREA OF BODY



③ BANDAGE THE PART, RAISE IT AND KEEP IT MOTIONLESS

*Figure 36. Frostbite.*

ing, to warm the victim, or to give stimulants. These measures are secondary; the most important thing to do is to get air into the victim's lungs.

- (2) Quickly sweep your fingers through the victim's mouth to clear out froth and debris, and draw his tongue forward.

- (3) The victim's body should be positioned to allow fluids to drain from the respiratory passages. His head should be extended, not bent forward, and the chin should not sag.
- (4) Begin artificial respiration and continue it rhythmically, without interruption, until the victim starts natural breathing or is pronounced dead. A smooth rhythm is desirable, but split-second timing is not essential.
- (5) Do not wait for a mechanical resuscitator; but when an approved model is available, use it. However, the mechanical resuscitator is no more effective than a properly performed "push-pull" manual technique, which is immediately available and accomplishes adequate ventilation. The most important advantages of good mechanical resuscitators are that they require less skill to operate, they are not fatiguing, they can supply 100 percent oxygen, and they can be employed when physical manipulation of the body is impossible or would be harmful, as during surgical procedures; in accident cases with extensive burns, broken vertebrae, ribs, arms; for victims trapped under debris or excavations, overturned vehicles; and during transportation of the victim. Furthermore, some resuscitators signal when the airway is obstructed and draw excess fluid from the respiratory passage of the victim.
- (6) If the victim begins to breathe on his own, adjust your timing to assist him. Do not

fight his attempts to breathe. Synchronize your efforts with his.

- (7) As soon as the victim is breathing for himself, or when additional help becomes available, see that his clothing is loosened (or, if wet, removed), that he is kept warm, and is being treated for shock. Do not, however, interrupt rhythmical artificial respiration to do this.

*b. Back-Pressure Arm-Lift Method.* (This method should be your first choice.)

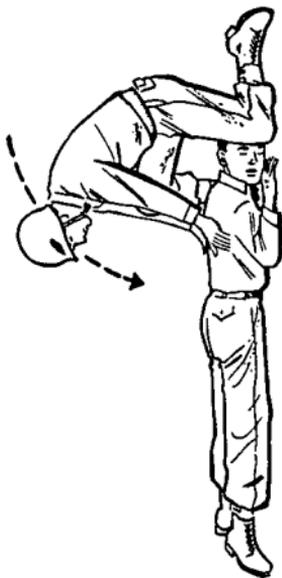
- (1) Place the victim in a face-down (prone) position. Bend his elbows and place his hands upon each other. Turn his face to one side and place his cheek upon his hands.
- (2) Kneel at the head of the victim on either your right or left knee. Place your knee close to the victim's arm and just to the side of his head. Place your opposite foot near his elbow. If it is more comfortable, you may kneel on both knees, one on either side of the victim's head.
- (3) Place your hands on the flat of the victim's back in such a way that the heels of the hands lie just below a line running between the armpits. With the tip of the thumbs just touching, spread your fingers downward and outward (fig. 37①).
- (4) Rock forward until your arms are approximately vertical and allow the weight of the upper part of your body to exert slow, steady, even pressure downward on your hands. This forces air out of the victim's

lungs. Your elbows should be kept straight and pressure exerted almost directly downward on his back. Do not exert sudden or too much pressure, and do not place your hands high on his back or shoulder blades (fig. 37②).

