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27 September 1983



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CATALOGUE OF STANDARD ORDNANCE ITEMS

OFFICE OF THE
CHIEF OF ORDNANCE
TECHNICAL DIVISION

DECLASSIFIED
27 September 1983

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U.S. ARMY MILITARY HISTORY INSTITUTE

CATALOGUE OF
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Office of the
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Technical Division

WASHINGTON, D. C.

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27 September 1958

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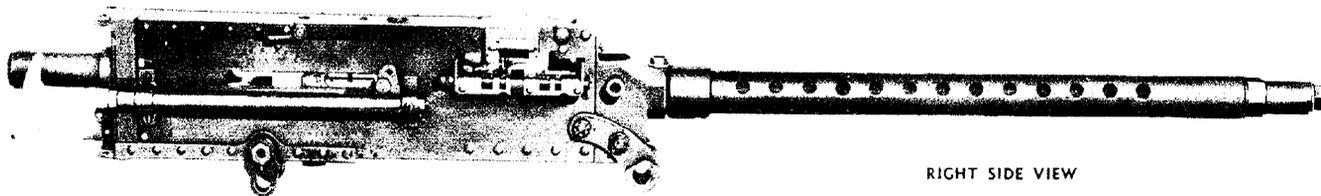
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INDEX

**SMALL ARMS
WEAPONS**

BROWNING MACHINE GUN, AIRCRAFT FIXED & FLEXIBLE CAL. .30, M2—STANDARD



RIGHT SIDE VIEW

BROWNING MACHINE GUN, AIRCRAFT, CAL. .30, M2, FIXED

This air-cooled weapon is a Standard item for installation in all types of aircraft in either fixed or flexible mounts, but since the trend in aircraft armament has been steadily toward greater fire-power from weapons of larger caliber, this gun has been supplanted almost entirely by the caliber .50 weapon.

The caliber .30 gun operates on the short-recoil principle which characterizes all Browning machine guns. The barrel reciprocates in a steel outer jacket drilled to facilitate cooling. The fixed and flexible guns are basically identical and guns of either type may be assembled to use either right-hand or left-hand feeds.

FEED—Feed is from a disintegrating metallic-link belt loaded in increments of 250 rounds. Two or more increments may be assembled in larger units of any desired capacity.

MOUNTING—Mounts for the gun are supplied by the Air Corps or are built into the plane at time of manufacture. Synchronized guns may be installed either singly or in pairs. The mounts are rigidly attached to the structure of the plane and fire is approximately parallel to the line of flight. Flexible mounts are installed so as to permit wide-angle fire in both azimuth and elevation. Guns so mounted are fired by a hand trigger.

FIXED GUNS—Fixed guns of this caliber are now mounted within the wings and fire through ports in the leading edge. The practice of mounting fixed guns within the fuselage, firing through the arc of propeller rotation, is rapidly becoming obsolescent in U. S. Army aircraft. Guns so mounted are controlled by a synchronizing device which times the fire in relation to the moving blades. The device permits only semi-automatic fire and reduces greatly the fire-power available and the combat efficiency of the plane.

The fire of wing-mounted guns is fully automatic and is controlled by a solenoid operated by a switch which is customarily mounted on the control stick of the plane.

All solenoids and other firing devices are Air Corps equipment and are supplied by that service.

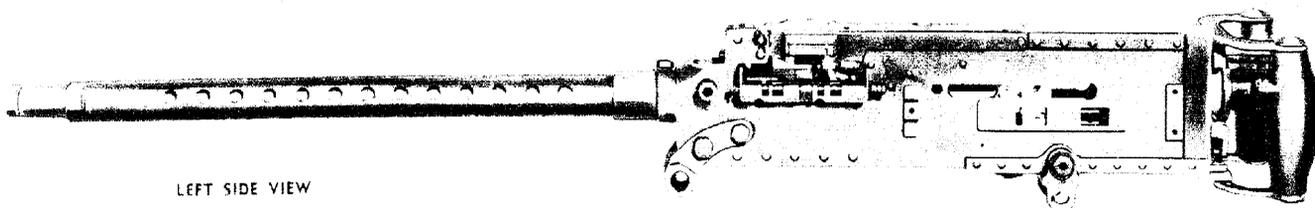
FLEXIBLE GUNS—The back plates of guns in flexible mounts are equipped with spade grips and manually operated triggers. They are fired by a gunner from a cockpit, "blister," or turret. The retracting slide is operated by hand and remains forward while the gun is firing, a feature which eliminates external moving parts and which is shared by all Browning machine guns. Fire of flexible guns may be full- or semi-automatic as the operator

may select. The usual fire is in short bursts, full-automatic.

SIGHTS—All sights and sighting equipment required for any installation of the Aircraft Machine Gun, caliber .30, M2, are supplied by the Air Corps. Sights for fixed guns are usually attached to the structure of the plane, those for flexible guns are mounted on the barrel jacket.

CHARACTERISTICS

Weight, total	Fixed, 21.5 lb. Flexible, 23.0 lb.
Weight of recoiling parts	6.56 lb.
Weight of barrel	3.81 lb.
Length, overall	39.8 ins.
Length of barrel	23.9 ins.
Rifling, length	21.35 ins., 70.9 cal.
No. of grooves	4
Twist	Right-hand, 1 turn in 10 ins. or 33.3 cal.
Depth of grooves	0.004 in.
Cross-sectional area of bore	0.074 sq. in.
Operation	Short-recoil
Feed	Link belt
Cooling	Air
Rate of fire	1000-1350 rds. min.
Firing pin release	Pressure applied to sear, 12-17 lb. Pressure applied to sear, holder, 25-35 lb.
Normal breech pressure	50,000 lb./sq. in. (copper)

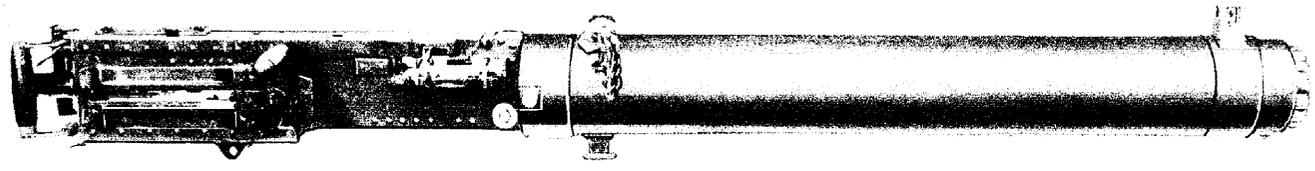


LEFT SIDE VIEW

BROWNING MACHINE GUN, AIRCRAFT, CAL. .30, M2, FLEXIBLE—LEFT HAND FEED

UNCLASSIFIED

BROWNING MACHINE GUN WATER-COOLED, FLEXIBLE CAL. .50, M2—STANDARD



BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, FLEXIBLE

This gun is a recoil-operated, belt-fed, water-cooled weapon used principally as an anti-aircraft weapon or against ground or floating targets from both movable and fixed mounts on docks and other shore installations and on ship-board. The water-cooling permits long bursts of fire without excessive overheating of the barrel. It is used on the anti-aircraft machine gun tripod mount, cal. .50, M3; on the cal. .50 mount, M43, Substitute Standard; and on the twin anti-aircraft machine gun mount, cal. .50, M46, Substitute Standard. It may also be used on the older anti-aircraft machine-gun tripod and pedestal mounts, M2 and M2A1, which are still in use but classified as Limited Standard.

The retracting slide is on the right side of the receiver. The back plate is of the flexible type, with or without spade grips. Removal of the spade grip assembly permits installation in positions where clearance is limited.

FEED—The caliber .50 cartridges are fed to the gun from either a fabric belt or a metallic-link belt of the disintegrating type loaded in increments of 110 rounds each. The gun is normally assembled for left-hand feed and when the gun is mounted on the Tripod Mount, M3, this feed must be used. Should installation requirements demand, the weapon may

be changed to right-hand feed by reversing the position of the bolt switch, belt feed slide, belt feed pawl arm and lever plunger, cartridge stops and link stripper, and the belt holding pawl.

As with all Browning machine guns, the retracting slide is connected with the bolt by a stud. The slide handle remains stationary in the forward position which the gun is firing.

COOLING—The gun barrel is surrounded with a water-jacket of ten quarts capacity connected by hose to a water chest which holds approximately 10 quarts. Water is circulated between chest and jacket by a hand-operated rotary pump.

A steam tube, sliding in front and rear supports, is in the top of the jacket. Movement of the tube covers and uncovers holes in the supports, the hole in the front support being covered when the muzzle is depressed, the rear hole being covered when the muzzle is elevated. Steam generated by the heat of prolonged firing passes through the uncovered hole and escapes through the steam tube into the circulating system where it is condensed.

Sights mounted on the gun are of the conventional machine gun type, a blade front sight, protected by a cover, and a folding-leaf rear with adjustments for

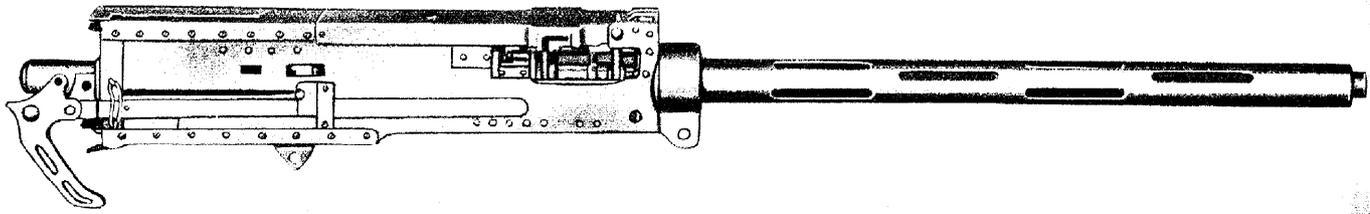
windage and elevation. The necessity of protecting the gunner by armor plate shields makes necessary the use of other sights when the gun is placed on the mounts on which it is used. The rear sight is a monocular peep sight, with rubber eyepiece and a sun-ray filter. It may be equipped with a rotatable disk providing peepholes of $\frac{5}{16}$, $\frac{1}{4}$, $\frac{3}{16}$, and $\frac{1}{8}$ inch diameter. The front sight is of the ring or "cartwheel" type and may be mounted so as to permit automatic adjustment in elevation and traverse by off-carriage control.

CHARACTERISTICS

- Weight, total... 100 lb., less water (water, 21 lbs.)
- Weight of recoiling parts... 24.5 lb.
- Weight of barrel... 15.2 lb.
- Length, overall... 66 ins.
- Length of barrel... 45 ins.
- Rifling, length... 40.11 ins., 81.8 cal.
- No. of grooves... 8
- Twist... Right-hand, 1 turn in 15 ins., 30 cal.
- Depth of grooves... 0.005 in.
- Cross-sectional area of bore... 0.2021 sq. in.
- Operation... Short-recoil
- Feed... Metallic link belt, 110 round capacity
- Cooling... Water, 10 qts.
- Rate of fire... 500-650 rds./min.
- Firing pin release... $\left. \begin{array}{l} \text{Pressure at sear,} \\ \text{10-20 lb.} \\ \text{Pressure at sear} \\ \text{slide, 30-35 lb.} \end{array} \right\}$
- Normal breech pressure. 48,000 lb./sq. in. (copper)

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BROWNING MACHINE GUN, AIRCRAFT FIXED & FLEXIBLE CAL. .50, M2—STANDARD



BROWNING MACHINE GUN, CAL. .50, AIRCRAFT, M2 (FIXED)

This gun is standard equipment for all U. S. airplanes carrying weapons of this caliber. It may be installed as a fixed gun in mounts that are a part of the aircraft or used in flexible form from turret or blister mounts.

FIXED TYPE—Customary installation of the fixed gun is in batteries of varying numbers of guns in the wings of the aircraft. When so mounted, the gun is fired by means of a solenoid attached to the receiver and controlled by a switch in the pilot's cockpit. Guns are now rarely installed so as to fire through the path of propeller rotation. Fixed guns are aimed by movements of the plane and sights are mounted on the aircraft. Sighting equipment for aircraft armament is supplied by the Air Corps.

FLEXIBLE TYPE—Flexible guns are installed as nose, tail, top, side, and belly guns as required by the particular aircraft. They are fired by hand and are equipped with spade grips. Flexible mount-

ing permits a wide field of fire in both azimuth and elevation. Sight bases are mounted on the receiver of the gun for such aircraft sights as may be used.

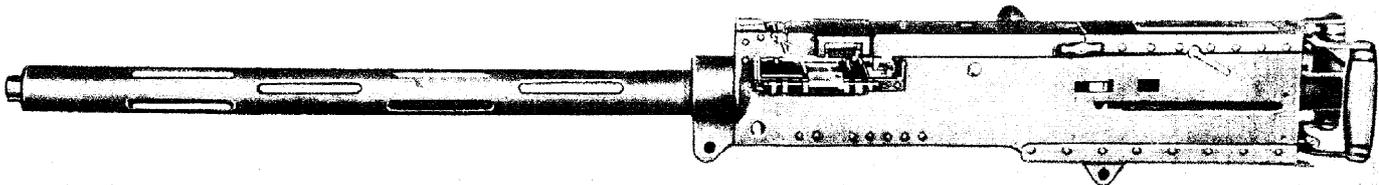
RATE OF FIRE—The rate of fire of the caliber .50 aircraft machine gun is controlled by adjustment of the oil buffer. A maximum burst of 75 rounds may be fired from the standard 36-inch barrel. After one minute firing may be resumed at the rate of one 20-round burst per minute.

The gun should be cooled for at least fifteen minutes before another long burst is attempted. If long bursts are not fired, the gun may be fired at a rate of 25 rounds per minute over a long period.

FEED—The gun is fed from a disintegrating metallic-link belt loaded in increments of 110 rounds. Any number of increments may be linked one to another to supply additional firepower. The caliber .50 aircraft machine gun, like all Browning machine guns, may be converted from left-hand to right-hand feed.

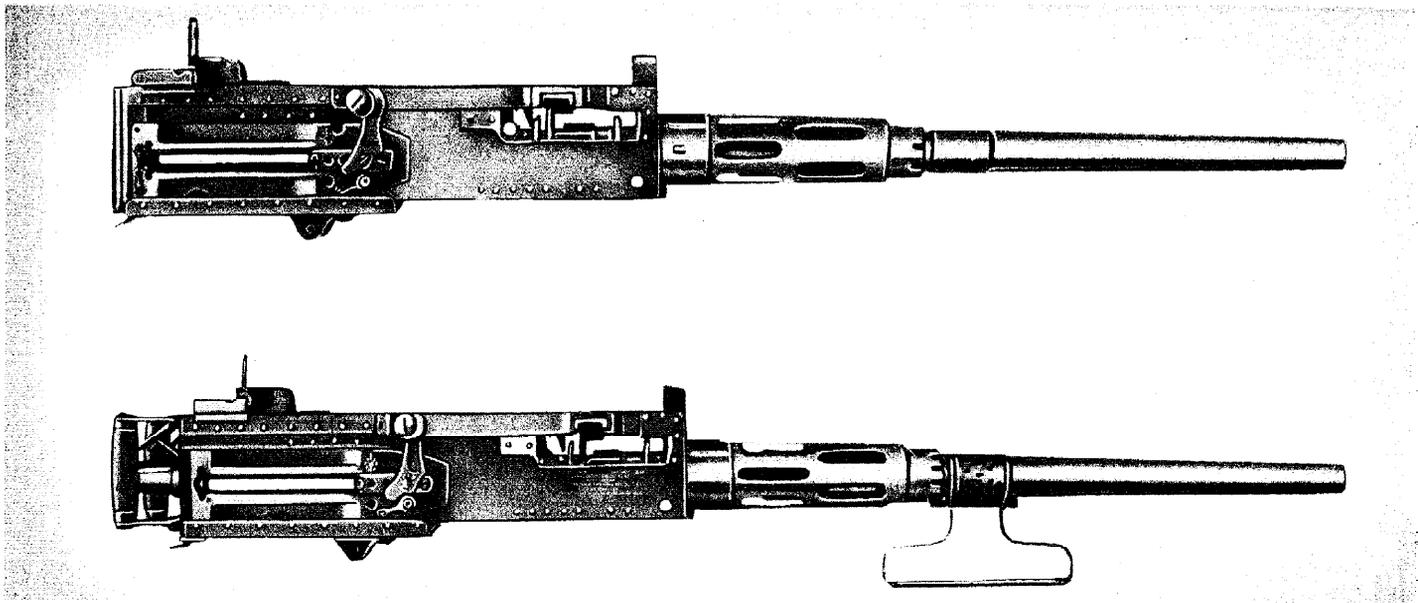
CHARACTERISTICS

Weight, total	{ Fixed, 64 lb. Flexible, 65.1 lb.
Weight of recoiling parts	19.2 lb.
Weight of barrel	9.8 lb.
Length, overall	57 ins.
Length of barrel	36 ins.
Rifling, length	31.91 ins., 63.8 cal.
No. of grooves	8
Twist	Right-hand, 1 turn in 15 ins., 30 cal.
Depth of grooves	0.005 in.
Cross-sectional area of bore	0.2021 sq. in.
Operation	Short-recoil
Feed	Metallic-link belt, 110 round
Cooling	Air
Rate of fire	750-850 rds./min.
Firing pin release	{ Pressure at sear, 10-20 lb. Pressure at sear slide, 30-35 lb.
Normal breech pressure	48,000 lb./sq. in. (copper)



BROWNING MACHINE GUN, HEAVY BARREL, CAL. .50, M2, HB—STANDARD

(FIXED, FLEXIBLE AND TURRET TYPES)



BROWNING MACHINE GUN, HEAVY BARREL, CAL. .50, M2, HB, FIXED (UPPER) AND FLEXIBLE (LOWER)

Assembly of a heavy barrel (27 pounds) in the receiver of the caliber .50 Browning machine gun permits continued firing over a longer period, or firing of longer bursts, with less danger of damage to the weapon by overheating. The heavy barrel is quickly and easily dismounted to form a separate load for carriage by pack or for limited movement by hand. Any type of caliber .50 barrel, light or heavy, air- or water-cooled, may be fitted to any caliber .50 receiver. By changing the back plate assembly any air-cooled gun may be adapted for either fixed or flexible use.

FEED—All types of caliber .50 ammunition may be used. Feed is from a disintegrating metallic-link belt loaded in increments of 110 rounds. The gun is normally assembled for left-hand feed, which may be changed to right-hand feed by reversal of certain parts.

FIXED TYPE—The fixed type of caliber .50, heavy barrel, machine gun is used only in Heavy Tanks, M6 and M6A1. Two of these guns are rigidly mounted in Twin Mount, T52, in the bow of the tank below the 3 inch and 37 mm guns which are the principal weapons. While the guns are fixed, the mount may be moved by hand in limited traverse and elevation. Fixed guns are identical with those of flexible type except that the spade grip assembly has been removed from the horizontal buffer back plate and filler plates added.

FLEXIBLE TYPE—The Browning machine gun, heavy barrel, caliber .50, M2, in flexible and turret types, is the most widely used of any U. S. machine gun. It is used by infantry and special weapon units from the Tripod Mount, M3, as an anti-tank weapon. The limited elevation of the mount restricts its use in anti-aircraft fire.

It is installed in both medium and heavy tanks both as a turret gun and in ring mounts and is standard armament in truck trailer, tank recovery, M7, in the 75 mm, 76 mm, 3 inch, and 105 mm gun motor carriages; in the Multiple Gun Motor Carriages, M13, M15, and M16; in the Armored Utility Car, M20; in half-track cars, scout cars, medium and heavy tractors, and tracked landing vehicles. In many of these the gun is installed in ring mounts permitting maximum elevation as an anti-aircraft weapon.

TURRET TYPE—The standard caliber .50, heavy barrel, machine gun is slightly modified for installation in tank turrets. The conventional blade and folding-leaf sights are replaced by anti-aircraft sights and an Edgewater ring spring adapter is placed on the barrel. The distinguishing designation "Turret Type" is used for manufacturing, supply, and administration identification.

SIGHTS—Usual sight equipment is the conventional blade and folding-leaf

sights. A mount is provided for either the T3, M1, or M1918A2 telescopic sights.

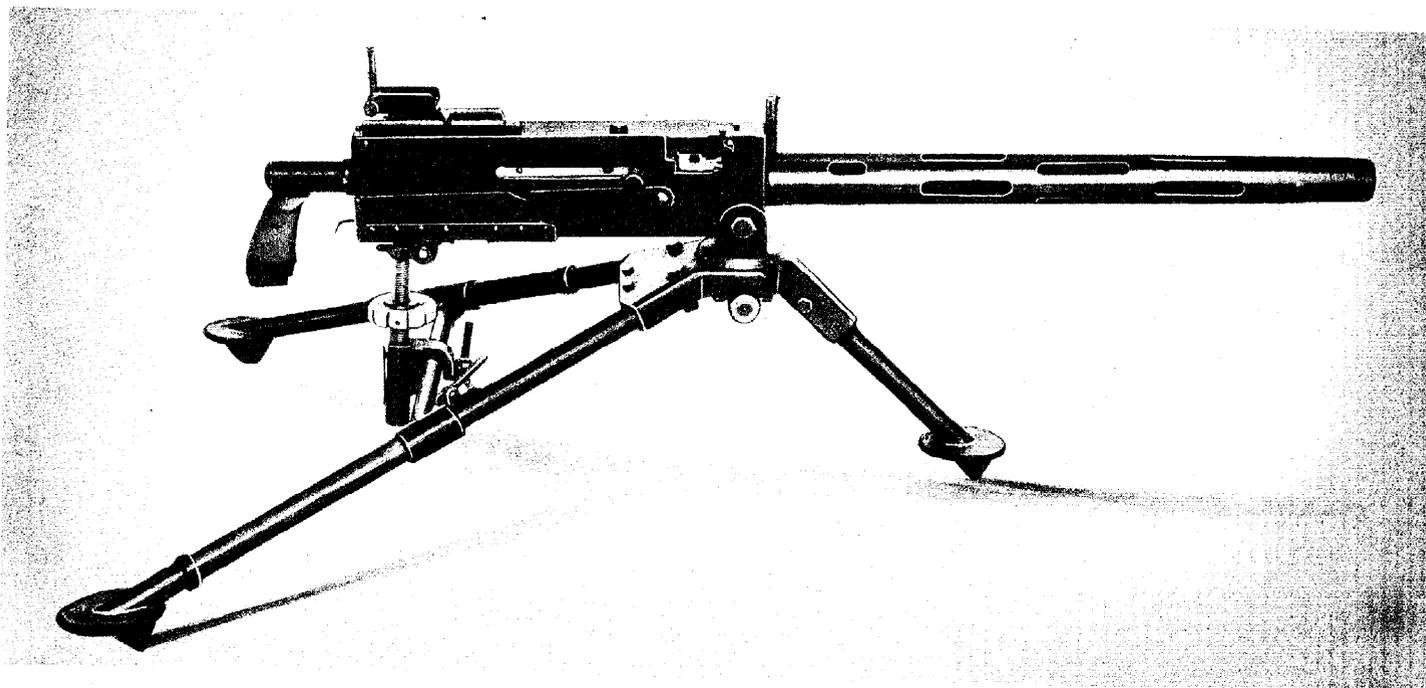
RATE OF FIRE—The timed cyclic rate of the caliber .50, heavy barrel, gun is from 450 to 575 rounds per minute. Normal fire is in short bursts or single shots in swift succession. A single burst of from 100 to 150 rounds may be fired from a cool gun. At the rate of 40 rounds per minute, 500 rounds may be fired without overheating.

CHARACTERISTICS

Weight, total.....	{ Fixed, 82 lb. Flexible, 84 lb. Turret, 81 lb.
Weight of recoiling parts.....	38.8 lb.
Weight of barrel.....	27 lb.
Length, overall.....	.65 ins.
Length of barrel.....	.45 ins.
Rifling, length.....	40.91 ins., 81 cal.
No. of grooves.....	8
Twist.....	1 turn in 15 ins., 30 cal.
Depth of grooves.....	.0005 in.
Cross-sectional area of bore.....	.02021 sq. in.
Operation.....	Short-recoil
Feed.....	Metallic-link belt, increments of 110 rds.
Cooling.....	Air
Rate of fire.....	450-575 rds./min.
Firing pin release.....	{ Pressure at sear, 10-20 lb. Pressure at sear bar, 30-35 lb.
Normal breech pressure.....	48,000 lb./sq. in. (copper)

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BROWNING MACHINE GUNS, CAL. .30, M1919A4, M1919A5—STANDARD AND M1919A6—SUBSTITUTE STANDARD



BROWNING MACHINE GUN, CAL. .30, M1919A4, ON TRIPOD MOUNT, M2

The Browning Machine Guns, cal. .30, M1919A4, M1919A5, and M1919A6, represent modifications and improvements upon the older M1919A2 which evolved from the M1919, originally designed as armament for the M1917 and Mk. VIII tanks, now obsolete.

