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A Guide to the Collection of Technical Intelligence, Part I, July 1950

Department of the Army, Assistant Chief of Staff

Robert Bolin , depositor
University of Nebraska - Lincoln, rbolin2@unl.edu

A GUIDE TO THE COLLECTION OF TECHNICAL INTELLIGENCE

(PART I)

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CONTENTS

ARMORED VEHICLES

Although the most useful sources of information required in the preparation of intelligence studies of a highly technical nature are to be found in photographs, technical documents, or in actual physical testing of matériel, a very large amount of valuable information can be obtained by visual inspection or by interrogations. It is essential that observers, regardless of the extent of their technical knowledge, know exactly what is important and what to look for in the procurement of information.

During World War II, for example, an accurate forecast of the future combination of slope and thickness of German armor enabled the British to design the subsequently adequate 17-pounder.

While general knowledge of standard weapons must include performance, recognition factors, and maintenance and operational instructions, information on research and development must include the extent of advancement in specialized fields and the estimated dates when the fruits of such effort can be made available to the armies.

The tank commander must know at what ranges he can defeat and be defeated. Design and development departments must insure that United States weapons are second to none, while plans and operations staffs must know that they have the right tools for the right job.

Technical Discussion

As a guide as to what is important and what to look for in the preparation of reports upon armored combat vehicles, the following check-list has been prepared covering the important points of:[1] (1) A tank; (2) an armored car; and (3) a self-propelled gun. As here used, the following definitions apply:

A Tank—an armored combat vehicle running on tracks and provided with a gun fitted in an enclosed turret having 360° traverse. (Figure 11.)

An Armored Car—a relatively lightly armored and lightly armed vehicle carried on a semi-tracked or wheeled chassis.

A Self-Propelled Gun—a field or antitank gun which is mounted on an armored chassis, usually a tank chassis, with a fixed superstructure giving it limited traverse, or an antiaircraft gun with 360° traverse in a very lightly armored combat compartment. (Figures 10 and 12.)

Tanks

1.—Hull.

a.—Side View.

(1) Is *idler wheel* at front or rear? (This wheel has no gear teeth.)

(2) Is *drive sprocket* at front or rear? (The drive sprocket is toothed on modern tanks so as to drive the tracks.)

(3) What is length of track on ground—i. e., distance between centers of front and rear track wheels? (These are often called bogie wheels.)

(4) What is number of track support rollers?

(5) What are number and approximate diameter of *track wheels*, and are they *single* or *double?*

(6) Are track wheels *in line*, as shown in Figure 1, or *overlapped* as shown in Figure 2, and have they track support rollers or not?

(7) Is the springing internal or external, and what is its type? Internal springing can be identified by a crank arm. Spring types are shown in Figures 3 and 4.

(8) Design: (a) Angles of plate to *vertical* (approx); (b) approximate thickness; (c) whether plates are welded, riveted, or bolted, or are a combination of all three. (d) is plate-interlocking employed? (e) what is the nose shape, and what shape of hull is employed? (See Figures 5 and 6.)

(9) Is armor "rolled plate" (i. e., flat slabs, welded or joined as above), or is it cast? (If cast, it may be recognized by rounded corners and "bumpy" surface of armor. Care should be taken, however, to distinguish between rough casting and a coating of anti-magnetic plaster.)

(10) What is *over-all* length of tank (excluding the overhang of the main armament)?

[1] See Figures 1 through 10, pages 2 and 3; and Figures 11 and 12, page 6.

FIGURE 1 TYPICAL SUSPENSION SYSTEMS

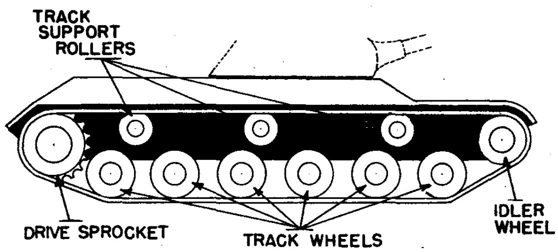
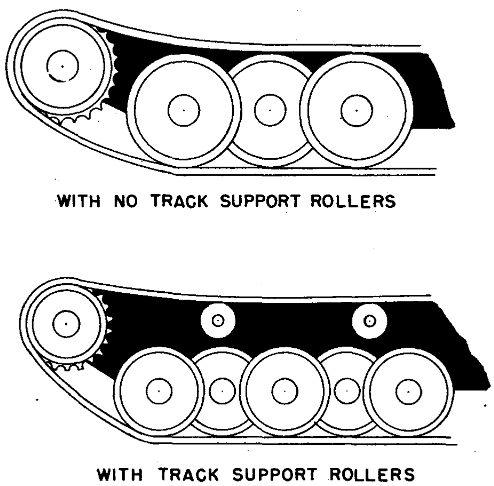


FIGURE 2



TYPICAL SPRING SYSTEMS

FIGURE 3

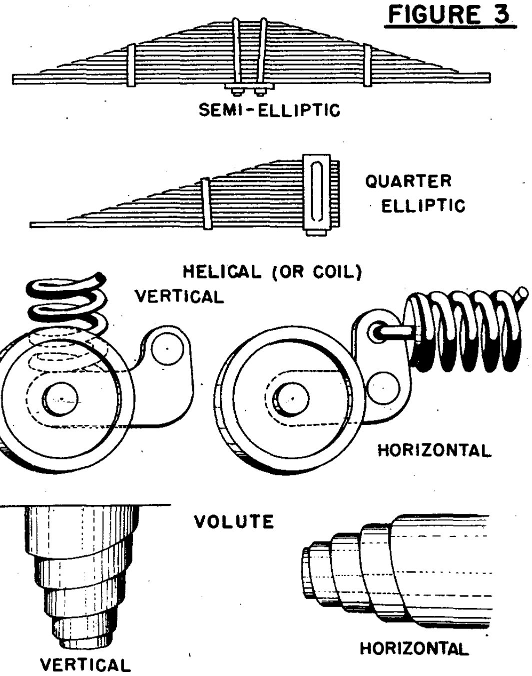
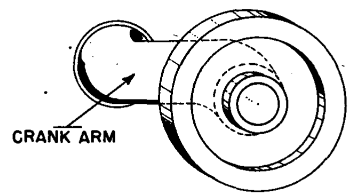
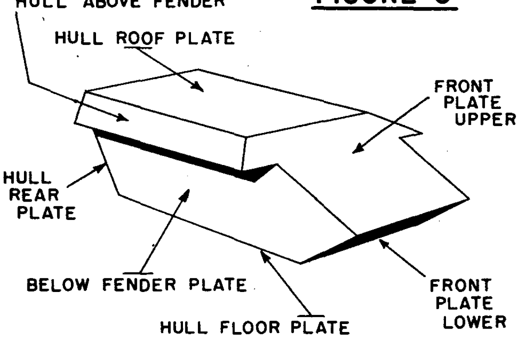


FIGURE 4



TYPICAL TANK HULL

FIGURE 5



ARMOR JOINING METHODS

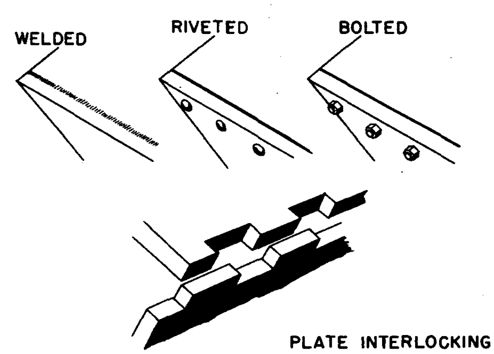


FIGURE 6

TYPICAL SPONSON ARRANGEMENTS

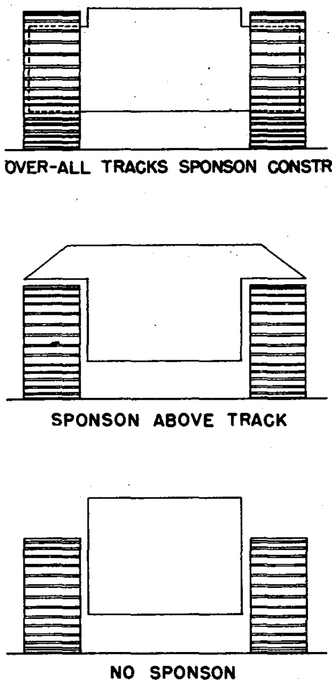
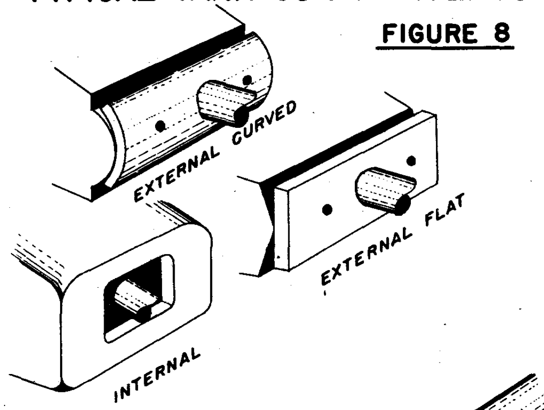


FIGURE 7

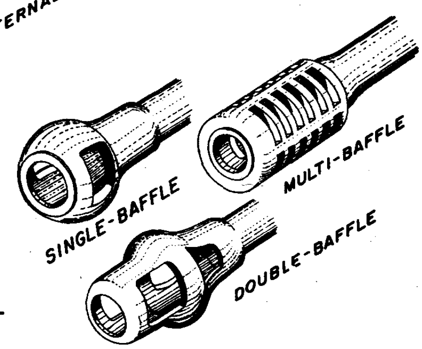
TYPICAL TANK GUN MANTLETS

FIGURE 8



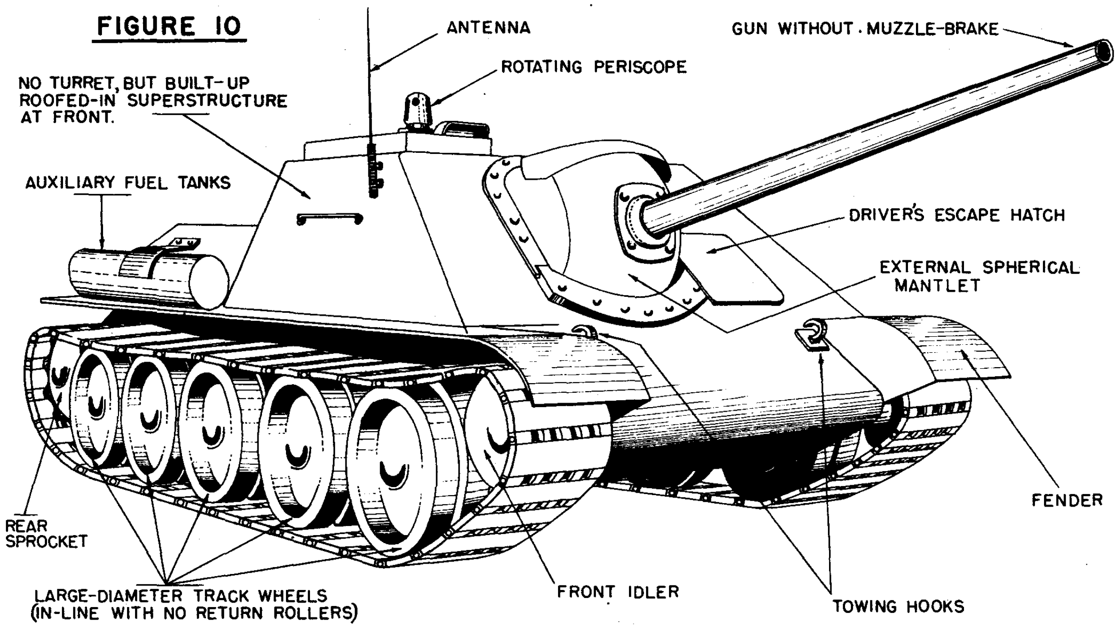
TYPICAL MUZZLE BRAKES

FIGURE 9



TYPICAL SELF-PROPELLED GUN MOUNTED IN FRONT GLACIS PLATE OF MODIFIED TANK

FIGURE 10



(11) What is the sponson arrangement? (See Figure 7.)

(11) What is the sponson arrangement? [1]

b.—Front View.

(1) Width over tracks.

(2) Width over-all, if greater than width over tracks.

(3) *Angle to vertical* of hull above fender.

(4) *Angle to vertical* of hull below fender plate.

(5) Width of each track.

(6) Type of hull construction. (See Figure 8).

2.—*Turret.*

a.—Front View.

(1) Is armor cast or welded rolled plate?

(2) Is the commander's cupola fitted and, if so, on what side is it located?

(3) What is the angle of the side plates to vertical?

b. Plan View.

What is the shape of the turret?

c.—Side View.

(1) What is the shape of the turret roof, and what are the angles to vertical?

(2) What is the shape of the turret front, and what is the angle to vertical? Is the gun mantlet internal or external, flat or curved? (See Figure 8.)

(3) What is angle of turret rear plate to vertical?

d.—Mantlet Designs.

What type of mantlet is fitted?

e.—Main Armament.

(1) Is gun long in relation to tank? If so, approximately how far does it project beyond nose or tail of tank?

(2) Has it a muzzle brake? If so, is it of single, double, or multibaffle type? Types are shown in Figure 9 on page 43.

(3) Approximate length of ammunition and muzzle velocity of each type (hollow charge, HE, AP, HVAP).

(4) Is ammunition "fixed" or "separate"? (i. e., is projectile fixed to cartridge case, or are the two loaded separately?)

(5) What are maximum angles of depression and elevation, in degrees?

(6) What is the performance of the gun against armor (specify range and angle of attack); or, if it is a low velocity weapon, what is its maximum range?

(7) Is the gun mounted in orthodox fashion (i. e., with recoil gear), rigidly mounted, or of recoilless type?

(8) What fire control devices are used (direct fire telescope, gun stabilization, infrared or radar)?

f.—Auxiliary Armament.

(1) Is there a coaxial machine gun? If so, on which side of the main armament is it mounted? (The larger hole in the mantlet beside the main armament usually indicates the machine gun's position.)

(2) Is there a front hull machine gun? If so, is it fixed or in a movable mount?

(3) Are there any more machine guns, smoke or grenade dischargers, or other auxiliary weapons? (Flame-throwers, whether mounted in place of the main or subsidiary armament may generally be distinguished externally by their thin barrels.)

3.—Miscellaneous.

(1) Type of engine—gasoline or Diesel? (Characteristics of the latter are blue exhaust smoke and deep-throated exhaust beat.) What is the horsepower output at specific number of r. p. m., and what is the maximum output? What is the number of cylinders? What is the cooling system?

(2) What is the approximate maximum speed? (Specify on roads or cross country.)

(3) Type of transmission—crash, synchromesh, or preselector; cross-drive or torqumatic—and number of speeds given, forward and reverse.

(4) Type of steering gear (mechanical, mechanical with servo, electric or hydraulic assistance, or electric, hydraulic, or air-operated; controlled differential or clutch and brake).

(5) Is the turret traversed by power as well as by hand? High turning speed is the characteristic feature. Is power traverse electric or hydraulic? Is it operated from the vehicle engine or by a separate engine?

(6) What is the tank's water-fording performance? Is it amphibious or submersible? If so, what special methods are used to drive it in the water, to seal the openings in the hull and turret, to communicate with other tanks or the shore when in the water, to guide it in water, and to ventilate it and supply air to the engine?

(7) What are its official army nomenclature and the manufacturer's nomenclature? Has the vehicle any nickname given to it by the troops? What is the manufacturing firm, and what is the serial number?

(8) Bridge-laying vehicles on tank chassis (bridge-laying tanks) are easily distinguished by the bridge structure on top of the hull. The bridge may be rigid or folding and put into position mechanically or by hand. If of

(9) What are the weight, combat-loaded, the ground clearance, height, number of crew, fuel capacity of the main and auxiliary tanks? Range of action (specify roads or cross-country), maximum trench-crossing ability, vertical step, fording, and gradient.

Armored Cars

1. Armored cars may be either wheeled, semi-tracked, or have alternative wheel or track drive. Of which type is the car under examination?

2. If wheeled, how many wheels has it, and what is their arrangement?

3. How are the wheels driven?

4. How many wheels are, or can be, driven and steered?

5. If a wheel-cum-track design, how are the wheels changed over for tracks and vice versa, and how long does the opreation require?

6. What is the weight of the vehicle when combat loaded?

7. What is the service or the manufacturer's nomenclature of the vehicle? What is the manufacturing firm, and what is the serial number?

8. What are the over-all length, width, height, track and wheelbase?

9. What is the main and auxiliary armament? Give details of ammunition (types and whether fixed or separate), number of rounds, performance at a specified range and angle of attack against armor and muzzle velocity. What are maximum angles of depression and elevation of main and auxiliary armament?

10. Is a muzzle brake fitted to the main armament?

11. What are the armor thicknesses of front, sides, rear, roof, and bottom plate, and at approximately what angles to the vertical are they mounted?

12. Is provision made for driving from either front or rear?

13. What are maximum speed and radius of action on roads?

14. What type of transmission is provided, and how many speeds does it give forward and reverse?

15. What type of engine is mounted? How many cylinders has it, of what arrangement, and what is its output in horse power at a specified number of revolutions per minute, and what is its maximum output?

16. How are the wheels sprung?

17. If semi-tracked, what type of track is fitted? Are the track pins dry or lubricated, and are they mounted in any type of anti-friction bearing? Do the track links have rubber pads? How many track wheels are there? How are they sprung, and what is their arrangement?

Self-Propelled Artillery

1. A self-propelled gun is usually based on the chassis of a standard tank, carrier, or semi-tracked vehicle. On what chassis is this equipment based?

2. Its most noticeable characteristic is the lack of a turret which can traverse through 360°, although an armored, fixed superstructure somewhat resembling a turret, may be fitted. Is the gun mounted: (a) In the hull front plate of the vehicle? (b) above the superstructure roof behind a roofless bullet-proof shield? (c) in a fixed armored "turret"?

3. What are the caliber and length in calibers of the gun?

4. What is the type of ammunition, and how many rounds are carried?

5. Is a muzzle brake fitted? If so, of what type?

6. What is the auxiliary armament?

7. Thicknesses and angles of armor plates, hull design, suspension, etc. as for tanks.

8. What is the official army nomenclature of the equipment? Or, failing this, the manufacturer's or popular nomenclature? What is the manufacturing firm, and what is the serial number?

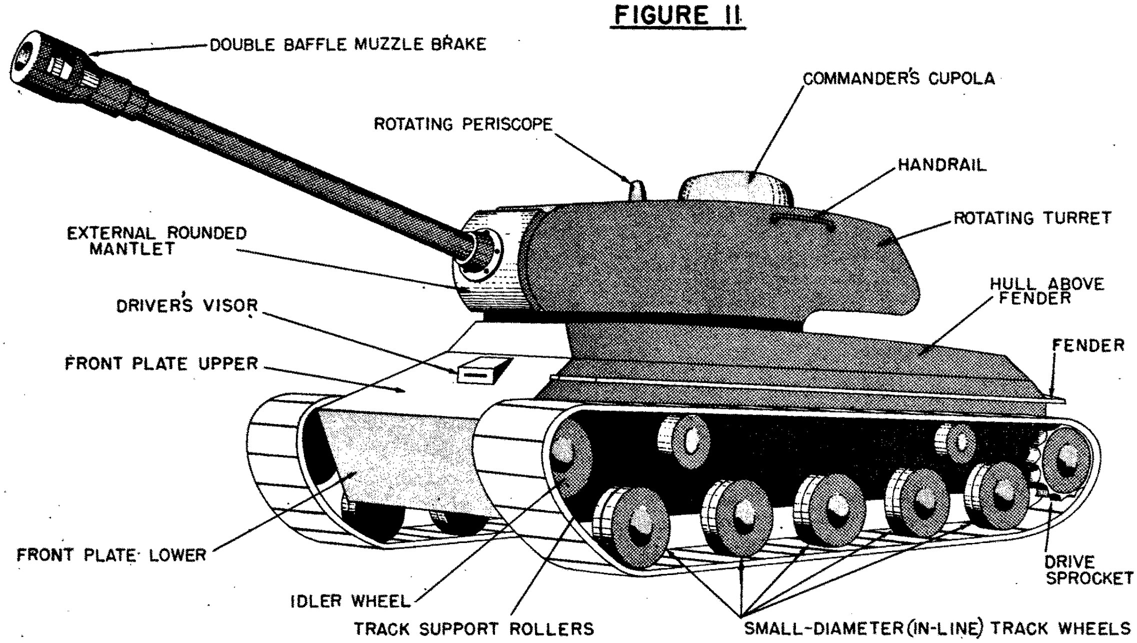
9. Main dimensions—over-all length including gun, gun overhang, over-all width, over-all height, distance between track centers, minimum ground clearance.

10. Traverse and elevation of main armament.

11. Is gun of recoiling, recoilless (i. e., with

TYPICAL TANK WITH ROTATING TURRET

FIGURE 11



SELF-PROPELLED GUN MOUNTED IN FIXED TURRET-LIKE SUPERSTRUCTURE

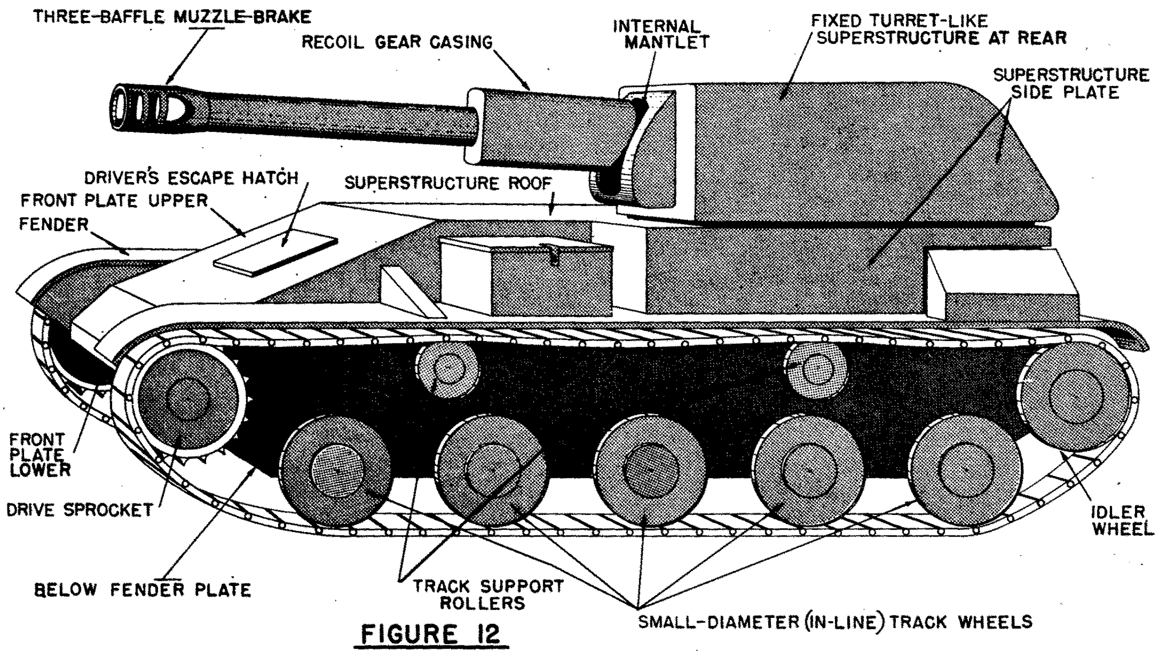


FIGURE 12

back-blast of gases on firing), or rigidly mounted to the vehicle?

12. If main armament is a single or multi-barrelled rocket projector, the projectile may be launched from guide rails, or from a trough or a tube superficially resembling the tube of an ordinary gun but distinguished by an outlet for the rearward-thrusting gases (i. e., a series of holes arranged in an annulus round the muzzle). State type and number of launching rails, troughs or barrels, together with approximate caliber and weight of projectile.

ARTILLERY

Even though artillery matériel has played a prominent part in battles throughout modern history, its development is far from complete, and there are no indications of its being rendered obsolete by the development of atomic and other unconventional weapons.

Among the many innovations that have appeared as a result of the stimulus of World War II are such weapons as the squeeze-bore gun, the rocket-assisted shell, and skirted and discarding sabot projectiles. Also, armies have begun to use rocket and recoilless guns on a large scale.

The commander in the field must know whether enemy guns at "A" can shell his troops at "B," and with what degree of accuracy. The performance of enemy antiaircraft and antitank artillery is no less important. Consequently, it is obvious that artillery design departments, as well as military planning staffs, must possess complete and accurate intelligence on the artillery capabilities of potential enemies.