- (5) Release the pressure by “peeling” your hands from the victim’s back without giving any extra push with the release. Rock slowly backward and grasp the victim’s arms, just above his elbows (fig. 37③).
- (6) Draw his arms upward and toward you. When doing this, do not bend your elbows; keep your arms straight; and, as you rock backward, the victim’s arms will naturally be drawn upward and toward you (fig. 37④). Put just enough lift on the arms to feel resistance and tension at the victim’s shoulders. The arm lift pulls on the victim’s chest muscles, arches his back, and relieves the weight on his chest; this allows air to be sucked into his lungs.
- (7) Gently replace the victim’s arms on the ground to complete the cycle.
- (8) This cycle should be repeated about ten to twelve times per minute at a steady uniform rate to the rhythm of (1) Press— (2) Release— (3) Lift— (4) Release—. Longer counts of equal length should be given to the “Press” and “Lift” steps; the release periods should be as short as possible.
- (9) Remember that either or both of your knees may be used; or you may shift knees during



① PLACE YOUR HANDS ON THE VICTIM'S BACK



② ROCK FORWARD



③ TAKE HIS ARMS



④ ROCK BACKWARD

*Figure 37. Back-pressure arm-lift method of artificial respiration.*

the procedure with no break in the steady rhythm. Observe how you rock forward with the back-pressure and backward with the arm-lift. This rocking motion helps to sustain the rhythm and adds to the ease of operation.

- (10) If you get tired and another person is available, you can "take turns." Be sure, however, that you do not break rhythm in changing.

*c. Back-Pressure Hip-Lift Method.* (Use this method when the victim has arm injuries.)

- (1) Place the victim in the face-down (prone) position with his elbows bent. Turn his face to one side and rest it on the back of one hand. His other hand is placed alongside and above his head.
- (2) Kneel on either your right or your left knee at the level of the victim's hips. Straddle him and place your foot on the ground near his opposite hip. Thus your heel is directly opposite your kneeling knee.
- (3) Now place your hands, with fingers spread, on the victim's midback just below his shoulder blades. Your two thumbs point toward each other and are one or two inches from his spine, with the fingers pointed outward (fig. 38①). Lean forward and allow the weight of the upper part of your body to exert slow, steady, even pressure downward on your hands (fig. 38②). This forces air out of the victim's lungs. Keep your elbows straight and exert pressure almost directly

downward. Do not exert sudden or too much pressure, and do not place your hands high on the victim's back or his shoulder blades.

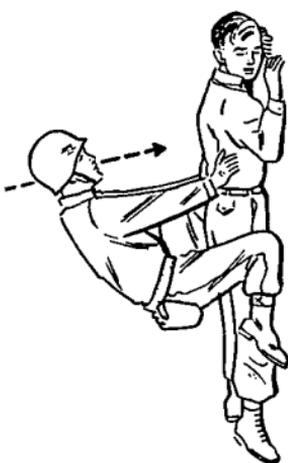
- (4) Now release the pressure by quickly removing your hands. This is done by "peeling" your hands from the victim's back without giving an extra push with the release.
- (5) As you release, rock backward and grasp the victim's hips. This will be several inches below his waist. *Do not grasp his waist.* Just slip your fingers under his hip bones where they touch the floor (fig. 38③).
- (6) Now lift both hips upward and toward you, approximately four to six inches from the ground (fig. 38④). This allows his abdomen to sag downward; his diaphragm descends, and air is sucked into his lungs. Be sure to keep your arms straight as you lift. In this way the work of lifting is done with your shoulders and back instead of with your arms. Do not bend your elbows as you lift the victim's hips.
- (7) Gently replace (*do not just drop*) the victim's hips on the ground in their original position. You are now ready to repeat the cycle.
- (8) This cycle should be repeated about ten to twelve times per minute at a steady uniform rate to the rhythm of (1) Press—(2) Release—(3) Lift—(4) Release—. Longer counts of equal length should be given to the active "Press" and "Lift" steps; the

release periods should be as short as possible.

- (9) (a) If the knee on which you began the procedure becomes tired or uncomfortable, you may switch to the opposite knee with practically no break in the steady rhythm. The best time for changing knees is immediately following the Press—Release—phases.
- (b) Continue the complete routine as long as possible. If you become tired, you may continue the back-pressure phase alone at a slightly faster rate (12 to 15 times per minute) resuming the hip-lift as soon as possible, or performing a hip-lift after each second, third, or fourth back-pressure or as often as possible.
- (c) If a second person is available, he can “take over” with practically no break in the rhythm. He does this by “coming in” on the side opposite where you are kneeling. He begins the “Press-Release” after one of the “Lift-Release” phases, while you move away. The relief operator should be in position by the time the next hip-lift phase of the cycle is due.