They are air-cooled, fabric-belt-fed weapons operating on the short-recoil principle common to all Browning machine guns. All have heavy barrels reciprocating within a steel sleeve, perforated to facilitate cooling. Mechanically they are identical with the Browning water-cooled machine gun, M1917, and working parts are interchangeable.

M1919A4—STANDARD—This gun is

issued in two types, fixed and flexible. The fixed gun is used only for tank installation and is mounted as a unit with 37 mm or 75 mm guns. The two move together within the limited elevation and traverse of the tank mounts and the machine gun so installed cannot be aimed individually. It has a vertical buffer tube and is without pistol grip.

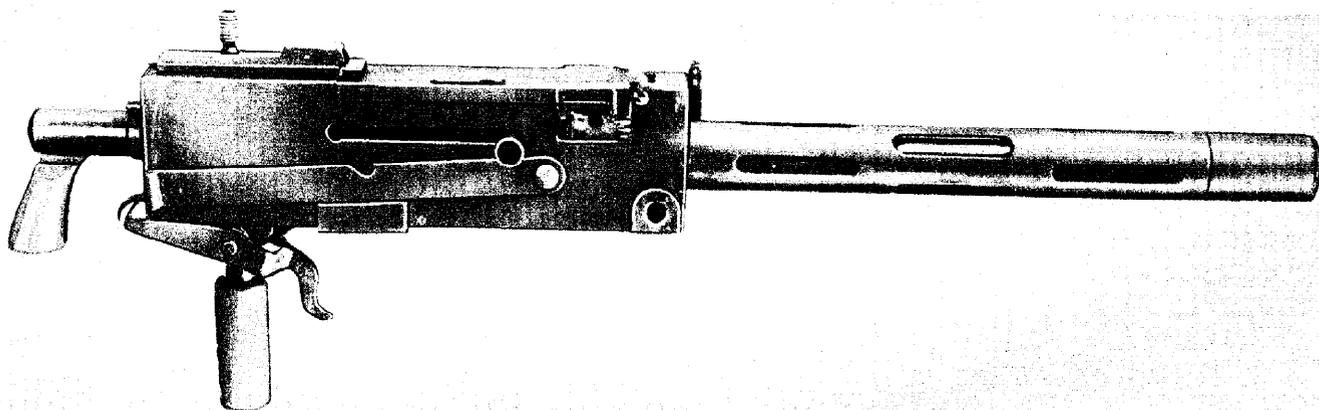
The flexible gun is for more general use. It is used as armament for combat vehicles, armored and unarmored, or may be fired as a ground weapon from the machine gun tripod mount, M2. It is equipped with a pistol grip and is fired from the back plate trigger.

As used by motorized and mechanized units the gun is installed on mounts of

various types, depending upon the type of vehicle and the position of the gun thereon. It is customary to carry a tripod mount, M2, for each gun to adapt the weapon for ground use.

Barrels of the M1919A4, A5, and A6 guns are 24 inches long, 5.37 inches longer than the barrel fitted to the M1919A2. The barrel sleeve has been correspondingly lengthened from 13.7 inches to 19.08 inches. Separate front barrel bearing plugs are provided to permit the use of either M1 or M2 ammunition.

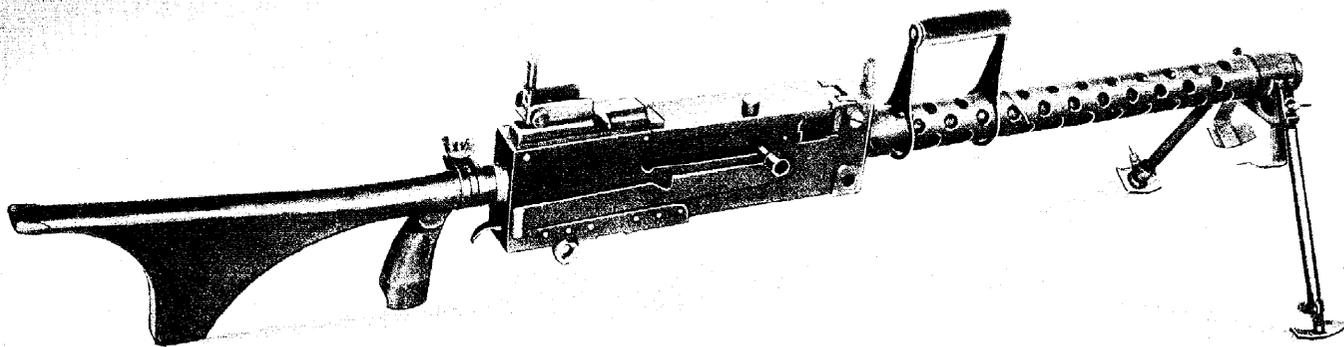
The M1919A2 gun was also modified by the addition of a belt feed lever group assembly which permits assembly and disassembly of the lever from above.



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BROWNING MACHINE GUN, CAL. .30, M1919A5

BROWNING MACHINE GUNS, CAL. .30, M1919A4, M1919A5 AND M1919A6 (Continued)



BROWNING MACHINE GUN, CAL. .30, M1919A6

The trunnion block was equipped with a bunter plug to resist wear by the points of the bullets.

Further modifications have been made since the weapon was designated M1919-A4. These include substitution of a buffer plug, buffer ring, and buffer disks for the older tapered form of plug with ring and filler. The change eliminates the "freezing" of ring and plug which retarded buffer spring action.

The bottom plate has been redesigned so that plate, stirrup, and elevating bracket are now a unit. The bottom plate is riveted to the receiver and a recess in the plate serves to locate the gun in the pack hanger.

SIGHTS—Sights are of the conventional machine gun type with the front sight mounted on the gun's trunnion block. The rear sight base is mounted on a bracket on the left side plate of the receiver. The folding leaf bears a mil elevation scale graduated for the sight radius of 13.94 inches. Each division on the elevation scale represents 100 yards

and the scale is graduated up to 2,400 yards.

M1919A5—STANDARD—In mounting the Browning machine gun, cal. .30, M1919A4, in the Light Tank, M3, it was found necessary to provide a special bolt-retracting slide and a different cover detent. To identify the weapon and to facilitate field supply and maintenance, the gun so modified was designated M1919A5 and classified as Standard.

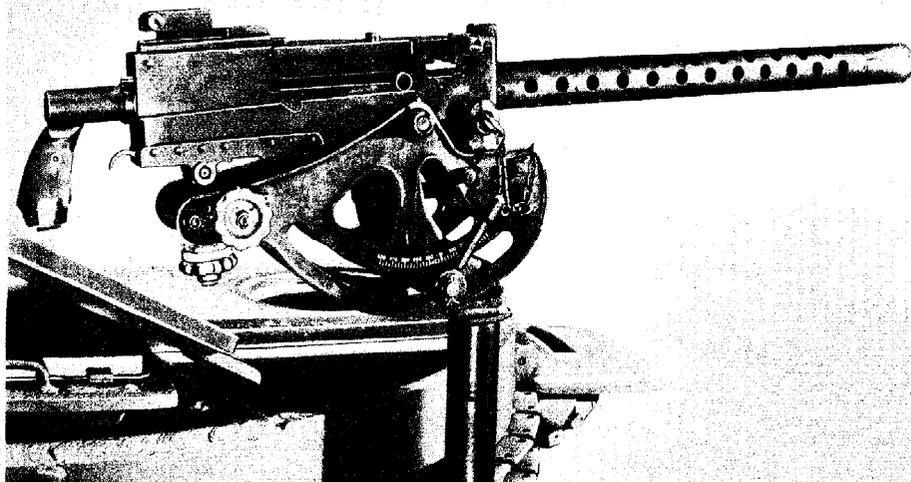
M1919A6—SUBSTITUTE STANDARD—The designation of M1919A6 is given the Browning Machine Gun, cal. .30, M1919-A4, as modified for infantry use. The principal modifications, shown in the illustration herewith, include a shoulder stock, a carrying handle, and a bipod mount fixed to the barrel sleeve. A new front barrel bearing was provided and the cover latch changed to permit easier opening of the cover. Changes were made in the barrel plunger and driving spring to assure proper functioning without the muzzle plug.

CHARACTERISTICS OF BROWNING MACHINE GUNS, M1919A4, M1919A5

Weight, total	{ Fixed, 30.5 lb. Flexible, 31 lb.
Weight of recoiling parts	11.7 lb.
Weight of barrel	7.35 lb.
Length, overall	{ M1919A5, fixed, 40.8 lb.
	{ M1919A4, fixed, 37.94 lb.
	{ M1919A4, flexible, 41.11 lb.
Length of barrel	24 ins.
Rifling, length	21.38 ins., 71 cal.
No. of grooves	4
Twist	Right-hand, 1 turn in 10 ins., 33.3 cal.
Depth of grooves	0.004 in.
Cross-sectional area of bore	0.074 sq. in.
Operation	Short-recoil
Feed	Fabric belt, 250 rds.
Cooling	Air
Rate of fire	400-550 rds./min.
Sear release	9 lb.
Trigger pull	7-12 lb.
Normal breech pressure	50,000 lb./sq. in. (copper)

CHARACTERISTICS OF BROWNING MACHINE GUN, M1919A6

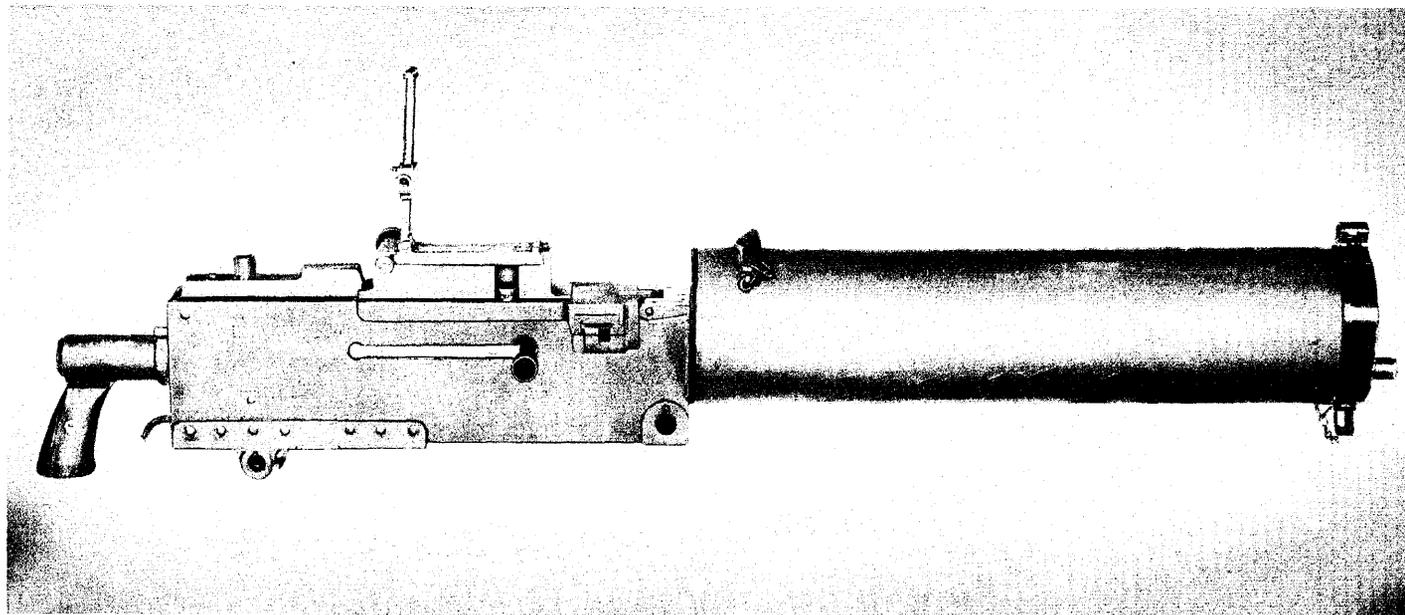
Weight, total	32.5 lb.
Weight of recoiling parts	7.5 lb.
Weight of barrel	4.65 lb.
Length, overall	53 ins.
Length of barrel	24 ins.
Rifling, length	21.38 ins., 71 cal.
No. of grooves	4
Twist	1 turn in 10 ins., 33.3 cal.
Depth of grooves	0.004 in.
Cross-sectional area of bore	0.074 sq. in.
Operation	Short-recoil
Feed	Fabric belt, 250 rds.
Cooling	Air
Rate of fire	400-450 rds./min.
Trigger pull	8½ lb.
Normal breech pressure	50,000 lb./sq. in. (copper)



BROWNING MACHINE GUN, CAL. .30, M1919A4, IN A. A. BRACKET MOUNT ON LIGHT TANK, M5

UNCLASSIFIED

BROWNING MACHINE GUN, CAL. .30, M1917A1—STANDARD



BROWNING MACHINE GUN, CAL. .30, M1917A1, RIGHT SIDE VIEW

This water-cooled machine gun, standard for ground use, is a development of the M1917 which proved its worth in World War I. Modifications upon the older weapon are designed to permit the gun to be used, from the ground, against aerial targets. The tripod mount, M1917A1, on which the gun is placed, is a modification of the M1917 tripod to permit fire in a wider angle of elevation. Water-cooling of the barrel of the M1917A1 gun permits sustained fire over comparatively long periods.

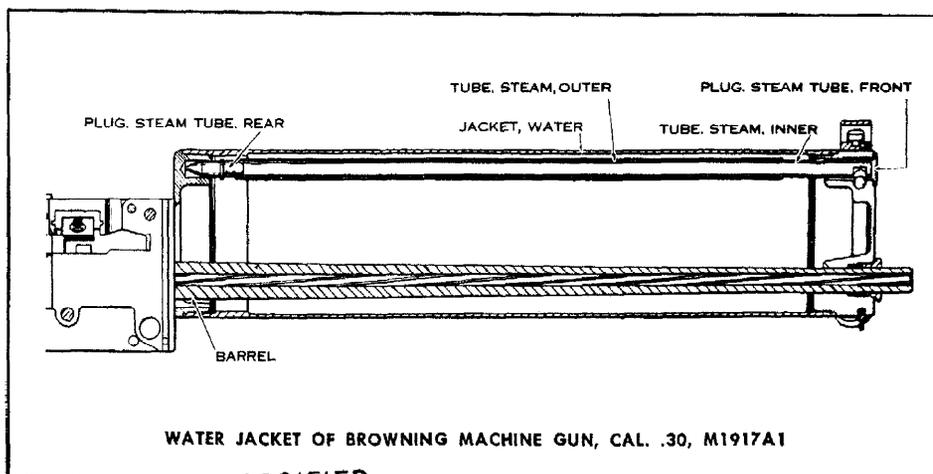
Modifications of the M1917 gun include

a new assembly which eliminates the separate stirrup, bottom plate, and elevating bracket by making those components integral; an improved steam tube assembly (see cut) of the type used in the caliber .50, M2, gun; and a cylindrical bunter plate of the type used in the caliber .30 gun, M1919A4. The belt feed lever and mounting of the M1919A4 gun has also been added to the M1917A1. This stronger mechanism is necessary to lift a loaded belt from an ammunition chest placed on the ground instead of being hung on the mount. Steel end caps

and trunnion blocks replace the bronze parts used in the M1917 gun.

SIGHTS—Sights are of the conventional machine gun type. The front sight is mounted at the outer end of the water jacket. Vibration of the rear sight is dampened by a tension spring. The slide is graduated to permit use of either M1 or M2 ammunition.

FEED—Feed is from a woven fabric belt with a capacity of 250 rounds of caliber .30 ammunition. The only metal used in the belt is a brass tab at either end to facilitate entering the belt in the gun.



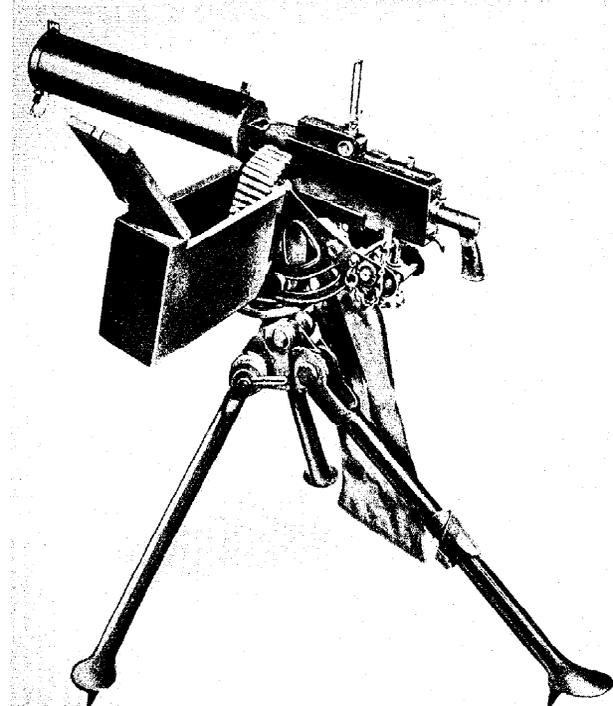
WATER JACKET OF BROWNING MACHINE GUN, CAL. .30, M1917A1

CHARACTERISTICS

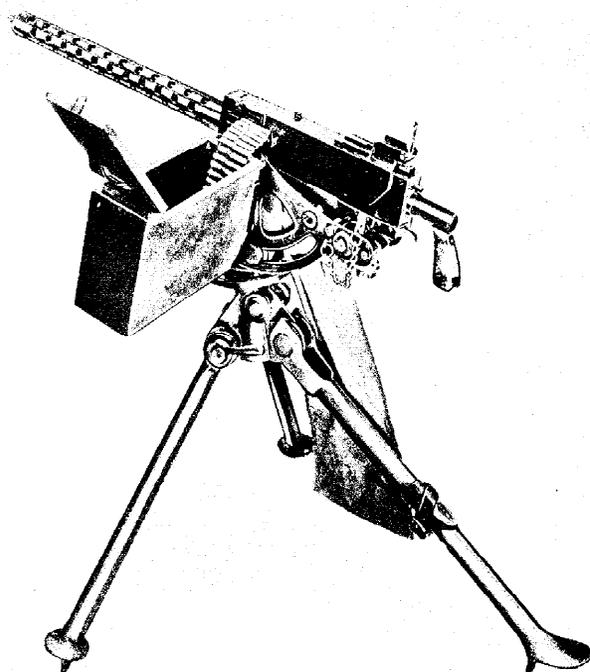
Weight, total	32.6 lb., less water
Weight of recoiling parts	7.35 lb.
Weight of barrel	3 lb.
Length, overall	38.64 ins.
Length of barrel	23.9 ins.
Rifling, length	21.28 ins., 71 cal.
No. of grooves	4
Twist	Right-hand, 1 turn in 10 ins. or 33.3 cal.
Depth of grooves	0.004 in.
Cross-sectional area of bore	0.074 sq. in.
Operation	Short-recoil
Feed	Fabric belt, 250 rds.
Cooling	Water, 8 pts.
Rate of fire	450-600 rds./min.
Trigger pull	9 lb.
Normal breech pressure	48,000 lb. (copper)

UNCLASSIFIED

TRAINERS, MACHINE-GUN, CAL. .22, M3 AND M4—STANDARD



TRAINER, MACHINE-GUN, CAL. .22, M3, ASSEMBLED TO MACHINE-GUN, CAL. .30, BROWNING, M1917A1



TRAINER, MACHINE-GUN, CAL. .22, M4, ASSEMBLED TO MACHINE-GUN, CAL. .30, BROWNING, M1919A4

These trainers consist of the Browning Machine Guns, caliber .30, M1917A1, water-cooled, and M1919A4, air-cooled, with such conversion parts as are necessary to adapt them to handle caliber .22 long rifle rimfire ammunition. Use of the small caliber cartridges permits the economical training of personnel in the handling of machine guns and the tactical uses of those weapons.

Either gun may be restored quickly and easily to caliber .30 should occasion require. This was not true of the original caliber .22 Machine-Gun Trainer, M1, now obsolete.

Requisite power for the operation of the guns is obtained by use of the Williams floating chamber. With this device the cartridge to be fired is seated in a loosely fitting chamber which "floats" within the receiver. Closing of the breech thrusts the chamber closely against the rear of the barrel and the bullet enters the rifling in the normal manner. The loose fit of the chamber permits it to move a short distance to the rear under the force of recoil and a portion of the gases of explosion escape between the chamber and

CHARACTERISTICS OF TRAINER, M3

Weight. Less water, 32 lb., with water, 39 lb.
 Weight of conversion parts. M3, 6.5 lb.; M4, 7lb.
 Weight of barrel. 3.01 lb.
 Length overall. 38.6 ins.
 Length of barrel. 22.75 ins.
 Length of rifling. 22.25 ins., 101 cal.
 Number of grooves. 4
 Twist. Right-hand, 1 turn in 16 ins., or 73.4 cal.
 Depth of grooves. 0.0025 in.
 Area of bore. 0.0383 sq. in.

the receiver walls, adding their pressure to that of the normal recoil of the cartridge.

This additional power is sufficient to operate the recoiling parts of the gun, extracting and ejecting the fired case and feeding a new round into the chamber. The loud report of service ammunition is also approximated, a feature to be desired in training personnel.

In addition to the caliber .22 barrel, the standard caliber .30 machine guns parts are replaced by a modified bolt, firing pin, driving spring and spring rod, cartridge

Operation. Short-recoil, floating chamber
 Feed. Fabric belt, 250 rds.
 Cooling. Water, 7 pts.
 Cyclic rate of fire. 550-650 rds./min.
 Sear release (trigger pull). 9 lb.

(The characteristics of the Machine-Gun Trainer, M4, are identical with those of the M3 except that it is air-cooled and the overall length is 41.1 ins. The weight is the same as that of the M3 less water.)

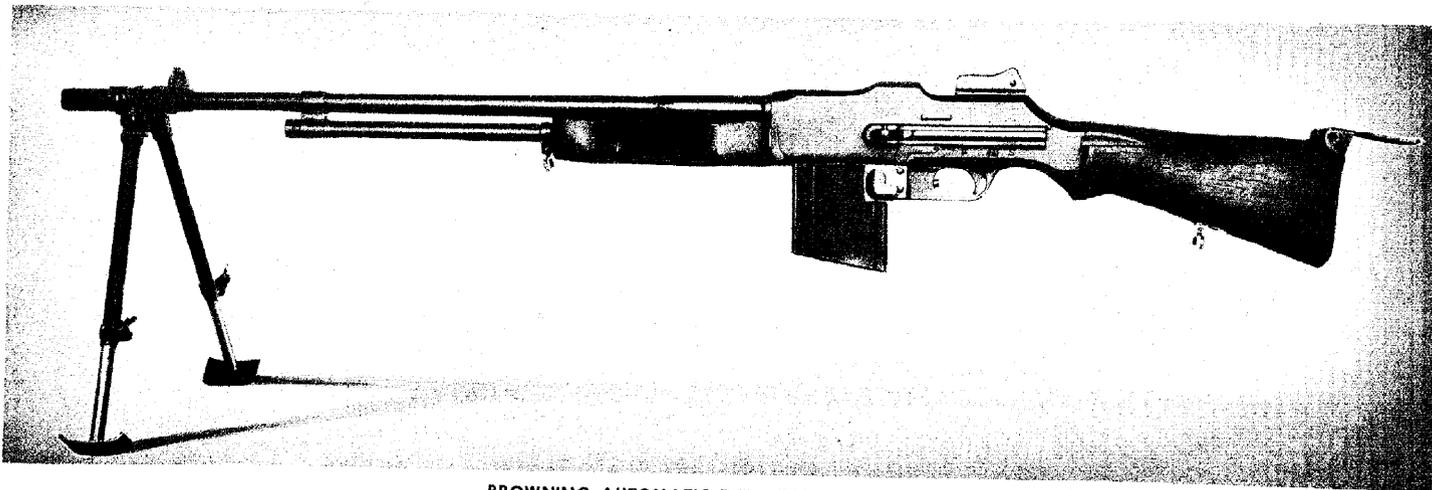
stop, barrel bearing, and barrel locking nuts.

The standard fabric belt for caliber .30 ammunition is used with the caliber .22 machine gun trainers, the smaller cartridges being held in adapters inserted in the pockets of the standard belt. Clips link the adapters in pairs and secure them in the belt.