The most useful sources of technical information on artillery—as with other matériel—are photographs, technical documents, or actual tests. However, even a casual observer can learn a great deal if he can recognize important characteristics and knows how to report them.

Technical Discussion

Artillery matériel may be divided into several categories according to its role: Field Artillery; antitank artillery; antiaircraft artillery; and coast defense artillery.[1] The matériel also may be classified as light, medium, or heavy. Although normally fired from a wheeled carriage, an artillery piece may be mounted in fixed, concrete fortifications or fired from a railway or self-propelled mount. Often it has a dual or multi-purpose role, a fact which should always be noted by a military observer.

As a guide, the following check list gives the most important points to be covered: (1) Performance and technical data; (2) the barrel and its breech mechanism; and (3) the carriage or mounting.

1.—Performance and Technical Data.

a.—What is the weapon's official name, and what nickname, if any, have the troops given it? Is it a gun, a howitzer, or a gun-howitzer?

b.—What role does the weapon perform? Is it dual- or multi-purpose?

c.—What is its maximum range when using HE, and what is its penetration performance when armor-piercing ammunition is used and the quality and slope of armor plate are considered? If an antiaircraft gun, what are its maximum vertical range and maximum effective ceiling?

d.—What types of ammunition are fired? What are the weights of the complete round and the projectile? What is the number of charges? Is the ammunition fixed or unfixed?

e.—What is the weapon's rate of fire, and how much time is required to bring it into action?

f.—What are the weapon's weights in the traveling and in the firing positions?

g.—What is the muzzle velocity (this may vary with different types of ammunition)?

h.—How many degrees of traverse and elevation does the piece have?

i.—What is the weapon's serial number and factory markings, who was the manufacturer, and what is the plant location?

j.—Give a general description of the weapon, including dimensions (length, width, and height) and any recognition features.

The Barrel and Breech Mechanism

1. *The Barrel.*[2]

a.—What is its caliber (diameter of the bore across the "lands" at the muzzle)? If the bore is tapered, the diameter at the breech should also be given.

b.—What is the length of the rifled portion, and what is the length of the chamber? What is the chamber capacity?

[1] See Figures 1 through 6, pages 10, 11, and 12.

[2] This is sometimes referred to as the "cannon."

c.—If the rifling appears to be unorthodox, give a description.

d.—Is the barrel fitted with a muzzle brake? If so, of what type, and how long?[1]

e.—What is the length of the barrel from the rear of the breech mechanism to the front of the muzzle brake?

f.—Is the barrel or cannon constructed of one tube or of several tubes? What is its general outline? Has it any pronounced differing external diameters? If so, give details.

2.—The Breech Mechanism.

a.—What type of breech mechanism is used? Is the gun fired by a lever, or electrically, or both?

b.—How is the breech mechanism opened and closed? Where is the lever?

c.—Are any automatic or semi-automatic breech operating arrangements employed? If so, of what type are they and how are they operated?

The Carriage or Mount

The terms "carriage" or "mount" are used to denote all components of an artillery piece except the barrel and breech mechanism. The word "carriage" is used in connection with mobile pieces; the word "mount" in referring to fixed or semi-fixed pieces.

1.—The Cradle.

This is the part of the weapon through or over which the gun recoils when fired. The cradle and gun are elevated and depressed about pivots known as trunnions, which are supported in a "top carriage". If the trunnions are at the point of balance of the gun and cradle, elevating can be carried out without the aid of "equilibrators"; if not, these must be provided.

a.—Is the cradle of welded or riveted construction?

b.—Is it cylindrical (permitting the gun to recoil through the cradle), or is it of the trough type (i. e. fitted with slides over which the gun recoils)?

c.—What are the positions of the trunnions and the equilibrators? Of what type are the equilibrators, spring, or pneumatic with liquid seal, or torsion bar?

2.—The Recoil and Recuperator Systems.

These consist of a "recoil mechanism" (in effect, a shock absorber) and a "recuperator" to return the gun to the firing position.

a.—Is the "recoil mechanism" of normal hydraulic type? Where is it situated?

b.—Is the recuperator of spring type or is it hydraulic, using compressed air? Where is it situated?

3.—Top Carriage.

This part usually supports the cradle and barrel in trunnion bearings during traverse and elevation on to a target.

a.—Is it of welded or riveted construction?

b.—What is the position of the trunnion bearings relative to the carriage pivot? What is the horizontal distance from the trunnion bearing to the center line of the pintle?

c.—What is the height of the trunnion bearings above the ground when the piece is in the firing position?

4.—Traversing and Elevating Mechanisms.

a.—What type of gearing is used (for example, nut and screw, or rack and pinion)?

b.—Are the mechanisms hand- or power-operated, or both?

c.—Where are the handwheels located?

5.—Sighting Mechanism.

Invariably, sighting mechanisms are found on the left side of field artillery pieces, and may be found on either or both sides in coast defense and AA matériel.

a.—Is the mechanism an indirect optical sight or a direct laying telescope? The former is normally employed with field pieces, while the latter is used for antitank guns. Frequently both types are provided.

b.—Is the sighting controlled from a remote point? This method usually is employed with coast defense and antiaircraft artillery and is usually indicated by the presence of transmission cables and follow-the-pointer dials on the weapon. In these cases, elevation and traverse are usually power-operated. A description of the system employed is required.

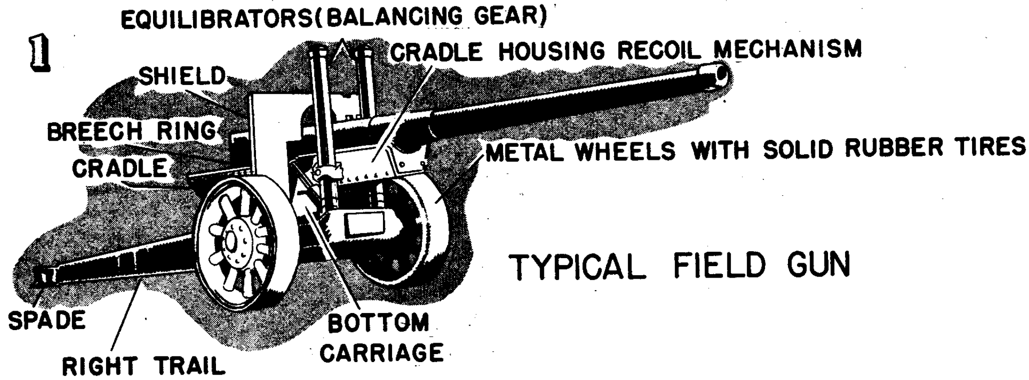
6.—Fuze-Setting Mechanism.

With coast defense and antiaircraft artillery, a fuze-setting machine which sets the fuze immediately before it is loaded into the gun usually is employed.

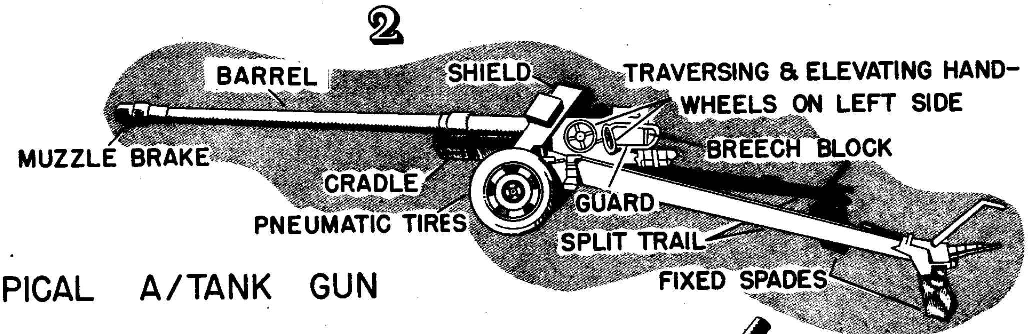
a.—Where are the machine or machines located?

b.—Are they hand-operated or power-op-

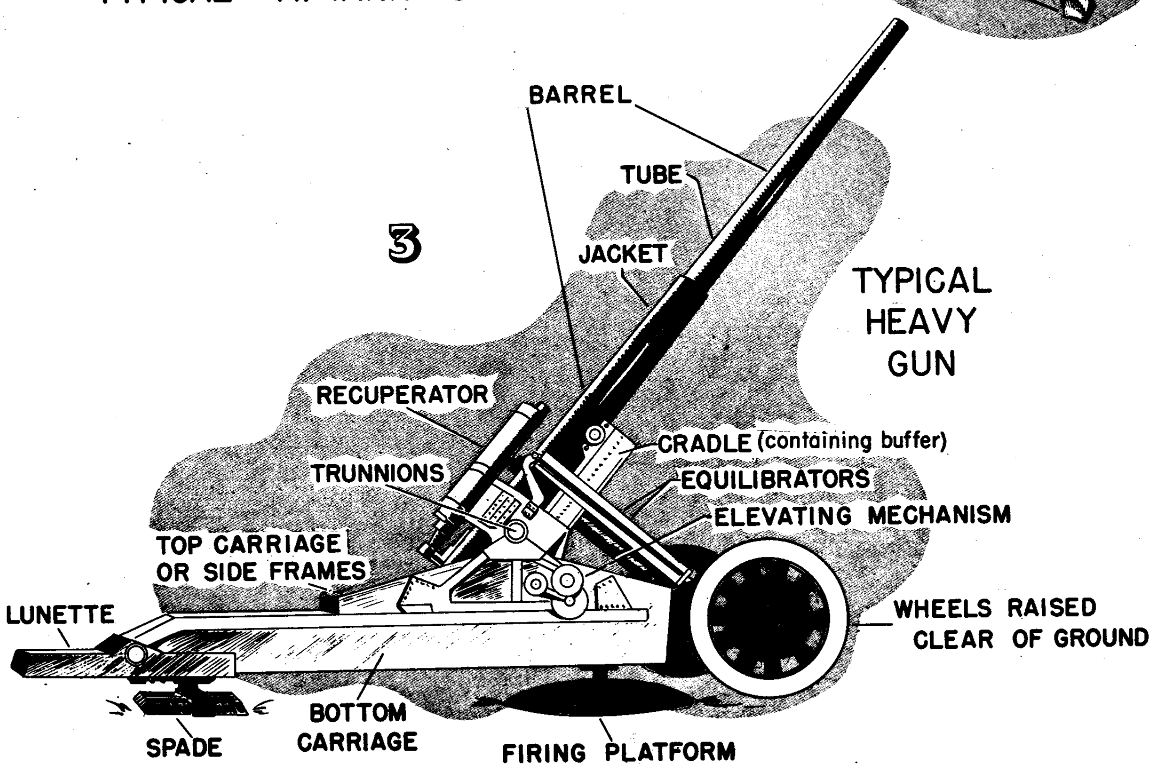
[1] See Figure 9, page 3.



TYPICAL FIELD GUN

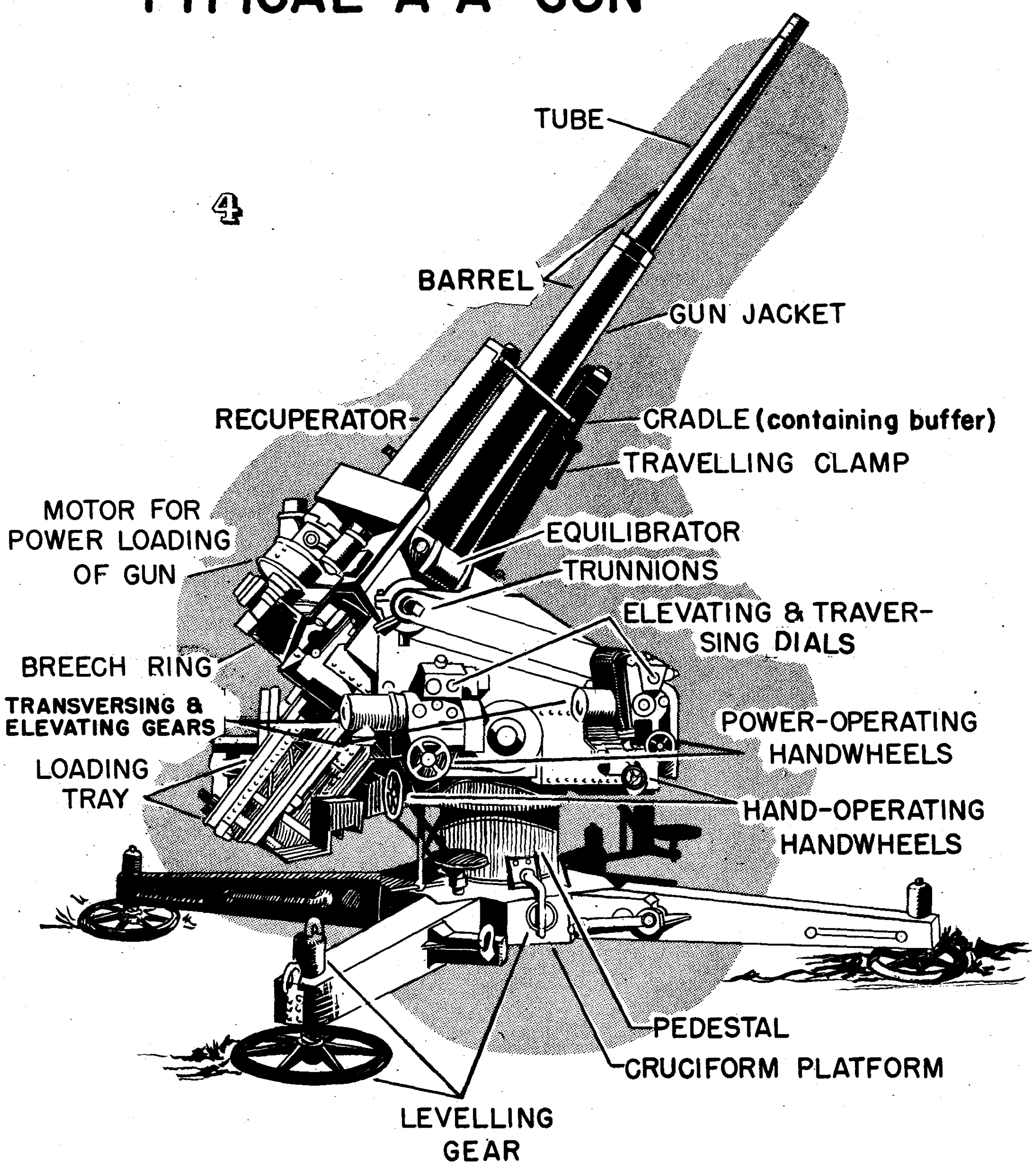


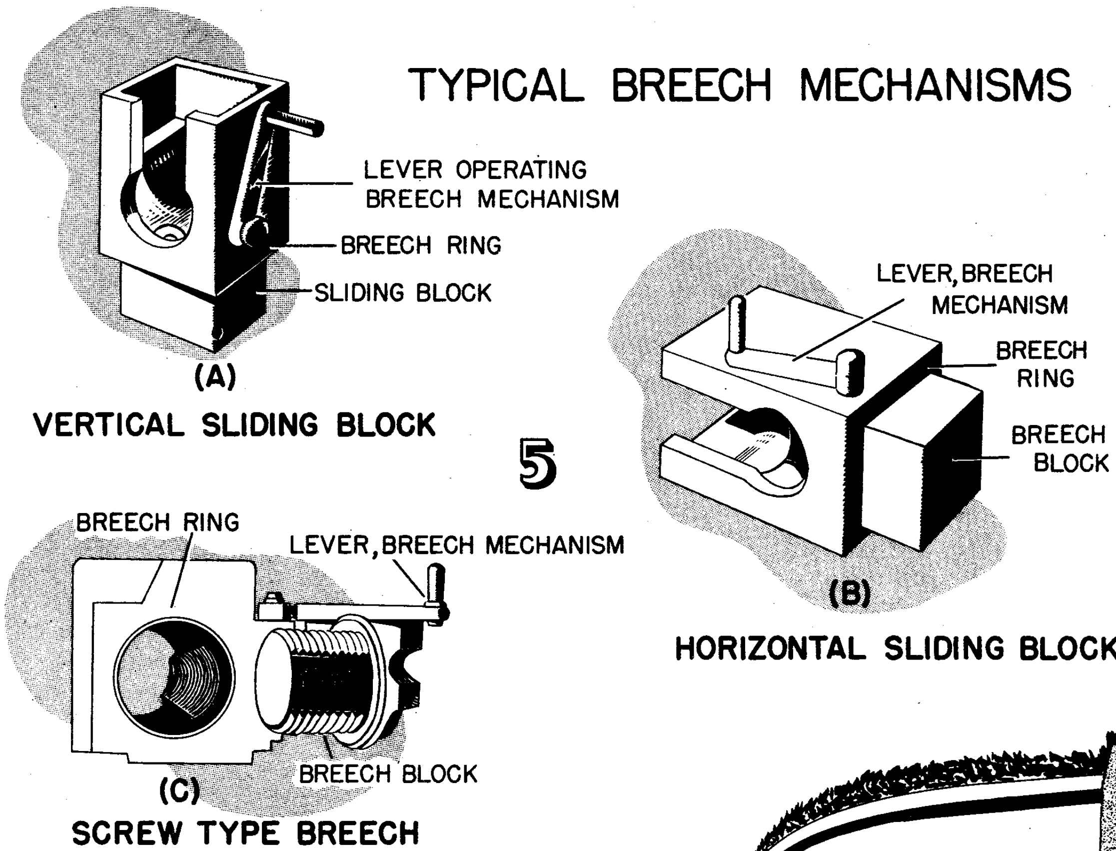
TYPICAL A/TANK GUN

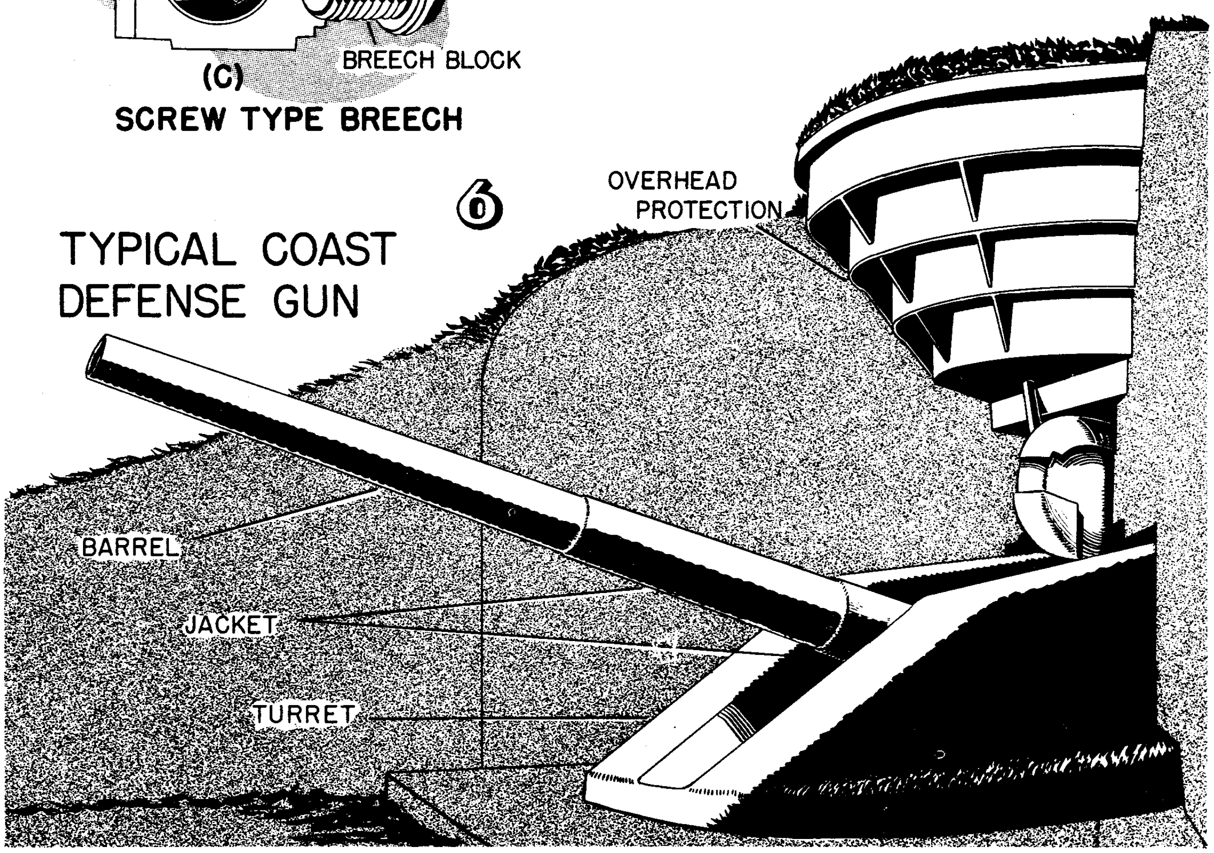


TYPICAL HEAVY GUN

TYPICAL A A GUN




TYPICAL BREECH MECHANISMS
LEVER OPERATING BREECH MECHANISM
BREECH RING
SLIDING BLOCK
(A)
VERTICAL SLIDING BLOCK
5
LEVER, BREECH MECHANISM
BREECH RING
BREECH BLOCK
(B)
HORIZONTAL SLIDING BLOCK
BREECH RING
LEVER, BREECH MECHANISM
BREECH BLOCK
(C)
SCREW TYPE BREECH


6
TYPICAL COAST DEFENSE GUN
OVERHEAD PROTECTION
BARREL
JACKET
TURRET

erated, or both?

7.—Loading Devices.

Loading and ramming devices are used where a high rate of fire is required—as with anti-aircraft artillery—or where the projectiles are heavy.

a.—How many loading trays are used?

b.—Are they hand- or power-operated?

c.—What system is used for ramming the projectiles?

8.—Miscellaneous.

Describe the following components if they are applicable: (1) Platform; (2) axle assembly; (3) trails. (These may be "split", of tubular or rectangular riveted or welded construction, or of the "box" type); (4) pedestal; (5) wheels—are they constructed of light alloy? (6) suspension system.

9.—Pack Load and Airborne Matériel.

This matériel is usually so constructed that it can be quickly disassembled, permitting division of the weapon into a number of loads for pack or airborne use.

This type of matériel may be identified by the presence of quick release levers, bolts, or plungers, or by the presence of shaped fittings to which parachutes or pack harness can be quickly attached.

The following additional information is required regarding this matériel: (1) Number of loads per weapon; (2) weight of individual loads; (3) time required to disassemble; (4) time required to assemble; (5) light metal components, if any.

10.—Recoilless Guns.

With this matériel the stresses of recoil are neutralized by directing a proportion of the propellant gases to the rear. Hence the gun has no trails, recoil mechanism, or recuperator and is of much lighter construction than a conventional piece.

Additional details required for recoilless matériel are: (1) Dimensions and description of the vent or nozzle directing the gases to the rear; (2) the size of the danger area to the rear (caused by the escape of gas); and (3) details of the ammunition whose cartridge case is large or of unorthodox design.

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INFANTRY SMALL ARMS

Small arms are the basic individual weapons not only of infantrymen, but of all other branches of service as well. They are generally defined as those weapons which can be carried by individuals and which do not exceed 15 millimeters in caliber (equivalent to caliber .60).

Small arms may be classified in three main groups: (1) Pistols and revolvers; (2) rifles and carbines; and (3) submachine guns, machine guns (light and heavy), and automatic rifles. The first two groups are usually single-shot (manual or semi-automatic), while the third group consists of fully automatic weapons, generally with provision for alternative single-shot operation.

Although the efficiency of modern small arms is the outcome of centuries of evolution, efforts to improve their design and performance have by no means ceased. For example, designers are still confronted with the perennial problem of increasing the rate of fire of the machine gun without incurring all the complications which result from overheating. Allied personnel who fought the Germans in 1943 will remember their first experience with the devastatingly high rate of fire of the German M. G. 42. Yet this weapon's 1,500 rounds per minute cyclic rate is very low compared with the 20,000 rpm recently achieved experimentally by one European designer.

The problems of more compact cartridges and of cartridges having combustible cases are also live research subjects. Simplification of design and reduction in weight are being sought by the designers of all small-arms-producing countries.

Another design aspect, which has received considerable practical application, is that of a "hybrid weapon" or one which combines the tactical advantages of the rifle and the submachine gun. Many nations have made considerable independent progress with this multipurpose type of small arm. While weapons of this type cannot be considered decisive in themselves, it would be foolish to underestimate the effect of a large surprise force armed with this type of weapon, equipped with infra-red night-aiming devices.

Following is a check-list of points to be noted in collecting intelligence information regarding the various types of small arms.

