This manual is correct to 26 July 1955

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DEMOLITION MATERIALS

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***This manual supersedes TB 9–1940–6, 25 March 1944; TB 9–1940–9, 11 September 1944, and TB ORD 214, 28 October 1944; and those portions of TM 9–1940, 15 July 1943, and C1, 7 August 1944; TB 9–1940–11, 2 August 1950; material of a technical nature of TM 5–220, 3 July 1945; and FM 5–25, 2 September 1954, that pertain to the demolition materials covered herein.**

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CHAPTER 1

GENERAL

Section I. INTRODUCTION

1. Scope

a. This manual provides information of a technical nature pertaining to the classification, identification, care, use, storage, packing and marking, and destruction to prevent enemy use of demolition materials.

b. For principles, doctrines, and policies governing the tactical use of the demolition materials covered herein and the training and field operating procedures incident thereto, see FM 5–25.

c. This manual differs from that part of TM 9–1940, 15 July 1943, in that it covers all current demolition materials and deletes information on demolition block M4 and combination firing device M1.

2. Field Report of Accidents

If an accident or malfunction involving the use of ammunition occurs during training or combat, the range officer for a unit in training or the officer or noncommissioned officer in charge of the firing unit in combat will immediately discontinue firing ammunition of the lot that malfunctions, then report the occurrence and all pertinent facts of the accident or malfunction to the technical service officer under whose supervision the ammunition for the unit involved is maintained or issued, in order that the action prescribed in SR 700–45–6 may be taken. If conditions of combat preclude immediate compliance, the action prescribed above will be taken as soon as practicable.

Section II. GENERAL DISCUSSION

3. Types of Demolition Materials

Demolition materials, representative types of which are shown in figure 1, consist of various types of high-explosive charges, equipment, initiating devices, and priming material required in their employment in military demolition work. Certain demolition materials are grouped into "sets" and "kits" (pars. 90–103) for convenience in performing various kinds of demolition.

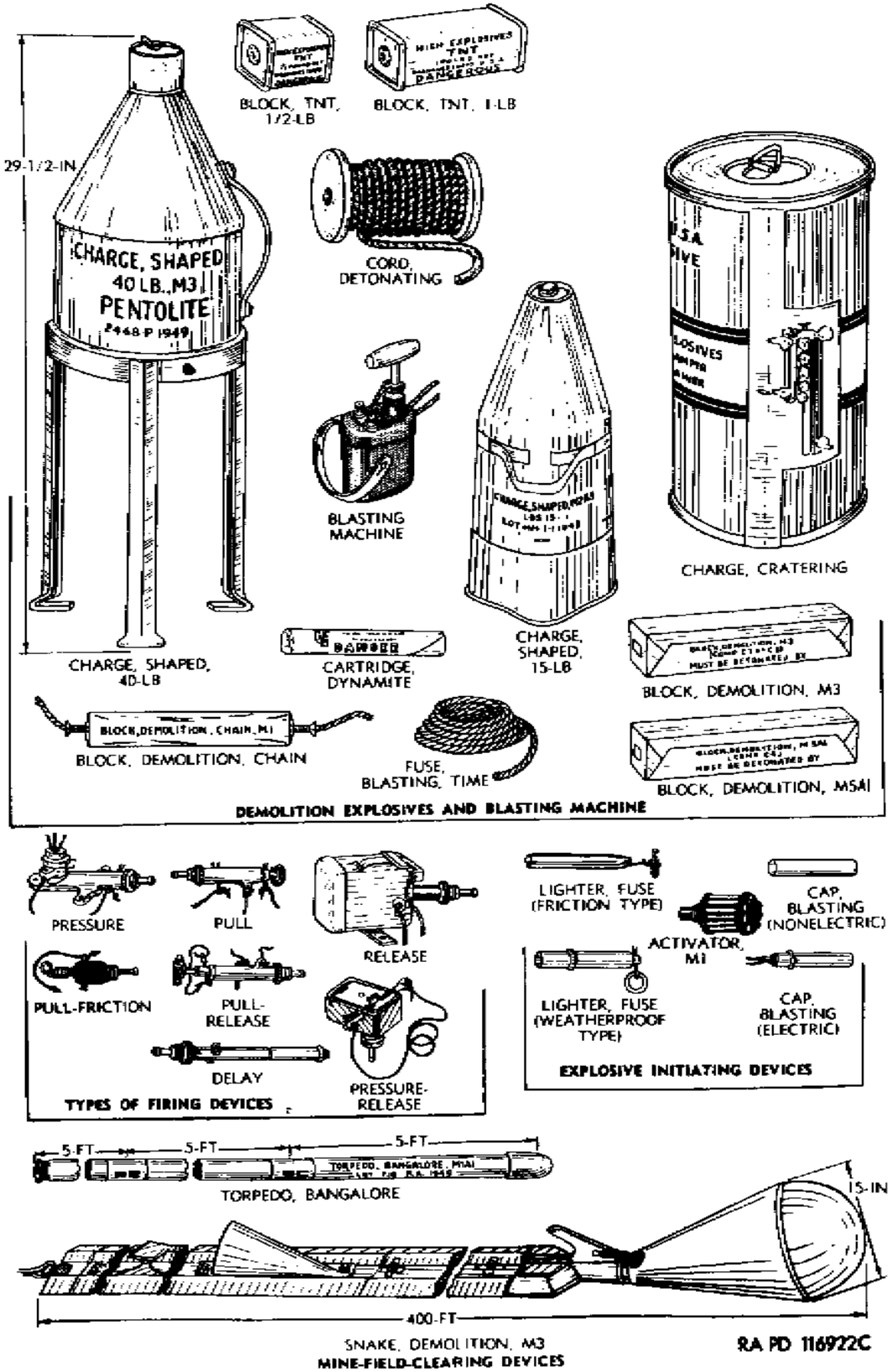


Figure 1. Representative types of demolition materials.

4. Booby Traps

a. A booby trap (fig. 2) is an explosive charge, either a standard mine or an improvised charge, that is exploded when a person disturbs an apparently harmless object. Although booby traps may be used in antipersonnel mine fields, they are not classified as antipersonnel mines.

b. Booby traps are intended to be initiated by enemy action on a concealed explosive device by pressure, by lifting an object, thus releasing pressure, or by moving a concealed trip wire. In general, booby traps are set with firing devices, which are equipped with safety pins, clips, forks, or keys, known as organic safeties (fig. 3).

5. Definitions and Terms

a. Adapter (Priming). A plastic connector (fig. 40) used to connect detonating cord, safety fuse M700, time blasting fuse, or electric firing systems to a demolition block.

b. Blasting Cap. A ¼-inch diameter (approx) metal tube or shell (figs. 38 and 39) containing a high explosive used to detonate a less sensitive explosive. There are two types of blasting cap, electric and nonelectric. The electric type is fired by an electric current and the nonelectric type is fired by safety fuse M700, time blasting fuse, or a firing device. In the firing chain, the blasting cap is the element that fires the main charge, or, the blasting cap may be the element that initiates a detonating cord, which fires the main charge.

c. Blasting Machine. A small hand-operated magneto-type electric generator (fig. 43), which is used to fire electric blasting caps. Push-down-type machines of 30-cap, 50-cap, and 100-cap capacities and a twist-type machine of 10-cap capacity are provided.

d. Block, Demolition. The term applied to a quantity (such as ½ lb, 1 lb, or 2¼ lb) (figs. 6 and 7) of high explosive, such as tetrytol or COMP C series explosives, to which a firing device or blasting cap with safety fuse or electric lead, whichever is applicable, may be attached for use in demolition work or as an improvised mine.

e. Breaching. The employment of any available means to secure a gap through an enemy mine field or obstacle.

f. Cable, Detonating. Especially designed demolition cable (figs. 62–66) composed of strands of detonating cord used for clearing mine fields.

g. Cap Well. Opening in demolition blocks and in certain types of mines, threaded to receive a firing device with blasting cap or to receive an adapter to which a time blasting fuse and nonelectric blasting cap or electric leads and an electric blasting cap are to be attached.

h. Cartridge. In demolition work, the correct term for a cylindrical piece of dynamite—sometimes popularly known as a "stick"

of dynamite (fig. 15). The term "cartridge" is also sometimes used for an explosive element of a demolition snake.

i. Charge. Any amount of explosive required to accomplish a particular mission. A charge may vary in size from a few ounces to several thousand pounds.

j. Cord, Detonating. A cord (figs. 23 and 24) that contains a core of high-explosive, PETN, wrapped in a plastic cover. The detonating cord, when properly initiated, explodes throughout its entire length, detonating any properly connected demolition charge or mine.

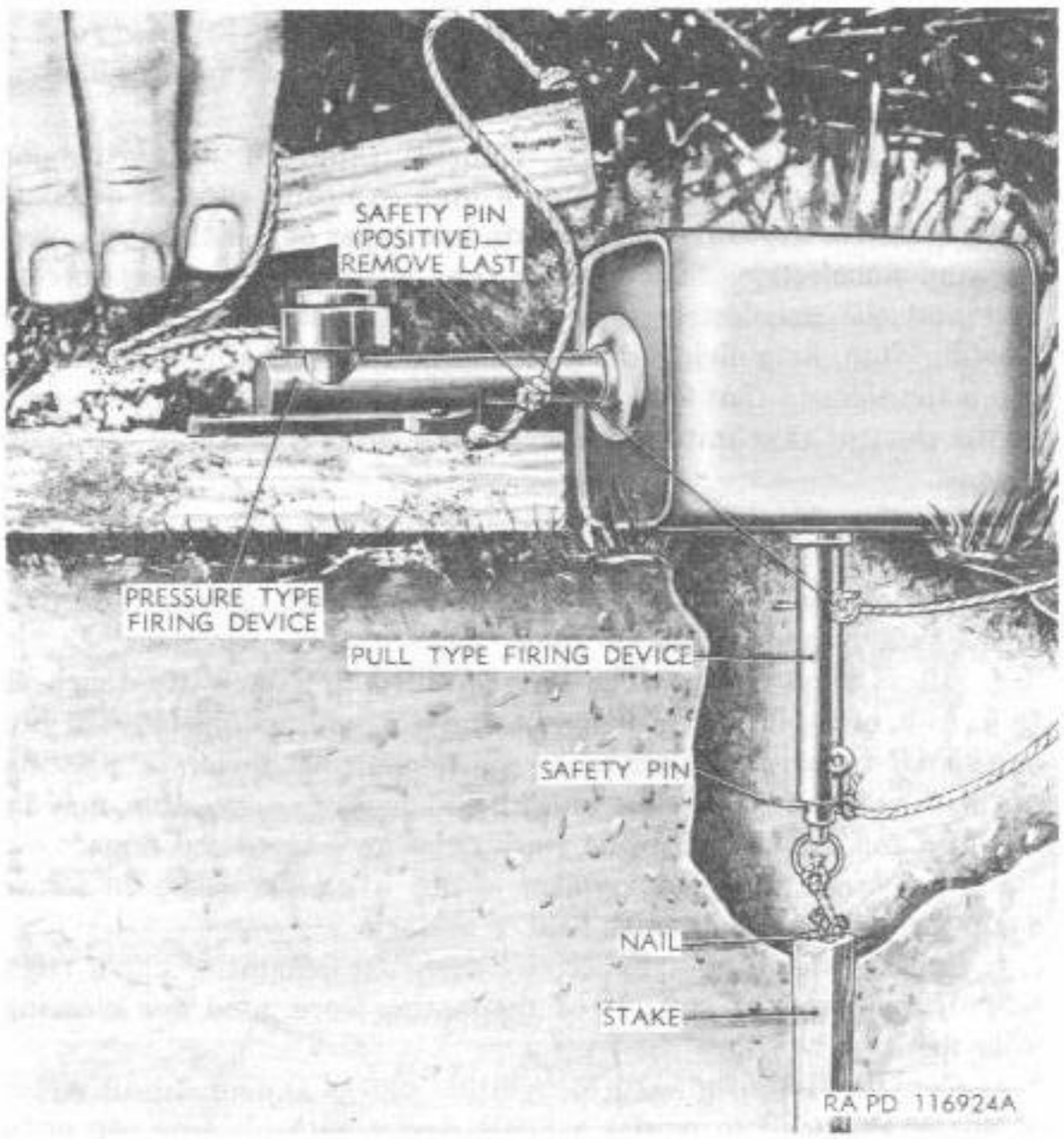


Figure 2. Explosive charge with pressure-type firing device "activated" with pull-type firing device—safety pins and fork to be removed after laying board lightly on pressure-type firing device.

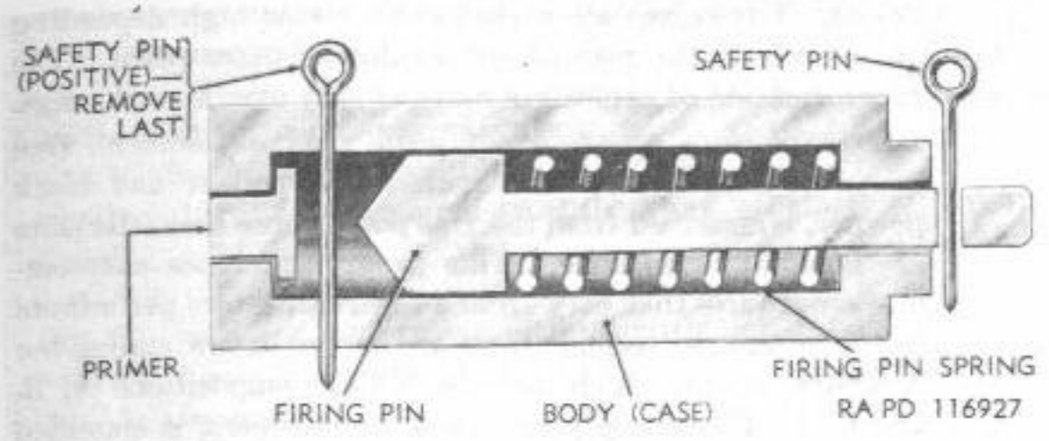


Figure 3. Schematic arrangement of firing device safeties and components.

k. Coupling Base. A metal coupling (figs. 27–36) containing a percussion primer and having a nipple to which a black powder igniter or blasting cap may be attached. The coupling base is threaded at one end to screw into a standard firing mechanism and at the other end to screw into a cap well of a demolition block or certain types of mines.

l. Crimper, Cap. This is a special plier-like tool (BB, fig. 47) used for cutting detonating cord, safety fuse, or time blasting fuse and for crimping a nonelectric blasting cap to detonating cord, safety fuse, or time blasting fuse, or crimping a blasting cap to the coupling base of a firing device. One handle of the crimper is pointed for making a hole in a dynamite cartridge; the other handle is flattened to form a screwdriver.

m. Demolition Material. The explosives, devices, and equipment used in demolition work. If conditions require, antitank mines may be used for demolition.

n. Detonation. Detonation is the reaction that takes places when a high-explosive is exploded. As the mass of high explosive is initiated, a detonating wave is created that progresses throughout the mass transforming it instantly into gases.

(1) *Low-order detonation.* The incomplete detonation of an explosive charge in a bomb, projectile, or other high explosive.

(2) *High-order detonation.* A complete and instantaneous explosion.

o. Detonator. A device (figs. 17–19), consisting of a primer composition charge and one or more additional high-explosive charges of different compositions, arranged in order of decreasing sensitivity and increasing quantity, used for exploding an explosive charge.

p. Explosive. Explosives are classified as low or high depending on the rate at which the reaction of explosion takes place. The rates of transformation of explosives into gas vary over a wide range.

(1) *Low explosives as compared with high explosives.* One group of explosives, which includes propellant and black powder, is classified from the viewpoint of use characteristics as "burning" explosives. This group undergoes autocombustion at rates that vary from a few centimeters per minute to 400 meters per second; these are known as low explosives. A second group, which includes TNT, Compositions A, B, and C, PETN, nitroglycerin, and many others, is classified from the viewpoint of use characteristics as "high" explosives. This group undergoes detonation at rates from 1,000 to 8,500 meters per second.

(2) *Propellants.* A propellant is an explosive (solid or liquid) that is suitable for effecting the controlled propulsion of a solid body such as a bullet, shell, rocket, blast-driven earth rod, or a moving part in a mechanical device. As disruption of the propellant container must not take place and as the movement of the object propelled must be controlled, the explosive process of the propellant must be controlled. Because of these requirements, only low explosives are suitable for use as propellants. However, some solid propellants are presently considered to be high explosives.

q. Firing Pin. A pointed metal plunger in the firing mechanism of a fuze or of a firing device (fig. 33) that, when released, strikes a sensitive explosive in a primer or detonator and explodes it. A firing pin is sometimes called a striker.

r. Firing Device. A small metal case or body (figs. 27–36) containing a firing pin mechanism and primed coupling base to which a blasting cap, igniter, or activator may be attached. Firing devices are used to initiate the explosion of demolition blocks and as secondary antitank mine fuzes. A firing device is issued separately. When assembled with a detonator, it may be used as a mine fuze, antilift device, or to set off prepared charges.

s. Firing Mechanism. That part of a firing device consisting of a firing pin assembly and its housing.

t. Fuse, Blasting, Time. Commercial-type waterproof cord (fig. 22) that has a corrugated surface and contains a core of black powder and is fabricated to provide delay for safety purposes. It is sometimes called a safety fuse (*ac* below). It is used only with nonelectric blasting caps or black powder igniters (squibs). The burning rate of a 1-foot length should be tested before using.

u. Fuze. A mine fuze is a complete assembly issued with a mine. It always contains a means of detonation and is normally used in primary fuze wells.

v. Fuze Well. Opening in a demolition block to receive a firing device or other priming arrangement.

w. Galvanometer. An instrument (fig. 42) for determining whether there is any current and, therefore, whether the circuit is closed.

x. Kit. A specific collection of equipment, tools, and explosives (fig. 52) used for performing certain particular demolition tasks or with inert simulated explosives for training personnel. The term "kit" is also used to designate a group of items, which together are a component of a set.

y. Lighter, Fuze. A small tubular device containing a friction compound and hand-pull friction wire or containing a firing pin and primer (figs. 20 and 21); used for attachment to and ignition of time blasting fuse or safety fuse M700.

z. Primer. A small cylindrical metal casing (fig. 37), used in a firing device, containing an internal cup filled with a very sensitive high-explosive and an anvil arranged so that, when the cup (showing at one end of the primer) is struck by a firing pin, the explosive is detonated and flame is spurted from the other end for the purpose of exploding a detonator or an igniting charge. Primers may also be actuated by friction or electric spark.

aa. Protector, Shipping. The small celluloid or cardboard cup-shaped cover (fig. 29) with which the nipple of the coupling base of a firing device is protected during shipment.

ab. Safeties. Organic safety devices (those incorporated in design) (fig. 3) characteristic of all fuzes and firing devices to help prevent accidental functioning. Their removal, as in the case of safety cotter pins, constitutes the process called "arming."

ac. Safety Fuse. Military-type waterproofed cord that has a smooth plastic cover and contains a core of black powder and is fabricated to provide delay for safety purposes. It is marked at 18-inch intervals to correspond to a burning time of 1 minute. The 18-inch intervals are rough and provide a means for measuring the fuse in daylight and darkness. It is used only with nonelectric blasting caps or black powder igniters (squibs).

ad. Set. A specific collection of explosives initiators, primers, equipment, and tools, used for performing particular demolition tasks or tasks supplementary thereto.

ae. Shaped Charge. A mass of high-explosive having a shaped metallic- or nonmetallic-lined recess that causes it to have a one-way penetrating action known as "MUNROE effect." It is used to blast boreholes in steel, concrete, or similar materials or may be used to

penetrate explosive-filled objects to induce a low order functioning, if the shaped charge is of appropriate size.

af. Snake, Demolition. An elongated and somewhat flexible fabricated metal container having a pear-shaped guiding nose and a body containing high-explosive charges (fig. 67). The snake is assembled in the field and manipulated into position, by a tank, among various obstacles or in an enemy mine field and there exploded by appropriate fuze arrangements in order to clear a path for troops or vehicles. Upon functioning, a trough-shaped path some 325 feet long, 4 to 12 feet wide, and 2 to 4 feet deep is made, depending on the character of the soil.

ag. Sympathetic Detonation. One which is induced by the explosion of another charge.

ah. Torpedo, Bangalore. An explosive device (fig. 16) consisting of any desired number of slim cylindrical explosive charges in metal containers. Any number of these containers may be attached to each other endwise. It is used against barbed wire and various other relatively light obstructions.

ai. Destructor, High-Explosive, Universal. The universal high-explosive destructor is a high-explosive charge initiated by means of blasting caps or mine activators and standard firing devices. It is used in preparing loaded projectiles and bombs as improvised mines, booby traps, and demolition charges. It is also used by disposal units to destroy deteriorated or abandoned ammunition.

6. Demolition Complete Round

a. Definition. A demolition complete round consists of all the components in one system of explosives, ranging from the initiating element to the element designed to accomplish the demolition. A complete round may be issued with all components in separate compartment of the same packing container or group of containers or with certain components shipped separately for assembly in the field.

b. Explosive Train. The main explosive charge of a demolition system must be comparatively insensitive, in order to permit safe handling in large quantities in storage and in transit. To insure high-order detonation of this charge, explosives of various degrees of sensitivity, such as in primers and detonators, must be used in conjunction with it. These sensitive explosives, when properly arranged, can be detonated with a lighter or a detonator. They are necessary only in relatively small quantities in an explosive system and, in some cases, are inclosed in a metal container. The most highly sensitive of these explosives in a system is in smallest quantity. When it is initiated, flame thereby produced is not ordinarily powerful enough to detonate the main explosive charge with high-order detonation. Therefore, one or more intermediate explosives are interposed in order of increasing quantity whereby a decreasing order of sensitivity is adequate. Thus, a succession of explosives is arranged progressing from a highly sensitive small quantity to a less sensitive larger quantity to a still less sensitive still larger quantity ending with the least sensitive and largest quantity, which is the main explosive. Such an arrangement of explosive charges is called an explosive train. However, sensitivity is not the only requirement of an explosive in the explosive train. It is also important that the explosion travels from the less powerful to the more powerful explosive. Delay elements are sometimes incorporated between two explosive train components to meet certain delay action requirements.

7. Classification

Demolition materials are classified as to composition as explosive or nonexplosive. They are classified as to use as service or training.

8. Identification

a. General. Demolition materials are identified by standard nomenclature, lot number, model, painting, marking, and ammunition identification code symbol. Such means of identification are associated with all packing containers and, unless the item is too small, on the item itself.

b. Ammunition Lot Number. When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. The lot number consists, in general, of the loader's initials or symbol, the assigned interfix number, and the serial number of the lot. The parts of the lot number are separated by dashes. This lot number is stamped or marked on every item and on all packing containers. It is required for all purposes of record, including reports on condition, functioning, or accidents in which the ammunition may be involved. In any one lot of ammunition, similar components used in assemblies are manufactured under as nearly identical conditions as possible.

c. Model. To identify a particular design, a model designation is assigned at the time the item is classified as an adopted type. This model designation becomes an essential part of the standard nomenclature and is included in the marking on the item. The present method of model designation consists of the letter "M" followed by an Arabic numeral. Modifications are indicated by adding the letter "A" and appropriate Arabic numeral. Thus, M1A1 indicates the first modification of an item for which the original model designation was "M1." Modifications that are functionally identical with the original model but which have manufacturing differences may be designated by "M1" followed by the letter "B" and an Arabic numeral, for example, M1B1. When a particular design has been accepted only for a limited procurement and service test, the model designation is

indicated by the letter "T" and an Arabic numeral and modifications by the addition of "E" and an Arabic numeral. In such cases, if the design subsequently should be standardized, an "M" designation is assigned; hence, there may be encountered some lots still carrying the original "T" designation (not yet remarked to show the later standardized "M" designation). There is no direct relationship between the numerical designation of a "T" item and that of the item when standardized and assigned an "M" designation. The present method of model designation for Navy items is "Mk" (signifying "mark"); modifications are indicated by "Mod 0," "Mod 1," "Mod 2," etc.

d. Painting. Service demolition materials, except some plastic materials, are painted to prevent rust and in various colors to provide a means of identification. Service explosive demolition materials are painted lusterless olive drab with marking in yellow. Inert demolition materials, which are used in training, and nonexplosive demolition materials, except certain tools are painted black with marking in white. Some items of practice demolition are painted blue.

e. Marking. Demolition materials are marked by stamping or stencilling with the type, size, model, and lot number.

f. Data Card. The ammunition data card is a 5″ x 8″ card prepared for each lot of ammunition. Copies are forwarded with each shipment of ammunition. In addition to the ammunition lot number, the data card gives the lot numbers of the components and other pertinent information concerning the ammunition. The data card is a basic document in the surveillance and use of the item to which it pertains.

g. Ammunition Identification Code (AIC). An ammunition identification code is established in order to facilitate requisitioning and record keeping in the field. The AIC symbol consists of five characters, the first two of which indicate the standard nomenclature list (SNL) in which the item may be found, the other three are peculiar to the item. Once a code symbol is properly assigned to an item and published, it is never assigned to another item. Further explanation of the AIC symbol may be found in ORD 1 (sec. I) and in TB 9–AMM 5.

9. Care, Handling, and Preservation

a. General Precautions.

Warning: Explosives and components containing explosives MUST be handled with appropriate care at all times. The explosive elements in primers, blasting caps, and fuzes are particularly sensitive to shock and high temperature. The use of the modern more highly sensitive explosives renders it especially necessary to follow the precautions herein and in TM 9–1900.

(1) Demolition explosives and related items are packed to withstand conditions ordinarily encountered in the field, being packed for shipment and storage in moisture-resistant containers and suitable packing boxes. However, they must not be handled roughly. Care must be taken to keep packing boxes and containers from being broken, cracked, or dented. Some specialized items may lose part of their effectiveness if distorted. If packing boxes and containers should become damaged, they must be repaired immediately and careful attention given to transferring all effaced parts of markings due to the damage to their proper places on the new parts of the box. If airtight containers are broken, they should be resealed and tested, if equipment for testing is available.

(2) Since explosives are adversely affected by moisture, and may become deteriorated or metal containers corroded to the point of unserviceability, they should not be left at any time in damp places. Moisture-resistant seals of containers must not be removed until just before the contents are to be used.

(3) Explosive materials must be protected at all times from all sources of excessive heat, including direct rays of the sun. All storable military materiel must be susceptible of safe storage and transportation without permanent impairment of its capabilities from the effects of temperature. The temperatures for storage purposes are: Lower limit, −80° F for periods of at least 3 days duration; upper limit, 160° F for periods as long as 4 hours per day. Temperatures of this order (160° F) are encountered within unventilated containers, inclosures, shelters, freight cars, closed vehicles, etc., when the structures themselves are exposed to an air temperature of about 125° F, plus full impact of solar radiation, 360 Btu per square foot per hour, for periods of approximately 4 hours daily.

(4) Demolition materials should be protected from mud, sand, dirt, and water. If they become wet or dirty, they should be cleaned at once, including removal of any verdigris or other corrosion.

(5) Demolition materials prepared for use but not used will be returned to their original condition and packings and appropriately marked. Such materials will be used first in subsequent operations, in order that stocks of opened packings may be kept to a minimum.

(6) Black powder must be kept dry. Components containing it should be stored in a dry, well-ventilated magazine. Black

powder is extremely flammable and must be carefully guarded against sparks and flame.

(7) Do not attempt to disassemble any initiating component, such as a primed coupling base with or without igniter or blasting cap fitted thereto.

(8) Do not remove protective or safety devices from firing devices until just before use.

(9) Containers of explosives must not be opened in a magazine.

(10) Blasting caps should not be stored assembled to detonating cord or any high-explosive charge.

(11) Storage compatibilities and quantity-distance regulations in TM 9–1900 will be observed. Where appropriate in oversea commands, the storage provisions of FM 9–6 should be used.

(12) Smoking or bringing an open flame near explosives is not permitted.

b. Safety Distance Requirements for Preparation of Primers and Demolition Charges. It is extremely important that personnel take adequate precautions to prevent accidental explosions while preparing primers for demolition activities. In addition to the general safety precautions currently in force, the safety rules for the preparation of primers and demolition charges in (1) through (14) below will be strictly observed.

(1) Test-burning of safety fuse or time blasting fuse for determination of rate of burning of the roll will be done at a minimum safety distance of 25 feet from exposed blasting caps or explosives in the direction toward which the air current is moving.

(2) Cutting square across end of safety fuse or time blasting fuse, remove and discard 2 or 3 inches of fuse from each roll.

(3) Cut off and test a 1-foot length from each roll for determination of burning time. *All fuse in the same roll should burn at a uniform rate, though the rate of burning of time blasting fuse may vary from approximately 30 to 45 seconds per foot in different rolls.*

Note. The standard fuse is FUSE, safety, M700, which is marked at 18-inch intervals that correspond to a burning rate of 40 seconds per foot.

(4) The supply of blasting caps for a required operation will be at a minimum of 25 feet from the supply of explosives.

(5) The preparation of nonelectric blasting caps will be performed not less than 25 feet from the supply of blasting caps or explosives.

(6) Cut sufficient safety fuse or time blasting fuse to permit firer to walk to a place of safety before the charge explodes.

(7) Do not use any blasting caps other than issue special blasting caps, nonelectric (type I) or electric (type II), for detonating military demolition material without first testing them to determine that they will adequately initiate the explosive. Weaker caps (of commercial type) may fail to initiate a detonation, resulting in scattering the charge, breaking it up, or starting a fire.

(8) Select one nonelectric blasting cap, hold it open end down, and shake *gently* to remove dirt or other foreign matter. Hold the desired length of safety fuse or time blasting fuse vertical and gently slip the cap down over the fuse until the explosive in the cap is in contact with the end of the fuse. If the fuse appears too large to enter the blasting cap easily, the end to enter the cap may be rolled lightly or merely pinched lightly between the fingers to restore the symmetry of the fuse.

Caution: Do not use force.

(9) When the fuse is properly seated within the blasting cap, use a cap crimper to crimp the cap at the open end; hold the fuse between the thumb and third finger of the left hand and extend the forefinger over the end of the cap when crimping cap to fuse. Crimp cap near its open end; a crimp too near the explosive in cap may detonate it. As a safety precaution, point cap out and away from body while crimping.

(10) No more than 10 blasting caps will be permitted at the site selected for preparation of primers at any one time.

(11) The priming of explosives will be performed at a distance of not less than 25 feet from the site of any other permissible storage or operation point involved in connection with the preparation of primers and demolition charges.

(12) Not more than one primed charge of explosives will be permitted at any site at any one time.

(13) The preparation of primers and the priming of explosives will not be performed in advance of requirements for use of same, in view of possible atmospheric effects.

(14) Bring to the site of the operation only sufficient explosives to meet the requirement of the operation involved.

c. Dynamites. Dynamites freeze at low temperatures rendering them entirely undependable until thawed. Frozen dynamite *must* be thawed before using. A two-compartment thawing kettle (fig. 4) is used. Place water in a separate container, make it as hot as can be borne by the hand, and pour it into the water compartment. Place the dynamite in the explosive compartment, laying each stick on its side in a position so air can circulate readily around it. Place the kettle in a barrel or box and surround it with dry hay or similar

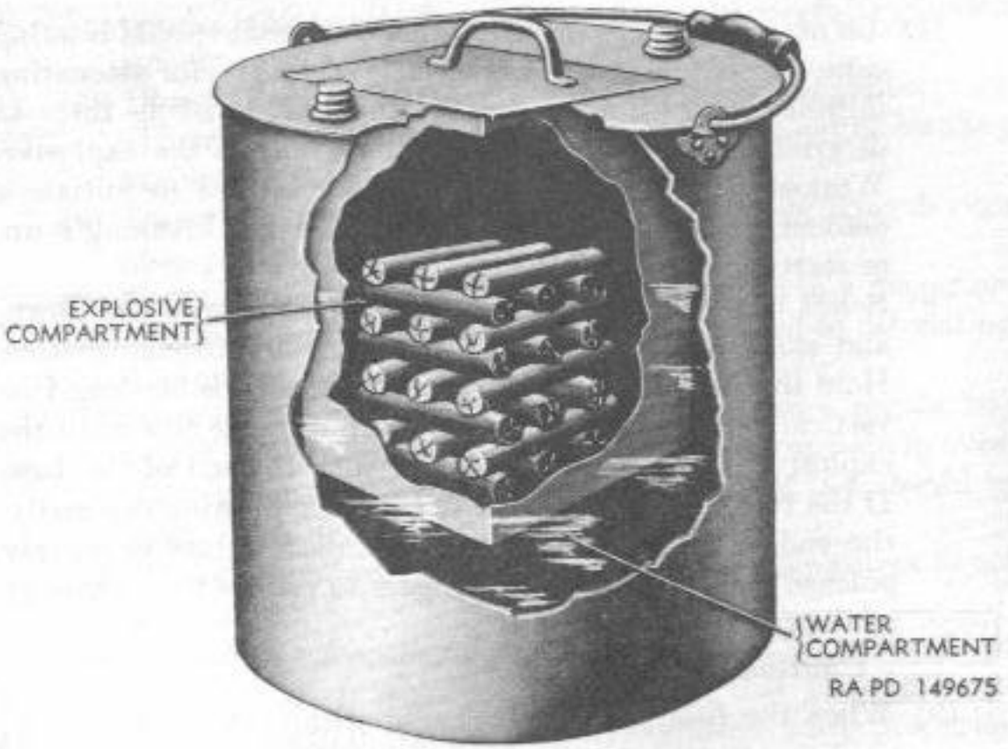


Figure 4. Dynamite-thawing kettle.

insulating material. Thaw no more than 50 pounds of dynamite in one lot. *Never* place the dynamite in the explosive compartment before pouring the water into the water compartment of the kettle. *Never* place the kettle over heat after the dynamite is in it.

10. Destruction of Unserviceable Demolition Materials

a. General. Demolition materials that have been designated for destruction as unserviceable will be destroyed, in general, as prescribed in TM 9–1900.

b. Destruction by Burning or Detonation. Destruction of unserviceable demolition materials (other than dynamite and black powder) by burning or detonation may be accomplished in essentially the same manner as the demolitions described in paragraphs 120 and 121.

c. Unserviceable Dynamites.

(1) *Commercial dynamite.* Commercial dynamite that has deteriorated from age has a dark color and is soft and mushy. Their packing cases are often discolored by dark brown stains. Such dynamites are extremely sensitive and should not be used but should be destroyed by burning. Packing cases should not be opened to remove the cartridges for destruction. Place the unopened packing cases of dynamite on a bed of combustible material such as excelsior or hay. Ignite the combustible as described in paragraph 121. Exuding dynamite has an oily emission (nitroglycerin) on the cartridges and on the packing cases. The packing cases should be opened carefully and the individual cartridges should be placed on a bed of combustible material. The cartridges should be placed on the combustible bed in a single layer, not greater in width than the length of one cartridge. When destroying dynamite by burning, the possibility of detonation always exists. Whenever possible, personnel should withdraw to a distance equal to the "inhabited building distance" based on the quantity of dynamite being destroyed (see quantity-distance tables in TM 9–1900). Dynamite awaiting destruction, especially during hot weather, should be shielded from the rays of the sun. Frozen dynamite is more likely to detonate during burning than dynamite at normal temperatures.

(2) *Military dynamites.* Military dynamites are very stable and are not expected to become soft and mushy or to exude. However, if they become unserviceable, they should be destroyed in the same manner as exuding commercial dynamite ((1) above).

d. Black-Powder-Loaded Components. These components can best be destroyed by burning in a hot fire or by dumping into a suitable stream of water (if not prohibited by law).

11. Handling Inert Demolition Material

The same basic safety rules should be followed when using inert training or lecture aids as prevails when the fully loaded items are being used; striking, dropping, or handling in other than the manner prescribed for explosive loaded (live) items should not be permitted. Personnel should be cautioned to treat all inert-loaded demolition materials and components of demolition materials as requiring the same degree of caution as their explosive-loaded (live) counterparts. In order to make inert items readily identifiable, several holes are drilled or cut in them where practicable. In addition, they are stamped and/or stencilled "EMPTY" if they have *no* filling and "INERT" if they have an *inert* filling. (For further information, see SR 385–410–1.)

12. Preparation of Demolition Materials for Firing

a. The burning rate of safety fuse or time blasting fuse should be tested prior to use.

b. In testing lengths of less than 2 feet, the burning time of the length to be used in service must not be merely estimated, but determined by a trial with the same length of fuse under the same conditions of altitude and confinement as expected for service use.

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c. The use of the same manufacturer's brands of electric caps in the same circuit will produce more uniform results, see paragraph 63.

d. The short-circuiting tab on the lead wires of electric blasting caps must be removed prior to connecting the caps into a firing circuit.

e. Charges for electric firing should not be primed or connected during a thunderstorm or if a thunderstorm is approaching.

f. Static electricity accumulates on many kinds of ungrounded objects. If allowed to accumulate to a sufficient extent that a spark should jump across an air gap in the presence of highly flammable material, a source of ignition might be provided. To eliminate this hazard, electrically continuous paths to ground, called "grounds" must be provided so that static charges will be continually dissipated. Therefore, all piles and stacks of explosive materials should be wired to grounded objects such as water pipes or metal rods driven into the ground.

g. Blasting caps should be crimped *only* with the cap crimper to insure a proper joint.

h. Do *not* crimp a blasting cap anywhere except very close to the open end.

i. Blasting caps weaker than the one prescribed to detonate the explosive being used should not be used. Weaker caps may cause misfires. If only less powerful caps are available, test shots should be made to determine how many of them are required to insure detonation.

j. Nonelectric blasting caps in underwater charges or charges placed in wet boreholes should not be used, see paragraph 65.

k. Safety fuse or time blasting fuse should not be cut short. For training purposes, less than 18 inches of fuse should not be used except in training for combat where practice with short lengths is required; in this latter case, token charges should be used.

l. Where lengths of safety fuse or time blasting fuse shorter than 2 feet are used, do not bend or mash the fuse and allow fuse powder to spill from the cords, as this may speed up the burning rate.

m. Do not use wire, a nail, or other similar instrument to remove blasting caps from the cap box. Nonelectric blasting caps, which are not easy to lift from the cap box with the fingers, should be handled by tilting the box into the palm of the hand until one cap begins to slide out. Withdraw this cap carefully. Keep cap box covered when not withdrawing caps.

n. Before crimping a nonelectric blasting cap to safety fuse or time blasting fuse, examine the end of the cap for foreign substance. In case of foreign substance in the cap, blow lightly into the open end of the cap. If this does not remove it, use another cap.

o. Do not force, bend, or twist the safety fuse or time blasting fuse in the blasting cap, as such action may fire the blasting cap.

p. Before lighting a safety fuse or time blasting fuse make sure that no other explosive charges or blasting caps are close enough to allow the flame from the lighted fuse end to reach such explosive charges or caps.

q. When lighting safety fuse or time blasting fuse, be sure that it is ignited properly before leaving it; this may be determined by the characteristic smoke and heat. In case of a nonelectric misfire where explosives are involved personnel will not approach the pit, trench, or point of misfired charge until a period of 30 minutes has elapsed.

r. Use dual-firing systems (see FM 5–25), if practicable, in order to increase the likelihood of a successful operation and to minimize the danger of unexploded charges being left hidden, tamped in the ground, or left unrecovered in shallow water.

s. When conducting training operations with demolition charges, training should be given (w/appropriate safety measures), in priming demolition charges with both single and dual systems of blasting cap-and-detonating cord firing, time blasting fuse-(safety fuse) and-blasting caps firing, electric current-and-blasting cap firing, and combinations of these and electric-firing systems, see FM 5–25.

t. In training or testing, *do not* use larger charges, shorter lengths of fuse, or greater exposure of personnel than is necessary for the purpose of the training or test.

u. Primed explosive blocks or cartridges should not be forced into a drill hole (borehole). Charges should be tamped only with blunt wooden tamping sticks; no tamping should be done with steel bars or tools.

v. Lead wires of electric blasting caps should not be connected to a blasting machine until ready to fire the charge; they should not be left attached to a blasting machine after charge is fired. When using a blasting machine, it should be operated vigorously.

w. Do not reload immediately after exploding a charge to spring a borehole. Wait until the hole is cool enough to prevent premature explosion of the second charge. Cool the hole with water if necessary.

x. Tape the connection between blasting cap and safety fuse or time blasting fuse when using a piece of fuse shorter than 1 foot. The taping prevents the flash of a fuse lighter from spitting directly into the cap.

y. When preparing to fire electrically, the one individual to do the firing will retain possession of the blasting machine and/or its handle *at all times* until he has fired the charge.

z. Do not allow any instructions or any set of rules to take the place of *care* and *thought* in carrying on demolition work.

aa. Electric blasting caps and electric blasting circuits may be energized to dangerous levels from outside sources, such as static elec-

tricity induced electric currents, radio communication equipment, high-tension wires, and the like. Safety precautions, therefore, shall be taken to reduce the possibility of a premature initiation of the electric blasting caps and explosive charges of which they form a part. Short wave radios must not be operated (either sending or receiving) within one-fourth mile of an electrical blasting or demolition operation and electric blasting caps must not be used within 1 mile of broadcasting or high-power short wave stations. These distances apply to all parts of the operation, including the lead wires of the cap and the firing wire circuit. Before connecting electric blasting caps to the firing wires, the blasting circuit shall be tested to determine if hazards from stray currents are present. A dummy test circuit, essentially the same as the actual blasting circuit except that a No. 47 radio pilot lamp of known good quality inserted in place of the blasting cap, shall be used without applying electric current to the circuit. If any glow of the radio pilot lamp is observed when viewed in darkness, electric blasting caps must not be used and nonelectric caps and safety fuse substituted. Other suitable instruments, such as the DuPont "Detech-A-Meter," may be used to test the circuit for stray current in lieu of the method described above. If the instrument shows the presence of stray currents, electric blasting caps shall not be used.

13. Misfires

A misfire is a complete failure to function. A hangfire is the failure to function until an abnormal lag beyond the instant of initiation has occurred, see SR 385–310–1.

a. Causes of Misfires and/or Hangfires.

(1) Electric or nonelectric blasting caps too weak to detonate explosive.
(2) Deteriorated safety fuse or time blasting fuse, detonating cord, or explosive charge.
(3) Improper electric or nonelectric connections.
(4) Improper operation of blasting machine.
(5) Weakened blasting machine.
(6) Failure to make sure that the safety fuse or time blasting fuse has been lighted.
(7) Improperly made priming materials.
(8) Damaged electric or nonelectric firing circuits.
(9) Use, in the same circuit, of electric caps made by different manufacturers.
(10) Attempting to fire too many electric caps in same circuit.

b. Prevention of Misfires and/or Hangfires. Care in placing charges, in making up and placing priming systems, and in connecting

firing circuits will prevent many misfires and hangfires. In most cases, the use of dual firing systems (FM 5–25) renders investigation unnecessary, as one of a pair of properly made up and connected electrical circuits or nonelectric arrangements is almost certain to detonate their charges.

c. Electric Misfires. Misfires of charges primed with electric blasting caps may be investigated immediately unless the charges are also primed nonelectrically. Upon occurrence of a misfire, several successive attempts should be immediately made to fire the electric blasting caps. Should these attempts fail, the connections of the firing wires to the terminals of the blasting machine should be checked, then three more attempts to fire should be made. If the circuit still fails to fire, wait 1 minute, disconnect the firing wire from the blasting machine and check the entire circuit, including firing wire, for breaks or short circuits; see FM 5–25 on testing circuits. If the fault is traced to a break or short circuit of wires below the tamping, for example, beneath the surface in a borehole, great care must be taken to avoid striking the electric blasting cap while removing the tamping material. Do not attempt to remove either the cap or the charge. If the fault is not located by removing the tamping to within a foot of the charge, place a new charge of 2 pounds of explosive with a new blasting cap at this point. Disconnect the wires of the original blasting cap from the circuit, connect the wires of the new blasting cap in their place, and replace the tamping. Detonation of the new blasting cap should then detonate the original charge.

Caution: Do not investigate immediately electrical misfires if the charges are also primed with nonelectric cap and fuse or with detonating cord that is being fired nonelectrically. Delay the investigation until the nonelectric circuit has fired the charges. If the nonelectric circuit misfires, delay the investigation as indicated in *d* below.

d. Nonelectric Misfires. Nonelectric misfires may be divided into two types: charges primed with time blasting fuse (safety fuse) to initiate a nonelectric cap and charges primed nonelectric cap to initiate a detonating cord.

(1) *Charge primed with time blasting fuse (safety fuse) and nonelectric cap.*
(*a*) If a charge primed with time blasting fuse (safety fuse) and nonelectric cap fails to fire, delay investigation until at least 30 minutes after the charge should have fired, as it may be a hangfire. After the lapse of 30 minutes, it may reasonably be considered a misfire.
(*b*) If the misfired charge is not tamped, install a new blasting cap. If it is tamped, remove the tamping to within about 1 foot of the charge, place a new charge of 2 pounds of explosive with a new blasting cap and new safety fuse or

time blasting fuse at this point and replace the portion of the tamping that was removed.

(*c*) If practicable, place additional primed charges near enough to the misfired charge to detonate it rather than disturb the original time blasting fuse (safety fuse), because disturbing the fuse might cause a possible smoldering section in the fuse to resume normal burning.

(2) *Charges primed with detonating cord.*

(*a*) If a nonelectric blasting cap is used to fire a detonating cord, but the cap fails to detonate, delay investigation at least 30 minutes. After the lapse of 30 minutes, cut the detonating cord main line between cap and charge and fasten a new cap to the detonating cord.

(*b*) If an electric blasting cap is used to fire detonating cord but the cap fails to detonate, follow the procedure set forth in *c* above. If necessary, and practicable, fasten a new blasting cap on the detonating cord.

14. Storage of Demolition Materials

a. Temoprary Magazine Locations.

(1) Accessibility, safety, dryness, and good drainage determine the magazine location. An isolated ravine is a good location if it is not subject to flash floods from heavy rains and cloudbursts. When single magazines are not isolated or where magazines are built in groups, each magazine should be surrounded with breastworks or baffle walls to minimize damage to adjacent structures in case of an explosion and to protect magazines from bomb and shell fragments.

(2) TM 9–1900 gives the distances at which magazines should be located from other magazines, buildings, and routes of communication.

b. Temoprary Magazine Construction.

(1) Temporary magazines made of heavy sheet iron sections are the most satisfactory, but care must be taken to prevent them from becoming too hot if exposed to the sun, particularly in hot climates. This may be done by using a double roof, the lower roof being of lumber and the upper roof of metal supported above it to leave space for free circulation of air between the two. If a single roof of sheet iron is used, some protection against intense heat is gained by painting the outer surface with aluminum paint.

(2) The types of structures described in (*a*) through (*d*) below may be used to accommodate moderate stocks of explosives.

(*a*) A chamber excavated in a dry bluff and timbered to prevent caving.

(*b*) An isolated house or shed.

(*c*) A light wooden frame erected on the plan of a box house with a wedge roof and covered with lightweight corrugated iron.

(*d*) A light wooden frame as described in (*c*) above covered with a tent or with canvas paulins.

c. Field Storage. In overseas commands and combat areas, the storage provisions of FM 9–6 should be observed.

d. Operation. Magazine operation should be based on the precautions in (1) through (12) below.

(1) Blasting caps will not be stored in the same magazine with other explosives. Primed demolition blocks or cartridges will not be kept in a magazine.

(2) Older explosives will be shipped first. Stocks should be arranged so that old stocks will be most readily accessible.

(3) Safety hand tools (nonsparking) must be used in buildings and at operations involving loose or bulk explosives, exposed explosives, and in the presence of hazardous concentrations of flammable gases and vapors.

(4) Matches, fire, nonsafety lamps, or spark-producing devices will not be allowed in a magazine.

(5) Cases of dynamite and any other nitroglycerin explosives will be stored right side up, not on sides or ends, so the cartridges will lie horizontally.

(6) Miscellaneous material will not be stored in a magazine with explosives.

(7) The grounds aroind magazines should be kept free from brush, dry leaves, or grass. A fence, preferably of barbed wire, should be erected around a magazine area.

(8) Packages of explosives may be opened only at a distance of not less than 100 feet from a magazine or dump.

(9) Shoes having exposed nails, metal plates, or cleats will not be worn in a magazine. Regulation safety shoes should be worn in magazines.

(10) Explosives should be stacked on planks or wooden mats for ventilation and protection against moisture. Explosives will not be stored in a damp place.

(11) Explosives will not be handled or stored in or near occupied buildings.

(12) Commercial dynamite should be turned periodically depending on temperature; see paragraph 35.

15. Transportation

Transportation of explosives by rail or truck in the United States is regulated by Interstate Commerce Commission Regulations for Transportation of Explosives and other Dangerous Articles by Freight, published by the Bureau of Explosives. Obtain a copy of the regulations and follow them exactly; see AR 55–157 and AR 55–470.

16. Packing and Marking for Shipment

a. Packing data for demolition materials are given in Department of the Army Supply Manual ORD 3 SNL R–7.

b. In addition to nomenclature and lot number, packages offered for shipment are marked with the Interstate Commerce Commission shipping name or classification of the article, volume and weight, the Ammunition Identification Code Symbol, and the Ordnance Corps escutcheon.

CHAPTER 2

EXPLOSIVE CHARGES

Section I. GENERAL

17. Types

The items described in this chapter consist of military explosives, such as trinitrotoluene (TNT), ammonium nitrate, nitrostarch, COMP C series explosives, tetrytol, pentolite, and similar explosives, in various sizes and shapes used as demolition charges and blocks in military demolition operations. Commercial dynamites used in military demolition operations are also described. Demolition explosives may be used as improvised land mines. On the other hand antitank mines as well as artillery shell and bombs may be used for demolition. For tactical employment of demolition materials described in this manual, see FM 5–25.

18. Characteristics

a. Requirements of demolition explosives for efficient and safe operation are a minimum of sensitivity, including insensitivity to bullet impact yet sufficient sensitivity to be positively detonated by simple initiators, relatively high detonation rate and power consistent with required insensitivity, storage stability at temperatures between −80° and 165° F., suitability for underwater use, and of optimum size and shape for convenient handling.

b. Characteristics used to aid in determining the appropriate explosive for a given operation are listed in table I. As general rules, the relative effectiveness of an explosive is proportional to the detonating rate, the high detonating rate explosives are more effective for the more intensive operations, such as cutting steel or breaching, and the lower detonating rate explosives are more effective for the bulkier operations, such as cratering.

Table I. Characteristics of Principal Explosives Used for Demolition

Name	Velocity of detonation (fps)	Relative effectiveness as external charge (TNT=1.00)	Value as cratering charge	Principal uses	Smallest cap required for detonation	Intensity of poisonous fumes
TNT (demolition blocks)	21, 000	1. 00	Good	General use in forward areas.	Special blasting cap, electric or nonelectric.	Dangerous.
				Cratering	Special blasting cap, electric or nonelectric.	Dangerous.
Ammonium nitrate (cratering charge).	11, 000	0. 42	Excellent	Same as TNT	Special blasting cap, electric or nonelectric.	Dangerous.
Nitrostarch	15, 000	0. 86	Good	Same as TNT	Special blasting cap, electric or nonelectric.	Dangerous.
Composition C2	26, 000	1. 34	Fair	Same as TNT		
Composition C3				Same as TNT		
Composition C4				Same as TNT		
Tetrytol	23, 000	1. 20	Fair	Same as TNT	Special blasting cap, electric or nonelectric.	Dangerous.
Straight dynamite	40%=15, 000 50%=18, 000 60%=19, 000	40%=0. 65 50%=0. 70 60%=0. 83	Good	Land clearing, cratering, and general use in rear areas.	No. 6 commercial cap.	Dangerous.
Ammonia dynamite (extra).	40%= 9, 000 50%=11, 000 60%=12, 000	40%=0. 41 50%=0. 46 60%=0. 53	Excellent	Land clearing, cratering, and general use in rear areas.	No. 6 commercial cap.	Dangerous.
Gelatin dynamite	40%= 8, 000 50%= 9, 000 60%=16, 000	40%=0. 42 50%=0. 47 60%=0. 76	Good	Land clearing, cratering, and general use in rear areas.	No. 6 commercial cap.	Slight.
Military dynamite (M1, M2, and M3).	20, 000			Land clearing, cratering, and general use in rear areas.	Special blasting cap, electric or nonelectric.	Dangerous.