MACHINE-GUN TRAINER, M9

Illustration and description of the electrically operated Machine-Gun Trainer, M9, will be found in the Fire Control section of this catalogue.

BROWNING AUTOMATIC RIFLE, CAL. .30, M1918A2—STANDARD



BROWNING AUTOMATIC RIFLE, CAL. .30, M1918A2

This gas-operated, air-cooled shoulder weapon represents successive modifications of the M1918A1 and the M1918, developed during World War I to meet infantry requirements for an easily transported weapon with a high fire-potential.

Commonly known in the service as the "BAR," the M1918A2 is now in active use on all fighting fronts.

The differences between BAR, M1918A2, and its predecessor models are summarized below:

BIPOD—A bipod with spiked feet was clamped to the gas cylinder of the M1918A1. This has been replaced by a bipod with skid type shoes, mounted on a bearing integral with the flash hider.

The legs may be folded to the rear or extended in the tubes in which they slide and locked in the extended position.

RECOIL SPRING—A metal shield has been set in the wooden forearm of the M1918A2 to protect the recoil spring from heat generated during sustained fire.

CYCLIC RATE—The M1918A2 differs from both prior models in that it is equipped with a selector mechanism, housed in the butt, which permits either a high-speed automatic fire of 500–600 rounds per minute or a retarded fire of 300–350 rounds per minute. The gun cannot be operated as a single-shot or semi-automatic weapon.

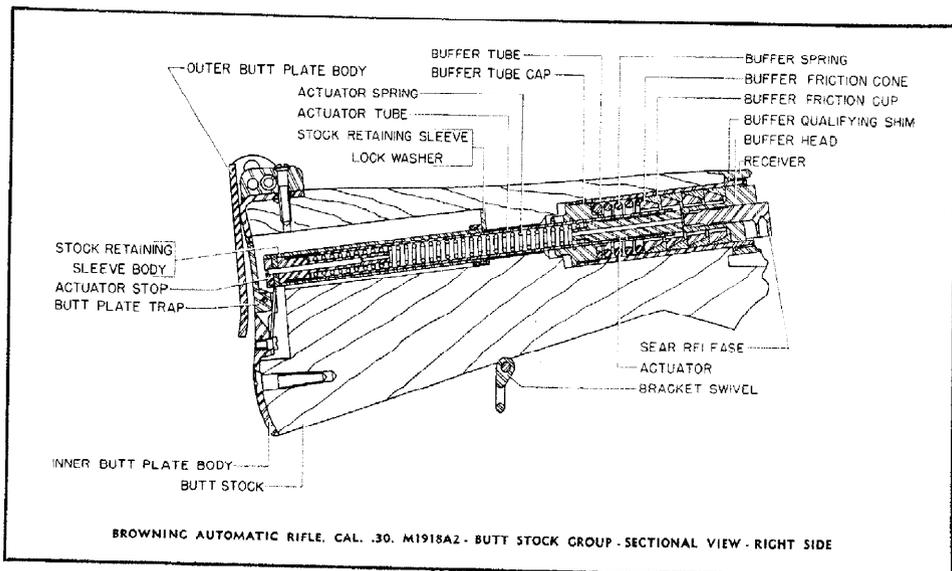
BUTT PLATE—A hinge lug welded to the butt plate permits the mounting of an outer plate which may be swung parallel with the top line of the stock to serve as an additional support for the gun against the operator's shoulder. When not in use the outer plate folds against the inner and is retained by a spring-ball latch.

GUIDE—A right-and-left guide fastened to the trigger guard facilitates insertion of the magazine.

SIGHT—A new rear sight provides adjustments for both elevation and windage by large mounts equipped with click mechanism for minutes of angle.

CHARACTERISTICS

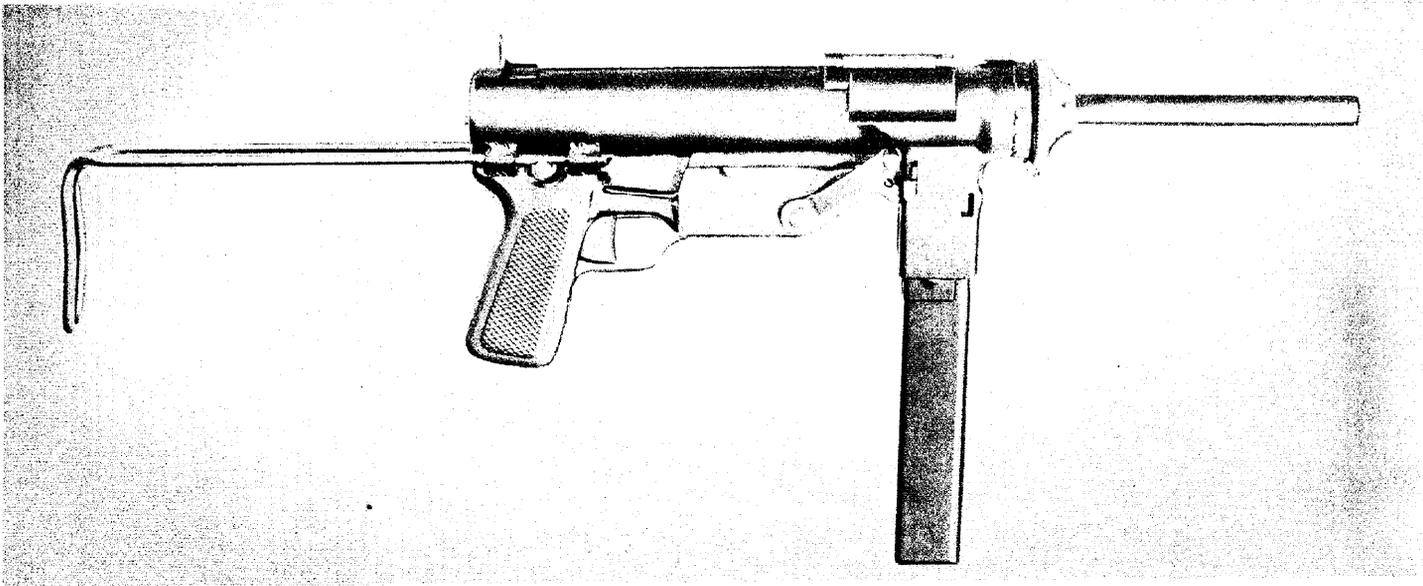
Weight, complete	19.4 lb.
Weight, less bipod	17 lb.
Weight of barrel	3.65 lb.
Length overall	47.8 ins.
Length of barrel	24.07 ins.
Rifling, length	21.41 ins., 71.1 cal.
No. of grooves	4
Twist	Right-hand, 1 turn in 10 ins., 71.1 cal.
Depth of grooves	0.004 in.
Cross-sectional area of bore	0.074 sq. in.
Operation	Gas
Feed	20-round box magazine
Cooling	Air
Rate of fire	High-speed, 500–600 rds./min. Retarded, 300–350 rds./min.
Trigger pull	10 lb. max., 6 lb. min.



BROWNING AUTOMATIC RIFLE, CAL. .30, M1918A2 - BUTT STOCK GROUP - SECTIONAL VIEW - RIGHT SIDE

UNCLASSIFIED

SUBMACHINE GUN, CAL. .45, M3—STANDARD



SUBMACHINE GUN, CAL. .45, M3

This weapon has been designed and put in quantity production since the outbreak of World War II to fill the requirements for a light, portable arm with a high fire-potential.

Although the submachine gun (or "machine pistol," as it is known in Europe) has been a standard weapon of the U. S. Armed Forces for nearly 15 years, the cal. .45, M3, is an entirely new weapon, the result of study and experimentation and the testing of more than twenty foreign and domestic weapons of this type.

The Submachine Gun, M3, is now in use in all theaters of operation. It is the primary weapon for such shock units as commando raiders and paratroopers and is carried as an auxiliary arm in tanks and other vehicles.

It is a straight blowback operated weapon weighing 8.9 pounds complete with magazine, oiler, and sling. It is chambered for the cal. .45, M1911, cartridge but may be converted to 9 mm by substitution of a barrel of that caliber, a replacement bolt, a 9 mm magazine and a magazine adapter. Conversion to 9 mm permits use of the Parabellum cartridge, standard in the British Armed Forces, as well as use of certain types of captured enemy ammunition.

The overall length is 29.8 inches which is shortened to 22.8 inches when the extension stock, which may be used in emergency as a cleaning rod, is closed.

The fixed firing pin in the heavy bolt fires the cartridge at the completion of the forward stroke and the major portion of the energy of the explosion is absorbed by the inertia of the bolt. When this overcome the remaining energy is sufficient to drive the bolt to the rear against the compression of the operating springs. The fired case is ejected on the retracting stroke and the fully compressed dual spring returns the bolt to firing position, picking up and chambering another round on the forward movement.

Use of a heavy bolt holds the cyclic rate of fire to 350-450 rounds per minute. This low rate of fire and the design which places the stock in almost a straight line with the axis of the bore combine to reduce recoil, virtually to eliminate muzzle-climb, and to produce exceptional accuracy whether the weapon be used from the shoulder or as a "two-hand" pistol.

Stampings are used wherever possible in the manufacture of the M3, only the barrel and bolt require machine operations, no critical metals are employed, and the gun may be produced at a minimum cost for one of this type.

The gun may be taken down without tools and folded into a space 12 $\frac{5}{8}$ inches long, 7 $\frac{3}{8}$ inches high, and 3 $\frac{1}{8}$ inches deep, or about 291 cubic inches. This permits convenient stowing in a soldier's pack for shipment or for packing in a standard container to be dropped by parachute.

Exhaustive tests conducted on the M3 have proved that it functions excellently under conditions of excessive dust or mud. Excessive moisture, such as would be encountered in tropical operations, has no effect whatever upon the weapon's functioning. The following sentence from the final report made upon the test program is significant: "Although it would be dangerous to state that further improvements and developments are unlikely, the ultimate has been reached in this type of weapon for the time being."

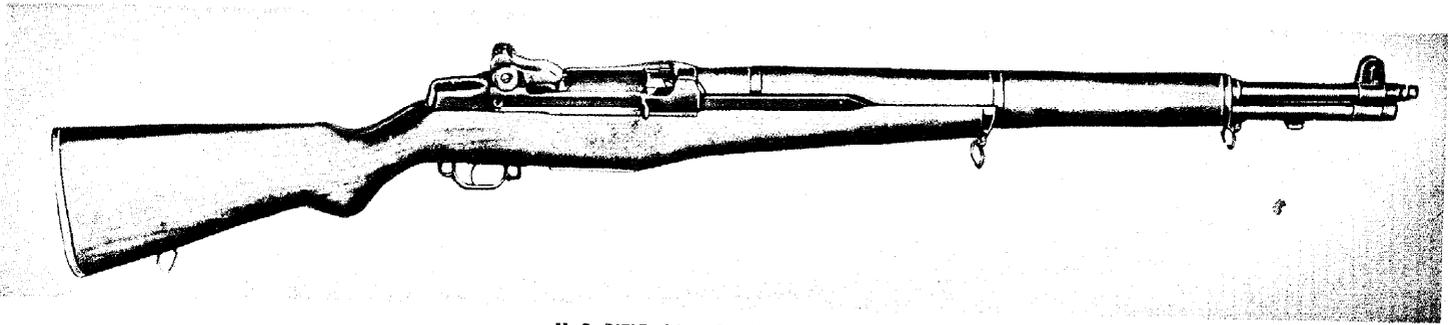
CHARACTERISTICS

Weight, complete.....	8.9 lb.
Weight, less magazine, oiler, and sling.....	8.1 lb.
Weight of recoiling parts.....	2.0 lb.
Weight of barrel.....	0.62 lb.
Weight of barrel assembly.....	1.43 lb.
Length, overall, stock extended.....	29.8 ins.
Length, stock closed.....	22.8 ins.
Length of barrel.....	8.0 ins.
Rifling, length.....	7.2 ins.
Number of grooves.....	4
Twist.....	{ Right-hand, 1 turn in 16 ins., 35.5 cal. Alternate: 1 turn in 15 ins., 33.3 cal.
Depth of grooves.....	0.0035 in.
Cross-sectional area of bore.....	0.1581 sq. in.
Operation.....	Straight blowback
Feed.....	30-round magazine
Cooling.....	Air
Cyclic rate of fire.....	350-450 rds./min.
Sights.....	Fixed peep rear, A-blade front (zeroed at 100 yds.)
Sight radius.....	10.8 ins.
Trigger pull.....	5-7 lb.
Pull to retract bolt.....	18-23 lb.

UNCLASSIFIED



U. S. RIFLE, CAL. .30, M1—STANDARD



U. S. RIFLE, CAL. .30, M1, RIGHT SIDE

The "Garand" rifle, designated as U. S. Rifle, cal. .30, M1, is a self-loading, semi-automatic shoulder weapon produced according to the design of Mr. John C. Garand, an employee at the Springfield Armory of the Ordnance Department. The rifle is gas-operated, clip-fed and air-cooled. It weighs 9½ pounds without the bayonet of approximately 1 pound weight.

Ammunition is loaded in clips of eight rounds carried in a bandoleer with six pockets holding a total of 48 rounds. Bandoleers weigh 3¼ pounds each.

The advantages of this rifle are inherent in the fact that it reloads itself after each shot. This prevents disturbance of aim or increase in fatigue due to manual operation of a bolt handle. It enables the soldier to deliver a volume of fire limited only by his proficiency as a marksman and his dexterity in inserting clips into the magazine. Troops equipped with this rifle possess greatly increased firepower with which to combat enemy ground forces, rapidly moving armored vehicles and low-flying planes.

The rifle consists of three main groups: a barrel and receiver group, a trigger-housing group, and the stock. The principal components of the barrel and receiver group are the barrel, gas cylinder lock, gas cylinder, operating rod, bolt assembly and

hand guard. The trigger housing supports the hammer, safety, trigger and trigger guard.

When the rifle is loaded and the bolt closed the hammer is held in the cocked position. Pressure on the trigger releases the hammer to strike the firing pin which transmits the blow to the primer of the cartridge.

As the bullet passes the gas port some of the gas enters the gas cylinder, where it drives the operating rod back, compresses the operating rod spring and carries the bolt to the rear. The empty cartridge case is extracted and ejected to the right front. The rearward movement of the bolt cocks the hammer and uncovers the magazine. The operating rod spring then forces the cartridges upward in the clip and the forward movement of the bolt slides the top cartridge into the chamber. The bolt is then locked by being rotated clockwise to engage the locking lugs in the receiver. The rifle is then ready to be fired again.

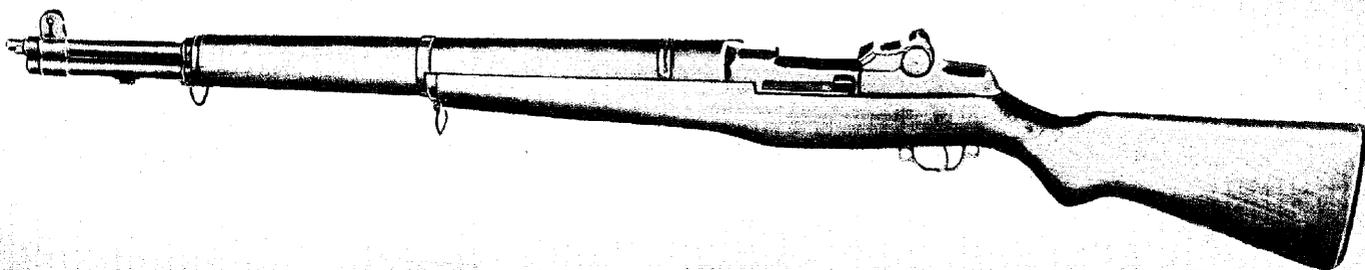
The entire clip is placed in the gun without removing the cartridges from the clip. It is necessary to squeeze the trigger to fire each cartridge. When the last round in the clip has been fired the clip is automatically ejected to the right from the top of the receiver and the bolt remains

open. The rifle is now ready for the insertion of another clip.

A receiver sight is used for greater ease of aiming and to obtain a longer sight radius. It is adjustable for range and windage. The elevation knob on the left side has numbered graduations for ranges of 100, 300, 500, 700 and 1100 yards. The windage knob is on the right side and each windage graduation represents an angular adjustment of 4 minutes. Both elevation and windage knobs are provided with clicks which represent approximately one minute of windage or one inch elevation at the target for each 100 yards of range.

CHARACTERISTICS

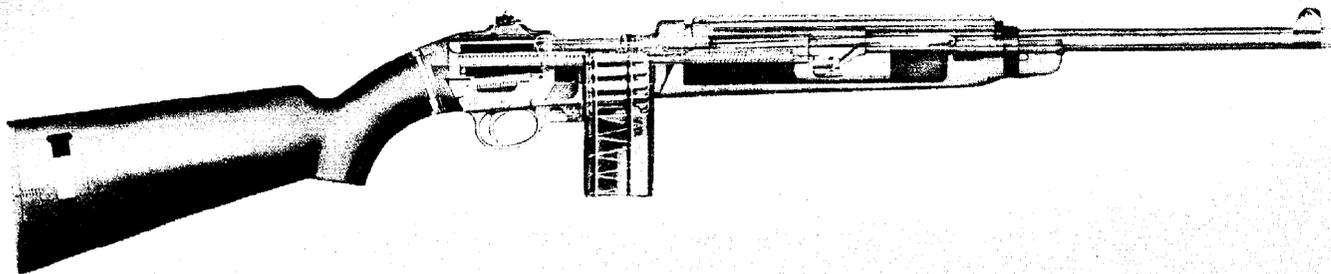
Weight	9.5 lb. (with Bayonet, M1905: 10.5 lb.)
Length (over-all)	43.6 ins.
Length of barrel	24 ins.
Length of rifling	21.30 ins., 70.8 cal.
Rifling	
Number of grooves	2 or 4
R.H. twist; 1 turn in	33.3 cal.; 10 ins.
Depth of grooves	0.0040 in.
Cross-sectional area of bore	0.0740 sq. in.
Type of mechanism	Gas-operated, semi-automatic
Feeding device	Clip
Capacity of feeding device	8 rounds
Rate of fire	Semi-automatic
Cooling	Air
Sight radius	27.9 ins. at 100 yd. range
Trigger pull	7.5 lb. max.; 4.5 lb. min.
Normal pressure	50,000 lb./sq. in. (copper)
Ammunition types	Ball, A.P., trace



U. S. RIFLE, CAL. .30, M1, LEFT SIDE

UNCLASSIFIED

U. S. CARBINE, CAL. .30, M1 AND M1A3—STANDARD



PHANTOM VIEW OF U. S. CARBINE, CAL. .30, M1, from Which U. S. Carbine, M1A2, Differs Only in Employing an Aperture Type Rear Sight Instead of an L-Type Rear Sight

This compact, light-weight, semi-automatic weapon is now standard for those groups and units formerly equipped with the caliber .45 pistol, M1911A1. It is the regulation arm for all officers up to the rank of major.

The caliber .45 pistol is essentially a defensive weapon. The development of the caliber .30 carbine has placed in the hands of our troops not only a high-speed, accurate defensive arm but an offensive weapon as well. The carbine is capable of delivering effective fire at ranges as great as 300 yards—at least four times the effective range of the pistol which it has replaced.

The carbine is gas-operated, a portion of the gases of the explosion being admitted to a gas cylinder through a port in the barrel. Travel of the piston under pressure of the gases drives the bolt to the rear against the compression of the operating spring and extracts and ejects the fired case. The spring closes the bolt which picks up and chambers a new round on its forward travel. Operation, functioning, and general design of the carbine are similar in many respects to those characteristics of the caliber .30 Rifle, M1.

Like the Rifle, M1, the carbine is a semi-automatic arm and the trigger must be pulled for each shot. In case of failure of the gas-operated mechanism, the gun may be used as a hand-operated repeating arm, the slide being retracted and returned to position by hand.

The weapon is fed from a box magazine with a capacity of fifteen rounds of ammunition designated Cartridge, Carbine, Cal. .30, M1. The bullet weighs 110 grains and is propelled by a 14-grain charge of military smokeless powder.

SIGHTS—The original models of the carbine were equipped with an “L” type of rear sight with no adjustments for windage and with elevation adjustments of only 150 and 300 yards. This has been replaced by a ramp type of rear sight with click adjustments permitting three points of either right or left windage. The peep eyepiece slides upon the ramp which is graduated for elevation from 100 to 300 yards in 50-yard increments.

The front sight is an “A” blade protected by wings.

M1A3—The designation M1A3 is given the carbine when equipped with a pantograph stock which when folded reduces the overall length of the weapon to 25.5

inches. The pantograph stock has proved itself more rigid and generally more satisfactory than the folding stock previously used.

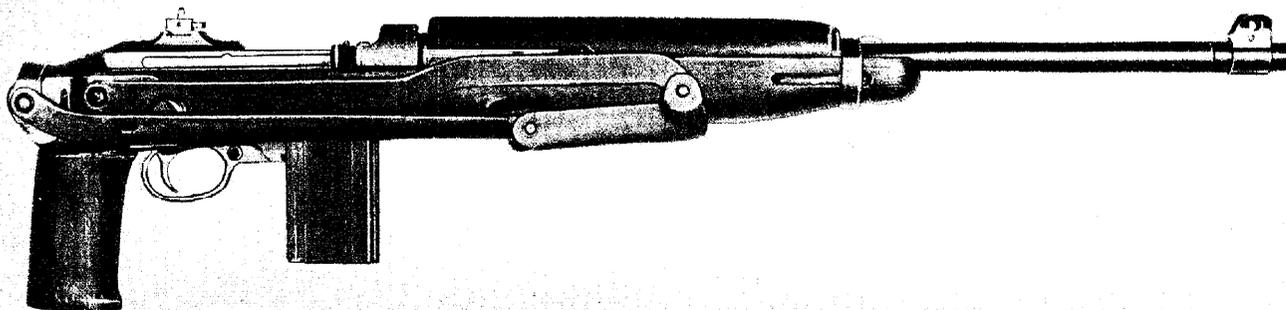
The M1A3 is issued to paratroopers and such other units as require a weapon which may be carried or stored within a limited space.

Both the M1 and M1A3 carbines may be fitted with a sling if necessary.

CHARACTERISTICS OF CARBINE, M1

Weight, total	5.2 lbs.
Length, overall	35.6 ins.
Length of barrel	18 ins.
Rifling, length	16.77 ins., 55.7 cal.
No. of grooves	4
Twist	Right-hand, 1 turn in 20 ins., 66.6 cal.
Depth of grooves	0.004 in.
Cross-sectional area bore	0.074 sq. in.
Operation	Gas, semi-automatic
Feed	15-rd. magazine
Cooling	Air
Trigger pull	4-6 lb.

(Carbine, M1A3, differs only slightly from the M1. The pantograph stock adds approximately 0.3 lb. to the weight. The length with stock extended is virtually the same. With stock folded the length is reduced to 25.5 inches.)



UNCLASSIFIED

U. S. CARBINE, CAL. .30, M1A3, WITH FOLDING PANTOGRAPH STOCK

PISTOL, AUTOMATIC, CAL. .45, M1911A1—STANDARD



AUTOMATIC PISTOL, CAL. .45, M1911A1, LEFT VIEW

This is a recoil-operated, self-loading, semi-automatic weapon and is the standard sidearm of the U. S. Armed Forces.

The initial energy of the exploding cartridge holds the barrel and slide firmly locked together by two lugs on the barrel's upper surface which engage corresponding keyways in the slide. As pressure decreases the barrel drops, permitting the slide to recoil and compress the operating spring. As with other automatic and semi-automatic weapons the fired case is ejected on the recoil stroke and a new round picked up and chambered as the spring returns the slide to position.

The M1911A1 pistol incorporates the following modifications of the original M1911 design.

The tang of the grip safety has been extended better to protect the operator's hand.

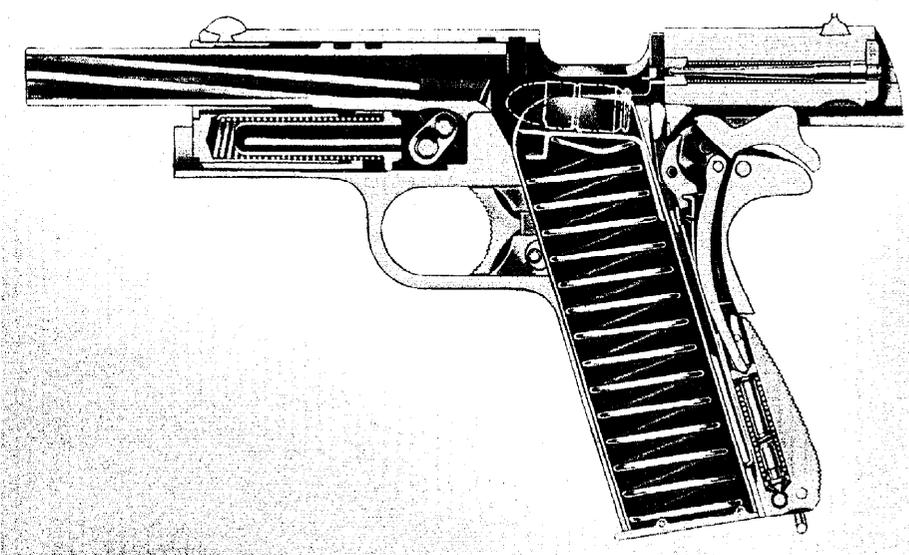
A clearance cut has been made on either side of the receiver for the trigger finger.