Performance and Tactical Data

a.—What is the official nomenclature, and of what type[1] is the weapon? What is its role? What is its caliber?

b.—What is its length, with and without accessories, such as mount, silencer, grenade-launcher, and special sights?

c.—What is its weight with and without full and empty magazine?

d.—What are its effective and maximum ranges? (State with what type of round, i. e., ball, AP, etc.)

e.—What are the rates of fire: cyclic or theoretical, and practical (including reloading, etc.)?

f.—Give the armor penetration, where applicable.

g.—What is the weight of bullet, propellant, and complete round? What types of ammunition are fired?

h. What is the muzzle velocity?

i.—What are the lengths of the rifled portion and the chamber? What is the weight of the barrel?

j.—Give any serial and model numbers which may be inscribed on the weapon, together with the name and location of the manufacturer, as well as his trade-mark. Furnish tracings if possible.

k.—What are the ammunition feeding arrangements? This should include: (1) The nature and form of the ammunition holder or conveyor (typical magazines are shown in Figures 28 to 31 on page); (2) the position of the ammunition holder in the weapon; (3) the number of rounds which the magazine or belt holds; and (4) the method of refilling.[2]

[1] See Figures 51 through 57, page 19.
[2] See Figures 28 through 29, page 18.

l.—Are any infra-red or other night-aiming systems used with this weapon? If so, give a description, including range.

m.—Is the weapon provided with: (1) A flash hider; (2) a muzzle brake; (3) a compensator; (4) a silencer?

(1) A flash hider is usually trumpet-shaped [1]

(2) The muzzle brake reduces recoil and often takes the form of a symmetrically slotted barrel extension.

(3) A compensator uses the escaping gases to counteract the tendency of light weapons to climb during automatic fire. It may take the form of an unsymmetrically slotted barrel extension or a short cylinder with gas-escape holes in its upper surface and attached to the muzzle.

(4) A silencer is a device for trapping the gases and therefore the sound, while allowing the bullet to escape. It usually takes the form of a cylindrical barrel extension.

n.—What types of ammunition are fired (armor piercing, incendiary, etc.)? What is the shape of the bullet (round-nosed and short like a pistol bullet or long like a rifle bullet)? [2] What are the dimensions of bullet and cartridge case? Is the cartridge case rimmed, rimless, or belted? Is the cartridge case tapered or parallel? What material is used in the cartridge case construction? Feed and ejection ports and magazines will usually give an indication of the ammunition size [3]

o.—Should the breech be locked at the moment of firing? How is this accomplished? (Rotation of bolt, bolt movement to locked positions, etc.)

Pistols and Revolvers

The basic difference between these well-known weapons is that the revolver ammunition supply is contained in a revolving cylinder [4] while in the pistol, the cartridges are carried in a magazine usually contained in the butt and are fed under the influence of a spring. A typical pistol is shown in Figure 2, page

a.—How many rounds can be carried in the magazine or revolving cylinder?

b.—If a pistol, has the weapon an external hammer? Can the hammer be made to rise and fall by simply pressing the trigger, or must it be cocked manually? Are provisions made for selective automatic and semi-automatic fire and for attachment of a shoulder stock?

c.—In the case of the pistol, what system of action is employed?

Rifles and Carbines

These two types of weapons are generally similar except that the carbine is shorter and lighter and sometimes fires a weaker cartridge than the basic rifle cartridge.

a.—Is the weapon manually reloaded, or is it reloaded automatically? Semi-automatic rifles can usually be distinguished from manually operated ones by their enclosed receivers which house the more complicated mechanisms and the driving springs.[5]

b.—Is a bayonet provided? What are its dimensions and shape, and what is the method of attachment? [6]

c.—Is the weapon also used as a grenade launcher? In this role, it is fitted with a short detachable cylinder over the muzzle into which the grenade is placed or with a similarly placed spigot. With the latter type, the grenade has a hollow tail which fits over the spigot.[7]

d.—Is the stock of plain wood, plywood, or plastic?[8]

e.—Is a handguard provided? Of what material is it?

f.—What are the sighting arrangements?

(1) Is the front sight one of the types shown in Figures 39 to 43?

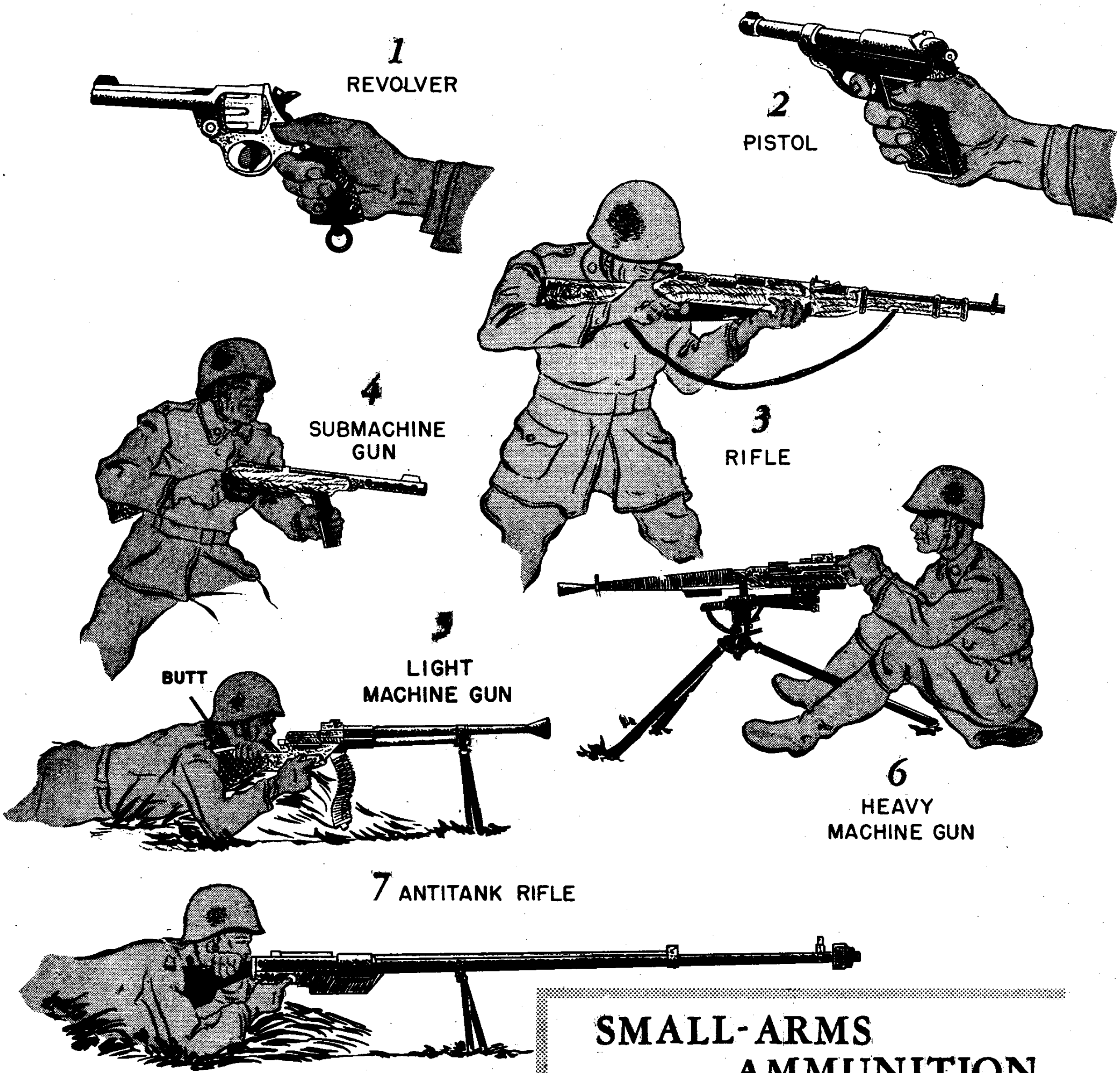
(2) Is the rear sight one of the types shown in Figures 44 to 49?

(3) If a sniper's telescopic sight is used with the rifle, how is it attached to the weapon? What are its dimensions and degree of magnification? What is the location of the range-setting drum, and what increases do the range-scale graduations represent? A typical sniper's sight is shown in Figure 50.

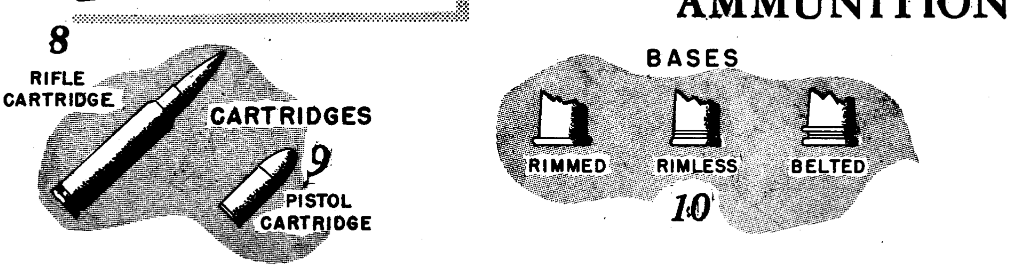
g.—Is the weapon an antitank rifle? (This is

[1] See Figures 51 through 57, page 19.
[2] See Figures 8 through 10, page 16.
[3] See Figures 11 through 13, page 17.
[4] See Figure 1, page 16, and figures 36 through 38, page 18.
[5] See Figures 24 through 25, page 17.
[6] See Figures 51 and 52, page 19.
[7] See Figures 57 and 58, page 19.
[8] See Figures 14 through 19, page 17.

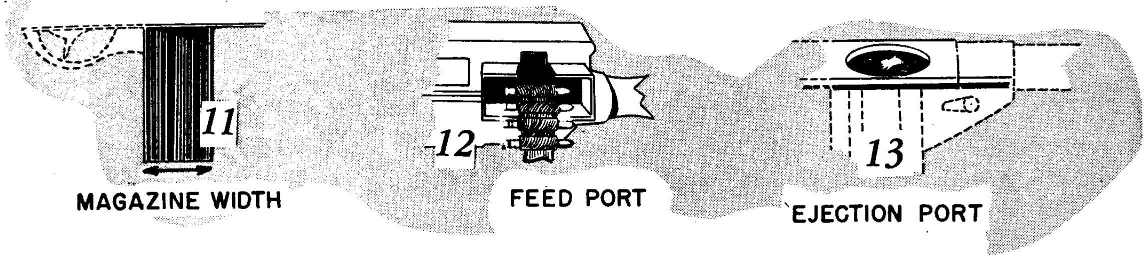
TYPES OF SMALL ARMS



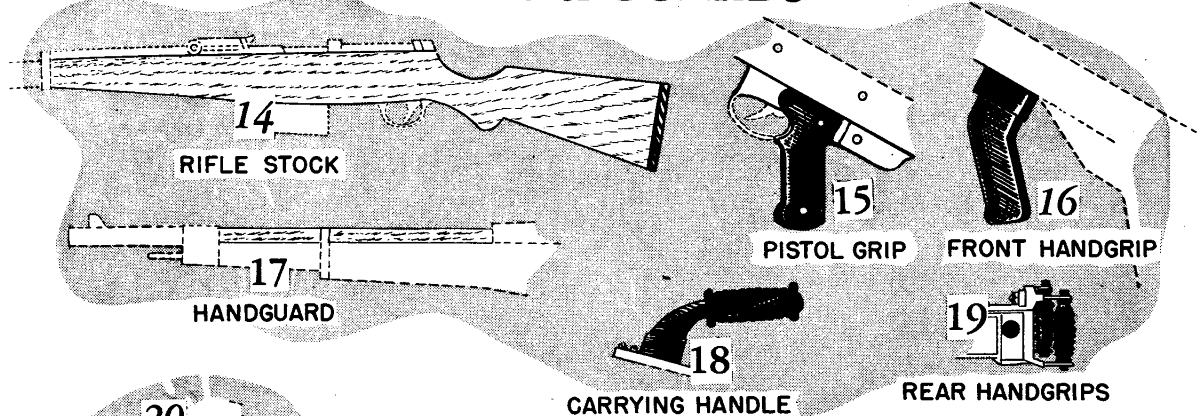
SMALL-ARMS AMMUNITION



INDICATIONS OF CARTRIDGE LENGTH

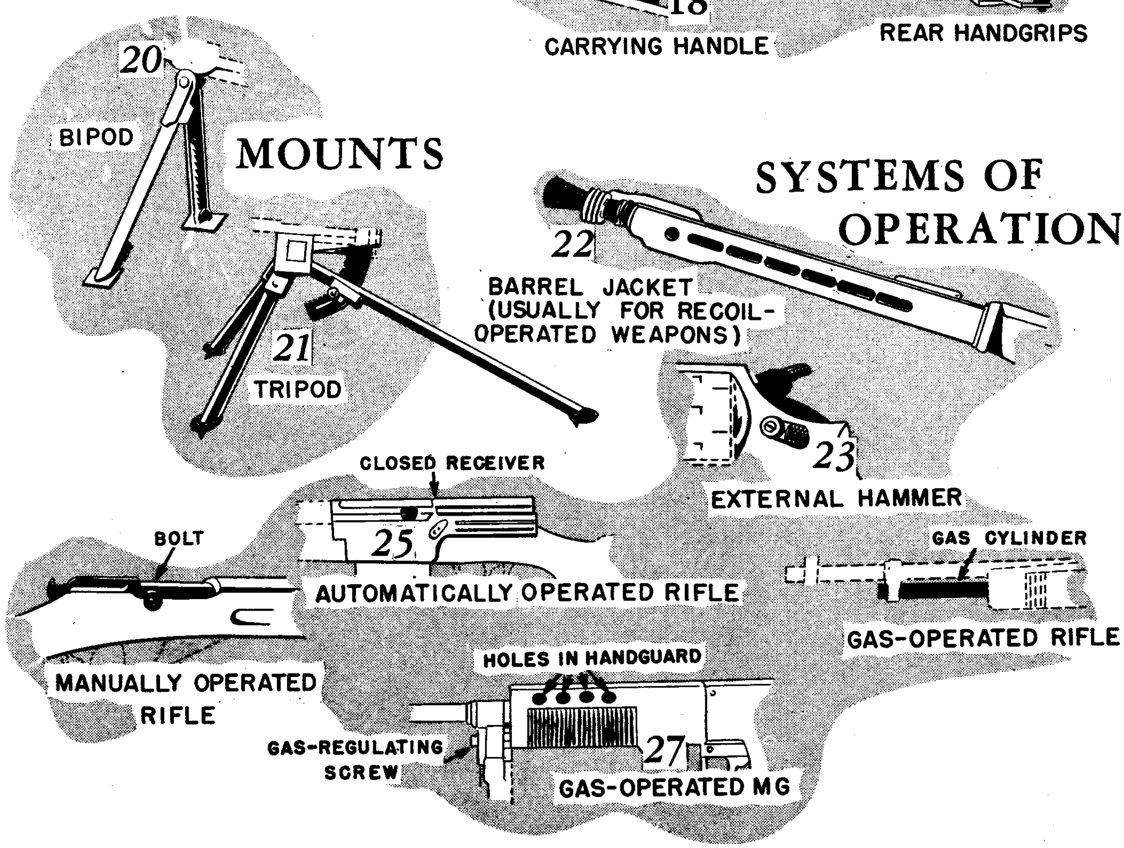


GRIPS & GUARDS

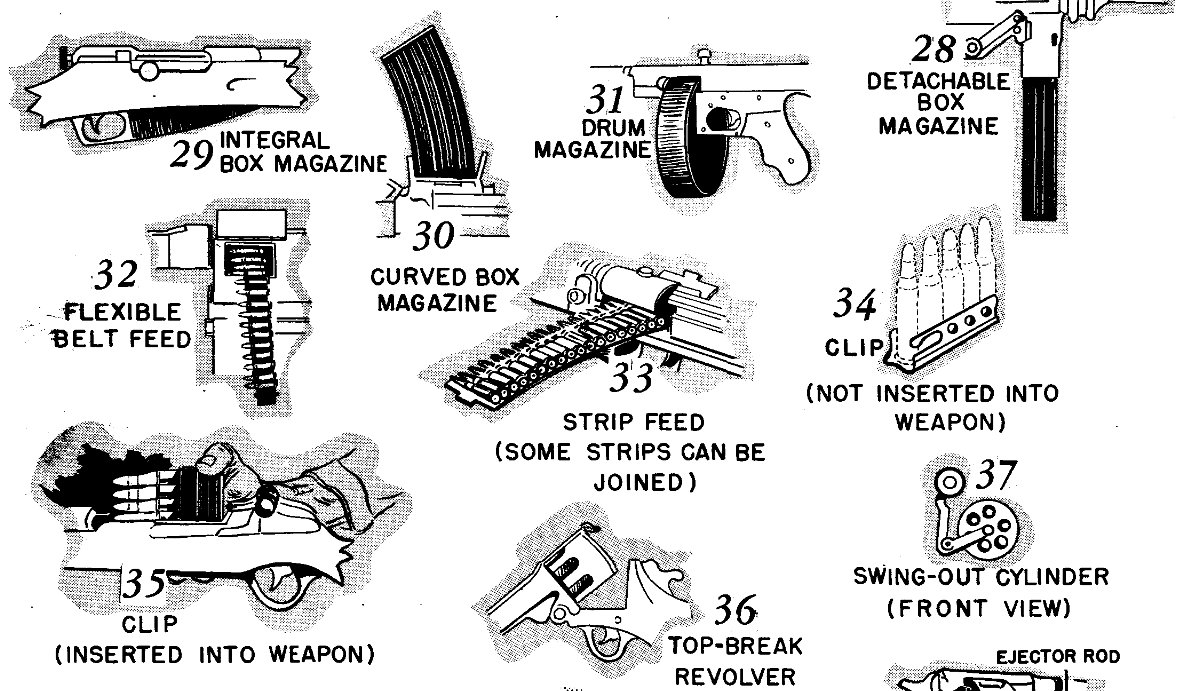


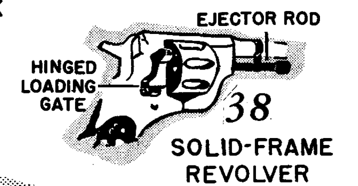
MOUNTS

SYSTEMS OF OPERATION

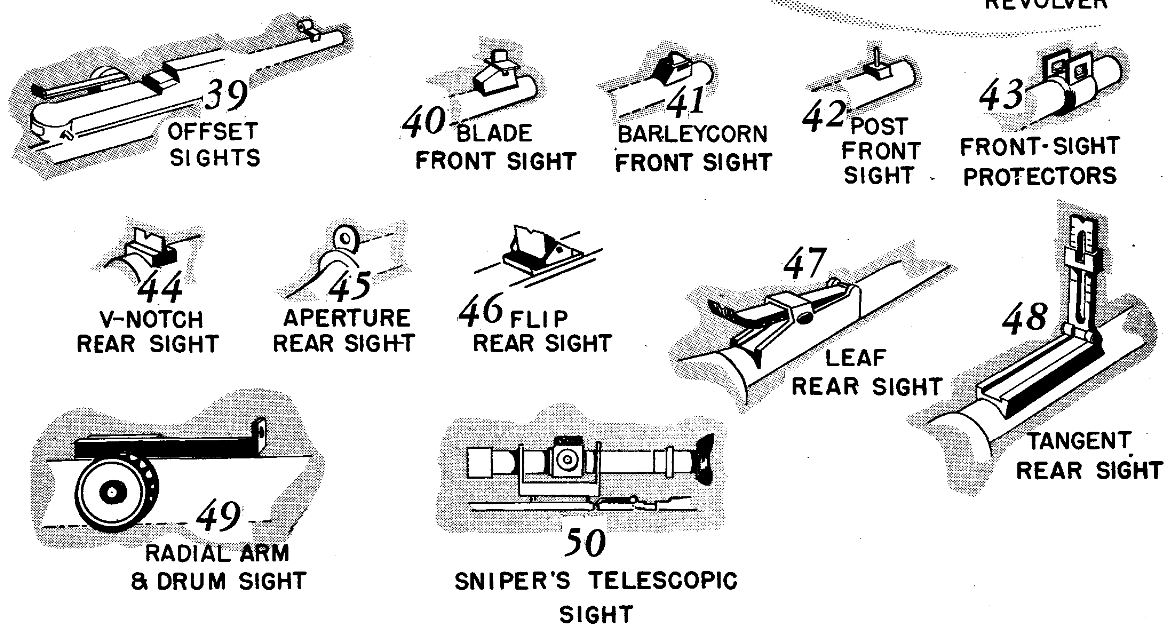


FEED DEVICES

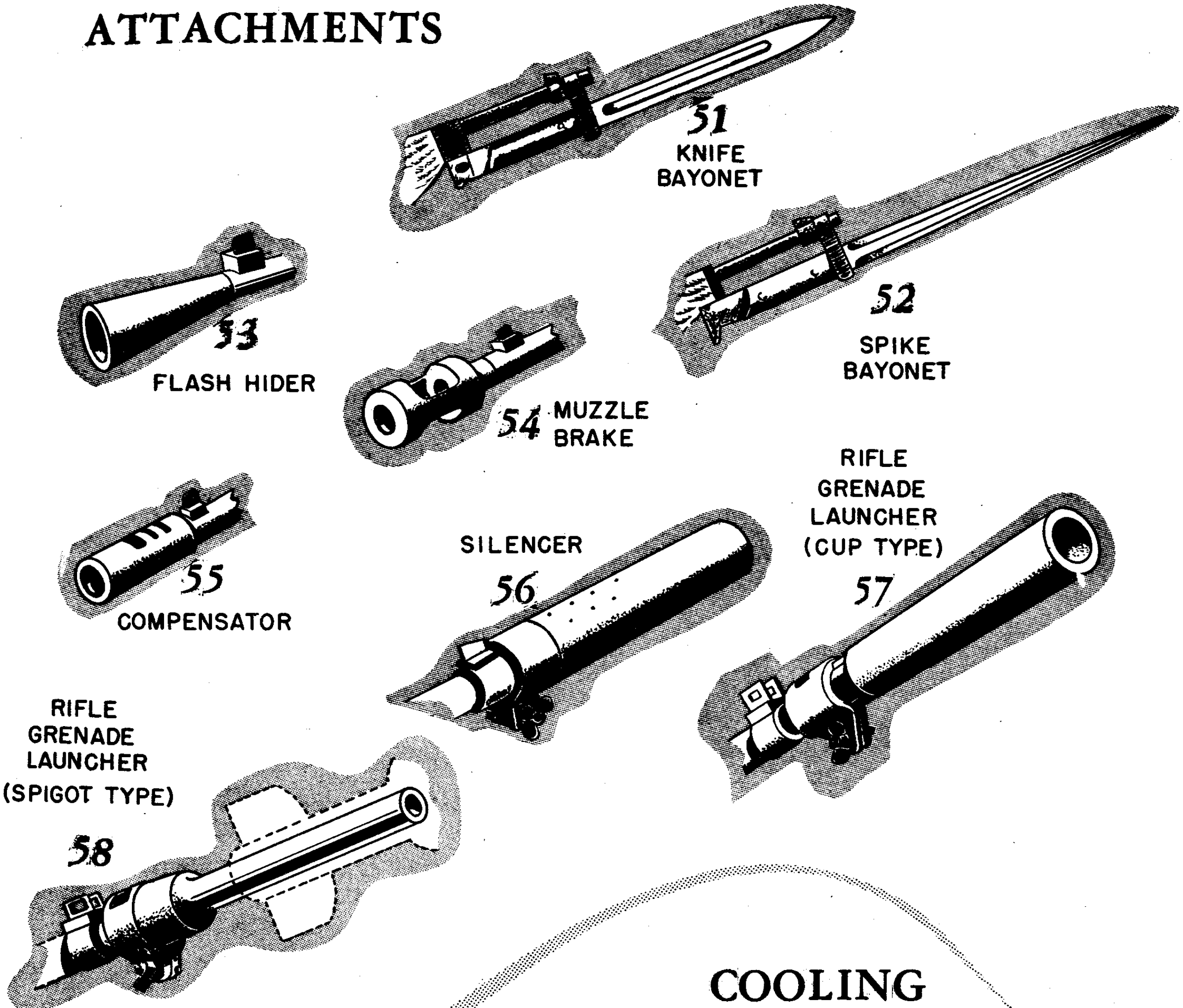




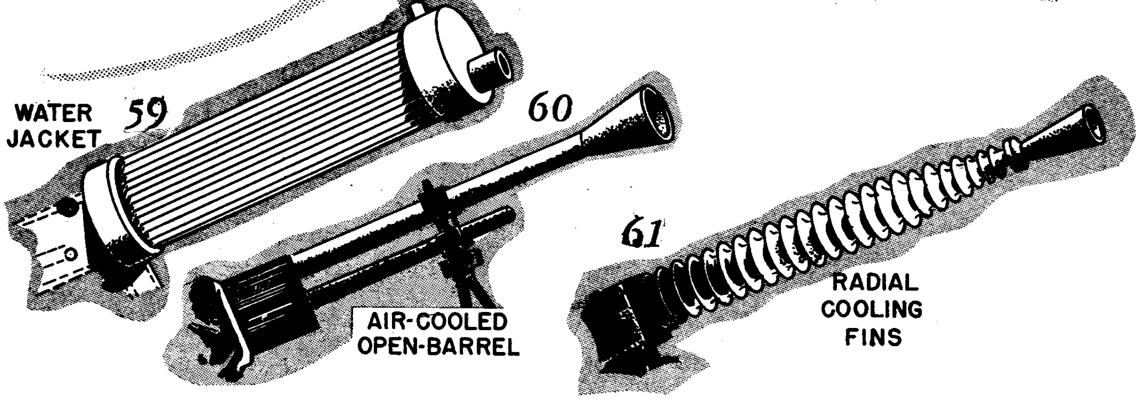
SIGHTING DEVICES



MUZZLE ATTACHMENTS



COOLING SYSTEMS



obsolete or obsolescent in modern armies.) It may be recognized by the unusually long barrel, the muzzle brake, and some form of support such as a monopod or bipod.