Section II. DEMOLITION BLOCKS

19. Block, Demolition, Chain, M1 (Eight 2½-Lb. Blocks)

a. General. This explosive charge (fig. 5) consists of eight blocks of tetrytol strung on a 16-foot length of detonating cord (primacord) and packed in a haversack. It is provided primarily for demolition purposes. The entire chain, or any part of the chain, may be used laid out in a line, wrapped around an object, or as packed in the haversack. Since tetrytol is more powerful and more brisant than TNT (par. 23), this explosive is more effective in cutting steel and in demolition work. The blocks and detonating cord are comparatively insensitive to shock, but the assembly, which includes a tetryl pellet, is slightly more sensitive than TNT (par. 23). The detonating cord is detonated by a blasting cap or a detonator. Simultaneous detonation of unconnected blocks can be obtained when separated by as much as 10 inches of air.

b. Description. Each block of the eight blocks is rectangular in shape, 11 x 2 x 2 and enclosed in a crinkle-kraft paper bag. The blocks are cast in place on the detonating cord with 8 inches between blocks and 2 feet of detonating cord at each end. The charge is 75/25 tetrytol, with a cylindrical pellet of tetryl cast in each end of each block. Printed on the paper bag covering in at least one place is the designation: "BLOCK, DEMOLITION, CHAIN, M1 (TETRYTOL). MUST BE DETONATED BY ORDNANCE CORPS U. S. ARMY BLASTING CAP. ONE BLOCK=SIX ½-LB TNT BLOCKS."

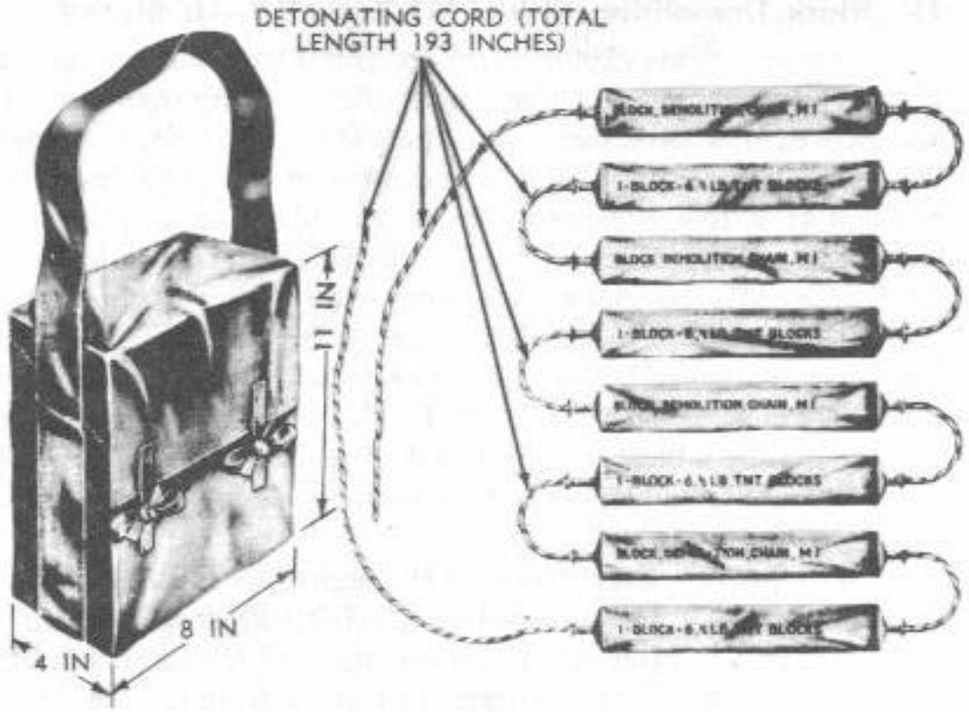
c. Packing. One chain is packed in a haversack, two haversacks (two chains) per box. The dimensions (in.) of the haversack are approximately 12½ x 9 x 4½, and its weight as packed is 22.5 pounds.

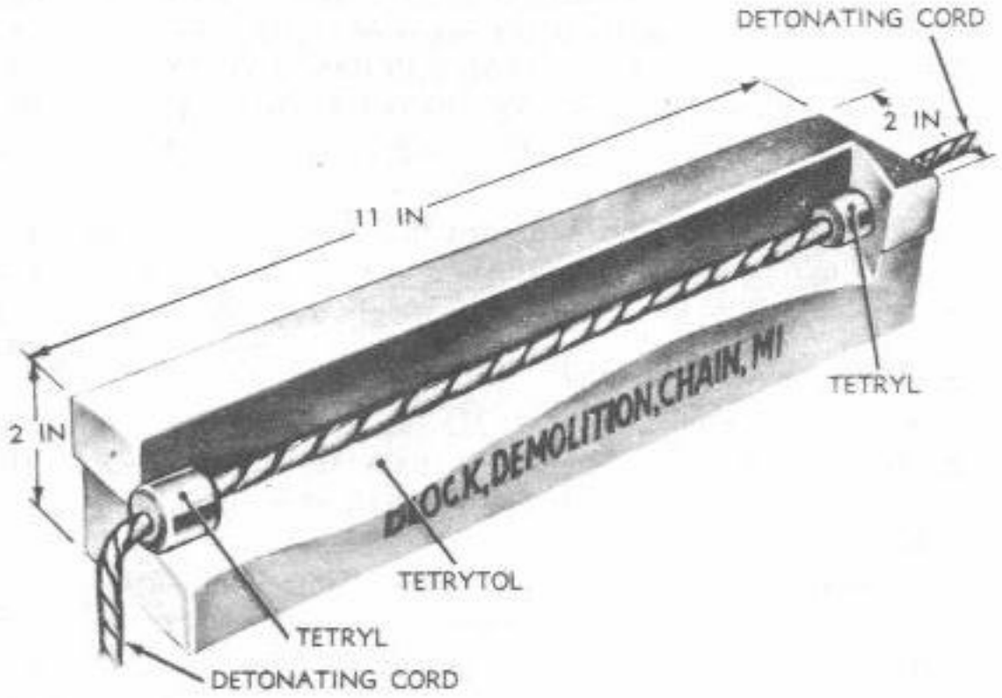
20. Block, Demolition, M2

a. General. Demolition block M2 (fig. 6) is similar to one of the eight blocks of BLOCK, demolition, chain, M1 (par. 19), except that, instead of a central core of detonating cord, there is a detonator well in each end.

b. Description. This demolition item is a block measuring 11 x 2 x 2. Each detonator well is threaded at the outer end to receive any standard firing device or a priming adapter. At the inner end of each well, there is a tetryl pellet cast in the block to act as a booster. Each block is wrapped in olive-drab paper on which is printed: "BLOCK, DEMOLITION, M2 (TETRYTOL). MUST BE DETONATED BY ORDNANCE CORPS U. S. ARMY BLASTING CAP. ONE BLOCK=SIX ½-LB TNT BLOCKS."

c. Packing. Packing is similar to that of the eight-block chain of demolition block M1. Eight demolition blocks M2 are packed in a haversack, two haversacks (16 blocks) per wooden box.





ENLARGED SECTIONED VIEW OF BLOCKS USED IN CHAIN

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Figure 5. Block, demolition, chain, M1, and carrying haversack for chain of blocks or for eight individual demolition blocks M1, M2, or M3.

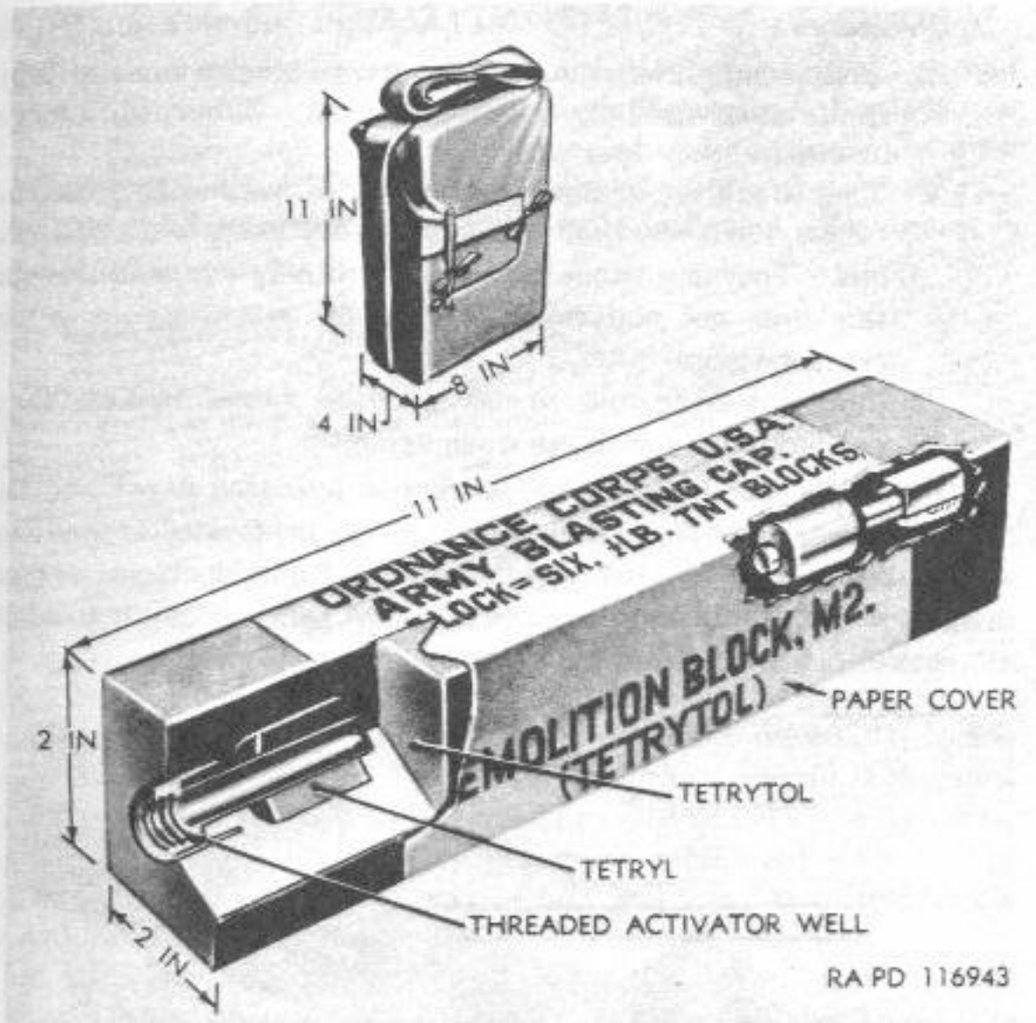


Figure 6. Block, demolition, M2—enlarged sectioned view and carrying haversack for eight blocks.

21. Block, Demolition, M3, COMP C2, and Block, Demolition, M3, COMP C3

a. General. These blocks (fig. 7) are rectangular 2¼-pound blocks of plastic explosive, 11 x 2 x 2. They are pliable and may be molded at temperatures between −20° and 125° F. However, composition charges are not easily molded at temperatures below freezing and, although body heat can keep the material pliable, emitted gases will cause sickening headaches. COMP C2 and COMP C3 are more powerful than TNT (par. 23) and of about the same sensitivity. The plasticity of the material permits it to be molded by hand like putty and packed into intimate contact with irregular objects with resulting high demolition efficiency. Being insoluble in water, blocks of COMP C2 or C3 are suitable for underwater demolition. Initiation may be by detonating cord tied in a double knot, with the plastic explosive molded into a ball around the knot.

b. Precautions.

(1) These compositions must not be exposed to open flame, as they ignite easily and burn with intense heat. If burned in large quantities, they may explode.

(2) They should not be stored below −20° F., because they become brittle, nor above 125° F., because they exude some of their oils. They may exude some oils at ordinary temperatures but this does not materially affect their sensitivity or other characteristics.

(3) They are dangerous to use in closed spaces, because they produce poisonous gases when exploded.

c. Packing. The blocks M3 are wrapped in glazed paper and inclosed in a labeled olive-drab cardboard carton perforated around the center, so that it may be readily broken open. Eight blocks are packed in an olive-drab cloth bag with carrying strap. Two bags (16 blocks) are packed in a wooden box.

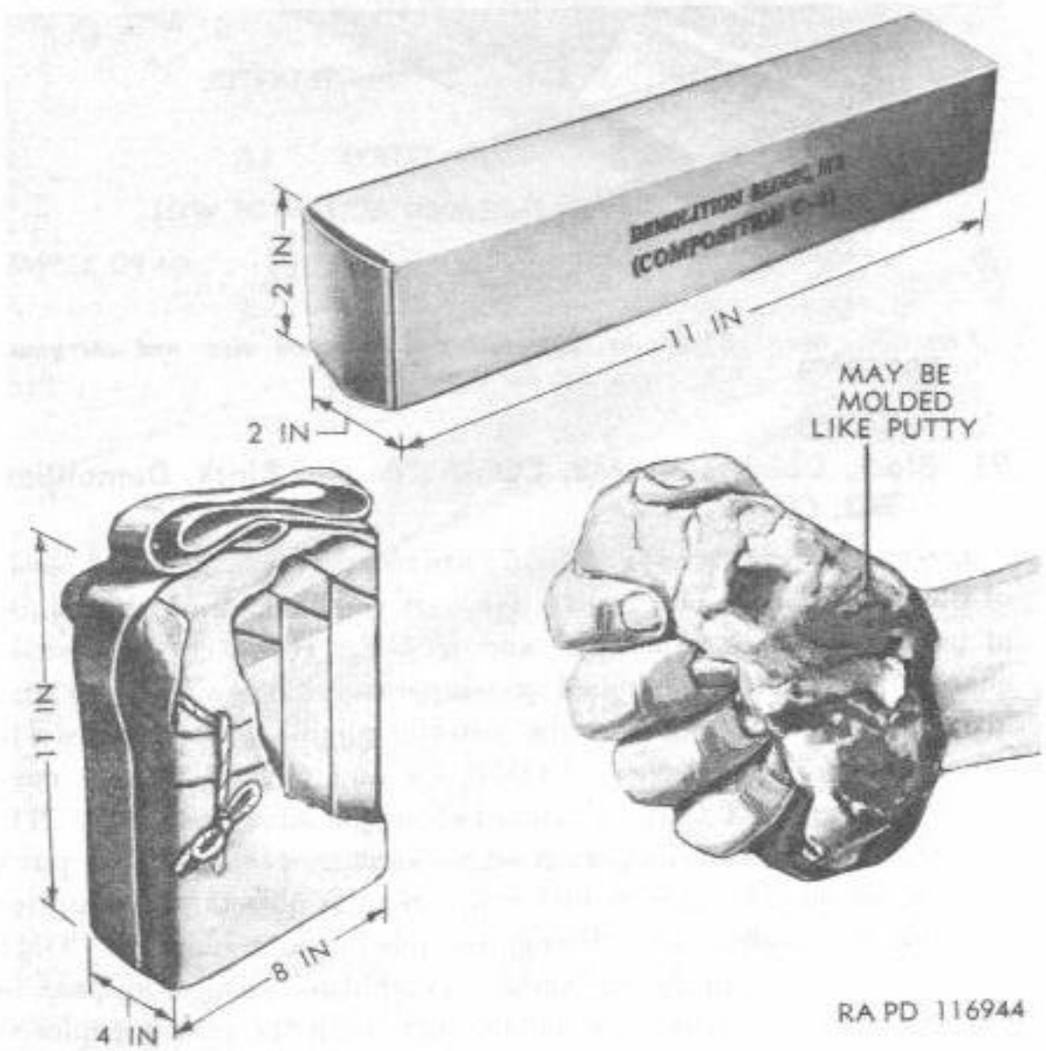


Figure 7. Block, demolition, M3 (COMP C3).

22. Block, Demolition, M5A1 (M5E1)

This block is slightly larger than the M3, similar in shape, and weighs 2½ pounds. It is composed of plastic explosive, composition C4. It is pliable and may be easily molded at temperatures between −70° and 170° F. Composition C4 is slightly more powerful than C3 and about the same order of sensitivity to initiation. This block is used in demolition kit M37 (par. 101).

23. Explosive, TNT, ½-Pound Block

a. Description. Trinitrotoluene (TNT), a powerful high explosive (fig. 8), is used in general demolitions primarily for cutting and breaching. It has a detonating rate of 21,000 fps and burns at 266° F. It can be burned in the open in small quantities without exploding. If an attempt is made to destroy it by burning when confined or in large quantities, it will explode. It is relatively insensitive to shock. Although it may not be exploded by the impact of a single rifle bullet, it would probably be exploded by concentrated rifle or machine gun fire. TNT is insoluble in water and can therefore be used in underwater charges. The ½-pound block is in a yellow container 1⅞ inches square and 3¾ inches long. One end of the block contains a threaded cap well 2⅛ inches deep to receive a priming adapter or a coupling base. A blasting cap, electric or nonelectric, is required to initiate the block. The nonelectric cap may be attached to a firing device or a length of safety fuse.

b. Special Precautions.

(1) TNT is not recommended for use in closed spaces, because its explosion produces poisonous gases.

(2) TNT is not consistently exploded by a cap less powerful than CAP, blasting, special, electric (Type II (J2 PETN)), or CAP, blasting, special, nonelectric (Type I (J1 PETN)) (par. 66).

c. Packing. The ½-pound blocks are packed 100 per wooden box.

24. Explosive, TNT, 1-Pound Block

This block is the same as the block described in paragraph 23, except as to length, weight, container, cap well, and packing. The 1-pound block consists of two ½-pound blocks packed in an olive-drab container 7 inches long and has a threaded cap well 2$^{9}/_{16}$ inches deep to receive either a priming adapter (pars. 71 and 72) or any standard firing device (pars. 54–60).

25. Explosive, TNT, 8-Pound Block

This block is made of cast TNT, and is 2 x 6 x 12 in size. It is packaged 8 blocks per wooden export box, each block being wrapped in waterproof barrier material, sealed in a manner that will comple-

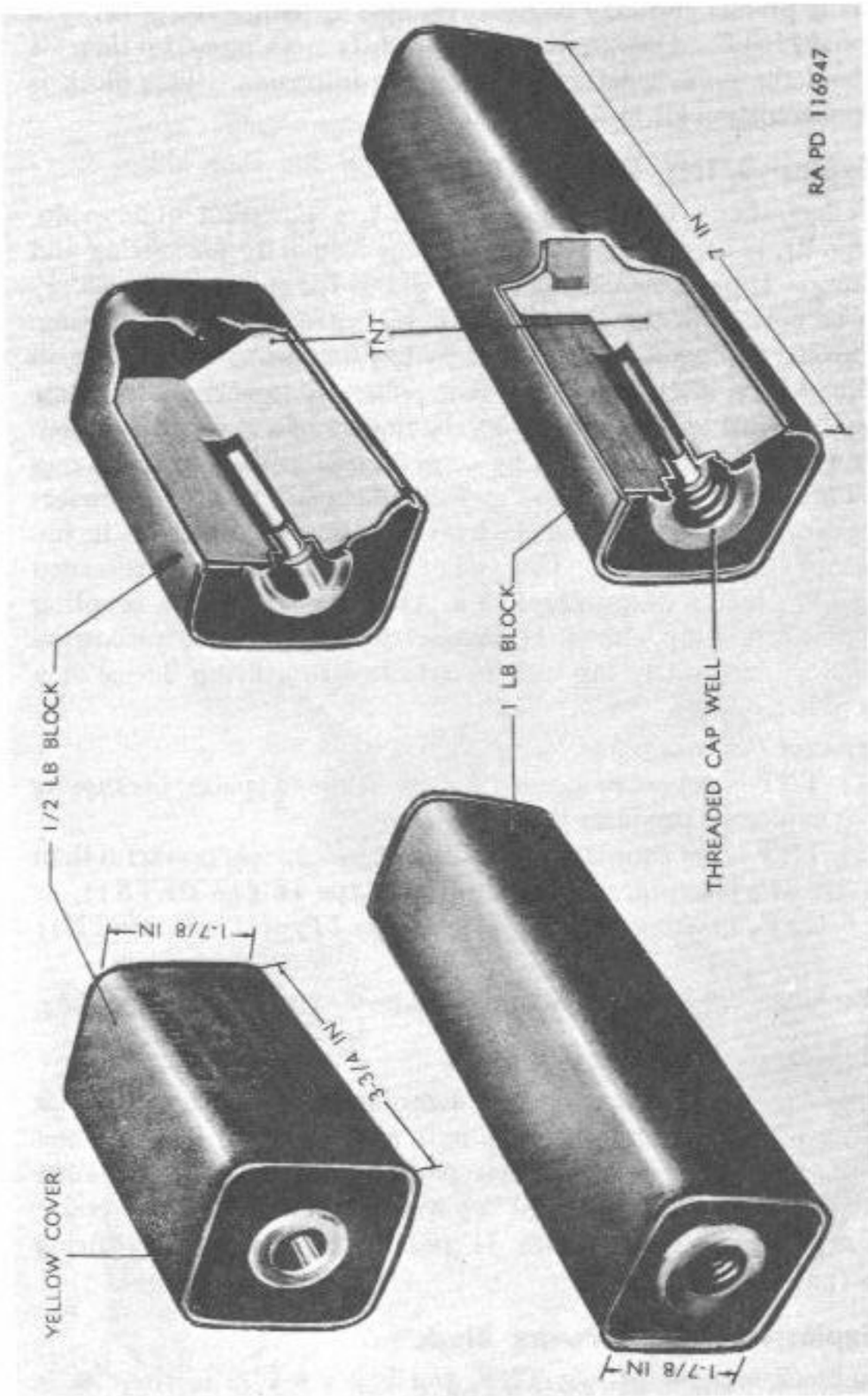


Figure 8. Explosive, TNT, ½-pound block, and explosive, TNT, 1 pound block.

ment the waterproofness inherent in barrier material. Each block is surrounded by filler material to cushion shocks incurred during overseas shipment. The 8-pound block is used as a charge auxiliary to antitank mine M6A2, also, for any suitable military demolition purposes in connection with other explosives that can initiate high order detonation in cast TNT.

26. Explosive, Nitrostarch, 1-Pound Block

a. Description. This item (A, fig. 9) consists of 12 square blocks of nitrostarch, each with a hole through its center. Groups of three blocks are wrapped into a ¼-pound package. Four of these ¼-pound packages are assembled and wrapped into a 2½-inch cubical 1-pound package. The blocks are so arranged in the package that the central holes form four continuous tunnels through the 1-pound package. These tunnels are called cap wells and their locations are marked by circles on the paraffin-treated outside wrapper. Nitrostarch is slightly less powerful than TNT (pars. 23–25) but has the same uses.

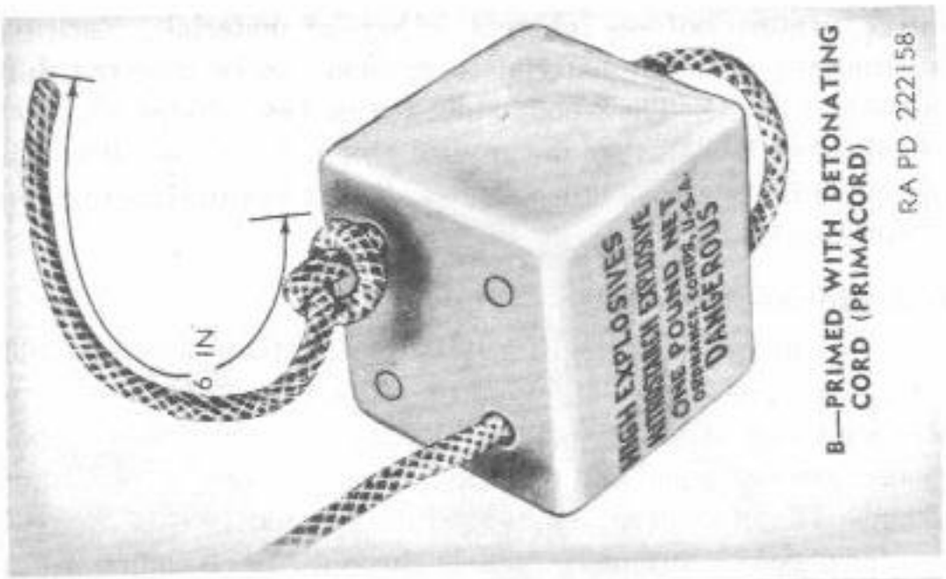
b. Priming. The 1-pound nitrostarch block is primed (B, fig. 9) by pushing holes through the wrapper with the punch handle of a crimper at two places marked by circles on the wrapper at diagonally opposite corners of the block, then passing detonating cord through the hole in one corner, then through the hole in the opposite corner, and tying a knot in the end of the cord to keep it in place. The cord may then be detonated at the opposite end by the 8-second delay detonator M2, by 15-second delay detonator M1, or by a blasting cap that, in turn, is detonated by time blasting fuse initiated by a fuze lighter.

c. Special Precautions.

(1) General precautions in handling explosives (par. 9) apply but it must be emphasized that nitrostarch is more sensitive to flame, friction, and impact than TNT or tetrytol. The blocks must not be broken or crushed.
(2) Blocks may explode if struck sharply.
(3) Blocks do not always explode with a cap less powerful than CAP, blasting, special, electric (type II (J1 PETN)) (par. 68).
(4) Nitrostarch is hygroscopic and therefore should be kept dry.
(5) Nitrostarch is somewhat soluble in water; it should be detonated promptly if used under water.
(6) Nitrostarch is not recommended for use in closed spaces, because its explosion produces poisonous gases.

d. Packing. The 1-pound blocks are packed 50 per wooden box.

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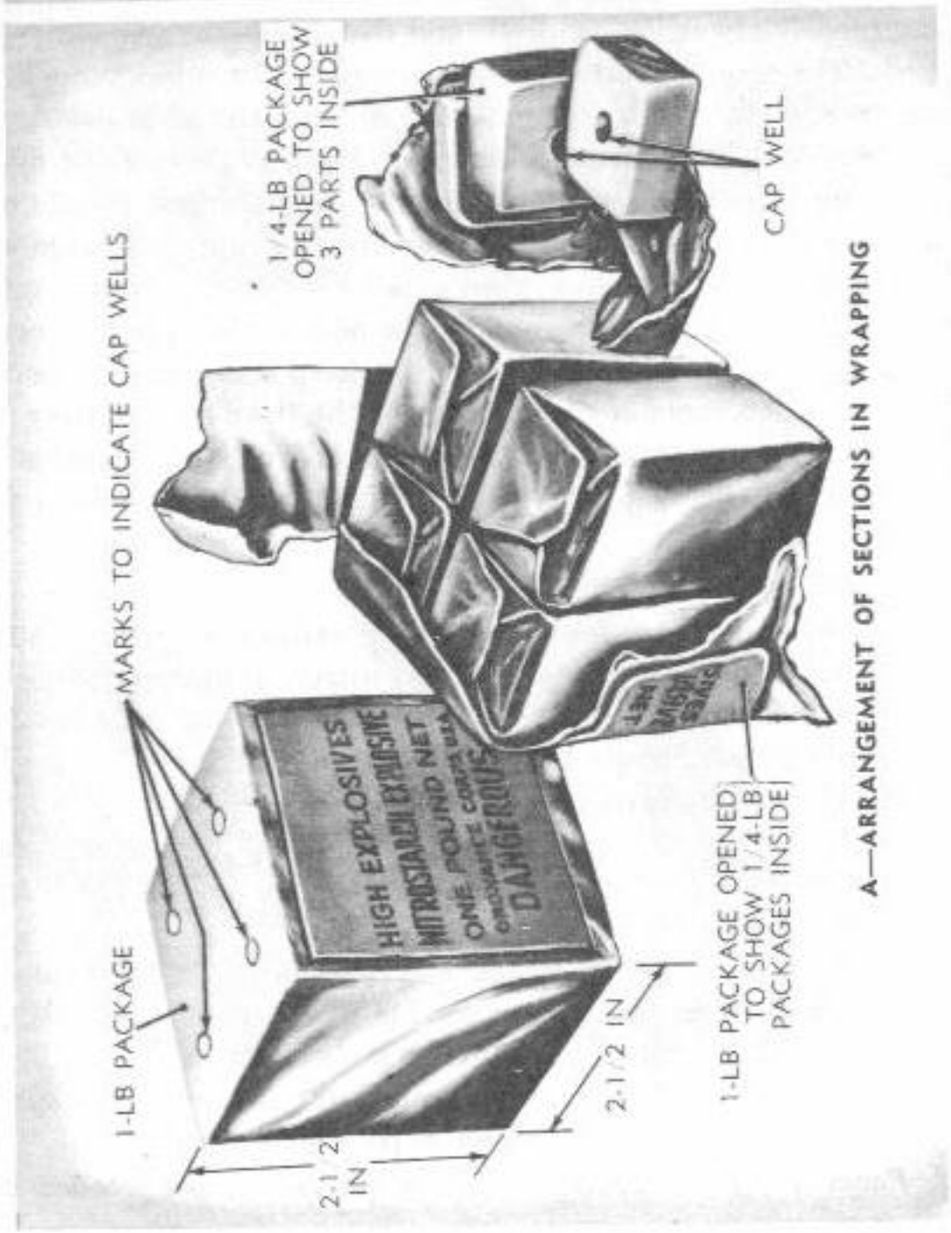


Figure 9. Explosive, nitrostarch, 1-pound block.

Section III. SHAPED CHARGES

27. General

Shaped charges used in military demolition consist of cylindrical blocks of high explosive having a conical or hemispherical metal-lined cavity in one end and a conical shape with blasting cap well at the other end. Detonation of the charge starts at the cap well and travels to the cavity where the detonation wave is said to be "focussed" to produce a narrow concentrated detonation jet resulting in penetration that is greater than could be produced without the cavity. With this effect, called "Munroe effect," boreholes can be blasted in steel, concrete, and similar material. Maximum penetration of a shaped charge is obtained when it is exploded at a certain characteristic distance, called "stand-off," from its target. This distance is provided for by a fiber sleeve or metal legs supporting the charge at time of firing. Maximum effect is produced by a stand-off of one to one and a half times the diameter of the charge. A carrying strap is attached to the charge for suspending it in a horizontal position for firing against a vertical surface. Penetration data are given in table II.

28. Special Precautions in Use

In using shaped charges, the precautions in *a* through *h* below should be observed.

a. The charge should be centered over the point to be attacked.

b. The axis of the charge should be in line with the direction of the hole desired. If the target is other than horizontal, the charge should be tied, taped, or propped in place.

c. The proper stand-off can be obtained by using the legs or pedestal provided for the purpose.

d. There should be no obstruction in the conical cavity or between the charge and target, as any obstruction will materially reduce penetration effect.

e. Although the principal effect of a shaped charge is in its piercing jet, considerable blast and fragmentation effect will be produced in all directions, especially directly opposite the direction of the jet. Personnel should withdraw 50 feet before firing the charge and all personnel within 200 feet should be protected by adequate cover.

f. Since pentolite is somewhat more sensitive than TNT, shaped charges containing pentolite should be handled with appropriate care.

g. In using several charges at one time, 15-pound charges should not be placed closer than 5 feet from each other unless they can be fired exactly simultaneously, that is, by exactly equal lengths of detonating cord detonated by a single cap or main cord. In like manner, 40-pound charges should not be placed closer than 8 feet apart.

Table II. Penetration of Shaped Charges

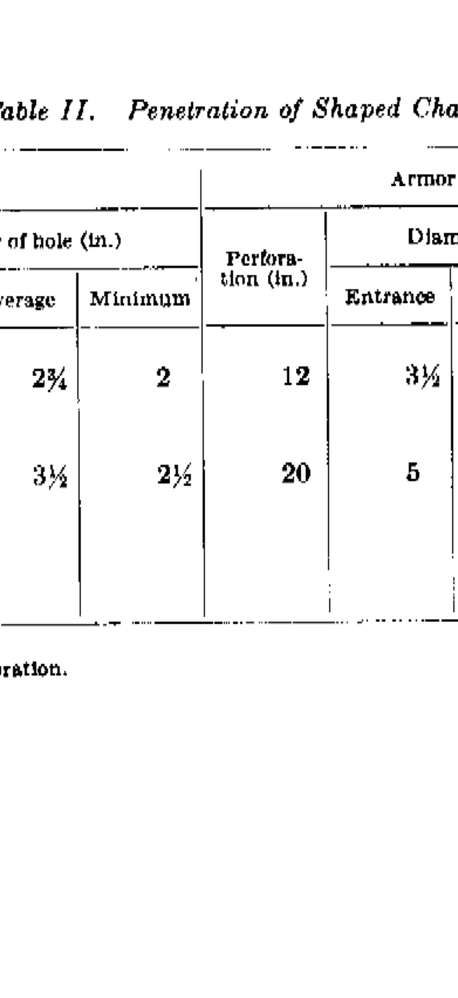
Model number of shaped charge	Reinforced concrete					Armor plate				Remarks
	Perforation [1] (in.)	Perforation [2] (in.)	Diameter of hole (in.)			Perforation (in.)	Diameter of hole (in.)			
			Entrance	Average	Minimum		Entrance	Average	Minimum	
M2A3	36	30	3¼	2¾	2	12	3½	1½	2	A second charge will increase concrete penetration to 45 inches.
M3	60	60	5	3½	2½	20	5	2½	2½	A second charge placed over the first hole will increase concrete penetration to at least 7 feet.

[1] Thickness of wall that can be perforated with charge.
[2] Depth of penetration when thickness is too great for perforation.

h. When shaped charges are used to blast boreholes for two-stage demolitions, care should be taken to allow the hole to cool sufficiently before loading the second demolition charge into the hole.

29. Charge, Shaped, 15-Pound, M2A3

a. Description. This charge (fig. 10) contains approximately 12 pounds of 50/50 pentolite, or COMP B with a 50/50 pentolite booster, in a moisture-resisting molded fiber container. The charge may be used in wet locations without deformation of the case. The top of the charge has a threaded cap well for receiving a blasting cap and adapter or any standard firing device. A cylindrical fiber base slips on the end of the charge, to hold the charge at the proper stand-off distance. A cone of glass is used as a cavity liner in this charge. This charge will pierce 36 inches of reinforced concrete (4,000 to 5,000 psi compressive strength) or in a wall of greater thickness will produce a hole 30 inches deep and 2 to 3½ inches in diameter.



RA PD 65159A

Figure 10. Charge, shaped, 15-pound, M2A3.

b. Packing. The shaped charge M2A3 is packed three per box; four per carton and two cartons (eight charges) per box; or four in a fiber container, one container per box. As packed, the charge is nested in its cylindrical base.

30. Charge, Shaped, 40-Pound, M3 (T3)

a. Description. This charge (fig. 11) contains approximately 30 pounds of 50/50 pentolite, or COMP B with a 50/50 pentolite booster, in a metal container. The cavity liner is made of metal. A threaded cap well is provided for receiving a blasting cap and adapter or any standard firing device. A metal tripod for gaging correct stand-off distance is shipped unassembled, but nested with the charge in the same container. This charge will penetrate 60 inches of reinforced

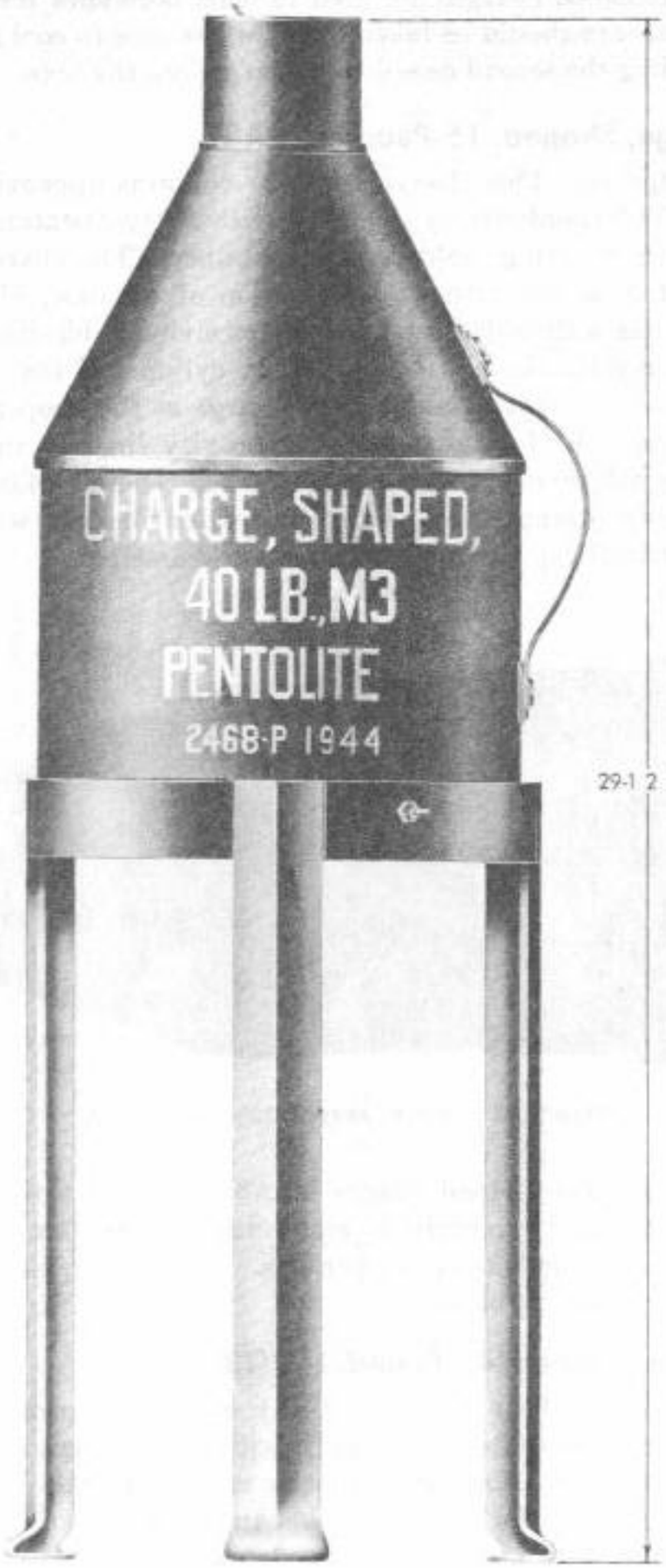


Figure 11. Charge, shaped, 40-pound, M3.

concrete (4,000 to 5,000 psi compressive strength) with a hole tapering from 5 inches to 2½ inches in diameter.

b. Packing. The shaped charge M3 is packed one per fiber container, one container per wooden box.

31. Container, Cavity Charge, Mk 2

a. Description. This container (fig. 12) consists of a body, a cone, and legs. The body is of terne plate or standard tin can stock in the shape of a hollow cylinder, 1 inch in diameter and 1¼ inches in length. The cone, which has an angle of 80°, is of sheet steel and fits into one end of the body, to provide the shape of the charge that the body is designed to hold. Three legs consisting of one-sixteenth-inch wire, 9 inches in length, are soldered to the outside of the body at the cone end, to provide the stand-off distance for the charge. The weight of the container is 0.25 pound. There are also cavity charge containers designated Mk 1, Mk 3, and Mk 4, which are Navy responsibility.

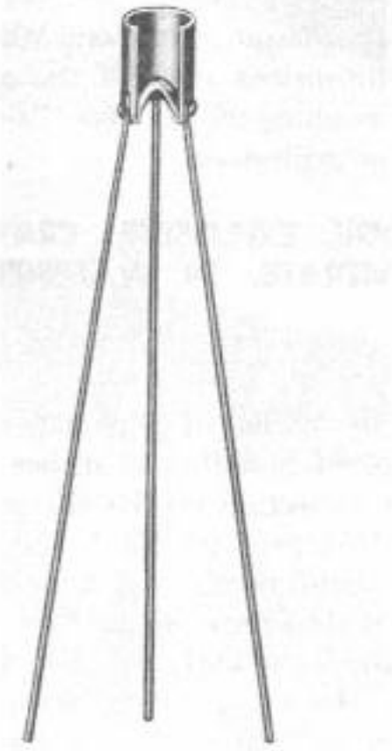


Figure 12. Container, cavity charge, Mk 2.

b. Functioning. The container when loaded is intended to open thin-skinned explosive-filled ammunition or charges by initiating low-order functioning. The charge to be used in the CONTAINER consists of 0.6 ounce of COMP C3 with nonelectric or electric special

blasting cap inserted one-quarter to three-eighths of an inch into the center of the top of the explosive and with its axis in line with the axis of the container. A stand-off distance of 8 inches, provided by the three wire legs is considered as the one most likely to give consistent low-order functioning of thin-skinned explosive-filled demolition materials or ammunition. Due to this large variation from the optimum stand-off distance of one to one and a half times the diameter of the charge, the jet will not always penetrate the explosive covering. If the demolition materials or ammunition item fails to initiate "low order" after the first shot, a second shot may be made at a different spot, using the same stand-off distance. If this fails, the stand-off distance should be lessened by 2 inches on each successsive shot until the item is opened. Although designed to open thin-skinned explosive items with low-order functioning of the explosive filling, there is a possibility that the explosive will detonate "high-order," hence precautions should be made to have all personnel under cover when using this charge as indicated. Making two shots at one place on thin-skinned explosive items increases the probability of high-order detonation.

c. Packing. Cavity charge containers Mk 2 are packed 50 per wooden box. The dimensions (in.) of the containers are approximately 6 x 6 x 9½, weighing 20 pounds. The box is labeled to indicate that it contains no explosives.

Section IV. CHARGE, EXPLOSIVE, CRATERING, 40-POUND, AMMONIUM NITRATE, IN WATERPROOF METAL CONTAINER

32. Description

This charge (fig. 13) consists of 40 pounds of ammonium nitrate in a light metal waterproof container 17 inches long and 8¼ inches in diameter. The central section of the charge consists of a booster of TNT. A cap well for priming the charge with time blasting fuse (safety fuse) and a blasting cap and a detonating cord tunnel for priming the charge with detonating cord are attached to the outside of the container opposite the booster. The cleat between the tops of cap well and tunnel is for tying safety fuse and blasting cap securely in place in the cap well with a piece of string or for tying detonating cord securely in place in the tunnel with a piece of string.

33. Packing and Use

The charge is packed in an individual wooden box (fig. 14). The charge is used for blasting craters in roads and for similar demolition. The relatively low speed of detonation renders the charge unsuitable for cutting steel.

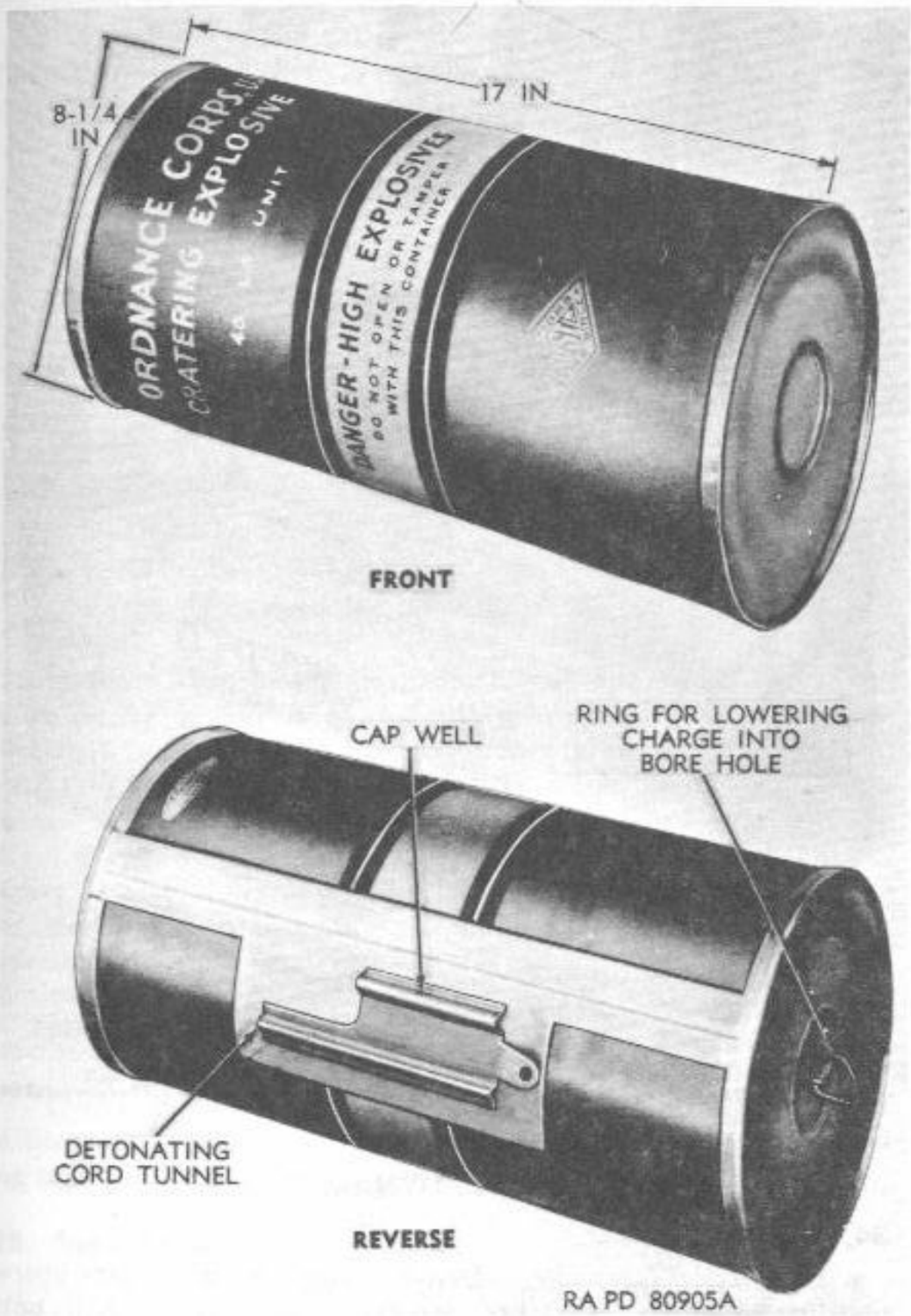


Figure 13. Charge, explosive, cratering, 40-pound, ammonium nitrate.



Figure 14. Charge, explosive, cratering, 40-pound, ammonium nitrate—packing box.

Section V. DYNAMITES

34. General

a. Commercial Dynamites. Dynamites are used in military operations for demolition, excavation, and cratering. Until recently, only the commercial dynamites were available for this purpose. The types prescribed for these operations are ammonia dynamite, gelatin dynamite, and ammonia gelatin dynamite. The percentage designation of commercial dynamites is the percentage by weight of the nitroglycerin

content. Commercial dynamites may be exploded when primed with a No. 6 or larger commercial blasting cap or by special blasting caps (pars. 63—68). Commercial dynamites are issued in ½-pound paraffin-treated paper cartridges, 1¼ inches in diameter by 8 inches long (fig. 15). For packing data, see Department of the Army Supply Manual ORD 3 SNL R–7. For additional information on dynamites, see TM 9–1910.

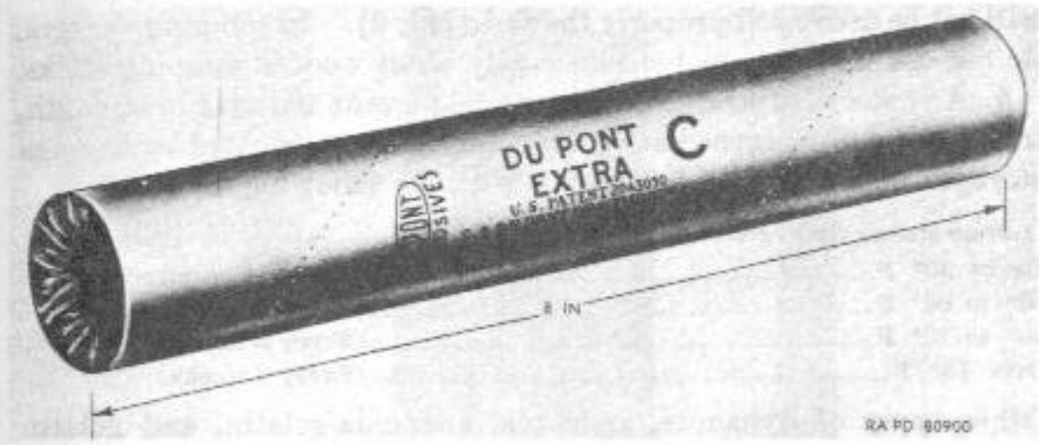


Figure 15. Dynamite cartridge.

b. Military Dynamites. The recently standardized military dynamites are for general use as a medium velocity blasting explosive replacing 60-percent commercial dynamites in military construction, quarrying, and service demolition work. The military dynamites contain no nitroglycerine and will not freeze in cold storage nor exude in hot storage. Turning of shipping containers in storage is not necessary. Safety in transportation, storage, and handling is much better than commercial dynamites. Military dynamites are packaged in standard dynamite cartridge waxed paper wrappers. Cartridge dimensions are as follows—

Dynamite, military, M1—1¼ inches diameter, 8 inches long
Dynamite, military, M2—1½ inches diameter, 8 inches long
Dynamite, military, M3—1½ inches diameter, 12 inches long.

Military dynamites may be exploded when primed with special blasting caps.

35. Special Precautions

Dynamites must be *handled with caution* because they may be exploded by flame, sparks, friction, and sharp blows, including impact from bullets or shell fragments. Explosion of some dynamites produces poisonous fumes that are dangerous in closed spaces. As compared to 60 percent straight nitroglycerin commercial dynamite, mili-

tary dynamites are relatively insensitive to friction, drop impact, and rifle bullet impact. Since the nitroglycerin in commercial dynamites drains to the bottom of the cartridges they should be turned in storage as in *b* below. Military dynamites do not contain nitroglycerin and do not need turning in storage.

a. General precautions in handling explosives (par. 9) apply, but it should be emphasized that dynamite that has deteriorated from age or other causes should not be used but should be destroyed as described in paragraph 10. Dynamite that is frozen but otherwise serviceable will not be used until properly thawed (par. 9). In tamping charges, do not use steel bars or tools; use only blunt wooden tamping sticks.

b. Any stocks of straight dynamite, 60 percent and over in strength, in storage will be turned at regular intervals as indicated by average storage temperature, in accordance with the following schedule:

Average storage temperature	*Interval to be turned*
Below 30° F	Does not require turning
30° to 60° F	Every 4 months
60° to 75° F	Every 3 months
Over 75° F	Every 6 weeks

Other types of dynamite, ammonia, ammonia-gelatin, and gelatin dynamites will not be turned in storage. However, yearly, at the conclusion of the hottest portion of the year, a *representative* sample will be selected and the containers examined for evidence of nitroglycerin exudation on the exterior of the cartridge. If exudation is found, the lot or lots involved will be reported on Ammunition Condition Report, 00 Form 517 (00 Form 7235 until exhausted) with recommendation for destruction.

Section VI. TORPEDO, BANGALORE, M1A1

36. General

TORPEDO, bangalore, M1A1 (fig. 16), consists of a group of 10 loading assemblies (steel tubes filled with high-explosive), which are used singly or in series with nose sleeve and connecting sleeves, for blasting a path through barbed wire entanglements or other obstructions or used in bundles as substitute explosive charges in the demolition snakes M2 series and M3, paragraphs 109 through 119.