The face of the trigger has been cut to sharper radius and knurled.

The flat mainspring housing of the M1911 pistol has been replaced by a curved housing fitting the palm of the hand.

CHARACTERISTICS

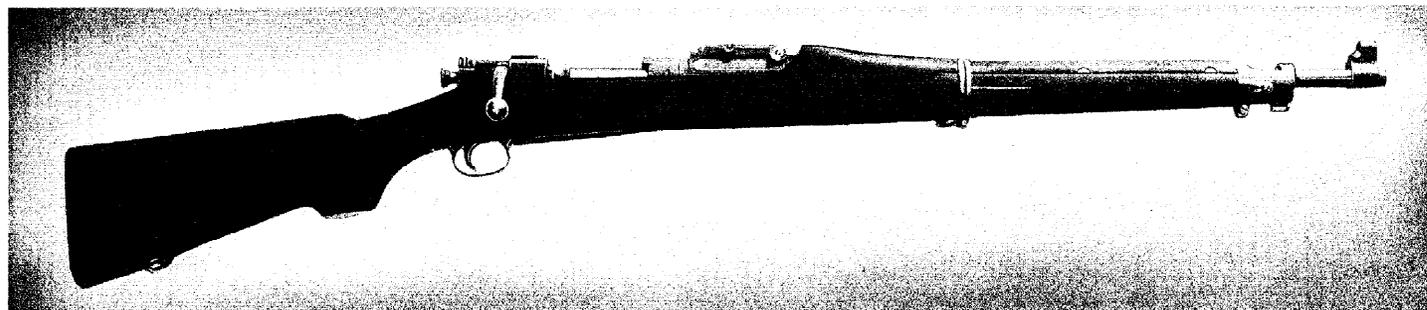
Weight	2.44 lb.	Number of grooves	6
Weight of recoiling parts	1.12 lb.	Twist ... Left-hand, 1 turn in 16 ins.,	35.5 cal.
Weight, barrel20 lb.	Depth of grooves	0.0039 in.
Length, overall	8.6 ins.	Cross-sectional area of bore	0.1581 sq. in.
Length of barrel	5.03 ins.	Operation	Short recoil
Rifling, length	4.08 ins., 9.2 cal.	Feed	7-round magazine
		Cooling	Air
		Trigger pull	5.5-6.5 lb.



AUTOMATIC PISTOL, CAL. .45, M1911A1, SECTIONAL VIEW

UNCLASSIFIED

U. S. RIFLE, CAL. .30, M1903A1, M1903A3, M1903A4 (SNIPER'S)



This bolt-action, manually operated rifle replaced the Krag-Jorgenson as U. S. Army standard in 1903 and remains a standard item of issue and manufacture although largely supplanted for combat purposes by the gas-operated, semi-automatic rifle, M1.

The M1903 rifle, like virtually all military rifles in use today, represents adaptation of the original Mauser design, developed in Germany during the last decade of the 19th century. It is fed from a magazine well which is integral with the receiver. The magazine holds five cartridges which may be loaded either singly or from the brass clip in which they are assembled at the arsenal. With an additional cartridge in the chamber, the weapon has a capacity of six rounds at one loading.

This rifle is rarely used at ranges greater than 600 yards but when necessity arises may be fired with a high degree of accuracy at 1,000 yards. All rifles of the series are equipped with swivels for the M1907 sling and carry integral with the front band a stud which permits mounting of either the M1 or M1905 bayonet.

M1903A1—The pistol-grip stock shown in the illustration of this rifle affords better support for the operator's hand

than the straight military stock of the M1903. Sights of the M1903A1 are identical with those of the M1903, a blade front sight protected by a hood and a folding-leaf rear sight with adjustments for windage and elevation.

M1903A3—The rear sight with which this model is equipped is similar to that developed for the caliber .30 carbine. It is a ramp type of sight, protected by parallel metal "ears". A knurled thumbscrew on the right side affords six points of windage adjustment, three right and three left. The peep slides upon the ramp which is graduated for adjustments in elevation covering ranges from 200 to 800 yards in 100-yard increments. The sight is mounted on the receiver bridge closer to the operator's eye than the rear sight of the M1903A1. This location increases the sight radius by approximately 6 inches.

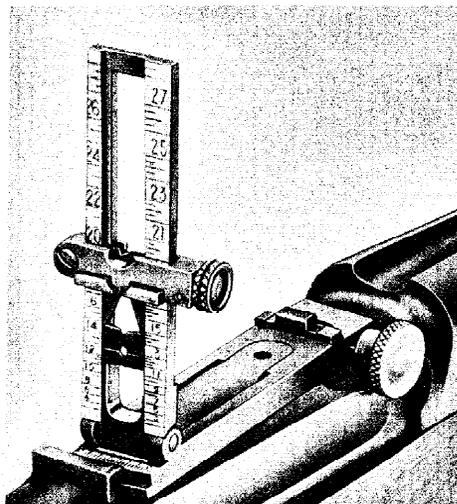
M1903A4 (SNIPER'S)—As implied by the designation, this rifle is equipped for highly accurate fire against such targets as enemy snipers or individual occupants of observation posts. The iron sights, front and rear, are removed and a hunting type commercial telescope is mounted upon the receiver. The bolt handle of the rifle has been slightly modified to prevent interference with the telescope when the

handle is raised and retracted. The telescopes now in use on the M1903A4 rifle include the Weaver 330-C with a magnification of $2\frac{3}{4}$ diameters and the Lyman Alaskan telescope with a magnification of $2\frac{1}{2}$ diameters. Both are supplied with crosshair reticles. The hairs used are of medium weight and subtend not more than one minute of angle. Both Weaver and Lyman telescopes have internal adjustments permitting exceedingly precise changes of elevation and windage.

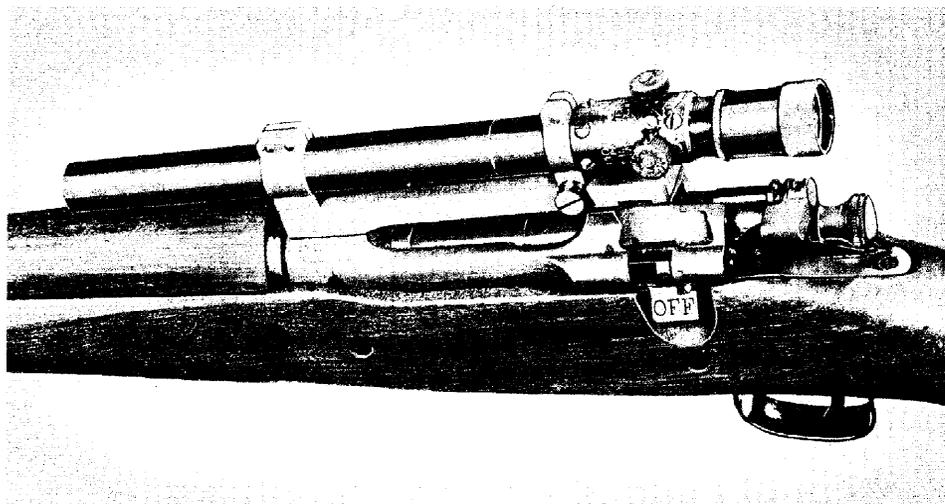
CHARACTERISTICS OF RIFLE, CAL. .30, M1903A1 AND M1903A3

Weight, with sling but without bayonet	9.0 lb.
Weight of Bayonet, M1	0.9 lb.
Length overall	43.5 ins.
Length with Bayonet, M1, mounted	53.3 ins.
Length of barrel	24 ins.
Rifling, length	21.28 ins., 70.7 cal.
Number of grooves	2 or 4
Twist	Right-hand, 1 turn in 10 ins., 33.3 cal.
Depth of grooves	0.004 in.
Cross-sectional area of bore	0.0740 sq. in.
Operation	Manual, bolt action
Feed	5-rd. magazine
Cooling	Air
Trigger pull	4-6 lb.

(Characteristics of the M1903A4 Sniper's Rifle are identical with the above except that the weight with Weaver 330-C telescope sight is 9.7 lb., and with Lyman Alaskan telescope, 9.9 lb.)



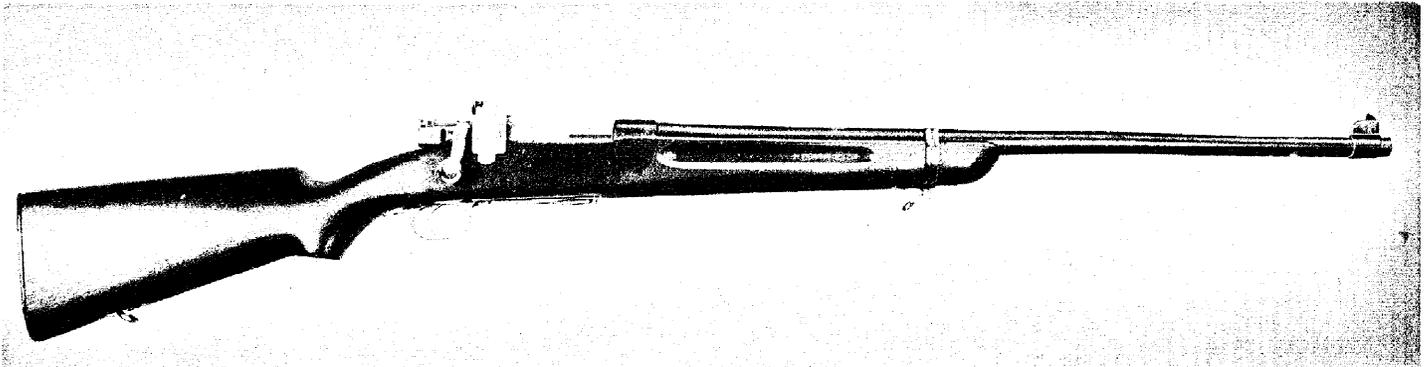
SIGHT, U. S. RIFLE, CAL. .30, M1903A1



RIFLE, U. S., CAL. .30, M1903A4 (SNIPER'S), WITH WEAVER 330-C TELESCOPE SIGHT

UNCLASSIFIED

U. S. RIFLE, CAL. .22, M2—STANDARD



U. S. RIFLE, CAL. .22, M2, RIGHT VIEW

This rifle was designed for indoor or short-range target practice and the economical training of personnel.

It was originally developed by the Ordnance Department with the collaboration of the National Rifle Association to provide a highly accurate small-bore weapon for civilian rifle clubs and the rifle teams of high schools and colleges. It was subsequently adopted for small-bore marksmanship courses in the Army, Navy, Marine Corps, and Coast Guard.

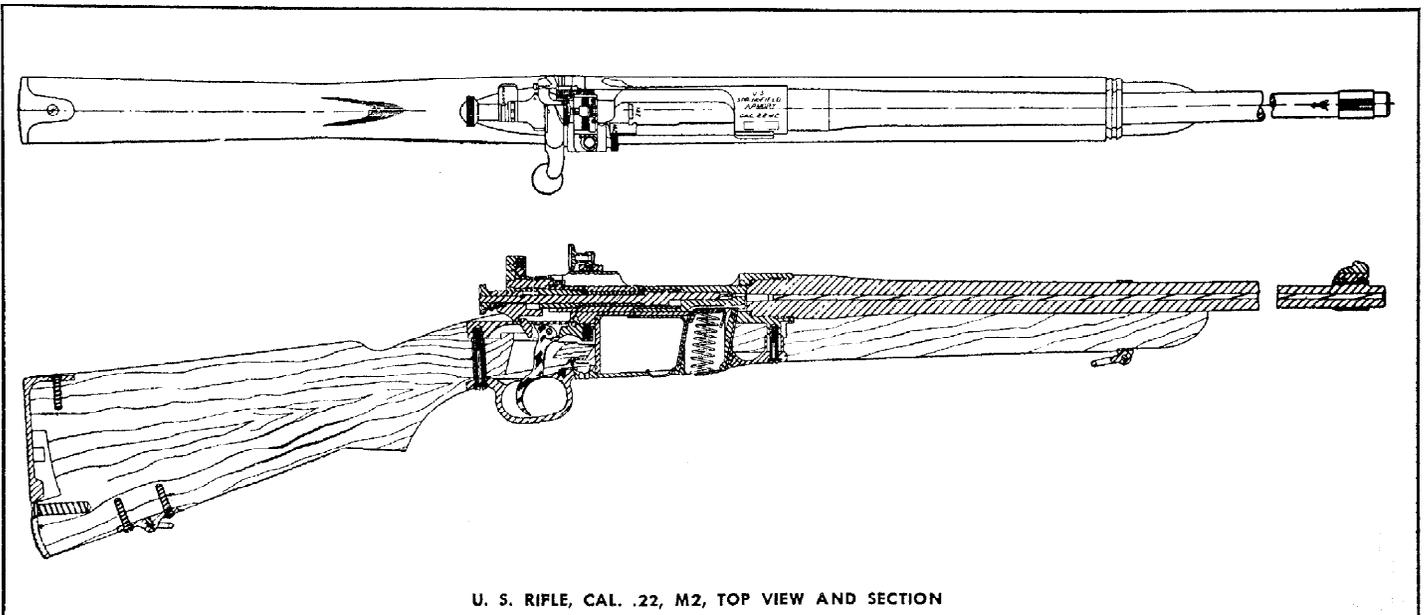
As initially produced, this gun was designated M1922 and was essentially a small-bore reproduction of the M1903

service rifle. Subsequent refinement and modification changed the designation to M1922M1 and the current M2. In its present form the rifle is equipped with the Lyman 48C receiver sight with click adjustments for both elevation and windage.

Firing-pin travel has been reduced to one-half that of the previous models and the trigger formerly used has been replaced by one of the speed-action type. Ammunition used is the commercial cal. .22 long rifle fed from detachable box magazines of either 5-round or 10-round capacity.

CHARACTERISTICS

Weight, with sling.....	9.3 lb.
Length, overall.....	43.7 ins.
Length of barrel.....	24 ins.
Rifling, length.....	23.35 ins., 107 cal.
No. of grooves.....	4
Twist.....	Right, 1 turn in 16 ins., 73.4 cal.
Depth of grooves.....	0.0025 in.
Cross-sectional area of bore.....	0.0383 sq. in.
Operation.....	Manual
Feed.....	Magazine, 5- or 10-round
Cooling.....	Air
Trigger pull.....	3.5-5 lb.



U. S. RIFLE, CAL. .22, M2, TOP VIEW AND SECTION

SHOTGUNS

Shotguns as produced by commercial manufacturers are procured by the Ordnance Department and issued for training personnel in firing on moving targets, for hunting purposes, and as riot guns for guard duty in congested areas or where firing will be at limited ranges.

Listed as Standard are the Winchester, M12; Remington, M31; Ithaca, M37; and Stevens, M620A. All are 12-gauge, hammerless, repeating arms of that type of action known variously as slide, pump, or trombone in which a manually operated sliding fore-end serves to extract and eject the fired case and to feed a new round from a tubular magazine beneath the barrel.

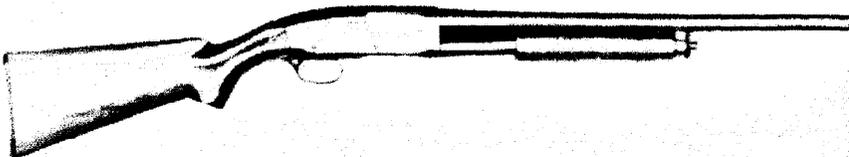
Emergency requirements, however, frequently make necessary the purchase of such shotguns as may be obtainable and various other shotguns are in use today. These include: Winchester, M97; Stevens, M520 and M620A; Remington, M10, M11, and Sportsman; and Savage, M720.

All are 12-gauge—a classification determined by the fact that twelve round lead balls exactly fitting the bore of the gun would weigh one pound. If measured in hundredths of inches, the 12-gauge ball would be equivalent to caliber .729. The Winchester, M97, is a slide-action, 5-shot weapon originally introduced by the Winchester Repeating Arms Co. in 1897. It is a "hammer" gun, the hammer being exposed and in a position where it may be cocked or lowered by hand. In the so-called "hammerless" actions of later models, the hammer is completely enclosed by the receiver housing. The Stevens, M620A, is a model of more recent design than the M620 and the Stevens, M520, is the designation applied to the short-barreled riot gun produced by that manufacturer. The Stevens guns are all hammerless, slide action, repeaters differing one from another only in minor construction details. The Remington, M10, many of which are in use, is also a hammerless, slide action. It loads and ejects from the bottom; the Remington, M31, is bottom-loading and side-ejection.

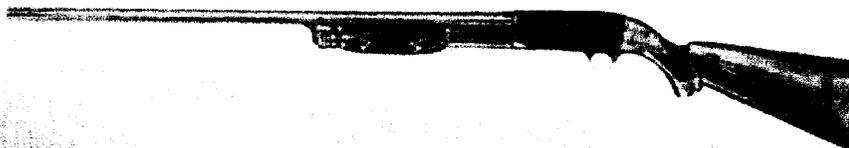
The Savage, M720, and Remington, M11 and Sportsman, represent an entirely different type of action. These are semi-automatic weapons operating on the long-recoil principle as distinguished from the short-recoil system of other automatic and semi-automatic weapons. Barrel, barrel extension, and breechblock, locked together, are moved to the rear by the expansion of the explosion gases and are not unlocked until the end of that rearward travel is reached. At that point the barrel is returned to position by the pull of the recoil spring.



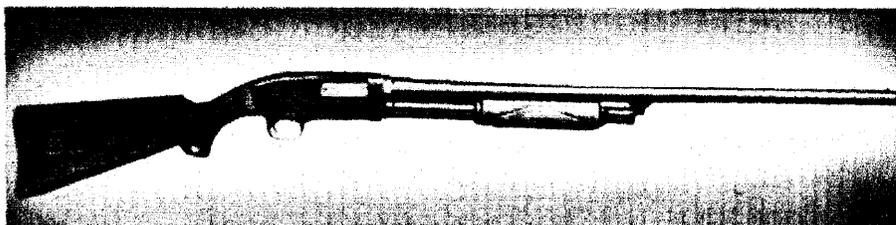
WINCHESTER SHOTGUN, 12 GAGE, M12, RIGHT SIDE VIEW



REMINGTON SHOTGUN, 12 GAGE, M31, RIOT TYPE, RIGHT SIDE



ITHACA SHOTGUN, M37, TRAP TYPE



STEVENS SHOTGUN, 12 GAGE, M620A, TRAP TYPE

The bolt is unlocked from the barrel and is held momentarily by engagement with the operating slide of a dog on the rear of the carrier.

As the assembly moves to the rear a new round is released from the magazine and enters the receiver where it is held by the shell stop until released by the forward motion of the barrel as it returns. The shell then springs to the rear, strikes and depresses the rear end of the carrier latch, and frees the carrier to be rotated upward. As the forward end of the carrier rises, the dog is released from engagement with the operating slide. This in turn frees the breechblock which completes its forward travel.

Both Remington and Savage guns of this type are manufactured under Brown-

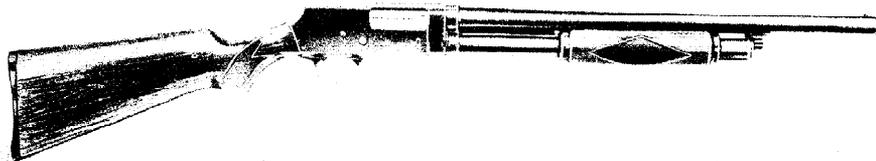
ing patents and are virtually identical in action and operation.

The designations given shotguns in Ordnance Department classification are, in all cases, the model numbers assigned the gun by the manufacturer.

All shotguns, regardless of make or model, are furnished in three types—riot guns, skeet guns, and trap guns—with various barrel lengths and type of boring.

Riot guns are for use in suppressing disorders or for guard purposes where ranges are short and where the use of rifles and ball ammunition would be dangerous. Guns of this type are furnished with 20-inch barrels bored to a true cylinder. They are frequently equipped with a stud which permits mounting a

SHOTGUNS (Continued)



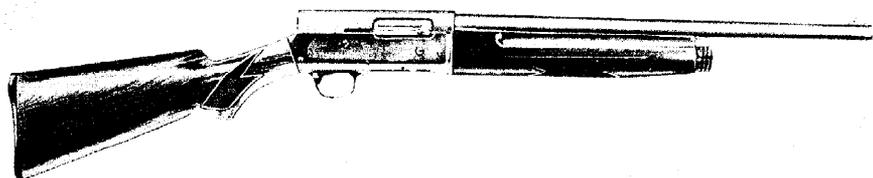
STEVENS SHOTGUN, M520, RIOT TYPE



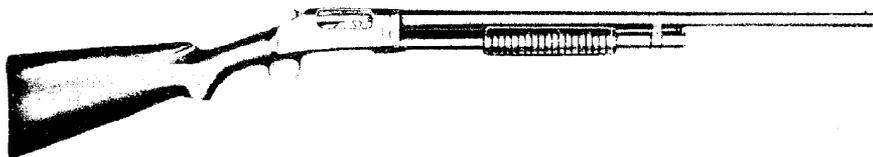
REMINGTON SHOTGUN, M10, RIOT TYPE



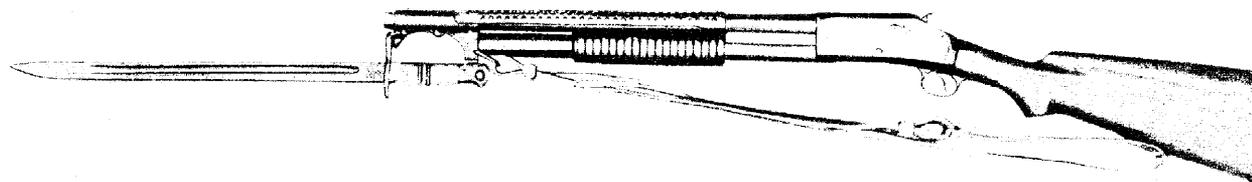
REMINGTON SHOTGUN, M11, SPORTSMAN



SAVAGE SHOTGUN, M720, RIOT TYPE



WINCHESTER SHOTGUN, M97, TRAP TYPE



WINCHESTER SHOTGUN, M97, RIOT TYPE, WITH SLING AND M1917 BAYONET

bayonet. The shot charge used with riot guns consists of nine pellets of size 00 shot, generally known as "buckshot."

Skeet Guns are supplied with 26-inch barrels with "improved" cylinder boring. This boring concentrates approximately 40 percent of the shot pellets of the charge within a 30-inch circle at a distance of 40 yards. The "true cylinder" bore of the 20-inch barrel on the riot gun places only $33\frac{1}{3}$ percent of the pellets in such a circle.

Skeet shooting is an adaptation of the older sport of trap shooting at inanimate targets—saucer-shaped disks made of pressed clay and known variously as clay pigeons or Bluerocks. In skeet shooting the gunners move from one station to another and the gun is kept at waist level until the target is released. A round of skeet includes firing at targets released at unknown angles, at incoming targets, at targets from overhead traps, and at doubles. The game closely approximates conditions to be expected in actual field shooting and tests to the utmost the gunner's skill and co-ordination.

Skeet guns may be fitted with tubular sleeves known as compensators which serve to convert the open-bored improved cylinder to any desired degree of choke.

Trap guns have 30-inch barrels with full-choke boring which permits the closest possible concentration of the shot charge. From 65 to 70 percent of the pellets are evenly distributed over a 30-inch circle at a range of 40 yards. Guns of this type are used for trap shooting from fixed stations at inanimate targets which may be released at both known or unknown angles but from known ranges.

A load of $1\frac{1}{8}$ oz. of No. 8 shot is used for both trap and skeet shooting. Shells loaded with No. 6 shot are procured by the Ordnance Department and supplied as a hunting load.