*d. Chest-Pressure Arm-Lift Method (Modified Silvester).* (Use this method when the victim cannot be placed face down.)

- (1) Place the victim in a face-up position with his arms folded on his chest. Raise his chin upward and turn his head to the side. If available, place a small object such as a block



② LEAN FORWARD PRESSING DOWNWARD



④ LIFT



① PLACE YOUR HANDS ON THE VICTIM'S BACK



③ SLIP YOUR FINGERS UNDER HIS HIPS

Figure 98. Back-pressure hip-lift method of artificial respiration.

or bundle of clothing beneath his shoulders so that his head will drop backward. (Take great care to make sure that the air passages are clear when using this method. If a second man is available, have him hold the victim's tongue forward. If necessary, tie the tongue in position or stick a pin through it to hold it out of the mouth.)

- (2) Kneel on either knee at the victim's head. Place a knee on one side of his head and the other foot on the opposite side of the head. (If the patient is on an operating table or some other high support, stand at his head.)
- (3) Take the victim's arms just above his wrists and place them over the lower ribs (fig. 39①). Rock forward and exert steady uniform pressure almost directly downward until you meet firm resistance (fig. 39②). This pressure forces air out of the lungs.
- (4) Move his arms slowly outward from his body and upward above his head. Continue this motion of his arms and sweep them above his head and backward as far as possible (fig. 39③). Be sure to keep his arms straight throughout this maneuver as you raise them first vertically upward and then above his head. Lifting and stretching of the arms increases the chest size and draws air into the lungs.
- (5) Slowly replace his arms on his chest and repeat the complete cycle.
- (6) The cycle should be repeated about ten to twelve times per minute at a steady uniform

rate to the rhythm of (1) Press—(2) Lift—(3) Stretch—(4) Release—. Longer counts of equal length should be given to the “Press,” “Lift,” and “Stretch” steps; the “Release” period should be as short as possible.

- (7) If you become tired or uncomfortable on one knee, you may quickly switch to the other knee. If it is more comfortable, you may kneel on both knees, although the forward and backward motion is easiest to obtain while kneeling on one knee only.
- (8) When a second man is available, he may take over the chest-pressure arm-lift with practically no break in the rhythm. This is done by the first man moving off to one side while the replacement comes in from the other side. When the second man is ready, the victim's arms are released during the “Stretch” and the new operator takes them and continues in the same rhythm.

*e. Follow-Up Care in Artificial Respiration.*

When the victim is breathing normally, wrap him in a blanket. He should remain lying down until he is seen by a physician or his recovery seems assured. When he is conscious, give him a warm drink, such as coffee or tea.

### **30. Electric Shock**

*a.* Electric shock accidents frequently result from contact with a “live” wire and occasionally occur when a person is struck by lightning.

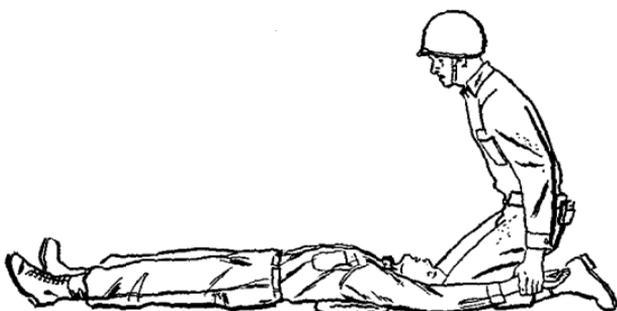
*b.* If a person has come in contact with an electric current, turn off the switch if it is nearby, but do not



① GRASP THE PATIENT'S ARMS



② ROCK FORWARD AND EXERT STEADY PRESSURE  
DOWNWARD



③ MOVE THE ARMS SLOWLY OUTWARD, UPWARD ABOVE  
THE HEAD AND BACKWARD AS FAR AS POSSIBLE.