37. Description and Functioning

The loading assemblies (tubes) are 5 feet in length and 2⅛ inches in diameter, grooved, and capped at each end. The explosive in the tubes is amatol, with about 4 inches of TNT at each end. The total weight of explosive in each tube is about 9 pounds. Each end of the loading assembly (tube) contains a threaded cap well, to accommodate any "issue" firing device with a blasting cap crimped thereto. The

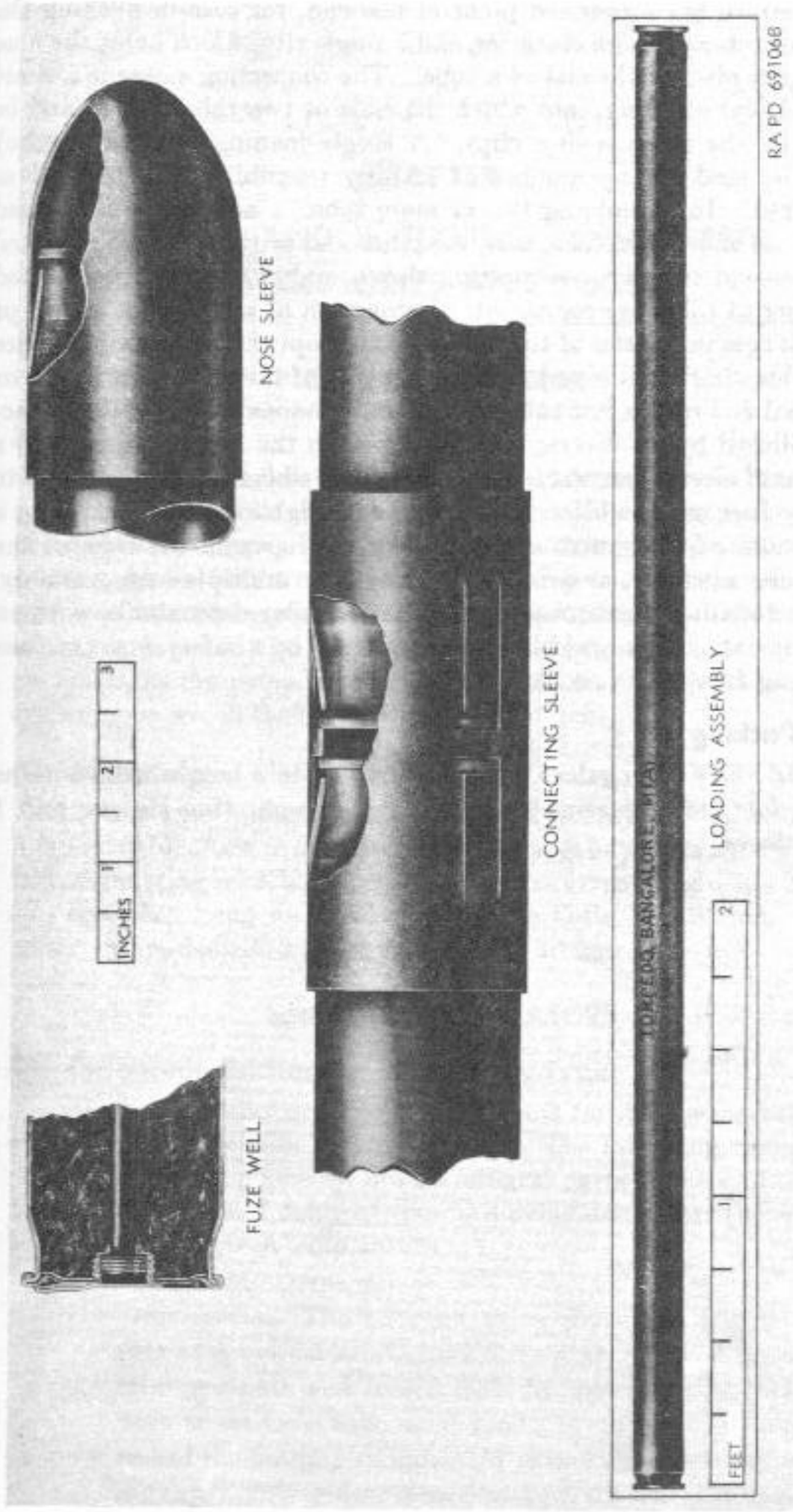


Figure 16. Torpedo, bangalore, M1A1.

nose sleeve has a rounded point at one end, for ease in pushing the tube or tubes through obstacles, and a single clip, which holds the nose sleeve in place at the end of a tube. The connecting sleeve is a short cylindrical coupling, into which the ends of two tubes can fit and be held by the three spring clips. A single loading assembly (tube) may be used or any number of loading assemblies may be used as required. In assembling two or more tubes, a nose sleeve is pressed onto one end of one tube, then the other end of this tube is connected to a second tube by a connecting sleeve, and so on until the desired number of tubes are connected. Detonation of a charge in a tube or all charges in a series of tubes may be accomplished by a firing device with blasting cap screwed into the cap well of the tail end of a tube or the tail end of the last tube in a series. Detonation may also be accomplished by an electric blasting cap with the leads connected to a source of electric current, or by a nonelectric blasting cap attached to safety fuse or time blasting fuse and fuse lighter, or by wrapping a minimum of four turns of detonating cord around the tube in the one-tube assembly, or around any tube in a multiple-tube assembly, and detonating the detonating cord with a delay detonator or with an appropriately arranged blasting cap primed by a safety fuse (or time blasting fuse) and fuse lighter.

38. Packing

TORPEDO, bangalore, M1A1, is packed in a box, which contains ten 5-foot loading assemblies (tubes), 10 connecting sleeves, and 1 nose sleeve.

CHAPTER 3

PRIMING AND INITIATING COMPONENTS, ACCESSORIES AND TOOLS

Section I. GENERAL

39. Priming

There are two groups of demolition materials that may be designated as the main explosive charges and the subsidiary materials known as priming materials required to initiate those charges in a safe, efficient, and expeditious manner. The use of priming materials in connection with explosive charges is indicated in paragraph 6, which explains the explosive train and also in complete round chart (app. I). Initiating materials, as the name implies, refers to those items in an explosive system upon which the first action is performed.

40. Materials

Priming and initiating materials consist of such materials as lighters, detonators, firing devices, primers, safety fuse, time blasting fuse, detonating cord, blasting caps, electric current producing devices, and accessory items and tools required in their installation. These materials are described in paragraphs 41 through 89.

Section II. DETONATORS

41. Detonator, Friction Igniter—Delay Type

a. General. Delay detonators are devices for detonating explosive charges after a definite period of delay. The initiating mechanism, delay system, and detonator are all integral parts of the unit. Table III gives the time of delay of standard delay detonators that may be anticipated at a given temperature.

b. 8-Second Delay Detonator.

(1) *Description.* The 8-second delay detonator (fig. 17) consists of a cylindrical-shaped olive-drab plastic housing containing a pull wire coated with friction material. The pull wire is set in a flash compound. A tube set in the lower end of the housing contains a 8-second time fuse and a blasting cap. This igniter is used to delay the firing of demolition

Table III. Temperature-delay for friction igniter detonators.

Degrees F	Time delay	
	8-sec delay detonator	15-sec delay detonator
140	7.8 to 9.1 sec	13.1 to 14.0 sec.
100	8.6 to 9.6 sec	14.2 to 15.0 sec.
60	9.5 to 10.2 sec	15.3 to 17.1 sec.
20	10.4 to 11.2 sec	16.0 to 18.0 sec.
−40	9.6 to 11.0 sec	17.5 to 19.5 sec.

charges, particularly during assault demolitions. It is also used to fire underwater charges.

(2) *Functioning.*

(*a*) With safety pin removed, pulling on T-ring draws coated wire through flash compound.

(*b*) Flash ignites powder-train delay.

(*c*) Eight seconds later, the delay element explodes the attached blasting cap. Actual time delay of 8-second delay igniter varies with temperature from approximately 10.5 seconds at 0° to 7.8 seconds at 140° F.

(3) *Preparation for use.*

(*a*) Remove protector cap.

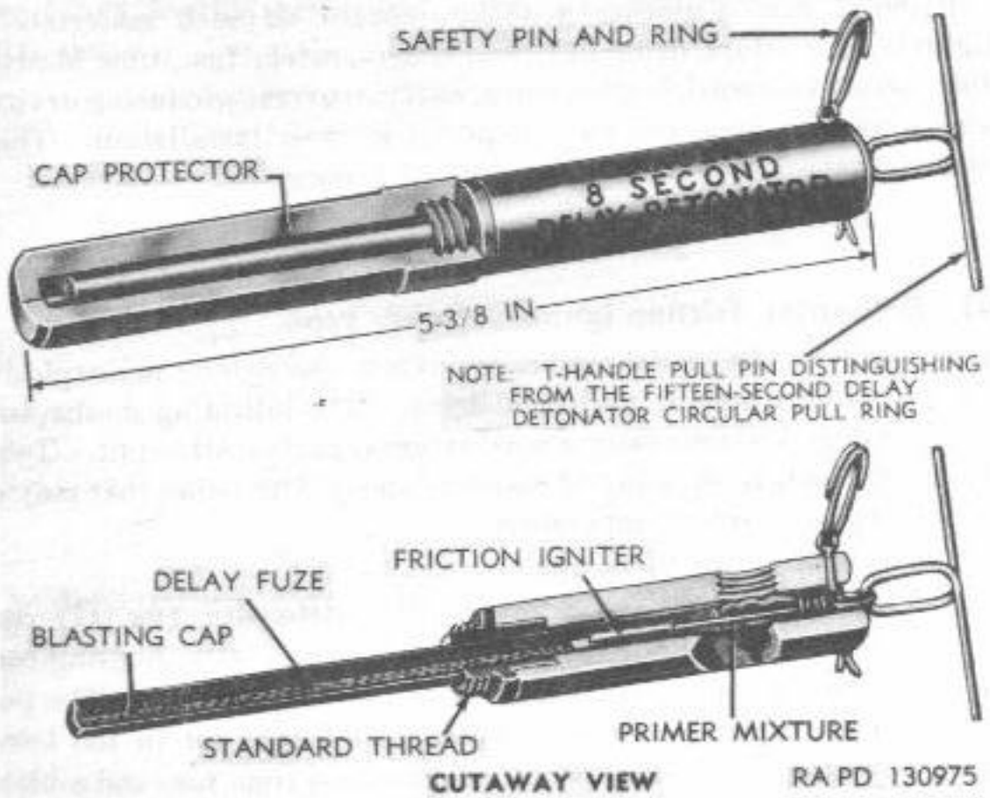


Figure 17. Detonator, 8-second delay, M2.

(*b*) Screw into threaded cap well in explosive.

(*c*) Place charge.

(*d*) Remove safety pin.

(*e*) Pull T-ring vigorously to fire and leave area immediately. *Do not stop to investigate installation.*

Caution: Once safety pin is removed, any movement of T-ring may ignite delay powder train and fire the detonator in prescribed time. There is little warning as the powder train gives off practically no smoke and is practically noiseless in burning.

(4) *Neutralizing.* The detonator cannot be neutralized once the T-ring has been pulled. If T-ring has not been pulled, proceed as directed in (*a*) through (*c*) below.

(*a*) Reinsert safety pin.

(*b*) Unscrew the detonator from charge.

(*c*) Replace protector cap.

Note. Once the T-ring has been pulled, this delay detonator cannot be reused.

(5) *Packing and transporting.* Ten detonators are packed in a cardboard box, five boxes in an inner packing, four inner packings (200 detonators) per wooden box; the complete packing weighs 53 pounds.

c. 15-Second Delay Detonator.

(1) *Description.* The 15-second delay detonator (fig. 18) is identical to the 8-second delay detonator in overall appear-

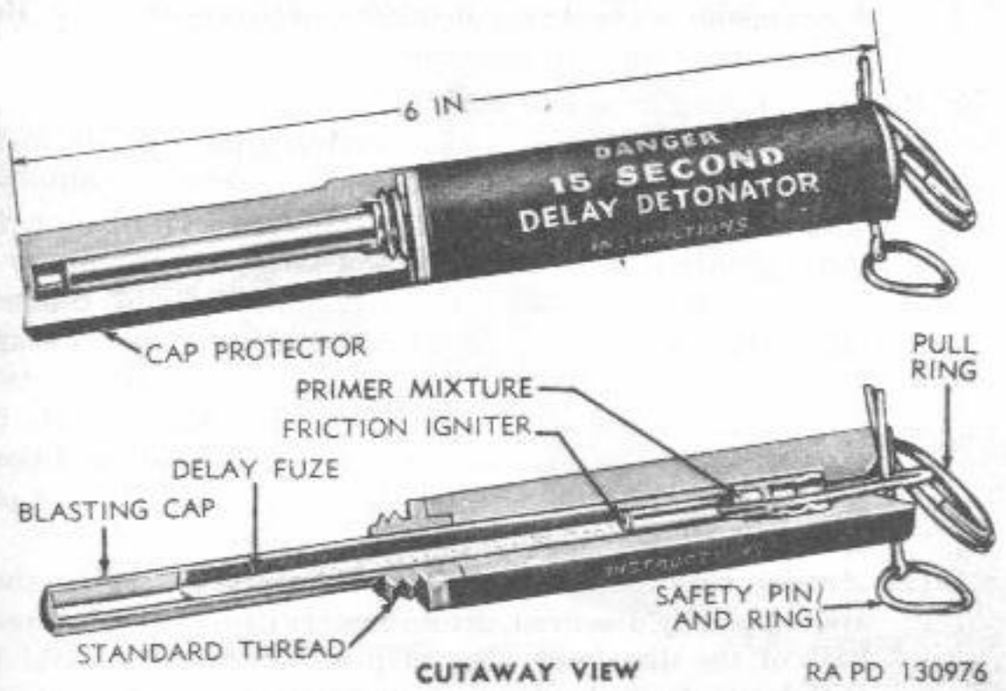


Figure 18. Detonator, 15-second delay, M1.

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ance and functioning. However, the pull ring is circular and the powder-delay train is of 15-seconds duration. The detonator is used for similar purposes as for the 8-second delay detonator. Preparation for use, neutralizing, and nonreuse are the same as for the 8-second delay detonator.

(2) *Packing and transporting.* Two hundred detonators are packed in a wooden box; complete packing weighs approximately 56 pounds.

42. Detonator, Concussion—Delay Type

a. General.

(1) *Description.* The concussion detonator M1 (fig. 19) is a mechanical firing device that is actuated by a concussion wave of a blast. It can be used to fire several charges simultaneously without interconnecting the charges with wires or detonating cord. A single charge fired in water or in air will detonate all charges equipped with concussion detonators within range of the main charge or each other. Table IV gives ranges at which concussion detonators function reliably in either air or water.

(2) *Functioning.* The detonator consists of a diaphragm-type-spring-loaded striker, restrained by a safety ball. The ball is held in place against the beveled shoulders of the striker by a spacer and a safety pin. When the safety pin is pulled, the positioning spring pushes the striker forward. This moves the safety ball and spacer upward, freeing the striker. A concussion wave strong enough to overcome the snap diaphragm functions the detonator.

b. Preparation for Firing in Water.

(1) *Delay tablets.* To provide safety while arming the device in water, two water-soluble time-delay salt tablets are supplied with the detonator. The blue tablet gives a delay of approximately 3½ minutes and the yellow tablet approximately 7 minutes. However, since the dissolving time of the salt tablets varies with surf conditions and water temperature, tests should be made to determine the arming time before preparing and installing the charge. The test is made by submerging the device to the proper depth under conditions similar to those anticipated in the actual operation and observing the dissolving time of the salt tablet.

(2) *Arming time.* Since the salt tablets become soft before they are completely dissolved, detonators are dangerous after one-half of the dissolving time elapses. Personnel should be withdrawn from the danger area within half of the arming time, since a nearby concussion from enemy bombs or shells

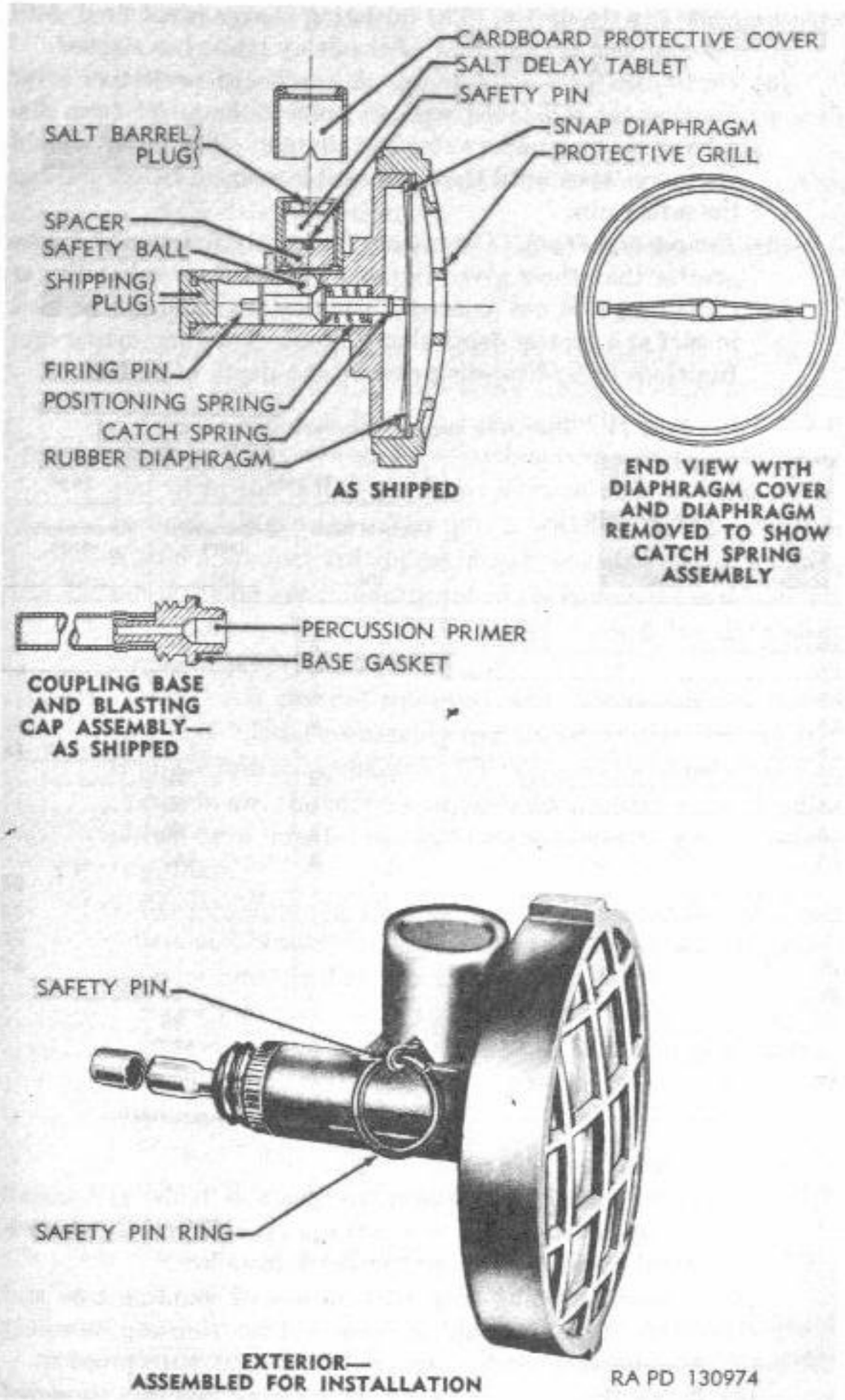


Figure 19. Detonator, concussion, M1.

could fire the device. The initiating charge is not fired until the complete arming time of the delay tablet has elapsed.

(3) *Cardboard protective cover.* A cardboard protective cover fits over the salt tablet well, to prevent the tablet from dissolving during underwater installation. The cover should not be removed until the last possible moment before pulling the safety pin.

(4) *Ranges and depth.* Detonators frequently function at ranges greater than those given in table IV, but their reliability at those ranges is not assured. The device should not be used in surf at a greater depth than 15 feet. The snap diaphragm functions by hydrostatic pressure at a depth of 25 feet.

Table IV. Operating range of concussion detonators.

Initiating charge (lb)	In water		In air
	Depth of water (ft)	Recommended range (ft)	Recommended range (ft)
0.5	2	10	
0.5	4	50	
0.5	6	80	
0.5	8	80	
2.5			15
2.5	2	20	
2.5	4	80	
2.5	6	80	
2.5	8	150	
5			20
10			35
15			35
20			35
20	2	20	
20	4	80	
20	6	180	
20	8	260	

(5) *Installing device in water.*

(*a*) If long delay is necessary, remove blue tablet and install yellow tablet, taking care that spacer, safety pin, and cardboard protective cap are properly installed.

(*b*) Discard shipping plug from nipple of coupling base and carefully insert coupling base and blasting cap assembly with its associated gasket to form a tight waterproof fit.

(*c*) Screw the coupling base with blasting cap into threaded cap well of charge or connect blasting cap to charge with a short length of detonating cord.

(*d*) Wire or tie detonator to charge and make sure detonator diaphragm is free of obstructions and is clearly exposed.

(*e*) Place all charges in water where required.

(*f*) Remove cardboard protective covers from salt tablet wells.

(*g*) Remove safety pins.

(*h*) Evacuate danger area within one-half of the arming time of the delay tablets in use.

(*i*) Wait full interval of arming time of the delay tablet before firing initiating charge.

c. Preparation for Firing in Air.

(1) *Checking and preparing.* When the detonator is used in air, remove and discard the salt delay tablet. Before fitting the coupling base and blasting cap assembly to the detonator, check to make sure that the catch spring restrains the firing pin when the safety pin is withdrawn and that the spacer releases. When the safety pin is withdrawn, the firing pin should move forward approximately one-sixteenth of an inch, but it should not fall or fly out of the barrel of the detonator. If it falls or flies out of the barrel, discard the detonator. Replace the spacer and safety pin.

(2) *Range.* All charges equipped with concussion detonators should be placed reasonably equidistant and at least 15 feet from the initiating charge. When placed too close to another charge in air, the concussion wave frequently causes the diaphram to be impaled on the firing pin, resulting in a misfire.

(3) *Installing.*

(*a*) Remove shipping plug and carefully screw the coupling base and blasting cap assembly with its associated gasket firmly into the detonator.

(*b*) Screw the other end of the coupling base into the threaded cap well of the charge so that the blasting cap goes into the well, or connect the blasting cap to the charge with a short length of detonating cord.

(*c*) Wire or tie the detonator to charge, making sure that the detonator diaphragm is free of obstructions and is clearly exposed.

(*d*) Place all charges with detonator diaphragms facing initiating charge.

(*e*) Withdraw safety pins and evacuate area. *The detonators are immediately armed as soon as the safety pins are withdrawn.*

(*f*) Fire initiating charge when personnel are clear of danger zone.

d. Disarming.

(1) Depress spacer and force safety ball against shoulder of firing pin.
(2) Insert tenpenny nail through holes in salt barrel.
(3) Remove coupling base and blasting cap assembly from device.
(4) Restore to original condition and packing.

Section III. LIGHTERS

43. Lighter, Fuse, Friction Type, M1

This fuse lighter (fig. 20) is a device for initiating safety fuse or time blasting fuse. It consists of a paper tube containing friction powder, which is mechanically ignited. The open end, when placed over the end of safety fuse or time blasting fuse, is held in place by the barbed surface inside the fuse lighter. The barbs are inclined so they permit the fuse to enter, but prevent its removal except by force. A

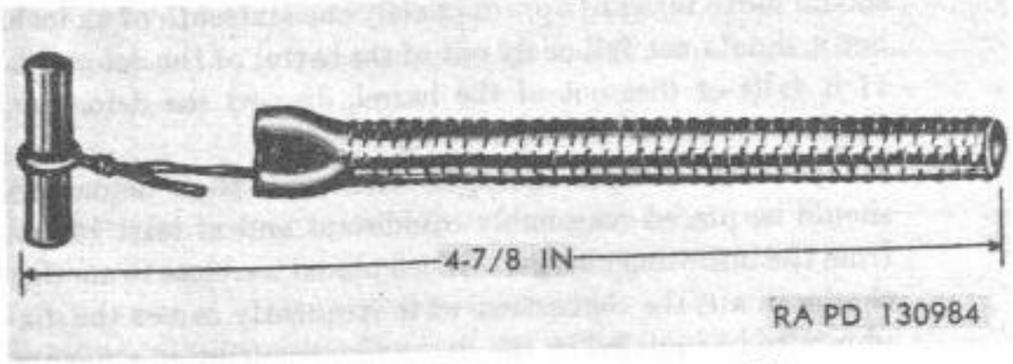


Figure 20. Lighter, fuse, friction-type, M1.

pull on the loop, or handle at the closed end, ignites the powder that, in turn, fires the powder train in the fuse. To prevent pulling the fuse lighter from the fuse and causing an air gap between the fuse end and the lighter, hold the body of the lighter in one hand and pull the igniter wire with the other. If any doubt exists as to whether the fuse is burning and the length of fuse will permit time, pull the fuse lighter off the fuse by force immediately after pulling the igniter wire.

44. Lighter, Fuse, Weatherproof, M2

The weatherproof fuse lighter M2 (fig. 21) consists of a barrel that holds the firing mechanism and a base that contains a percussion cap and has a pronged fuse retainer. The barrel contains the striker spring and striker, held locked in one end by a release pin. The other end is threaded to fit over the base. Plastic sealing material is used to waterproof the joint of the safety fuse (or time blasting fuse) and fuse lighter. When the release pin is pulled, the striker strikes the percussion cap that, in turn, ignites the fuse. The lighter will ignite the fuse under all weather conditions, even under water.

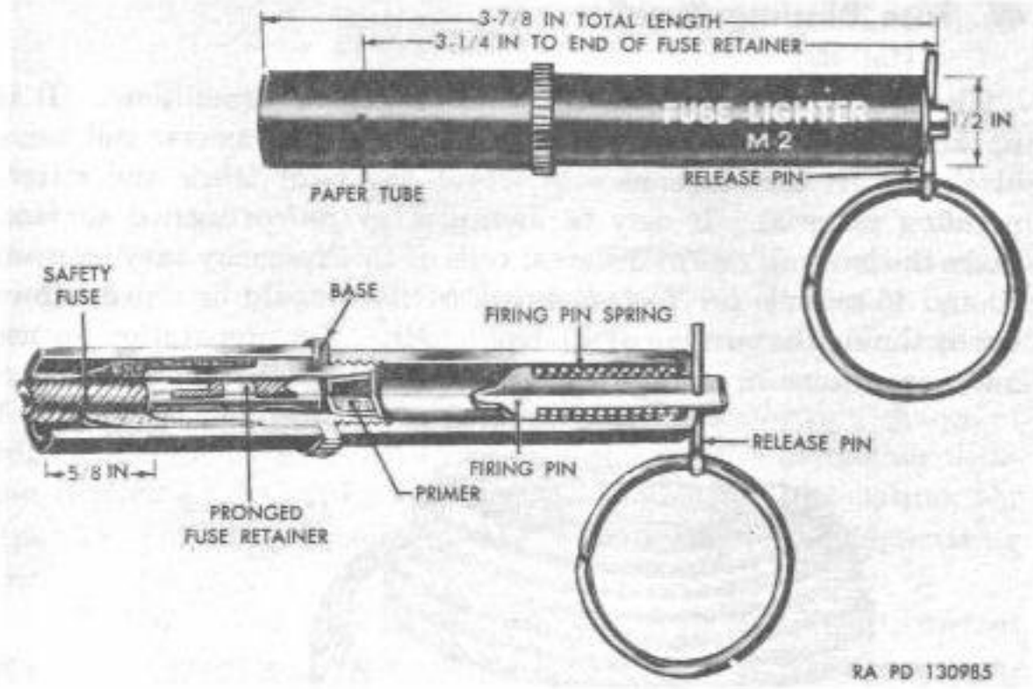


Figure 21. Lighter, fuse, weatherproof, M2.

Section IV. SAFETY FUSE AND TIME BLASTING FUSE

45. Fuse, Safety, M700

a. General. This fuse is standard for general use in military demolitions. It is in the form of a cord, 0.20 inch in diameter. It is dark green in color and smooth, with abrasive markings at 18-inch intervals that correspond to approximately 1 minute each of burning time. When ignited by an ordinary match or a fuse lighter, it transmits a flame to a nonelectric blasting cap, which may be installed in a high-explosive charge either on land or under water. The fuse, which has a black powder core, burns approximately a uniform rate of 40 seconds per foot, allowing the person firing a charge to walk to a place of safety before the charge explodes.

b. Preparation for use. In preparing to attach a nonelectric blasting cap, first cut off about 2 to 3 inches of fuse and discard. Cut the fuse squarely in the place provided in the jaws of the blasting cap crimper (par. 87). The fresh end of the fuse must be inserted firmly into the open end of the nonelectric blasting cap, then the cap crimped in the place provided in the jaws of the crimper.

c. Precautions in Storage and Handling. The fuse should be stored in a cool, dry place free from oils, paints, gasoline, kerosene, and similar distillates and solvents. In handling the fuse, avoid twists, kinks, or sharp bends that may crack the covering or cause breaks in the powder train of the fuse.

46. Fuse, Blasting, Time

(fig. 22)

The fuse is limited standard for use in general demolitions. It is in the form of a cord approximately 0.20 inch in diameter and has a black powder core covered with several layers of fabric and waterproofing material. It may be identified by its corrugated surface. Since the burning rate of different rolls of this fuse may vary between 30 and 45 seconds per foot, each roll of fuse should be tested before use by timing the burning of a 1-foot length. For preparation for use and precautions in storage and handling, see paragraph 44*b* and *c*.

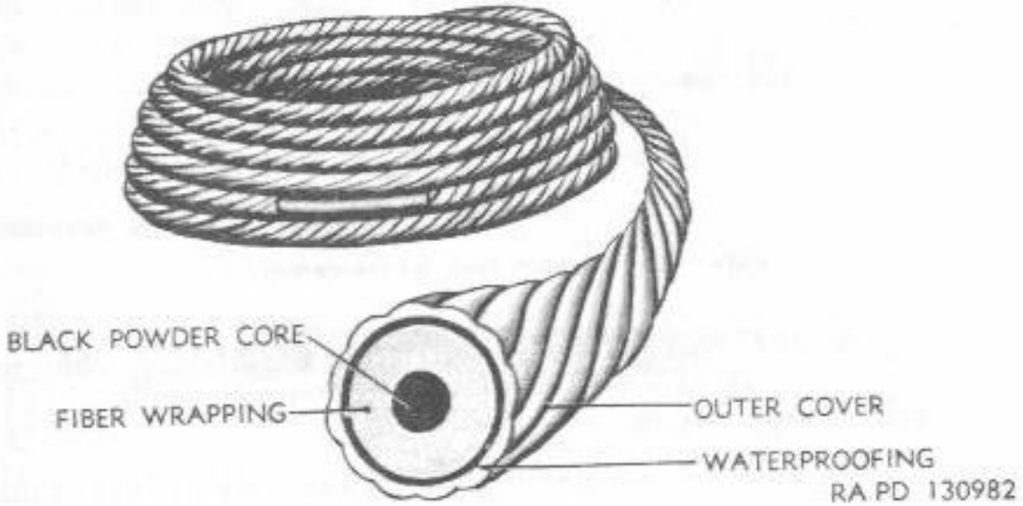


Figure 22. Fuse, blasting, time.

Section V. DETONATING CORD

47. Cord, Detonating, Waterproof

This cord consists of an explosive core of PETN contained in a braided seamless cotton tube. On the outside this tube is a layer of asphalt on which is a layer of rayon. All are covered by a continuous extruded coating of plastic, which is colorless and smooth to the touch. The outside diameter of the cord is 0.200 inch. This waterproof detonating cord is the standard cord for general use in military demolitions, both on land and underwater.

48. Cord, Detonating (PETN) (Fuse, Primacord)

a. Description. Detonating cord (primacord) (figs. 23 and 24) consists of a flexible tube filled with PETN in the approximate amount of 40 grains per foot (approx. 5.7 lb per 1,000 ft). This cord is a limited standard item and will be used for training purposes only as soon as sufficient supply of waterproof detonating cord (par. 47) becomes available. It is ordinarily used to transmit a detonation

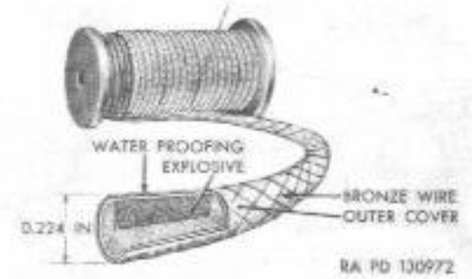


Figure 23. Cord, detonating (PETN) (fuze, primacord).

from primed blasting cap or from a delay detonator to a charge of high explosive or from one charge of high explosive to another without requiring the use of a second cap. CLIP, cord, detonating, M1 (par. 79) (fig. 25), is a small metal device used for joining detonating cord.

b. Packing. The cord is packed in 50-, 100-, 500-, and 1,000-foot spools in hermetically sealed cans in wooden boxes; some boxes containing a total of 1,000 feet and some containing 4,000 feet.

49. Cord, Detonating, Reinforced, Pliofilm Wrapped

This cord is similar to the cord described in paragraph 48, except in the covering, which is designed for vigorous uses and severe weather.

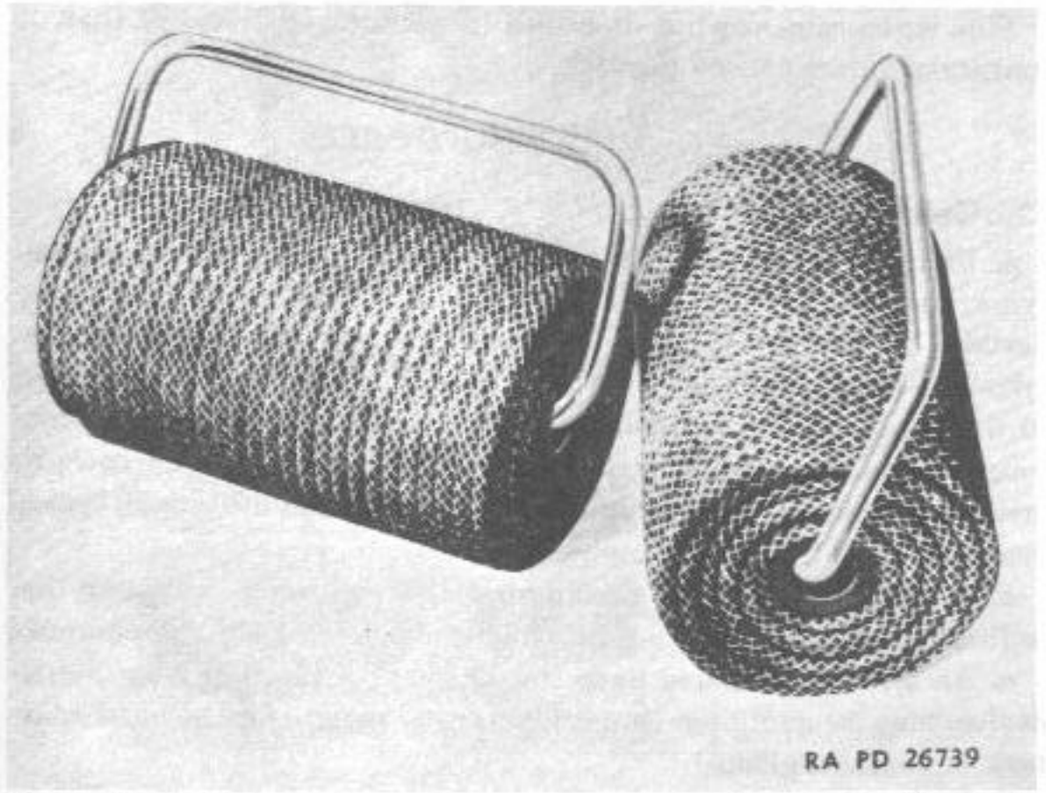


Figure 24. Cord, detonating (PETN) (fuze, primacord) on spool with plastic handle.

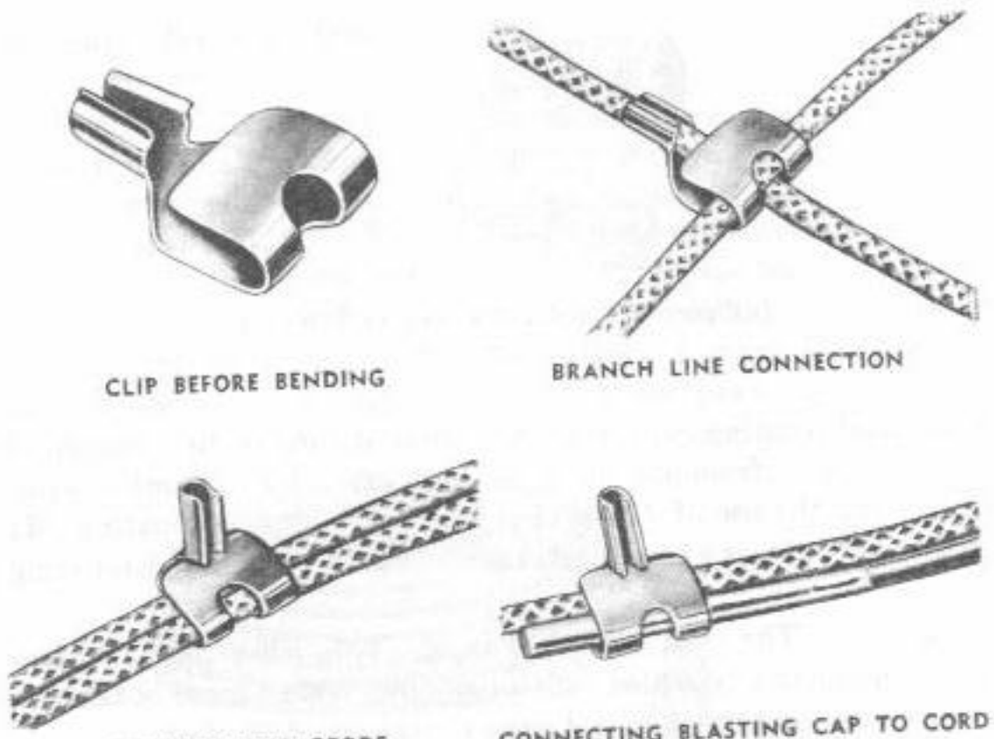


Figure 25. Clip, cord, detonating, M1—methods of connecting detonating cord.

50. Cord, Detonating, 50-Foot Spool, Spliced

This is the same cord as described in paragraph 48 except that it consists of pieces spliced together.

Section VI. FIRING DEVICES

51. General

a. Firing devices (pars. 54–60) and (table V) are of two general types, the tubular type and the box type. The tubular-type firing devices, consisting of head, case, and primed coupling base, are arranged for actuation by pressure, pull, or release of pull according to the design of the particular model. The box-type firing device, consisting of a rectangular steel body and primed coupling base, is arranged for release of pressure. The coupling base, fitted to all types, has a standard thread and nipple.

b. The coupling base of a firing device is removable, except in the pull-friction and delay types in which the base is not to be removed.

c. As all firing devices have the same type coupling base, firing devices may be used interchangeably as appropriate for the particular task to be accomplished.

d. Firing devices may be used with demolition blocks or explosive charges (fig. 26). They may also be used with heavy antitank mines



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Figure 26. Representative methods of using firing devices fitted to demolition blocks for initiation by enemy troops—safety pins removed.

if fitted to activators, with light antitank mines, and with improvised explosive charges. When a firing device is used with a service activator or a practice activator (TM 9–1940), a blasting cap or an igniter is not necessary and cannot be used. When used with light antitank service mines or with demolition blocks, a firing device requires a crimped-on blasting cap.

e. Primed coupling bases (pc mk 82–0–175A) are now issued separately for reuse of firing devices.

52. Firing Device Data

Dimensions and means of initiation of the various types, models, and delays of firing devices are shown in table V. It should be noted that a "tri-pronged firing mechanism," which supersedes the former pressure-cap-type combination firing device M1, is a component of antipersonnel mine fuzes M6A1 and M7A1 and antipersonnel mine fuze M10A1, see TM 9–1940.

Table V. Firing Device Data

Nomenclature	Means of initiation	Dimensions (in.)		
		Length	Width	Height
FIRING DEVICE, delay type, M1, black, 9-min delay. FIRING DEVICE, delay type, M1, red, 15-min delay. FIRING DEVICE, delay type, M1, white, 1-hr delay. FIRING DEVICE, delay type, M1, green, 2½-hr delay. FIRING DEVICE, delay type, M1, yellow, 5½-hr delay. FIRING DEVICE, delay type, M1, blue, 11½-hr delay.	Finger pinch	6¼	⅜ diam	⅜ diam
FIRING DEVICE, pressure-release type, M5.	Removal of restraining load.	1¾	1⅛	1⅛
FIRING DEVICE, pressure type, M1A1.	20-lb pressure	4¼	½ diam	½ diam
FIRING DEVICE, pull-friction type, M2.	3-lb pull	1½	⅝ diam	⅝ diam
FIRING DEVICE, pull-release type, M3.	Release or 6-lb pull.	4½	½ diam	½ diam
FIRING DEVICE, pull type, M1.	3-lb pull	4¾	⅝ diam	⅝ diam
FIRING DEVICE, release type, M1.	Removal of restraining load.	2	2	3

53. Firing Mechanism Tri-Pronged

a. This firing mechanism is a component of fuzes of bounding-type and cast-iron-block type antipersonnel mine fuzes. The firing mechanism consists of a head and case. The head contains a trigger pin, to which three pressure prongs are attached, and a release pin. The case contains a spring-loaded firing pin, which also extends through the head. The tri-pronged firing mechanism is used with antipersonnel mines (*b–d* below), see TM 9–1940.

b. When the long-type coupling base with black powder igniter is fitted to the firing mechanism, the assembly becomes FUZE, mine, combination, M6A1, which is used to fuze antipersonnel mine M2A4 and parachute trip flare M48. The firing mechanism alone may be designated and identified as FUZE, mine, combination, M6A1, less igniter assembly.

c. When the short-type primed coupling base with special blasting cap Type I crimped thereto is fitted to the firing mechanism, the assembly becomes FUZE, mine, combination, M7A1, which is used to fuze antipersonnel mine M3. The firing mechanism alone may also be designated and identified as FUZE, mine, combination, M7A1, less blasting cap assembly.

d. When the safety-fused-type primed coupling base with black powder igniter is fitted to the firing mechanism, the assembly becomes FUZE, mine, combination, M10A1, which is used with antipersonnel practice mine M8. The firing mechanism alone may also be designated and identified as FUZE, mine, combination, M10A1, less igniter assembly.

54. Firing Device, Delay Type, M1

a. General. This is a chemical device (fig. 27) used for delay action firing of a mine, demolition block, or other explosive charge.

b. Description. The device consists of a two-part case or tube, the parts being joined near the center by a coupling. The tube is about three-eighths of an inch in diameter and the device is 6¼ inches long including a primed coupling base, which is not removable, having the same size thread and nipple as on all firing devices. The half of the case attached to the coupling base is brass and the other half is thin copper capable of being crushed between thumb and finger. The copper half contains a sealed glass ampoule of corrosive chemical and the brass half houses a firing pin and spring. An identification and safety strip, colored according to the length of delay in which the device functions, extends through slots opposite an inspection hole near the primer of the coupling base. Devices with black, red, white, green, yellow, and blue strips are packed separately, according to color. A restraining wire, extending from the end of the device

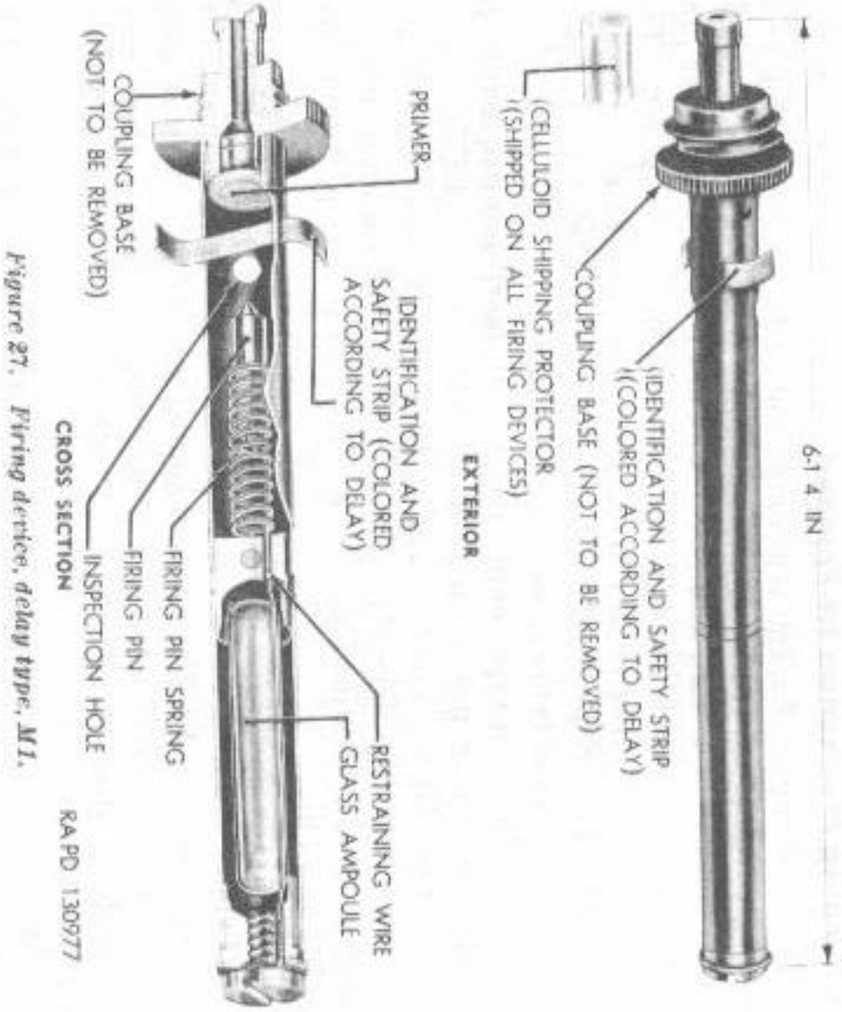


Figure 27. Firing device, delay type, M1.

where it is held by a screw, extends along the ampoule, through the firing pin spring, and to the firing pin to which it is attached.

c. Functioning. When the glass ampoule is crushed (fig. 28), the corrosive liquid is released. The liquid then eats through the restraining wire releasing the firing pin. The firing pin, driven by a spring, fires the primer in the coupling base. A temperature correction table (one in each box) shows the delay of a device having a strip of a particular color at various temperatures as shown in table VI.

d. Installation and Arming.

(1) The card found in each box of devices indicates the color for the required delay at the prevailing temperature (table VI).

(2) Select a device with identification strip of this color.

(3) Look in or insert a nail or wire into the inspection hole, to make sure that the firing pin has not been released. Examine the copper half of the tube of the device (this half contains the glass ampoule of corrosive chemical), to see that it is undented and that there is no evidence that the ampoule has been crushed.

(4) Remove the celluloid protective shipping cap from the coupling base and crimp on a nonelectric blasting cap.

(5) Insert the blasting cap into the cap well of the charge, demolition block, or mine, as the case may be, and screw the device into the threads of the well.

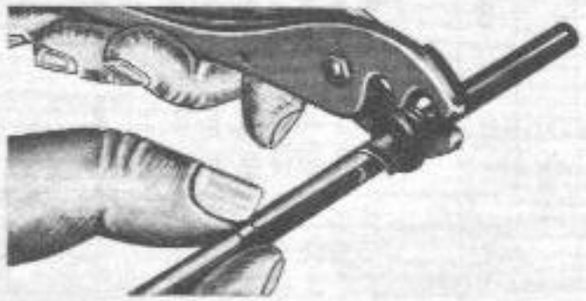
Table VI. Effect of Temperature on Delays of Firing Device, Delay Type, M1

t° F.	Black		Red		White		Green		Yellow		Blue		t° C.
	OM	ST	OM	ST	OM	ST	OM	ST	OM	ST	OM	ST	
−25	.....	.....	8.5 hr	3.3 hr	3 day	1.3 day	.....	.....	.....	.....	.....	.....	−32
0	8 hr	2.5 hr	45 min	20 min	17.5 hr	8 hr	2.6 day	1.2 day	8.5 day	3.8 day	23 day	10 day	−18
+25	36 min	16 min	25 min	11 min	5.5 hr	2.5 hr	17 hr	8 hr	2.0 day	20 hr	5.0 day	2.2 day	−4
50	15 min	7 min	17 min	8 min	2 hr	55 min	6 hr	2.7 hr	14 hr	6.0 hr	1.3 day	14 hr	+10
75	9 min	4 min	15 min	7 min	1 hr	27 min	2.5 hr	70 min	5.5 hr	2.5 hr	11.5 hr	5 hr	24
100	5 min	2.0 min	8 min	3.5 min	32 min	14 min	70 min	30 min	2.5 hr	65 min	5.2 hr	2.3 hr	38
125	4 min	1.5 min	5 min	2 min	20 min	9 min	35 min	15 min	80 min	36 min	2.5 hr	1.1 hr	52
150	3 min	1 min	4 min	1.5 min	15 min	6 min	20 min	9 min	46 min	21 min	80 min	36 min	66

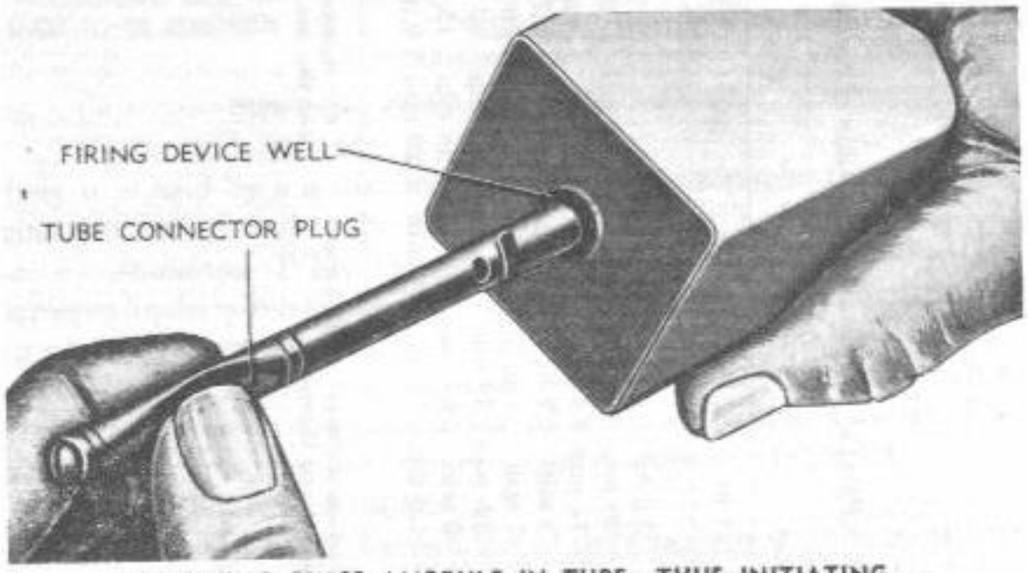
OM—Most likely delay if two devices are used in the same charge. If only a single device is used, this value should be increased approximately 15 percent.

ST—Reasonably safe time. Delays of less than this value should not occur more often than one in a thousand.

(6) If detonating cord is used, tape one end of the cord to the blasting cap on the delay firing device, then extend the other end of the cord to the charge, block, or mine, where it must be fitted with another blasting cap for insertion or taping.
(7) Crush ampoule between thumb and fingers.
(8) Look through inspection hole to see whether the firing pin has been released.



CRIMPING BLASTING CAP TO COUPLING BASE



CRUSHING GLASS AMPOULE IN TUBE—THUS INITIATING THE DEVICE INSTALLED ON DEMOLITION BLOCK

RA PD 130978

Figure 28. Firing device, delay type, M1—installation.

(9) If the firing pin rests on the identification and safety strip, remove the device and discard.
(10) If the firing pin has not been released, withdraw the strip.

e. Neutralizing. There is *no safe way* to neutralize this firing device. If an *extreme necessity* arises to neutralize the device before the period of delay expires, a cotter pin or a wire should be inserted very gently through the inspection holes. The device should then be removed from the charge and discarded, because, once actuated, *no attempt must be made to reuse it.*

f. Precautions in Use.
(1) When screwing this device into an explosive item, it should be held with the thumb and fingers gripping the coupling that joins the two halves (copper and brass) of the tube.
(2) The time delay starts when the ampoule is crushed—*not* when the colored identification and safety strip is withdrawn. Calculations must be made accordingly.
(3) Areas where explosives fuzed with this type of device have been installed and actuated should be especially so marked and recorded. Troops must not approach installed charges employing this type of delay firing device.

g. Packing. This device is packaged in paperboard box in sets of 10 devices of 1 color; 10 wrapped packages are packed in a shipping box.

55. Firing Device, Pressure-Release Type, M5

a. Description. This device (fig. 29) consists of a rectangular pressed-steel case containing a spring-loaded striker. The striker is restrained by a release plate, which is held in place by a safety pin. A coupling base fits into the threaded hole in the bottom of the case. This device is used to activate antitank mines equipped with supplementary fuze wells (cap wells) and for general booby-trap installations with charges having a threaded well.

b. Functioning.
(1) When restraining load of at least 5 pounds is displaced more than five-eighths of an inch, the release plate releases the firing pin.
(2) The firing pin, impelled by spring, fires percussion cap.

c. Installing and Arming.
(1) Inspect the device to make sure that there are no obvious defects, that firing pin is cocked, and that the safety pin is in proper position.
(2) Remove small cotter pin.
(3) Slip a nail or length of stout wire through interceptor holes.
(4) Remove the coupling base.
(5) Remove the celluloid shipping cap from the coupling base and crimp on a nonelectric cap.
(6) Screw the coupling base into the firing mechanism.
(7) Screw the device into the threaded fuze well (cap well) of charge or mine.
(8) Install so that the release plate is held closed by weight of a mine, a charge, or a booby-trap bait, or by wedging against some stable object. If the device is in the ground, use a small board issued with the device to provide solid foundation.