Submachine Guns, Machine Guns, and Automatic Rifles

Machine guns may be light or heavy. Light and heavy machine guns differ chiefly in role and weight. Light machine guns are normally of rifle caliber (cal. .256–cal. .315), belt-fed, and are provided with a bipod. Heavy machine guns are provided with more stable mounts and are sometimes of larger than rifle caliber (cal. .256–cal. .60). A dual-purpose machine gun is one that can be used as either a light or a heavy machine gun by merely changing the type of mount. In United States nomenclature, automatic rifles are similar to the weapon shown in Figure 5, page 16 but are magazine-fed. Submachine guns are hand-held weapons capable of automatic fire. Sometimes they are equipped with a selector to permit either automatic or semiautomatic fire. Submachine guns usually fire pistol cartridges.

a.—Is the weapon: (1) Recoil-operated; (2) gas-operated; or (3) blowback-operated?

(1) In the case of the recoil-operated weapon, the barrel must be free to move backward and forward. It is frequently, but not always, housed within a slide or barrel jacket or casing.[1]

(2) The gas-operated weapon usually carries a gas cylinder above or below the barrel. It has some sort of gas regulator screw.

(3) Blowback-type weapons utilize the pressure of the powder gases to force the bolt to the rear independently of the barrel, to which it is not locked at the moment of firing. This system has been practically restricted to submachine guns.

b.—Does the weapon give automatic fire only—i. e., does it fire as long as the trigger is pressed—or selective automatic or semi-automatic fire, accomplished by moving a change lever or press button?

c.—Is the gun air-cooled or liquid-cooled? An air cooled weapon frequently has a slotted barrel casing. Sometimes the barrel has no casing but is provided with fins to assist in the cooling. Air-cooled barrels also may have no casing or fins. A liquid-cooled weapon is provided with a large jacket surrounding the barrel.[2]

d.—Is the weapon provided with the following components? If so, are any of them folding or collapsible?

(1) A butt, as shown in Figure 5, page 16; (2) a stock, as shown in Figure 14, page 17; (3) a pistol grip, as shown in Figure 15, page 17; (4) a front hand-grip, as shown in Figure 16, page 17; (5) a bipod, as shown in Figure 20, page 17; or, in the case of heavy machine guns, a tripod as shown in Figure 21, page 17. How is the bipod or tripod attached to the weapon? (6) a barrel casing as shown in Figure 22, page 17; (7) a carrying handle as shown in Figure 18, page 17; (8) rear grips as shown in Figure 19, page 17.

e.—What are the sighting arrangements? (1) Is the front sight one of the types shown in Figures 39 to 43, page 18? (2) is the rear sight one of the types shown in Figures 44 to 49, page 18? (3) is any sighting mechanism provided for indirect fire? If so, where is it mounted? Is it provided with optical or open sights? What is the arrangement of the dials and arcs, and how are they graduated?

[1] See Figures 22 through 27, page 17.

[2] See Figures 59 through 61, page 19.

MORTARS, INFANTRY ANTITANK WEAPONS, AND GRENADES

Mortars and grenades have been used for generations, but the modern infantry rocket and recoilless weapons owe their rapid development to World War II.

Increased thickness of armor has created a need for an infantry, man-carried weapon capable of defeating heavy armor. The present combination of rocket (or recoilless) weapons and a shaped charge enables a single infantryman to carry and fire his weapon and thereby defeat the armor of the heaviest tank. The infantry rocket launcher, however, has severe limitations in range and accuracy. Recoilless weapons, on the other hand, are currently limited in penetrative power, owing to the fact that the HEAT[1] as well as other projectiles fired by recoilless weapons are spin-stabilized, a condition which mitigates against the effectiveness of these projectiles in armor penetration. Designers are now devoting considerable energy to solving these difficulties. The prospect of rendering impotent so cheaply and so easily the most costly and most heavily armored tank is, to say the least, an attractive one.

Infantry weapons, other than small arms, fall into three main categories: (1) Mortars; (2) antitank weapons (rocket launchers and recoilless weapons); and (3) grenades.

Mortars

Mortars may be of the well-known conventional type shown in Figure 1, page 42, or of the spigot type as shown in Figure 6, page 42.

A spigot mortar is one in which the shell is discharged off a spigot or shaft instead of from a barrel. Spigot mortars have been used principally for projecting heavy demolition charges to a relatively short distance.

In collecting technical data on these weapons, care should be taken to avoid confusion, because foreign nomenclature sometimes uses a word which obviously is related to "mortar" to designate a heavy artillery mortar. The literal translations of many foreign words for the conventional mortar are often "mine thrower", "shell thrower", "grenade launcher", and similar terms.

Figure 1[1] illustrates a conventional 81-mm. (approximately 3-inch) mortar. The ignition cartridge[2] is inserted in the tail of the shell. For the longer ranges, additional propellant increments are fixed between the shell's fins. The shell is loaded tail first and, after dropping down the barrel, forces the percussion primer[3] in the base of the ignition cartridge upon the fixed firing pin in the base cap. Flash from the ignition cartridge passes through the holes in the boom to ignite the increments. The mortar can readily be dismounted into its three main components: barrel and base cap, base plate, and bipod mount.

Following are the most pertinent questions regarding any type of mortar:

(1) What is the caliber of the weapon, and what is its official nomenclature? Who is the manufacturer, and where is the plant located? When was the weapon adopted or standardized, or both?

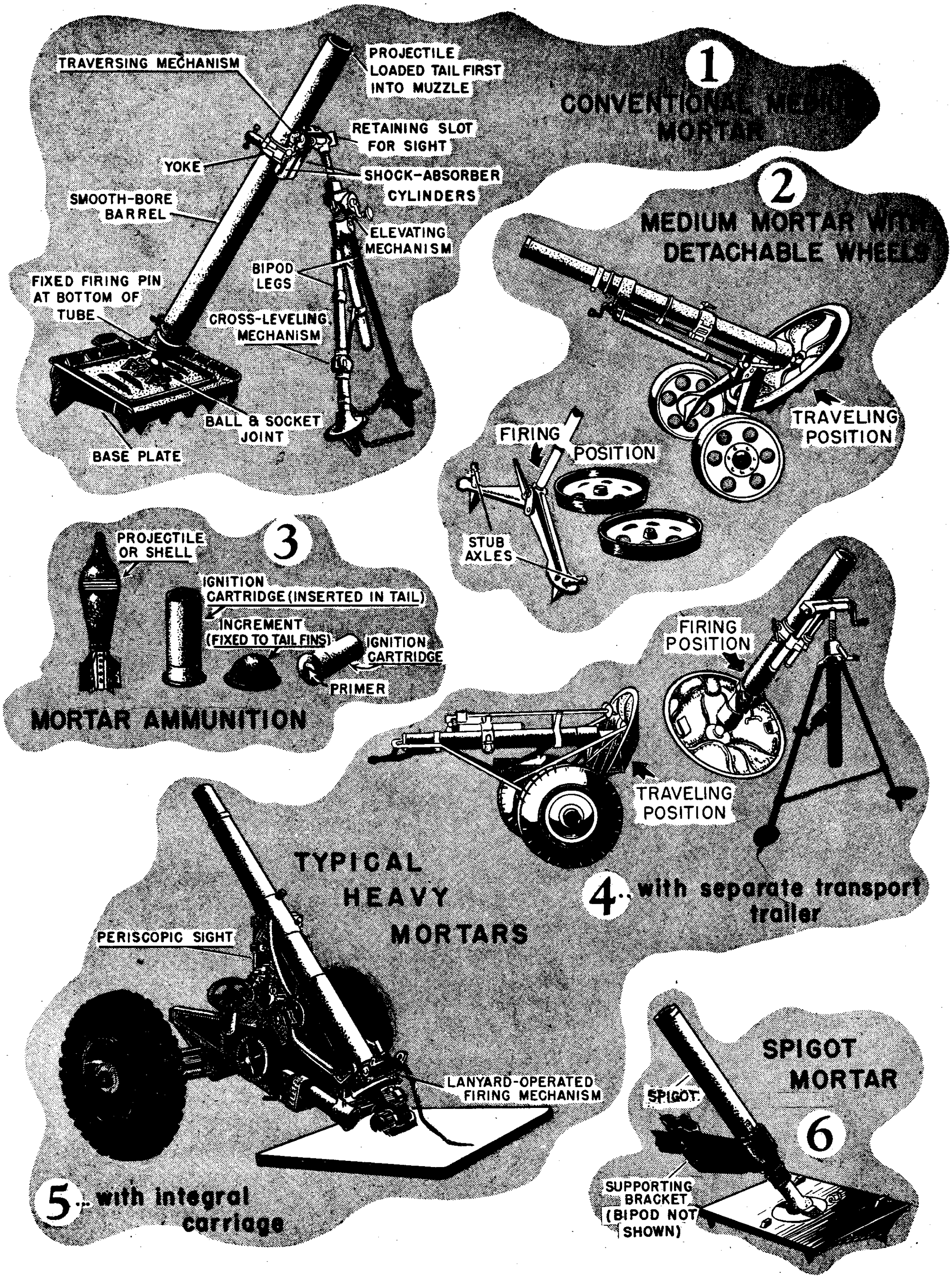
(2) What are its performance characteristics? (a) Maximum and minimum ranges; (b) maximum and sustained rates of fire; (c) probable errors in deflection and range at maximum and minimum ranges; and (d) time required to go into and out of firing position.

(3) What are the weights of: (a) The complete weapon in the firing position? (b) the weapon in the traveling position? (c) the bipod or tripod? (d) the base plate? (If not of the type shown in Figure 5, page 22.) (e) the barrel? (f) the transport cart or trailer?

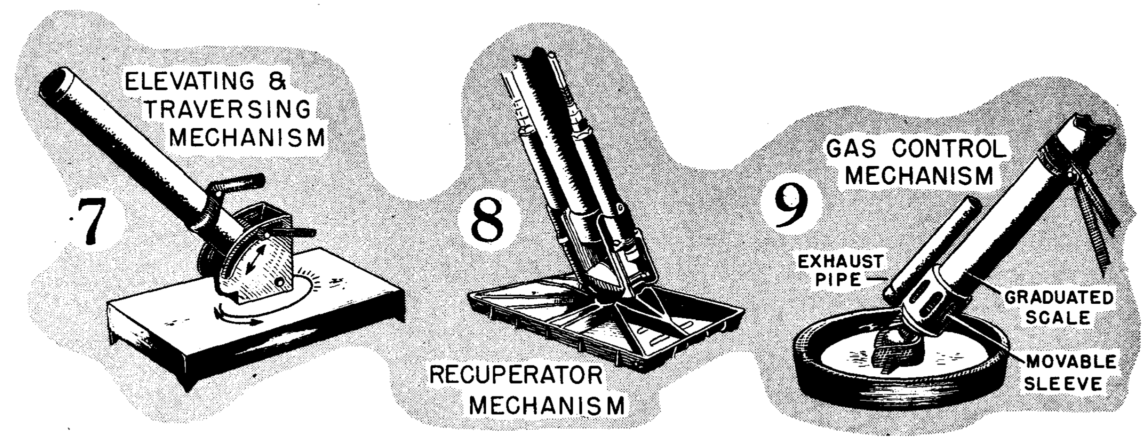
(4) What are the dimensions of: (a) The base plate? (b) the barrel (length from muzzle

[1] High Explosive Antitank.

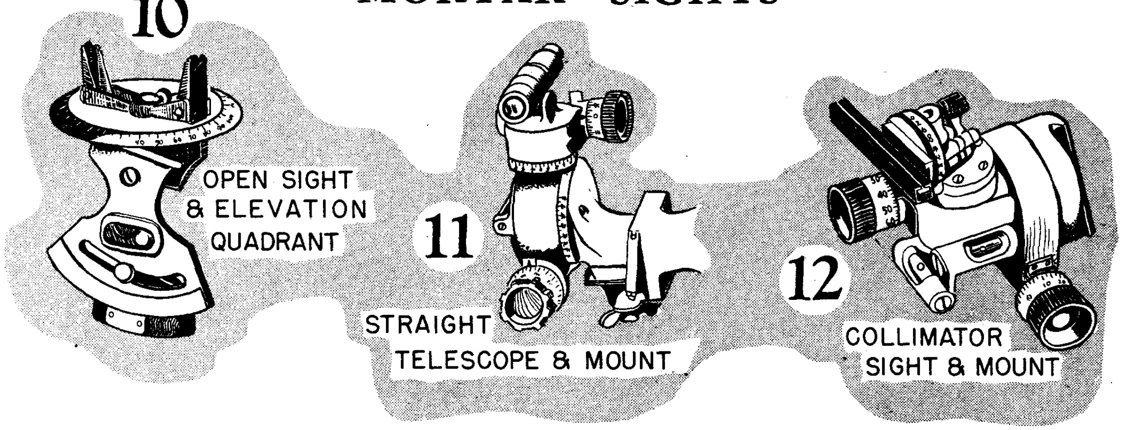
[1] See Page 22.
[2] See Figure 3, page 22.
[3] See Figure 3, page 22.


1
CONVENTIONAL
MORTAR
TRAVERSING MECHANISM
PROJECTILE LOADED TAIL FIRST INTO MUZZLE
RETAINING SLOT FOR SIGHT
YOKE
SHOCK-ABSORBER CYLINDERS
SMOOTH-BORE BARREL
ELEVATING MECHANISM
BIPOD LEGS
FIXED FIRING PIN AT BOTTOM OF TUBE
CROSS-LEVELING MECHANISM
BALL & SOCKET JOINT
BASE PLATE
2
MEDIUM MORTAR WITH DETACHABLE WHEELS
FIRING POSITION
TRAVELING POSITION
STUB AXLES
3
PROJECTILE OR SHELL
IGNITION CARTRIDGE (INSERTED IN TAIL)
INCREMENT (FIXED TO TAIL FINS)
IGNITION CARTRIDGE
PRIMER
MORTAR AMMUNITION
FIRING POSITION
TRAVELING POSITION
TYPICAL HEAVY MORTARS
4.. with separate transport trailer
PERISCOPIC SIGHT
LANYARD-OPERATED FIRING MECHANISM
5.. with integral carriage
SPIGOT MORTAR
SPIGOT
6
SUPPORTING BRACKET (BIPOD NOT SHOWN)

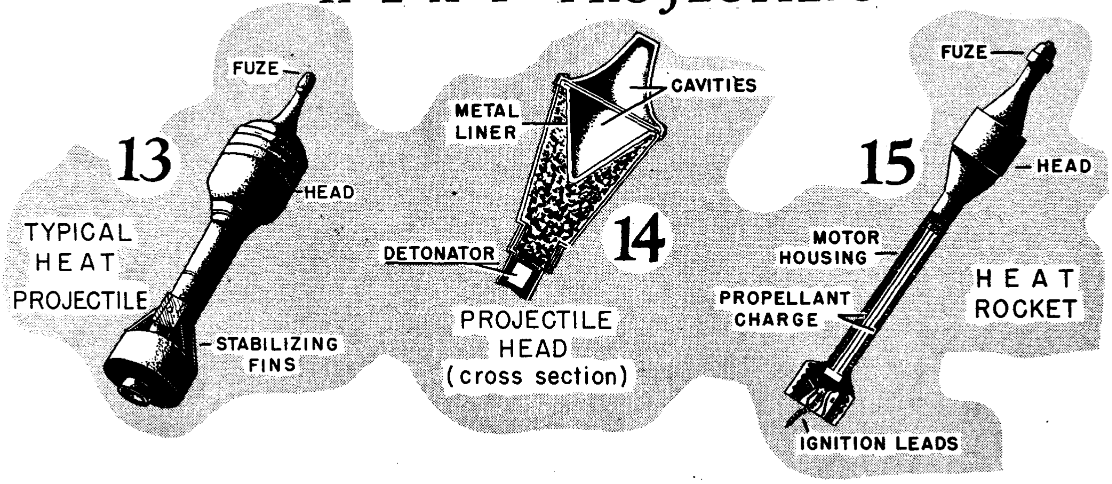
MORTAR COMPONENTS



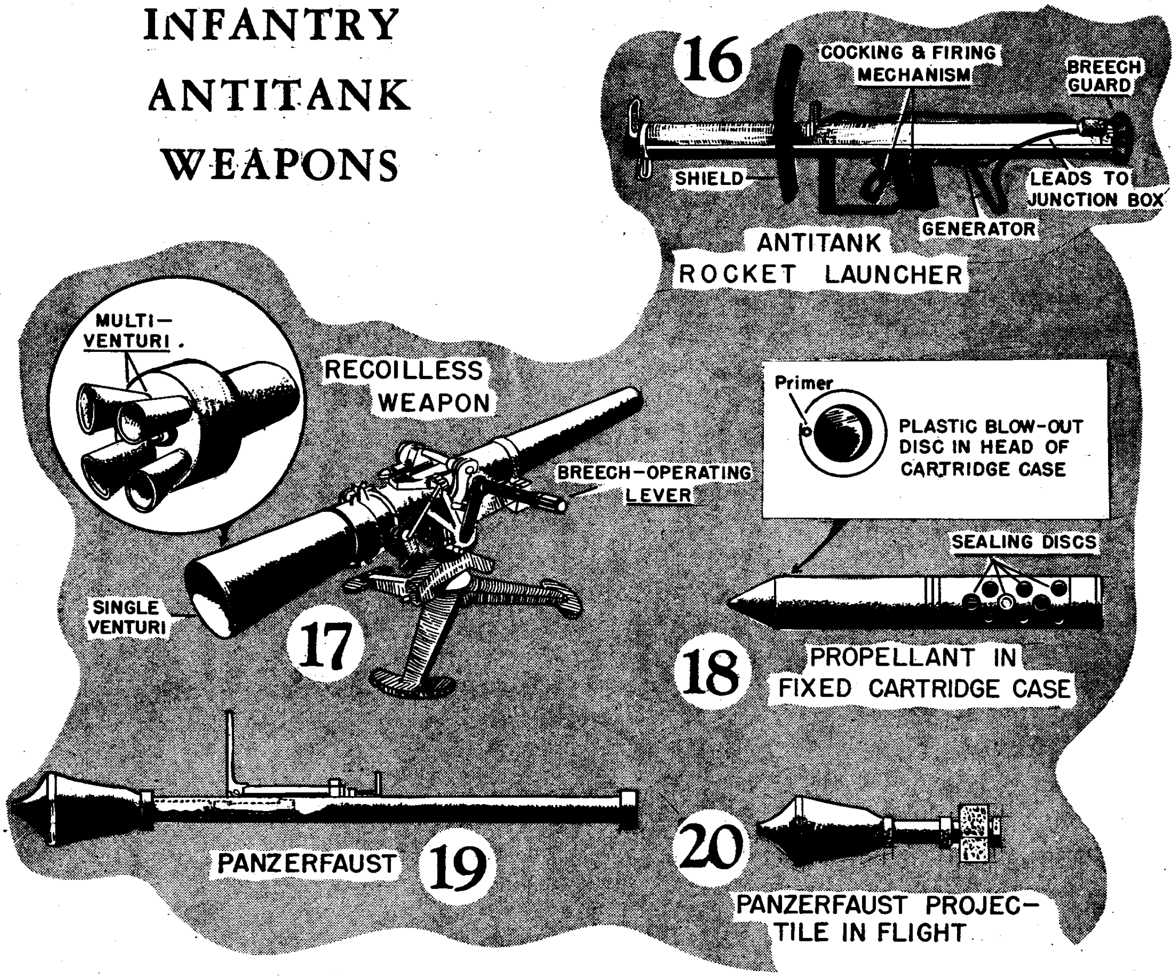
MORTAR SIGHTS



H E A T PROJECTILES

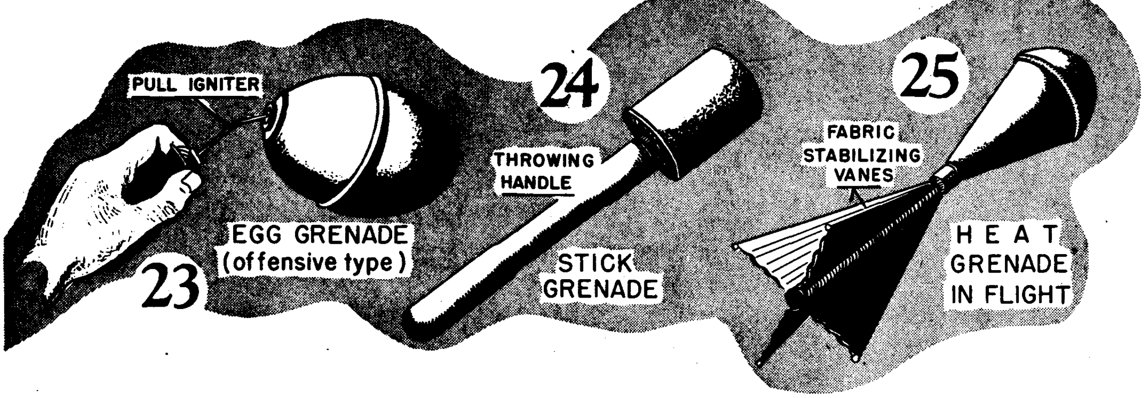


INFANTRY ANTITANK WEAPONS

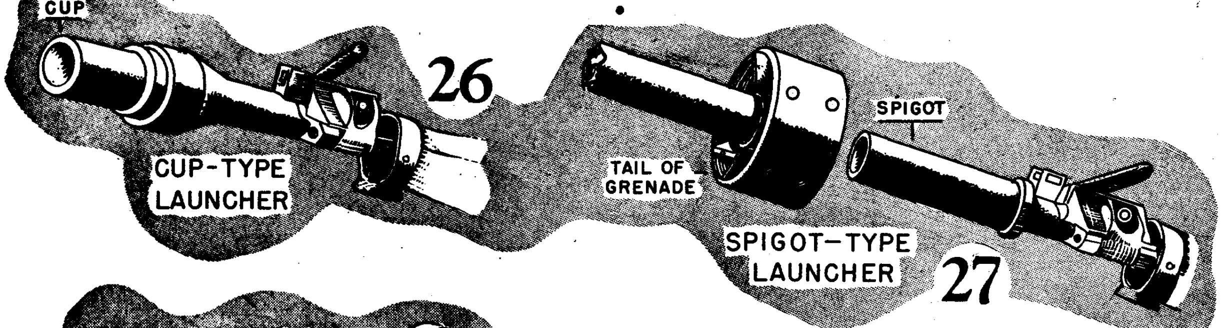


HAND GRENADES

HAND GRENADES (continued)

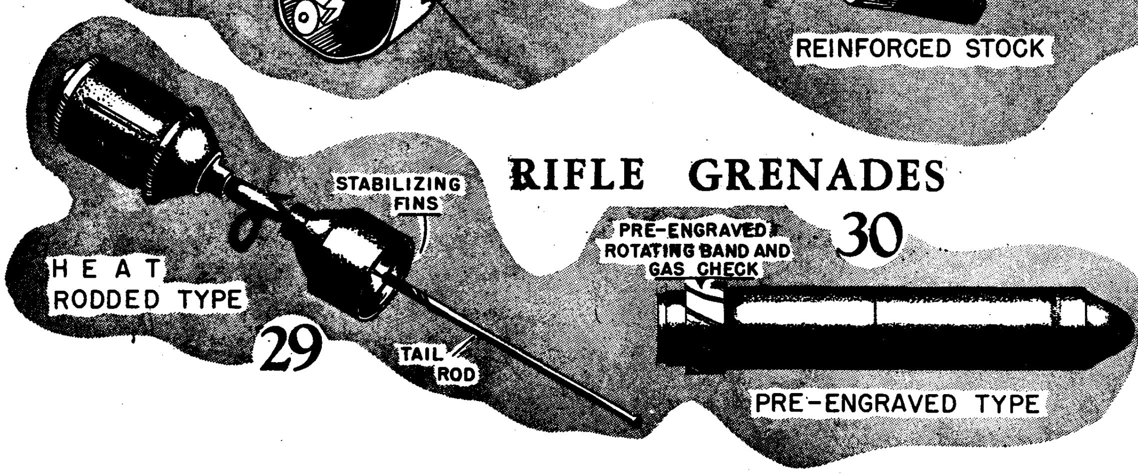


RIFLE GRENADE LAUNCHERS



LAUNCHER ACCESSORIES

RIFLE GRENADES



to end of spherical projection or base cap)? (c) the bore (diameter and length from muzzle to tip of firing pin or projectile step)?