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CHARACTERISTICS

Gun		Remington, M31	Remington, M10	Remington, M11 and Sportsman	Winchester, M12	Winchester, M97	Ithaca, M37	Stevens, M520, M620, M620A [§]	Savage, M720
Weight	Riot	6 ⁷ / ₈ lb.	7 ¹ / ₂ lb.	7 ³ / ₄ lb.	6 ¹ / ₂ lb.	8 lb.	6 lb.	7 lb.	7 ⁵ / ₈ lb.
	Skeet	7 ⁵ / ₈ lb.	†	8 ¹ / ₂ lb.	7 lb.	7 ⁵ / ₈ lb.	6 ¹ / ₄ lb.	7 ⁵ / ₈ lb.	8 lb.
	Trap	7 ³ / ₄ lb.	7 ³ / ₄ lb.	8 ¹ / ₂ lb.	7 ³ / ₈ lb.	7 ³ / ₄ lb.	6 ⁵ / ₈ lb.	7 ³ / ₄ lb.	8 ¹ / ₄ lb.
Length, overall	Riot	40 ins.	39 ¹ / ₂ ins.	40 ins.	40 ins.	39 ins.	40 ins.	40 ins.	39 ¹ / ₂ ins.
	Skeet	46 ins.	†	46 ins.	46 ins.	45 ins.	46 ins.	46 ins.	45 ¹ / ₂ ins.
	Trap	50 ins.	49 ¹ / ₂ ins.	50 ins.	50 ins.	49 ins.	50 ins.	50 ins.	49 ¹ / ₂ ins.
Length, barrel	Riot	20 ins.	20 ins.						
	Skeet	26 ins.	†	26 ins.	26 ins.				
	Trap	30 ins.	30 ins.						
Boring	Riot	cylinder	cylinder						
	Skeet	imp. cyl.	†	imp. cyl.	imp. cyl.				
	Trap	full choke	full choke						
Gage		12	12	12	12	12	12	12	12
Cross-sectional area of bore		0.4174 sq. in.	0.4174 sq. in.						
Operation		Manual Slide action	Manual Slide action	Semi-automatic Long recoil	Manual Slide action	Manual Slide action	Manual Slide action	Manual Slide action	Semi-automatic Long recoil
Feed		Tubular magazine 3-4 rounds*	Tubular magazine 5 rounds	Tubular magazine 4-2 rounds†	Tubular magazine 5 rounds	Tubular magazine 5 rounds	Tubular magazine 4 rounds	Tubular magazine 5 rounds	Tubular magazine 4 rounds
Pressure (copper)		Approximately 11,000 lb./sq. in.	Approximately 11,000 lb./sq. in.						

*Remington, M31, is furnished with magazine capacity of both 3 and 4 rounds.

†Remington, M10, is not regularly supplied as a skeet gun.

‡The manufacturer's designation of "Sportsman" is given to those models of the Remington, M11, with magazine capacity of two rounds.

§The Stevens, M620A, is the maker's designation of an improved model of the M620; the designation M520 is given to the same gun in the "riot" type.

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PYROTECHNIC PISTOL AN-M8 WITH MOUNT M1—STANDARD

This is a double-action, hammerless, single-shot pistol firing all types of aircraft signals, rimmed and rimless. The rimmed signals must be loaded into the weapon from the breech but rimless signals may be inserted from either breech or muzzle.

The barrel is of seamless steel tubing, 4.12 inches long, with a bore of 1.58 inches. Pressure on the knurled under-surface of the breech lock—the lower of the two curved levers projecting from the top of the pistol—opens the breech for loading.

There is no external hammer nor any provision for single-action operation. A spring-actuated safety lever within the frame turns with the breech lock and prevents the internal hammer from rising unless the breech is fully closed and locked.

The Mount, M1, permits the projection of signals from the cabin or pilot's compartment of aircraft. The mount is permanently positioned in the airplane wall and secured by screws passing through an external flange. A spring-retained cover closes the interior opening when the mount is not in use.

Four lugs machined on the pistol barrel engage corresponding keyways within the sleeve of the mount. The pistol is then rotated one quarter-turn and locked in position by a latch on top of the barrel which snaps into a slot in the sleeve. The latch is disengaged by pressure on the upper of the curved levers shown in the illustration.

The sleeve is supported by four coil springs which absorb recoil when the pistol is fired. A cushioning gasket at the outer end of the sleeve takes up any counter-recoil.

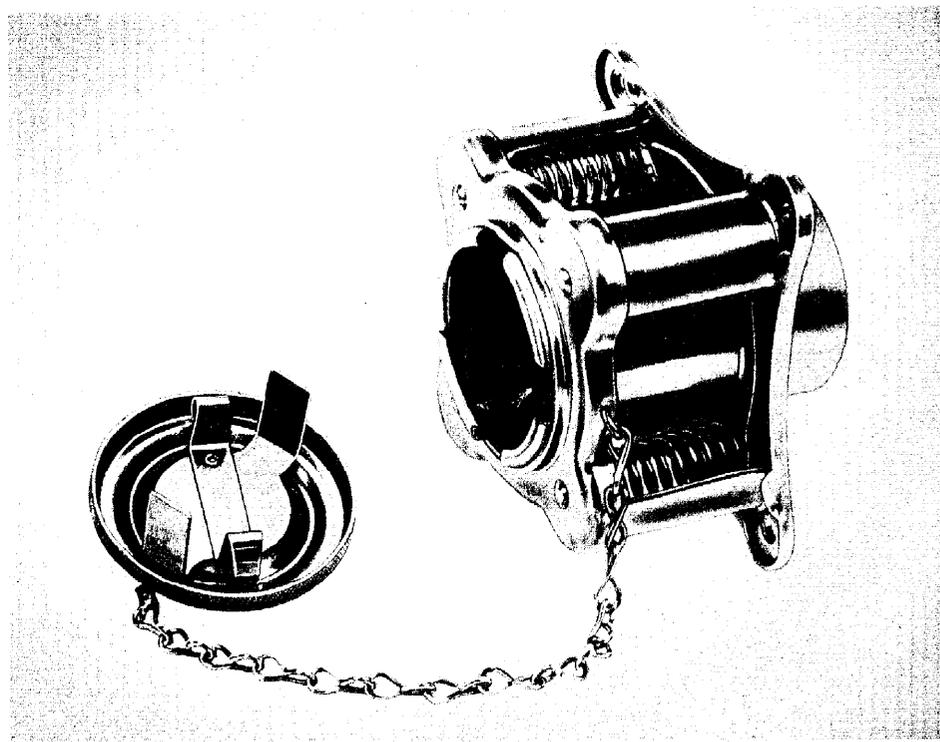
CHARACTERISTICS

Length of pistol	8.2 in.
Length of pistol and mount	9.9 in.
Weight of pistol	2.1 lb.
Weight of mount	1.1 lb.
Height of pistol	8.4 in.
Length of barrel	4.12 in.
Diameter of bore	1.58 in.
Trigger pull	5 to 8 lb.

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PISTOL, PYROTECHNIC, AN-M8, LEFT SIDE VIEW, WITH MOUNT, M1



PYROTECHNIC PISTOL MOUNT, M1

DISCHARGER, PYROTECHNIC, AN-M5—STANDARD

The Pyrotechnic Discharger, AN-M5, was designed to permit signals to be fired from aircraft in flight without the necessity of reloading the projecting device for each shot. It is rigidly mounted in any suitable position in the airplane, the muzzle projecting through the metal covering, and is fired by a cable from a remote control unit.

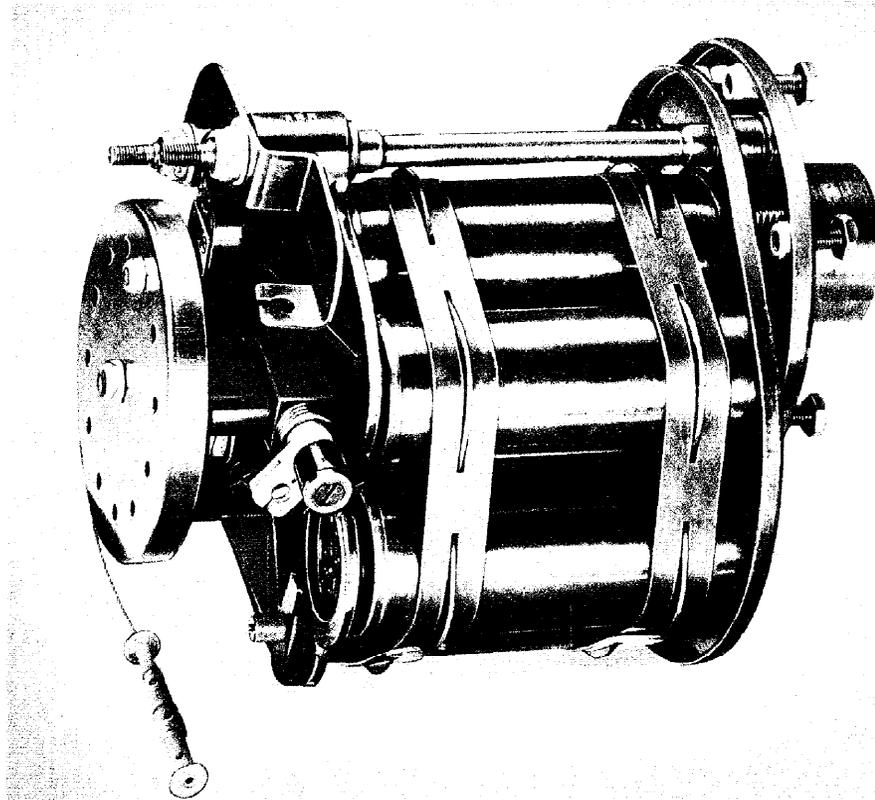
The action and operation of the discharger is similar in every way to that of the ordinary revolver. Six smoothbored sections of seamless steel tubing are rigidly bound about a central tube or bushing which, in turn, rotates on a fixed spindle exactly as the six-chambered cylinder of a revolver rotates to align the chambers successively with the firing pin and the barrel.

In the pyrotechnic discharger, that rotation is controlled by an index plate and index flange. The chambers in which the signals are placed are alined with the short muzzle which protrudes through the outer skin of the airplane and is secured by a mounting plate to which the barrel and body groups of the discharger are fastened by tie rods.

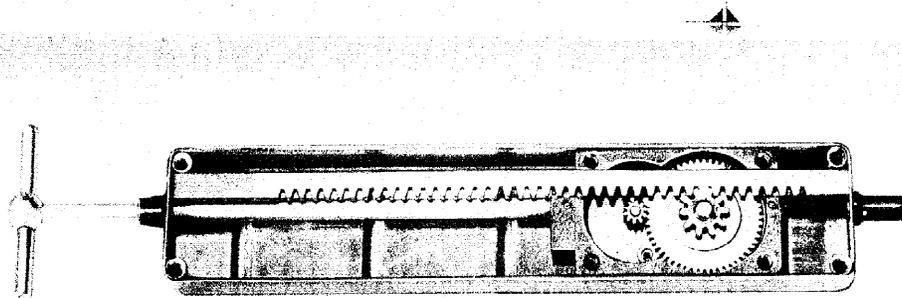
A pull upon the cable rotates the pulley and index shaft and cams the double-action hammer backward. A cylinder is lined up in firing position as the cam action ceases and the hammer spring drives the hammer forward until its pin strikes the primer of the signal and discharges it. The cases of the fired signals remain in the barrels and are removed singly by hand.

The signals are loaded into the barrels through a pivoted loading gate, or trap, which may be seen in the left foreground of the illustration covering the lowest of the three barrels visible. The operating cable, also shown, must be pulled a full stroke and released in order to rotate the barrel group $\frac{1}{6}$ revolution and bring another barrel into loading position.

Accidental discharge of a signal during the loading operation is prevented by a safety spindle lever which is raised by the opening of the loading trap and while raised blocks the hammer in the half-cocked position and prevents its fall. A sliding catch locks the loading trap in the



DISCHARGER, PYROTECHNIC, AN-M5



REMOTE CONTROLLER, M2

closed position and must be pushed down in its slot before the trap can be opened.

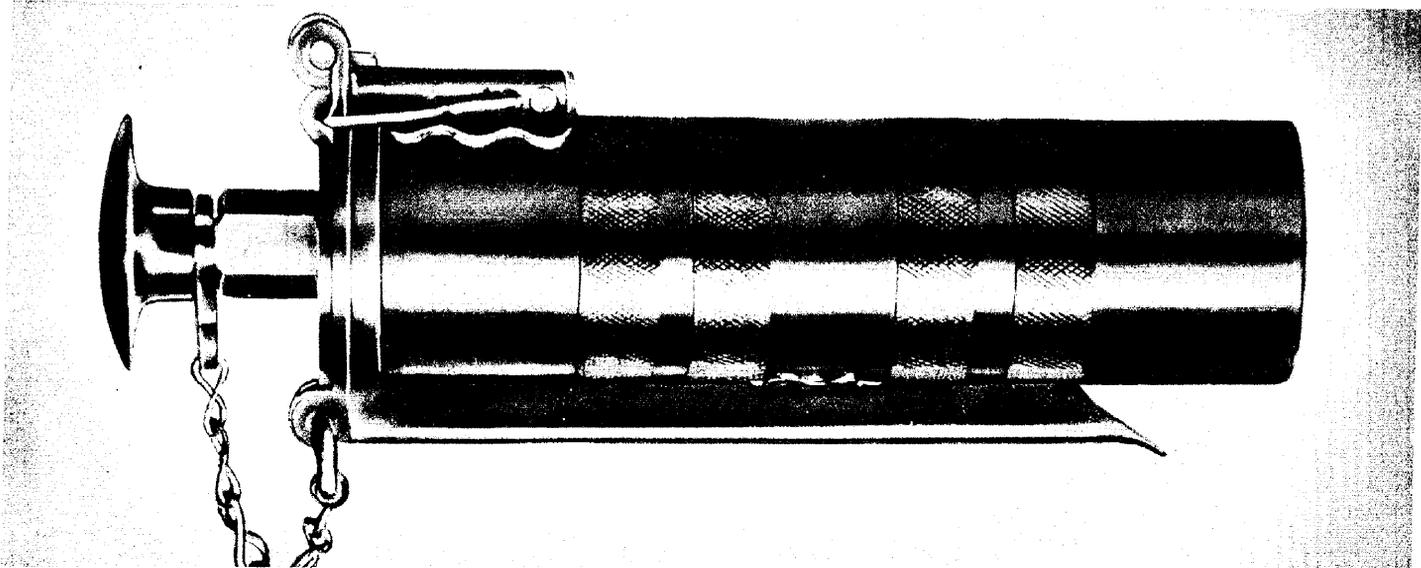
Once loaded, the entire operation of the discharger is by means of the Remote Controller, M2, here illustrated with cover removed to show the rack and pinion mechanism. The controller is mounted at any convenient point in the airplane or at the station of that crew member designated to operate the discharger. Each pull on and release of the handle of the controller rotates the body

group of the discharger $\frac{1}{6}$ revolution and fires a signal.

CHARACTERISTICS

Weight of discharger.....	8.6 lb.
Weight of controller (9.9 in.).....	0.9 oz.
Length of discharger.....	9 ins.
Length of controller.....	9.9 to 15 ins.
Length of barrels.....	4.5 ins.
Bore.....	1.58 ins.
Signals used.....	AN-M37 through AN-M45

PROJECTOR, PYROTECHNIC, HAND, M9—STANDARD



PROJECTOR, PYROTECHNIC, HAND, M9, WITH SAFETY SET

This simple device consists of a short smooth-bored barrel with a hinged breechplate in which a firing-pin and cocking-piece are mounted. There is no trigger and the arm may be fired by striking the rounded base of the cocking-piece with the hand or against the ground. A spring clip attached by a short chain

to the hinge pin of the breech latch is used to hold the hand knob and pin in the retracted position and prevent accidental discharge.

The ejector is linked to the breech plate and opening of the breech extracts the round.

Projector, M9, is used in firing the

double-star Aircraft Signals, AN-M37 through AN-M42; the single-star Aircraft Signals, AN-M43 through AN-M45; and the rimless signals AN-M28 through AN-M36, no longer standard.

The projector weighs 14 ounces, measures 7.6 inches overall, and has a bore diameter of 1.58 inches.

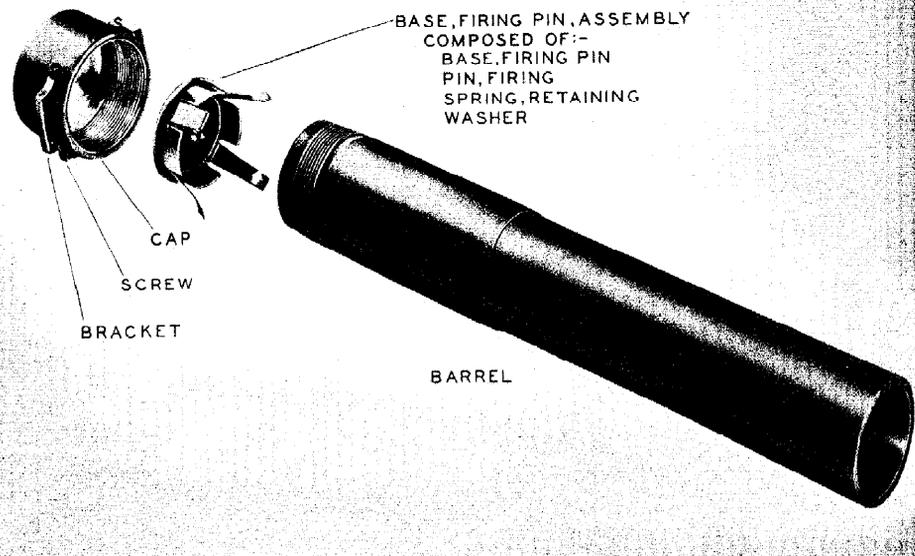
PROJECTOR, SIGNAL, GROUND, M4—STANDARD

The manually operated Ground Signal Projector, M4, is used in firing the single-star parachute Signals, M17A1B2, M19A1B2, and the Cluster Signals, M18A1B2, M20A1B2, M22A1B2. The high-burst ranging Ground Signal (smoke), M27, may also be launched from this projector.

The projector is a smooth-bored tube, one end of which is closed by a threaded cap which holds in place a base assembly on which is mounted a fixed firing pin and four retaining springs. The signal is inserted from the muzzle and pushed into the projector until gripped by the retaining springs which prevent premature discharge by holding the primer end of the signal away from contact with the firing pin.

The operator lies prone and fires the signal by striking the cap of the projector smartly against the ground. The signal is projected fin first but reverses at approximately 100 feet and continues to rise to 600 feet.

The Projector, M4, measures 11.9 inches overall and weighs 2.63 lb. The barrel is 1.66 inches in diameter and 11.6 inches long.



PROJECTOR, SIGNAL, GROUND, M4, DISASSEMBLED

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LAUNCHERS, GRENADE, M1, M2, M7, M8—STANDARD

Grenade launchers are tubular devices attached to the muzzles of U. S. rifles and carbines to permit launching or firing of the various standard rifle grenades, explosive or practice, and the parachute and cluster Ground Signals M17A1 to M22A1, inclusive. The Mark II fragmentation hand grenade may be converted to a rifle grenade by means of the Grenade Projection Adapter, M1, and may then be fired from the standard grenade launchers.

The M1 launcher is for use with caliber .30 rifles of the M1903 (Springfield) series, and the virtually identical M2 launcher (not illustrated) for use with the M1917 (Enfield) rifle. The gas-operated, semi-automatic M1 rifle and M1 carbine employ the M7 and M8 grenade launchers respectively.

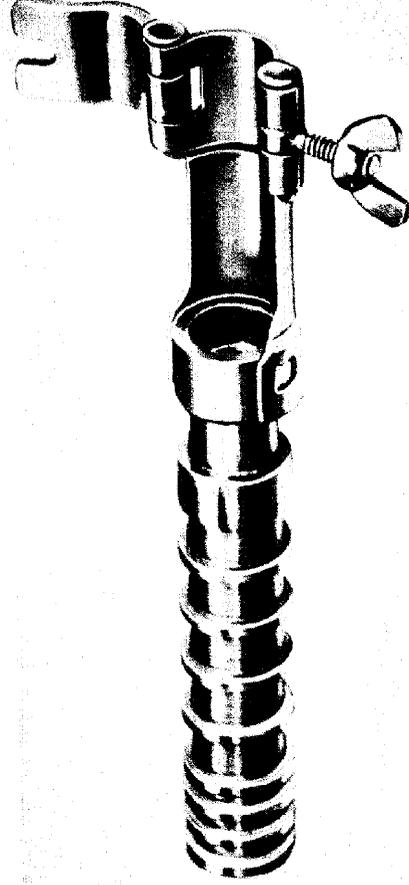
All launchers are of the same outside diameter, 0.86 inch, a dimension determined by the integer diameter of the stabilizer tube of the rifle grenades and ground signals. The tubular body of the launcher fits snugly within the stabilizer tube and the depth to which the launcher is inserted in the tube determines the

range attained by the fired grenade.

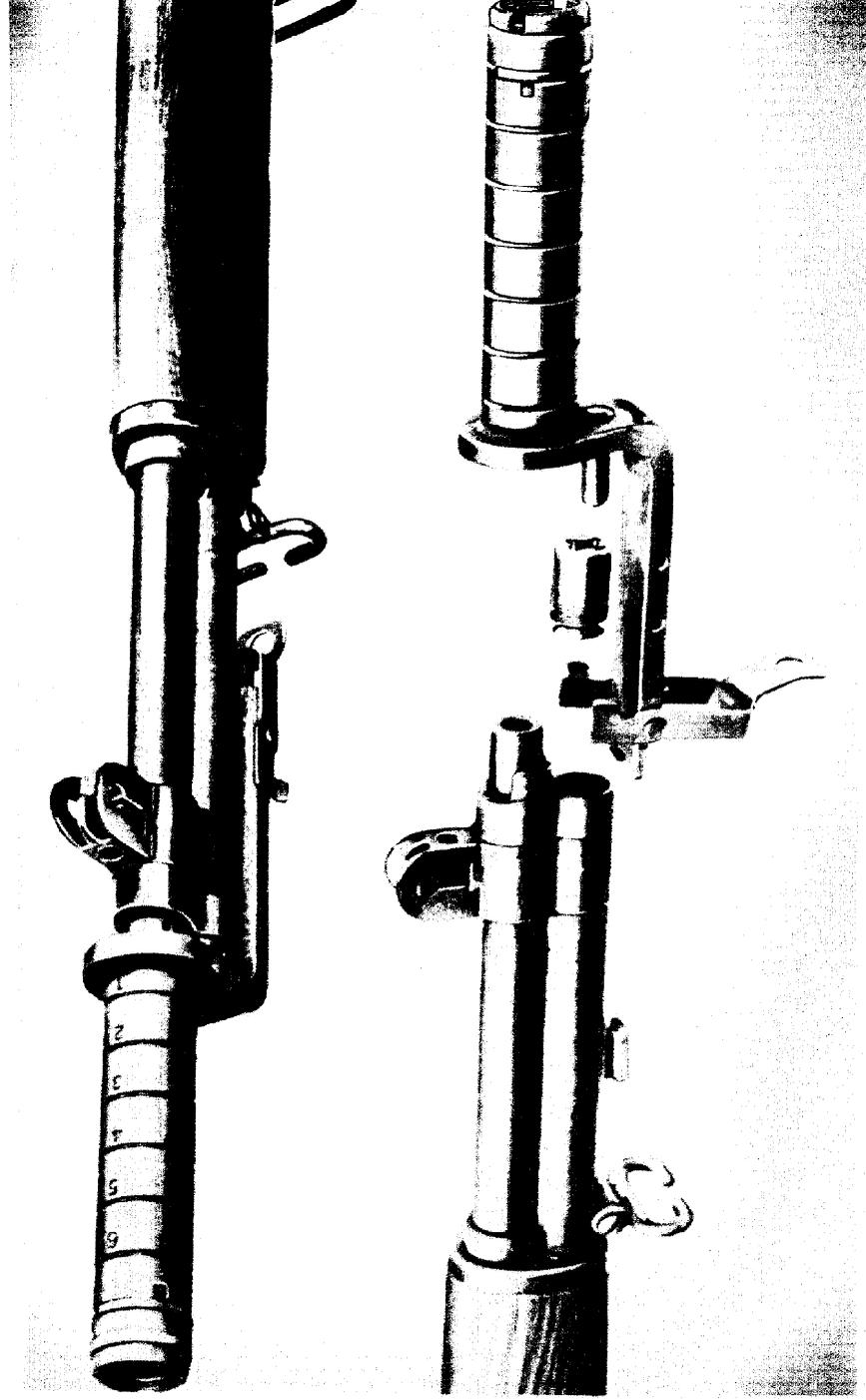
Reference to the illustrations will show that the exterior surface of each launcher is marked in a series of rings. These rings are numbered consecutively from the rear to the muzzle on the M7 and M8 launchers. By counting the rings exposed, the firer can adjust for range. The rings are raised so that they may be counted and the range determined in night firings,

As an example, when the M17 fragmentation rifle grenade is fired from the M7 launcher on the M1 rifle, five rings visible indicates that the grenade will attain a range of approximately 55 yards; four rings, 80 yards; three rings, 105 yards; two rings, 130 yards; and one ring, approximately 165 yards.