365238 O—55——5

See that the safety pin is in proper position and adjust the installation so that the safety pin will slip out easily.

(9) Remove the safety pin gently by pulling attached cord. If it does not come out easily, restraining force is probably insufficient or improperly placed; check.

(10) If no clicking sound is heard, pull out wire or nail from interceptor hole. It should come out easily.

d. Neutralizing.

(1) Insert wire or nail through interceptor holes.

(2) Insert safety pin.

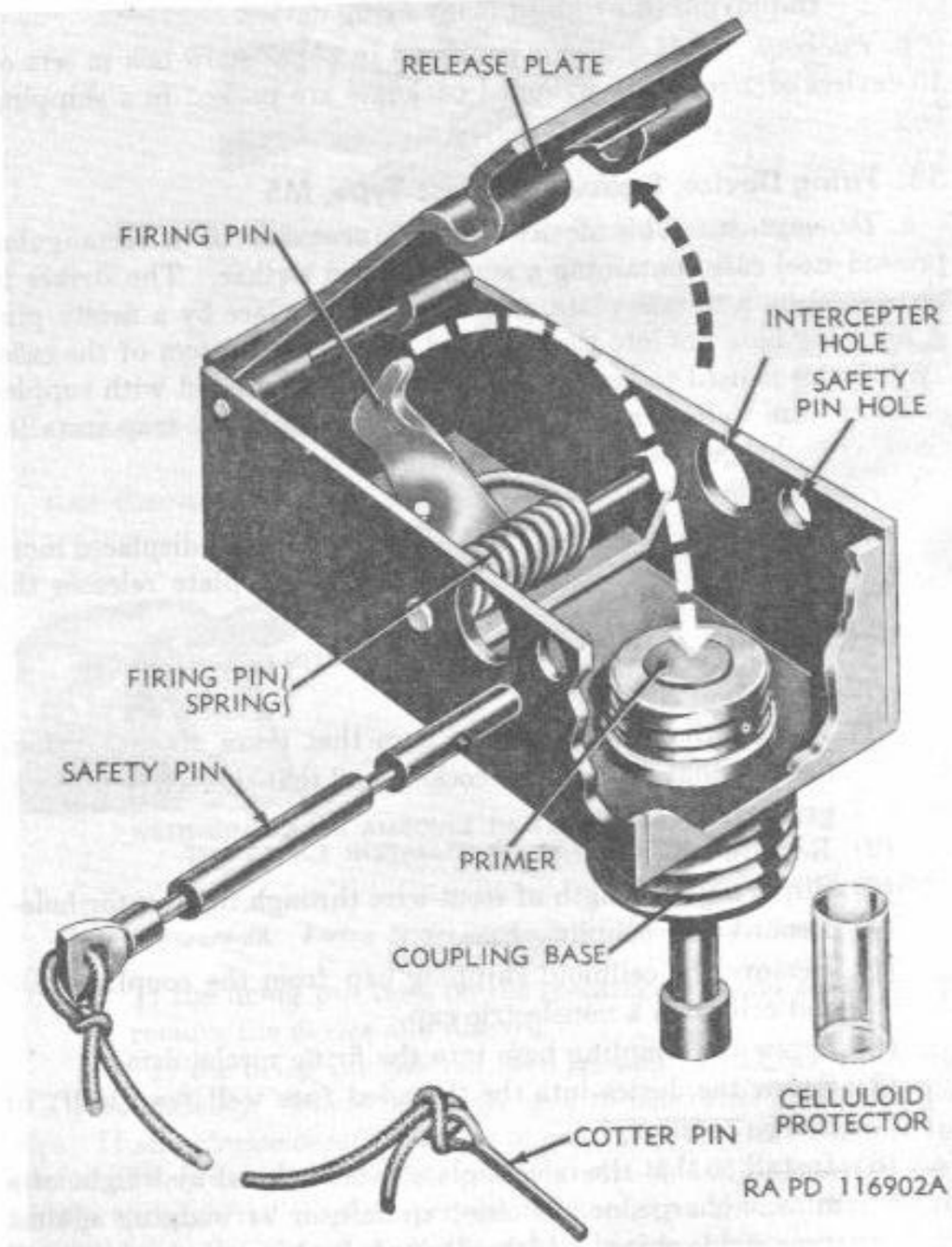


Figure 29. Firing device, pressure-release type, M5.

(3) Remove mine or other restraining load.

(4) Remove the device from mine or charge.

(5) Unscrew coupling base and destroy or store in a safe place. Protector cap from used 15-second delay firing device may be used. *Do not attempt to remove blasting cap from the coupling base.*

e. Packing. Four firing devices, complete with percussion primers in the coupling bases, and four small plywood boards are packed in cardboard box. The dimensions (in.) of the box are 1⅝ x 3 x 4¾; complete packing weighs 15 ounces.

f. Reuse. If the primer (percussion cap), in the standard coupling base, has been fired in training or if there is no blasting cap attached to the base, the base may be reused, if desired, by removing the fired primer and pressing an M2 (or M3) primer firmly into place. To recock, proceed as directed in (1) through (6) below.

(1) Remove the coupling base.

(2) Hold the firing mechanism with release plate up, hinge of release plate toward you.

(3) With nail held in right hand perpendicular to long axis of firing mechanism, force the firing pin back to cocked position.

(4) Hold down release plate and withdraw nail.

(5) Insert safety pin.

(6) With release plate held down firmly, withdraw safety pin to see that it slides out easily; replace safety pin.

Note. Other methods of recocking may be used if found satisfactory.

56. Firing Device, Pressure Type, M1A1

a. General. This firing device (figs. 30 and 31) is designed for actuation by pressure and intended for use in setting up booby traps.

b. Description. The firing device consists of a head, case, and coupling base. The case that contains the firing mechanism has three lugs, each with a hole for use in anchoring the device. The firing mechanism consists of a spring-loaded firing pin held in the "cocked" position by a firing pin release pin, which is attached to the pressure cap. This is accomplished by a keyhole-shaped opening in the trigger pin. The smaller part of this opening fits into a groove in the firing pin (cocked position); the larger part of the opening permits the free movement of the firing pin upon release. The head, an integral part of the case, contains the firing pin release pin mechanism, which terminates in a pressure cap. A tapped hole in the center of the pressure cap is provided for use of an extension. The coupling base, which screws into the case, contains the primer. A removable fork, located under the pressure cap, prevents movement of the firing pin release pin. The safety pin, which passes through a hole in the case between the firing pin and the primer of the coupling base, prevents the firing

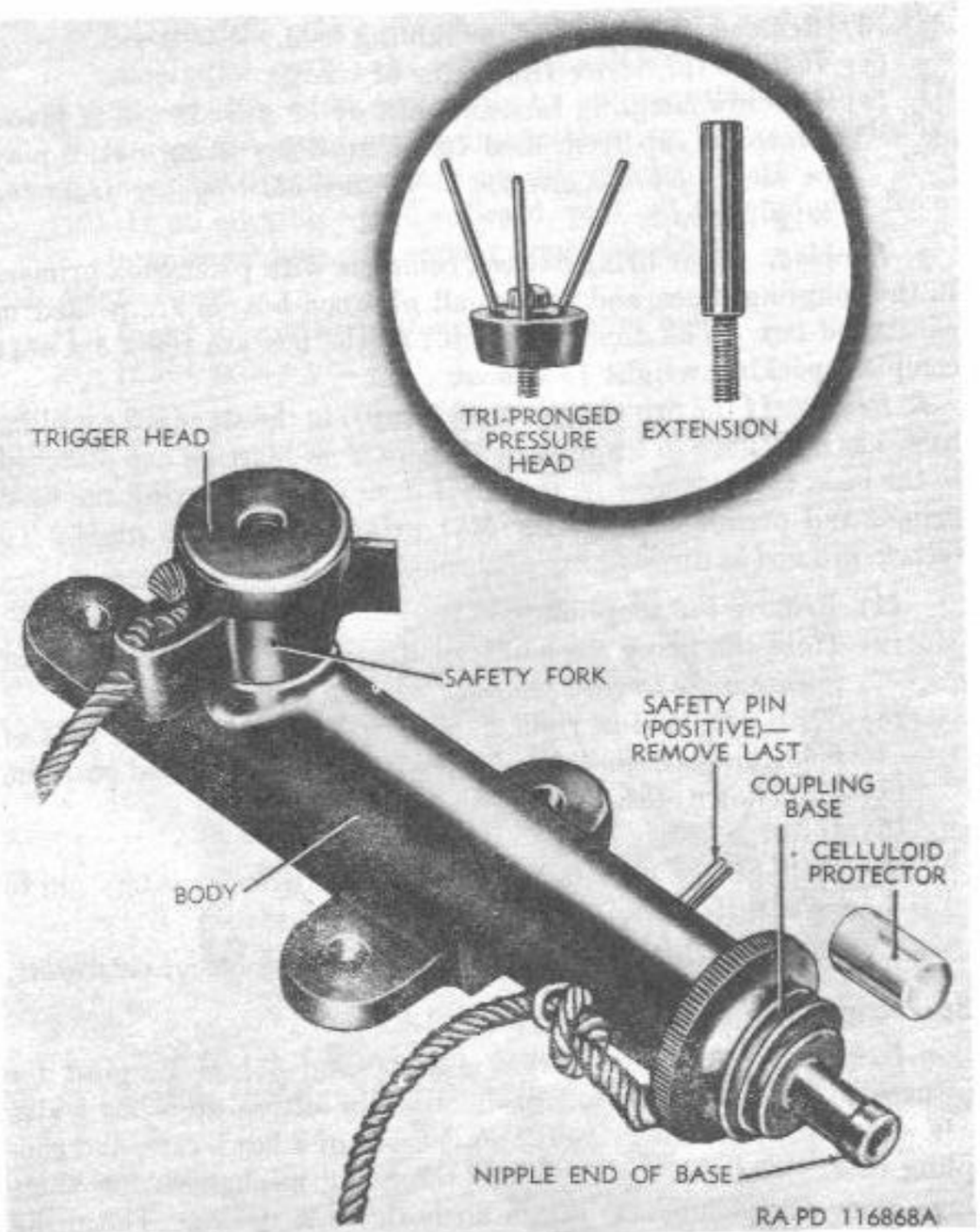


Figure 30. Firing device, pressure type, M1A1.

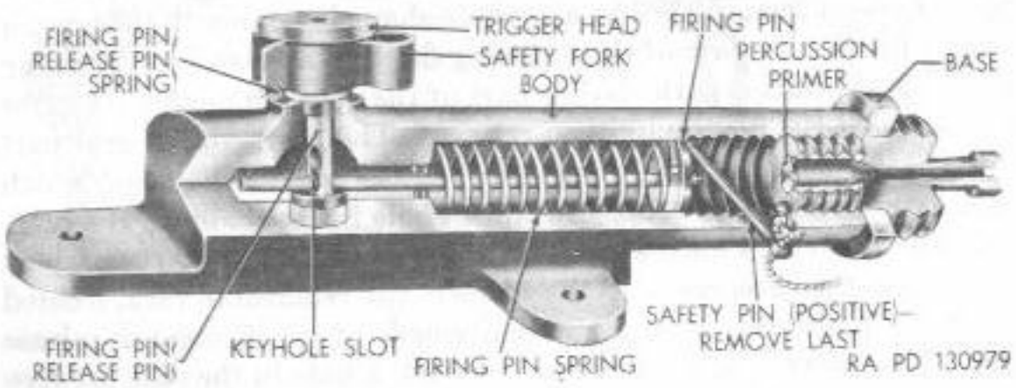


Figure 31. Firing device, pressure type, M1A1—sectioned.

pin from striking the primer should the firing pin be accidentally released.

c. Functioning. A pressure of 20 pounds on the pressure cap compresses the firing pin release pin spring and pushes the release pin inward. When the enlarged portion of the keyhole-shaped opening in the release pin is in line with the spindle, the firing pin is released. The spring-loaded firing pin then fires the primer.

d. Preparation for Use.

(1) *Inspection before use.* Check the firing mechanism as directed in (*a*) through (*f*) below.

(*a*) Unscrew the coupling base from the firing mechanism and inspect the primer. Invert the coupling base and hold it against the firing mechanism, with the nipple extending into the threaded end of the firing mechanism.

(*b*) Holding the coupling base firmly against the case, remove safety fork and safety pin. Depress the pressure cap. The firing pin should strike the nipple end of the coupling base sharply, indicating proper functioning of the firing mechanism.

(*c*) Recock the firing mechanism by pushing firing pin inward with unsharpened end of a pencil or a small blunt rod and, at the same time, pressing downward on the pressure cap, so that the end of firing pin can pass through the enlarged portion of the keyhole in the firing pin release pin.

(*d*) Release pressure on pressure cap, to allow the narrow part of the keyhole to engage the groove on the spindle.

(*e*) Replace safety pin and safety fork. The safety pin and the safety fork should be free enough for easy removal after the firing device has been installed.

(*f*) Screw the coupling base into the firing mechanism hand-tight. This restores firing device to original condition.

(2) *Installation and arming.*

(*a*) Remove protector tube from nipple and then screw firing device, with safety fork and safety pin in place, into a mine or other explosive charge.

(*b*) Bury and anchor the assembled mine and firing device on a firm flat foundation.

(*c*) Place or arrange some suitable object such as a pressure board in contact with, but not bearing on, the pressure cap. If the particular object does not touch the pressure cap, screw extension rod into pressure cap and adjust by unscrewing the rod up snugly against object, then backing the rod away one quarter turn to relieve any pressure on pressure cap. If three-pronged extension is to be used, screw it into the pressure cap and adjust in the same manner.

(*d*) Remove the safety fork. It should pull off easily. A sudden jerk may cause firing device to function. If the safety fork does not pull off easily, check the installation to make sure there is no pressure on pressure cap.

(*e*) Using the attached cord, pull out safety pin slowly and carefully. If it resists a gentle pull, the firing pin may have been released and is pressing against it. In such a case, replace the safety fork, remove the installation, and remove firing device from mine. Unscrew coupling base and check firing mechanism. If the firing mechanism is defective, replace it.

Note. Remove the safety pin from a safe distance, using a cord or length of wire for the purpose.

(*f*) Retain safety fork and safety pin for subsequent use in disarming.

(3) *Disarming and removal.*

(*a*) Carefully insert the safety pin into the case of the firing device, then install safety fork.

(*b*) Take up assembled firing device and mine or other explosive charge.

(*c*) Remove firing device from mine or explosive charge or demolition block.

(*d*) Restore firing mechanism and coupling base to original condition and packing.

e. Packing. Five devices are packed in a carton, 50 cartons (250 devices) per wooden box. Approximate dimensions (in.) of packing box are 27¼ x 12¾ x 10¼; the weight of the complete packing is 80.0 pounds.

57. Firing Device, Pull-Friction Type, M2

a. General. This firing device (fig. 32), which contains a friction initiated primer, is designed for actuation by a pull wire and intended for use in setting up booby traps.

b. Description. The firing device consists of a body, a nonremovable base, and an assembly consisting of a pull ring, a spring, and a coated wire secured by a safety pin. The nipple on the nonremovable base is fitted with a celluloid protector, which contains a dessicant to keep the friction compound dry. The outer end of the base is threaded to fit activators and firing device wells (cap wells). The coated wire, to which the spring and pull ring is attached, passes through an axial hole in the body of the device, through the friction compound, and into the nipple.

c. Functioning. A direct pull of 3 to 9 pounds on the trip wire (pull wire) stretches the spring and draws the coated wire through the friction compound, thereby igniting it.

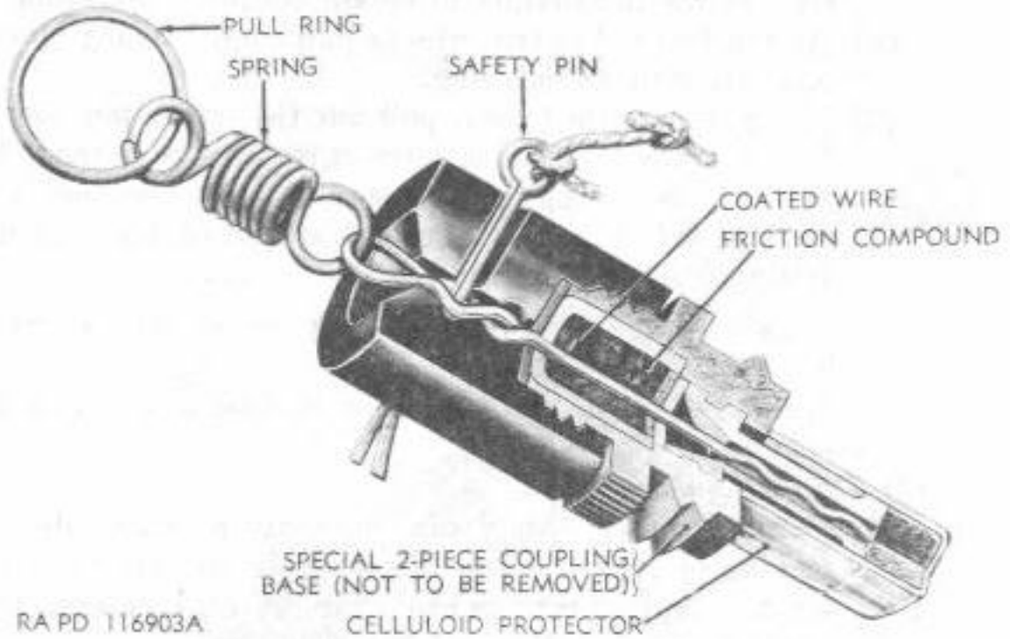


Figure 32. Firing device, pull friction type, M2—sectioned.

d. Preparation for Use.

(1) *Inspection before use.* Check the firing device as directed in (*a*) through (*c*) below.

(*a*) Check for presence of safety pin. Loosen the safety pin. It should be free enough for easy removal after the firing device has been installed. *Do not attempt to remove the base.*

(*b*) Examine for position of coated wire. The loop of the wire should be in the body recess. If wire is partially withdrawn, discard the firing device and use a new one.

(*c*) Check for presence of celluloid protector. If the celluloid protector is missing and if friction compound has absorbed moisture, a dud may result.

(2) *Installation and arming.*

(*a*) Remove celluloid protector from the nipple of the coupling base.

(*b*) Crimp a nonelectric blasting cap onto the nipple. Screw the firing device and blasting cap, with safety pin in place, into the cap well of a mine or into the cap well of an explosive charge to be used. The coupling base is threaded to screw into the cap well of the antitank mine M7 series, the practice antitank mine M10, or certain demolition blocks.

(*c*) Install loose trip wire, attaching anchor end first. Unspool the trip wire to the mine. Before connecting trip wire to the firing device, step off to the side and inspect for detectability of trip wire and mine. If necessary, re-

arrange the installation to obtain adequate concealment.

(*d*) Attach free end of trip wire to pull ring, drawing up excess wire through pull ring.

(*e*) Using the attached cord, pull out the safety pin slowly and carefully. If undue force is required to remove the pin, examine spring to make sure it is not tensioned and examine safety pin for excessive spread of legs. If defective, replace firing device.

Note. Remove safety pin from a safe distance, using a cord or length of wire for the purpose.

(*f*) Retain safety pin for future use in disarming the firing device.

(3) *Disarming and removal.*

(*a*) Carefully insert safety pin into body of safety device, making sure that the legs of safety pin are closed. After insertion, spread the legs enough to prevent accidental loss of pin during handling and shipment.

(*b*) Disconnect trip wire from the pull ring.

(*c*) Unscrew firing device from mine or charge, and destroy the device or store it in a safe place.

Caution: Do not attempt to remove the blasting cap from the firing device.

(4) *Reuse.* An unfired "pull-friction" firing device may be reinstalled provided it has been kept dry. Once fired, it cannot be reused.

e. Packing. Five devices with two 80-foot spools of trip wire are packed in a carton, 5 cartons per inner package, 5 packages (125 devices) per wooden box.

58. Firing Device, Pull-Release Type, M3

a. General. This firing device (fig. 33) is a mechanical device containing a percussion cap. It is designed for actuation by either an increase (pull) or decrease (release) of the tension in a taut trip wire and is intended for use with antipersonnel mine M3, improvised antipersonnel mines, or in setting up booby traps.

b. Description.

(1) The firing device consists of a head, body, coupling base, firing pin, release pin, safety pin, and winch assembly. The head, which is crimped to the body, acts as a guide for the release pin. The body contains a spring-loaded firing pin, in which the knob end of the release pin is installed. The coupling base, which screws into the body, contains the primer. The outer end of the coupling base is threaded to fit activators and firing device wells (cap wells) and has a nipple, to which a blasting cap may be assembled.

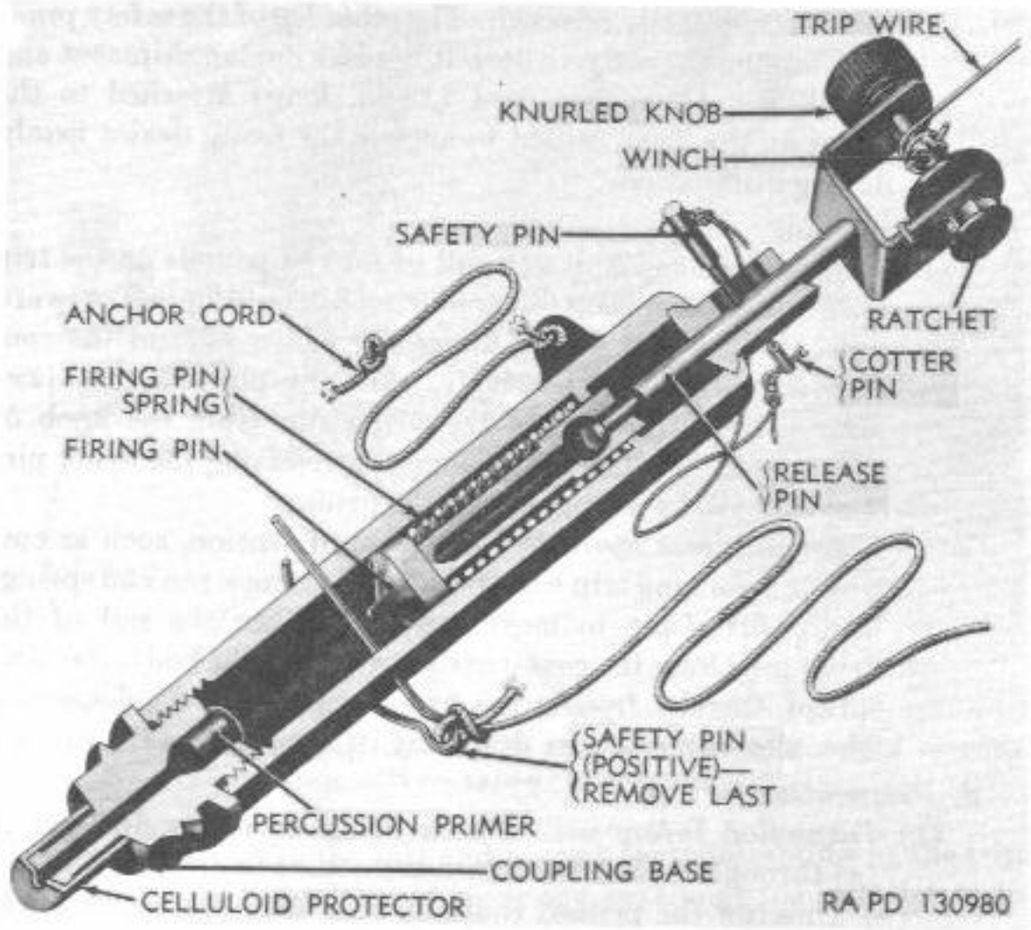


Figure 33. Firing device, pull-release type, M3—sectioned.

(2) The outer end of the firing pin is slotted longitudinally to form four jaws and grooved internally to receive a knob on the inner end of the release pin. The slotted end of the firing pin passes through a cylindrical opening in the body, in which position it is held by the knob of the release pin when the release pin is in its normal axial position and the safety pin in place. The safety pin passes through an elongated opening in the head and a hole in the release pin. A small cotter pin, which passes through a hole in the end of the safety pin, prevents accidental movement of the safety pin during shipment. The safety pin, when in position, prevents forward or rearward movement of the release pin (beyond the slight movement permitted by the elongated slot in the head), thus preventing release of the firing pin. The winch, consisting essentially of a bracket, spool with a knurled knob, and a pawl, is attached to the outer end of the release pin.

(3) A positive safety pin, one leg of which passes through a hole in the body between the firing pin and the primer, prevents the firing pin from striking the primer should the firing

pin be accidentally released. The other leg of the safety pin is bent around the body, to keep it in place during shipment and handling. An anchor cord (12 in. long) attached to the eyelet on the body is used to anchor the firing device firmly during installation.

c. Functioning.

(1) *Pull operation.* A direct pull of 6 to 10 pounds on the trip wire causes the release pin and firing pin to be pulled outward until the jaw end of the firing pin passes beyond the constricted opening in the body. In this position, the jaws spread, thereby releasing the firing pin from the knob of the release pin. The jaws then close, releasing the firing pin, which driven by its spring fires the primer.

(2) *Tension-release operation.* Release of tension, such as cutting or detaching trip wire, permits the release pin and spring-loaded firing pin to move inward. When the end of the firing pin clears the constricted opening in the body, the jaws spread, thereby freeing the firing pin from the release pin. The released firing pin, driven by its spring, fires the primer.

d. Preparation for Use.

(1) *Inspection before use.* Check firing device as directed in (*a*) through (*c*) below.

(*a*) Unscrew the primed coupling base from the firing mechanism and inspect the primer.

(*b*) Inspect the positive safety pin and the safety pin, to see that they are in place, yet free enough for easy removal after the firing device has been installed.

(*c*) Leaving the positive safety pin and safety pin in position, pull the winch assembly out with the finger until it is stopped by the safety pin, then release: repeat two or three times. The winch assembly should move smoothly approximately one-quarter inch and should require a force of 6 to 10 pounds. If the assembly hangs or moves jerkily or too easily, examine the firing device. If fault cannot be corrected, use another firing device.

(2) *Installation and arming.*

(*a*) Remove the protector cap from the nipple of the primed coupling base and crimp on a blasting cap.

(*b*) Screw the firing mechanism to the primed coupling base (fig. 34).

(*c*) Screw the firing device, with positive safety pin and safety pin in place, into a mine or other explosive charge.

(*d*) Secure the trip wire at the anchor end, making certain that this tie will not slip. Unspool the trip wire to the mine or charge. Before connecting the trip wire to the firing device,

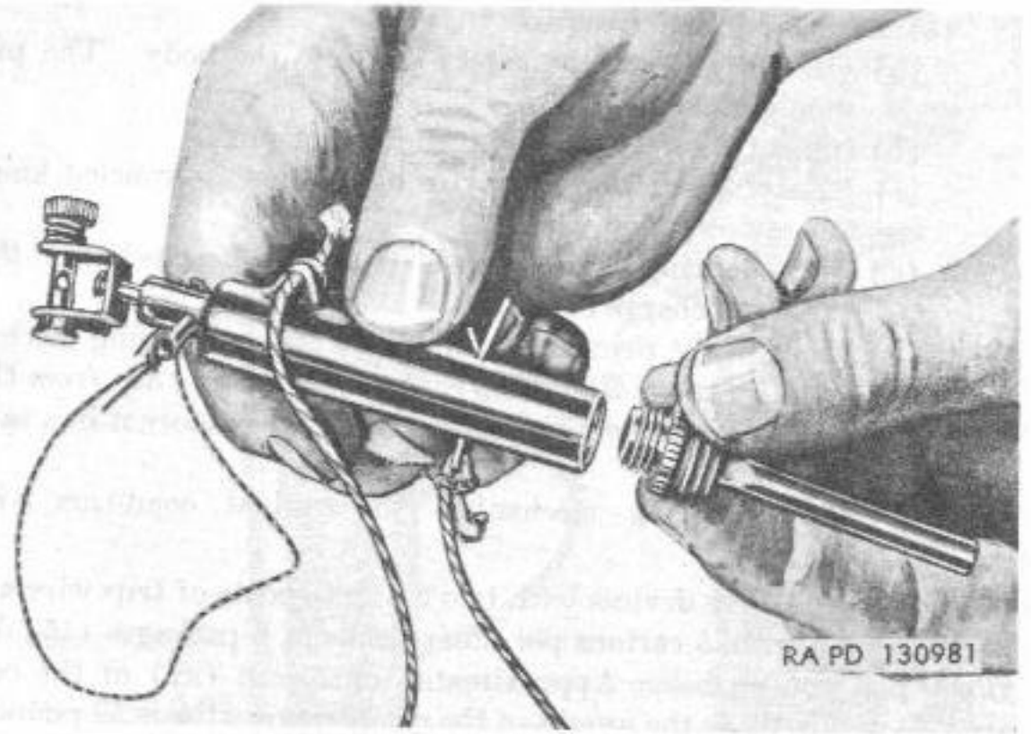


Figure 34. Assembling pull-release type firing mechanism to primed coupling base with crimped-on blasting cap.

step off to the side and inspect for detectability of the trip wire and mine. If necessary, rearrange the installation to obtain adequate concealment.

(*e*) Attach loose end of trip wire to the winch by threading it through the hole in the winch spindle.

Note. The wire must be threaded through the hole in the winch spindle, to prevent slippage and accidental functioning.

(*f*) Draw up excess wire through hole in winch spindle. Take up the remaining slack by turning the knurled knob until the safety pin is pulled exactly into the midposition (wide portion) of its elongated hole in the head.

(*g*) Remove small cotter pin from safety pin and then gently remove the safety pin. If safety pin does not slide out easily, adjust the winch winding until the safety pin is loose enough to be withdrawn easily.

(*h*) Using the attached cord, pull out the safety pin slowly and carefully. It should come out easily. If it resists a gentle pull, install the safety pin and remove trip wire from winch by depressing knurled knob and stripping off the wire. Remove the coupling base and check the mechanism. If defective, replace the whole firing device.

Note. When finally removing safety devices, remove them from a safe distance, using a string or length of wire for the purpose.

(*i*) Retain safety devices for subsequent use in disarming.

(3) *Disarming and removal.*

(*a*) Carefully insert the safety pin into the body. The pin should enter freely.

(*b*) Insert the safety pin and install cotter pin.

(*c*) Release tension on trip wire by depressing knurled knob and stripping off wire.

(*d*) Remove firing device with blasting cap attached from the explosive charge or mine.

(*e*) Unscrew the primed coupling base from the firing mechanism. *Do not attempt to remove the blasting cap from the primed coupling base;* either destroy it or store it in a safe position.

(*f*) Restore firing mechanism to original condition and packing.

e. Packing. Five devices with two 80-foot spools of trip wire are packed in a carton, 5 cartons per inner package, 6 packages (150 devices) per wooden box. Approximate dimensions (in.) of the box are 17¾ x 13 x 10¼; the weight of the complete packing is 52 pounds.

59. Firing Device, Pull Type, M1

a. General. This firing device (fig. 35) is of the firing pin type. It is designed for actuation only by a pull on a trip wire and intended for use with antipersonnel mine M3 and improvised antipersonnel mines, for activation of antitank mines, and for setting up booby traps.

b. Description.

(1) This firing device consists of a cylindrical case (body), head, and coupling base. The head, which is permanently joined to the case, contains a release pin, release pin ring, a loading spring, and a safety pin. The case, which contains the firing mechanism consisting of the firing pin and compression spring, also contains a positive safety pin. The coupling base, which screws into the case, contains the primer. The outer end of the coupling base is threaded to fit activators and firing device wells (cap wells). It has a nipple to which a blasting cap may be assembled.

(2) The pull ring end of the firing pin, which is slotted axially to form four jaws, passes through a cylindrical opening in the case. The end of the release pin, fitting into an axial hole in the slotted end of the firing pin, causes it to engage on the upper surface of the opening, thereby restraining downward movement of the firing pin.

(3) The safety pin, which passes through a hole in the head and a hole in the release pin, prevents accidental movement of the release pin during shipment and handling. The positive

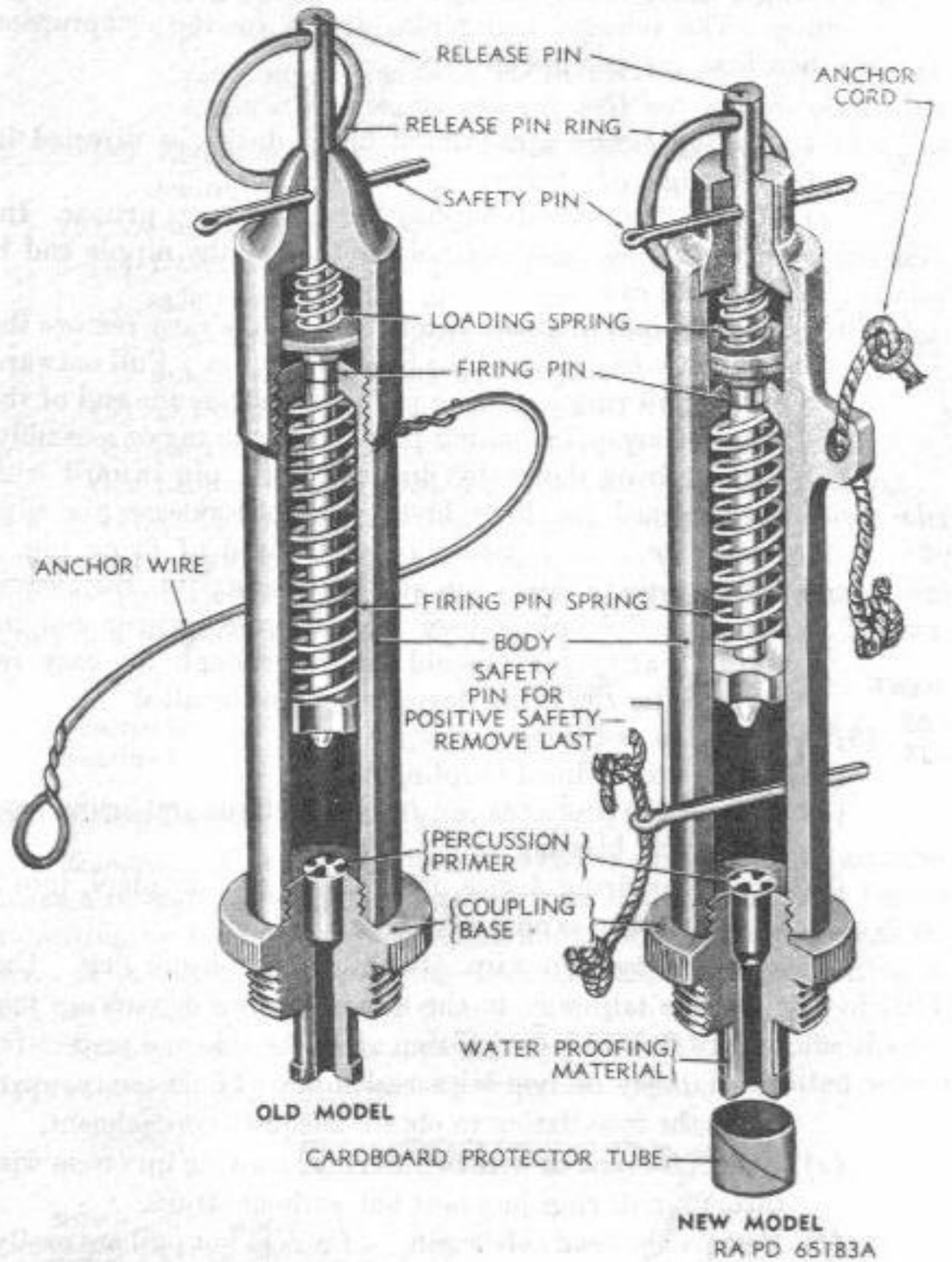


Figure 35. Firing device, pull type, M1—sectioned.

safety pin, which passes through a hole in the case between firing pin and primer, prevents the firing pin from striking the primer should the firing pin be accidentally released. An anchor cord, on the case, is used to anchor the firing device firmly during installation.

c. Functioning. A direct pull of 3 to 5 pounds on the trip wire causes the release pin to be pulled outward, overcoming the resistance of the loaded release pin spring. The slotted end of the firing pin,

being no longer restrained by the cylindrical opening, passes through the opening. The released firing pin, driven by the compression spring, then fires the percussion cap.

d. Preparation for Use.

(1) *Inspection before use.* Check firing device as directed in (*a*) through (*d*) below.

(*a*) Unscrew the primed coupling base and inspect primer. Invert coupling base and hold it so that the nipple end is inside the case.

(*b*) Holding coupling base firmly against the case, remove the positive safety pin and the head safety pin. Pull outward on the pull ring. Firing pin should strike the end of the nipple sharply, indicating proper functioning of assembly.

(*c*) Recock firing device by pushing firing pin inward with unsharpened pencil or blunt rod until release pin slips into place, thus expanding slotted head of firing pin.

(*d*) Insert positive safety pin and head safety pin, then screw the primed coupling base into the case, primer end inward. Safety pins should be free enough for easy removal after the firing device has been installed.

(2) *Installation and arming.*

(*a*) Remove the primed coupling base.

(*b*) Remove the protector cap from the nipple and crimp on a nonelectric blasting cap.

(*c*) Screw the firing device, with safety pins in place, into a mine or other explosive charge.

(*d*) Install loose trip wire, attaching anchor end first. Unspool the trip wire to the mine. Before connecting trip wire to the firing device, step off to the side and inspect for detectability of trip wire and mine. If necessary, rearrange the installation to obtain adequate concealment.

(*e*) Attach free end of wire to pull ring, drawing up excess wire through pull ring just taut but without strain.

(*f*) Remove the head safety pin. If it does not pull out easily, trip wire may be too tight. Adjust trip wire if necessary. If head safety pin still binds, remove the coupling base and check mechanism. If defective, replace faulty firing device with a serviceable one.

(*g*) Using the attached cord, pull out the positive safety pin slowly and carefully. If it resists a gentle pull, the firing pin may have been released and is pressing against it or spread of legs of the positive safety pin is excessive. If spread of legs is not excessive but the pin still resists gentle pull, install head safety pin, unscrew coupling base, and check mechanism. If defective, replace faulty firing device with a serviceable one.

Note. Remove the safety pin from a safe distance, using a cord or length of wire for the purpose.

(*h*) Retain safety pins for future use in disarming the firing device.

(3) *Disarming and removal.*

(*a*) Carefully insert the positive safety pin first, then the head safety pin into the firing device. After insertion, spread legs of safety pins just enough to prevent accidental loss of pins during handling and shipment.

(*b*) Disconnect trip wire from the pull ring.

(*c*) Unscrew firing device from mine or charge.

(*d*) Restore firing device to original condition and packing.

e. Packing. Five firing devices with two 80-foot spools of trip wire are packed in a carton, 30 cartons (150 devices) per wooden box or 50 cartons (250 devices) per wooden box. Approximate dimensions (in.) and weights (lb) of the 30- and 50-carton boxes are as follows:

	Length	*Width*	*Height*	*Weight*
30-carton box	13½	10	8½	35. 0
50-carton box	25¾	11½	10	71. 0

60. Firing Device, Release Type, M1

a. General. This firing device (fig. 36) is designed to be actuated when a restraining weight is removed from it and is intended for use in setting up booby traps. The restraining weight is applied at the time of installation. The firing device is restrained from firing as long as there is a load greater than 2 pounds on the top face of latch.

b. Description. The firing mechanism of this device is cube-shaped, approximately 2 inches square by 3 inches long. It is fitted with a

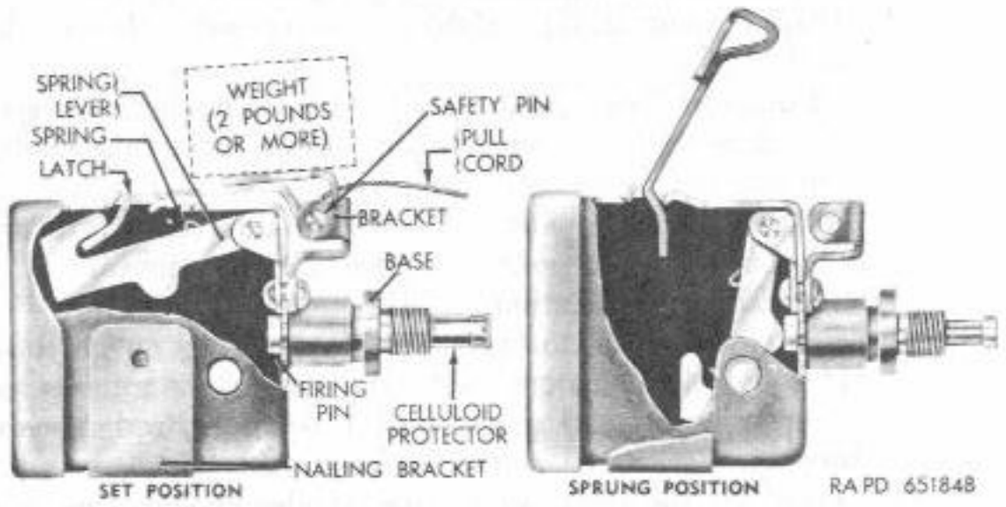


Figure 36. Firing device, release type, M1.

cover at one end and a threaded hole to receive a primed coupling base at the opposite end. The body houses a spring lever, a spring, and a firing pin. One end of a steel latch engages a lip on the lever, the remaining portion of the latch rests on top of the device and, as issued, is held in place by a safety pin. This arrangement holds the lever in the set position. Two 3/16-inch holes are provided in the sides of the body, to permit the insertion of a nail or heavy gage wire to act as an additional safety device by intercepting the lever and preventing it from striking the firing pin should premature functioning occur during installation. A strip of metal 3/4-inch wide and 4 inches long spot welded to the base of the body serves as a nailing bracket.

c. Functioning. Upon removal of restraining weight from the firing device, the lever is unlatched and is driven through an arc of approximately 75 degrees to strike the firing pin, which explodes the primer contained in the coupling base.

d. Preparation for Use.

(1) *Inspection before use.* Check firing device for any obvious defects and to make sure that the safety pin is properly installed and that the lever is latched in the set position.

(2) *Installation and arming.*

(*a*) Remove the cotter pin in the end of the safety pin.

(*b*) Slip a nail or stout wire through the interceptor holes.

(*c*) Remove coupling base. Remove its protector cap and crimp on a nonelectric blasting cap.

(*d*) Screw the coupling base into the firing mechanism.

(*e*) Screw the firing device thus assembled into fuze well (cap well) of the mine or charge.

(*f*) Provide a level surface at the base of the hole in which the mine or charge with firing device assembled is to be planted. A board may be used for this purpose.

(*g*) Place the assembled mine (or charge) and firing device in the hole, with the latch on the firing device uppermost.

(*h*) Place the restraining weight on the exposed surface of the latch.

Caution: The weight placed on the latch must be greater than 2 pounds to prevent firing device from functioning when safety devices are withdrawn.

(*i*) Make sure that the safety pin cord and interceptor wire are at ground level in position convenient for removal.

(*j*) Conceal the installation.

(*k*) Gently withdraw the safety pin by pulling on its cord. If it does not come out easily, the load on the mine is too light or improperly placed on the latch. If resistance is met, uncover and check the installation.

(*l*) Withdraw the interceptor wire; it also should come out easily.

(3) *Disarming and removal.*

(*a*) Carefully uncover installation.

(*b*) Insert a nail or wire through interceptor holes.

(*c*) Insert safety pin.

(*d*) Remove restraining weight.

(*e*) Remove mine (or charge) with its assembled firing device. Unscrew the firing device (firing mechanism and coupling base) from the mine or charge.

(*f*) Unscrew the coupling base from the firing mechanism.

(*g*) Destroy the coupling base with blasting cap attached or store in a safe place.

Caution: Do not attempt to remove the blasting cap from the coupling base.

(*h*) Restore firing mechanism to original condition and packing.

e. Packing. This firing device is packed 4 per chipboard box and 20 chipboard boxes (comprising a total of 80 firing devices) per wooden box. Approximate dimensions (in.) of the box are 24¾ x 9¾ x 8¼; the complete packing weighs 41.5 pounds.

Section VII. PERCUSSION PRIMERS

61. Primer, Percussion Cap, M2

This primer (fig. 37) consists of copper cup, 0.216 inch in diameter and 0.307 inch long. It has a 0.276-inch diameter flange at one end

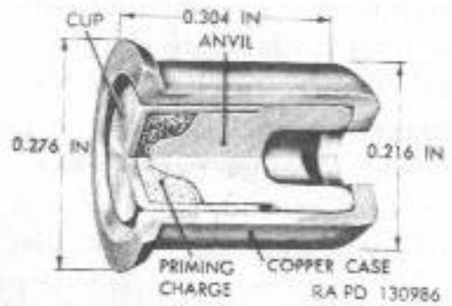


Figure 37. Primer, percussion cap, M2.

and a 0.085-inch hole at the other. It contains an inner inverted cup, an initiating charge, and an anvil. The primer produces a small flame when struck by a firing pin, to initiate a blasting cap or igniter charge. Firing devices are issued with this type of primer installed in the coupling base. The primer is also issued separately for repriming firing devices used with regular practice mines or with improvised practice mines or booby traps. A fired primer may be punched out of a coupling base from the nipple end by a suitable rod. Separately issued primers are used for repriming fired firing devices used in training

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activities. A new primer may be inserted in place of the fired primer provided it fits snugly enough to be held tightly in place.

Caution: No attempt will be made to remove an unfired primer from a coupling base.

62. Primer, Percussion Cap, Improved No. 3

This primer is essentially the same as the M2 (par. 61).

Section VIII. BLASTING CAPS

63. General

Blasting caps, used for priming explosives, are the Army types and the commercial type. The Army type consists of a thin tubular metallic shell of noncorrosive material about 2½ inches long and ¼-inch diameter (figs. 38 and 39) containing an initiating composition and a charge of tetryl or PETN, which are sensitive high-explosives. Blasting caps are used for initiating high explosives and as the detonating element for certain types of land mine fuses. The caps are designed to be inserted into cap wells, the electric type being fitted with lead wires for attachment to a blasting machine and the nonelectric type crimped to any standard firing device or to time blasting fuse (safety fuse) fitted with a fuse lighter. Special Army electric (type II (J2 PETN)) and nonelectric (type I (J1 PETN)) caps, similar in size and shape to the tetryl caps illustrated in figure 38, are used to detonate the less sensitive military explosives, such as TNT and ammonium nitrate. Commercial caps, principally the No. 6 and No. 8, may be used to detonate the more sensitive explosives, such as tetryl, tetrytol, or nitrostarch. The No. 8 cap is more powerful than the No. 6, hence the No. 8 cap may be used to detonate a less sensitive explosive than one which can be detonated by a No. 6 cap. Caps, blasting, No. 8, first, second, third, and fourth delay are used to detonate charges of commercial dynamite (or lengths of detonating cord) in a sequence, especially in quarrying or tunnel driving operations.

Caution: Blasting caps are extremely sensitive and may explode unless handled carefully. They must be protected from shock and extreme heat and must not be tampered with. They are never to be stored with any other explosives. Caps and explosives must not be carried on the same truck except in emergency.
See FM 5–25, for firing systems and priming.

64. Electric Caps

a. When two or more electric caps are connected in the same circuit, they must be the product of the same manufacturer. This is essential to prevent misfires because caps of different manufacturers do not have

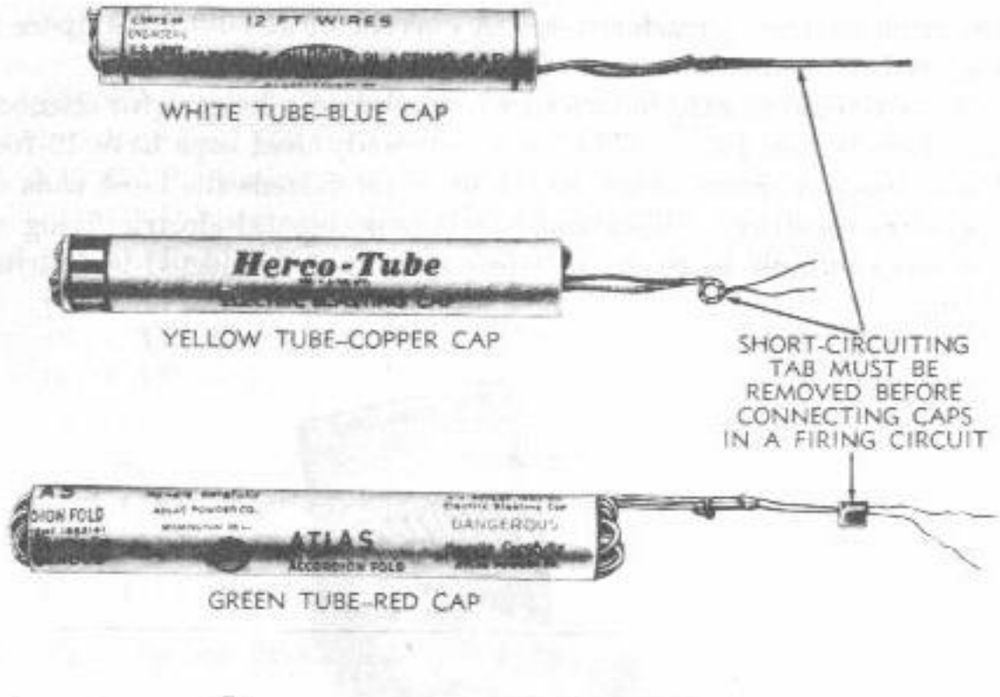


Figure 38. Caps—blasting.

the same electric characteristics. A current of at least 0.5 ampere is required to insure detonation of electric blasting caps.

b. Issue electric caps have lead wires of various lengths for connecting them to the circuit. The most commonly used caps have 12-foot lead wires. A short-circuiting tab or shunt fastens the loose ends of the wires together. This shunt prevents accidental electric firing of the cap and must be removed before the cap is connected in a firing circuit.



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Figure 39. Blasting caps—packed in cartons.

65. Nonelectric Caps

Because nonelectric caps are extremely difficult to waterproof, their use should be avoided in priming charges placed under water or in wet boreholes. Such charges, if they are to be fired nonelectrically, should be primed with the nonelectric blasting cap crimped to the detonating cord, which should be kept above the water or ground level. If it becomes necessary to use nonelectric caps in damp boreholes, they should be moisture-proofed with waterproofing compound and fired immediately after placing.

66. Types

Blasting caps currently used in priming explosives are described in *a* and *b* below.

a. Army Type.

(1) CAP, blasting, special, electric, Type II (J2 PETN).
(2) CAP, blasting, special nonelectric, Type I (J1 PETN).
(3) CAP, blasting, tetryl, electric, waterproof (fuze, submarine mines) (4-ft lead wires).
(4) CAP, blasting, tetryl, nonelectric.

b. Commercial Type.

(1) CAP, blasting, electric, No. 6, instantaneous.

(2) CAP, blasting, commercial, electric, No. 6, instantaneous, medium length lead (12 ft–40 ft).
(3) CAP, blasting, commercial, electric, No. 6, instantaneous, long lead (50 ft–100 ft).
(4) CAP, blasting, nonelectric, No. 6, instantaneous.
(5) CAP, blasting, nonelectric, No. 8, instantaneous.
(6) CAP, blasting, electric, No. 8, 1st delay, 1.00 sec (approx).
(7) CAP, blasting, electric, No. 8, 2d delay, 1.18 sec (approx).
(8) CAP, blasting, electric, No. 8, 3d delay, 1.35 sec (approx).
(9) CAP, blasting, electric, No. 8, 4th delay, 1.53 sec (approx).
(10) CAP, blasting, commercial, electric, No. 8, instantaneous, medium length lead (12 ft–40 ft).
(11) CAP, blasting, commercial, electric, No. 8, instantaneous, long lead (50 ft–100 ft).
(12) CAP, blasting, nonelectric, No. 8, instantaneous.

67. Caps for Positive Detonation

The types of caps required for positive detonation of various explosives are shown in table I (par. 18).

68. Charge, Propelling, M12 (T1), With Primer M44, for Rod, Earth, Blast-Driven

This item is described under ROD, earth, blast-driven (pars. 95–99).

Section IX. ACCESSORIES

69. General

This section pertains to accessories used in conjunction with explosive items. These accessories consist of nonexplosive items such as instruments, special tools, containers, fittings, and related items.