*Figure 39. Chest-pressure arm-lift method of artificial respiration.*

waste time looking for it. Use a dry wooden pole, dry clothing, dry rope, or some other material which will not conduct electricity, to remove the person from the wire. If a pole is not handy, simply drag him off the wire by means of a loop of dry cloth (fig. 40①). Don't touch the wire or man with your bare hands or you will also get a shock.

c. Electric shock causes breathing to cease, so start artificial respiration *immediately* after freeing the person from the wire. Keep it up for at least 2 hours, just as for drowning (fig. 40②).

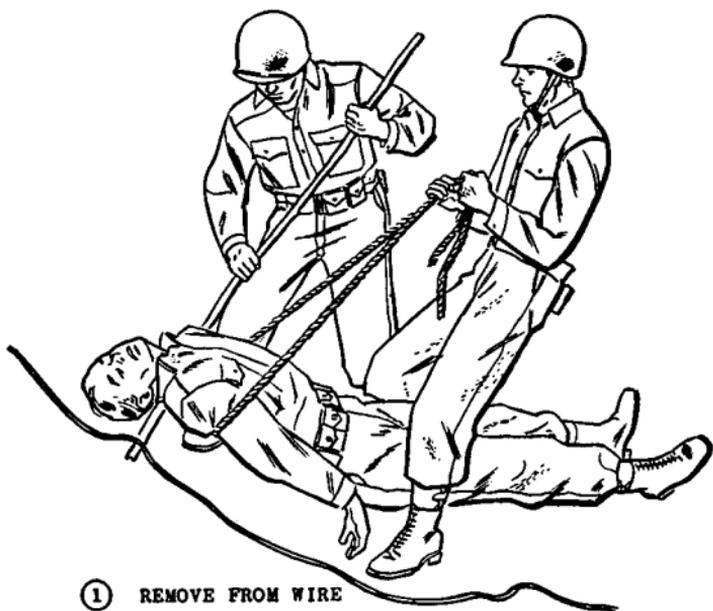
### **31. Carbon Monoxide Poisoning**

a. Carbon monoxide gas has no odor and kills without warning. Poisoning from this gas usually is caused by breathing motor vehicle exhaust gas. It frequently occurs when an engine is run with garage doors closed or when a person sits in a vehicle with the windows closed and the motor running, especially when the exhaust becomes clogged, as with snow. The same gas is formed by stoves in poorly ventilated shelters (fig. 41).

b. The symptoms may be dizziness, weakness, headache, vomiting—then unconsciousness.

c. If a person is overcome with carbon monoxide, get him into fresh air and start artificial respiration immediately. Keep him quiet.

d. *There is no excuse for carbon monoxide poisoning. It results from carelessness. Prevent it.*