In all cases the actual launching is accomplished by means of a special

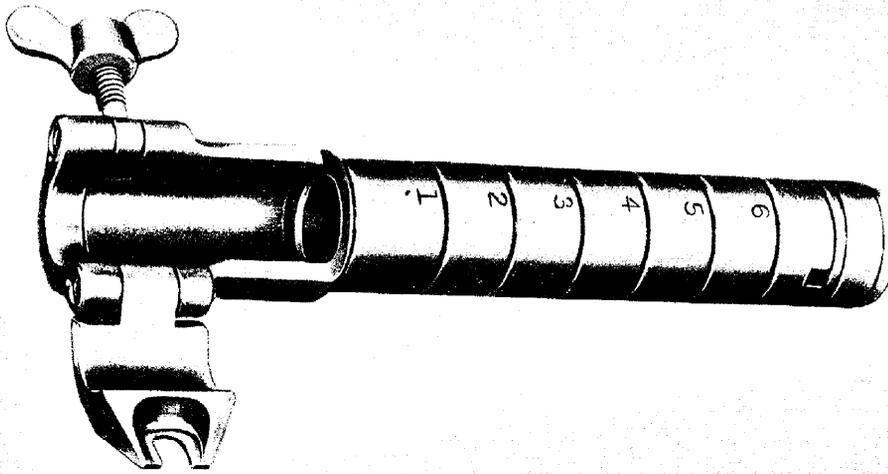


GRENADE LAUNCHER, M1



GRENADE LAUNCHER, M7, MOUNTED ON U. S. RIFLE, CAL. .30, M1, AND (BELOW) LAUNCHER DETACHED SHOWING VALVE SCREW TO REPLACE GAS-CYLINDER LOCK SCREW

LAUNCHERS, GRENADE, M1, M2, M7, M8—STANDARD (Continued)



GRENADE LAUNCHER, M8

blank cartridge, caliber .30, fired in the usual way in the rifle or carbine. The grenade cartridge may be distinguished from the ordinary blank cartridge by a rose crimp in the mouth of the case. These cartridges are illustrated and described in the small arms ammunition section of this Catalogue.

Modern warfare has emphasized the need for grenades to be fired at longer ranges and at higher velocities than were possible with the standard blank grenade cartridges. This has been accomplished by the so-called "vitamin pill," recommended for standardization on 15 January 1944 as Cartridge, Grenade, Auxiliary, Cal. .30, M7.

The designation as caliber .30 is somewhat misleading but refers to the rifle with which the auxiliary cartridge is used. The cartridge itself is a tube of drawn brass 0.45 inch in diameter and open at both ends. The open ends are sealed with paper wads after the tube is loaded with 20 grains of powder.

One end of the auxiliary cartridge is finished with a beveled rim which serves to keep it in place when it is inserted into the muzzle end of the launcher. The body of the launcher is then inserted in the stabilizer tube of the grenade as in normal firing. The effect is that of a booster, the flame of the grenade cartridge igniting the charge of the auxiliary cartridge and the power of the two combining to project the grenade from the launcher. Tests have determined that from 100 to 150 yards greater range is obtained when the auxiliary cartridge is used.

The auxiliary cartridge case is ejected from the launcher simultaneously with the launching of the grenade.

Since a maximum range is desired, the grenade is set as far back as possible on the launcher when the auxiliary is used. The auxiliary also increases the grenade's velocity, however, so that it may be used at shorter ranges where a reduced time of flight is desired.

LAUNCHER, GRENADE, M7—This launcher represents an improvement, without change in designation, upon the original model designed for use with the U. S. Rifle, M1. A launcher of simple clamp-on design could not be used with this gas-operated weapon because of the creation of excess pressures which caused premature opening of the breech and drove operating rod and bolt back with sufficient force to break the receiver.

The problem was solved by the development of a valve screw to be inserted in the gas cylinder of the rifle in place of the regular gas-cylinder lock screw. The valve within the screw opens to permit the escape of excessive pressures. Service ammunition may be fired from the M1

rifle with the grenade launcher in place. Since the valve is fully open, operating pressures are not developed within the cylinder and the rifle can be used only as a single-shot weapon.

The M7 launcher as first designed fastened to the muzzle of the M1 rifle by means of a two-armed, hinged clamp. Service tests demonstrated that three distinct motions were necessary to attach or remove the device. Technicians at Springfield Armory developed a superior fastening in the form of a simple clip which locked behind the bayonet stud on the gas cylinder. Manufacturing was facilitated by using larger parts and reducing the total number of parts of the launcher from ten to five.

LAUNCHER, GRENADE, M8—Development of a grenade launcher for the Carbine, M1, was deferred until after a satisfactory launcher had been developed for the M1 rifle. Both weapons are gas-operated, semi-automatic arms and it was felt that the many difficulties encountered in designing a launcher for the rifle would be greatly augmented with the lighter gun.

The problem proved much simpler than had been expected. It was found that immobilization of the semi-automatic feature of the carbine was not necessary and that a simple clamp-on launcher similar to the M1 and M2 could be used. The carbine may be operated semi-automatically with the launcher attached and there is little loss of accuracy.

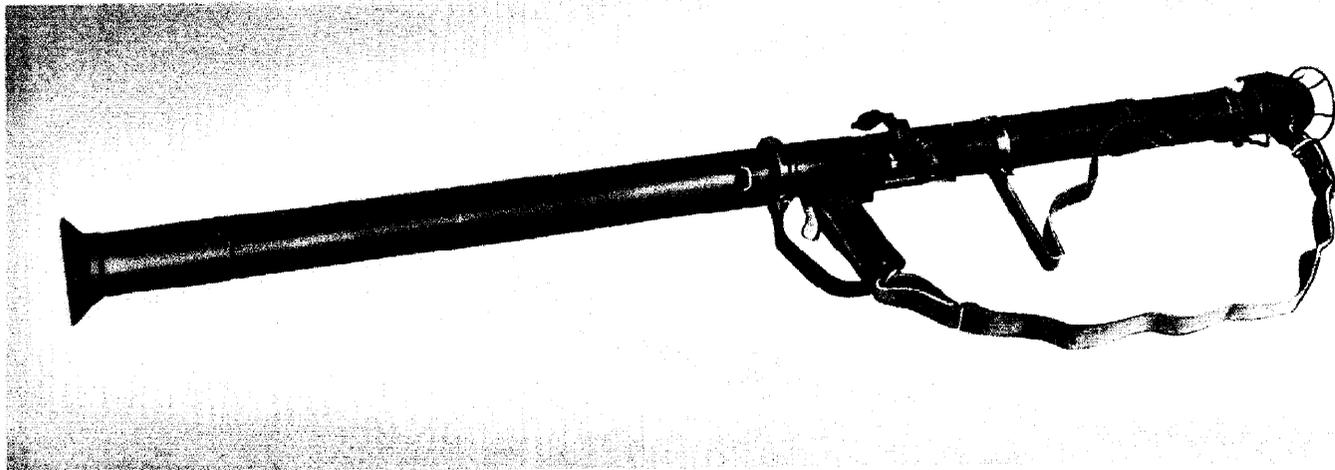
SIGHT—By action of the Ordnance Committee 10 February 1944 (OCM 22847) a new and more accurate sight, adaptable to all U. S. rifles and carbines, was standardized as Sight, Rifle Grenade Launcher, M15. It consists of a five-inch sighting bar which may be quickly attached to or removed from a plate permanently mounted on the left side of the rifle stock. The bar carries a leveling bubble, a front sight, and an aperture rear sight with click adjustments for elevation.

CHARACTERISTICS

Launcher	Weight	Length	Outside Diameter	Diameter of Bracket	Diameter of Bore
M1.....	0.53 lb.	7.1 in.	0.86 in.	0.68 in.	0.50 in.
M2.....	0.50 lb.	6.7 in.	0.86 in.	0.62 in.	0.47 in.
M7.....	0.75 lb.	7.5 in.	0.86 in.		0.50 in.
M8.....	0.75 lb.	6.0 in.	0.86 in.		0.40 in.

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LAUNCHER, ROCKET, ANTITANK, 2.36 INCH, M9—STANDARD



ROCKET LAUNCHER, A.T., M9, LEFT SIDE

The rocket launcher, popularly known and widely publicized as the "Bazooka," represents the adaptation to modern warfare of one of the oldest forms of military pyrotechnics, the rocket. It represents, too, the first practical development of a rocket gun or rocket launcher as a shoulder weapon for infantry use against tanks and other armored targets.

The launcher is an open tube approximately 54 inches long and 2.365 inches in internal diameter equipped with a shoulder stock, a pistol grip, electrical firing mechanism, and sights. The Rocket, M6A3, is 19.4 inches long and weighs 3.38 pounds. It carries a shaped charge of TNT capable of penetrating heavy armor at angles of impact up to 30°. The optimum range is approximately 200 yards although the rocket may be em-

ployed at ranges as great as 600 yards. The Rocket, 2.36 inch, M6A3, is illustrated and described in the ammunition section of this catalogue.

In its original form the rocket launcher was supplied with a wooden shoulder stock midway of its length and was not reinforced for additional bore-safety. A two-cell dry battery supplied the spark for ignition of the rocket's propelling charge, pressure on the trigger completing the circuit.

The first models of the launcher were equipped with a hinged rear sight and fixed front sights. These were followed by a peep rear sight and a front sight in the form of a rectangular frame at the muzzle of the launcher. The vertical sides of the frame carried graduations for ranges of 100, 200, and 300 yards.

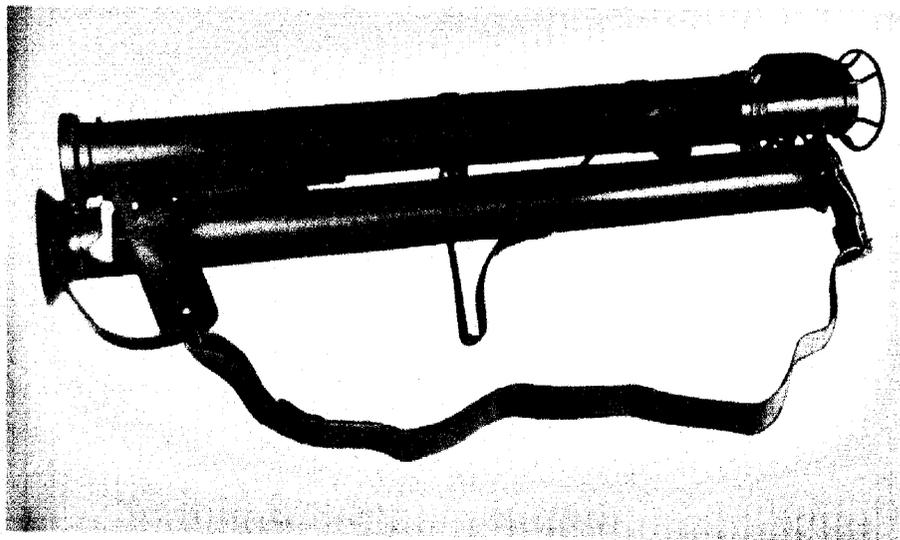
The rocket launcher was introduced as a combat weapon during the North African campaign of 1942-43. Use in battle indicated the need for various improvements and for a model which could be broken down into two approximately equal loads for use by parachute troops. The present launcher, M9, represents the development of those tactical requirements.

Since a higher safety factor was required, the tube of the launcher is now wrapped with wire around all that portion adjacent to the operator's face. The skeleton stock is of metal and is shaped so as to permit two shoulder positions for ease of sighting at high and low elevations and for prone shooting. Midway of the tube is a flange with bayonet joints which breaks the launcher into sections which may be carried by paratroopers or packed into containers for aerial delivery. Reassembly can be effected in a few seconds without tools and the joint locked rigidly.

The dry cells which supplied the ignition spark in the earlier models have been replaced by a self-contained magneto operated by pressure on the "squeezer" type trigger. A one-way safety switch incorporated in the trigger mechanism cuts out the magneto and prevents generation of an electrical impulse as the trigger returns to position.

The sight is an optical ring hinged to fold against the tube when not in use and protected by a cover. An adjustable range scale provides graduations from 50 to 700 yards in 50-yard increments.

Assembled and ready for firing, the rocket launcher measures 55 inches overall and weighs approximately 14½ pounds.



ROCKET LAUNCHER, M9, BROKEN DOWN

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**SMALL ARMS
MOUNTS**

MACHINE GUN MOUNTS

Machine gun mounts designed for installation on trucks and other vehicles are illustrated and described in the Tank and Automotive volume of this Catalogue. Included in the category of Vehicular Mounts are: Truck Pedestal Mounts, M24, M24A1, M24A2, and M31, Dash Mount, M48, Ring Mounts, M49 and M49C, and Truck Mounts, M32, M36, M37, M37A1, M37A2, M37A3, M50, M56, M57, M58, M59, M60, and M61.

MOUNT, TRIPOD, MACHINE GUN, CAL. .30, M1917A1 — STANDARD

This mount, which accommodates any caliber .30 Browning machine gun, air- or water-cooled, is the older mount, M1917, modified to permit elevation through a wider arc in operation against hostile aircraft. As now issued, the gun may be elevated to $+65^\circ$ and depressed to -28° from the horizontal.

The central member of the mount is a socket in which the three legs are mounted and in which the cradle pintle fits and rotates as a pivot. A clamp prevents the pintle from being pulled from its socket and serves as a brake against too free rotation.

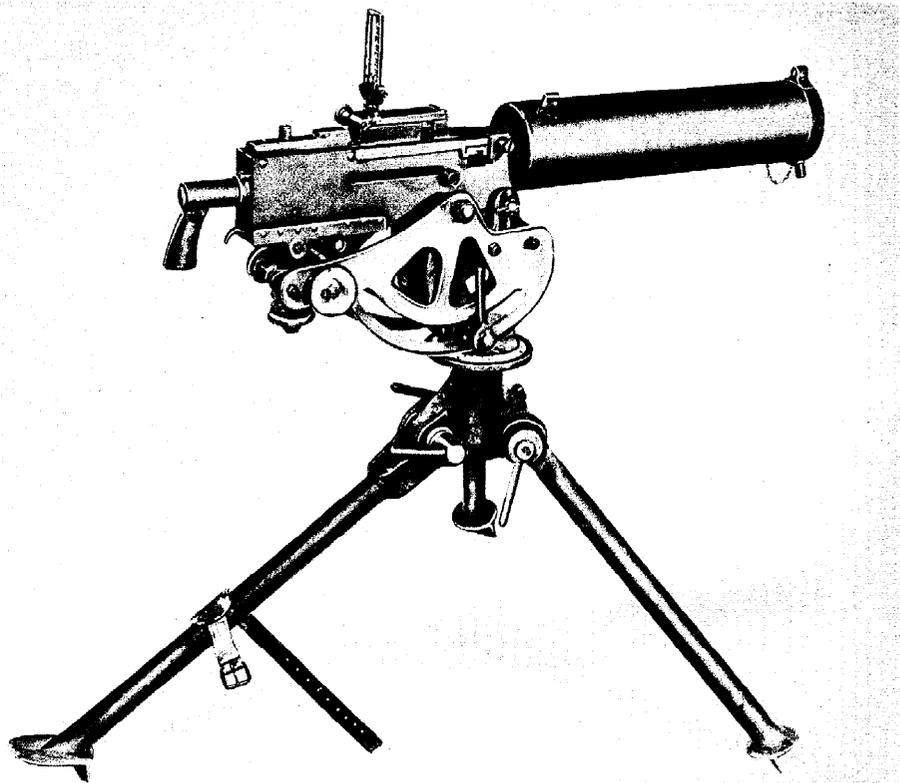
The traversing dial is mounted on top of the socket. Two types of dials are now in use. The older type is graduated clockwise in azimuth from 0 to 6,400 mils; the later dials are graduated to 3,200 mils clockwise and counter-clockwise from 0. Both type dials are subdivided to permit readings in 20-mil units. A clamp secures the traversing dial in any desired position.

Elevation is through the arc shown in the side of the cradle as illustrated. Rapid and free adjustments in elevation may be obtained by release of the cradle clamp. The upper side of the elevation arc carries a mil-graduated scale reading from 500 to 0 to 400, subdivided in 20-mil units.

Both elevating and traversing mechanism are housed in the rear of the cradle frame. Screws controlled by handwheels permit mechanical manipulation in single mil units.

The legs of the tripod mount, M1917A1, may be adjusted independently to obtain firm footing on uneven ground. Stability has been improved by mounting the gun so that the center of the tripod absorbs the major portion of the recoil.

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MOUNT, TRIPOD, MACHINE GUN, CAL. .30, M1917A1

CHARACTERISTICS

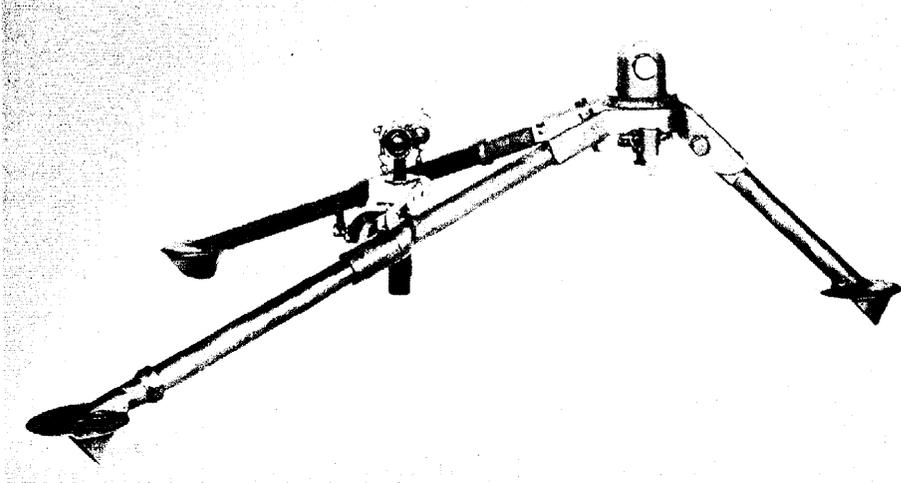
Weight	53.2 lb.
Length, extended	42 ins.
folded for transportation	36 ins.
Spread of front legs, extended	39 ins.
Command	23 ins.
Traversing range, free	6,400 mils (360°)
mechanical	50 mils
least increment	1 mil
Elevating limits, free	+1,156 mils (65°)
mechanical	-498 mils (28°)
least increment	50 mils
least increment	1 mil
Elevating arc graduated	Every 25 mils for 900 mils

MOUNT, TRIPOD, MACHINE GUN, CAL. .30, M2—STANDARD

This tripod mount was developed for the air-cooled caliber .30 Browning machine gun, M1919A2. It is the standard mount for that gun as modified to the current designation of M1919A4. It is carried as auxiliary equipment in combat vehicles and is used by cavalry as a pack mount. The tripod mount, M2, is for use against ground targets only, its limited range of elevation precluding its employment in antiaircraft fire.

The mount consists of three telescoping tubular steel legs in a tripod head. The two rear legs are joined by and obtain additional support from a graduated traversing bar which also carries the elevating mechanism and supports the rear of the gun.
The dial with which the bar was originally equipped has been replaced by a more easily read scale graduated in 100-mil increments and 5-mil subdivisions.

The scale has a range of 444.5 mils to right and left from 0.
With the rear of the gun supported by the bar, elevation of +19° and depression of -21° may be obtained by use of the elevating mechanism. Free elevation, with the gun supported only at the trunnion, is through an arc of 21°. Free depression may be obtained up to -45°. The tapered steel pintle on the receiver of the gun mates with a bronze bushing in the tripod head and is held securely by a latch which engages in an annular groove on the pintle.

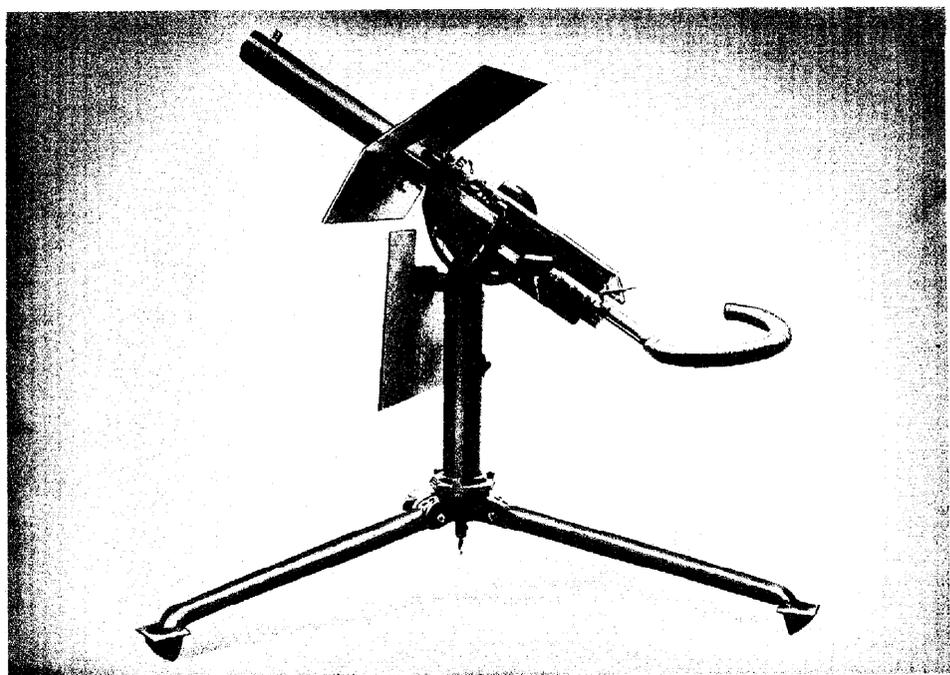


MOUNT, TRIPOD, MACHINE GUN, CAL. .30, M2

CHARACTERISTICS

Weight.....	14 lb.
Length, extended.....	32.5 ins.
folded for transportation.....	27 ins.
Spread of rear legs.....	30 ins.
Command.....	11 ins.
Traversing range, free.....	6,400 mils (360°)
mechanical (without release) 50°	
Traversing bar graduated.....	800 mils
Elevating range, free.....	+21°, -45°
mechanical.....	+19°, -21°
least increment.....	.1 mil
Elevating handwheel graduated.....	every mil

MOUNT, MACHINE GUN, CAL. .50, ANTI-AIRCRAFT, TRIPOD AND PEDESTAL M2A1—STANDARD



MOUNT, MACHINE GUN, CAL. .50, A.A., M2A1, ON TRIPOD

This mount was designed to accommodate the caliber .50 water-cooled Browning machine gun, M2, in semi-permanent and permanent positions as a defensive weapon against hostile aircraft. The cradle in which the gun rests is supported by a tubular column, or pedestal, which may be placed upon a tripod for semi-permanent mounting or upon a pedestal base in permanent positions. When used with the tripod legs, the mount occupies a circle 104 inches in diameter.

When the gun is installed on this mount the back plate and spade grips are replaced by a flexible back plate assembly. Firing is from the side plate trigger and the gunner is supported by a body rest and protected by two shields of 1/4 inch armor 32 inches wide.