(5) What are the weapon's total traverse and elevation?

(6) What type of cross-leveling mechanism is used? (This is a device to compensate for any unevenness in the ground by canting the sight mount into a true horizontal plane.)

(7) What is the method of range adjustment, and what is the muzzle velocity? Some mortars, chiefly those of smaller caliber, have been used in which differences in range are obtained not by altering the charge or the elevation of the barrel, but by allowing more or less gas to escape through valves in the breech. Weapons employing this system usually will be recognizable by the existence of an exhaust pipe or baffle plate and a graduated control mechanism, the latter at the breech.[1]

(8) What are the transporting arrangements? The components of some large mortars are too heavy to be conveniently man-handled. For such mortars a two-wheeled trailer or cart is often provided. In some cases, the mortar must be completely removed from this carriage before it can be fired[2]. In other cases, however, the carriage may serve as the barrel mount in action in a manner reminiscent of a towed artillery weapon. Sometimes wheels are fitted as shown in Figure 2, page 42.

(9) Is the mortar drop- or trigger-fired? If the latter, where is the trigger situated and how is it operated—e. g., by hand or by lanyard? Or can either method of firing be chosen by manipulation of a selective lever?

(10) Where is the sight placed? Is it an open or an optical sight?[3] If the latter, is it of the collimator, straight telescope,[7] or periscopic telescope type?[4] How many scales has it, and how are they graduated? Does the sight embody a cross-level indicator bubble? If so, where is it located?

(11) What is the form of the base cap? Does it mate directly with the base plate by means of a conventional ball joint,[5] or are there intermediate components? Is there any buffer and recuperator mechanism between base cap and base plate?[1]

(12) Is it muzzle-loaded? If not, describe fully the means by which the shell is introduced into the barrel. Is loading by hand or by some other means?

(13) Is the barrel smooth-bored or rifled? If the latter, with how many grooves, of what width and depth, and what is the pitch of the rifling—i. e., what is the length in which each groove makes one complete turn? How does the shell engage the rifling?

(14) What is the shape of the base plate and spades? What is the depth of the spades?

(15) What metals are used in the barrel, base plate, and mount?

(16) How many men are in the crew, and what are their duties?

(17) What are the weight, the length, and the type of the shell?

Infantry Antitank Weapons

The two systems most commonly used in infantry antitank weapons (other than grenades and antitank guns) are rocket propulsion and recoilless.

These two principles, although often confused, are fundamentally different. The propellant of a rocket is part of the projectile, is usually contained within it,[2] and moves with it while burning. In a recoilless weapon the action and location of the propellant in relation to the projectile are similar to those of a conventional firearm. Some of the propellant gases, however, neutralize recoil by escaping either directly backward or in a general rearward direction through a venturi or venturis at the breech, so as to equalize the reaction in both directions.[3]

a.—Rocket Launchers.—An antitank rocket launcher is likely to exhibit at least some of the following features:[4]

(1) A tube resembling a gun barrel, but thin-walled, smooth-bored, and open-ended; it may terminate in a funnel serving as a loading guide.

(2) A firing lever, button, or trigger well forward of the rear of the launcher.

(3) A battery or generator connected with the rear end of the launcher (in cases where

[1] See Figure 9, page 23.
[2] See Figure 4, page 22.
[3] See Figures 10 through 12, page 23.
[4] See Figure 5, page 22.

[1] See Figure 8, page 22.
[2] See Figure 15, page 23.
[3] See Figure 17, page 24.
[4] See Figure 16, page 24.

firing is initiated electrically).

(4) A shield with transparent sight windows to protect the firer from back flame as the rocket leaves the launcher. The firer may also wear protective clothing.

(5) When the rocket is fired, flame will shoot from the rear of the projectile and continue to stream from the projectile in flight until all the propellant is burned. During this period a continuous roaring noise quite unlike a firearm's report usually will be heard.

(6) The projectile will have no cartridge case, but it will have a venturi or venturis at its base.

b.—*Recoilless Weapons.*—A recoilless weapon may also be an open-ended tube (see Figure 17, page 24) but is more likely to have a breech mechanism incorporating a venturi or venturis (see Figure 17, page 24). The barrel may be rifled or smooth-bored. The propellant is often contained in a fixed-round cartridge case (see Figure 18, page 24), which must be so designed as to allow gases egress to the venturi upon firing—by means, for example, of base or side sealing discs which rupture under pressure. Figure 19, page 24, illustrates the German Panzerfaust, one of the outstanding developments in infantry recoilless weapons during World War II.

c.—*HEAT Projectiles.*—Modern infantry antitank weapons fire HEAT projectiles, which have extraordinary lethal effect against armored vehicles. The "shaped" or "hollow" charges used in HEAT projectiles (see Figure 14, page 43, for typical internal construction) do not themselves pierce armor but, upon detonation under suitable conditions, they produce a forward concentrated jet of high penetrative power. This results from the rush of explosive force and heat into the cone-shaped internal cavity, which is the essential feature of the charge and serves to focus the penetrative effect at the point of contact.

In contrast to projectile penetration, shaped-charge penetration usually makes a hole much smaller than the diameter of the projectile. Figure 13, page 23, illustrates the typical external appearance of a shaped-charge projectile for infantry antitank use—it looks much like a mortar shell with an elongated nose. This characteristic shape is dictated by various factors which affect the optimum performance of a shaped charge; but it may of course be varied to suit a particular type of weapon. An effective projectile of this type is not likely to be small, and this results in a weapon undesirably heavy for infantry use unless the recoilless principle is employed.

d.—*Infantry AT Weapons and Ammunition.*—The following details are required on infantry antitank weapons and their ammunition:

(1) Weapon—(a) General description—sketch or photograph, if available; (b) official nomenclature and troops' nickname, if any; manufacturer and location of plant; date of adoption and/or standardization; (c) dimensions and weight; (d) does the weapon exhibit any features associated with rocket launchers or recoilless guns? (e) If it has a barrel or tube, the caliber, length, barrel, thickness, type of bore, and description of breech end; (f) aiming—type, position, and graduations of sights; (g) has it a mount or wheeled carriage, or is it man-carried? How is it held for firing? (h) loading and firing—how are these operations carried out? Position and description of firing mechanism. (i) has the weapon any secondary role, other than antitank? (j) number and duties of crew.

(2) Projectile—(a) General description, illustrated if possible. (b) what are the dimensions and weight? (c) has it a cartridge case? Venturi? Fins? (d) does the round need to be prepared for firing? (e) is ignition by electric or percussion means?

(3) Performance—(a) Maximum accurate range; (b) armor penetration figures; (c) rate of fire.

Grenades

The main types of grenades are antipersonnel, antitank, and chemical. The most common methods of delivery are: (1) Throwing by hand; and (2) using a launcher. The following details in respect to any grenade are required:

a.—*General Description.*—Approximate dimensions, general external appearance (send a sketch or photograph if available); color and other markings; material and construction of the grenade; nature of loading.

b.—*Use, e. g., antipersonnel, antitank, or smoke.*—If antipersonnel, is the principal effect one of blast or of fragmentation—i. e., must the thrower take cover after throwing? If it is a thin-walled blast grenade, is it designed to be fitted with a steel jacket or sleeve to convert to a fragmentation type?

c.—*Weight.*—What are the weights complete and weight or volume of loading?

d.—Arming.—What action must be taken to arm the grenade—e. g., removal of the safety pin or pulling the igniter cord or wire? Does this action leave the grenade ready to explode after a given delay, or does it only become so after being thrown? If the grenade has been armed but not thrown, can it be re-set to "Safe?"

e.—Fuze.—Is it time or impact? If the former, give length of delay in seconds. Can the fuze be set for either time or impact action? Describe the fuze action and the components briefly. When fired from a rifle, at what distance from the muzzle does the grenade fuze become armed?

f.—Effectiveness.—Lethal radius, penetration of armor, or duration and area of smoke screen under average conditions.

g.—*Method of delivery.*

(1) Thrown by hand?

(2) Launched from a rifle?

(3) Can either method be used?

h. If thrown by hand: (1) Give maximum distance it can be thrown by an average man; (2) Has it any throwing aids, such as a handle (Figure 24, page 25) or stabilizing vanes of metal or cloth (Figure 25, page 25)?

i. If launched from a rifle: (1) Is the rifle modified in any way for the purpose—e. g., wire-winding to reinforce stock and handguard (Figure 28, page 25)?

(2) Method of discharge. Two conventional methods are used—a cut-type launcher (Figure 26, page 25), and a spigot-type launcher (Figure 27, page 25). In either case the launcher is fitted to the muzzle of a service rifle which is loaded with a bulletless or woodenbullet cartridge containing a special propellant. Give a brief description of the launching attachment and note how it is attached. Describe the propelling cartridge.[1]

(3) How is the grenade stabilized in flight? Does it have fins? Or does it spin? If it spins, what causes it to do so?

(4) Method of aiming. Is a special sight employed, e. g. (Figure 28, page 25)?

(5) Is anything attached to the grenade to assist its discharge, such as a gas check (Figure 30, page 25) or a tail rod for muzzle-loading (Figure 29, page 25)?

(6) What muzzle velocity is attained?

(7) How is the weapon held—e. g., against the firer's shoulder, under his arm, or with the butt of the weapon resting on the ground?

(8) What is the maximum range?

j.—Within what range limitations can it be effectively employed? Give maximum elevations for such effective ranges.

[1] Rocket propulsion may be used here.

MINES, BOOBY TRAPS AND DEMOLITIONS

(Prepared with the assistance of Engineer Research Division, Army Map Service)

The use of mines, booby traps, and demolitions[1] has long been an important feature of land warfare for safeguarding defensive positions, channelizing hostile attacks, and demoralizing and destroying enemy troops. They differ from other weapons—such as guns, tanks, mortars, and machine guns—in that they are deliberately placed at selected spots where they can injure the enemy and are activated either by the enemy himself or by some timing or remote-control device.

Most of the world's armies employ specially trained engineer troops for the tactical handling of these dangerous materials. With the increased use of armored and other vehicles in modern armies and with decreased reliance on elaborate, prepared positions, it is expected that in future operations these weapons will assume even greater importance.

Mines

A mine is a charge of explosive, usually encased, fitted with a detonating device or devices designed to be activated by vehicles, boats, or personnel.

a.—Types of Mines.—Mines are classified according to the purpose for which they are designed. The six basic types employed in land warfare are: (1) Antitank; (2) antipersonnel; (3) antiamphibious; (4) drifting contact; (5) improvised; and (6) dummy.

(1) *Antitank mines* (Figure 1) are designed to immobilize tracked or wheeled vehicles. They vary greatly in the amount of explosive they contain, the normal charge being from 4 to 22 pounds. The fuze is usually the pressure type, either percussion or chemical. Ordinarily a pressure of 200 pounds or more is necessary to detonate them.

(2) *Antipersonnel mines* (Figures 2 and 3) are used primarily to produce casualties among foot troops. The weight of explosive charges usually varies from one-fourth pound to four pounds. The force of initiating action normally required varies from 5 to 160 pounds.

(3) *Antiamphibious mines* (Figure 4) are used principally to hinder the landing of an enemy force by destroying landing craft and disabling landing vehicles. They are placed on the beach or in shallow water. They vary greatly in size and explosive content. The normal charge for this type of mine is from 20 to 70 pounds.

(4) *Drifting contact mines* (Figure 6) are employed to destroy enemy floating bridges and fixed bridge piers. They vary in size and explosive content, the normal charge being from 25 to 100 pounds.

(5) *Improvised mines* (Figure 5) are used when issue mines are unsuitable or unavailable for a particular mission. They may contain any of the standard explosives and can be set off by standard or improvised fuzes.

(6) *Dummy mines,* frequently used in place of real mines because they are cheaper and easier to install, can be made of any material. They may be used in dummy minefields or to supplement real mines in a live minefield. These mines often contribute materially to delay and confusion of the enemy when properly used.

b.—Mine Components.—The five main component parts of a mine are: (1) Fuze; (2) detonator; (3) booster charge; (4) main charge; and (5) case.

(1) The *fuze* is the device which initiates the explosive action, either instantaneously or after a set period of delay. The fuze is actuated by one or a combination of the following: pressure (Figure 7), pull (Figure 8), tension-release (Figure 9), or pressure-release (Figure 10), by personnel, boats, or vehicles. Fuzes are usually designed for use with a particular mine, for use under special conditions, or for special purposes (i. e., booby traps) (Figure 17).

[1] See Figures 1 through 37, pages 32 through 36.

The fuze is usually kept separate from the mine until the mine is to be used. There are four basic types of fuzes.

(*a*)—*Percussion.*—A striker fires a percussion cap. (Figures 11, 15, 16, and 17.)

(*b*)—*Friction.*—Friction ignites substances within the fuze. (Figures 12 and 18.)

(*c*)—*Chemical.*—Chemical action, usually accomplished by the breaking of a vial allowing a chemical to come in contact with another chemical or with air, results in flame or explosion (Figure 13).

(*d*).—*Electrical.*—The closing of an electric circuit fires an electric cap. The current may be provided either by a battery or by chemical reaction within the fuze (Figures 14 and 19).

(2) The *detonator* (Figures 20 and 21) is an explosive of such high sensitivity as to be easily set off by action of the fuze. The detonator's function is to set off the booster charge or the main charge of the mine. The detonator may be an integral part of the fuze, an integral part of the mine, or separate from both.

(3) The *booster charge*, not present in all mines, is an intermediate charge to insure detonation of the main charge. The booster explosive is less sensitive but more powerful than that of the detonator.

(4) The *main charge* is a relatively insensitive explosive set off by the booster or detonator. The main charge provides the striking power of the mine.

(5) The *case*, which may be made of almost any substance or combination of substances, is the container for the charges and provides wells for the fuze or fuzes.

c.—*Elements of Information.*—In collecting intelligence information, the following check-list regarding mines and fuzes will be helpful.

(1) Of what type is the mine? (Purpose and use for which designed.)

(2) What are the official nomenclature and popular name?

(3) What are the identifying marks and colors?

(4) What are the shape, dimensions, and weight of the assembled mine?

(5) What are the component parts of the mine? (Figures 1, 2, and 3.)

(6) What are the weight, material, and construction of the case? If an antipersonnel mine, what are the type, number, size, and total weight of pellets or fragments? Is the case equipped with carrying handles?

(7) What are the name, composition, and weight of the main charge? What substitute explosives, if any, are used?

(8) Is there a booster charge? Where is it located? What are the name, composition, and weight of the booster charge? (Figure 1.)

(9) What are the shape, size, material, and total weight of the detonator? What are the name, composition, and weight of the explosive in the detonator? Is the detonator an integral part of the mine, a part of the fuze, or separate? (Figures 20 and 21.)

(10) What fuzes are, or can be, used with the mine?

(a) How is the fuze actuated (by pressure, pull, tension-release, pressure-release, or combination thereof)? What force is required to activate the fuze?

(b) What type is the fuze (percussion, friction, chemical, electrical, or a combination of these)?

(c) Is the fuze instantaneous or delay? What is the time of delay?

(d) What are the official nomenclature and popular name?

(e) What are the identifying marks and colors?

(f) With what other mines can this fuze be used? Is it readily adaptable for other use, primarily for booby traps?

(g) What are the shape, dimensions, and weight of the assembled fuze?

(h) What are the name, construction, and material of the component parts (Figures 15, 16, 17, 18, and 19)? What is the sequence of operation? What are the safety devices?

(i) What are the steps in arming and disarming?

(j) What are the effects of moisture, temperature, shock, and passage of time on the operation and reuse of the fuze?

(k) How are the fuzes packed and transported?

(11) For the mine, what devices are used for transmitting the force required for detonation (spider, pressure board, extension rod, etc.)?

(12) What force is required for detonation?

(13) Are there provisions for booby trapping, such as bottom or side wells or hooks? Where are they located and what fuzes are used? (Figures 1 and 28.)

(14) How effective is the mine against vehicles, boats, structures, or personnel? What

is the effective bursting radius? At what height does a jumping-type mine (Figure 3) detonate?

(15) What steps, techniques, and precautions are necessary in installing, arming, neutralizing, and removing the mine?

(16) Can the mine be laid from the air?

(17) What are the effects of moisture, temperature, shock, and passage of time on the operation and reuse of the mine?

(18) How are the mines and their component parts packed and transported? Are the fuze, detonator, and mine packaged, or carried together or separately?

(19) What is the military issue classification? Is it standard, substitute standard, limited standard (obsolescent), or limited procurement (experimental)?

Booby Traps

A booby trap is a hidden charge so placed that it is detonated when an apparently harmless object is disturbed. Although often employed in minefields, booby traps are not classed as mines. The booby trap is used primarily to destroy the morale of enemy personnel and to inflict casualties. It may be encountered under almost any circumstances and in almost any form. (Figures 23, 24, 25, 28, and 29.)

a.—General Description.—Booby traps are usually improvised from materials at hand, their form and initiating action being limited only by the materials available and the ingenuity of the makers. A few manufactured booby traps were encountered during World War II, and their large-scale use in the future is possible. Such booby traps might take the form of cigarettes, flashlights (Figure 26), candy bars, billfolds, pipes (Figure 27), articles of clothing, or similar objects.

Any fuze can activate a booby trap. A number of small and very versatile fuzes were developed during World War II, especially for booby trapping work.

b.—Elements of Information.—In collecting intelligence information, the following check-list regarding booby traps will be helpful.

(1) For fuses and charges, use the elements of information check-list for the foregoing mines and demolitions. Type of initiating action, details of construction, and methods of installation should be emphasized.

(2) What training are troops receiving in the use of booby traps?

(3) What are the tactics and techniques for using booby traps?

Demolitions

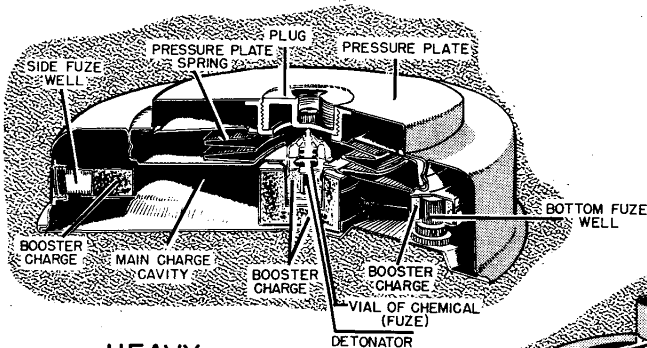
Explosive demolitions have always been used to destroy structures, but it was not until the German and Soviet retrograde movements in World War II that there was wholesale use of demolitions to destroy anything of potential use to an advancing army. Continuous research is striving to develop more dense and more powerful explosives, which greatly enhanced their power, and in the development of the shaped charge (Figure 31) which concentrates the explosive energy in one direction. The effect of the shaping was to give greater penetration than was otherwise possible and also to blast boreholes in steel, concrete, or similar materials. There is an increasing trend toward the use of plastic explosives for demolitions, owing primarily to the ease of molding the explosive to the surface of the element to be destroyed (Figure 32).

a.—Explosives.—An explosive is a substance (liquid, plastic, or solid) which, through chemical reaction, violently changes into a gas, creating pressure and heat. This rate of change into a gas is called "velocity of detonation" and is measured in feet per second. The velocity of detonation of TNT, for example, is 21,000 feet per second. Explosives are generally classified as high explosive or low explosive. There is no exact dividing line between the two classes. However, as a general guide, an explosive with a velocity of detonation of less than 15,000 feet per second is considered a low explosive.

To expedite and improve military demolitions, explosives have been cast into many shapes or placed in prefabricated containers (shaped or hollow charges, demolition snakes, Bangalore torpedoes, etc.) (Figures 31 and 33),

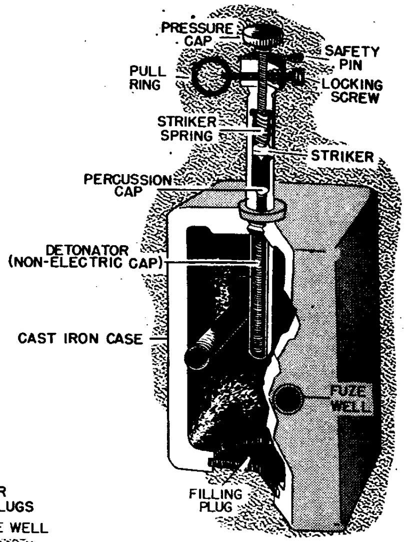
b.—Blasting Accessories.—To use the various explosives effectively and safely, numerous accessories have been devised. The more familiar blasting accessories are detonating cords, time or safety fuzes, fuze lighters, and blasting machines for detonating electrical caps. It is important that the distinction between detonating cord and safety fuze be carefully noted. The detonating cord explodes, whereas the safety fuze burns. Usually the two have distinctive outer color and texture for ready identification by sight or by feel (for night use). The accessories are usually assembled into sets for issue.