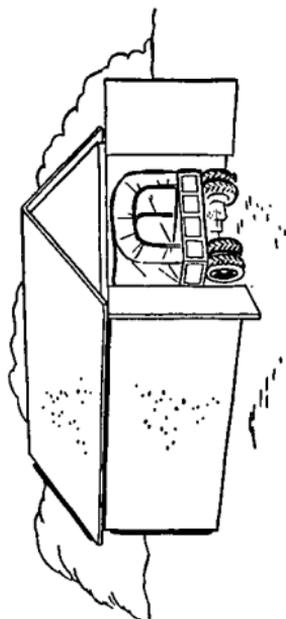


① REMOVE FROM WIRE

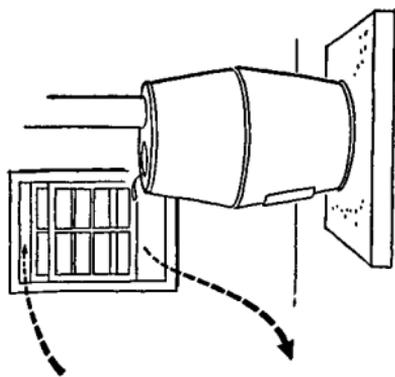


② GIVE ARTIFICIAL RESPIRATION

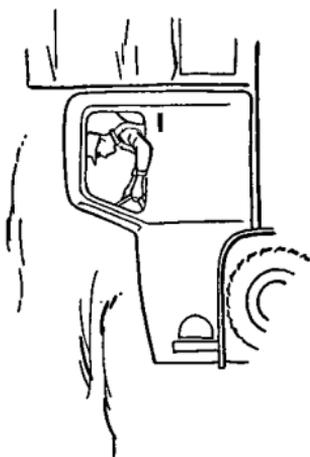
*Figure 40. Electric shock.*



OPEN GARAGE DOORS WHILE RUNNING  
AN ENGINE



VENTILATE A ROOM OR TENT HAVING  
STOVES



VENTILATE THE CAB OF A VEHICLE  
WHILE THE MOTOR IS RUNNING

*Figure 41. Prevent carbon monoxide poisoning.*

## CHAPTER 5

### TRANSPORTATION OF SICK AND WOUNDED

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#### 32. General

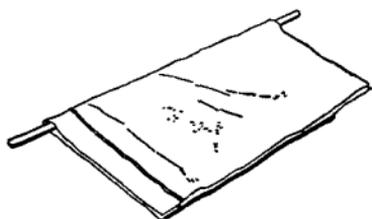
Knowing how to move seriously injured persons is one of the most important parts of first aid. Careless or rough handling not only may increase the seriousness of an injury, but also may even cause the victim's death. Unless there is a good reason for immediately moving an injured person, do *not* transport him until a litter or ambulance is available. Sometimes when the situation is urgent and you know that no medical facilities are available, you will have to move the victim yourself. That is why you should know the different ways of carrying casualties. Always give necessary first aid before attempting to move the wounded soldier. If the casualty has a broken bone, never attempt to move him unless you have splinted it.

#### 33. Improvised Litters

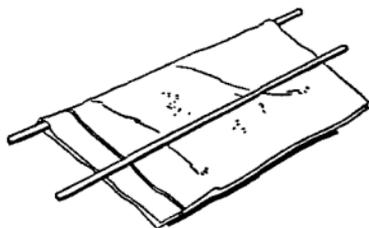
Using a litter not only makes it easier for you to carry the casualty, but also makes the journey safer and more comfortable for him. If the distance is long or if the patient has a fracture of the leg, hip, back, neck, or skull, he must not be moved except on a litter. A litter can be improvised from many different things.

*a. Pole and Blanket Litter.* A blanket, shelter

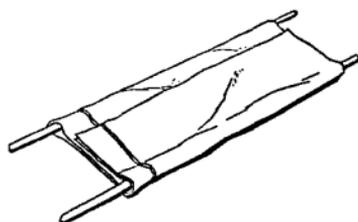
half, tarpaulin, or other material may be used for the litter bed. The poles may be made from such objects as strong branches, tent poles, rifles, and skis (fig. 42).



- ① OPEN A BLANKET, LAY ONE POLE LENGTHWISE ACROSS THE CENTER AND FOLD BLANKET OVER IT.



- ② PLACE THE SECOND POLE ACROSS THE CENTER OF THE NEW FOLD.