70. Adapter, Priming, M1A4

The priming adapter is a plastic hexagonal-shaped device, approximately $1\frac{1}{10}$ inches long, 0.63 inch across the flat portion, and hexagonal-shaped for 0.85 inch of its total length, the balance of its length being threaded to fit female threads of threaded cap wells and the destructor M10 (par. 73). A shoulder inside one end is large enough to permit time fuze or detonating cord to pass through but too small for an Army special blasting cap. The adapter is slotted longitudinally, so the wires of an electric blasting cap can be inserted easily and quickly. The hexagon-shaped item can be more readily handled, using arctic mittens. This item, which replaces adapters M1A2 and M1A3, simplifies the priming of military demolition explosives having threaded cap wells and utilizing Army special blasting caps, both electric and nonelectric.

71. Adapter, Priming, M1A3

The priming adapter (fig. 40) simplifies the priming of military explosives having threaded cap wells. It is a plastic cylinder approximately ¾-inch long with 1 1/16-inch maximum OD and 5/16-inch maximum ID. A shoulder inside one end is large enough to permit time blasting fuse or detonating cord to pass through, but too small for a blasting cap. The other end is threaded with a 9/16-inch external thread, which fits the internal thread of threaded cap wells. The adapter is slotted longitudinally, so that the wires of an electric blasting cap can be inserted easily and quickly. The priming adapter is used as indicated in *a* through *c* below.

a. With Electric Blasting Cap (A, fig. 40).

(1) Pass cap wires of the electric cap through slot of priming adapter.
(2) Pull cap into adapter.
(3) Insert cap into fuse well (cap well) of explosive.
(4) Screw the adapter into the well.

b. With Nonelectric Blasting Cap and Safety Fuse M700 or Time Blasting Fuse (B, fig. 40).

(1) Pass the end of the fuse through the adapter.
(2) Crimp the nonelectric blasting cap to the fuse.
(3) Pull the cap into the adapter.
(4) Insert cap into cap well of explosive and screw adapter into place.

c. With Detonating Cord.

(1) Cut off and discard 6 inches from the end of the detonating cord.
(2) Use same method as for nonelectric cap and time blasting fuse.

Note. Detonating cord alone in the cap well of a TNT block is not sufficiently powerful to detonate it.

72. Adapter, Priming, M1A2

This adapter is the same as that described in the paragraph 71, except for minor details.

73. Destructor, High-Explosive, Universal, M10

a. General.

(1) The universal high-explosive destructor M10 is a high-explosive charge initiated by means of blasting caps or mine activators and standard firing devices. Destructors are used with demolition sets No. 1, 2, and 5.
(2) The destructor M10 is essentially an adapter-booster, with thread bushings that will fit 1.5-, 1.7-, and 2-inch standard right-hand threaded fuse wells. It is used in preparing

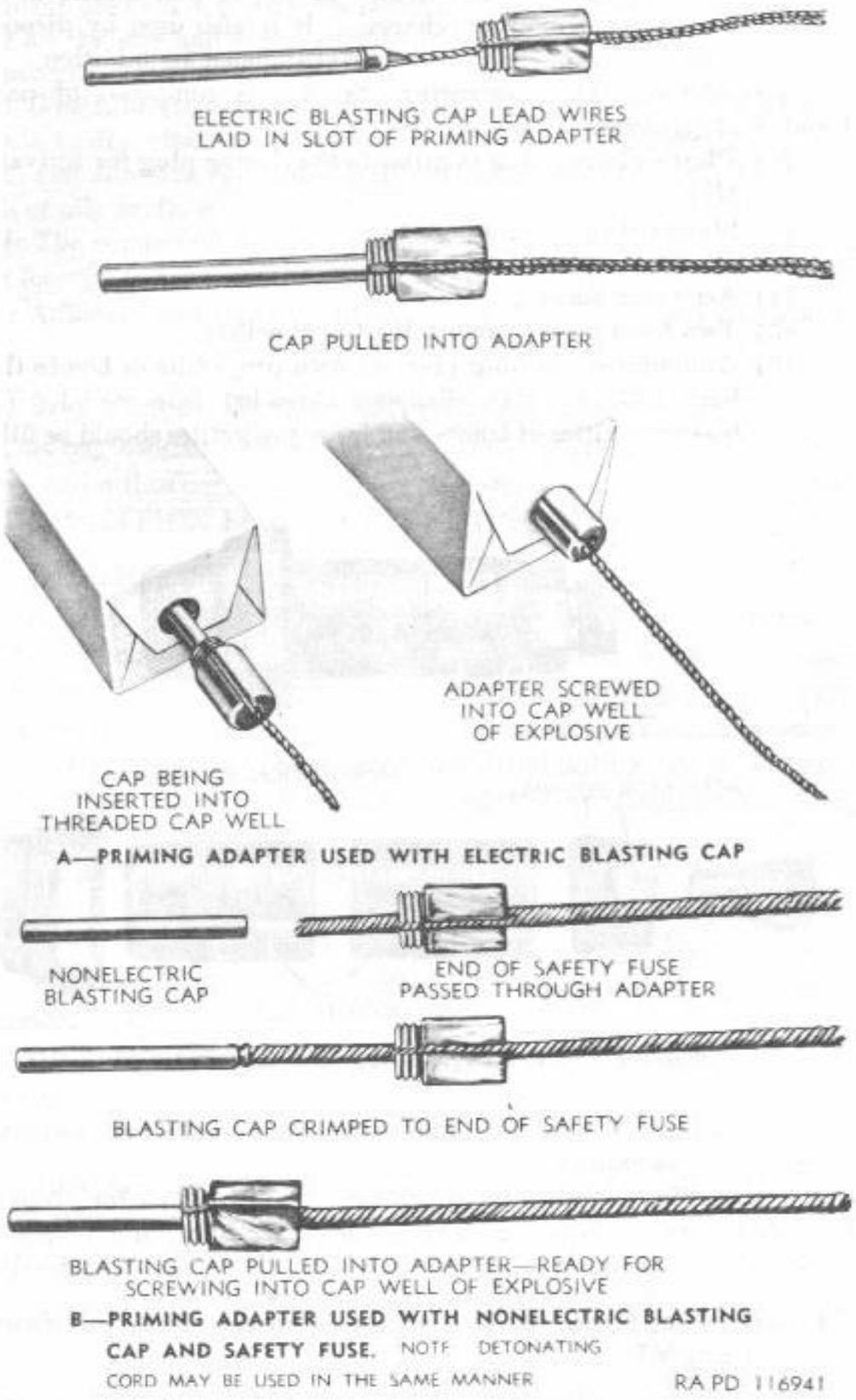


Figure 40. Use of adapter, priming, M1A3, with electric and nonelectric blasting caps and with safety fuse and detonating cord (PRIMACORD).

loaded projectiles and bombs as improvised mines, booby traps, and demolition charges. It is also used by disposal units to destroy deteriorated or abandoned ammunition.

b. Description. This destructor (fig. 41) is composed of parts listed in (1) through (6) below.

(1) Plastic closing plug (similar to the closing plug for activator M1).
(2) Standard priming adapter.
(3) Blasting cap bushing.
(4) Activator bushing.
(5) Two booster cups, containing tetryl pellets.
(6) Ammunition bushing (for use with projectiles or bombs that have 1.7- or 2-inch diameter threaded fuse wells). The booster cavities of bombs and large projectiles should be filled

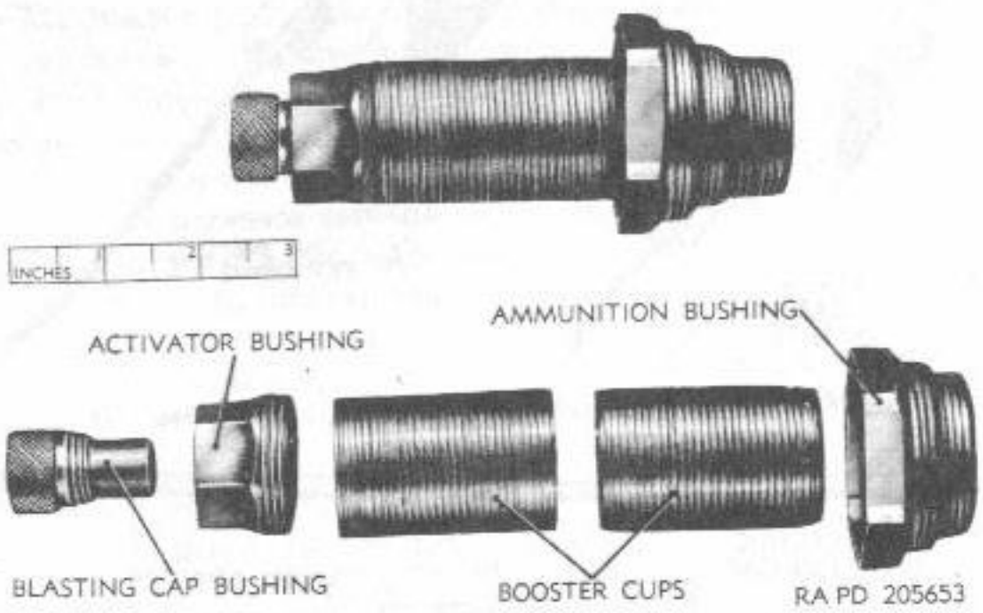


Figure 41. Destructor, high-explosive, universal, M10.

to the full depth by adding booster cups to the destructor M10 as required.

c. Safety Precautions. Safety distance requirements for preparation of primers and demolition charges as set forth in TM 9–1900 must be observed when preparing the universal destructor M10 for use.

74. Adhesive, Paste, for Demolition Charges, One-Half Pound Can, M1

a. Adhesive compound is a sticky puttylike substance issued in some demolition sets for attaching charges to vertical surfaces or to overhead flat surfaces. It is useful in holding charges while tying them in place or, under some conditions, holding charges without tying.

Charges are held in place from several minutes to several days depending on the size and shape of charge and the surface to which it is attached.

b. The adhesive compound will hold a single thickness of explosive blocks to dry, clean wood, steel, or concrete for several days.

c. The adhesive compound will not adhere satisfactorily to dirty, wet, or oily surfaces.

d. The compound becomes stiff and hard at subzero temperatures and loses its adhesive quality.

e. Adhesive compound is softened by water and becomes useless if wet.

75. Bag, Canvas, Carrying, Demolition Equipment

This bag consists of a rectangular canvas receptacle with shoulder strap and adjusting straps. It is used for carrying the components of DEMOLITION EQUIPMENT SET NO. 5, individual (fig. 49).

76. Boxes for Blasting Caps

Especially designed empty boxes of various capacities are provided for demolition equipment sets and blast-driven earth rod sets. These boxes consist of rectangular wooden blocks with telescoping covers. Holes in the block-like interior of the box are receptacles for nonelectric blasting caps. The boxes are filled with blasting caps when preparing the sets for use. The available blasting cap boxes are described in *a* and *b* below.

a. BOX, Cap, 10-Cap Capacity, Infantry. This box is one of the non-explosive components of DEMOLITION EQUIPMENT SET NO. 5, individual (fig. 49), ROD, earth, blast-driven, Set No. 1 (fig. 51), and DEMOLITION EQUIPMENT SET NO. 1, engineer squad (fig. 47).

b. BOX, Cap, 50–Cap Capacity, Engineer. This box is one of the non-explosive components of DEMOLITION EQUIPMENT SET NO. 2, engineer platoon (fig. 48).

77. Case, Leather, Galvanometer, Blasting, Type I, With Leather Carrying Strap

This is a leather case with leather shoulder strap for carrying and protecting the galvanometer (par. 81), which is used for testing electrical circuits and their components. This item may be requisitioned separately for replacement purposes when necessary. The case has an opening in one side to register with the scale of the galvanometer. By lifting the cover of the case to expose the terminals, the galvanometer can be used without its removal from the case. The case should be used and stored under as dry conditions as practicable.

78. Chests (Demolition)

a. CHEST, Demolition Squad. This chest is used to hold the components of DEMOLITION EQUIPMENT SET NO. 1, engineer squad (fig. 47). The dimensions of the chest are approximately 40 x 17 x 16. Partitions are arranged especially for keeping components of the set in order.

b. CHEST, Demolition Platoon Engineer, M1931. This chest is used to hold the components of DEMOLITION EQUIPMENT SET NO. 2, engineer platoon (fig. 48). The dimensions of the chest are 32¾ x 17¾ x 12¾. Partitions are arranged especially for keeping components of the set in order.

79. Clip, Cord, Detonating, M1

This is a metal device used to join detonating cord; for application, see figure 25.

80. Compound, Sealing, Blasting Cap, Waterproof, ½-Pint Can

This compound is used to waterproof the connection between safety fuse and a nonelectric blasting cap and to moisture-proof dynamite primers. It does not make a permanent waterproof seal and must not be submerged in water unless the charge is to be fired immediately.

81. Galvanometer, Blasting (W/Leather Case and Carrying Strap)

a. The galvanometer (fig. 42) is used to test electrical firing wire circuits. It contains an electromagnet, a small special silver-chloride dry cell, and a scale and indicator needle. When the two external terminals are joined by a closed circuit, the flow of current from the dry cell causes the needle to move across the scale. The amount of deflection depends upon the amount of resistance in the closed circuit and on the strength of the cell.

b. The galvanometer must be handled with care and kept dry. Before using, it is tested by holding a piece of metal across its two terminals. If this does not cause a wide deflection of the needle, the cell is weak and must be replaced. Only the special cell (silver chloride dry cell battery, type BA 245/U) may be used in the galvanometer, because other cells may be strong enough to detonate a cap. The galvanometer is delicate and must not be tampered with or opened except to replace a weak cell.

c. Dry cells tend to freeze and to cease functioning at temperatures below 0° F. When using the galvanometer in a cold climate, protect it from freezing by placing it under the clothing near the body.

d. A leather carrying case with carrying strap is issued with this instrument. The case may also be requisitioned separately as a replacement, see paragraph 77.

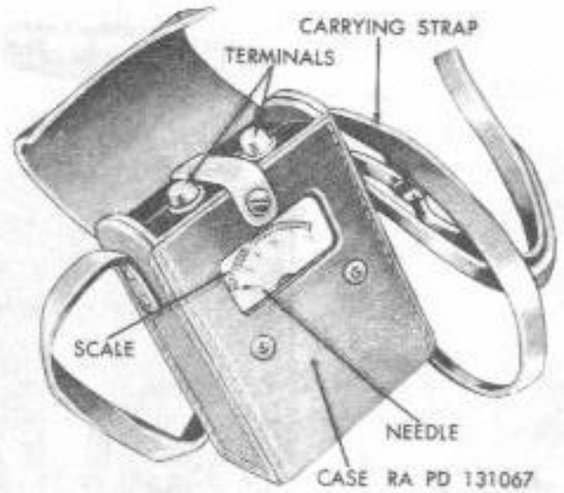


Figure 42. Galvanometer and carrying case.

e. For use of the galvanometer to test firing wires and circuits, see FM 5–25.

82. Machine (Blasting)

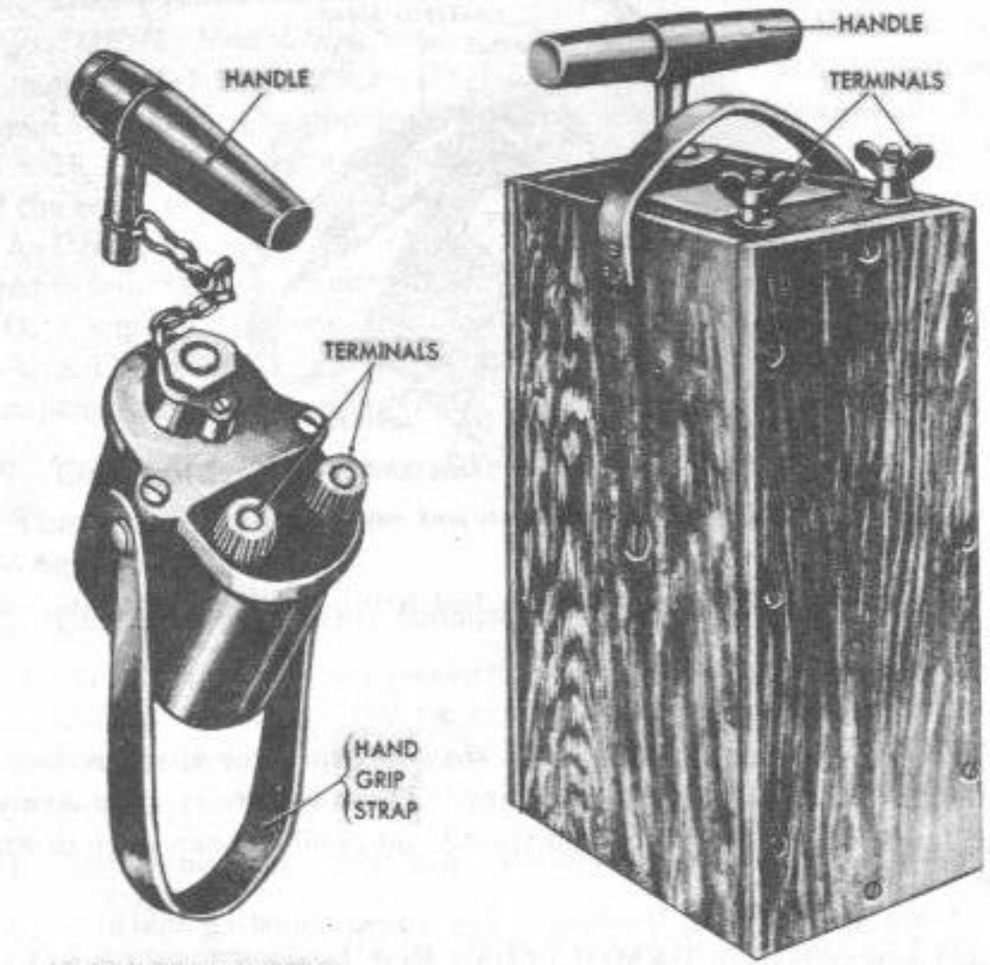
The blasting machine is a small electric generator that produces current for firing electric blasting caps. There are two types in Army use, the 10-cap twisting type and the 30-, 50-, and 100-cap push-down type.

a. Ten-Cap Blasting Machine. The 10-cap blasting machine (A, fig. 43) is standard in DEMOLITION EQUIPMENT SETS NO 1, 2, and 7. If operated correctly, it will fire 10 electric blasting caps properly connected in series. It weighs 5 pounds. When using this machine, proceed as indicated in (1) through (3) below.

(1) To be sure the machine is working properly and to loosen it up, operate it several times before attaching the firing wires.
(2) Insert the T-shaped handle.
(3) Insert the left hand through the strap and grasp the bottom of the machine very firmly as shown in C, figure 43. With the back of the right hand toward you, grasp the handle and give it a very vigorous clockwise turn as far as it will go.

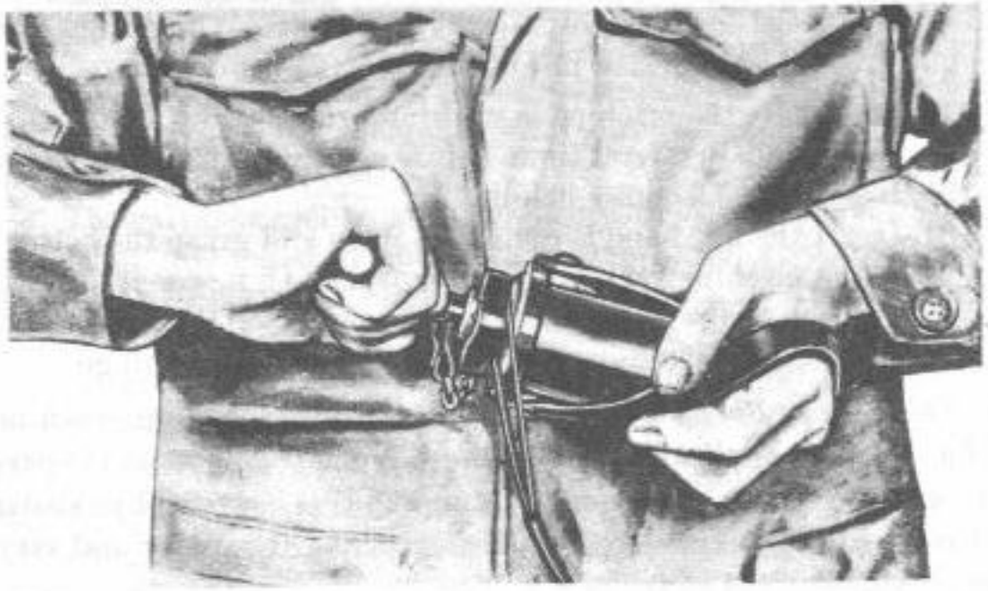
b. Thirty-Cap Blasting Machine. The 30-cap blasting machine (B, fig. 43) fires 30 electric caps properly connected in series if operated correctly. It weighs about 20 pounds. It is operated by raising the handle to the top of its stroke, then pushing it rapidly and very forcefully downward as far as it will go.

c. Fifty-Cap Blasting Machine. The 50-cap blasting machine is similar to the 30-cap blasting machine, except for size and weight, and is operated in the same manner. It weighs 21 pounds. It will fire 50 electric caps properly connected in series.



A—TEN-CAP BLASTING MACHINE

B—THIRTY-CAP BLASTING MACHINE



C—METHOD OF USING 10-CAP BLASTING MACHINES

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Figure 43. Blasting machines.

d. One Hundred-Cap Blasting Machine. The 100-cap blasting machine is similar to the 50-cap machine, except for size and weight, and is operated in a similar manner. It weighs 40½ pounds and will fire 100 caps properly connected in series.

e. Testing. Blasting machines should be frequently tested for capacity with a rheostat connected in series with the machine and with a circuit of electrically connected electric blasting caps. See paragraph 84, for description of rheostats used with blasting machines.

f. Care and Preservation.

(1) Blasting machines are of somewhat rugged construction but they house a relatively delicate, electrical mechanism, hence the machine should be treated with care.

(2) No attempt will be made to disassemble or repair a blasting machine.

(3) Cleaning and oiling will be done only by authorized personnel.

(4) When not in use, machines will be stored in a clean, dry, and relatively cool place.

(5) Directions for care and use on metal plates attached to each machine should be followed carefully.

83. Reels and Spools

a. REEL, Wire, Firing, 500-foot, RL–39A, With Two Carrying Straps, With Winding Device, Without Spool, Without Wire. This firing wire reel (fig. 44) consists of a spool, a handle assembly, and a crank and axle. Two carrying straps are used to carry the reel.

(1) The spool is 9 inches in diameter and about 8 inches wide. It has a capacity of 500 feet of 18-gage firing wire. The fixed end of the wire is brought from the spool through a hole in the side of the drum and fastened to brass thumb nut terminals.

(2) Two U-shaped steel rods form the handles. A loop at each end encircles a bearing assembly, consisting of a brass housing that contains a steel center to receive the axle.

(3) The axle is a square $\frac{5}{16}$-inch shaft. A crank is riveted to one end and a hole near the other end receives a cotter pin, which holds the axle in place.

b. REEL, Wire, Firing, 500-foot, With Two Detachable D-shaped Handles. This firing wire reel (fig. 45) is a metal drum mounted on an axle, to which two detachable D-shaped handles are fastened. The arm with knob on the side of the drum is used to crank it.

c. REEL, Wire, Firing, 1,000-foot, Empty. This item is similar to the item described in *b* above, except that it is empty and has a capacity of 1,000 feet of firing wire.

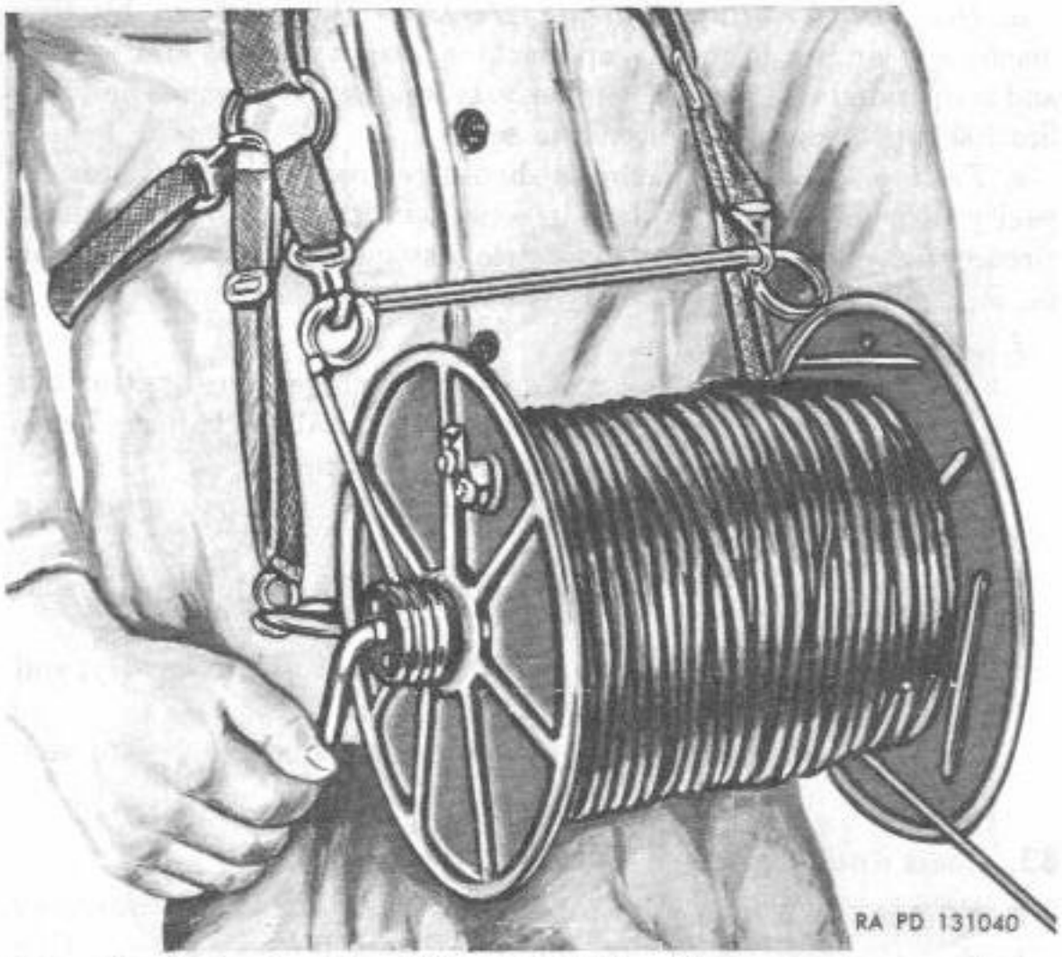


Figure 44. Reel, wire, firing, 500-foot, RL–39A, with carrying straps, and wire.

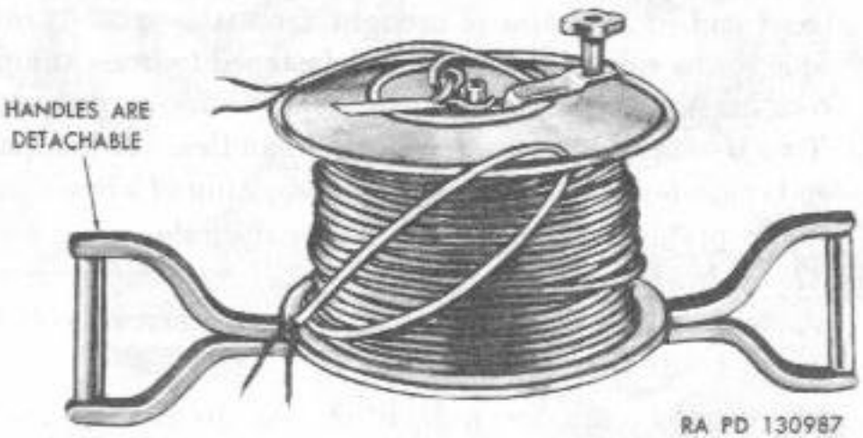


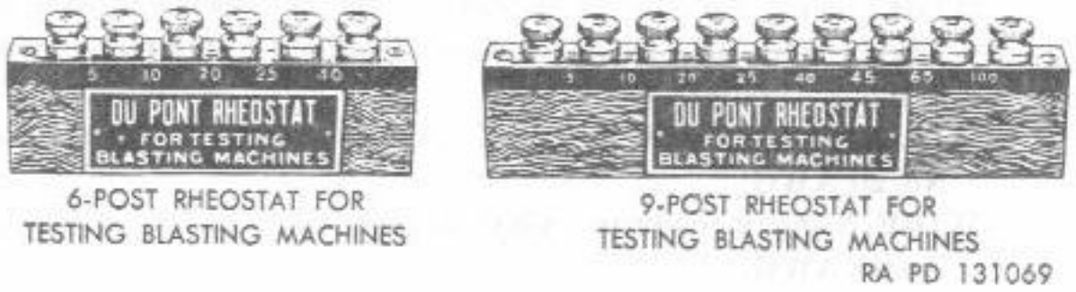
Figure 45. Reel assembly, wire, firing 500-foot, with two detachable D*-shaped handles.*

84. Rheostats

There are two types of rheostats used in the Army in connection with testing blasting machines (par. 82), the six-post and the nine-post (fig. 46).

a. RHEOSTAT, Blasting Machine, Testing, 6-Post.

(1) *Description.* This rheostat consists of a series of coils of electrical resistance wire in a rectangular block-type case approximately 3½ inches in length. Six brass binding posts with round nuts protrude from the top of the case. The terminals of the resistance coils inside the case are connected to the internal ends of the binding posts. Numbers on the side of the case between adjacent pairs of binding posts indicate the number of caps in series having the same resistance as the internal resistance coil connected to that particular pair of posts. The number of caps in series having a resistance equal to that between any pair of posts is obtained by adding the figures between the pair selected.



6-POST RHEOSTAT FOR TESTING BLASTING MACHINES

9-POST RHEOSTAT FOR TESTING BLASTING MACHINES

Figure 46. Rheostats for testing blasting machines.

(2) *Use.* In order to test a blasting machine, connect the rheostat at any selected pair of binding posts, in series with the blasting machine and in series with a circuit of several blasting caps, themselves in series. Operate the blasting machine. If all the caps are successfully exploded, the number of caps plus the number stamped between the binding posts, to which the circuit is attached, will be the tested capacity of the machine. Many combinations of blasting cap circuits and pairs of rheostat binding posts may be used, thus testing the blasting machine from 5- to 100-cap capacity.

b. RHEOSTAT, Blasting Machine, Testing, 9-Post. This rheostat is similar to that described in *a* above, except that it is longer. It has nine binding posts and correspondingly larger capacity than the 6-post rheostat.

85. Twine and Tape, Friction, General Use, Grade A, ¾-Inch Wide, ½-Pound Roll

Twine and friction tape are included in demolition sets, to fasten caps to detonating cord, insulate electrical connections, fasten charges in place, tie or tape blocks of explosive together into a compact package, and miscellaneous uses.

86. Wire (Annunciator and Firing)

Firing wire for electric firing of charges is issued in 500 foot lengths of 2-conductor, No. 18 AWG plastic- or rubber-covered wire. The wire is carried on one of the reels described in paragraph 83. In setting off charges, two reels of wire may be required to reach a safe distance. Single-conductor No. 20 AWG annunciator wire is issued for making connections between electric caps or between cap and firing wire. See FM 5–25 for use of these wires in electric firing systems:

WIRE, annunciator, single-conductor, cotton covered, 200-foot roll, No. 20 AWG.

WIRE, firing, 2-conductor, rubber covered, 500-foot roll, No. 18 AWG. This 500-foot roll may be issued for use with reel shown in figure 45 only.

WIRE, firing, 2-conductor, vinyl polymer covered, 500-foot roll, No. 20 AWG.

WIRE, firing, 2-conductor, vinyl polymer covered, 500-foot roll, No. 18 AWG.

Section X. TOOLS

87. Crimper, Cap (W/Fuse Cutter) M2

a. This crimper (BB, fig. 47) is designed to squeeze the shell of the nonelectric cap tightly enough around safety fuse or time blasting fuse or detonating cord to prevent it from being pulled off easily and still not interfere with the burning of the powder train in the fuse. The lower portion of the jaws of the crimper are shaped and sharpened for cutting fuse. One leg of the handle is pointed for punching holes for caps in dynamite cartridges. The other leg has a screwdriver end.

b. The cutting jaws must be kept clean and must be used only for cutting fuse or detonating cord. The cap primer must not be used as pliers.

c. The crimper M2 has a narrow jaw that crimps a water-resistant groove completely around the cap. Earlier model cap crimpers have wider crimping jaws, which form a sleeve at the open end of the cap. Both crimpers are constructed so the jaws cannot be closed tightly enough to injure the cap or fuse.

88. Knife, Pocket, General Purpose, 74–K–65

This pocket knife is a component of DEMOLITION EQUIPMENT SETS NOS. 1 and 2.

89. Pliers, Lineman's, Side-Cutting, Length 8 Inches

This item (CC, fig. 47) is a component and replacement item for DEMOLITION EQUIPMENT SETS NOS. 1 and 2. The item can also be used separately.

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CHAPTER 4

DEMOLITION EQUIPMENT—SETS AND KITS

Section I. DEMOLITION EQUIPMENT SETS

90. General

Demolition sets described in this section are made up of demolition explosive items, accessories, and tools selected from those described in paragraph 19 through 89, with especially designed containers and carrying attachments for the efficient performance of particularly designated demolition tasks.

91. Demolition Equipment Set No. 1, Engineer Squad

The individual items in this set are described separately in this manual. The set (fig. 47) consists of the items listed below:

Note. The item letters are keyed to figure 47.

Item letter	*Item*
A	3 BOX, cap, 10-cap capacity, infantry
B	5 FIRING DEVICE, pull-friction type, M2
C	30 CLIP, cord, detonating, M1
D	5 FIRING DEVICE, pressure type, M1A1
E	10 DETONATOR (five 15-sec delay, M1, and five 8-sec delay, M2)
F	1 CHEST, demolition squad
G	1 REEL, wire, firing, 500 ft, RL–39A, w/2 carrying straps, w/winding device, w/o spool, w/o wire, and 1 SPOOL, DR–8A, empty, reel, wire, firing, 500 ft
H	1 BLOCK, demolition, chain, M1 (eight 2½-lb block strung on cord, detonating)
J	1 WIRE, firing, 2-conductor, vinyl polymer covered, 500-ft roll, No. 18 AWG
K	2 WIRE, annunciator, single-conductor, cotton covered, 200-ft roll, No. 20 AWG
L	1 FUSE, safety, M700, or FUSE, blasting, time (50-ft coil)
M	30 ADAPTER, priming, M1A4, or ADAPTER, priming, M1A3, or ADAPTER, priming, M12
N	30 CAP, blasting, special, nonelectric (type I (J1 PETN))
P	1 KNIFE, pocket, general purpose, 74–K–65 (stored, issued, and reviewed by Quartermaster Corps)
Q	8 BLOCK, demolition, M3 (COMP C3) (2¼-lb block)
R	8 BLOCK, demolition, M2 (2½-lb block)
S	3 CORD, detonating (PETN) (100-ft spool)
T	1 TWINE, hemp, No. 18, 4-oz ball
U	1 MACHINE, blasting, 10-cap capacity, class A

Item letter	*Item*
W	3 TAPE, friction, general use, grade A, ¾-in. wide, ½-lb roll
X	1 GALVANOMETER, blasting (w/leather case and carrying strap)
Y	30 EXPLOSIVE, TNT, 1-lb block
Z	40 LIGHTER, fuse, weatherproof, M2
AA	25 CAP, blasting, special, electric (type II (J2 PETN))
BB	2 CRIMPER, cap (w/fuse cutter), M2
CC	1 PLIERS, lineman's, side-cutting, length 8 in. 2 DESTRUCTOR, high-explosive, universal, M10 (T20)

92. Demolition Equipment Set No. 2, Engineer Platoon

The individual items in this set are described separately in this manual. The set (fig. 48) consists of the items listed below:

Note. The item letters are keyed to figure 48.

Item letter	*Item*
A	2 BOX, cap, 50-cap capacity, engineer
B	60 CLIP, cord, detonating, M1
C	15 FIRING DEVICE, pressure type, M1A1
D	10 DETONATOR, 15-sec delay, M1
E	1 REEL, wire, firing, 500 ft, RL 39A, w/o carrying straps, w/winding device, w/o spool, w/o wire, and 1 SPOOL, DR–8A, empty, reel, wire, firing, 500 ft
F	3 BLOCK, demolition, chain, M1 (eight 2½-lb block strung on cord, detonating)
G	1 WIRE, firing, 2-conductor, vinyl polymer covered, 500-ft roll, No. 18 AWG
H	2 WIRE, annunciator, single-conductor, cotton covered, 200-ft roll, No. 20 AWG
J	1 CHEST, demolition platoon, engineer, M1931
K	3 FUSE, safety, M700, or FUSE, blasting, time (50-ft coil)
L	10 DETONATOR, 8-sec delay, M2
M	2 KNIFE, pocket, general purpose, 74–K 65 (stored, issued, and reviewed by Quartermaster Corps)
N	100 ADAPTER, priming, M1A4, or ADAPTER, priming, M1A3, or ADAPTER, priming, M1A2
P	100 CAP, blasting, special, nonelectric (type I (J1 PETN))
Q	15 FIRING DEVICE, pull-friction type, M2
R	3 CORD, detonating (PETN) (100-ft spool)
S	24 BLOCK, demolition, M2 (2½-lb block)
T	24 BLOCK, demolition, M3 (COMP C3) (2¼-lb block)
V	1 MACHINE, blasting, 10-cap capacity, class A
W	3 TWINE, hemp, No. 18, 4-oz ball
X	1 PLIERS, lineman's, side-cutting, length 8 in.
Y	2 CRIMPER, cap (w/fuse cutter), M2
Z	100 CAP, blasting, special, electric (type II (J2 PETN))
AA	100 LIGHTER, fuse, weatherproof, M2
BB	4 TAPE, friction, general use, grade A, ¾-in. wide, ½-lb roll
CC	1 GALVANOMETER, blasting (w/leather case and carrying strap)
DD	100 EXPLOSIVE, TNT, 1-lb block 4 DESTRUCTOR, high-explosive, universal, M10 (T20)

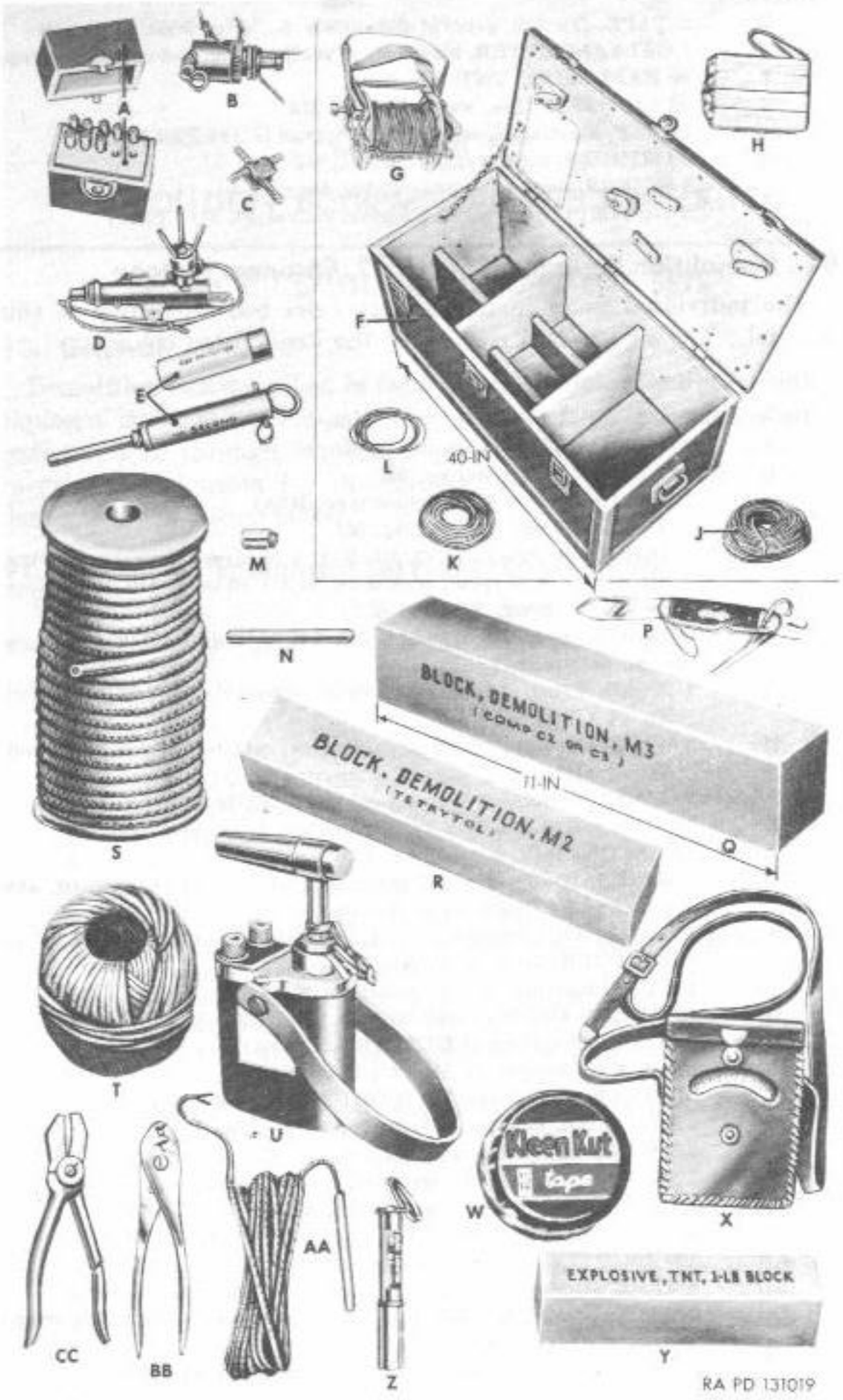


Figure 47. Demolition equipment set No. 1, Engineer Squad.



Figure 48. Demolition equipment set no. 2, engineer platoon.

93. Demolition Equipment Set No. 5, Individual

The individual items in this set are described separately in this manual. The set (fig. 49) consists of the items listed below:

Note. The item letters are keyed to figure 49.

Item letter	*Item*
A	10 LIGHTER, fuse, weatherproof, M2
B	2 FIRING DEVICE, pressure type, M1A1
C	8 BLOCK, demolition, M3 (COMP C3) (2¼-lb block)
D	10 CLIP, cord, detonating, M1
E	2 FIRING DEVICE, pull-friction type, M2
F	10 ADAPTER, priming, M1A4, or ADAPTER, priming, M1A3, or ADAPTER, priming, M1A2
G	2 CRIMPER, cap (w/fuse cutter), M2
H	1 CORD, detonating (PETN) (100-ft spool)
J	2 BAG, canvas, carrying, demolition equipment
K	1 FUSE, safety, M700, or FUSE, blasting, time (25-ft coil)
L	10 CAP, blasting, special, nonelectric (type I (J1 PETN))
M	4 DETONATOR, 15-sec delay, M1
N	2 TAPE, friction, general use, black, width ¾-in., 8 oz roll
P	2 ADHESIVE, paste, for demolition charges, ½-lb can, M1
	1 BOX, cap, 10-cap capacity, infantry
	5 DESTRUCTOR, high-explosive, universal, M10 (T20)

94. Demolition Equipment Set No. 7, Electrical

The individual items in this set are described separately in this manual. The set (fig. 50) consists of the items listed below:

Note. The item letters are keyed to figure 50.

Item letter	*Item*
A	1 MACHINE, blasting, 10-cap capacity, class A, w/extra handle
B	9 CAP, blasting, special, electric (type II (J2 PETN))
C	10 ADAPTER, priming, M1A4, or ADAPTER, priming, M1A3, or ADAPTER, priming, M1A2
D	1 GALVANOMETER, blasting (w/leather case and carrying strap)
E	1 WIRE, firing, 2-conductor, vinyl polymer covered, 500-ft roll, No. 20 AWG
F	1 BAG, canvas, carrying, demolition equipment

Section II. ROD, EARTH, BLAST-DRIVEN, SET NO. 1

95. General

This set (fig. 51) is used for making holes for demolition or constructional purposes as deep as 6 feet and as large in diameter as several inches in earth and soft shale. It is not usable in rock or other hard material.

96. Description

This set consists of nonexplosive and explosive items as listed in paragraph 97. The main rod is of steel, 6 feet in length and 1¼ inches in diameter. The point, which is 1½ inches in diameter, fits



Figure 49. Demolition equipment set No. 5, individual.



A—MACHINE, BLASTING, 10-CAP CAPACITY, CLASS A, W/EXTRA HANDLE
B—CAP, BLASTING, SPECIAL, ELECTRIC, J2 (PETN)
C—ADAPTER, PRIMING, M1A4 OR ADAPTER, PRIMING, M1A3 OR ADAPTER, PRIMING, M1A2
D—GALVANOMETER, BLASTING, W/LEATHER CASE AND CARRYING STRAP
E—WIRE, FIRING, 2-CONDUCTOR, VINYL-POLYMER COVERED, 500-FT ROLL, NO 20 AWG
F—BAG, CANVAS, CARRYING, DEMOLITION EQUIPMENT

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Figure 50. Demolition equipment set No. 7, electrical.

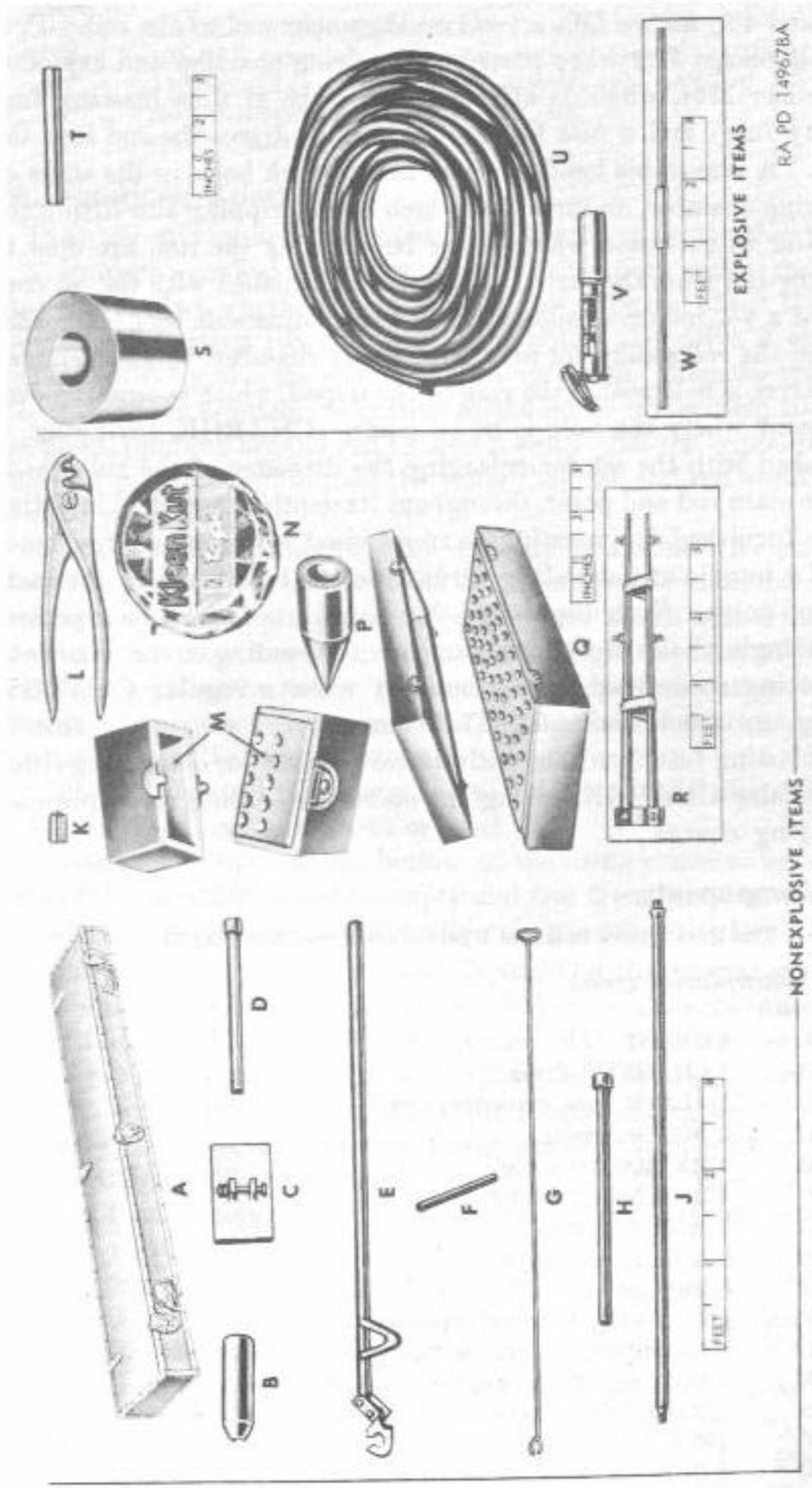


Figure 51. Rod, earth, blast-driven, set No. 1.

the lower end of the rod and a cylindrical firing chamber, 15 inches long and 4 9/16 inches OD, screws on the upper end of the rod. Propelling charge M12 when placed in the firing chamber and exploded by primer M44, which is attached to a piece of time blasting fuse (safety fuse) and a fuse lighter (par. 97*b*), drives the rod into the earth. A removable handle, which fits through holes in the walls of the firing chamber, an extractor, which is for gripping and lifting the rod, and an extension which is for lengthening the rod, are used to pull the rod from the earth. The tripod furnished with the set consists of a 4¾-inch ring supported on three adjustable legs. In order to hold the rod steady for firing, the firing chamber, when assembled to the rod, is held within the ring of the tripod, which is centered over the point where the hole is to be made. CHARGE, springing, is furnished with the set for enlarging the diameter of the hole, made by the main rod and point, throughout its depth. A forked inserting rod is furnished for inserting an improvised springing charge, made up of a bundle of detonating cords, into the hole made by the main rod and point. Such improvised charges may be used as an expedient for springing holes of various diameters (depending on the number of detonating cords used in the bundle) when a regular CHARGE, springing, is not available. The blasting caps and safety fuse or time blasting fuse furnished with the set are used for detonating either the regular CHARGE, springing, or for detonating an improvised springing charge.

97. Components

Note. The item letters in *a* and *b* below are keyed to figure 51.

a. Nonexplosive Items.

Item letter	Item
A	1 CHEST
B	1 CHAMBER, firing
C	1 PLATE, base, extractor, assy
D	1 ROD, extension
E	1 EXTRACTOR, rod
F	1 ROD, handles and starting
G	1 ROD, inserting
H	2 ROD, intermediate
J	2 ROD, main, long
K	100 ADAPTER, firing, explosive, M1A3 or M1A4
L	1 CRIMPER, cap, M2 (w/fuse cutter)
M	1 BOX, cap, 10-cap capacity, infantry
N	2 TAPE, friction, general use, black, ¾-in. wd, 8 oz roll
P	100 POINT
Q	2 BOX, cap, 50-cap capacity, engineer
R	1 TRIPOD

b. Explosive Items.

Item letter	Item
S	100 CHARGE, propelling, M12 (T1) (w/primer, M44)
T	100 CAP, blasting, special, nonelectric (type I (J1 PETN))
V	2 FUSE, safety, M700, or FUSE, blasting time, 50-ft coil
U	200 LIGHTER, fuse, weatherproof, M2
W	100 CHARGE, springing

98. Functioning and Use

The blast-driven earth rod is used as indicated in *a* through *g* below.

a. Prepare a conical depression about 8 inches deep and 30 inches in diameter at place where hole is desired. Insert the end of the 1¼-inch handle and starting rod into one of the points and drive it about 8 inches vertically into the center of the depression. Remove the handle, leaving the point at the bottom of the hole. Fit a main rod into the point, tamping around rod to hold it erect. Set the tripod so that its collar is in position to hold the firing chamber and rod steady in a vertical position.

b. The propelling charge (M12) is highly flammable. *No smoking should be permitted while handling it.* Unscrew the small metal cap from a can containing a propelling charge and punch a hole through the cap. Insert primer M44, attached to a length (at least 12 in.) of time blasting fuse or safety fuse into the propelling charge, which consists of loose smokeless powder M2, slip the cap of the can over the fuse, and screw the cap to the can.

c. Place the propelling charge in the bottom of the firing chamber and tamp the charge with earth or sand.