TYPICAL MINES



HEAVY ANTITANK MINE

(1)

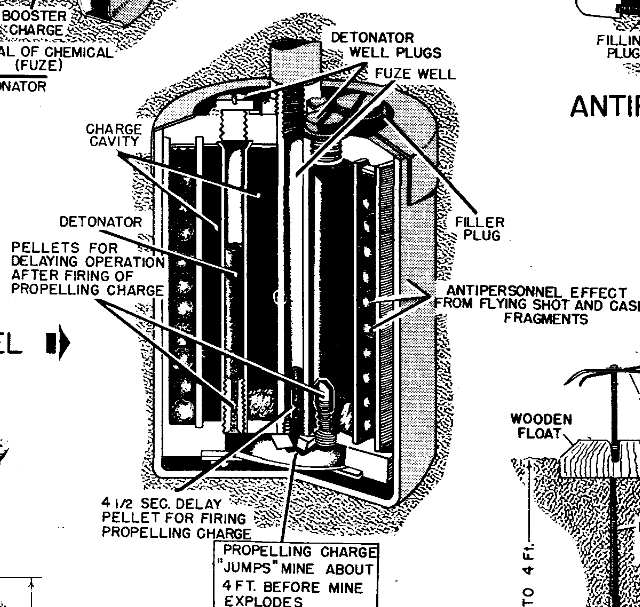


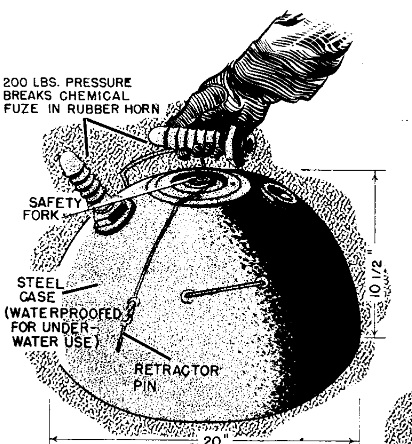
ANTIPERSONNEL MINE

(2)

(3)

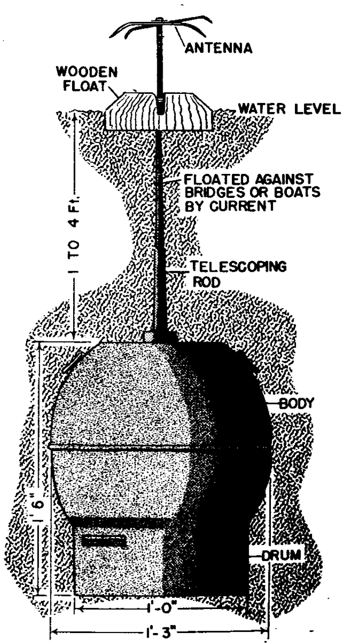
JUMPING ANTIPERSONNEL MINE





(4)

ANTIVEHICULAR & ANTIAMPHIBIOUS MINE

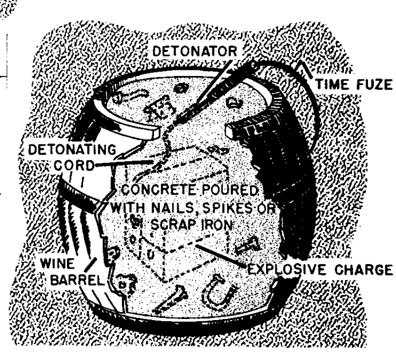


DRIFTING MINE

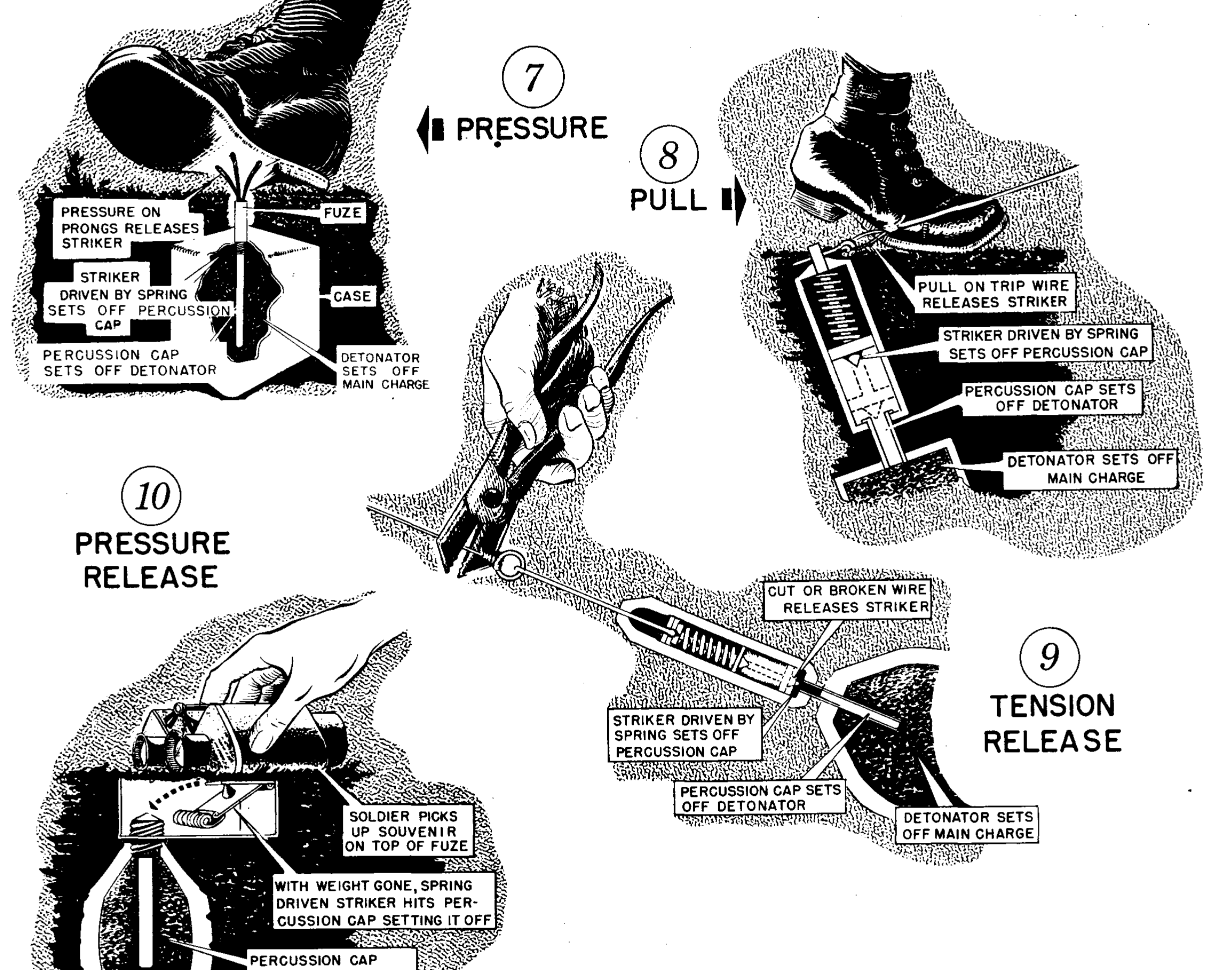
(6)

IMPROVISED MINE

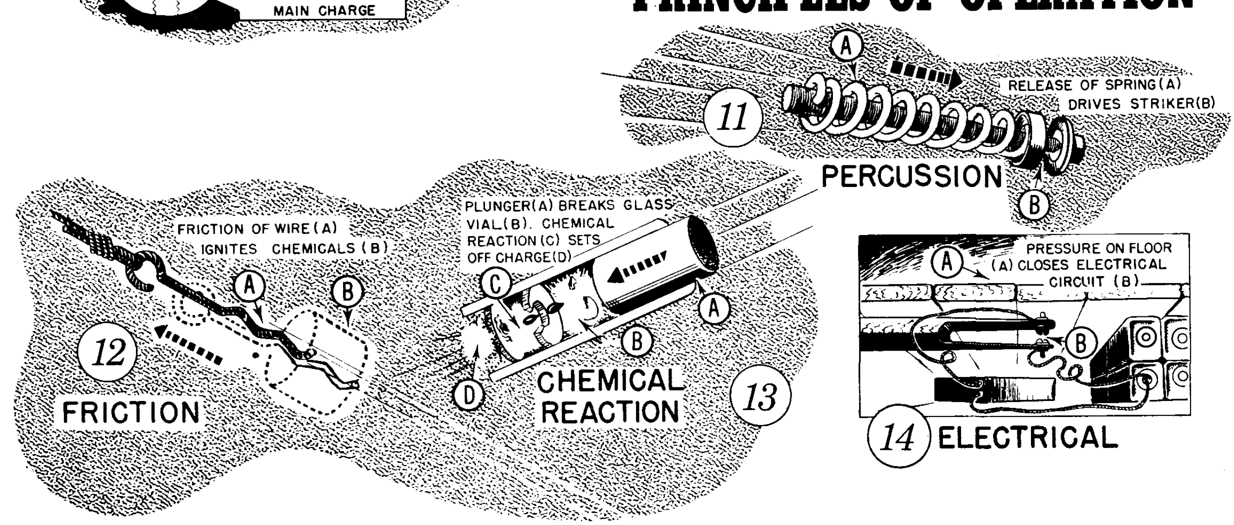
(5)



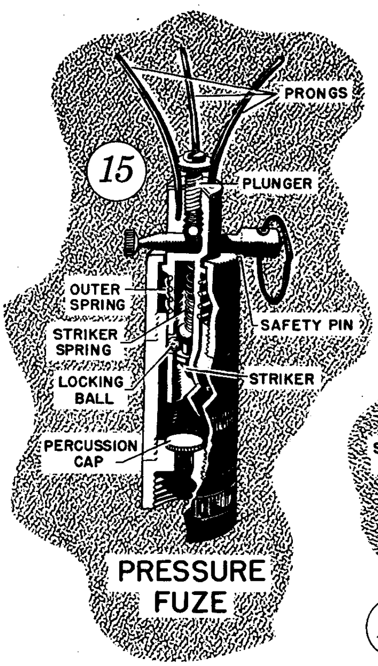
TYPES OF INITIATING ACTION

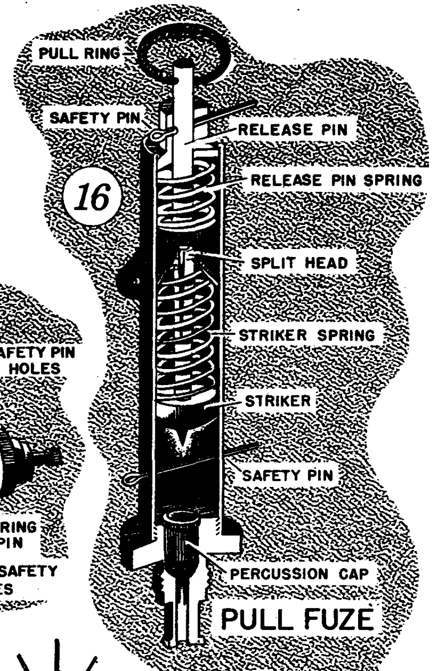


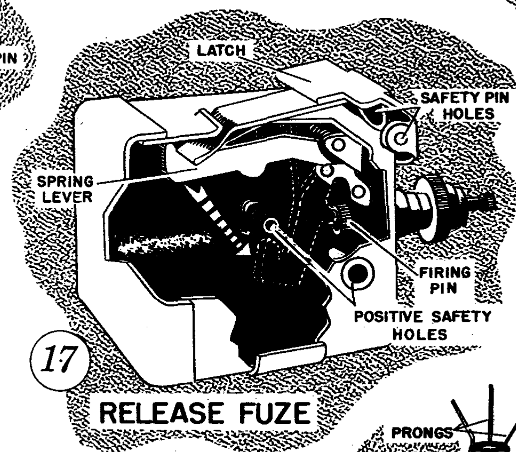
PRINCIPLES OF OPERATION

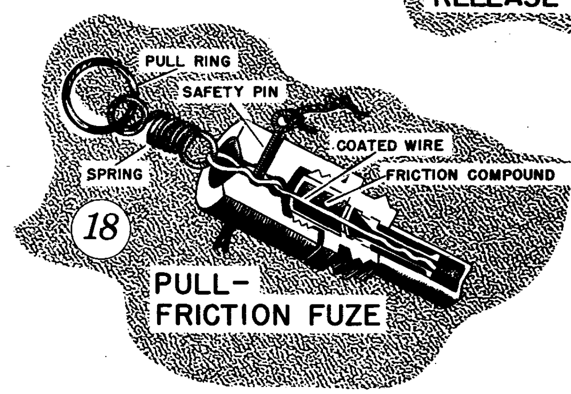


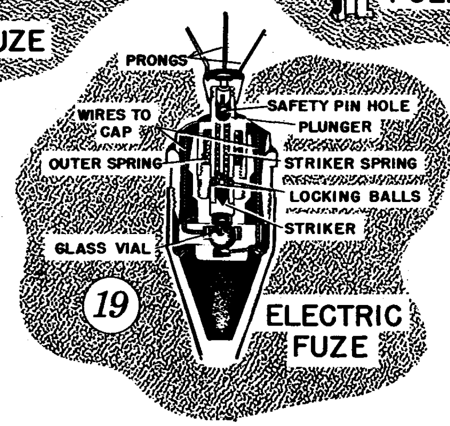
TYPICAL FUZES



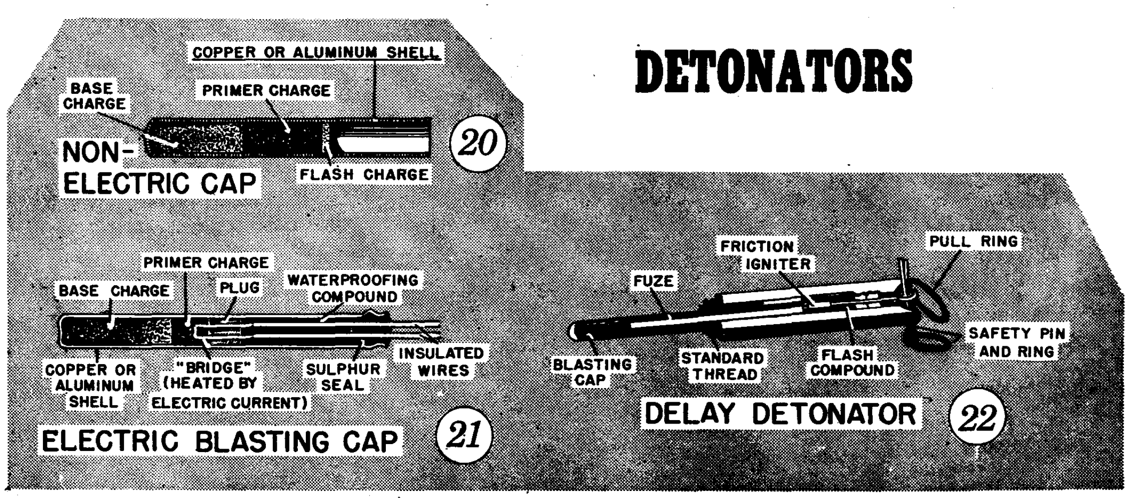




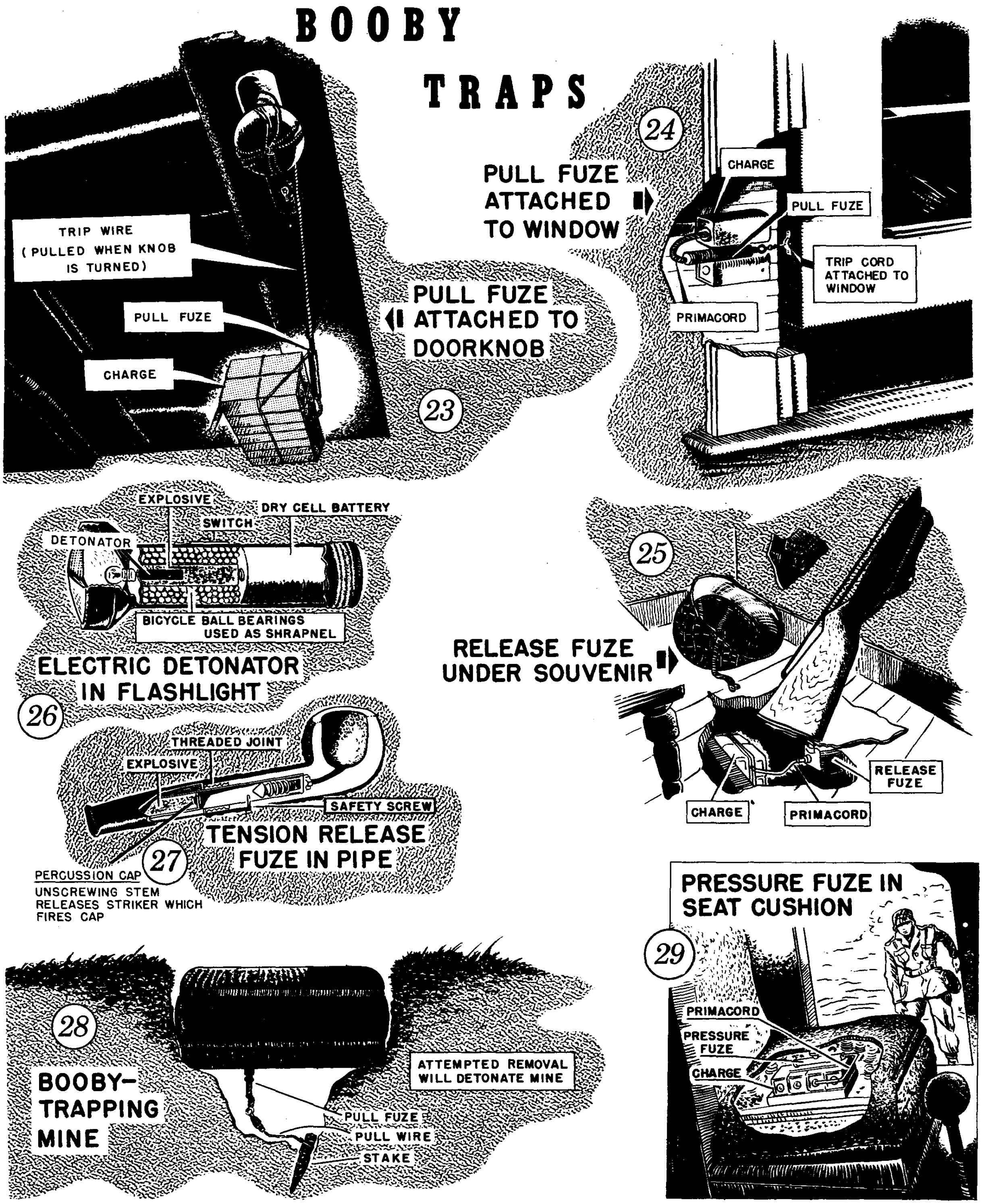




DETONATORS

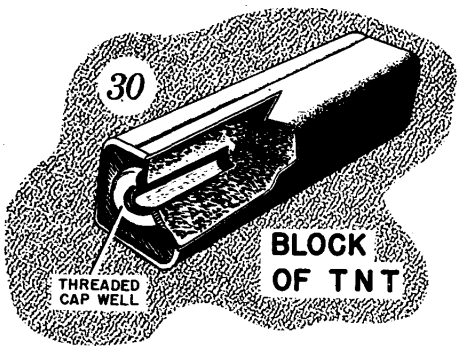


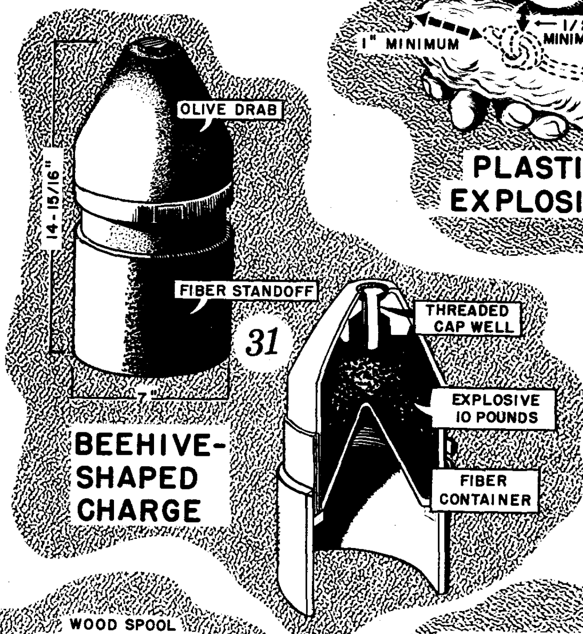
BOOBY TRAPS

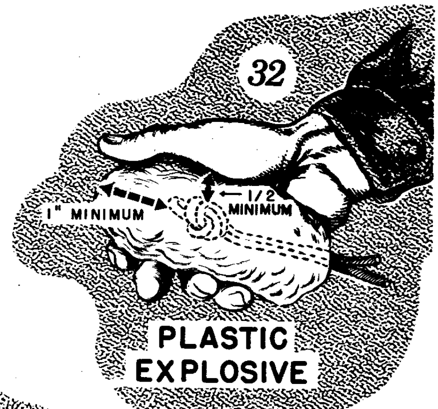


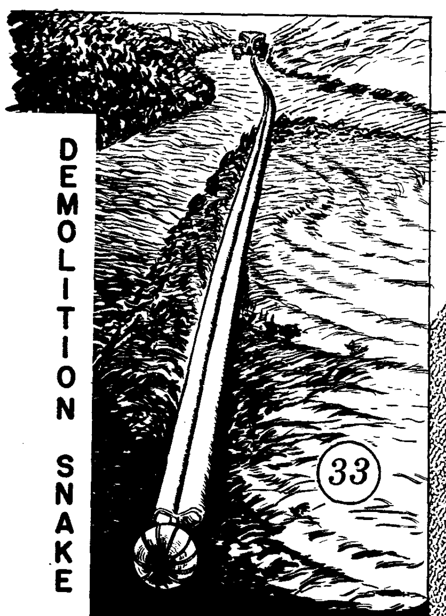
24
PULL FUZE ATTACHED TO WINDOW
CHARGE
PULL FUZE
TRIP CORD ATTACHED TO WINDOW
PRIMACORD
TRIP WIRE (PULLED WHEN KNOB IS TURNED)
PULL FUZE
CHARGE
PULL FUZE ATTACHED TO DOORKNOB
23
EXPLOSIVE
DRY CELL BATTERY
SWITCH
DETONATOR
BICYCLE BALL BEARINGS USED AS SHRAPNEL
ELECTRIC DETONATOR IN FLASHLIGHT
26
25
RELEASE FUZE UNDER SOUVENIR
RELEASE FUZE
CHARGE
PRIMACORD
THREADED JOINT
EXPLOSIVE
SAFETY SCREW
TENSION RELEASE FUZE IN PIPE
27
PERCUSSION CAP
UNSCREWING STEM RELEASES STRIKER WHICH FIRES CAP
PRESSURE FUZE IN SEAT CUSHION
29
PRIMACORD
PRESSURE FUZE
CHARGE
28
BOOBY-TRAPPING MINE
ATTEMPTED REMOVAL WILL DETONATE MINE
PULL FUZE
PULL WIRE
STAKE

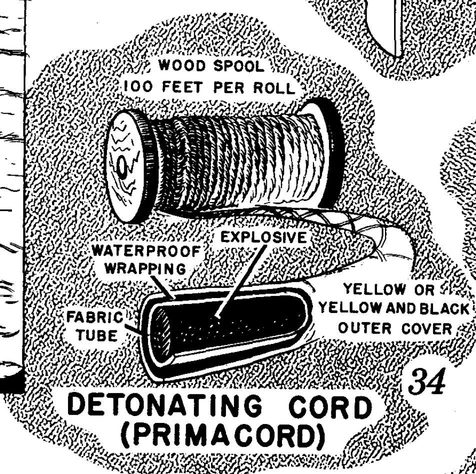
DEMOLITIONS

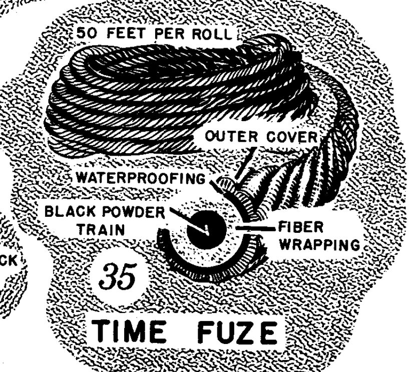


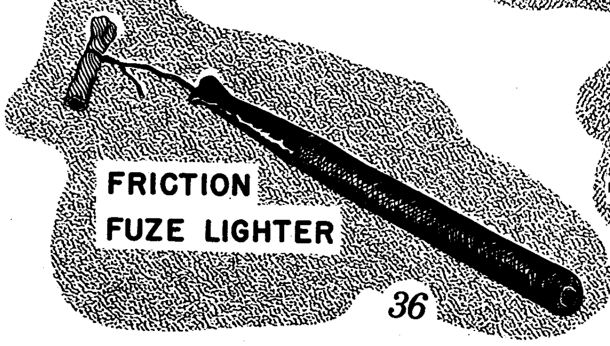


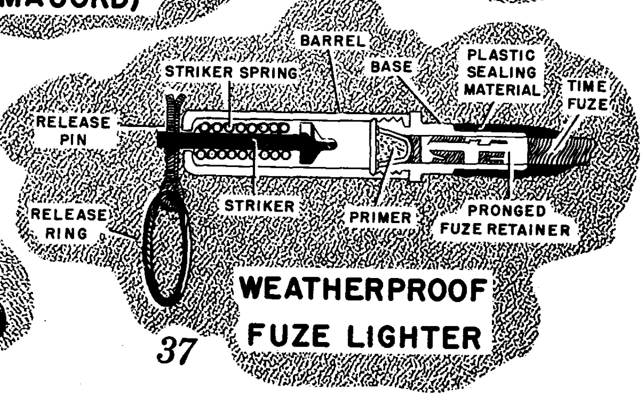












to troops having responsibility for demolition work.

c.—Elements of Information.—In collecting intelligence information, the following check-list regarding demolitions (explosives and accessories) will be of value.

(*1*) *Explosives*

(a) What are the official nomenclature and trade name, or other name, by which the explosive is known?

(b) What is the classification (high or low)? What is the velocity of detonation (number of feet per second)?

(c) What are its principal uses?

(d) What is the chemical composition of the explosive?

(e) What are the nature (liquid, plastic, crystalline, or cast), density, and color of the explosive?

(f) What are the weight, shape, dimensions, color, and markings of the packaged unit? Does it have threaded or unthreaded wells for insertion of blasting caps? What are the dimensions of the wells? (Figure 30.)

(g) What type of blasting cap is used?

(h) What is the stability under varying conditions of temperature, moisture, and time?

(i) What is the relative sensitivity to shock and friction?

(j) How is it packaged for shipment? What special handling is required?

(*2*) *Prepared Demolition Charges* (Figures 31 and 33).

(a) What is the official nomenclature?

(b) For what special or general purpose has the charge been designed?

(c) What are the name, weight, and chemical composition of the explosive used?

(d) What are the shape, size, weight, color, and markings of the container, and of what material is it constructed?