The design of the cradle and the mounting of the gun are similar in all major respects to the caliber .30 mount,

MOUNT, MACHINE GUN, CAL. .50, ANTI-AIRCRAFT, M2A1 (Continued)

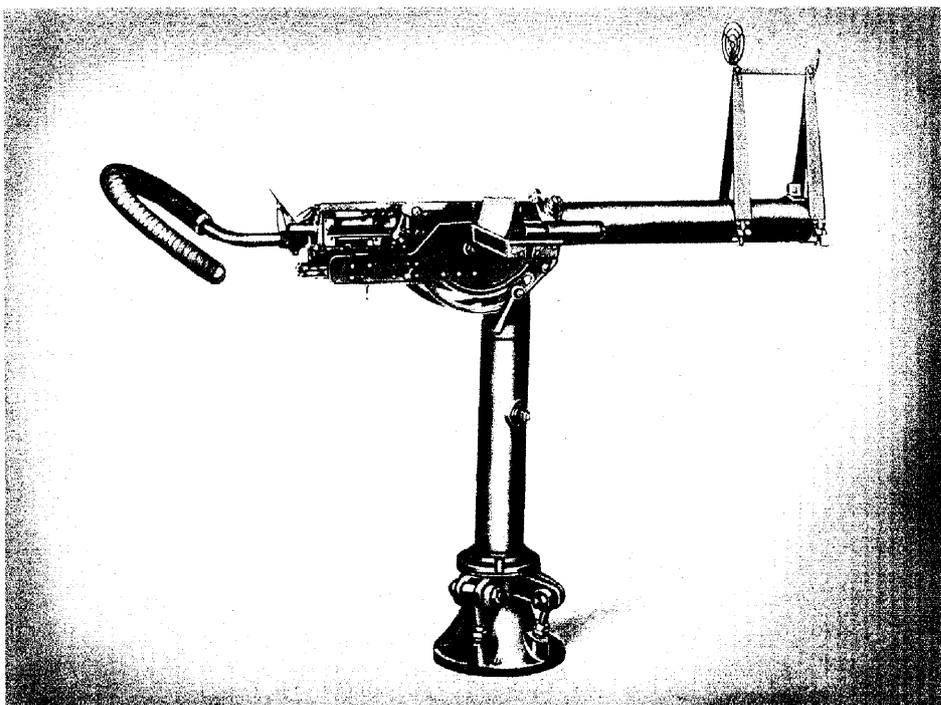
M1917A1, although the cradle is of heavier construction throughout to adapt it to the caliber .50 gun.

The gun may be traversed throughout the full range of 360° and has an elevation range of +60° and -15° from the horizontal.

The unarmored gun is illustrated as equipped with the Sight, cal. .50, Anti-aircraft, M1. Use of this sight with the armored gun is optional.

CHARACTERISTICS

Weight, complete,	{	tripod, 375 lb.
without armor	{	pedestal, 315 lb.
Weight of upper shield, armor		72 lb.
Weight of lower shield, armor		46 lb.
Weight of bracket, armor		8.5 lb.
Weight of sight, A. A., cal. .50, M1		10 lb.
Weight of legs, tripod mount		112 lb.
Weight of pedestal base		52 lb.
Weight of back rest		17 lb.
Weight of cradle		119 lb.
Command		48.8 ins.
Height of sights above ground		74.2 ins.
Traverse		360°
Elevating limits, tripod mount		+60°, -15°
pedestal mount		+69°, -15°



MOUNT, MACHINE GUN, CAL. .50, A.A., M2A1, ON PEDESTAL BASE

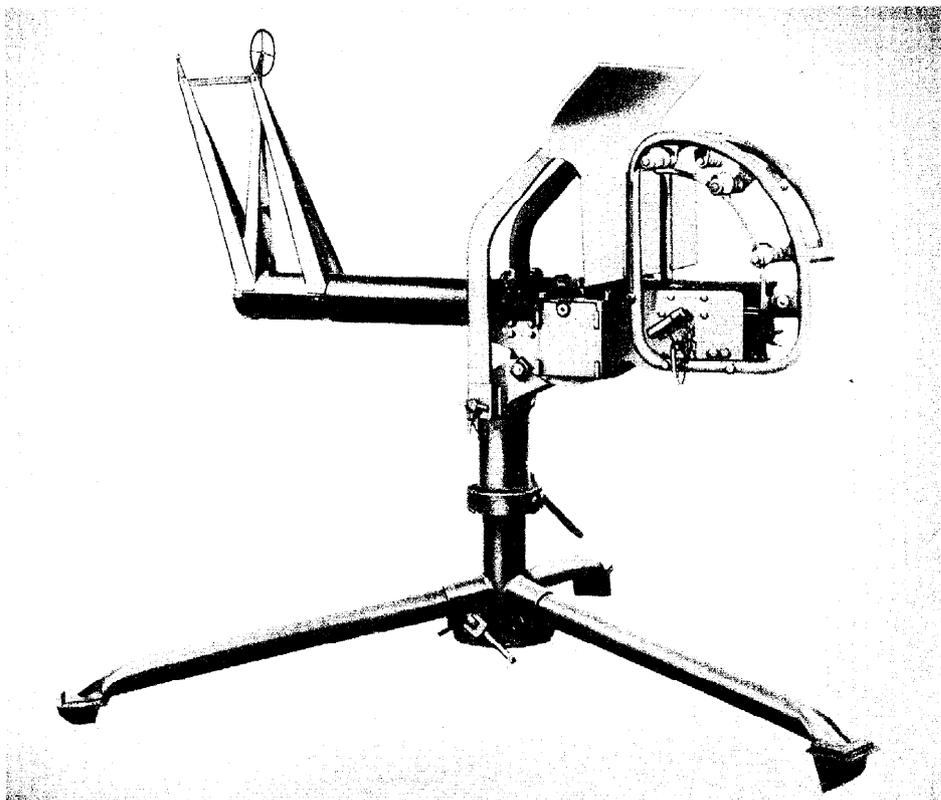
MOUNT, MACHINE GUN, CAL. .50, A.A., M3—STANDARD (NAVY DESIGNATION, Mk. 30)

Experience with the caliber .50 mounts, M2 and M2A1, developed the need for a mount of greater stability which would permit more accurate fire and meet the "close-in" defensive conditions under which anti-aircraft machine guns must operate against low-flying, high-speed targets at ranges of less than 1,000 yards.

The caliber .50 anti-aircraft mount, M3, embodies those improvements. It is built to accommodate the water-cooled, flexible, caliber .50 Browning machine gun, M2, but may be adapted to take any Browning machine gun in that caliber. Like its predecessors, this mount may be assembled as a tripod mount for ground use in semi-permanent positions or may be set on a pedestal base in fixed positions.

In general, the operation of the M3 mount is similar to that of the M2 and M2A1. Traverse through the full arc of 360° is possible and elevation range has been increased to 90°. The gun on the M3 mount may be depressed through an arc of 15°.

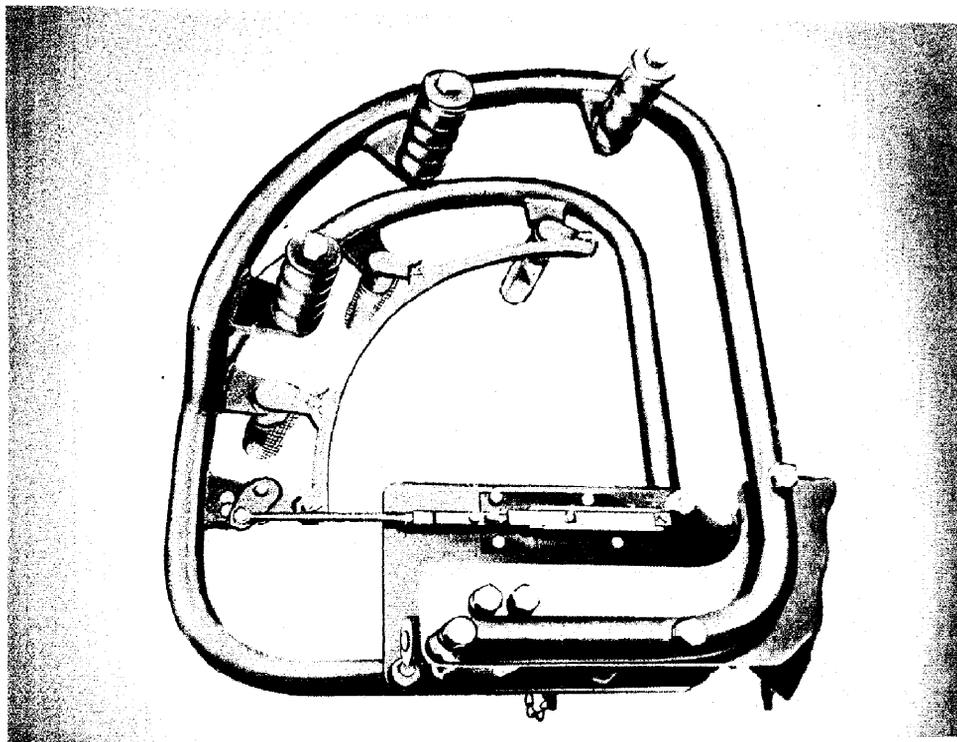
The trigger control mechanism is



MOUNT, MACHINE GUN, CAL. .50, A.A., M3

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MOUNT, MACHINE GUN, CAL. .50, A.A., M3 (Continued)



TRIGGER CONTROL MECHANISM, CAL. .50, A.A., MOUNT, M3

entirely different from that of the M2 and M2A1 mounts. It consists of a curved frame of steel tubing (shown in the illustration) fastened to the rear of the cradle side plates. Six trigger control grips are assembled in pairs, one above the other, three grips on the right member of the frame, three on the left. The grips are pivoted to a radial segment which connects by a bracket and rods with the trigger.

Rotation of any one of the grips moves the radial segment and fires the gun. The design permits the gunner to remain upright instead of reclining in the backrest as was necessary with the M2 and M2A1 mounts.

CHARACTERISTICS

Weight, complete with armor plate	380 lb.
Weight of cradle and carriage, less shield	120 lb.
Weight of pedestal assembly	112 lb.
Weight of legs, tripod mount	81 lb.
Radius of legs	49 ins.
Command	37.1 ins.
Space required, axially	73.6 ins.
Space required, transversely	84.8 ins.
Traverse	360°
Elevating limits	+90°, -15°

MOUNT, TRIPOD, MACHINE GUN, CAL. .50, M3—STANDARD

This mount is similar in all essentials to the .30 caliber tripod mount, M2, but is of more rugged construction throughout to accommodate the heavier caliber .50 weapon. It is designed for ground fire with the caliber .50, heavy barrel, flexible Browning gun.

Each leg consists of two telescoping sections of seamless steel tubing. A shoe with spade extension is welded to the end of each lower section. Normal mounting of the tripod is with the front leg at

an angle of 60° and with all extensions closed. In this position the gun trunnion is 10 inches above the ground. Minor adjustments in command height may be obtained by changing the angle of the front leg or by extending the telescoping sections of all three legs. A clamping ring on the sleeve section of each leg permits locking the extension at any desired length.

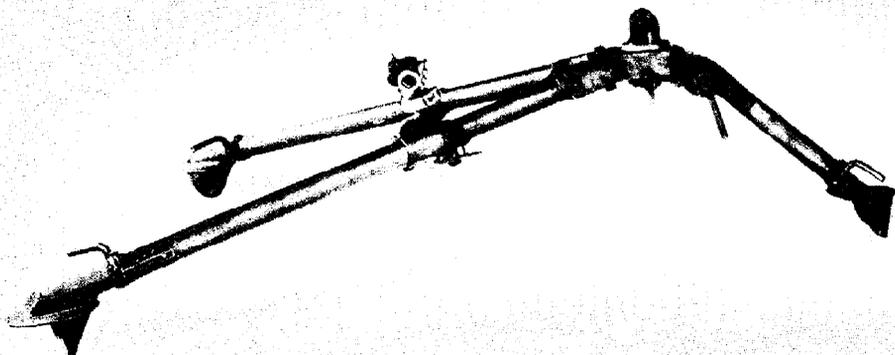
A bronze bushing in the tripod head mates with the pintle of the gun which is

locked in position by a pintle-latch. A free traverse of 360° is possible. As with the mount for the caliber .30 gun, a traversing bar joins the two rear legs, supports the rear of the gun, and carries the elevating and traversing mechanism. The traversing scale is graduated in 5-mil subdivisions to 400 mils right and left from zero. The traversing dial formerly furnished with this caliber .50 mount has been eliminated.

The lower end of the elevating mechanism attaches to the traversing bar through the traversing slide; the upper end is attached to the gun by a pin. The mechanism is a double screw assembly and affords an elevating range from +100 mils to -250 mils in increments of 50 mils or in 1-mil subdivisions.

CHARACTERISTICS

Weight	44 lb.
Length, folded for transportation	41 ins.
legs fully extended	71 ins.
Height of trunnion, legs retracted	10 ins.
legs extended	13 ins.
Range of traverse	6,400 mils (360°)
Range of elevation	+100, -250 mils
Elevating handwheel graduated	every mil



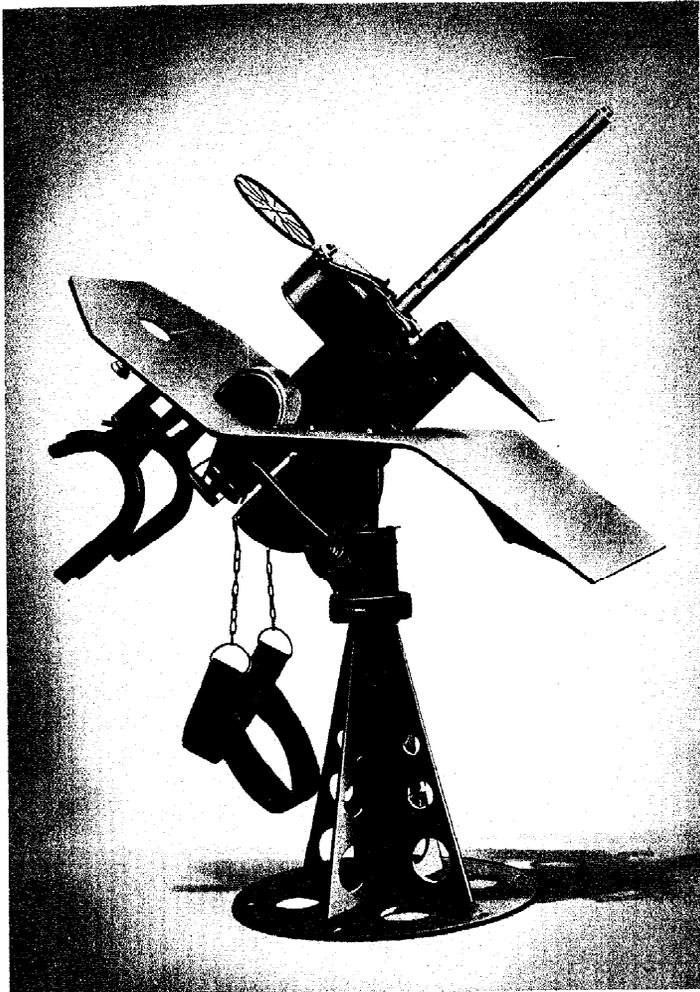
MOUNT, TRIPOD, MACHINE GUN, CAL. .50, M3

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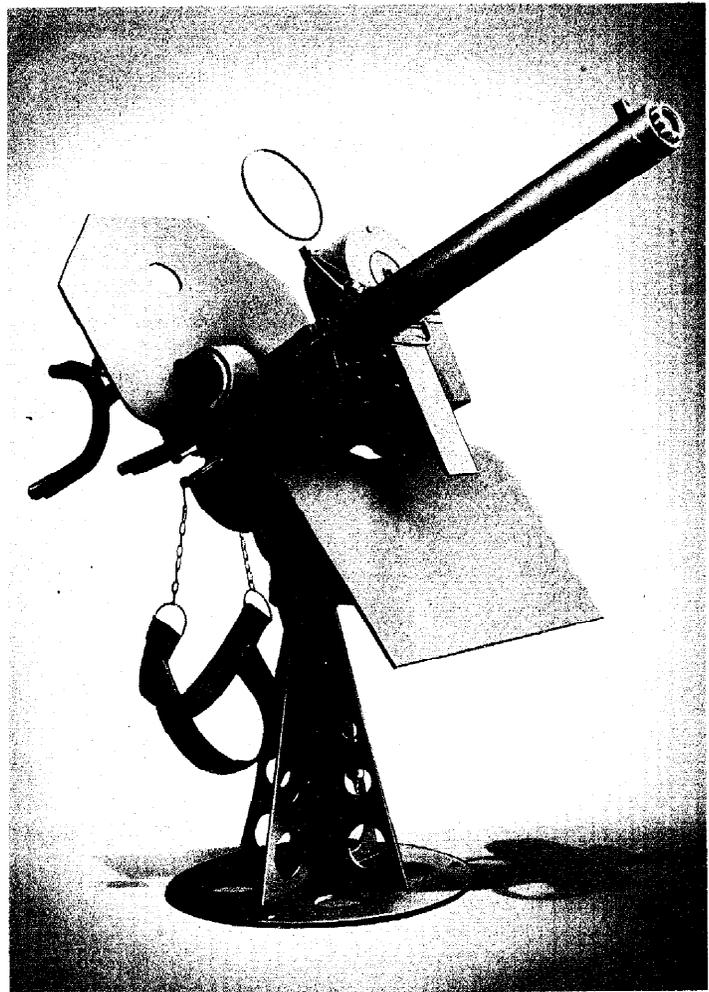
OFFICE CHIEF OF ORDNANCE

1 MARCH 1944

MOUNTS, PEDESTAL, MACHINE GUN, A.A., CAL. .50, M39, M43, M46— SUBSTITUTE STANDARD



MOUNT, PEDESTAL, MACHINE GUN, CAL. .50, M39
(NAVY DESIGNATION, Mk. 21)



MOUNT, PEDESTAL, MACHINE GUN, CAL. .50, M43
(NAVY DESIGNATION, Mk. 21)

These mounts were designed to provide rigid mounting of caliber .50 Browning machine guns, air- and water-cooled, in permanent positions for defense against hostile aircraft. They may be installed on ships, on docks, or in defense positions on bridges, rooftops, or elevated platforms erected especially to accommodate them.

Mounts, M39 and M43, are single gun mounts. The M39 is built for the air-cooled model of the Browning caliber .50 machine gun, Aircraft, M2; the M43 is for the water-cooled model of the same gun. The M46 is a twin mount, accommodating two water-cooled guns, with heavier equilibration springs, two heavy barrel, M2, or aircraft, M2, guns.

In both the single and twin mounts

the aggregate weight of the carriage and mounted parts—gun, armor, ammunition, and ammunition chest—is counterbalanced by a helical spring within the pedestal tube. No counterweight is used, since the equilibrator spring cushions the fall of gun and carriage in moving from an elevated toward a horizontal position and serves the purpose of a counterweight in reducing the effort required to elevate the weapon for high-angle fire. This spring counterbalancing permits easy handling of the gun without the use of auxiliary power.

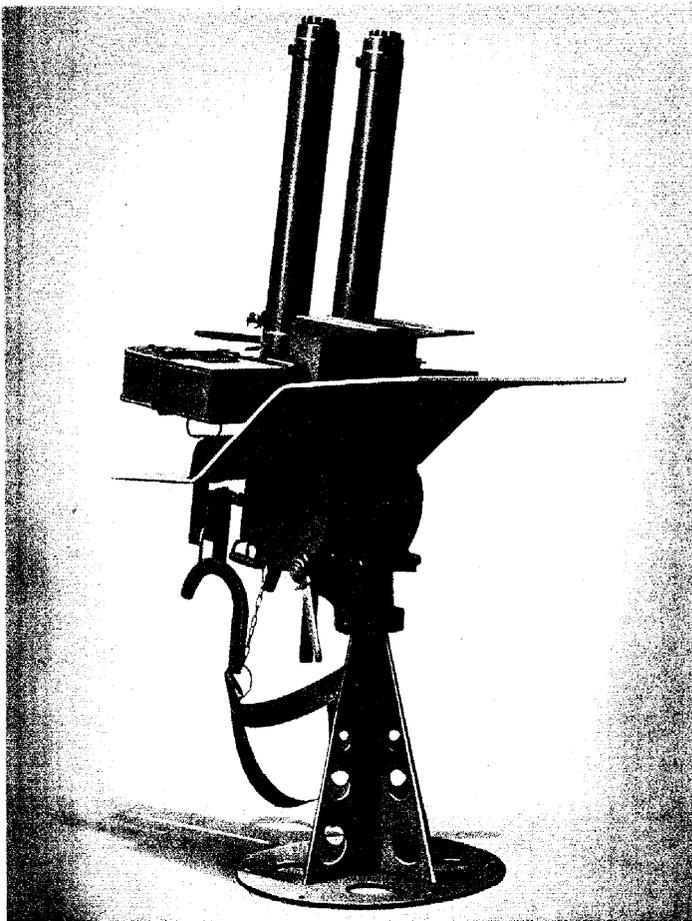
Both single and twin mounts may be trained by hand through the full 360° of traverse and may be elevated from -10° to +80°. All mounts may be quickly locked in any position for oper-

ation against stationary targets. All are designed to accommodate the ammunition chest, M2, with a capacity of 200 rounds of caliber .50 ammunition.

PEDESTALS—The pedestals for both single and twin mounts are identical. The circular base is of ½-inch mild steel plate 30 inches in diameter. The tube and its supporting flanges are made of ¼-inch plate. The upper end of the tube is machined to take the ball thrust bearing on which the cradle moves in traverse.

CARRIAGE—In both single and twin mounts the carriage for cradle and gun is a one-piece casting, the base of which forms the upper half of the race housing of the ball thrust bearing. A single lever on the right side locks the carriage to

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MOUNT, CAL. .50, M46 (NAVY DESIGNATION, Mk. 22)

the pedestal in traverse and to the side plate of the cradle in elevation. Pulling the lever to the rear and upward locks the carriage in both planes. The handle is held in its unlocked position by a stop and spring clip.

CRADLE AND SHIELD—The shields of both single and twin mounts are bolted to angle-pieces welded to the side plates of the cradle, and the two are considered a single assembly. The single mount cradle has no recoil-absorbing device and the inner plates, on which the gun is mounted, are fixed to the outside plates. The twin mount cradle is equipped with a dual-action recoil absorber. The inner plates and guns slide back and forth within the outer plates in recoil. Springs in the forward end of the cradle dampen this movement.

The M39 and M43 mounts use a shield of 1/2-inch armor plate; the shield of the M46 mounts is of 3/8-inch plate. Both shields are resistant to cal. .30 and cal. .303 bullets at test range.

CHARACTERISTICS

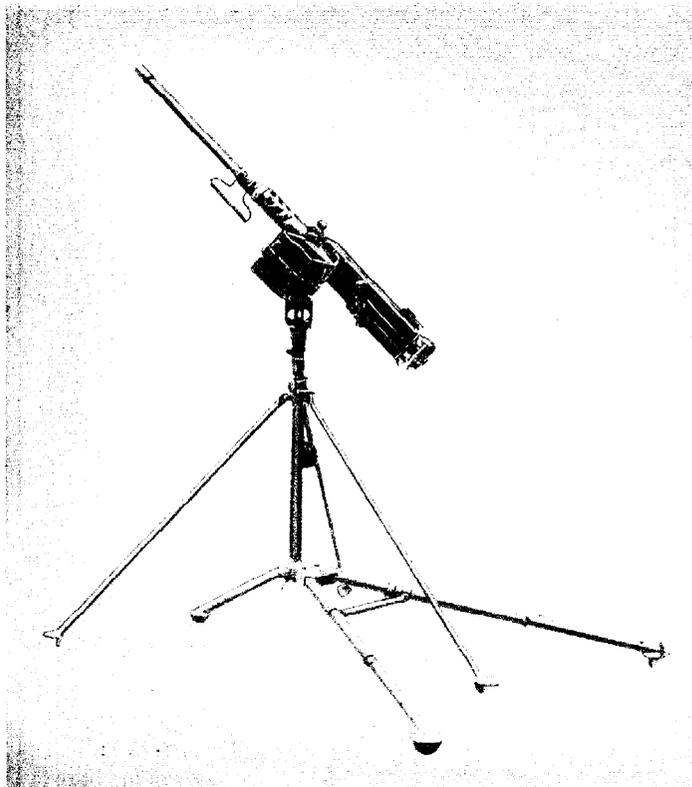
	M39, M43	M46
Weight complete except for gun and ammunition.....	725 lb.	825 lb.
Working space, maximum radius of.....	40 ins.	40 ins.
Command.....	48.5 ins.	48.5 ins.
Height of sights above ground.....	64.1 ins.	64.1 ins.
Traverse.....	360°	360°
Elevation.....	+80° -10°	+80° -10°

ELEVATOR-CRADLE, A.A., CAL. .50, M1—STANDARD

This elevator and cradle assembly consists of an adapter, with tripod legs for additional stability, for the Standard tripod machine gun mount, cal. .50, M3. It is for the use of ground troops and enables those troops to convert their ground mounts to antiaircraft fire and to adapt low ground mounts for enfilade fire over high banks, out of trenches or ditches, or from the concealment of high grass or brush. It also permits a machine gun mount to be installed in any vehicle for protection against hostile aircraft or for use as a mobile fire platform.

The assembly consists of a cylindrical pedestal which fits in the Standard tripod mount and which carries a cradle for installation of the caliber .50 Browning machine gun, heavy barrel, M2. The cradle permits unlimited traverse in azimuth, elevation to 90°, and depression to -45° or more, depending upon the position in which the basic mount is installed and the nature of the terrain in front of the gun.