Caution: The space at the bottom of the firing chamber below the level of the shoulder should be empty and free from tamping material or water before placing the propelling charge can into place.

The firmness of tamping required depends on the character of the soil into which the rod is to be driven. Never use a charge other than CHARGE, propelling, M12, with primer, M44, with this set. Test shots are necessary to determine the tamping required. Screw the firing chamber tightly to the top of the rod, adjusting the tripod, if necessary, in order to hold the firing chamber firmly in position. Attach LIGHTER, fuse, weatherproof, M2, to the length of time blasting fuse (safety fuse). Operate the lighter and take cover or retire 25 yards until the charge fires.

d. To remove the rod from the ground, fit the gripper of the rod extractor around the rod and lift it from the hole. The base plate is placed on the ground beneath the purchase (pry) leg of the extractor for support, with the bolt of the base plate passing between the branches of the purchase leg. If the rod is buried too deep to be reached with the extractor, remove the firing chamber and place an extension on the end of the rod. The point is expendable and need not be recovered.

e. To spring the hole, using CHARGE, springing, lower or gently push one or more charges, as required, into the hole made by the rod. The charges are in cylindrical containers about 1 inch in diameter. Attach a blasting cap, crimped to a length (at least 12 in.) of time blasting fuse (safety fuse), to the uppermost charge in the hole in the place on the charge provided. Attach LIGHTER, fuse, weatherproof, M2, to the length of time blasting fuse (safety fuse). Operate the lighter and take cover or retire 25 yards until the charge fires. Additional charges may be fired in the same hole, to increase the diameter of the hole as desired.

Caution: Wait one-half hour between any successive firings in the same hole, so that it may cool to a safe temperature. Water may be poured into the hole to speed the cooling if desired.

f. To spring the hole with an improvised springing charge made up of several strands of detonating cord, cut several lengths of detonating cord (not furnished with the set) and tape them together tightly at the center and both ends, thus making a detonating cord charge (several strands bound together). The number of strands of detonating cord used depends on the desired diameter of the sprung hole and their length depends on its depth. Fifteen strands of detonating cord usually will produce a 12-inch hole in average ground. If a larger hole is required, first use one or two strands to widen the small hole, then use a greater number of strands for a second shot. Using the inserting rod, place the strands in the hole. Prime the detonating cord charge with a blasting cap and fuse lighter. Light the fuse lighter and take cover or retire about 25 yards until the charge is fired. Repeated firings may be made as in *e* above, observing the same precautions.

g. If it is desired to spring a spherical enlargement at the bottom of the hole, use one springing charge at the bottom of the hole and primer as in *e* above. Repeated firings may be made in *e* above, observing the same precautions.

99. Packing

The set is packed in a plywood box. The dimensions (in.) of the box are $73\frac{3}{16}$ x $11\frac{3}{16}$ x $5\frac{5}{8}$, the cover being chained to bottom of box. The chain is long enough to allow the cover to go 20° past vertical open position.

Section III. KIT, DEMOLITION, M37

100. Description

This kit (figs. 52 and 53) consists of a set of eight demolition blocks M5A1, eight demolition block hook assemblies (PC Mk 82–0–1776), and two priming assemblies M15. The demolition block M5A1, which

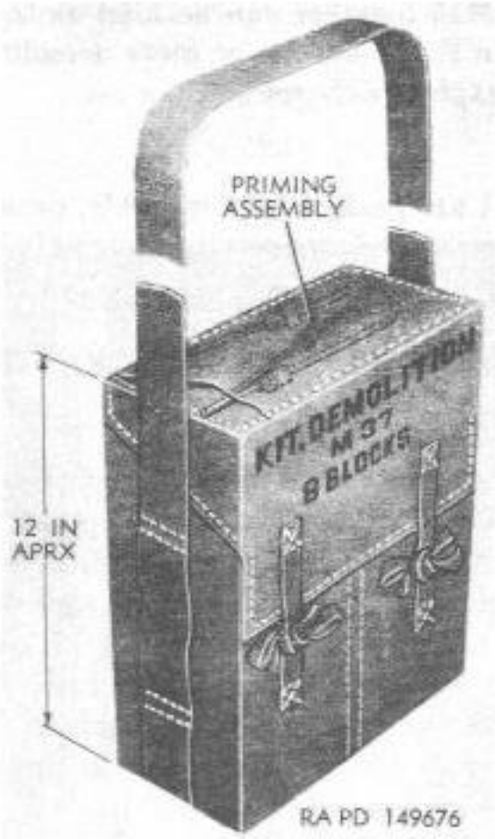


Figure 52. Kit, demolition, M37—in haversack.

is composed of composition C4, is about $2\frac{1}{4}$ inches square and $11\frac{3}{4}$ inches long. The priming assembly M15 (fig. 53) consists of a length (approx. 5 ft.) of detonating cord, to each end of which is attached a hexagonal-shaped plastic adapter and a booster. The priming assembly also includes two detonating cord clips. The adapter is threaded to fit the conventional size cap well of demolition blocks and light antitank mines. The booster, which is about one-quarter inch in diameter and 2 inches in length, contains a charge of 13.5 grains of RDX. The booster is crimped, one to each end of the 5-foot detonating cord, and is cemented in place. The clips, which are in place on the cord about 20 inches from either end of the assembly, are for forming junctions (fig. 25) on mainlines of detonating cord in a demolition system. The mainlines, with their initiators, and the

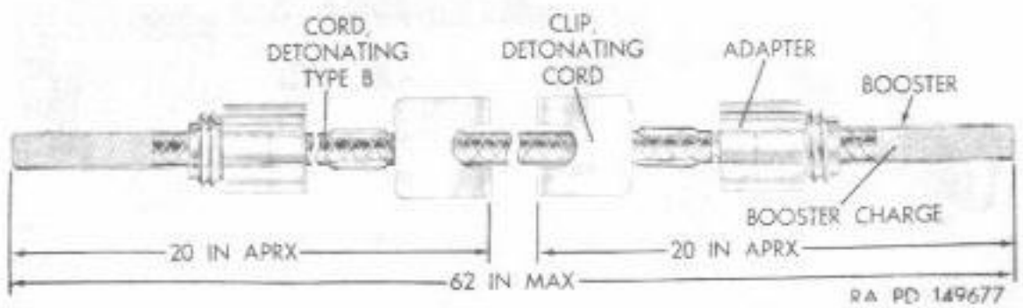


Figure 53. Priming assembly, demolition, M15.

priming assembly M15 together can be used as the "priming" of a system, of which, in this case, one or more demolition blocks M5A1 would be the main explosive charger.

101. Packing

The blocks M5A1 are packed four in BAG, demolition block, M5. Two bags (eight blocks) and two priming assembly M15 are packed in CASE, carrying, M85.

Section IV. DEMOLITION TRAINING KITS T38 AND T39

102. General

These kits (figs. 54—60) are for the training of personnel in the use of demolition materials. The kits are composed of items selected from those described in paragraphs 19 through 89 inerted for training purposes. All items from which the explosive contents were removed to render them inert are painted black. Haversacks, priming adapters, inert detonating cord, inert safety fuse, wires, instruments, and tools retain their normal colors or simulate the colors of their explosive counterparts. Inerted items used in these training kits are



Figure 54. Demolition training kit T38.

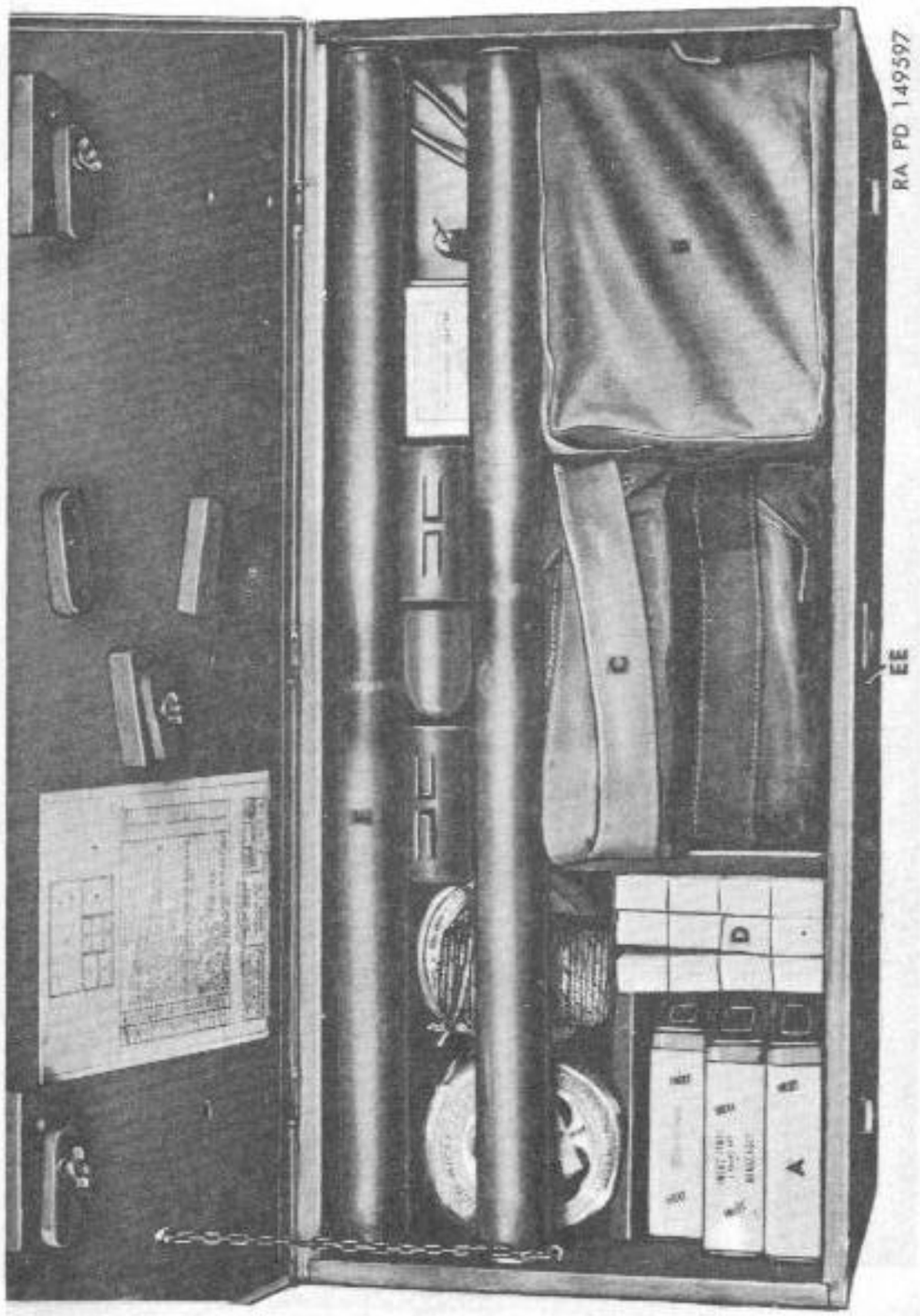


Figure 55. Demolition training kit T38—packing plan, top layer.

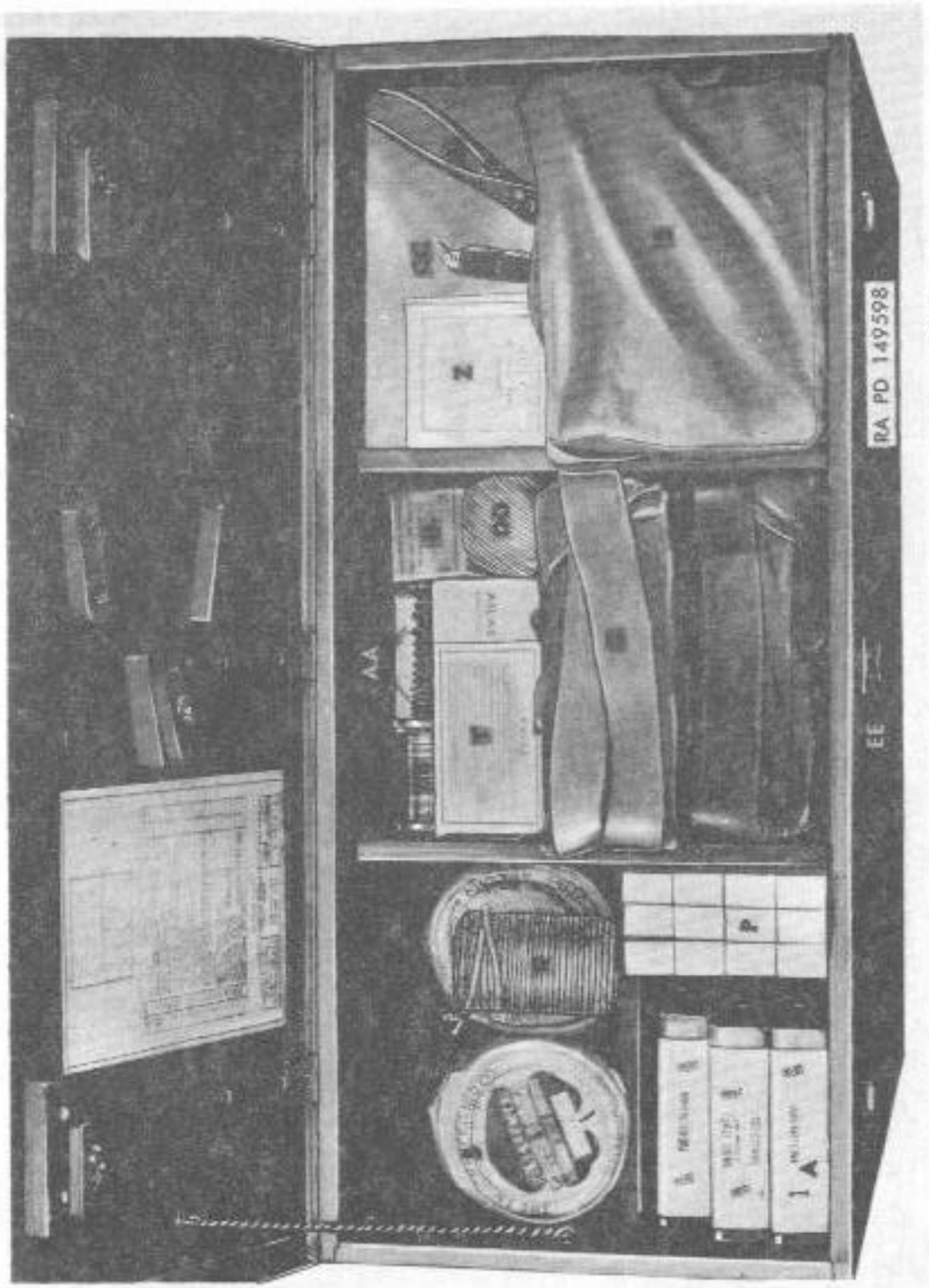


Figure 56. Demolition training kit T38—packing plan, middle layer.

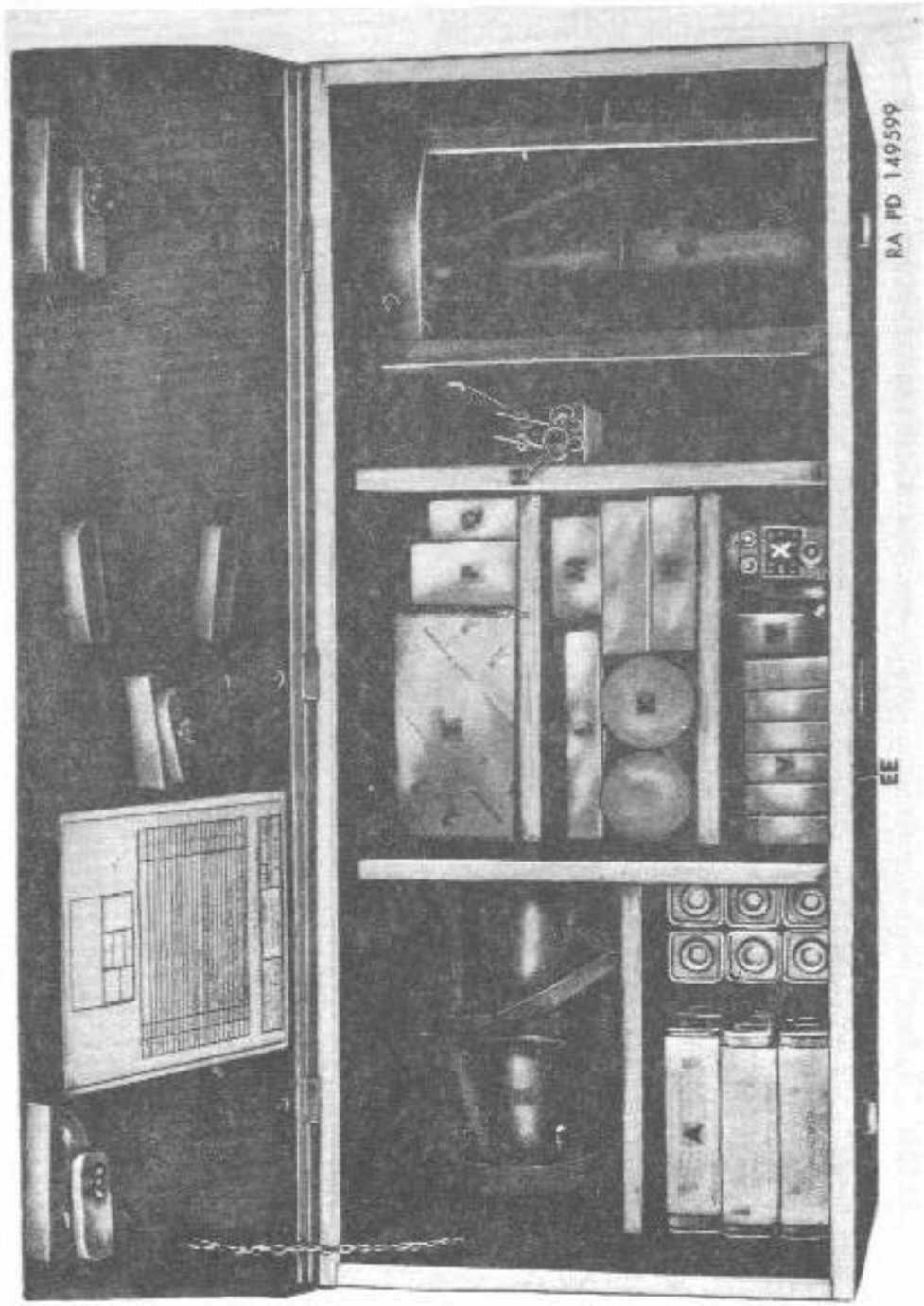


Figure 57. Demolition training kit T38—packing plan, bottom layer.

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to be employed in exactly the same manner and *with the same care and precautions* as are the explosive items comprising the demolition equipment sets simulated, hence it is essential that personnel, in training, be fully conversant with all procedures and instructions given in this manual pertaining to the explosive item of those simulated sets. For descriptions of individual service items simulated by items in these kits, see paragraphs 19 through 89.

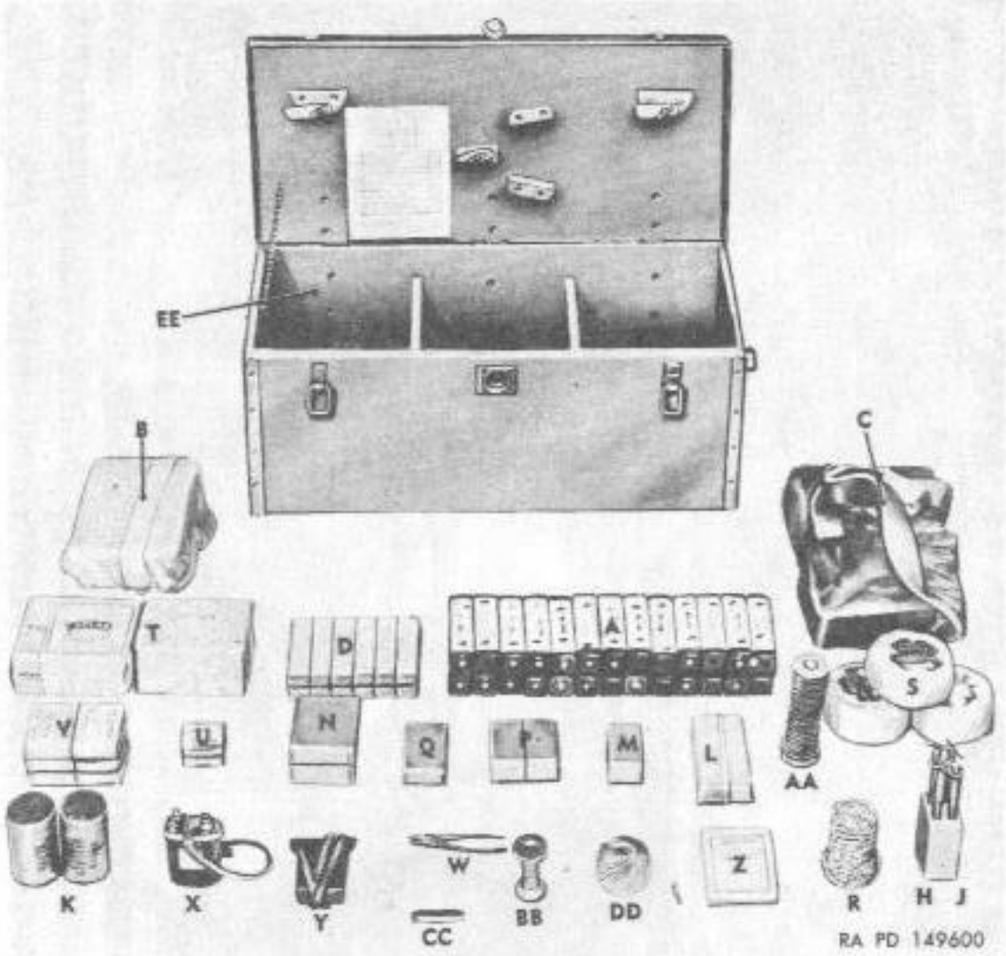


Figure 58. Demolition training kit T39.

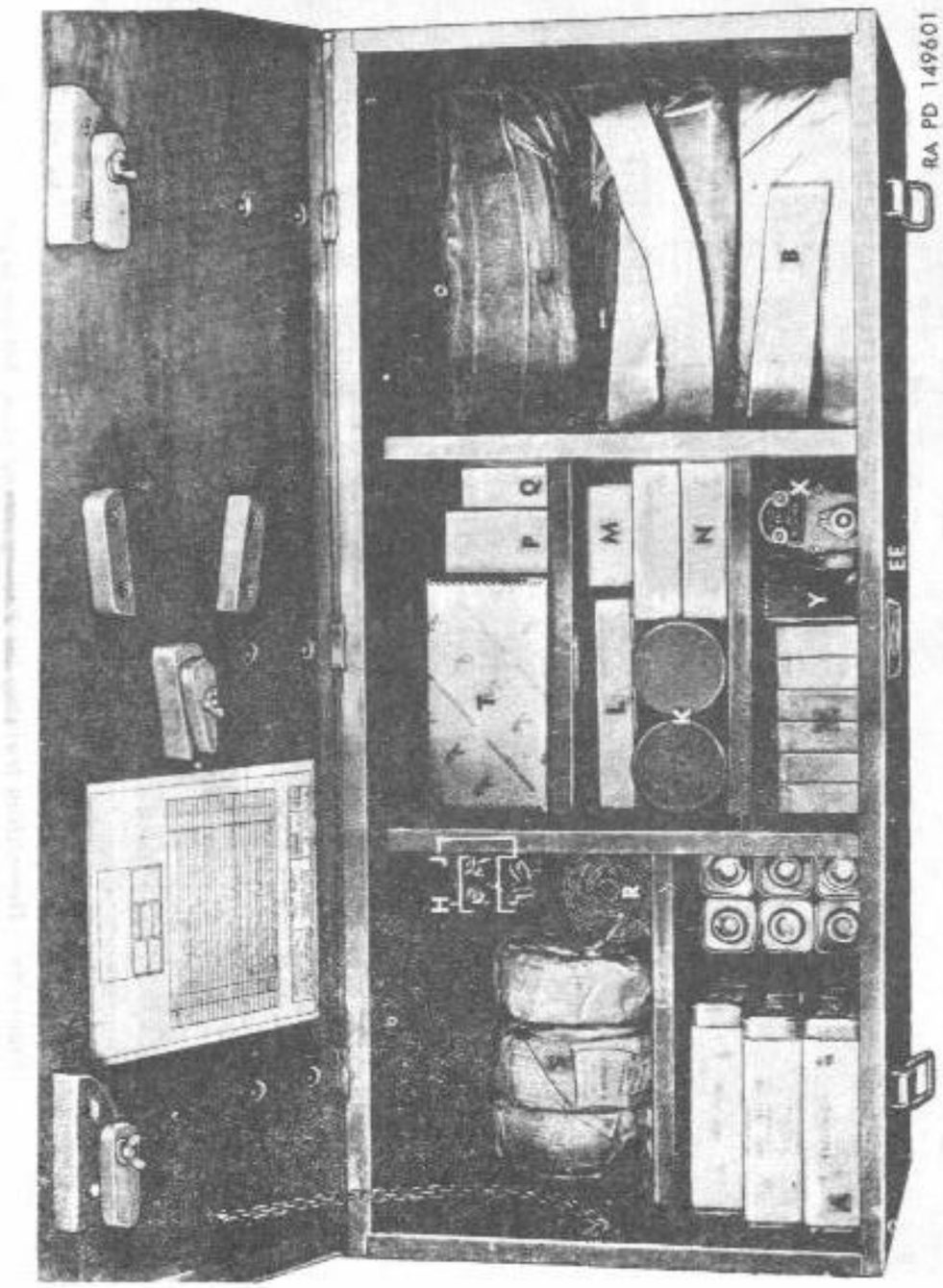


Figure 59. Demolition training kit T39—packing plan, top layer.

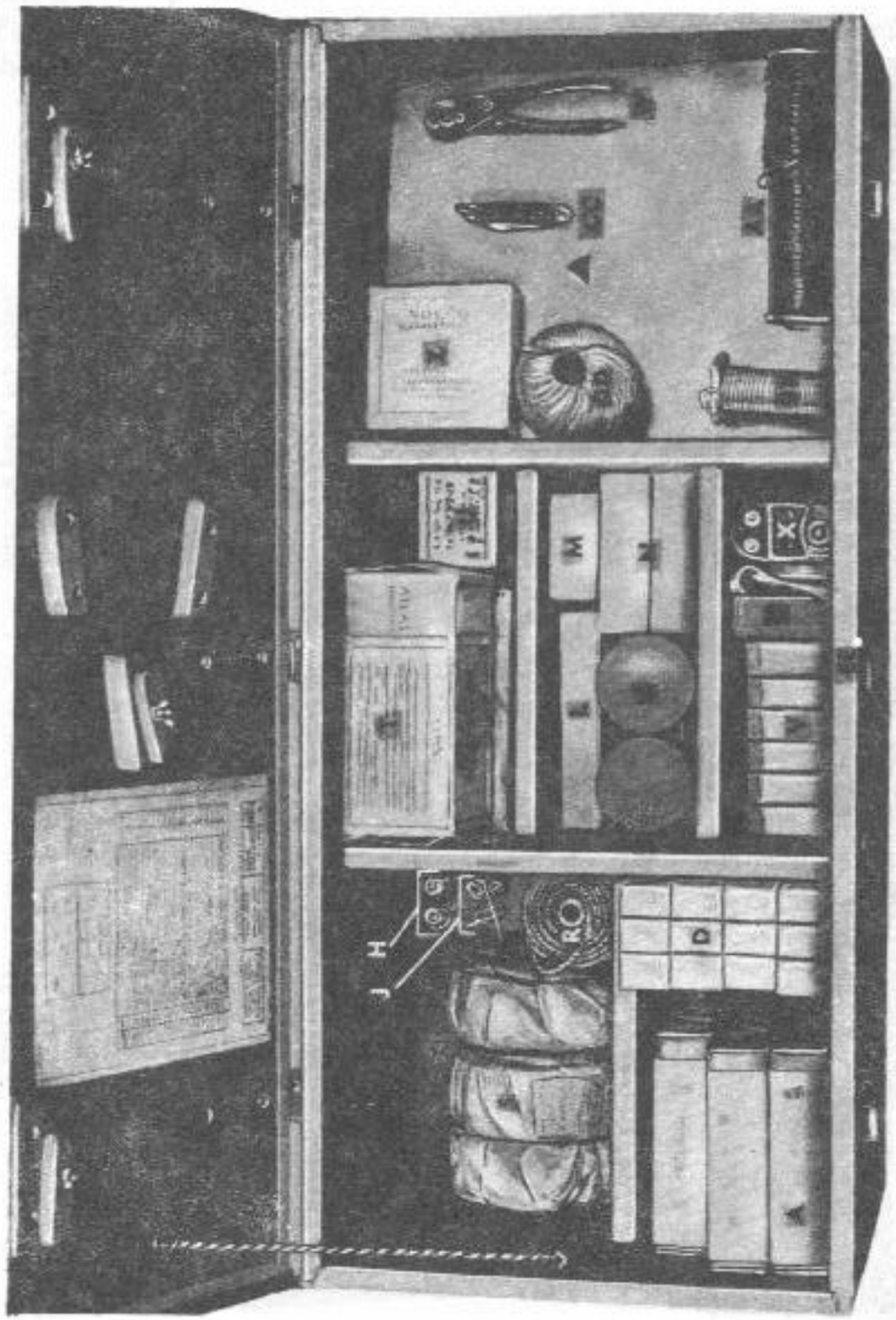


Figure 60. Demolition training kit T39—packing plan, bottom layer.

103. Components

The training kits T38 and T39 are identical, except that kit T39 omits the following:

Bangalore torpedo (E in fig. 54 and in list below)
Shaped charge—15 pounds (F in fig. 54 and in list below)
Shaped charge—40 pounds (G in fig. 54 and in list below)

Note. The item letters are keyed to figures 54—60.

The components of these training kits are as follows:

Item letter — *Item*

A — *26 EXPLOSIVE, TNT, 1-lb block, inert.*
Standard cartons, inert loaded to approximate weight.

B — *8 BLOCK, demolition, chain, M1, inert.*
8 wooden blocks loaded to approximate weight, strung on ¼-inch rope to simulate primacord, and packed in standard haversack.

C — *16 BLOCK, demolition, M3, inert.*
Two sets of 8 standard M3 training demolition blocks, filled with simulated inert COMP C3, packed in standard haversacks.

D — *12 BLOCK, demolition, ½ lb, inert.*
Cartons filled with simulated inert COMP C3.

E — *1 TORPEDO, bangalore, M1A1, inert.*
1 standard nose cap, 3 standard connecting sleeves, and 3 torpedo sections, each 38-inches long with standard ends. Torpedo sections to be inert loaded to approximate weight. (For use in kit T38 only.)

F — *1 CHARGE, shaped, 15 lb, M2A3, inert.*
Standard training shaped charge, inert loaded to approximate weight. (For use in kit T38 only.)

G — *1 CHARGE, shaped, 40 lb, M3 inert.*
Standard training shaped charge, inert loaded to approximate weight, complete with tripod. (For use in kit T38 only.)

H — *2 Detonator, 15-sec delay, M1, inert.*
Standard 15 sec-delay detonator, with inert primer and detonator.

J — *2 DETONATOR, 8-sec delay, M2, inert.*
Standard 8 sec-delay detonator, with inert primer and detonator. To be packed in 4-hole wooden block, which accommodates items H and J.

K — *2 DETONATOR, concussion type, M1, inert.*
Standard concussion detonator, with inert primer and detonator and wooden pellets substituted for the salt pellets.

L — *50 ADAPTER, priming, explosive, M1A3.*
One box of 50 standard priming adapters.

M — *50 CLIP, cord, detonating, M1.*
One box of 50 standard detonating cord clips.

N — *10 FIRING DEVICE, pressure type, M1, inert.*

P — *10 FIRING DEVICE, pull-friction type, M2, inert.*

Q — *5 FIRING DEVICE, pressure-release type, M5, inert*
Items N, P, and Q are standard firing devices, with inert primers and detnoators, packed 5 per box.

Item letter	Item
R	*4 CORD, detonating, inert (100-ft spool).*
S	*3 FUSE, time blasting, inert (100-ft spool).*
	Items R and S are of inert detonating cord and time blasting fuse, respectively, simulating the standard items.
T	*100 CAP, blasting, special, electric (type II (J2 PETN)), inert.*
U	*100 CAP, blasting, tetryl, nonelectric, inert.*
	Items T and U are of inert standard blasting caps; item T to be packed 50 per box; item U to be packed 100 per box.
V	*30 LIGHTER, fuse, weatherproof, M2, inert.*
	Standard fuse lighters, with inert primers, packed 5 per box.
W	*2 CRIMPER, cap (w/fuse cutter), M2.*
	Standard cap crimper.
X	*1 MACHINE, blasting, 10-cap capacity (class A).*
	Standard cap blasting machine.
Y	*1 GALVANOMETER, blasting, complete.*
	Standard blasting galvanometer, complete with case and carrying strap.
Z	*2 TAPE, friction, general use, grade A, ¾-in wide, ½-lb roll.*
	Standard ¾-inch friction tape, in ½-pound rolls, one roll per package.
AA	*1 WIRE, firing, 2-conductor, vinyl polymer covered, 250-ft roll, No. 20 AWG, training.*
	Standard double conductor firing wire, in 250-foot rolls.
BB	*1 WIRE, annunciator, single-conductor, cotton covered, 50-ft roll, No. 20 AWG, training.*
	Standard commercial, single conductor, cotton covered annunciator wire, in 50-foot rolls.
CC	*1 KNIFE, pocket, general purpose, 74–K–65 (Quartermaster Corps.)*
	Standard general purpose pocket knife.
DD	*2 TWINE, hemp, No. 18, 4-oz ball.*
	Commercial No. 18 hemp twine.
EE	*1 CHEST, demolition squad.*
	Standard demolition squad chest, less contents.

Note. All inert or dummy items are stamped "INERT" or "DUMMY," as may be appropriate, in large black block letters on the item or, if its size does not permit, on its container. Detonators (caps) are perforated with at least two small holes in the side wall, to prevent confusion with loaded items.

CHAPTER 5

MINE-CLEARING DEVICES

Section I. CABLE, DETONATING, MINE-CLEARING, ANTIPERSONNEL, M1

104. General

This demolition item is a flexible linear charge used to clear narrow lanes in antipersonnel mine fields (fig. 61).

105. Description

a. Detonating Cable.

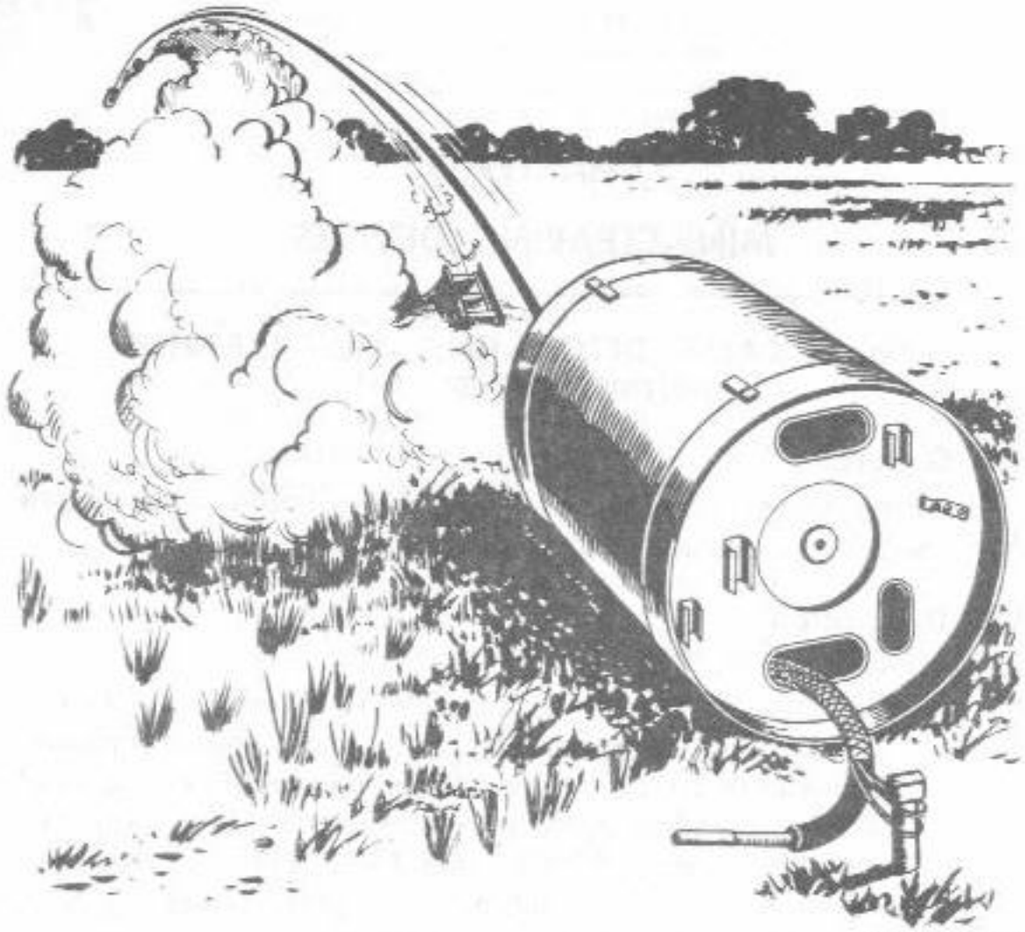
(1) The nylon-covered detonating cable is 170 feet long and about 1 inch in diameter, weighs 63 pounds, and contains 46 pounds of oil-soaked PETN. This charge consists of 19 strands of *special* detonating cord, each strand containing approximately 100 grains of PETN per foot. This contrasts with the 40 grains per foot contained in regular detonating cord, which should *not* be used as a substitute.

(2) The cable is coiled around a cone in a carrying case (fig. 62). The cone is removed (par. 107*d*) from the case before the unit is fired. One end of the cable is anchored to the ground and has a sleeve containing a booster charge and a threaded cap well for inserting a 15-second-delay detonator. This end also has a braided-wire cable grip with two 8-inch wire loops for anchoring the cable to a 13-inch oak tent stake driven into the ground.

b. Launcher. The launcher is a folding stand made of small aluminum angles. When set up on level ground with the propulsion unit (jato) on the launcher, the angle of elevation is 38°.

c. Other Equipment. A fuse lighter M2 is provided for igniting the propulsion unit, a 15-second-delay detonator for exploding the cable, and a 13-inch oak tent stake for anchoring one end of the cable.

d. Carrying Case. The entire assembly is contained in a cylindrical aluminum can, 16½ inches in diameter, 20 inches long, and weighing 92 pounds. Both ends of the can have removable lids with carrying handles. The joints between the lids and the case are waterproofed. The loaded case is designed for transportation to the firing point by two men.



RA PD 131039

Figure 61. Propulsion unit in flight, laying a detonating cable over a mine field.



RA PD 116948

Figure 62. Cable, detonating, mine-clearing, antipersonnel, M1—carrying case.

106. Functioning

The cable is projected across the mine field by a jet propulsion unit from a launcher, where it is exploded by a 15-second-delay detonator. Grass, leaves, other light vegetation, and some soil are blown aside in a lane about 8 feet wide. More soil is blasted aside when the ground is moist and soft than when dry and hard. Camouflaged antipersonnel mines and those near the surface in the 8-foot lane normally are exposed.

a. Mines. If the cable is less than 6 inches off the ground, pressure-type antipersonnel mines with the pressure surface directly under the cable are detonated or destroyed. Pressure-type mines within 5 feet of the cable may or may not be fired, depending on the particular mine installation. *Mines not exploded by the cable may become extremely sensitive.*

b. Trip Wires. The detonation of the cable across trip wires either cuts the wires or detonates the mines to which they are connected.

107. Preparation for Use

Procedure for setting up and firing the cable is as directed in *a* through *h* below.

a. Two men carrying the case stop about 100 feet from the mine field and select or prepare a location where each may take cover in the prone position when the cable is detonated. They then carry the case forward as close as practicable to the mine field, placing the case on the ground so the end with the letter *T* (top) embossed on the lid faces the direction in which the cable is to be launched.

b. One man at the front removes the top lid (fig. 63), unbuckles the strap holding the plywood retainer in place, and removes the retainer. He then takes the jet propulsion unit and folded launcher

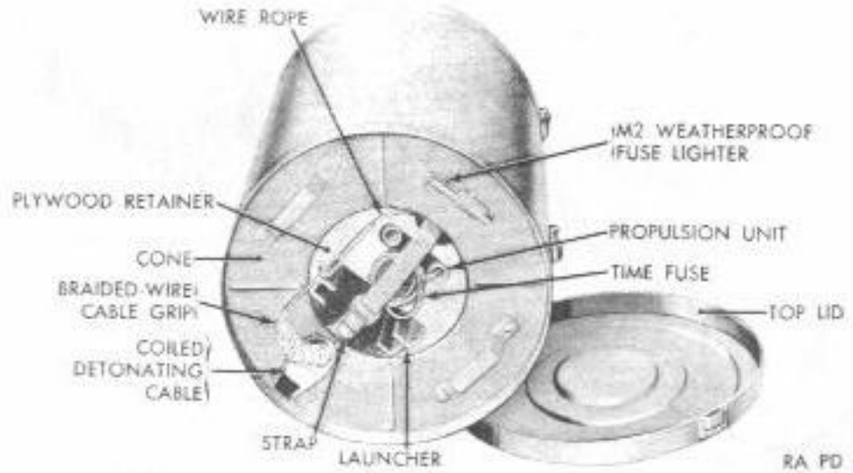


Figure 63. Cable, detonating, mine-clearing, antipersonnel, M1—top lid of case removed.

out of the cone and sets up the launcher on level ground about 5 feet ahead of the case.

c. Simultaneously, the man at the rear removes the bottom lid (fig. 64) from the carrying case and unscrews the wing nut holding the cone in the case.

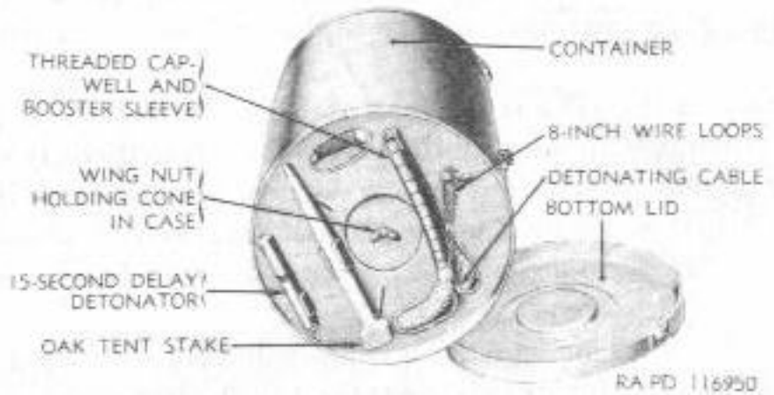


Figure 64. Cable, detonating, mine-clearing, antipersonnel, M1—bottom lid of case removed.

d. Then the case is placed in an upright position (top lid end up), the cone carefully lifted out by the two handles, and the case replaced on its side. The arrangement of components in the case is shown in figure 65.

e. The man at the front of the case places the jet propulsion unit on the launcher, so the rear (nozzle) end rests against the launcher-bottom crossbar. He pulls about six coils of cable out of the case. He then takes the fuse lighter M2 off the cone and removes the cardboard protective cover and rubber plug from the fuse lighter. He cuts about 4 inches from the end of the waterproof tubing around

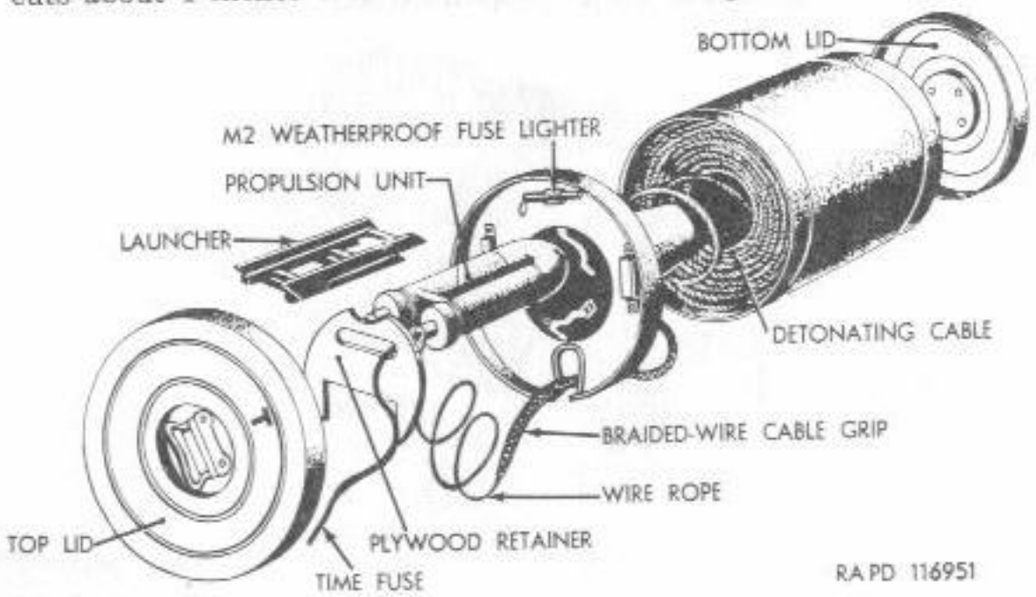


Figure 65. Cable, detonating, mine-clearing, antipersonnel, M1—arrangement of components in case.

the fuse projecting from the nozzle, to expose the powder train. Making sure the sealing material around the end of the fuse lighter does not foul the end of the fuse, he pushes the end of the fuse into the fuse lighter as far as possible, and withdraws it slightly, so the prongs of the fuse retainer inside the lighter fasten securely to the fuse.

f. Simultaneously, the man at the rear of the case removes the wood stake from the case, drives it into the ground about 6 inches behind the case, and places both cable-wire loops over the stake. He then removes the cap protector from the 15-second delay detonator and screws the detonator into the cap well (fig. 64) in the rear end of the cable.

g. The man at the rear is the first man to take cover, which he does in a prone position at a predetermined location about 100 feet to the rear. The cable is now ready for firing (fig. 66). The second man (the man at the front) pulls the fuse lighter (15-sec time fuse) on the jet propulsion unit and 4 to 7 seconds *later* the same man pulls the 15-second delay detonator safety pin, then pulls the ring on the rear end of the detonator. This delay is necessary, since firing-time delay of both the jet propulsion-unit fuse and the delay detonator is 15 seconds. The second man then takes cover in the prone position about 100 feet to the rear. The first man to take cover aids the second man in finding a covered position by signaling.

h. When the fuse ignites the jet propulsion-unit propellant, the rubber plugs in both nozzles of the propulsion unit are blown out and the unit flies through the air 150 to 170 feet, laying out the detonating cable behind it in an approximately straight line (fig. 61). The cable explodes several seconds later. Since the carrying case may be broken and thrown about 40 feet in the air, personnel must take care to avoid being hit by fragments.

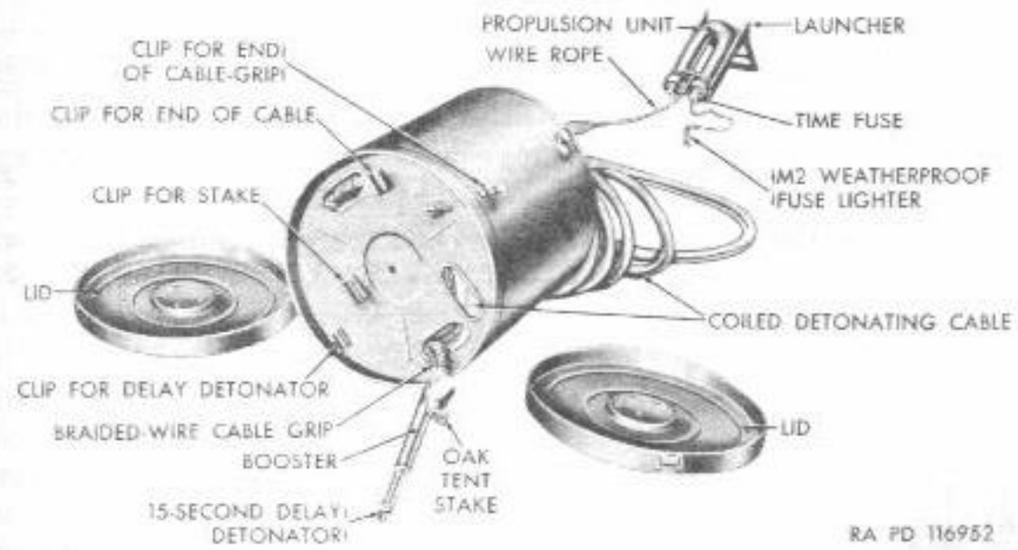


Figure 66. Cable, detonating, mine-clearing, antipersonnel, M1—ready for firing.

108. Packing

The item is issued complete with detonating cable, jet propulsion unit, launcher, firing equipment, and waterproof aluminum carrying case (fig. 62) painted olive drab. Both ends of the case have removable lids with carrying handles. Each case is packed in a wooden box.

Section II. SNAKE, DEMOLITION, M2, M2A1, AND M3

109. General

The demolition snake M3, which is described in this section, is the standard demolition snake. For essential differences between the snakes M3 and the limited standard snakes M2 and M2A1 see paragraph 119. Tactical use of demolition snakes and their effect on mine fields are described in FM 5–32. The use of demolition snakes for the demolition of obstacles other than mine fields is described in TM 5–220.

110. Description of Demolition Snake M3 Parts

a. General. This snake (fig. 67) consists of two parallel linear explosive charges encased between corrugated aluminum plates, bolted together to form a rigid assembly, which can be towed or pushed by a light or medium tank. It is flexible in vertical plane to permit it to pass over rough ground and rigid enough in horizontal plane so it will maintain a relatively true course when being pushed. The assembled snake, shown in cross section in figure 68, is 14 inches wide, 5 inches high, and 400 feet long. It weighs approximately 9,000 pounds, including 4,500 pounds of explosives. For information pertaining to training of crews for assembly of snake, see FM 5–32 and/or TM 5–220. A list of parts issued with each snake is given in table VII.

Table VII. Accessories, Tools, and Component Parts for Construction of 400-Foot Demolition Snake M3

Item	Quantity
Snake parts:	
Corrugated aluminum body plate	200
1⅛-in. bolt, 3 in. long	210
Special washer	420
1⅛-in. square nut	210
Nose	1
Nose adapter and towing hook	1
Nose retainer	1
Tamping bag	40
Pushing hook	1
Fuze shield	2
Tail ramp	1
Explosives:	
Explosive charge for demolition snake M3	128
Bullet impact fuze M1	2

Table VII. Accessories, Tools, and Component Parts for Construction of 400-Foot Demolition Snake M3—Continued

Item	Quantity
Tank accessories:	
Pulley support post with pulley	5
Rope guide ring with pulley	2
Rope guide ring	1
⅜-in. sash cord (ft)	15
⅛-in. aircraft cable (ft)	33
Cable clamp	1
Periscope fitting (for medium tank)	1
Direct-vision port fitting (for light tank)	1
Crank	1
Towing yoke assembly	1
⅝-in. pushing chain, 5½ ft long	1
Tools:	
Structural wrench	6
Socket-wrench assembly	2

b. Body Plates. The corrugated aluminum plates (fig. 69) form the body of the demolition snake. Top and bottom plates are identical. Each plate is 9 feet long and 14 inches wide, about one-eighth inch thick, and weighs 16 pounds. Five holes are spaced 2 feet apart along the center of the plate, starting 6 inches from either end. The plates are painted olive drab, with a patch of white paint around each bolt hole for ease in locating holes in night assembly.

c. Bolts, Washers, and Nuts (fig. 70). Eleven-sixteenths x three steel bolts, washers, and nuts are used to fasten the corrugated plates together. The washers are specially shaped to assure a uniform bearing surface. Nuts and bolt heads are 1 inch square.

d. Nose Adapter and Towing Hook (fig. 71). The nose adapter connects the demolition snake to the nose. It is fitted between the body plates at the forward end of the snake and is secured by two bolts, which fasten the plates together. The towing hook is an integral part of the adapter, being welded to its upper side as shown. A bumper ring around the adapter just forward of the towing hook prevents the nose from sliding too far back over the adapter.

e. Nose and Nose Retainer (fig. 72). The hollow pear-shaped aluminum nose fits over the nose adapter. It is lashed to the adapter with the ⅛-inch aircraft cable. This cable, which is looped through the slot in the towing hook, is passed through the 3-inch hole in the tapered part of the nose, then through the loop in the nose retainer, and the ends of the cable joined with a wire clip. The nose is free to swivel slightly in any direction and aids in guiding the forward end of the demolition snake over or around obstructions, such as trees or boulders.