(e) What type of fuze well is provided? Is it threaded or unthreaded?

(f) What type of fuze is used for detonation?

(g) What are the techniques of application of the prepared charge?

(h) How effective is the charge as applied to the demolition of specific objects?

(i) How is it packed and transported?

(3) *Blasting Accessories*

(*a*)—*Blasting Caps and Detonators.*—Electric or non-electric (Figures 20 and 21)? Instantaneous or delay (Figure 22)? What is the time of delay? What explosive does it contain? What explosive can it be used with? What type of cap crimper is provided for crimping non-electric caps?

(*b*)—*Adapters.*—What type of priming adapters are used to simplify the priming of packaged explosives having threaded cap wells?

(*c*)—*Detonating Cords.*—What is the official designation? What explosive is used in the core? What are the material, color, and texture of the covering? What is the velocity? What is the length of the normal unit of issue? What is the stability under varying conditions? (Figure 34.)

(*d*)—*Detonating cord clips.*—What methods or devices are used for attaching two strands of detonating cord together?

(*e*)—*Time or safety fuzes.*—What is the official designation? At what rate per foot does it burn? What powder is used in the core? What are the material, color, and texture of the covering? What is the length of the issue unit? What is the stability under varying conditions? (Figure 35.)

(*f*)—*Cap sealing compounds.*—What types of compounds are used to moisture-proof the connection between a non-electric cap and a time fuze?

(*g*)—*Fuze lighters.*—What types of fuze lighters are used to facilitate the lighting of the time fuze? What is their dependability under all weather conditions? What are the component parts of the lighter? (Figures 36 and 37.)

(*h*)—*Firing reels and wire.*—What are the dimensions, material, and weight of the reel used for dispensing the firing wire? What length of wire is furnished, and what is its thickness?

(*i*)—*Galvanometers.*—What are the size and weight? What is the maximum length of circuit that can be tested?

(*j*)—*Blasting machine or exploder.*—What is the official nomenclature? What are the size and weight? What number and type of caps over various lengths of circuit will it fire?

(*k*)—*Kits.*—Are demolition materials issued in kits? If so, what are the component parts of the kit? What are the shape, dimensions, weight (complete), color, and markings of the case?

AMMUNITION

Intelligence on foreign ammunition is valuable for both tactical and technical reasons. The battlefield commander who knows what ammunition, and consequently what artillery, is being used against him is at an obvious advantage. To develop the most effective United States weapons, the designers must have details on the effect of other nations' ammunition on personnel and its performance against armor.

For the field commander, knowledge that guns opposing him are issued with anti-concrete rounds will help him decide whether the protection afforded by the adjacent bunker is adequate or not. Possession of proximity fuzes by the enemy will render the occupation of slit trenches rather hazardous. Employment of tungsten, carbide-cored, high-velocity ammunition will increase materially the penetration performance of an antitank gun, while even the low-muzzle-velocity howitzer, with shaped-charge or other special ammunition, is capable of defeating the most heavily armored tank. The enemy is less capable of inflicting an unpleasant surprise if one knows in advance that he may use canister, illuminating, shrapnel, smoke, or chemical rounds. Another field aspect is that of ammunition fragment identification, a most valuable pointer for counterbattery work.

Among the most useful ammunition intelligence is that concerning interchangeability. This means knowing which enemy ammunition can be fired from Allied guns and which Allied ammunition can be fired from enemy weapons. During World War II the scope of this interchangeability was suprisingly great. It is particularly useful when airborne and irregular forces are employed and supply lines are precarious.

Although it cannot be recommended except in emergency, the use of enemy ammunition during World War II on many occasions saved the day. A considerable quantity of enemy mortar ammunition was used by the 101st and 82d U. S. Airborne Divisions in their various operations. In the autumn of 1944 an acute ammunition shortage existed on many fronts in the European Theater. During one two-week period, 85 percent of the ammunition expenditure of the U. S. XX Corps came from captured stocks. When this is expressed in tonnage and shipping requirements, its importance is obvious.

Ammunition (excluding rockets) falls into three main categories:[1] (1) Small Arms; (2) mortar; and (3) artillery.

Small-arms ammunition consists of four major component parts: the bullet, the cartridge case, the propellant charge, and the primer. These are shown in Figure 1.

Bullets, which are of numerous types and combinations and may or may not include a tracer element, are usually fixed to the cartridge case by one of five common methods. Bullet attachment methods and five common types of bullets are shown in Figure 2.

Cartridge cases may be of brass, steel, or light alloy, and the cartridge case usually has one of the shapes shown in Figure 3. The walls may be either tapered, parallel, or necked, as shown in Figure 4.

Propellants are usually formed with one of eight common shapes, as shown in Figure 5.

Primers are generally one of two classes: rim-fire or center-fire. Center-fire primers are divided into two types: (1) The "Boxer" type whose anvil is a component of the primer assembly; and (2) the "Berdan" type whose anvil is an integral part of the cartridge case. Examples of these are shown in Figure 6.

Following is a check list of the main details required on small-arms ammunition.

1.—Complete round (see Figure 1.)

a.—What is the nomenclature of the complete round, and from what weapon or weapons is it fired? What is its basis of issue? What mission is it designed to perform?

b.—What is its over-all length?

c.—What is its weight?

d.—What are the method and type of joint waterproofing employed?

[1] See Figures 1 through 15, pages 41 through 42.

e.—What is the muzzle velocity of the round and, if it is armor-piercing, what is its performance?

f.—What markings are present, and what do they signify?

2.—Bullet (see Figure 2.)

a.—What type is the bullet, and what is its weight?

b.—What are the component parts of the bullet?

c.—What is its over-all length, and what is the bullet length protruding from the cartridge case?

3.—Cartridge Case (see Figures 3 and 4.)

a.—Of what type is the case, and of what material is it constructed?

b.—What are its dimensions: length, neck diameter, and base diameter?

c.—What method is used to fix the bullet to the case (see Figure 2)?

d.—What are the markings and their meanings?

4.—Propellant Charge (see Figure 5).

a.—What are the weight and type of propellant?

b.—What is its chemical composition?

5.—Primer (see Figure 6).

a.—What type of primer is used and what is the method of fixing it to the cartridge case?

b.—What is the chemical composition of the primer material?

6.—Packing

a.—What are the size and composition of the container?

b.—What are the container markings, and what do they mean? (Do labels or stencil markings restrict the use of the ammunition in any way? Is a class or grade indicated by the markings?)

c.—What are the weights of empty and full container?

d.—What are the total contents of the container and the method of packing (applicable to small-arms rounds, which are usually in belts, cartons, magazines, clips, or bandoliers)? What is the manufacturing firm, and where is the plant located?

Mortar Ammunition

Mortar ammunition usually consists of three major component parts, as shown in Figure 7. These are: (1) The fuze; (2) the body and tail fin assembly; and (3) the propellant charge. The propellant charge consists of the ignition cartridge and possibly one or more increment charges.

The ignition cartridge (see Figure 7) is inserted into the tail of the shell, which is loaded into the mortar, tail first, from the muzzle. The striker at the base of the mortar tube meets the primer in the base of the ignition cartridge. Flash from the ignition cartridge passes through holes in the tail to ignite the increment charges, which are attached to the tail fins to give additional range.

The placing of a special small charge at the head of a shell, so that on impact it is thrown up into the air and there explodes, is a device which has often been tried—though with unsatisfactory results—with the object of obtaining an airburst. The use of proximity fuzes to obtain the same result is a possibility for the future.

Following is a check list of the main details required on mortar ammunition.

1.—Fuze

Some foreign mortar fuzes are interchangeable with those used for artillery ammunition, and all are at least similar to certain artillery fuzes. Details required on mortar fuzes are, therefore, covered in the discussion of artillery fuzes below.

2.—Shell Body (see Figure 7.)

The body may be streamlined or cylindrical in shape and has an important tolerance known as "windage", i. e. the clearance between the shell and the mortar tube.

a.—What is the nomenclature (including caliber) of the round and what is its type (high-explosive, smoke, illuminating, etc.)? What is its basis of issue? What mission is it designed to perform?

b.—From what weapon or weapons is the shell fired? Are they smooth bored or rifled?

c.—What is the length of the round with and without fuze?

d.—What is the length of the fins, and how many are there?

e.—What is the weight of the shell fuzed, and what is the weight of the filling?

f.—What is the type of filling?

g.—What are the markings or colorings (stamped or stenciled), and what do they signify?

h.—What are the packing arrangements? (See discussion of packing under small arms above.)

i.—What is the manufacturing firm, and what is the plant location?

3.—Propellant Charge (see Figure 7)

This usually consists of an ignition cartridge and increment charges. The range may be varied by increasing or decreasing the number of increment charges. These charges are usually one of two shapes: cylindrical or in the form of a ring.

a.—What type of ignition cartridge is used, and what is the weight of its charge?

b.—What types of increment charges are used, and what is the maximum number that can be used?

c.—What type of propellant is used in both ignition cartridge and increments, and what is its shape?

d.—What are the weight and shape of the increments?

e.—What is the method of assembly of the increments for various charges?

f.—What are the markings, and what do they mean?

Artillery Ammunition

Artillery ammunition usually consists of five major component parts: (1) The fuze; (2) the projectile; (3) the cartridge case; (4) the propellant charge; and (5) the primer. A typical complete round is shown in Figure 8. These components are assembled into three basic types of ammunition: fixed, semi-fixed, and separate-loading. (Drawings of these will be found in Figure 9.)

Following are descriptions and check lists of the main details required on artillery ammunition:

1. Fuze (see Figures 10 and 15).

Fuzes are devices used with projectiles to cause them to explode at the time and under the circumstances desired. They generally contain some of the most sensitive explosives. *Unauthorized personnel should never attempt to disassemble these devices and investigate their internal mechanism, as such action is extremely hazardous.* However, a considerable amount of technical data may be obtained from an analysis of visible fuze characteristics.

Artillery fuzes are of two basic types, according to their position on the projectile: point and base. They may also be classified according to their system of operation as: (1) Impact; (2) time; or (3) proximity.

Impact fuzes are set off by impact against a target, either with or without a time delay. Time fuzes function after a predetermined time of flight. Combinations of these types include: superquick and delay, time and superquick (powder-train time with a superquick or point detonating element in the nose), and mechanical time and superquick.

Base fuzes are normally of the impact type and may function as delay or nondelay.

Proximity fuzes are designed to operate either automatically on reaching proximity to a target, or as a result of influence from an external source. They are actuated by radio, radar, electrostatic, acoustic, photoelectric, infrared, or other methods. No fuze setting is required. Proximity fuzes are very similar to other types in external appearance.

Fuzes normally incorporate safety devices to prevent their premature operation during handling, firing, or early stages of flight. They are armed (i. e., the safety device is released) by various methods during flight, such as centrifugal force resulting from the spinning of the projectile or "set-back" of fuze components as a result of changes in speed of flight.

Following is a check list of the information required on fuzes. It is again emphasized that unqualified personnel should never attempt to investigate the working mechanism of any fuze; data should be obtained by other means.

a.—What are the nomenclature and markings (stamped or stenciled) on the exterior of the fuze, and what do they signify?

b.—What are the type and position (mechanical, time, impact, etc., and point or base location)?

c.—What are the external safety devices (cap or pull ring, safety wire, etc.)?

d.—What is the over-all length and shape?

e.—What is the exposed length?

f.—What are the depth and diameter of fuze intrusion into the projectile?

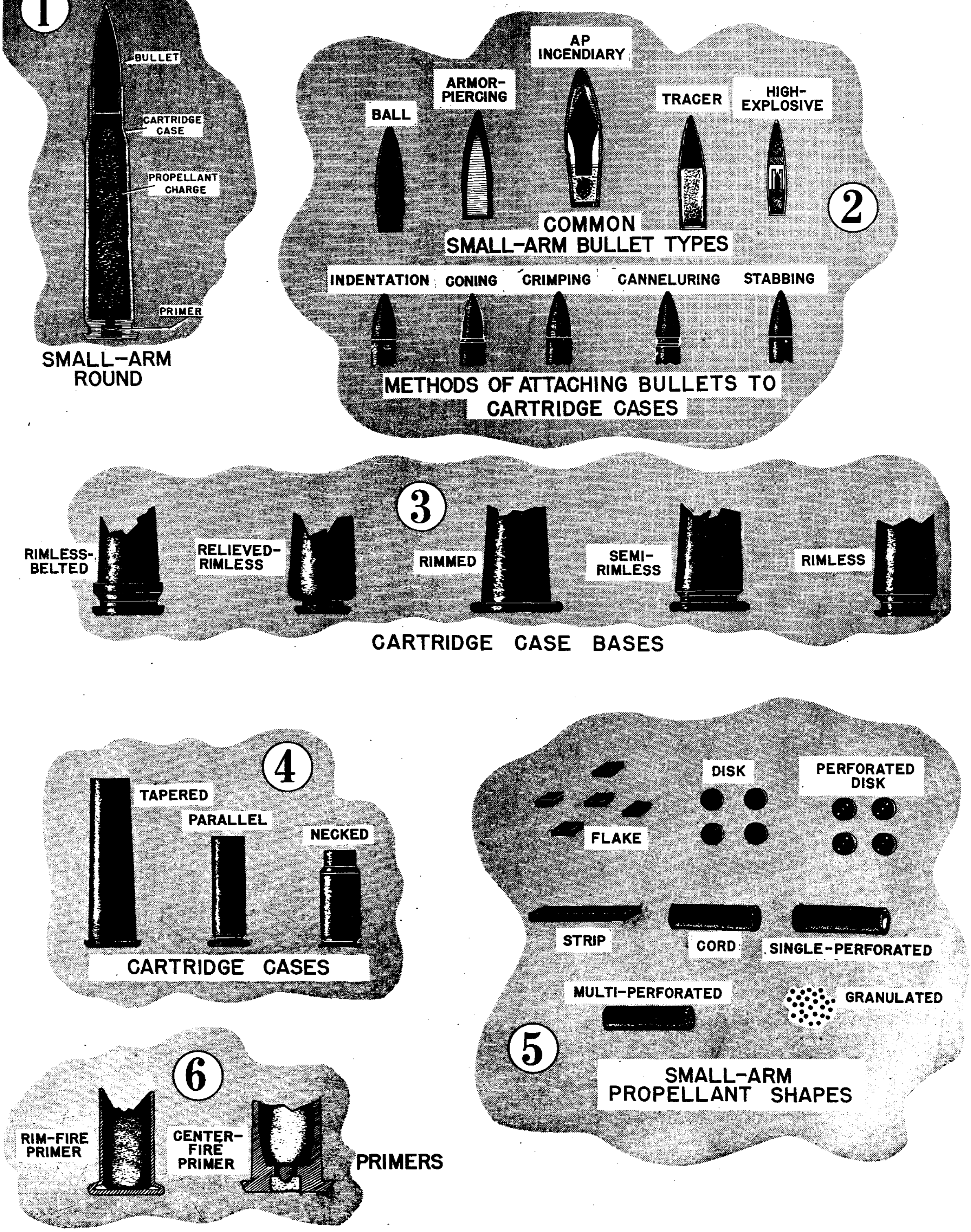
g.—What is the weight of the fuze?

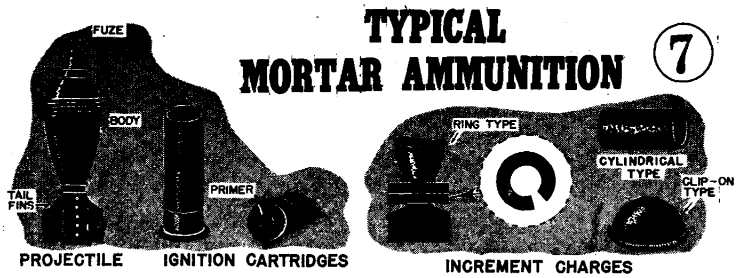
h.—What is the body material: steel, aluminum, magnesium, plastic, etc.?

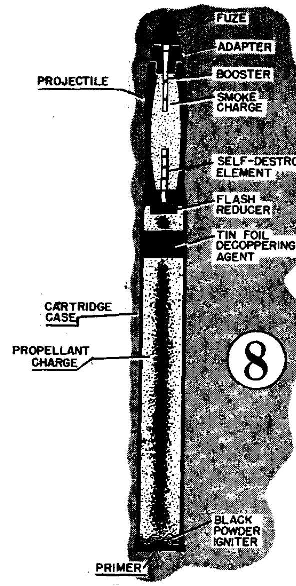
i.—Provide, if possible, sketches and photos (preferably cross-sectional), with dimensions and pertinent information including diameter, pitch, and contour of threads.

j.—In combination types of fuzes, is there a device for selecting which type of functioning is

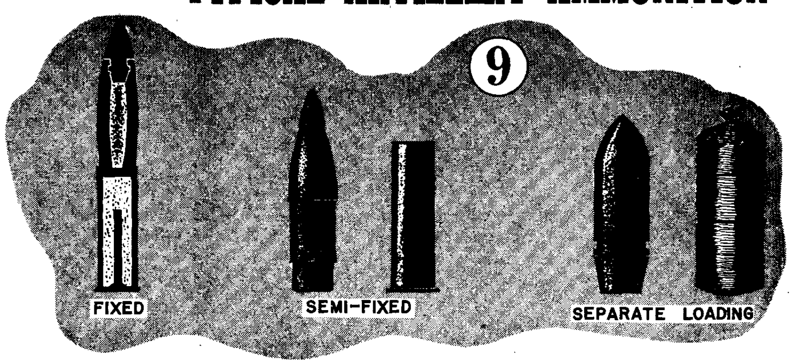
TYPICAL SMALL-ARMS AMMUNITION



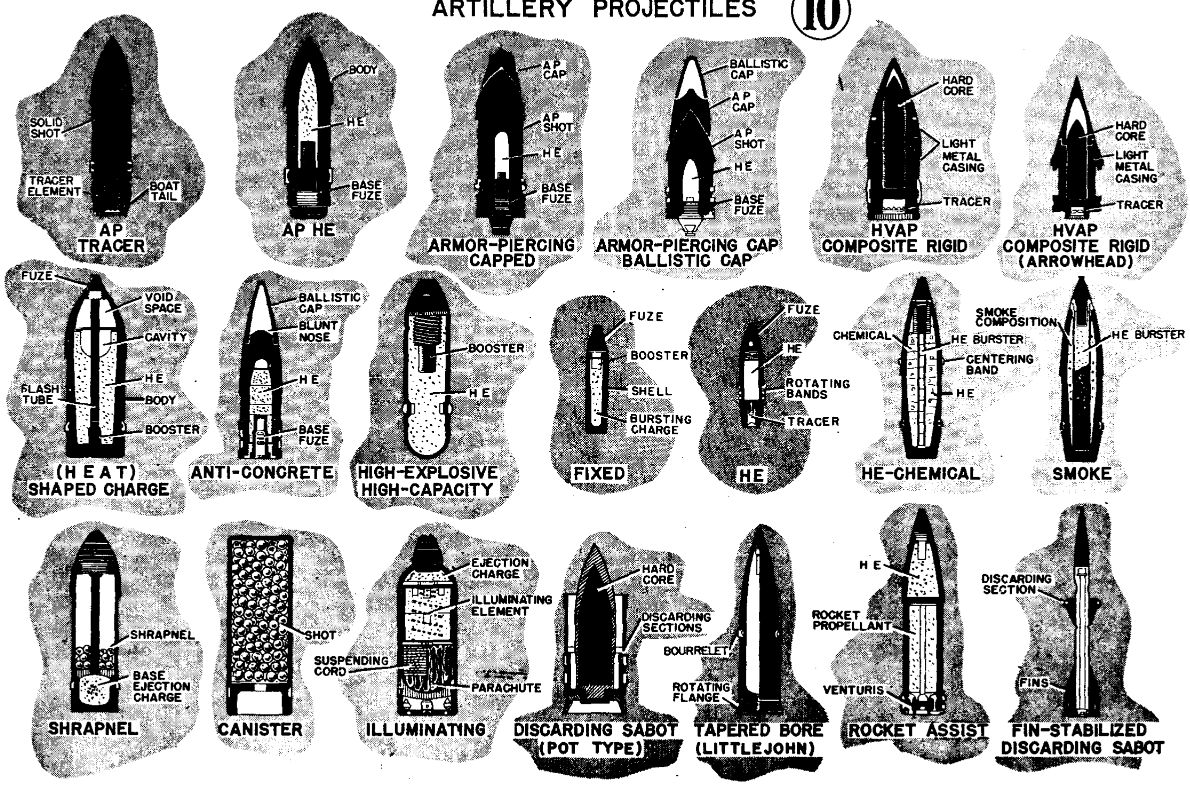




TYPICAL ARTILLERY AMMUNITION



ARTILLERY PROJECTILES (10)



TYPICAL ARTILLERY AMMUNITION
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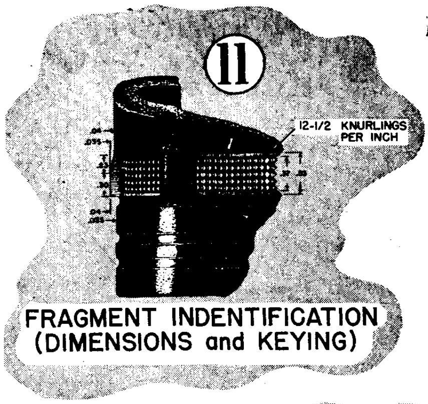
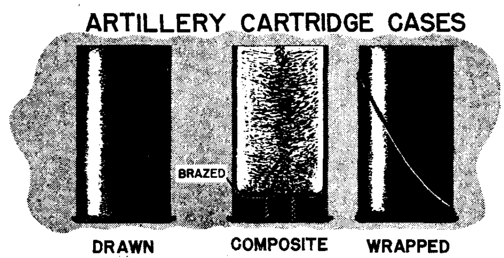
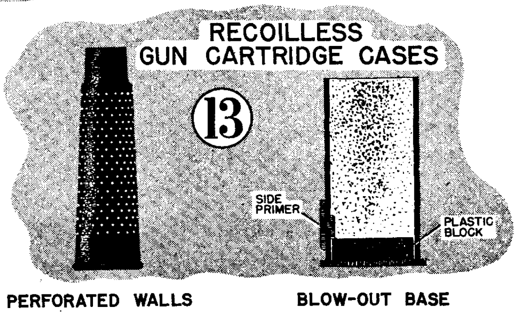
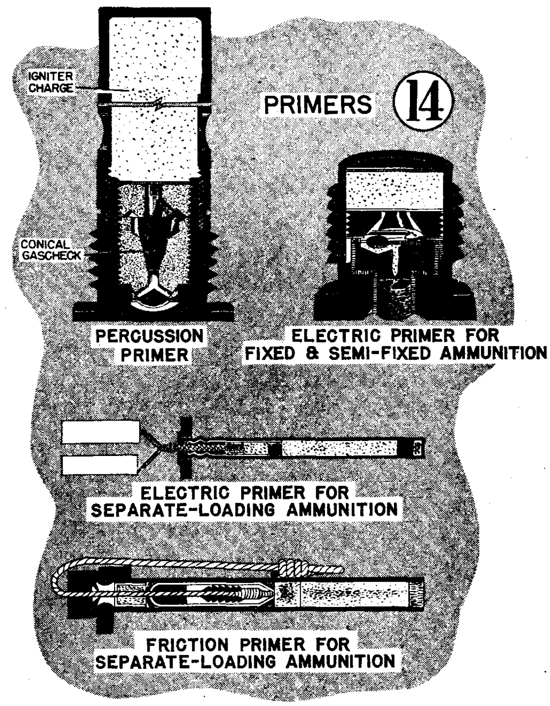
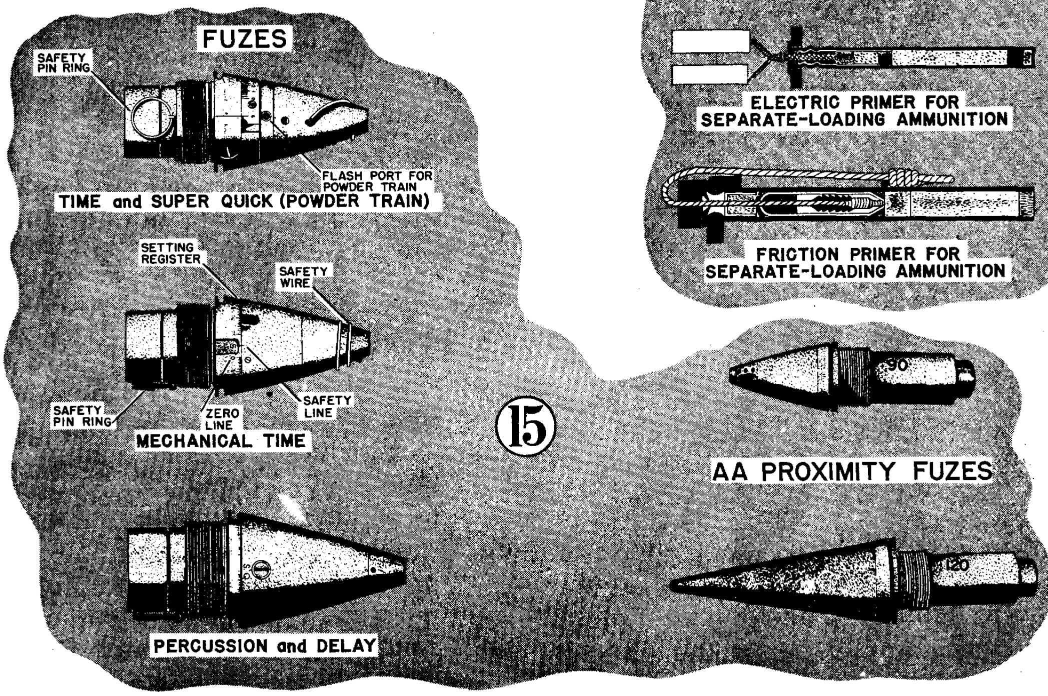










to be obtained, and can such a device be changed to another setting at the gun?

k.—In time fuzes, what is the number of time rings (if a powder-train fuze), and what are the maximum and minimum functioning times? Is the fuze set by means of hand setter or weapon setter? What are the graduation units on the time ring?

l.—What are the details of arming and safety devices in terms of revolutions per minute or forces to actuate on set-back?

m.—What are the details of operation or setting before and during firing?

n.—Are detonator and sensitive explosive train interrupted by use of out-of-line elements until the fuze emerges from the weapon? Does the fuze incorporate a "delay-arming" device, i. e., provided with additional safety devices to prevent functioning on striking obstructions within a given distance of the gun? If so, to what distance, and what types of safety devices are employed? Does the fuze incorporate a "bore-safe" device, i. e., an additional safety device to prevent the fuze functioning within the bore of the weapon? If so, how does the device accomplish this end?

o.—Will the fuze function on graze or ricochet impact when its nose does not strike the target? How is this effect obtained?

p.—What is the method of fixing the fuze to the shell?

q.—What is the composition of all explosive charges?

r.—What are the method and type of waterproofing?

s.—With which projectiles is the fuze used?

t.—Against what types of targets is the fuze used?