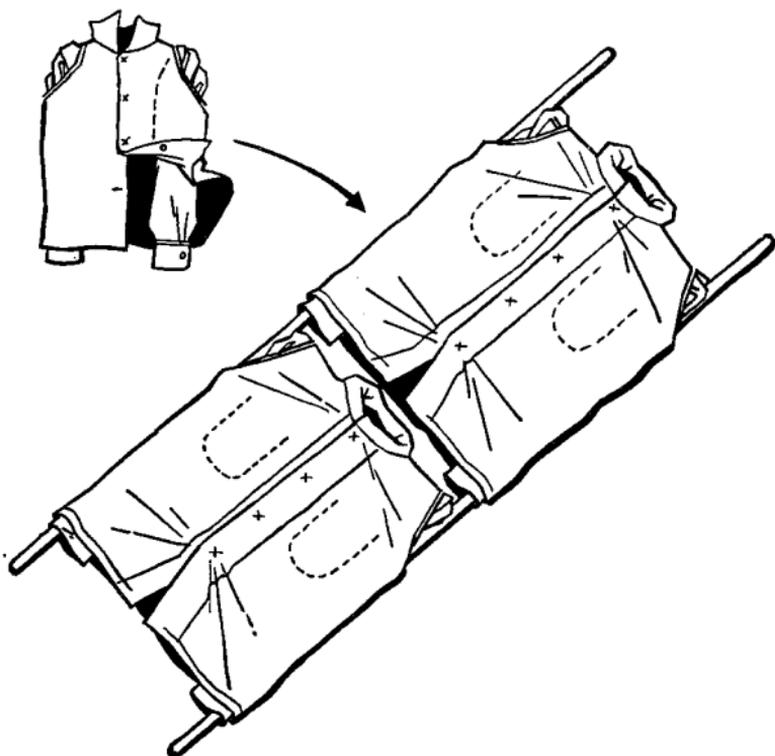
- ③ FOLD THE FREE EDGES OF THE BLANKET OVER THE SECOND POLE.

Figure 42. Pole and blanket litter.

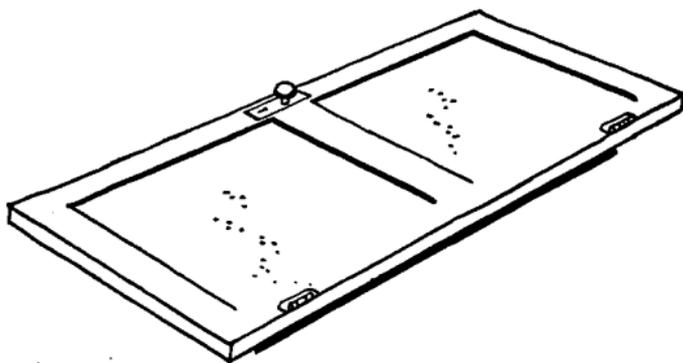
*b. Pole and Jacket Litter.* Obtain two or three blouses, shirts, or field jackets. Button them up and turn inside out so that the lining is outside and the sleeves inside. Pass a pole through each sleeve (fig. 43).

*c. Door or Board Litter.* Use any plane-surfaced object of suitable size, such as cots, window shutters, doors, benches, ladders, boards, or poles tied together. Pad the litter if possible (fig. 43).

*d. Pole and Sack Litter.* Rip open the bottoms or cut the corners of sacks, bags, bedticks, or mattress covers. Pass two poles through them (fig. 44).