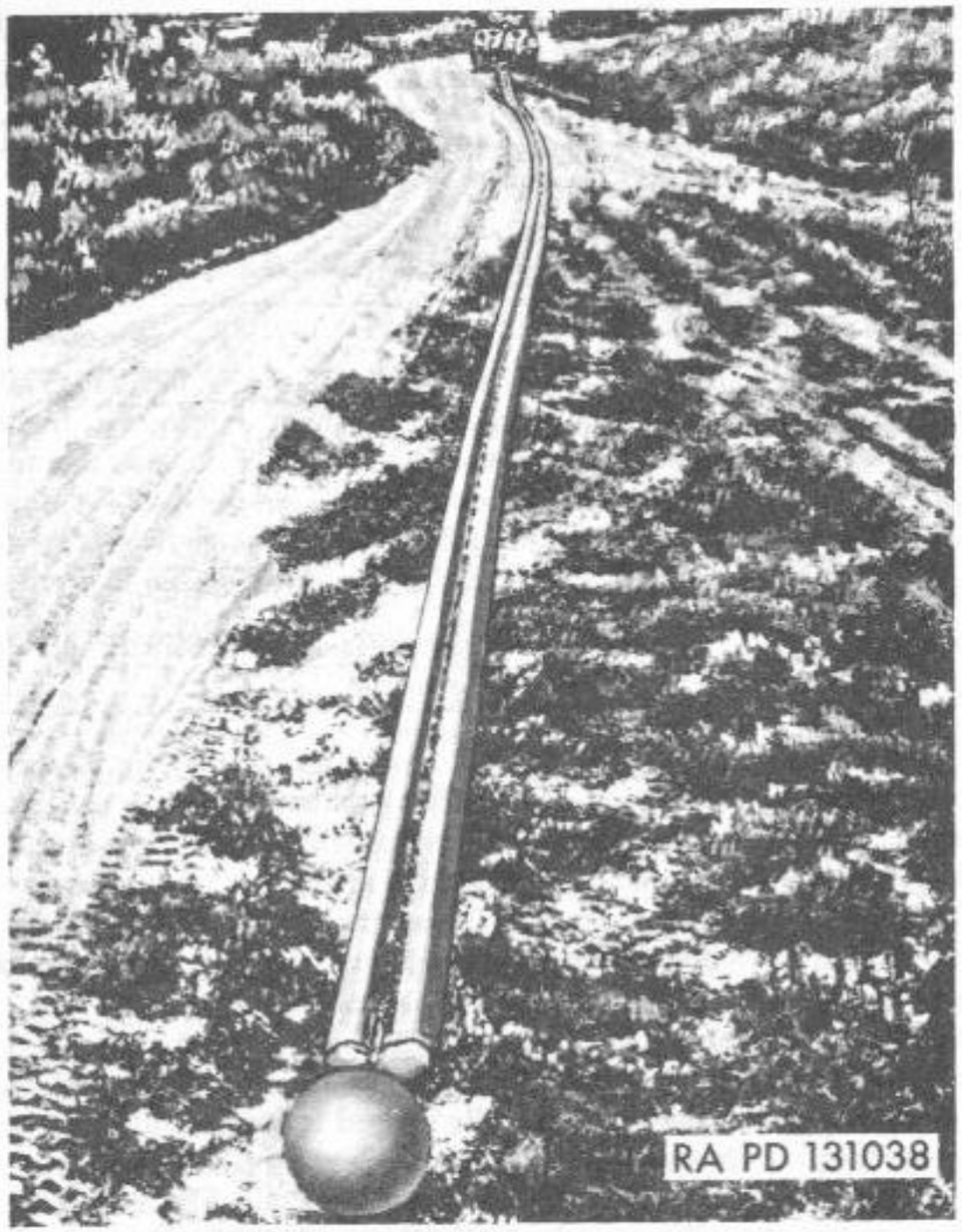


Figure 67. Medium tank pushing demolition snake M3.

f. Pushing Hook (fig. 73). The pushing hook assembly consists of a hook welded to a steel bar, which has four bolt holes for attachment to the demolition snake. A flat steel plate welded to the top of the hook bears against the belly of the tank during pushing operations. The assembly is bolted to the snake's rearmost plate, starting with the second bolt hole from the rear end.

g. Bullet Impact Fuze M1 and M1A1 and Fuze Shield.

(1) *Fuze.* Fuze, bullet impact, M1A1 (fig. 75) is used with demolition snakes M2A1 and M3. It consists of a target plate of $\frac{3}{8}$-inch steel, spring mounted on three studs, and a body, which contains a detonator and two shaped-charge boosters. The target plate bears on a firing pin, which is

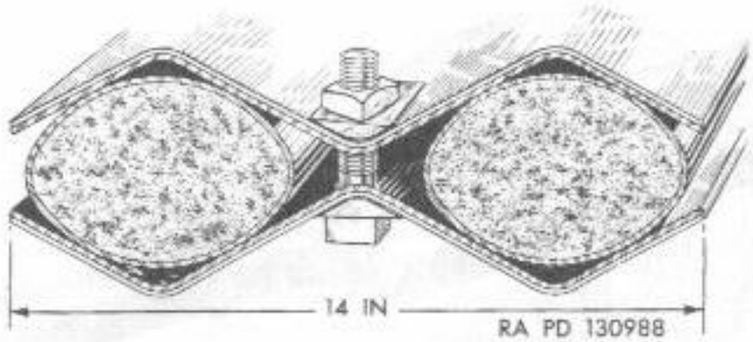


Figure 68. Cross-section of demolition snake M3 loaded with explosive charges.



Figure 69. Corrugated aluminum plates, demolition snake M3.

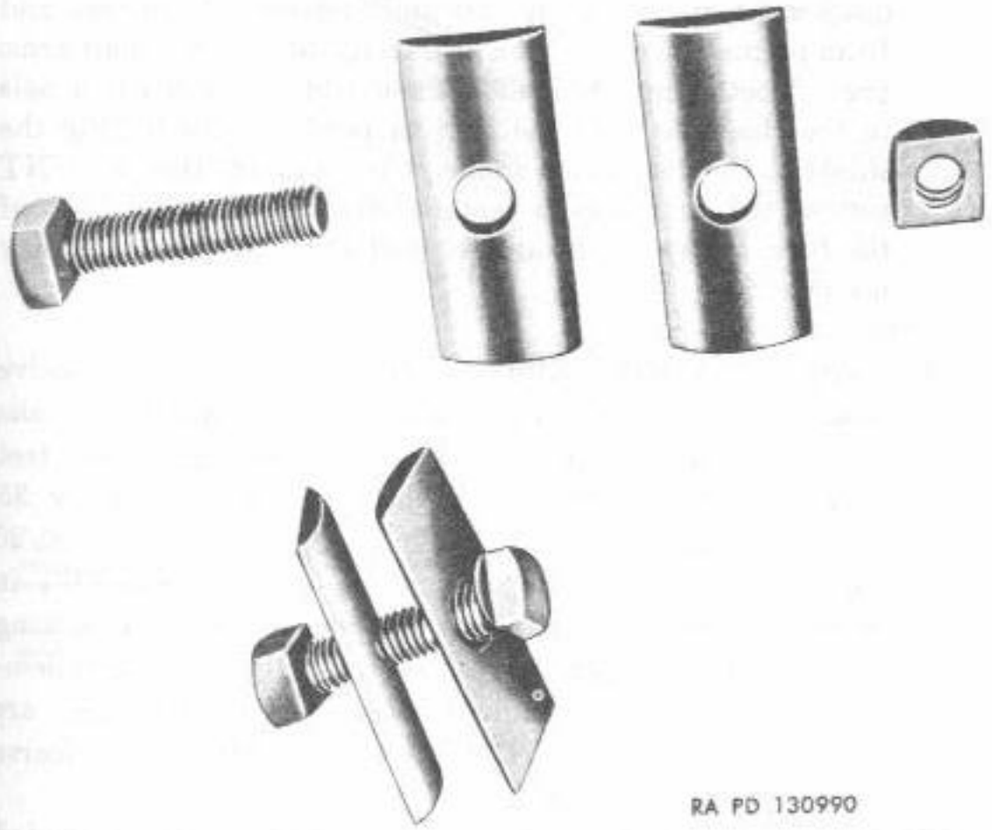


Figure 70. Bolts, washers, and nuts for demolition snake M3.

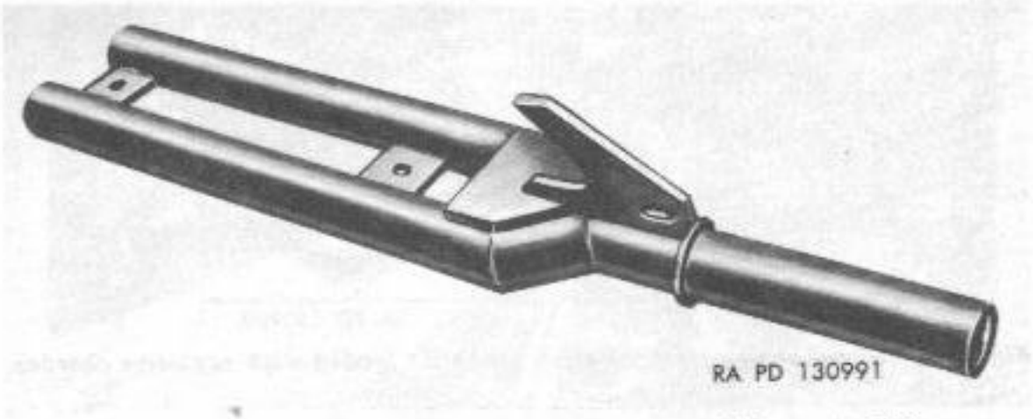


Figure 71. Nose adapter and towing hook; demolition snake M3.

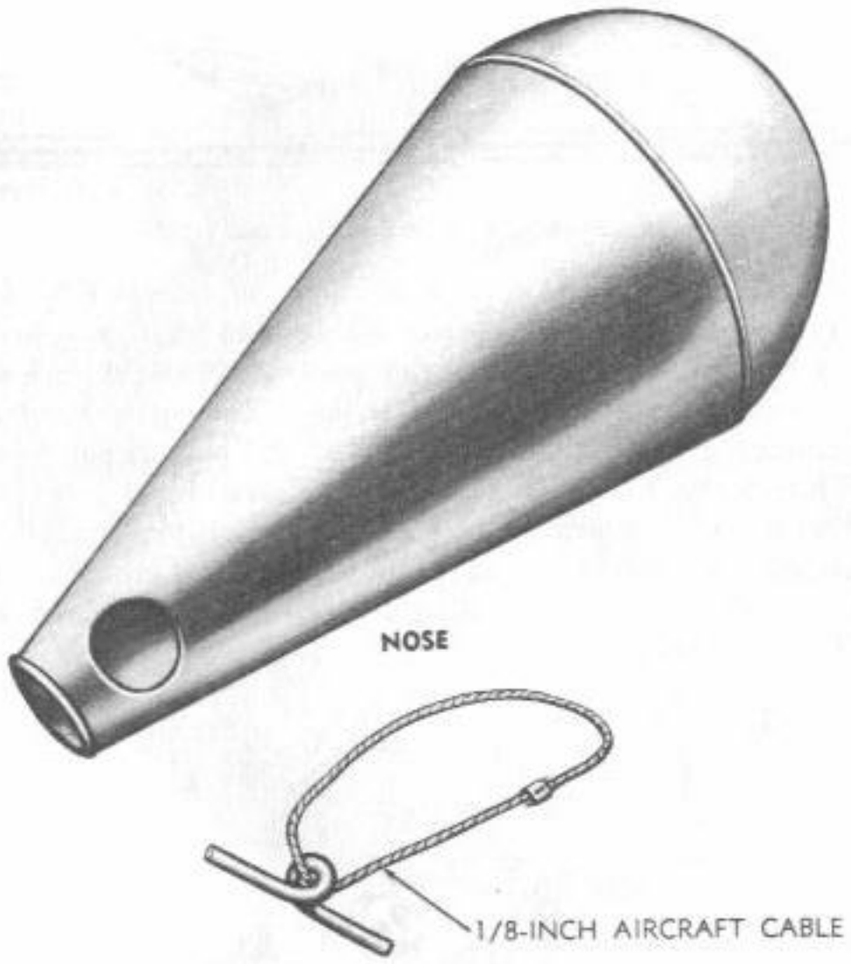
restrained by a shear pin and safety fork. The safety fork must be removed before the fuze can be operated. In placing the fuze, care must be exercised to have the semicircular end up, since the effect of the two shaped boosters is directly downward, perpendicular to the two flat edges. Two of these fuzes are furnished with each snake M2A1 and M3. The fuze M1 (fig. 74) is similar to the M1A1, except for minor constructional differences. The fuzes are packed one per hermetically sealed metal-lined wooden box.

(2) *Fuze shield.* The fuze shield (figs. 76 and 77) serves as a bracket for mounting the fuze and protects it from view and from premature detonation or damage by frontal small-arms fire. A cotter pin chained to the shield is inserted in a hole in the shield to hold the fuze in position. In bolting the shield to the demolition snake, it is necessary that the TNT ends of the cartridges be centered directly below the body of the fuze, otherwise the amatol portion of the cartridge may not detonate.

h. Explosives.

(1) *Explosive charges.* Elliptical (in cross section) explosive charges (figs. 78 and 79) are issued with the demolition snake M3. They are 5⅜ inches wide, 3¾ inches high, and 5 feet long, and weigh 40 pounds, including approximately 35 pounds of explosive. The bulk of the explosive is 80/20 amatol, with a 6-inch booster charge of crystalline TNT in each end. One end contains a cap well to receive a blasting cap, when the charges are used individually for general demolition work. One hundred twenty-eight cartridges are loaded in 320 feet of a 400-foot snake giving an explosive weight of 14 pounds per foot.

(2) *Bangalore torpedoes.* Bangalore torpedo charges (loaded tubes) may be used as alternate explosive charges when demo-



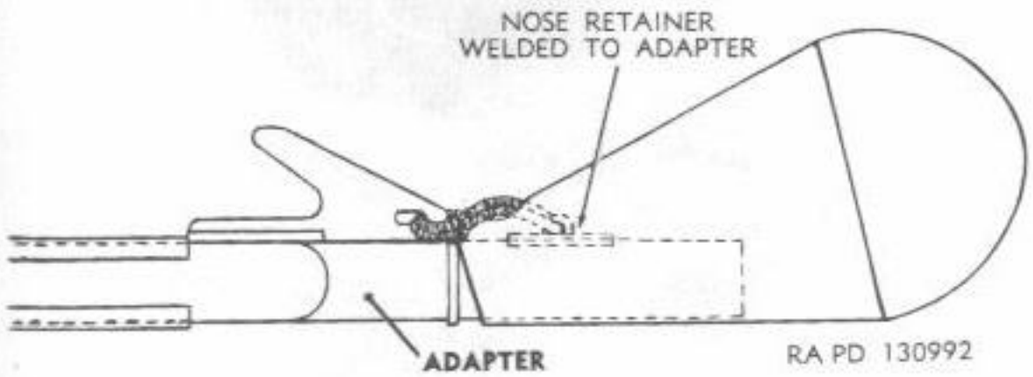


Figure 72. Nose and retainer, demolition snake M3.

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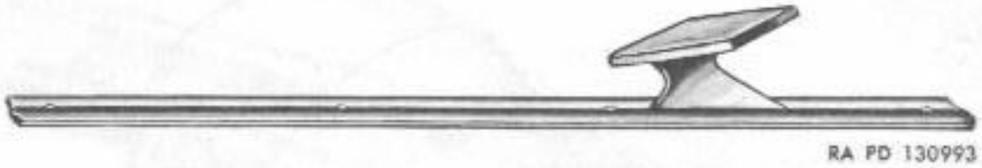


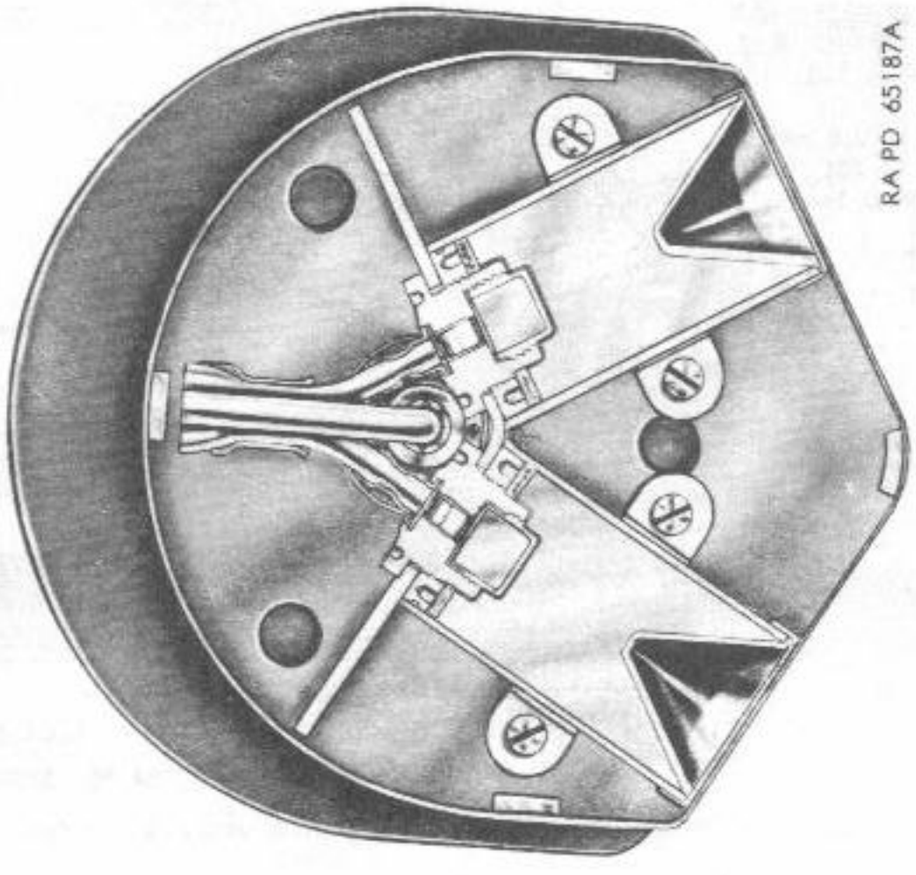
Figure 73. Pushing hook, demolition snake M3.

lition snake charges are not available or when stubs of exploded demolition snakes are salvaged to build new snakes. A bundle of four bangalore charges (figs. 16 and 80) is loaded in each corrugation of the snake. The eight bangalore charges give an explosive weight of 14.4 pounds per foot.

i. Tail Ramp (fig. 81). The tail ramp is a small hinged steel skid, which fastens to the rearmost bolt of the demolition snake. The hinged bar extends beyond the snake and drags on the ground, to prevent the pushing chain from fouling on the end of the snake when engaging the pushing hook.



Figure 74. Fuze, bullet impact, M1.



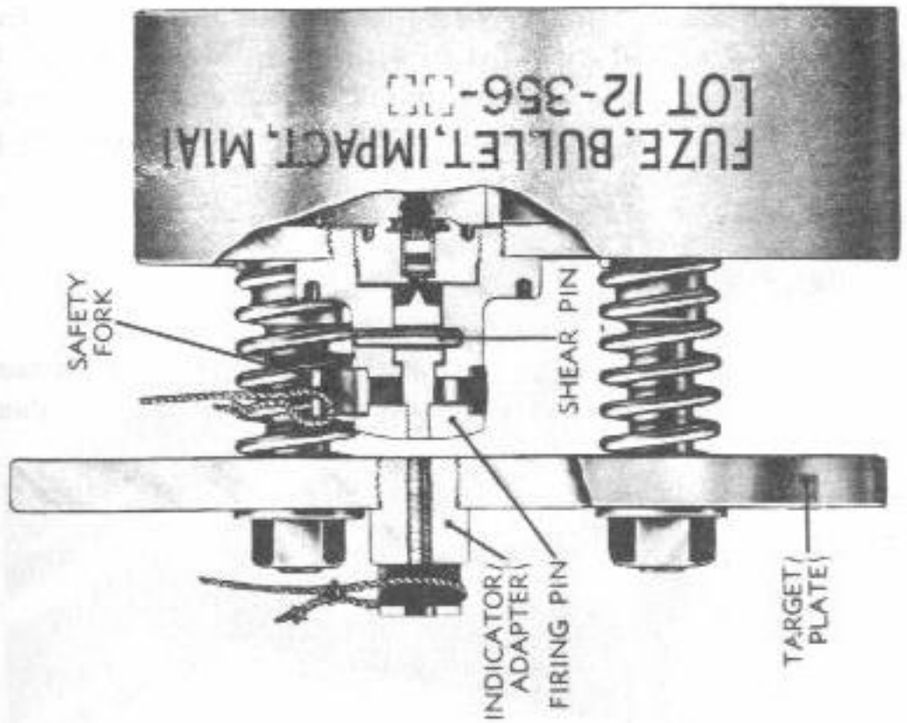


Figure 75. Fuze, bullet impact, M1A1—Cutaway and rear view.

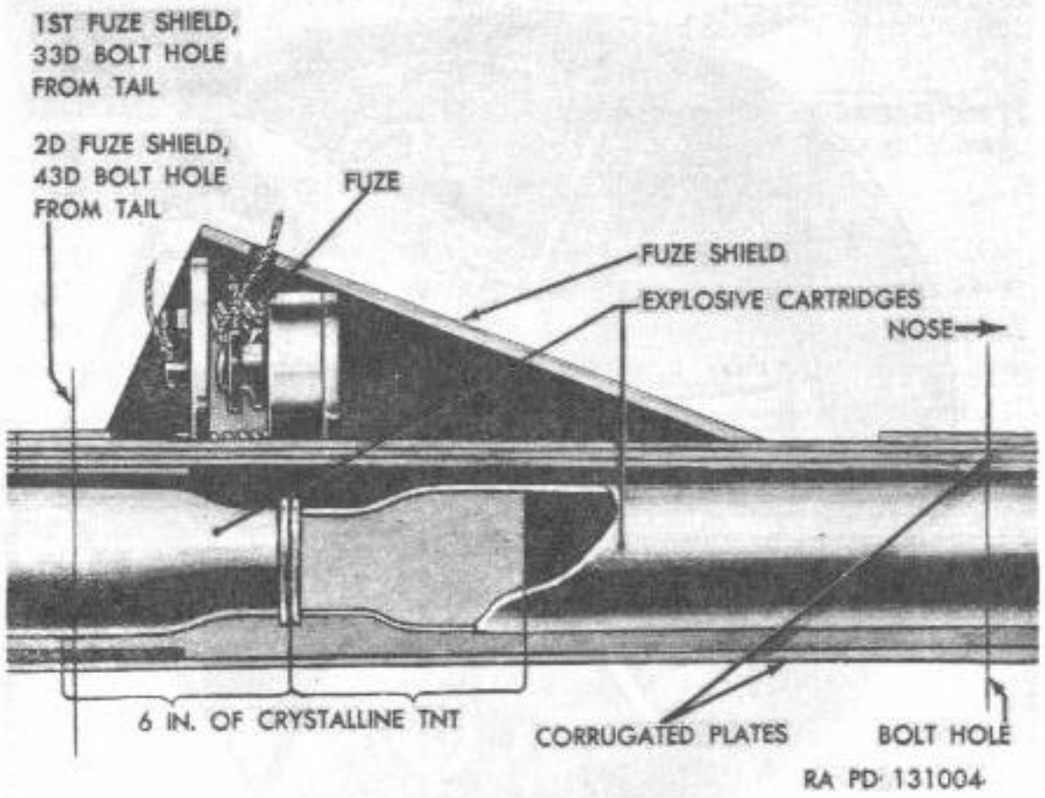


Figure 76. Longitudinal section of demolition snake M3 at fuze.

j. Tamping Bags (fig. 82). Forty light cloth or paper bags, 4 inches in diameter and 24 inches long, are furnished with each demolition snake for use as tamping bags, to prevent the charges from shifting. They are filled with dirt to within 3 inches of the top, the end is folded over, and the bags are placed in both ends of the snake. When available, 75-mm ammunition containers filled with dirt are satisfactory for tamping.

111. Tank Accessories

(fig. 83)

a. Pushing and Towing Assemblies.

(1) *Pushing chain.* A 5½-foot length of ⅝-inch chain, fastened to the tank's front towing clevises, is used to push the demolition snake. A length of sash cord tied to the chain leads into the tank for raising and lowering the chain.

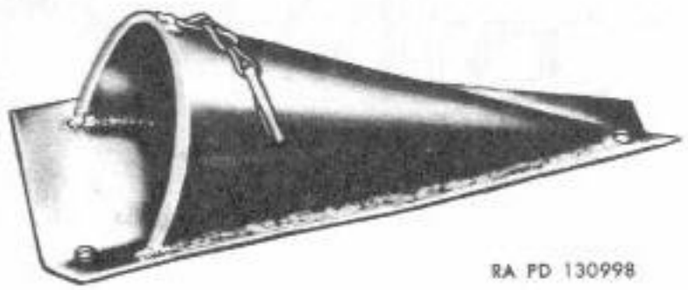


Figure 77. Fuze shield, demolition snake M3.

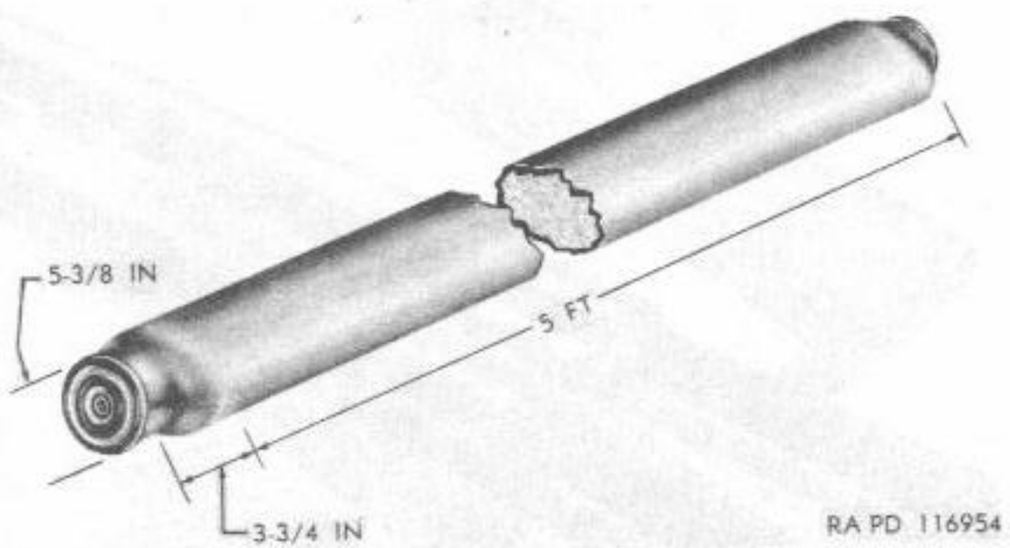


Figure 78. Charge, for snake, demolition M2A1 and M3.

(2) *Towing yoke assembly.* The towing yoke assembly is used to tow the demolition snake behind a tank. It consists of two 1-inch square bars pinned to the rear towing lugs of the tank, a semicircular yoke pinned to the outer ends of the

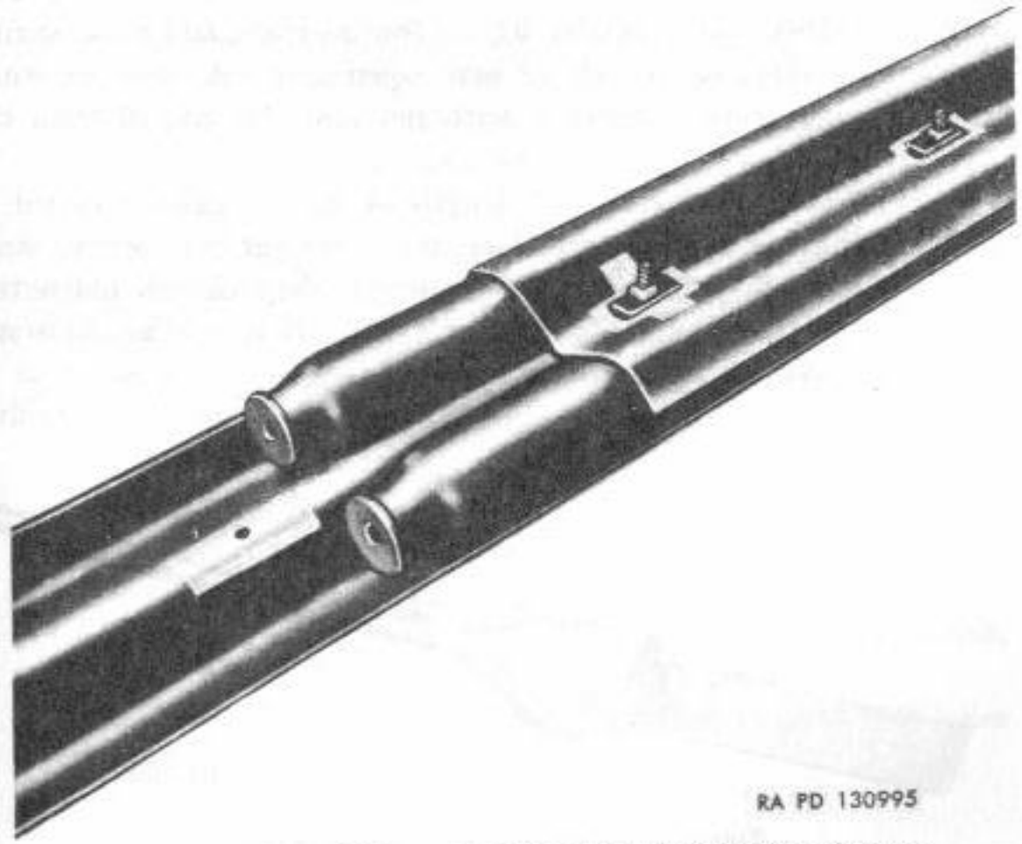


Figure 79. Demolition snake M3 loaded with explosive charges.

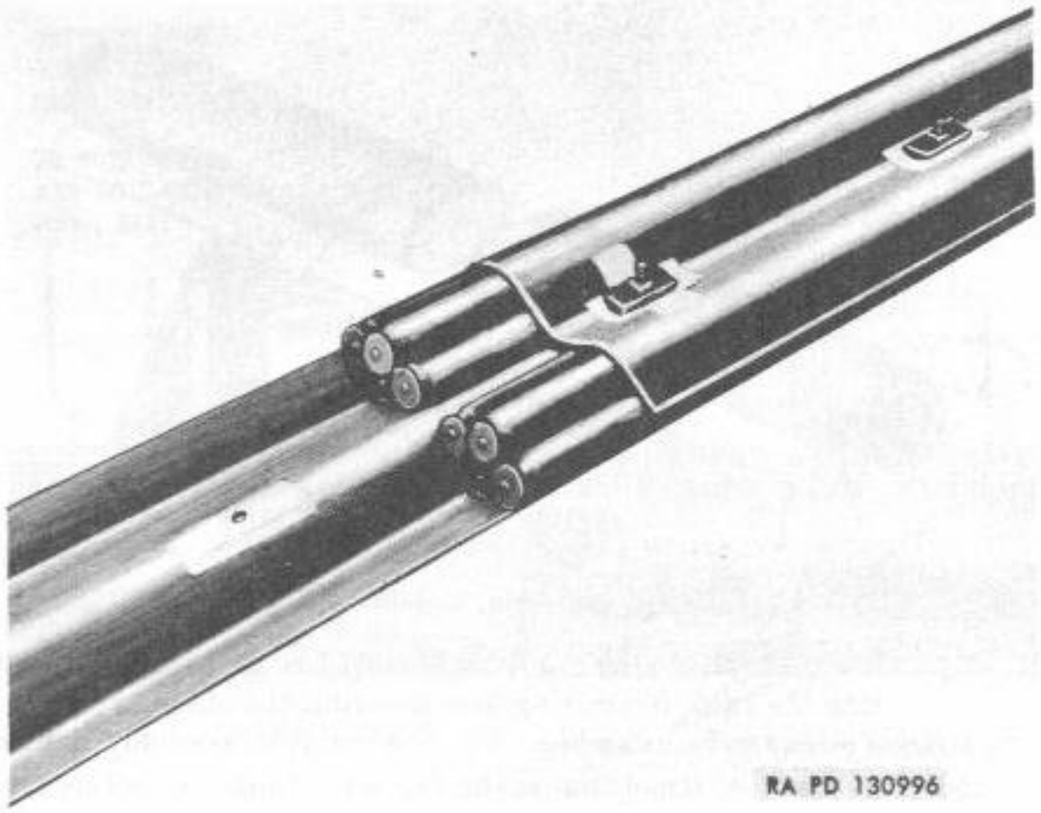


Figure 80. Demolition snake M3 loaded with bangalore torpedoes.

bars, which catches the snake towing hook, a lifting bail bolted to the yoke for lifting the assembly, and a coil spring shackled to the lifting bail to act as shock absorber while maneuvering the tank with the yoke disengaged from the snake.

(3) *Pulleys and cable.* A length of ⅛-inch cable clamped to the coil spring runs along the top right side of the tank, through a series of pulleys welded to the tank hull, and enters the tank at the bow gunner's seat. It is used to raise and lower the towing yoke assembly.

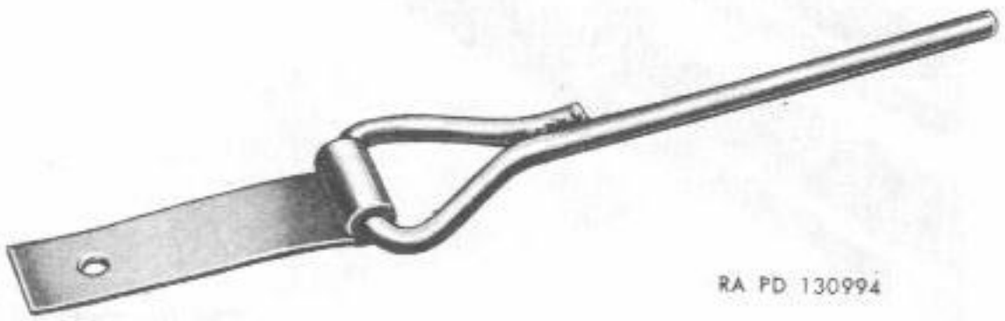


Figure 81. Tail ramp, demolition snake M3.

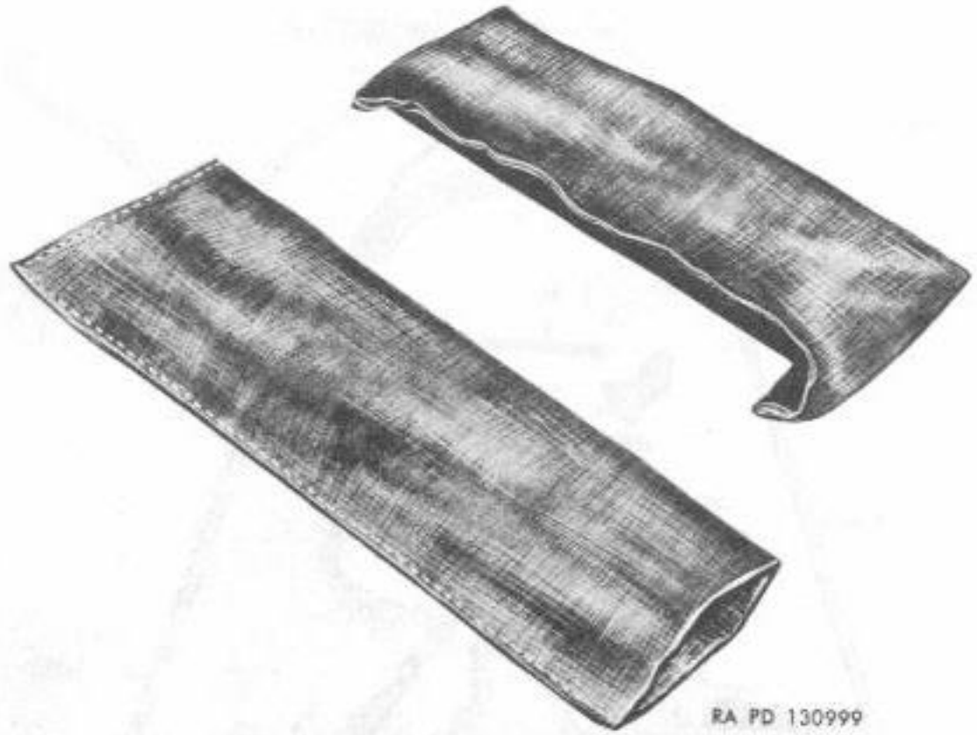


Figure 82. Tamping bags, demolition snake M3.

(4) *Periscope and port fittings.* The periscope fitting is placed in the bow gunner's forward periscope slot in the medium tank. The sash cord tied to the pushing chain and the ⅛-inch cable from the towing yoke assembly enter the tank through holes in the fitting. The direct-vision port fitting is used on the light tank M24 instead of the periscope fitting. It fits in the bow gunner's direct-vision port and operates the same as the periscope fitting.

b. Wrenches (fig. 84). Two double-socket wrenches and six-end wrenches are supplied for assembling the demolition snake. The tapered ends are used as drift pins, to aline the plates during assembly.

c. Additional Equipment. The following equipment is not issued with the demolition snake, but is required for its construction:

2 heavy wrecking bars, to assist in moving or lifting sections of snake.
4 mallets and ledges, to open explosive packing boxes.
1 shovel, to fill tamping bags.
1 2½-ton or larger truck with winch, half-track with winch, or tank, to tow snake backward as it is assembled.
30 driftpins, ½-, ⅝-, or ¾-inch in diameter, to aline bolt holes during assembly.

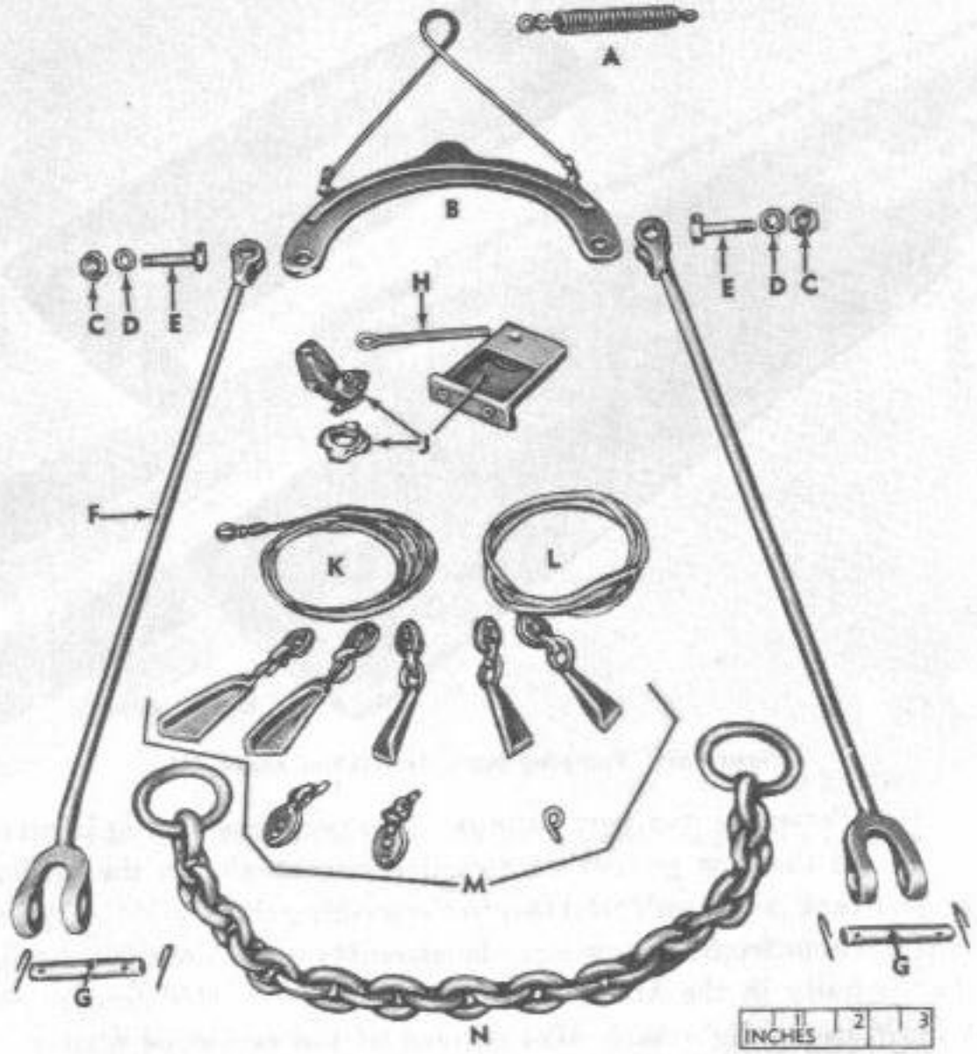


Figure 83. Tank accessories, demolition snake M3.

112. Assembly of Demolition Snake

a. Training of Personnel. Personnel must be thoroughly trained to assemble the demolition snake efficiently and to eliminate undue fear of handling large explosive charges. Personnel should realize that only an almost-direct hit with artillery shell will detonate the snake. High-explosive 105-mm projectiles must land within 1 yard of the snake to detonate it. Small-arms fire striking the crystalline TNT ends of the explosive charges of the snake may detonate it. The snake should be assembled several times during both day and night

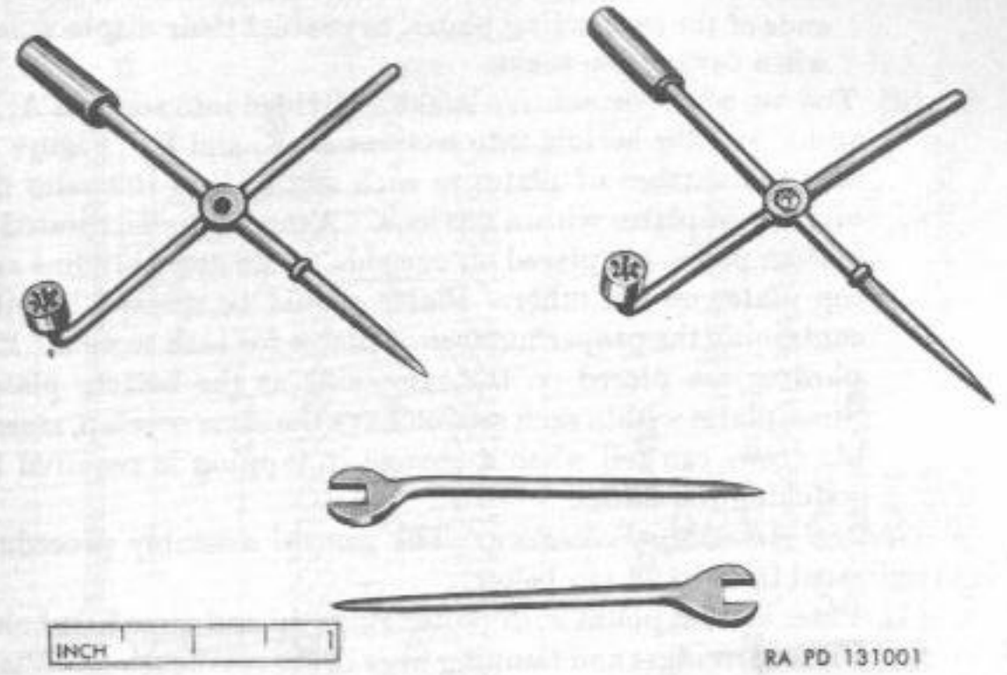


Figure 84. Assembly wrenches, demolition snake M3.

until the crew is entirely familiar with the parts and their assembly before attempting to use the snake in any military operations. A practice detonation of a snake is desirable for the benefit of both assembly and operating personnel.

b. Selection of Site. A level assembly site is desirable, but any fairly smooth area may be used. The surrounding terrain must permit towing the demolition snake backward as increments are added and towing it forward when completed. The site should be as near as possible to the point of anticipated detonation, preferably within 1 mile and in defilade from enemy fire and observation.

c. Preparation.

(1) Before starting assembly, the approximate alinement of the demolition snake is determined and the site prepared. Either of the methods in (*a*) or (*b*) below can be used.

(*a*) Place expedient supports, such as short logs at least 5 inches in diameter, at 5-foot intervals along the line on which the demolition snake is to be assembled. The logs elevate the snake, so bolts can be easily inserted from the bottom. Drive stakes at the ends of the logs, to keep them in position when towing the snake.

(*b*) Dig a trench 3 feet wide by 6 inches deep and 45 feet long, to permit insertion of bolts from the bottom. Place eight demolition snake plates with edges down across it at 5-foot intervals, to support the snake during assembly. Five-foot lengths of 3-inch pipe or 4-inch logs may be used in-

stead of the snake plates. Pile earth from the trench on the ends of the supporting plates, to prevent their displacement when towing the snake.

(2) The top of the demolition snake is divided into sections A, B, and C and the bottom into sections D, E, and F. Figure 85 lists the number of plates in each section and indicates the lapping of plates within sections. Assembly is facilitated if bottom plates are placed on one side of the assembly line and top plates on the other. Plates should be stacked in piles containing the proper number of plates for each section. Explosives are placed on the same side as the bottom plates. Since plates within each section have the same overlap, assembly crews can tell when a change in lapping is required by watching the stacks.

d. General Assembly Procedure. The general assembly procedure is as indicated in (1) and (2) below.

(1) Place bottom plates with center ridge up and aline bolt holes. Place cartridges and tamping bags in the corrugations. Place cover plates with center ridge down and aline bolt holes. Bolt top and bottom plates together. Tow completed portion to rear and retighten all bolts.

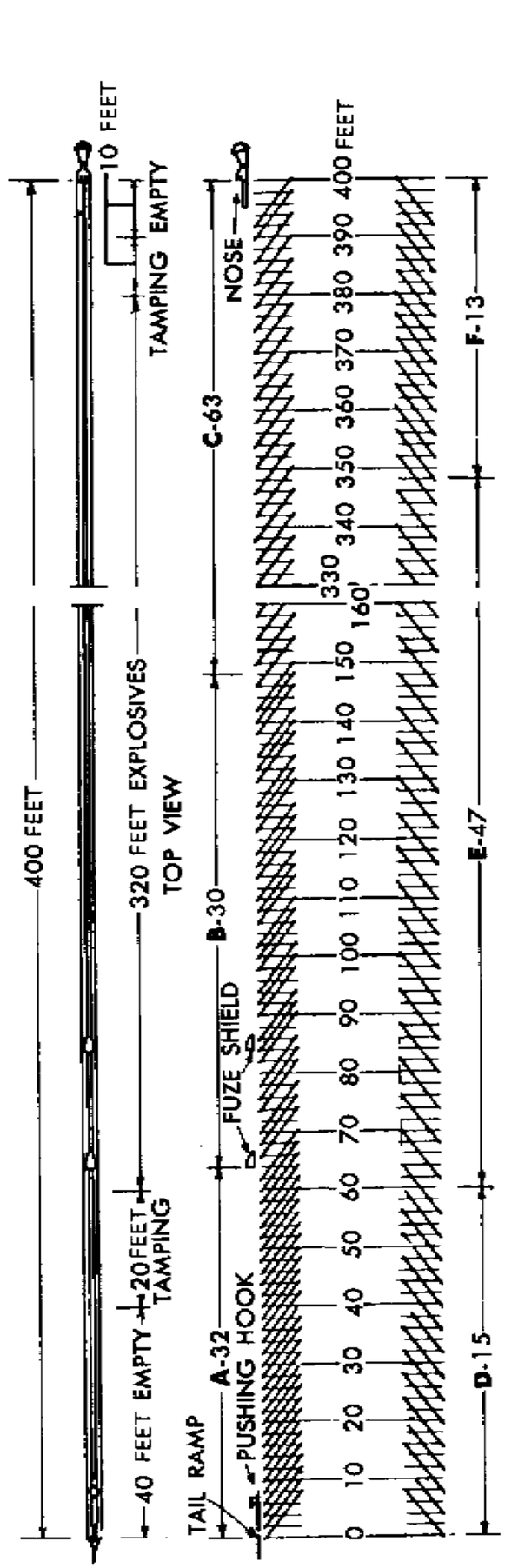
(2) To facilitate feathering of plates, assemble the demolition snake from rear to front. Build it in about 40-foot increments and tow it to the rear after each increment is added to minimize carrying of parts. Towing shakes the parts into better alinement, permitting bolts to be retightened, and increasing structural stability.

e. Detailed Assembly.

(1) *Rear 40 feet.*

(*a*) To assemble the rear 40 feet of demolition snake, underlap each successive under plate (sec. D, fig. 85), then overlap each successive cover plate (sec. A, fig. 85). The bottom-plate carrying detail carries plates from the proper stack and places them with the correct lapping. After lapping is checked by the noncommissioned officer in charge, aliners, working on the opposite side of the snake, aline the boltholes with driftpins or ends of assembly wrenches. Pins are left in place until they interfere with placing of top plates. This rearmost 40-foot section contains no explosives but, when time permits, is completely filled with tamping for additional stability.

(*b*) Aliners remove interfering driftpins from boltholes. Top plates are placed from the proper stack with the correct overlap and pins are reinserted for realinement. When the plates are placed and properly alined, the bolt carrier dis-



TOP SECTION	NO. OF PLATES
A	32
B	30
C	63
TOTAL	125

BOTTOM SECTION	NO. OF PLATES
D	15
E	47
F	13
TOTAL	75

Figure 85. Assembly diagram for demolition snake M3.

tributes one bolt, two washers, and one nut to each bolthole along the demolition snake. Fasten tail ramp with rear-most bolt and hinge it forward, to prevent its being damaged during assembly of the snake. Fasten pushing hook with four bolts immediately ahead of the rear bolt (fig. 86). The bolting detail removes the driftpins from each bolthole, thrusts the bolt (w/washer) through the hole from the bottom, places the top washer, and hand tightens the nut. Wrench handlers then finish tightening the nuts with wrenches.

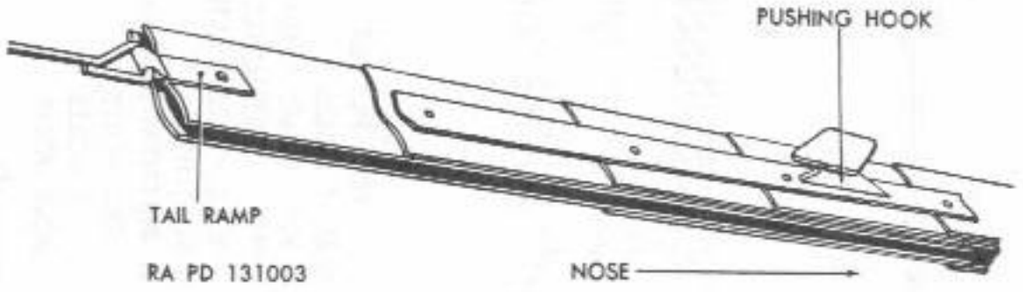


Figure 86. Assembled tail of demolition snake M3.

(2) *Central portion of demolition snake.*

(*a*) After the first 40 feet are towed to the rear, place the next 40 feet of bottom plates. The lapping of plates changes from three boltholes per plate in section D to two holes per plate in section E, 60 feet from the rear end of the demolition snake. Use all bottom plates from the first stack, then take plates from the next stack. At this stage, determine the locations of the fuze shields (fig. 76). The open end of the first fuze shield will be bolted to the snake at the thirty-third bolt from the rear end. The open end of the other shield will be bolted to the snake 10 boltholes (20 ft) forward of the open end of the first shield. Place the first pair of cartridges or bangalore torpedoes with the forward ends 6 inches in front of the hole, to which the open end of the shield will be fastened. This places the open end of the rear shield 64 feet from the tail of the snake and insures that 12 inches of TNT (6 in. in ea of the adjacent cartridges) is beneath the body of the fuze.