What is its sensitivity in terms of thinnest target, such as aluminum sheet, that will actuate it at various ranges? What is the ruggedness in terms of thickest targets on which the fuze will function properly? What is the maximum obliquity at which the fuze will function?

u.—What are the details of delayed arming, and what is the range at which the fuze is armed by this device?

v.—What self-destruction devices are employed, and how do they operate (retardation of spin, tracer action, etc.)?

w.—What is the muzzle velocity or the range at which the fuze is armed?

2.—*Projectile* (see Figure 10.)

Projectiles may be either fin-stabilized or spin-stabilized. In the former case, they make use of tail fins and either do not rotate or rotate comparatively slowly, while those of the latter type have spin imparted to them during their passage through the bore of the gun by means of the gun rifling and a rotating band on the shell, or by pre-engraved splines on the shell. The types of projectiles in common use are shown in Figure 10. A drawing, showing a rotating band and also giving examples of the minute dimensions required for projectile identification, is shown in Figure 11. Shapes and positions of other types of rotating bands will be found in Figure 10.

a.—What is the nomenclature of the projectile, and from what gun or guns is it fired?

b.—What type of projectile is it (HE, AP, smoke, etc.)? Describe fully and include cross-sectional drawings. What is the maximum muzzle velocity? What is its basis of issue?

c.—What is the weight of the projectile (fuzed, unfuzed, filled, or empty)?

d.—What is its length (fuzed or unfuzed)? What are the angle and length of the boat tail (tapered rear portion)?

e.—Of what material or combination of materials is the projectile constructed, and what method is used for fixing any ballistic caps to it?

f.—What is the radius of ogive (curve of nose portion)?

g.—Give details of any fuze adapters and plugs used? Is a fuze cavity liner used? If so, give material and thickness of liner.

h.—What is the fuze diameter?

i.—In the case of AP projectiles, give the hardness pattern of the projectile and cap. What is the method of attachment of cap to projectile?

j.—What are the number, width, and material of the rotating and centering bands, and what is the distance from the projectile base to the lower edge of the rotating band (or bands, if more than one)?

k.—What is the number of grooves in the rotating band and what are the minute dimensions of the keying of rotating and centering bands. What are the width and material of the centering band?

l.—What is the weight of the projectile filling? If HE, what type of explosive is it?

m.—Give details of the explosive train, including booster composition and weight. Is there a smoke charge in the booster? If so, give composition, weight, and color of smoke produced.

n.—What are the weight, composition, and duration of burning of the tracer? What color is the trace? Does it have bright or dark ignition, i. e., does the tracer "light up" at the muzzle or after a short delay? How long is the delay?

o.—What are the markings and colors, and what are their meanings?

3.—Cartridge Case (see Figure 12.)

Cartridge cases may be constructed of brass, steel, plated steel, light alloys, plastics, etc., by one of three methods: drawn, wrapped, or composite. Examples of cartridge cases for conventional guns are shown in Figure 12.

Recoilless gun cartridge cases are constructed in such a manner as to allow a portion of the propellant gases to escape through the venturi or nozzle to the rear of the gun. Two common designs of this type of cartridge case are shown in Figure 13.

Information required on cartridge cases includes the following:

a.—What is the nomenclature, and with what weapons is the cartridge case used? What purpose is it designed to perform? What is its basis of issue?

b.—What are its length, volume, base diameter, neck length, neck diameter, rim diameter, and weight empty?

c.—Of what material is the case constructed, and what is the method of fixing the case to the projectile? What type of primer is used, and how is it assembled in the cartridge case (press fit or threaded)?

d.—What markings (and colors) are used, and what are their meanings?

4.—Propellant Charge

Propellant charges may be loaded loose into the cartridge case, contained in bags within the cartridge case, or loaded in bags for use with separate-loading ammunition. The propellant may be any one of the shapes described under small-arms ammunition propellant (see Figure 5). Some semi-fixed ammunition propellant charges are composed of varying types and sizes of increments which, when combined in specified ways, give varying ranges and muzzle velocities.

a.—What is the propellant nomenclature, and of what type is it (gunpowder, nitro-cellulose, cordite, etc.)? What is the official nomenclature of the charge, and with what weapon or weapons is it used?

b.—Is the propellant flashless and/or smokeless?

c.—What are the total weight, shape, size, and color?

d.—What are the numbers of specified charges and increments?

e.—What is the method of assembling increments to form charges, and what is the weight of each increment? What are the weights of the various resulting charges?

f.—What decoppering agent is used (if any)? What are its composition, weight, and location?

g.—What is the charge bag material (cotton, silk, etc.)?

h.—What is the composition of the flash reducer, and what are its weight and location?

i.—What is the igniter composition, what are its location and weight?

j.—What are the markings on the charge bags, and what are their meanings?

5.—*Primers* (see Figure 14.)

The propellant charge is ignited by a primer, which may be one of three types: percussion, electric, or friction. Drawings of several variations of these types are shown in Figure 14. Primers are located in the base of the cartridge cases used in fixed and semi-fixed ammunition, whereas those used with separate-loading ammunition are inserted into the breech mechanism of the weapon. Primers used with fixed and semi-fixed ammunition may be assembled with long perforated tubular igniters which project into the propellant charge to improve its ignition.

a.—What is the nomenclature of the primer, and what type is it? With what weapons and ammunition is it used?

b.—What are its base diameter, over-all length, weight, and body composition (brass, steel, etc.)?

c.—What is the method of fixing to the cartridge case or firing mechanism (press fit or threaded)?

d. What are the markings and their meaning?

e.—What are the amount and composition of the priming compound and igniter compound (if any)?

f.—For electric primers, give the firing voltage, energy required, and type of firing circuit used (batteries, condenser, magneto, etc.).

6.—Miscellaneous

a.—What are the length and weight of the assembled complete round?

b.—What are the method and type of joint waterproofing?

c.—What is the manufacturing firm, and where is the plant located?

7.—Packing

In addition to the data on packing listed in the foregoing discussion of small arms, the following details are required:

a.—Type of components carried (fuzes, projectiles, etc.).

b.—Number of components.

c.—Is the complete round shipped assembled with fuze or with nose plug? If nose plug is used, describe method of sealing fuze cavity.

ARTILLERY ROCKETS AND ROCKET LAUNCHERS

(UNCLASSIFIED)

This chapter is confined to rocket launchers of the field artillery type. These weapons, usually multibarrelled, are often used in place of artillery when it is desired to saturate an area with high explosive or other projectiles. Frequently these weapons are dual-purpose, being capable of launching antiaircraft barrage fire as well as fulfilling ground-to-ground roles. The many advantages of light, mobile equipment capable of projecting a heavyweight shell at a high rate of fire ensures a place for the rocket-launcher in any modern army.

The artillery rocket is not normally controlled in flight. The use of homing devices, with or without proximity fuzes, would, however, in certain circumstances, greatly improve the weapons' efficiency, and such developments should be watched for.

The rocket's accuracy, although not comparable with that of rifled weapons or mortars, is sufficient to saturate target areas, or for AA barrage fire. The fairly large 50-percent zone [1] of these weapons, coupled with the salvo fire and large charge-weight ratio of shell, makes them particularly suitable for chemical warfare purposes, where area contamination and the development and maintenance of high concentrations of lethal gases are desired.

From the production point of view, the elimination of rifled barrels and of carriages adequate for heavy recoil loads presents decided advantages, although an increased expenditure of propellant and the more costly manufacture of ammunition must be accepted.

While the effects of rockets are no greater than is to be expected from their HE content and thickness of casing, the cumulative effect of large salvos arriving in quick succession, heralded by their characteristic and alarming noise, can be most devastating even for experienced troops, unless they have been previously and adequately forewarned.

[1] A horizontal zone within which 50 percent of all the rockets fired at the same range will fall.

The antitank application [2] of the rocket is no less important than its roles as field and antiaircraft artillery. Light, man-carried, rocket-propelled, shaped charges have played havoc with heavy armor, and improvements in this type of rocket may be expected.

Artillery rocket-launchers fall into three main categories: (1) Self-propelled equipment carried on wheeled or tracked vehicles [3] (Figure 1); (2) towed carriages (Figure 2); and (3) static launching racks or frames (Figure 3).

Any of these categories may use rocket guides (those portions of the weapon which support the rocket before and during its first moments of flight) of the following types:

a.—Smooth bore metal tubes resembling barrels. These usually are thin-walled, parallel-sided, and open at both ends (Figures 1 and 2).

b.—Metal frames which provide guiding surfaces for the rocket (Figures 3 and 7).

c.—Wooden or metal packing cases which serve as launching frames (Figure 4). Rockets fired from their packing cases are usually employed in static defenses and may be launched in quantity from simple frames or earth ramps.

d.—Longitudinally slotted rails. With this type, the rockets are provided with studs to engage in the slots and either rest above or are suspended from beneath the rails (Figure 5).

Launchers

Artillery rocket-launchers are usually designed to fire salvos and are, therefore, provided with multi-guide rails (Figures 1, 2, and 7). These guide-rail groupings may be of any form or shape, but most often are in rectangular banks.

The following is a check list of information required on rocket launchers:

a.—If self-propelled, what basic chassis is used, and what modifications have been made?

b.—What are the official nomenclature and the nickname, if any? What is the caliber of

[2] See page 26.

[3] See Figures 1 through 10, pages 48 and 49.

rocket fired, and what is the weapon's role, i. e., ground-to-ground, ground-to-air? Has the weapon any dual- or multi-purpose?

c.—What types of ammunition are fired, and what are their maximum ranges? How accurate is the weapon?

d.—What is the rate of fire of a salvo, and how long does it take to reload? How much time is required to bring the launcher into action?

e.—What are the limits of traverse and elevation?

f.—What form of guide rail is used? What is the number of guide rails, and how are they arranged? What is the length of each guide rail? Are the guide rails or tubes provided with any adaptors to permit the firing of ammunition of a different caliber?

g.—Are the rockets loaded from the front or the rear? Are any mechanical loading devices used?

h.—What are the dimensions of the launcher?

i.—Where is the firer's position, and by what means is he protected from the backblast of the rockets?

j.—What types of mechanism are used for elevating and traversing?

k.—What are the sighting arrangements, and what do the graduations represent?

l.—How many men are there in the crew and what are their duties?

m.—Is firing by percussion or electric. If the former, describe the mechanism? If electric,[1] what is the source of current supply?

n.—Give a general description of the launcher, including the platform, if static, and the carriage, if towed.

o.—What is the name of the manufacturer or manufacturers, and what is the location of the plant or plants?

Rockets

An artillery rocket normally consists of two major components: (1) The shell,[2] which contains HE or some other filling, together with a fuze[2]; and (2) the motor, consisting mainly of the solid fuel or other propellant, and the venturi or venturis.[3]

[1] A typical hand generator is shown in Figure 6.

[2] For check lists of these components see page 39.

[3] A restricted or shaped orifice designed to increase the velocity of passing liquids or gases.

Figure 8 illustrates a conventional rocket projectile having a single-axial venturi and tail-fin stabilization. Some of the more important variations from this general design which may be encountered are:

a.—Spin stabilization, effected by multiple small venturis around the circumference of the base of the motor (Figure 9). These venturis are inclined at an angle to the axis so that the issuing gases impart rotation to the rocket.

b.—A rocket in which the shell is of markedly larger diameter than the motor (Figure 4).

c.—A rocket, in which the shell is behind the motor instead of in front of it (Figure 9).

d.—A rocket in which the shell surrounds the motor or vice versa. This design achieves a better ballistic shape owing to the improved distribution of weight during burning of the propellant.

The efficiency of a field rocket projectile is partly determined by the amount of assembly which must be carried out immediately before firing. Where rockets are transported in sections in order to avoid risk of damage or accident in transit, the time necessary to achieve a ready-to-fire condition should be noted.

Following is a check list of the main information required on field rockets:

a.—What is the caliber of the rocket? What are its official nomenclature and its nickname?

b.—What are the minimum and maximum ranges of the rocket?

c.—From what launchers is the rocket fired, and what is its role? Is it dual- or multi-purpose; i. e., AA, ground-to-ground, or AT?

d.—What type of filling is contained in the shell, i. e., HE, smoke, chemical?

e.—What are the dimensions of the various components and stabilizing fins, if any?

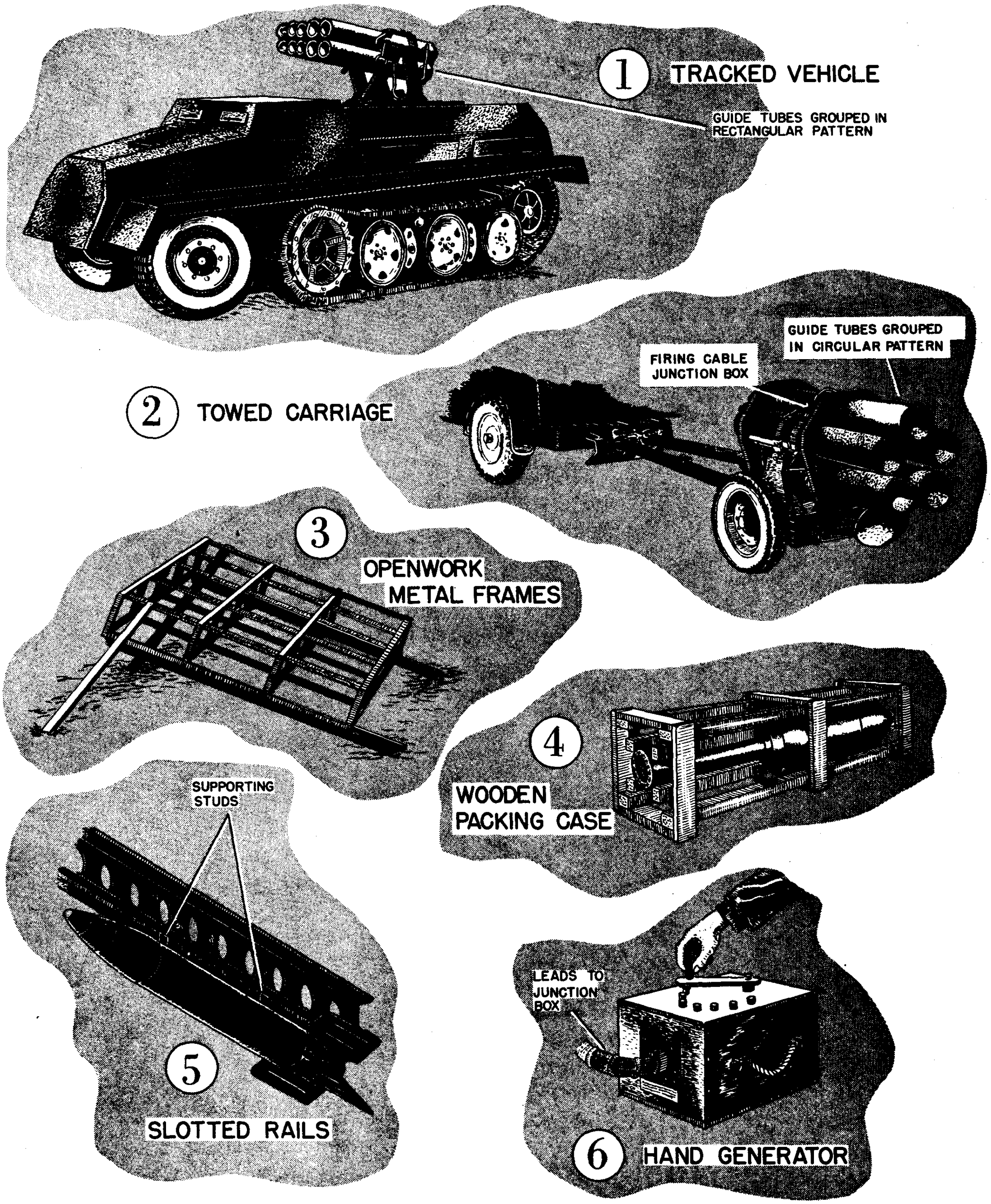
f.—What are the weights of the various components and fillings?

g.—Is firing by electrical means or percussion? Describe the firing arrangements.[4]

h.—Does it have spoilers? Spoilers are devices fitted to a projectile to be fired at less than the normal minimum range (Figure 10). They reduce range without lowering the angle of projection. Give a description of any which may be used.

[4] A typical hand generator is shown in Figure 6.

ARTILLERY ROCKET MATERIEL



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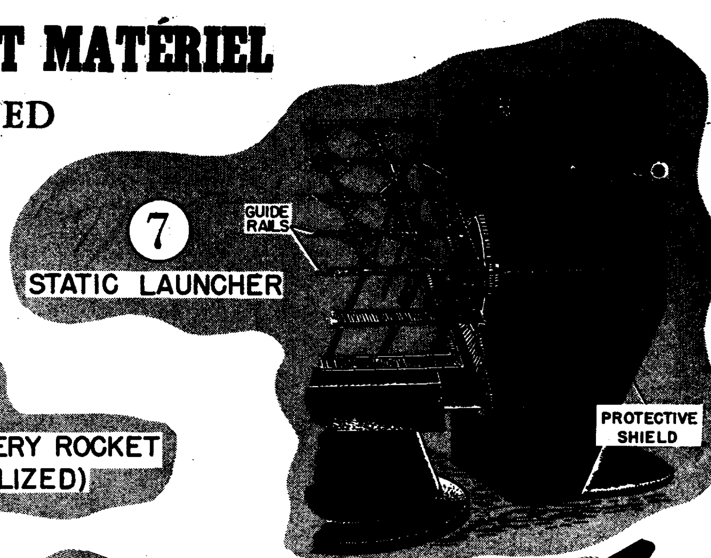
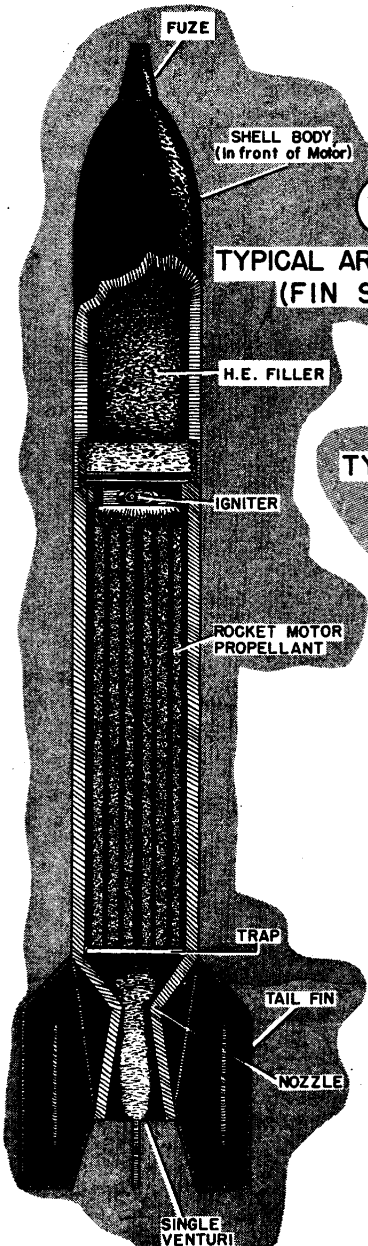
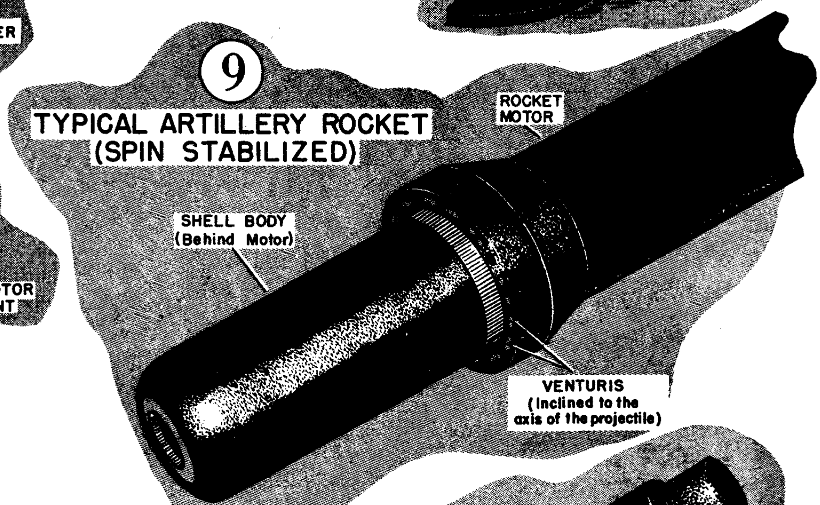


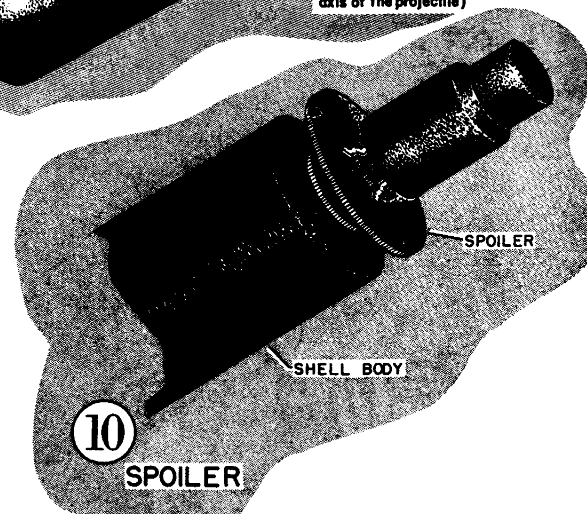
7 STATIC LAUNCHER



8 TYPICAL ARTILLERY ROCKET (FIN STABILIZED)



9 TYPICAL ARTILLERY ROCKET (SPIN STABILIZED)



10 SPOILER

i.—Complete ballistic details are required, including time of burning of propellant charge and temperatures. What are the length and breadth of the 50-percent zone?

j.—What are the details of the shell and its fuze? Field rocket shells and fuzes are basically similar to those of artillery projectiles.

k.—What type and composition of propellant are used? Are any special precautions taken during storage?

l.—What are the safe firing temperature limits? Are different rounds used for cold and hot climates?

m.—What materials of construction are used? If steel, what composition and what heat treatment, if any, are used?

n.—What is the name of the manufacturer(s), and what is the location of the plant(s)?

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