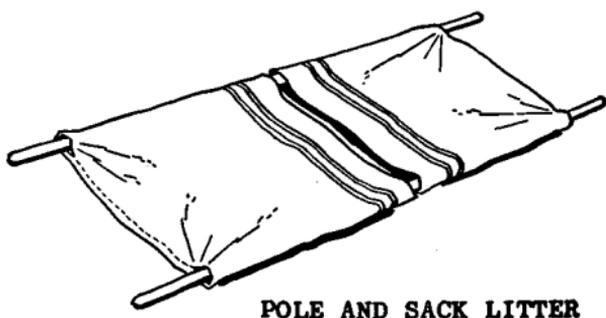


**POLE AND JACKET LITTER**

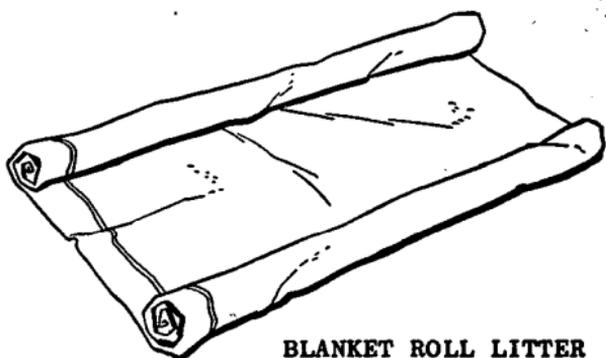


**DOOR OR BOARD LITTER**

*Figure 43. Pole and jacket litter and door or board litter.*



**POLE AND SACK LITTER**



**BLANKET ROLL LITTER**

*Figure 44. Pole and sack litter and blanket roll litter.*

*e. Blanket Roll Litter.* If no poles can be obtained, roll a blanket, shelter half, or tarpaulin from both sides toward the center. Use the rolls as grips when carrying a patient (fig. 44).

### **34. Carries**

Several ways by which a casualty may be moved without a litter are shown below. Some of these carries require only one man; others require two. Methods of dragging a casualty when under enemy fire are also shown. Use the carry which is easiest for you and which is best for the situation. *Do not*



- ① Turn the man face down on the ground and support his head on his arm



- ② Place hands on man's shoulders

*Figure 45. Fireman's carry.*

attempt to carry a man who has a broken back or neck.

*a. Fireman's Carry.* The fireman's carry is the easiest method for one man to carry another (fig. 45).

*b. Alternate Methods.* After getting a man off the ground by using the first three steps of the fireman's carry, you can use any of the following one-man carries:

- (1) *Supporting Carry.* Grasp the wrist of the man's uninjured arm and draw his arm around your neck. Then the man can walk,



③ Straddle the man and (placing your hands under his armpits) lift him to a standing position



④ Support the man by arm around his waist and step to his front

*Figure 45.—Continued.*



⑥ Grasp the man's right hand with your left hand. Bend at the waist, pulling his right arm around the back of your neck so that his body comes across your back



⑥ Grasp his legs at the knees with your right arm. Lift the man off the ground as you straighten up. Hold his knees in your right hand



⑦ Then grasp the man's right hand, leaving your left hand free—this is the position of carry. A man can be carried some distance in this manner

Figure 45.—Continued.

using you as a crutch. This carry is useful when the man is only slightly hurt, as in foot and ankle injuries (fig. 46).

- (2) *Arms Carry.* This is good for short distances. Carry the patient high to lessen

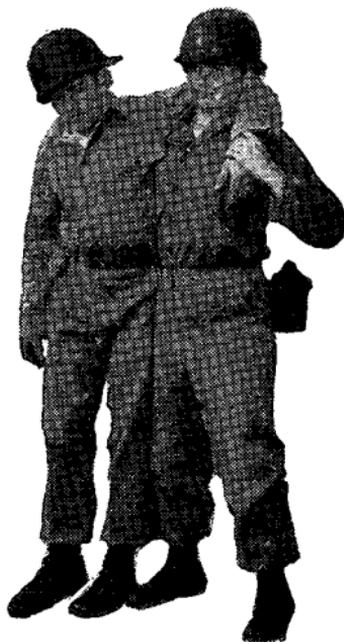


Figure 46. *Supporting carry.*

fatigue. Do not use this carry when the man has a broken leg (fig. 47).

- (3) *Saddle-Back Carry.* After getting the man up, keep a hold on his arm and step in front of him. Have the man encircle your neck with his arms; then stoop, clasp your hands beneath his thighs, and raise him upon your back (fig. 48).
- (4) *Pack-Strap Carry.* After raising the man, step in front of him. Grasp his wrists with your hands and hoist him so that his arm-



*Figure 47. Arms carry.*



*Figure 48. Saddle-back carry.*

pits are over your shoulders. This is a good way to carry an unconscious man. Do not use it if the man has any broken bones (fig. 49).



Figure 49. Pack-strap carry.

*c. Back Lift and Carry.* For this carry, the man must be conscious and able to stand on one leg. After raising him to a standing position, place yourself back to back with him. Have him stretch out his arms sideways. Bend backward, put your hands under his arms, and grip his upper arms. Bend forward, pulling him onto your back (fig. 50).