(*b*) Tightly pack earth-filled tamping bags (fig. 82) for 20 feet in back of rear-most explosive charges without disturbing their position. The explosive detail places additional charges forward of the two already placed. The charges or bangalore torpedoes must fit tightly end-to-end, to prevent the crystalline TNT booster portion of the charge

from shifting from beneath the fuzes. This should be checked by the noncommissioned officer in charge.

(*c*) After the explosive charges are properly placed, assemble the cover plates, paying particular attention to the charge in lapping between sections A and B. During the bolting of this portion, mount the fuze shields on the cover plates at the predetermined locations. Do not place the fuzes in the shields until the assembly is complete and the snake is ready for use. Assemble successive portions of the snake similarly. Note the change in lapping under plates, 348 feet from the rear end.

(3) *Front portion of demolition snake.*

(*a*) Assemble the front portion of the demolition snake in the same way. Lap one of the top plates in forward section C over four boltholes instead of three, so the under and cover plates terminate at the same point. This four-hole lap is made most easily with the last plate.

(*b*) Place explosive charges to within 20 feet of the front end of the snake, then add 10 feet of tamping bags, to prevent them from moving.

(*c*) Fasten the nose adapter between the under and cover plates at the forward end of the snake by the two foremost bolts. Slip the nose over the adapter until it is snug against the bumper ring. Pass one end of the nose-retainer wire-rope loop through the hole in the towing hook. Pass the retainer bar through the loop on the opposite side of the hook, through the hole in the nose, and position it inside the nose with the bar across the opening (see figs. 72 and 87).

(*d*) Position the remaining cover plates and bolt them into place. When assembly is completed, it is checked by the junior noncommissioned officer, all bolts are retightened, and the tail ramp is hinged to the rear.

(*e*) Arm the demolition snake by removing the safety forks and inserting the fuzes within the shields. The fuze must

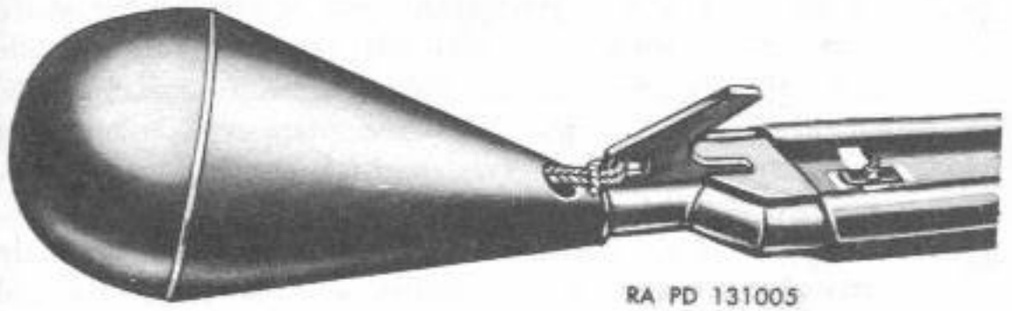


Figure 87. Nose assembly, demolition snake M3.

be seated well forward against the vertical stop plate inside the shield. Fasten it in place with the key chained to the shield.

113. Assembly of Towing and Pushing Assemblies

a. Towing Assembly. Bolt the towing rods and lifting bail (fig. 83) to the towing yoke. Pin the front ends of the rods to the rear towing lugs of the tank and shackle the coil spring to the lifting bail (fig. 88). The towing assembly is raised in medium and light tanks as shown in figures 91 and 92.

b. Pushing Chain. Fasten the pushing chain to the front clevises of the tank (fig. 89).

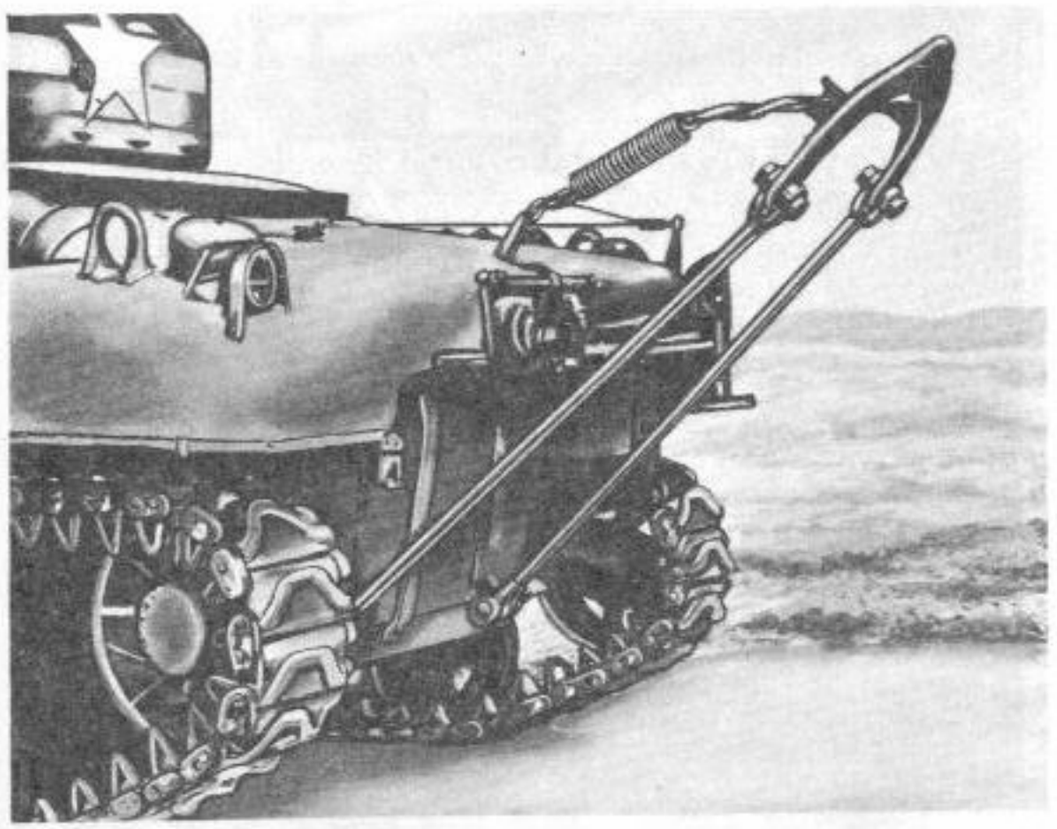
c. Rigging Fixtures.

(1) *Pulleys and mounting posts.* Five pulley support posts with pulleys, two rope guide rings with pulleys, and one rope guide ring are furnished with each demolition snake. They are used in raising the towing yoke and pushing chain and are welded on the tank hull. Location of the pulleys depends on the tank model. Figure 90 shows location of the fittings on several typical tanks. Posts and guide rings must be installed so that tank gun clears them when the turret is traversed and the gun is at its lowest elevation.

(2) *Periscope fitting.* The periscope fitting, through which the towing yoke cable and the pushing-chain rope enter the tank, fits in the periscope slot on medium tanks. The bow gunner in most tanks of the M4 series has two periscopes; one in the hatch door and one in the hull just forward of the hatch door. The periscope fitting is inserted in the bow gunner's hull-periscope slot. On some early production models of tank M4 series, the bow gunner has a periscope in the hatch cover and direct-vision slot in the hull. When these tanks are used, the periscope fitting is inserted in the periscope slot in the bow gunner's hatch cover. In this case, the bow gunner's view is obstructed and he cannot use his machine gun and the coaxially-mounted machine gun must be used to detonate the snake. As an alternate method, a cover plate for the radio-antenna hole on the right of the bow gunner may be improvised and the direct-vision port fitting mounted on the plate.

(3) *Direct-vision port fitting.* This fitting may be used in place of the periscope fitting. The cover plate over the bow gunner's direct-vision port is removed and the fitting is inserted in the port and fastened in place.

(4) *Rigging.* Tie the sash cord securely to the pushing chain, thread it through the front pulley, and take it into the tank through the larger hole in the periscope or direct-vision port



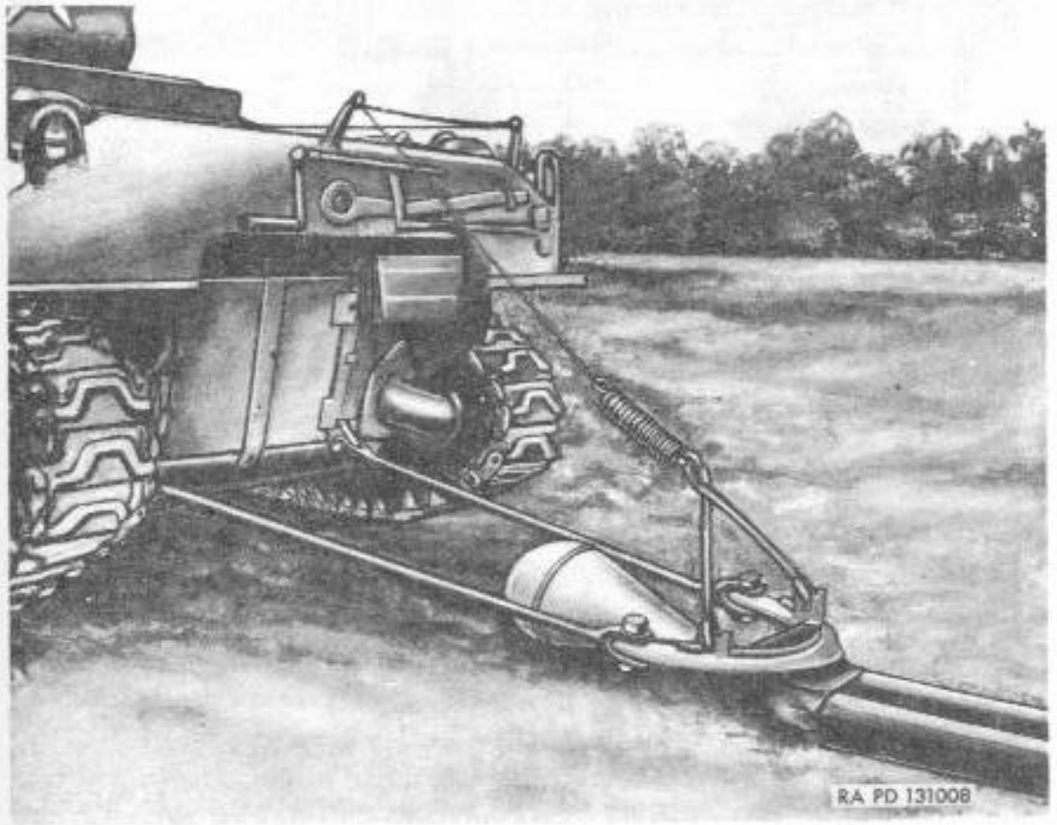
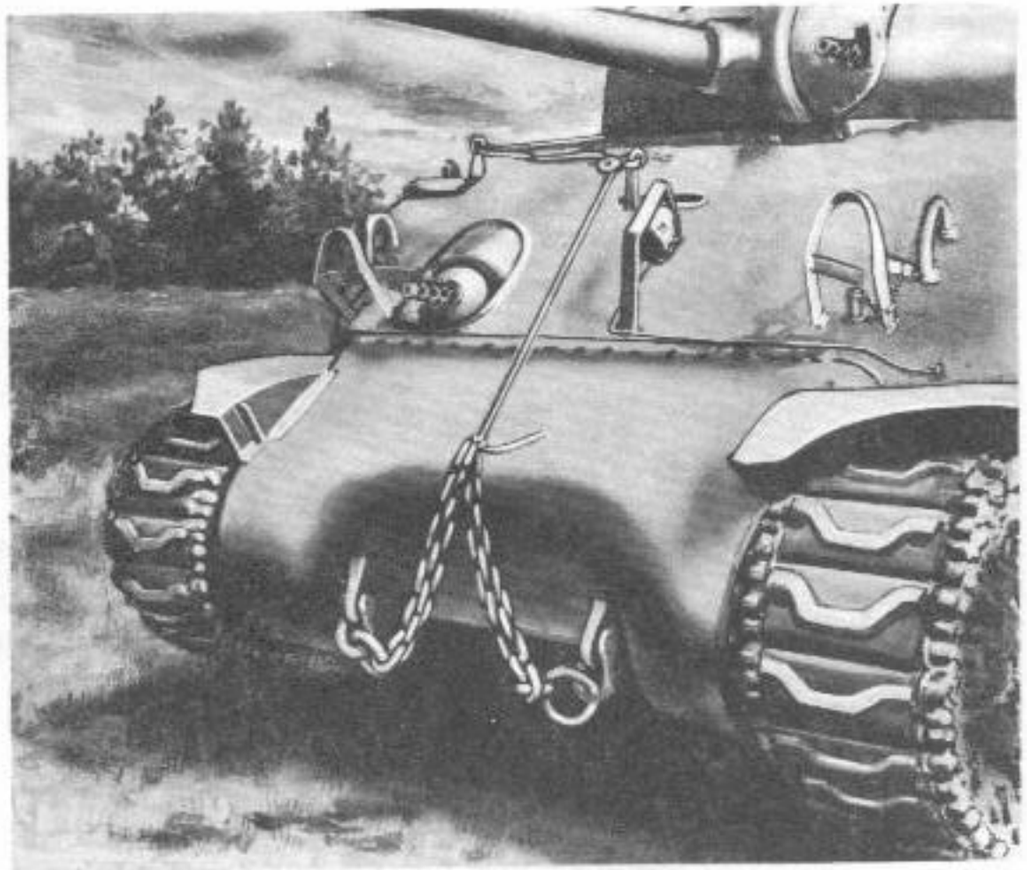


Figure 88. Towing assembly, demolition snake M3.



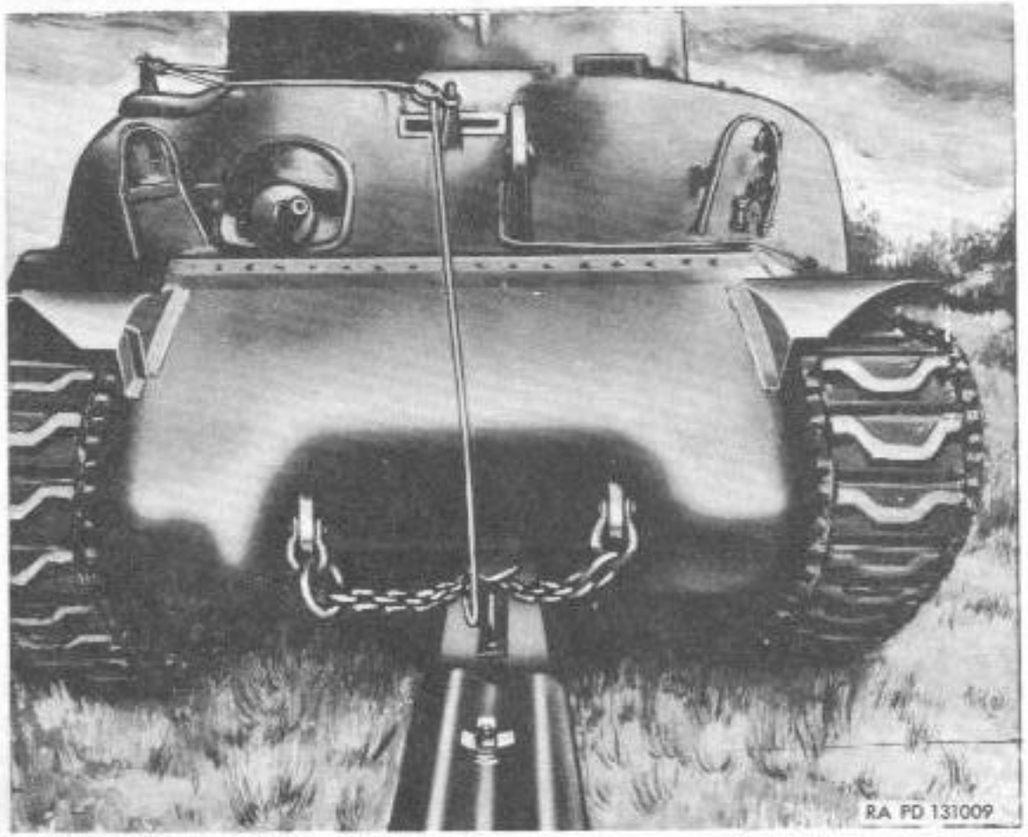
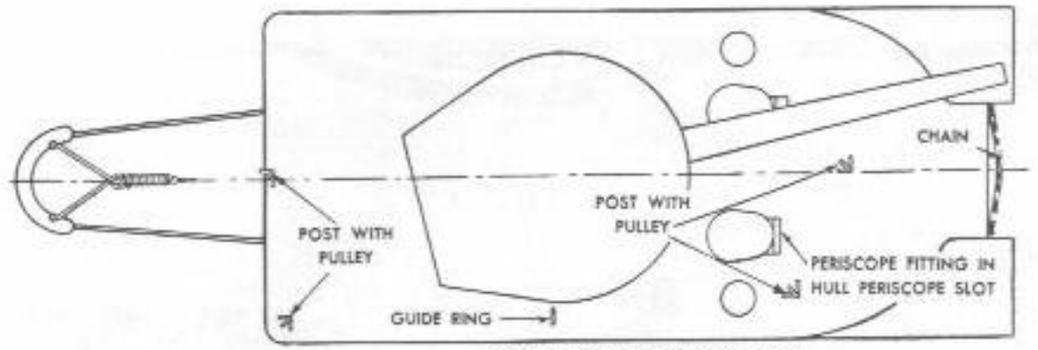
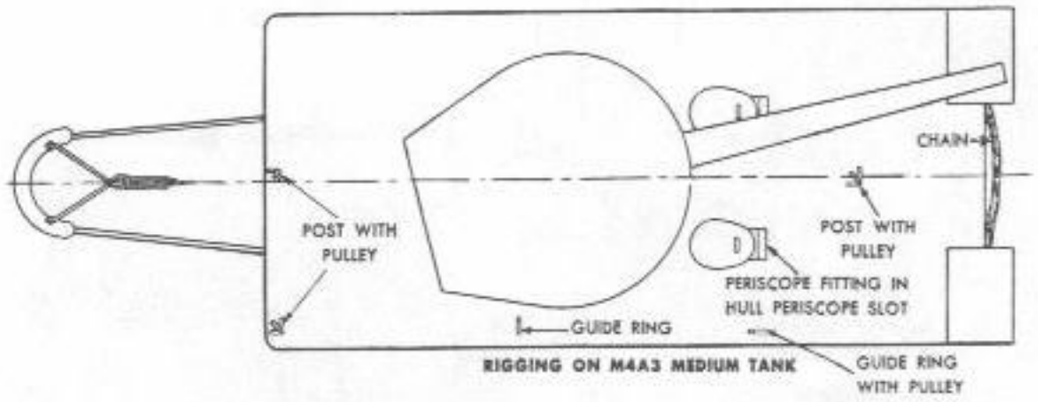


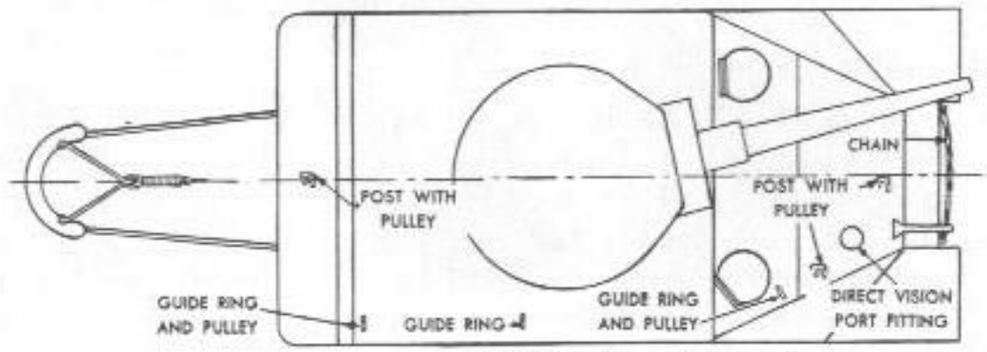
Figure 89. Pushing assembly, demolition snake M3.



RIGGING ON M4A1 MEDIUM TANK



RIGGING ON M4A3 MEDIUM TANK



RIGGING ON M24 LIGHT TANK

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Figure 90. Location of rigging fixtures on tank hulls.

fitting. Fasten one end of the ⅛-inch cable to the coil spring on the lifting bail, using the special cable clamp. Then, thread the cable through the pulleys and into the tank through the smaller hole in the periscope or direct-vision port fitting. Wind the end of the cable on the reel in the fitting. The pushing chain is raised and lowered by hand with the sash cord. The towing yoke is raised by winding the reel on the periscope or direct-vision port fitting. A wrench is provided for winding the reel (fig. 91), however, the yoke can be raised much faster using a ratchet wrench (fig. 92) and a 1-inch socket. To drop the yoke, the ratchet bar on the reel is pushed to the right.

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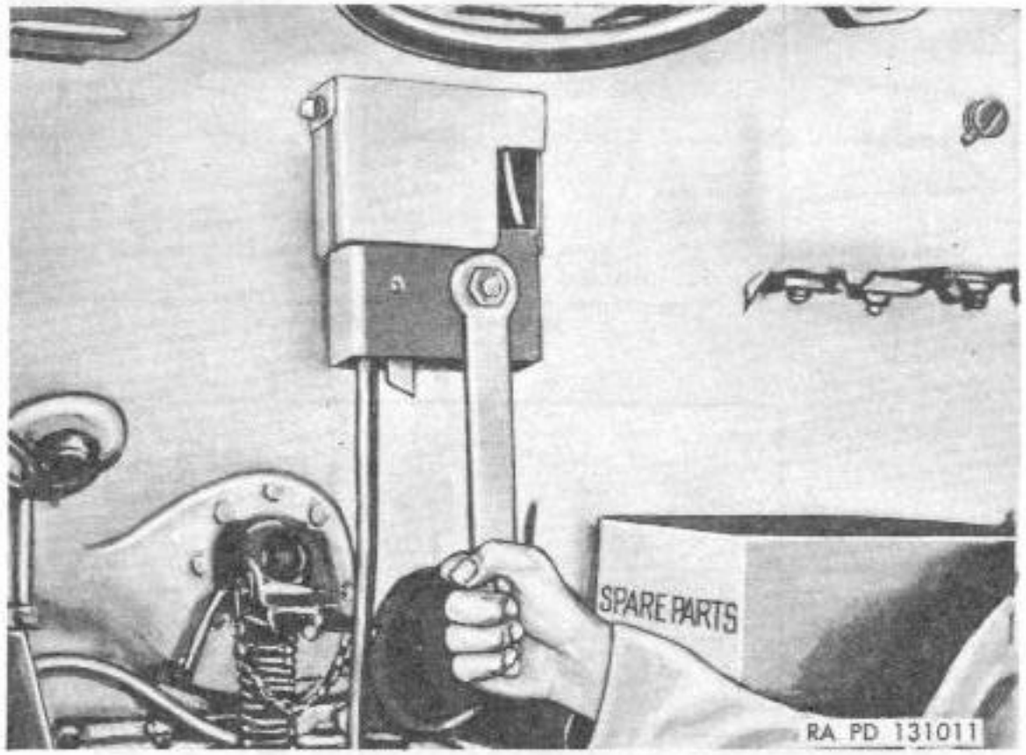


Figure 91. Medium tank bow gunner raising towing assembly with wrench issued with demolition snake M3.

114. Night Assembly

a. Night assembly procedure is the same as during the day, but requires more practice and normally requires two to three times as long as day assembly. Parts must be laid out where they are easily accessible and can be readily found. Close supervision is important to insure proper assembly. Driftpins and wrenches are less easily lost if painted white.

b. Even though the fuze faces are coated with luminous paint, they often cannot be seen from inside the tank at night. Therefore, when firing a demolition snake at night, a standard flashlight should be wired securely to the bolt nearest the fuze, with the beam directed on the fuze (fig. 93). An alternate method is to place a piece of white paper under the flashlight lens to diffuse the beam and point the flashlight toward the tank.

115. Safety Precautions

When a demolition snake is detonated, the blast pressure is minimum toward the rear and is greatest on the flanks of the snake. Blast pressure from the detonation causes the tank crew no discomfort. If the snake is fired immediately after it is released by the tank, flame from the explosion may enter the tank, if any ports are open. However, there will be no damage to the tank or injuries to personnel, if safety precautions listed in *a* through *c* below are observed. Detonation may throw fragments as far as 1,000 yards laterally or 300 yards to the rear, but most of the fragments are thrown at right angles to the line of the snake. The precautions in *a* through *c* below must be taken when handling snakes.

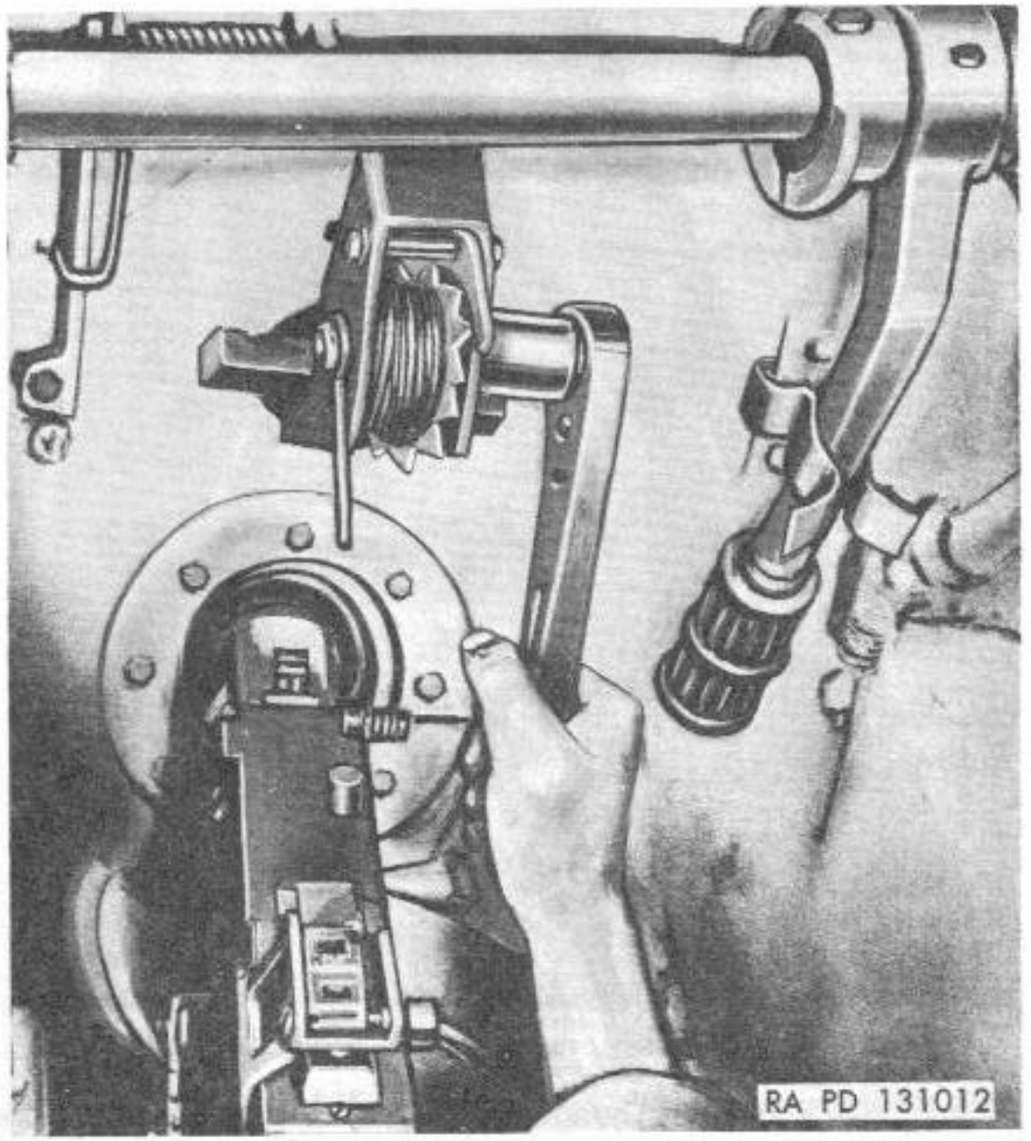


Figure 92. Light tank bow gunner raising towing assembly, using ratchet wrench.

a. Pushing and Towing Tank.

(1) All loose oil and fuel drippings must be removed from inside tank.
(2) Tank fire extinguishers must be in good working condition and ready for use.
(3) Pistol port must be locked securely.
(4) All direct-vision slots must be closed.
(5) Fuel-tank filler covers must be properly fastened.
(6) Gaskets and latches on all hatch covers must be in good condition.

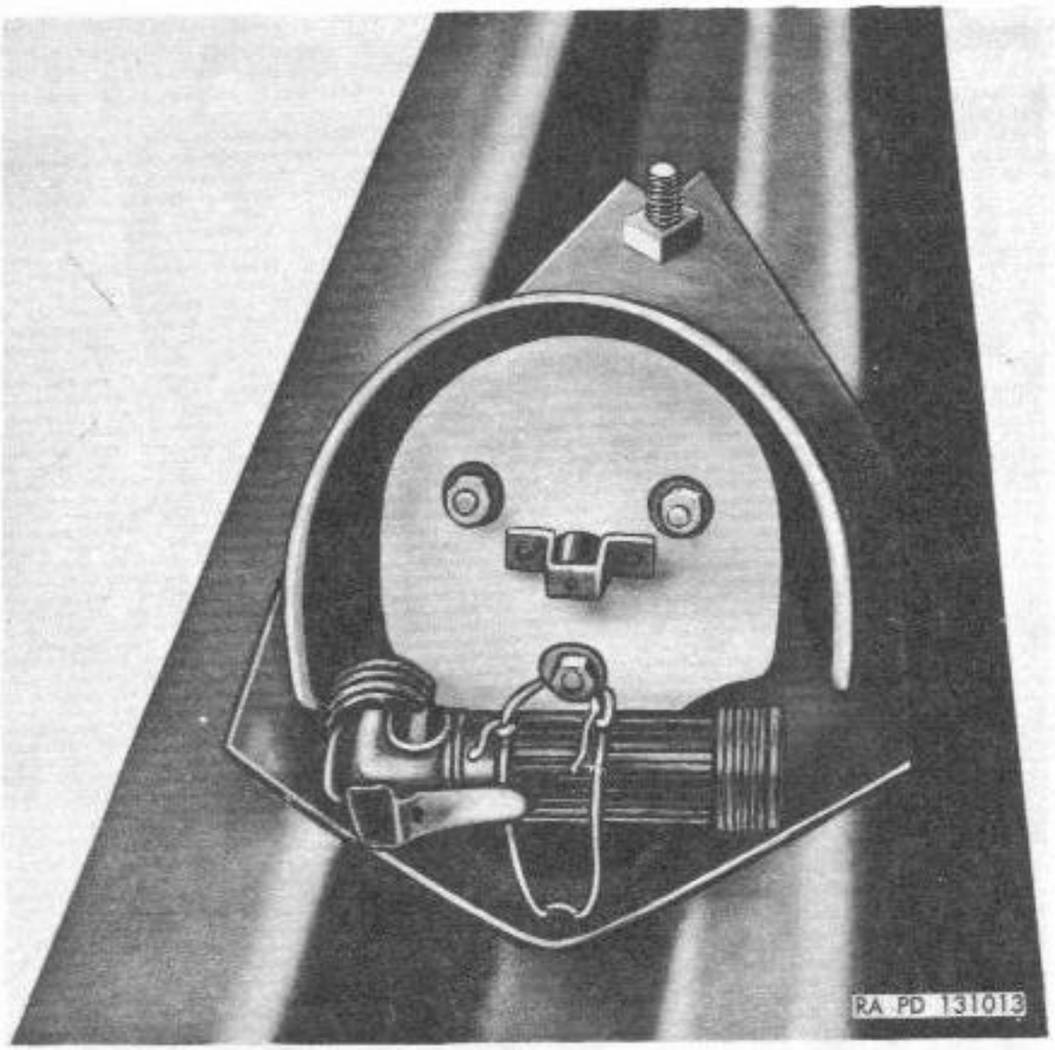


Figure 93. Fuze, bullet impact, M1, illuminated by flashlight.

(7) Hatch doors must be securely latched. Detonation of a snake will blow open improperly latched hatch covers.
(8) Periscopes must be fitted in all periscope holders.
(9) Smoke mortar, turret machine guns, and bow machine guns must be in place or wooden plugs wedged in openings.
(10) Canvas or asbestos should be stuffed around hull and turret ventilators to minimize dirt blowing into tank.
(11) Canvas or asbestos should be stuffed in gun shield opening behind rotor shield, to prevent flame from explosion from entering tank.

b. Tanks Close to the Tank Pushing or Firing the Demolition Snake.

(1) The minimum safe lateral distance for tanks is 100 yards.
(2) Tanks within 500 yards should have all ports and slits closed and all hatch doors securely latched.

c. Personnel Outside of Tanks.

(1) No personnel must be within 250 yards of snakes in firing position or armed snakes being towed or pushed.

(2) Personnel must take cover when 250 to 800 yards away laterally or 250 to 300 yards to the rear of an armed snake.

116. Towing and Pushing

The average tank driver requires 1 week of daily practice in pushing and towing inert demolition snakes (loaded w/tamping material) to become proficient. Before a live snake is towed or pushed, precautions listed in paragraph 115 must be taken.

a. Towing.

(1) Aline the tank with the demolition snake in front of the nose, then back the tank until the towing yoke is behind and above the towing hook. Take care not to back over the nose and crush it. The bow gunner releases the cable holding the towing yoke and the yoke falls into the snake behind the towing hook. The tank then moves forward slowly until the yoke engages the hook. Towing assembly is shown in figure 88.
(2) When towing a demolition snake, it is important that changes in direction and speed be made gradually and without jerking.
(3) Tow the demolition snake as close as possible to the obstacle. The last 400 feet of the tow must be as straight as possible, so the snake will take a straight course when pushed into the obstacle. When the snake is to be dropped, stop the towing tank and back it about 2 feet to disengage the yoke from the towing hook. Raise the yoke by cranking up the cable on the periscope fitting. The yoke is raised much faster using a ratchet wrench and a 1-inch socket rather than the wrench furnished with the snake. Then move the tank forward far enough to clear the nose of the snake before turning.

b. Pushing.

(1) *Alinement.* To push a demolition snake, approach the tail of the snake and aline the tank astride the snake. Practice is required to aline the center of the tank with the snake, because the driver is seated off center and his view is restricted. Pronounced misalinement may cause the snake to buckle during pushing.
(2) *Engaging pushing hook.* Before reaching the tail ramp, the bow gunner releases the pushing chain (fig. 89). The tank then advances slowly until the chain engages the pushing hook and the hook is picked up and held against the belly of the tank.

(3) *Starting push.* After picking up the hook, the tank starts forward in lowest gear and slowly accelerates until it is running in second or third gear. Alinement of the center of the tank over the center of the snake must be preserved and the driver must follow the snake carefully, *making no attempt to guide it.* Attempts at guiding usually cause structural failure of the plates immediately in front of the tank.

(4) *Observation by tank driver.* The driver must frequently manipulate the periscope to observe the terrain ahead, the behavior of the nose, the relative alinement of the tank with the snake, and the condition of the snake near the tank. The entire length of a 400-foot snake is seldom completely within the limited field of vision of the periscope.

(5) *Releasing the snake.* To release the snake, back the tank up far enough to clear the chain from the hook. The chain is pulled up by hauling in on the control rope.

117. Detonation

The flash of flame produced by detonation of the demolition snake M3 (aluminum plates) is greater than that produced by detonation of the M2 and M2A1 models (steel plates). It may extend back to the tail of the snake, and, if the snake is detonated immediately after the tank disengages from the pushing hook, the tank may be partially enveloped in flame for an instant. A number of snakes have been fired with the tank in this position without injuries or damage. All precautions listed in paragraph 115 were taken. It is preferable, after dropping the snake, to back the tank up about 40 feet before detonation. However, the snake can be fired while pushing, without stopping to unhook or back up, and the tank can immediately advance through the cloud of smoke and dust raised by the explosion, the driver feeling his way through the crater.

a. Bullet Impact Fuze. The demolition snake is normally detonated by firing at one of the fuzes mounted on the snake with either machine gun mounted on the tank. Two fuzes are provided, because the position of the snake may place one of the fuzes where it is difficult to see or hit. The coaxially mounted machine gun is generally the better gun to use, because it is mounted higher in the tank. In medium tanks where the periscope fitting is inserted in the hatch cover, the bow gunner's view is obstructed hence the coaxial gun must be used. Tracer ammunition must be used when firing at night with the fuzes illuminated (see fig. 93).

b. Detonating Snake with Tank Gun. If neither fuze can be hit by machine-gun fire, the demolition snake is detonated by a direct hit from the tank gun (37-mm and over), using a high-explosive shell with superquick fuze. The snake will explode when any loaded section is hit. Fire should not be directed at the snake's rear 60 feet, which contains no explosive.

118. Effectiveness of Demolition Snake M3

a. Most Suitable Terrain. Demolition snakes are most effective in flat or moderately rolling, open, or lightly wooded terrain. Such terrain, moreover, is suitable for maneuvering tanks.

b. Crater. The size of the crater blasted by a demolition snake depends on the type of soil and its moisture content. In most soils, the crater will be 320 feet long, 12 to 16 feet wide, with maximum depth of 3 to 5 feet. The crater provides a well-marked route for tanks.

c. Breaching Obstacles.

(1) The principal use of demolition snakes is breaching mine fields; however, they may also be used to breach bands of log posts, steel rails, antitank ditches, and some small concrete obstacles. Effectiveness of the snake depends on type, shape, height, weight, spacing and emplacement depth of the individual obstacles, and ground characteristics. The snake is either pushed through or over the obstacles. Length of snake used depends on the depth of the obstacle. When fired, the section of snake loaded with explosives must be over or adjacent to the obstacle. When the snake is detonated, a crater is blasted and the obstacles in the crater are generally shattered or blown out of the crater, depending on the characteristics of the obstacles.

(2) Against reinforced-concrete obstacles interconnected by ground sills and against large reinforced-concrete blocks, detonation of a single demolition snake may not produce an adequate breach, because of the weight and strength of the blocks and because good contact of explosives with surface of concrete is not obtained.

(3) Success in breaching antitank ditches depends on the depth, width, and revetting of the ditch and whether the nose of the demolition snake clears the far side of the ditch. Detonation of a demolition snake breaks down the sides of the ditch. In average unrevetted ditches 5 feet deep, a single snake will blast a gap passable by tanks. Deeper ditches may require the detonation of a second snake in the crater of the first. It is generally not practicable to breach ditches deeper than 8 feet.

119. Comparison of Demolition Snake Models

a. Principal differences between demolition snake M2, M2A1, and M3 are tabulated below:

	M2	*M2A1*	*M3*
Total net weight	12,500 lb	15,000 lb	9,000 lb
Corrugated plates	Steel	Steel	Aluminum
	53 lb	53 lb	16 lb
	164	172	200
Washers	1 per bolt	1 per bolt	2 per bolt
	2 in. long	2 in. long	4 in. long
Nose	Steel	Steel	Aluminum
	Two-piece, bolted	Two-piece, bolted	One-piece, welded
	Held to adapter by bolt	Held to adapter by special retainer.	Held to adapter by special retainer.
Tamping bags	Paper	Paper	Cloth or paper
Pushing attachment.	Wire rope	Steel chain	Steel chain
Total explosive load.	3,200 lb	4,500 lb	4,500 lb
Explosive cartridges.	4 feet long	5 ft long	5 ft long
	20-lb explosives	35-lb explosives	35-lb explosives
	Steel casing	Aluminum casing	Aluminum casing
	Circular in cross section.	Elliptical in cross section.	Elliptical in cross section.
Fuze and shield	1	2	2
Towing assembly and rigging.		M2 fittings and rigging improved and strengthened.	M2 fitting and rigging improved and strengthened.
	Rope on towing yoke raised by hand.	Cable on towing yoke raised by winch on periscope fitting.	Cable on towing yoke raised by winch on periscope fitting.

b. Assembly procedure for demolition snake M2 and M2A1 is similar to that of the snake M3, except that lapping of the steel plates differs from that prescribed for aluminum plates.

c. With demolition snake M2 and M2A1, an expedient nose can be used in place of the standard pear-shaped nose and adapter. It is built from steel body plates and is fastened to the two foremost bolt holes of the assembled snake. This nose is better adapted for pushing snakes over obstacles presenting a vertical face of limited height.

CHAPTER 6

DESTRUCTION OF AMMUNITION TO PREVENT ENEMY USE

120. General

a. Destruction of demolition materials, when subject to capture or abandonment, will be undertaken by the using arm only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of or policy established by the Army commander.

b. This information is for guidance only. The conditions under which destruction will be effected are command decisions and may vary in each case, dependent upon a number of factors such as the tactical situation, security classification of the demolition materials, their quantity and location, facilities for accomplishing destruction, and time. In general, destruction of demolition materials can be accomplished most effectively by burning or detonation or a combination of these. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, demolition materials and their components must be so badly damaged that they cannot be restored to a usable condition in the combat zone. Equally important, the same essential components of all demolition materials must be destroyed, so that the enemy cannot assemble complete rounds from undamaged components of several damaged complete rounds.

d. If destruction of demolition materials is directed, due consideration should be given to (1) and (2) below.

(1) Selection of a site (place for the destruction operation) that will cause greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments, which may occur incidental to the destruction.

(2) Observance of appropriate safety precautions.

121. Methods

Demolition material can be most quickly destroyed by burning or detonation. The methods in *a* and *b* below, in order of preference, are considered the most satisfactory for destruction of demolition materials to prevent enemy use.

a. Method No. 1—By Burning.

(1) *General.* Packed and unpacked high-explosive items such as, cratering charges, shaped charges, demolition blocks, dynamite cartridges (sticks), detonating cord, firing devices, time blasting fuse (safety fuse), and similar items may be destroyed quickly and effectively by burning. Blasting caps set aside for destruction by burning must be stacked in separate piles and not with other explosives.

(2) *Method of destruction.*

(*a*) The explosives should be stacked in a pile if possible (not over 2,000 lb to a pile).

(*b*) Pour fuel oil over the entire pile.

(*c*) Ignite the pile by means of a combustible train (excelsior or slow burning propellant) of suitable length and take cover immediately. The danger area for piles being burned in the open is 400 yards.

Caution: Cover must be taken without delay, since an early explosion of the explosive materials may be caused by the fire.

b. Method No. 2—By Detonation.

(1) *General.* Packed and unpacked high-explosive items such as cratering charges, shaped charges, demolition blocks, dynamite cartridges (sticks), detonating cord, blasting caps, firing devices, time blasting fuse (safety fuse), and similar items may be destroyed by placing them in piles and detonating them with TNT, COMP C, or other explosives of equivalent potential.

(2) *Method of destruction.*

(*a*) The explosives should be stacked in piles if possible (not over 2,000 lb to a pile).

(*b*) Each 100 pounds of packed explosives (mines, blocks, etc.), require a 2-pound (min) explosive charge, to insure complete detonation of the pile. For unpacked explosives, a 1-pound (min) explosive charge for each 100 pounds is sufficient.

(*c*) Prepare the explosive charge, using EXPLOSIVE, TNT or equivalent together with the necessary detonating cord per charge, and place the charge on top of the pile to be detonated and then cover with earth or other inert material.

(*d*) Provide for dual priming as explained in FM 5–25, to minimize the possibility of a misfire. For priming, either a nonelectric blasting cap crimped to at least 5 feet of safety fuse, or time blasting fuse (safety fuse burns at the rate of 40 seconds per foot and time blasting fuse burns at the rate of 30 to 45 seconds per foot—test whichever is to be used before using), or an electric blasting cap and firing wire may be used. Safety fuse or time blasting fuse, both of which contain black powder, and blasting caps must be protected from moisture at all times. Safety fuse or time blasting fuse may be ignited by a fuse lighter or an ordinary match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

Caution: Blasting caps, detonating cord, and safety fuse and time blasting fuses must be kept separated from the charges until required for use.

Note. For the successful execution of methods of destruction involving the use of demolition materials, all personnel concerned will be thoroughly familiar with the provision of FM 5–25. Training and careful planning are essential.

(*e*) Detonate the charges. If primed with nonelectric blasting cap and safety fuse or time blasting fuse, ignite and take cover; if primed with electric blasting cap, take cover before firing the charges. The danger area for piles detonated in the open is a circular area of a radius, which varies according to the quantity of explosive items to be destroyed. Quantity-distance data for inhabited buildings as given in TM 9–1900 may be used as an approximate guide for such operations as are contemplated in this chapter.

APPENDIX I

COMPLETE ROUND TABLE

Demolition explosive	Priming means [1]	Initiating means	
CORD, detonating (PETN) (FUZE, primacord). [2] DYNAMITE, ammonia, 40%. DYNAMITE, ammonia, 60%. DYNAMITE, ammonia, gelatin, 40%. DYNAMITE, gelatin, 40%. DYNAMITE, gelatin, 60%. DYNAMITE, gelatin, 75%.	CAP, blasting, electric, No. 6 or No. 8.	Electric current.	
	CAP, blasting, nonelectric, No. 6 or No. 8.	FUSE, safety, M700 or FUSE, blasting, time.	Match
			LIGHTER, fuse, weatherproof, M2.
		FIRING DEVICE, any.	
	Any cap, cord, or detonator listed below in this column and corresponding initiator.		
BLOCK, demolition, chain, M1. BLOCK, demolition, M2. [1] BLOCK, demolition, M3, COMP C2. BLOCK, demolition, M3, COMP C3. BLOCK, demolition, M5A1. CHARGE, explosive, cratering, ammonium nitrate, in 40-lb waterproof metal container.	CAP, blasting, special electric.	Electric current.	
	CAP, blasting, tetryl, electric.		
	CAP, blasting, special, nonelectric.	FUSE, safety, M700 or FUSE, blasting, time.	Match
			LIGHTER, fuse, weatherproof, M2.
CHARGE, shaped, 15-lb, M2A3. [1] CHARGE, shaped, 40-lb, M3(3). [1] DYNAMITE, military, M1. DYNAMITE, military, M2. DYNAMITE, military, M3. EXPLOSIVE, nitrostarch (various size blocks). EXPLOSIVE, TNT [4] (various size blocks). TORPEDO, bangalore, M1A1. [1] [3]	CAP, blasting, tetryl, nonelectric.	FIRING DEVICE, any.	
	CORD, detonating (PETN) (FUZE, primacord). [2]	CAP, blasting, any.	FUSE, safety M700, or FUSE, blasting, time.
			Match
			LIGHTER, fuse, weatherproof, M2.
			FIRING DEVICE, any.
	DETONATOR, concussion type, M1. DETONATOR, 8-sec delay, M2. DETONATOR, 15-sec delay, M1.	None.	
CABLE, detonating, mine clearing, antipersonnel, M1.	CAP, blasting, special, nonelectric.	FUSE, safety, M700 or FUSE, blasting, time.	LIGHTER, fuse, weatherproof, M2.
CHARGE, for demolition snake M2. CHARGE, for demolition snake M2A1 and M3.	FUZE, bullet impact, M1A1.	Bullet impact.	
CHARGE, propelling, M12, w/primer, M44, for ROD, earth, blast-driven.		Match or LIGHTER, fuse, weatherproof.	

[1] ADAPTER, priming, M1A4 or ADAPTER, priming, M1A2 or M1A3, may be used with electric and nonelectric blasting caps and with detonating cord and is intended for use with demolition items having firing device wells with standard threads.

[2] CORD, detonating may be placed in priming adapter or may be wrapped around the demolition explosive, except in the case of shaped charges.

[3] Connecting sleeve and/or nose sleeve may also be used.

APPENDIX II

REFERENCES

1. Publication Indexes

DA pamphlet 310-series, DA Pam 108–1, FM 21–8, AFR 5–3, AF Film Catalog, and TO 00–1–11 should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

2. Supply Manuals

The following supply manuals of the Department of the Army Supply Manual pertain to this ammunition:

a. Explosive Materials Required for Destruction.

Land Mines and Components; Demolition Explosives and Related Items; and Ammunition for Simulated Artillery, Booby Trap, Hand Grenade, and Land Mine Fire.	ORD 3 SNL R–7

b. Maintenance and Repair.

Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials.	ORD 3 SNL K–1
General Tools and Supplies for Ordnance Ammunition Company.	ORD 10 SNL N–17
Special Tools for Ordnance Explosive Disposal Munitions, Ammunition Renovating Tools, and Bomb Handling Tools.	ORD 3 SNL J–11, section 2
Tool Set, Maintenance (Field), Explosive Ordnance Disposal Squad.	ORD 6 SNL J–8, section 1
Tool Set, Maintenance (Field), Ammunition Renovation Platoon.	ORD 6 SNL J–8, section 4

c. Training Aid.

Training Aid Catalog	TO 28–1–3 (USAF)

d. USAF Supply Catalog.

USAF Supply Catalog	Class 28E (USAF)

3. Forms

The following forms pertain to the ammunition covered in this manual:

OO Form No. 517, Ammunition Condition Report
OO Form No. 5981, Complete Round Charts
OO Form No. 7235, Ammunition Condition Report
AF Form No. 191, Ammunition Disposition Report
AFR 65–19, Ammunition Disposition Report

4. Other Publications

The following explanatory publications contain information pertinent to this ammunititon and associated equipment.

a. Ammunition, All Types.

Distribution of Ammunition and Explosives for Training Purposes.	SR 710–60–50
Ammunition and Explosives Materiel—Surveillance and Safety.	AFR 136–6
Ammunition, General	TM 9–1900
Ammunition Identification Code (AIC)	TB 9–AMM 5
Ammunition Inspection Guide	TM 9–1904
Ammunition Renovation	TM 9–1905
Transportation by Water of Explosives and Hazardous Cargo	AR 55–228

b. Camouflage.

Camouflage, Basic Principles	FM 5–20

c. Decontamination.

Decontamination	TM 3–220
Defense Against Chemical Attack	FM 21–40

d. Destruction to Prevent Enemy Use.

Explosives and Demolitions	FM 5–25

e. General.

Dictionary of United States Army Terms	SR 320–5–1
Engineer Field Data	FM 5–34
Engineers' Reference and Logistical Data	FM 5–35
Engineer Soldier's Handbook	FM 21–105
Inspection of Ordnance Materiel in the Hands of Troops	TM 9–1100
Military Chemistry and Chemical Agents	TM 3–215
Ordnance Service in the Field	FM 9–5
Report of Loss, Theft, and Recovery of Government Property	SR 210–10–10

f. Maintenance and Repair.

Abrasive, Cleaning, Preserving, Sealing, Adhesive, and Related Materials Issued for Ordnance Materiel.	TM 9–850

g. Shipment and Limited Storage.

Army Shipping Document	TM 38–705
Instruction Guide: Ordnance Preservation, Packaging, Packing, Storage and Shipping.	TM 9–1005
Marking and Packing of Supplies and Equipment: Marking of Oversea Supply.	SR 746–30–5
Shipment of Supplies and Equipment: Report of Damaged or Improper Shipment.	SR 745–45–5
Ammunition: Restricted or Suspended	TB 9–AMM 2
Ammunition Supply	AFR 67–28
Ammunition Surveillance Manual	OFSB 3–20
Carrying Live Bombs and other Ammunition on Tactical Aircraft.	AFR 55–25
Characteristics and Employment of Ground Chemical Munitions.	FM 3–5

Coordination with Armed Services Explosives Safety Board Report of Hazardous Conditions Involving Military Explosives or Ammunition.	SR 385–15–1
Disposal by Dumping at Sea	SR 75–70–10
Ammunition	SR 755–140–1
Employment of Land Mines	FM 20–32
Explosive Ordnance Disposal Policies and Responsibilities	AR 75–15
Identification of Inert Ammunition and Ammunition Components.	SR 385–410–1
Issue of Supplies and Equipment: Processing Requisitions	SR 725–10–2
Land Mines	TM 9–1940
Land Mine Warfare	TC 34
Military Explosives	TM 9–1910
Military Pyrotechnics	TM 9–1981
Ordnance Ammunition Service in the Field	FM 9–6
Passage of Obstacles other than Mine Fields	TM 5–220
Pricing Guide—Ammunition	ORD 5–3–6
Qualifications and Familiarization	AR 370–5
Regulations for Firing Ammunition for Training, Target Practice, and Combat.	SR 385–310–1
Reports	SB 9–AMM 8
Reports of Malfunctions and Accidents Involving Ammunition and Explosives (during Training or Combat).	SR 700–45–6
Accident Reporting	SR 385–10–40
Small-Arms Ammunition	TM 9–1990
Transportation of Explosives and other Dangerous Articles	AR 55–225

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