*d. Pistol-Belt Carry* (fig. 51).

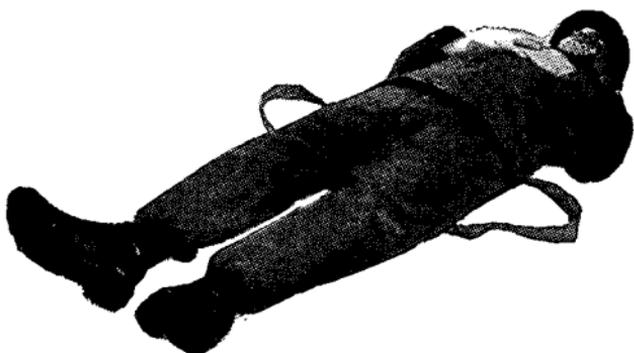
*e. The Neck Drag.* Tie the man's hands together and loop them around your neck. This enables you



Figure 50. Back lift and carry.

to crawl along, dragging the man, who may be unconscious. The advantage of this method is that both you and the man you are carrying can remain low on the ground; thus you are protected. *Never* attempt to drag a man with a broken neck or back (fig. 52).

*f. Pistol Belt Drag.* Extend two pistol belts and join them in one continuous sling. After placing the man on his back, pass a loop of the sling over his head and work it into position across his chest and under his armpits. Then cross the sling straps at the man's shoulder, forming another loop. Lie slightly forward on your stomach beside the man. Slip the second loop of the sling over your arm and shoulder. Place your arm which is nearest the man's



① Link together two pistol belts into a continuous belt. Place it under the man's thighs and hips so that a loop extends from each side.



② Lie between the man's outstretched legs. Thrust your arms through the belt loops. Grasp the man's right hand with your left hand and his right leg with your right hand.



③ Then rolling toward the left side, turn face downward, carrying the wounded man onto your back. Adjust slings before proceeding. If the man has an injury on the left side, grasp the man's left hand with your right hand and his left leg with your left hand.

*Figure 51. Pistol-belt carry.*



④ Then rise to a kneeling position. The continuous belt will hold the man in place.



⑤ Place one hand on your knee for support, then stand up. The man is now supported on your shoulders.

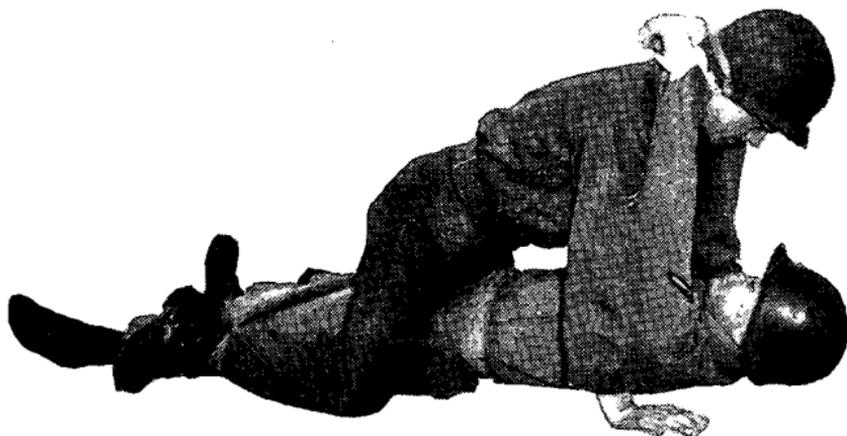
*Figure 51.—Continued*



© Your hands are free to help you climb steep banks and get over other obstacles. Both you and the man you carry can fire rifles.

*Figure 51—Continued.*

head underneath his head to protect it during movement. Then advance by crawling, dragging the man with you. This carry permits both you and the man carried to remain on the ground, protected from enemy fire. It can be used only for very short distances (fig. 53).



*Figure 52. Neck drag.*



*Figure 53. Pistol-belt drag.*

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