The complete assembly of elevator, cradle, and tripod stabilizing legs weighs 95 lb.



ELEVATOR-CRADLE, A.A., CAL. .50, M1, WITH GUN IN POSITION

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**SMALL ARMS
AMMUNITION**

SMALL ARMS AMMUNITION—STANDARD

CALIBER .30 CARTRIDGES

The caliber .30 cartridge, standard for all rifles and machine guns manufactured in that caliber, is issued in the following forms: Ball, M2; Tracer, M1; Incendiary, M1; Armor-Piercing, M2.

The caliber .30 cartridge is also issued in the following special-purpose forms: Rifle Grenade, M3; Dummy, M2; Blank, M1909; Guard, M1; and High-Pressure Test, M13.

BALL, CAL. .30, M2—The cartridge so loaded is for use against enemy personnel and those matériel targets which do not require the employment of armor-piercing or other special-purpose rounds. The complete round includes primer, case, propelling charge of approximately 50 grains of IMR 4895 powder, and 150-grain bullet. The case is of drawn brass. Production of the steel case is being discontinued. The bullet consists of a gilding metal jacket on an alloy core of 90% lead, 10% antimony. As an alternate, a core of 97.5% lead, 2.5% antimony may be used. The bullet is not boattailed. The neck of the case is crimped into a cannellure in the bullet and yields to a minimum pull of 45 pounds.

Tested for accuracy, the M2 ball groups within a 13-inch circle at 500 yards and within a 15-inch circle at 600 yards.

The following range table gives the external ballistics of the M2 150-grain service bullet. Those of the armor-piercing, incendiary, and tracer bullets vary slightly therefrom due to minor differences in bullet weights and velocities. Use of the IMR 4895 powder, which replaced the older IMR 4876, has shown a decrease in flight time of from one to two seconds at the ranges listed.

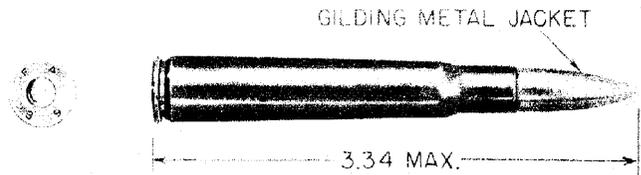
RANGE TABLE

Range (Yards)	Angle of Elevation (Mils)	Time of Flight (Seconds)	Maximum Ordnate (Inches)	Angle of Fall (Mils)
100	0.7	0.12	0	1
200	1.5	0.25	3.6	2
300	2.4	0.38	7.2	3
400	3.4	0.53	14.4	4
500	4.6	0.70	21.6	6
600	6.0	0.89	36.0	9
700	7.7	1.11	61.2	12
800	9.6	1.35	86.4	17
900	11.9	1.62	159.6	22
1,000	14.6	1.91	183.6	28

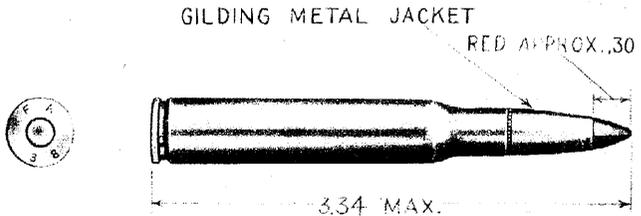
TRACER, CAL. .30, M1, is used in machine guns and rifles to indicate the path of the bullet in flight as an aid in fire against moving targets. The round is identified by a red point, approximately .30 inch long, on the bullet. A 17-grain tracer compound is ignited by the propelling charge and burns with a brilliant red flame. The length of the trace is approximately 1,000 yards. Tracer bullets have an incendiary effect upon targets struck before the trace has burned out, but this action is not so pronounced nor so reliable as with rounds loaded for incendiary purposes.

The trajectory of the Tracer, M1, bullet crosses that of the Ball, M2, and Armor-Piercing, M2, at approximately 600 yards.

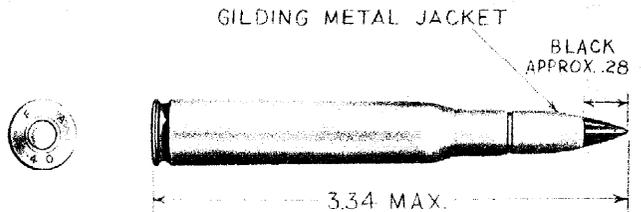
ARMOR-PIERCING, CAL. .30, M2, is designed for fire against enemy aircraft, lightly armored vehicles, and similar targets. The round is identified by a black tip on the bullet. The core is of hardened steel instead of the lead alloy used in the ball cartridge.



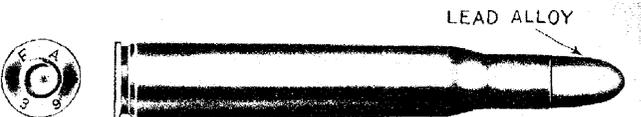
BALL, CAL. .30, M2



TRACER, CAL. .30, M1



ARMOR-PIERCING, CAL. .30, M2



GUARD, CAL. .30, M1

INCENDIARY, CAL. .30, M1—This round, used for the purpose indicated by its designation, has not been manufactured since November, 1943. Existing stocks are issued for use in caliber .30 rifles and machine guns. The round is identified by the light-blue tip, approximately .30 inch in length, on the bullet. The bullet is not boattailed and contains a chemical incendiary compound which ignites upon contact.

GUARD, CAL. .30, M1—This round was formerly designated Gallery Practice, cal. .30, M1919, and was used as a reduced load for indoor and short-range outdoor practice. It is now standard for guard purposes where long-range, high-velocity loads are neither necessary nor desirable. It may be identified by its shorter length (2.95 inches overall) and the short, round-nose, lead bullet.

RIFLE GRENADE, CAL. .30, M3—This specialized cartridge is used in caliber .30 rifles of all types for firing rifle grenades

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SMALL ARMS AMMUNITION (Continued)

from the Grenade Launchers, M1, M2, and M7. It is not used in machine guns. It may be identified by the five-petal rose crimp of the nose of the case.

The case is base-loaded with 5 grains of FFFG black powder for rapid ignition, then with 45 grains of a progressive-burning IMR powder.

BLANK, CAL. .30, M1909—This round is a standard item of issue for use in all caliber .30 rifles during maneuvers, for signaling, and for firing salutes. By means of a blank-firing adapter it may be used for training purposes in machine guns and automatic rifles. The round may be identified by the absence of a bullet and a cannellure in the neck of the case against which the cardboard wad is seated and sealed with a drop of shellac. Blank rounds may be distinguished from rifle grenade cartridges by a roll crimp at the neck of the case. The rifle grenade cartridge case is closed with a rose crimp.

The complete assembly of the blank round weighs approximately 207 grains. Second-grade cases may be used in the assembly of blank ammunition.

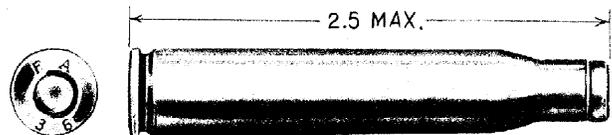
DUMMY, CAL. .30, M2—This dummy cartridge was standardized by Ordnance Committee action 23 March 1944 (OCM 23258). It replaces the Cartridge, Dummy, Cal. .30, M1906,

for use in training personnel in loading weapons and in simulated fire. The longitudinal corrugations which identified the M1906 cartridge prevented proper fit in belts and magazines and caused failures to feed. Manufacture of cases with longitudinal corrugations was discontinued and the new dummy round, Cal. .30, M2, is identified by two holes drilled through the case, which may be of either steel or brass. Cartridge, Dummy, Cal. .30, M1906, was reclassified as Limited Standard.

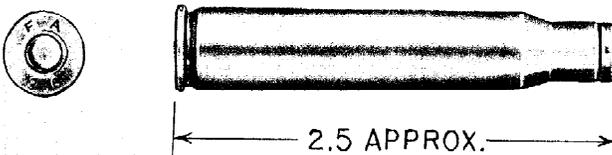
HIGH-PRESSURE TEST, M1—This cartridge is used for proof-firing rifles, automatic rifles, and machine guns and is loaded with a powder charge sufficient to develop breech pressure of approximately 68,000 pounds. Due to the danger involved in such pressures, weapons under test are fired from a fixed rest under a hood and the trigger is released mechanically. Only authorized personnel are permitted to fire this cartridge and great care is taken with its issue to prevent it becoming mixed with service ammunition. The cartons in which the cartridges are packed are labeled with a description of the round and the word "Dangerous." Individual cartridges are identified by the tinned brass case, the color of which is different from that of any service round.

SUBCALIBER, CAL. .30, M1925—This is a Limited Standard item and is issued only for firing from the subcaliber tube in the 3-inch (15 pounder) Guns, M1902 and M1903. It differs from all other caliber .30 cartridges in that it uses a rimmed case. The complete round weighs 385.5 grains.

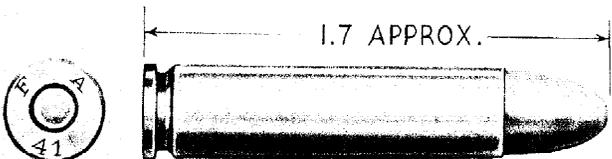
CARBINE, BALL, CAL. .30, M1—This is the standard cartridge for use in the U. S. Carbines, Cal. .30, M1 and M1A3. It can be fired in no other caliber .30 weapon and is immediately identified by its small size (1.68 inches overall) and the straight case. It is manufactured as Ball, M1; Tracer, M16; Grenade Cartridge, M6, for firing rifle grenades from Launcher, M8; as a Dummy, M13; and as a high-pressure test load developing a breech pressure of approximately 50,000 pounds. There is no blank cartridge for the Carbine, M1, nor are cartridges made with armor-piercing or incendiary bullets. The grenade cartridge is identified by the absence of a bullet and the rose crimp which closes the mouth of the case; dummy cartridges are identified by the usual holes in the case.



RIFLE GRENADE, CAL. .30, M3



BLANK, CAL. .30, M1909



CARBINE, BALL, CAL. .30, M1



GRENADE, AUXILIARY, M7

RANGE TABLE

Range (Yards)	Angle of Elevation (Mils)	Time of Flight (Seconds)	Angle of Fall (Mils)
100	1.5	0.17	1.7
200	3.5	0.38	4.8
300	6.2	0.64	9.4
400	9.7	0.94	15.6
500	14.0	1.28	23.5

GRENADE, AUXILIARY, M7—This special-purpose round was developed as a booster to obtain increased ranges and higher velocities with rifle grenades and ground signals fired from grenade launchers mounted on U. S. rifles and carbines. The name "vitamin pill" was given the cartridge during its development and has clung to it since it has been made an item of standard issue.

Actually, the cartridge is a tube of drawn brass 0.45 inch in diameter and resembling in every way a caliber .45 blank cartridge, rimmed. There is a no primer but a hole is drilled through the center of the base. Both that hole and the mouth of the case are sealed by paper wads against the escape of the 20 grains of powder with which the cartridge is loaded.

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The cartridge is inserted in the muzzle of the grenade launcher and retained there by the rimmed base. The flame of the regular grenade cartridge fired in the chamber of the rifle burns through the paper wad sealing the mouth of the case and ignites the auxiliary charge. The effect is that of a booster and the grenade is launched at greater speed and attains a range of from 100 to 150 yards above that to be expected when the grenade cartridge is used alone. The fired auxiliary cartridge is expelled from the launcher with the grenade.

CALIBER .45 CARTRIDGES

BALL, CAL. .45, M1911—This cartridge is standard for the Pistol, M1911A1, the Colt and Smith & Wesson Revolvers, M1917 (Limited Standard), and the Submachine Gun, Cal. .45, M3. Substitute and Limited Standard submachine guns are also chambered for this cartridge. When fired in the M1917 revolvers the cartridges must first be loaded in lunate clips holding three rounds.

The round is made as a Dummy, M1921, for training personnel in loading pistols and submachine guns. The dummy cartridge uses a steel case and may be distinguished by the absence of a primer and by three 1/8-inch holes drilled equidistantly about the case.

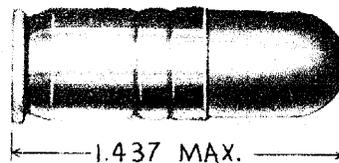
Cartridge, Blank, Cal. .45, M1, is issued only for use in training cavalry horses and for saluting purposes in the M1917 revolvers. It is made with a rimmed case to permit its use without clips in the revolvers. There is no bullet and the mouth of the case is taper-crimped for 5/16 inch. The rim prevents the use of the caliber .45 blank cartridge in either pistols or submachine guns. A rimless caliber .45 blank cartridge which may be used in those weapons was standardized 11 November 1943. It is designated Cartridge, Blank, Cal. .45, M9 (Rimless).

RANGE TABLE

Range (Yards)	Time of Flight (Seconds)	Drop (Inches)
10	0.037	0.3
20	0.075	1.1
30	0.113	2.4
40	0.151	4.4
60	0.229	9.9
80	0.308	18.0
100	0.388	28.0

HIGH-PRESSURE TEST, CAL. .45, M1—This special cartridge is loaded for testing caliber .45 weapons at arsenals or at their places of manufacture. Its excessive powder charge develops a breech pressure of approximately 20,000 pounds, 4,000 pounds above normal pressure. The high-pressure test cartridge is fired by mechanical means with the weapon in a fixed rest and shielded. Only authorized personnel are permitted to conduct such tests. The high-pressure test cartridge may be identified by the tinned case.

SHOT, CAL. .45, M12, M15—This round was developed as an article of issue to Air Corps personnel and others who might be compelled to land upon uninhabited islands or in jungle areas where survival might depend upon small birds and animals shot "for the pot." The bullet is replaced by a capsule of wax-impregnated paper, red in color, which contains approximately 118 pellets of size 7 1/2 shot. Reports from using arms indicated that difficulty had been experienced with swelling of the paper-capsule M12 cartridge in excessively humid areas and that the shot patterns produced by that cartridge were not



SHOT, CAL. .45, M12



SHOT, CAL. .45, M15



BALL, CAL. .50, M2

consistent. Cartridge, Shot, Cal .45, M15, was developed to overcome those difficulties. It is a straight brass case, closed by a top wad, and containing both the powder charge and the shot. It is similar in construction and appearance to a brass shotgun shell. The M15 cartridge was standardized 30 December 1943.

CALIBER .50 CARTRIDGES

BALL, CAL. .50, M2—The standard service cartridge for all types of the caliber .50 machine gun, used in all theaters of operation by land, sea, and air forces. The round is also issued as Tracer, M1 (red-tipped bullet); as Armor-piercing, M2 (black tip); and as Incendiary, M1, identified by a light-blue tip on the bullet. A bullet combining the armor-piercing and incendiary characteristics is in process of development.

The mouth of the case of the caliber .50 round is crimped into a cannellure machined on the bullet. A minimum pull of 100 pounds is required to remove the bullet from the case.

The Tracer Bullet, M1, is not boattailed, the base of the projectile being open to permit ignition of the tracer compound. The trace, bright red in color, begins at a point not more than 250 feet from the muzzle and continues for approximately 1,600 yards.

DUMMY, CAL. .50, M2, is used for training personnel in loading and unloading machine guns and ammunition belts. The round may also be used for testing extraction and ejection and other mechanical features of the gun. It is identified by the absence of a primer and by three holes drilled equidistantly about the case at its midpoint. Both brass and steel cases are used in assembling dummy rounds.



SMALL ARMS AMMUNITION (Continued)

HIGH-PRESSURE TEST, CAL. .50, M1—This cartridge is over-loaded with a charge of IMR powder sufficient to develop a breech pressure of 62,500 pounds for any ten consecutive shots. Guns under test are fired mechanically from a fixed rest and from under a hood.

The high-pressure round, caliber .50, is identified by the tinned case.

RANGE TABLE

Range (Yards)	Angle of Elevation (Mils)	Time of Flight (Seconds)	Maximum Ordinate (Inches)	Angle of Fall (Mils)
200	1.2	0.22	3.6	1.4
400	2.7	0.46	10.8	3.3
600	4.3	0.72	25.2	5.2
800	6.1	1.00	50.4	7.4
1,000	8.2	1.32	86.4	10.5
1,200	10.7	1.69	131.4	15.4
1,400	13.7	2.10	216.0	22.0
1,600	17.3	2.56	311.4	30.5
1,800	21.5	3.07	457.2	40.6
2,000	26.3	3.61	630.0	52.3

CALIBER .22 CARTRIDGES

BALL, CAL. .22, LONG RIFLE—This cartridge superseded the caliber .30 Gallery Practice Cartridge, M1919. It is used in the caliber .22 U. S. Rifles, M1922, M1922A1, and M2; in caliber .22 Machine Gun Trainers, M3 and M4, and in pistols and revolvers for gallery practice and training purposes. It is not manufactured by the Ordnance Department but is purchased from commercial makers.

This cartridge is the only rimfire round used by the armed forces. The cartridge case is of steel, brass, copper, or gilding metal and the ignition charge is spun into a circular recess inside the rim instead of being seated in the head of the case as a separate component. A blow from the firing pin on any point of the rim explodes the priming composition and ignites the propelling charge. Caliber .22 long rifle ammunition as purchased is manufactured with a noncorrosive, nonmercuric primer compound.

Characteristics of various makes of caliber .22 ammunition vary slightly. The powder charge is approximately 1.7 grains and the weight of the lead bullet is approximately 40 grains. Caliber .22 rifles and ammunition are notoriously "tempera-

mental" and the rifle which gives only a fair performance with ammunition of one make may produce excellent targets when fired with cartridges of another manufacturer or even of another lot.

Containers of caliber .22 ammunition are marked by the manufacturer with the lot number and such trade names as "Kleanbore," "Lubaloy," "Tackhole," etc. This practice provides a means of identifying and reporting any ammunition which may become defective.

Caliber .22 long rifle cartridges of different manufacturers show slight variations in velocity and pressure. The average muzzle velocity is 1,100 feet per second and the chamber pressure averages 16,000 pounds. The maximum range is approximately 1,500 yards with the muzzle elevated at an angle of 30°.

Neither dummy nor high-pressure test cartridges are purchased or manufactured by the Ordnance Department in caliber .22 long rifle. A blank cartridge, designated Cartridge, Field Artillery Trainer, M2, is issued to field artillery units as the propellant for a 1-inch diameter steel ball, hardened, ground, and polished, which serves as the projectile in the Field Artillery Trainer, M2 and M2A1. The ball weighs 1,024 grains and is propelled at an estimated velocity of 100 feet per second.

SHOTGUN SHELLS

SHELL, SHOTGUN, 12 GAGE—Shotgun shells are purchased by the Ordnance Department from commercial manufacturers for use in sporting and riot type shotguns, issued for guard and combat use and for hunting and trap or skeet shooting. The purpose for which the shell is intended may be determined by inspection of the top wad which is marked with the size shot loaded in the shell. Shells for guard or combat use are loaded with 26 grains of a dense smokeless powder and 1¼ ounces of No. 00 shot—"buckshot." Shells for trap shooting or sporting use have a lighter load of 3 drams of bulk smokeless powder and 1¼ ounces No. 8 chilled shot. Shells loaded with No. 6 shot are issued as a hunting load.

The cases of shotgun shells are customarily of wax-impregnated paper. Brass shells may be issued for use in the excessive moisture of the tropics.

Primer, make of powder used in the charge, and other characteristics of shotgun shells are as supplied by the manufacturer.

CHARACTERISTICS

(External ballistics, as here shown, are approximate figures only. Muzzle velocity of the cal. .30, Ball, M2, when fired from a rifle will differ from that obtained from the same cartridge fired from a machine gun. The performance of the cal. .45 ball cartridge fired in the Pistol, M1911A1, is not identical with that of the cartridge fired in the Submachine Gun, M3.)

	Weight, Round (Grs.)	Weight, Bullet (Grs.)	Weight, Powder (Grs. approx.)	Length, Round (Inches)	Length, Bullet (Inches)	Muzzle Velocity (Ft. per sec.)	Muzzle Energy (Ft.-lb.)	Pressure (Lb.) (Copper)	Maximum Range (Yds.)
.30 Ball, M2	396	152	50	3.34	1.125	2,805	2,429	50,000	3,500
.30 A-P, M2	414	162	51	3.34	1.39	2,775	2,780	50,000	3,500
.30 Tracer, M1	396	152.5	50	3.34	1.45	2,750	2,775	50,000	3,450
.30 Incend., M1	386	140	54	3.32	1.41	3,050	2,700	52,000	5,500
.30 Guard, M1	346	142	10.5	2.95	0.82	1,200	376	15,000	2,500
.30 Carbine, M1	193	110	14	1.68	0.69	1,975	775	41,000	2,000
.45 Ball, M1911	327	234	6	1.28	0.68	825	383	14,000	1,700
.50 Ball, M2	1,830	711.5	250	5.45	2.29	2,935	10,765	52,000	7,200
.50 Tracer, M1	1,789	681	220	5.45	2.40	2,865	10,400	52,000	6,000
.50 A.P., M1	1,837	718	250	5.45	2.31	2,985	10,700	52,000	7,200
.22 l.r., ball	53	40	1.7	.984	0.46	1,100	102	16,000	1,500

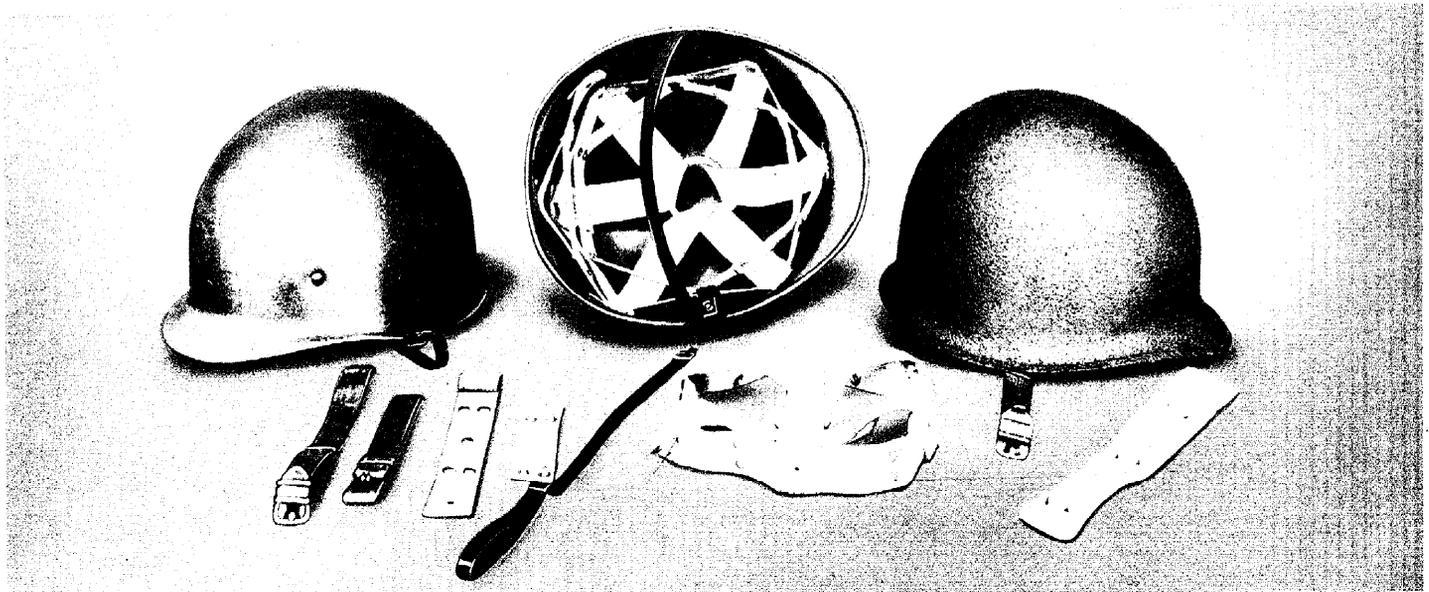
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**SMALL ARMS
EQUIPMENT**

Small arms equipment includes all types of rifles, pistols, shotguns, and other firearms, as well as accessories such as magazines, scopes, and cleaning kits.

Small arms equipment is used for a variety of purposes, including law enforcement, military operations, and personal defense.

HELMETS M1, M3, M4—STANDARD



HELMET, M1

HELMET, M1, is a standard article of issue for the use of ground troops in all branches of the service. It was designed as an improvement on the M1917A1 helmet, now Limited Standard. Changes in design were to provide maximum protection with no increase in weight or interference with vision or hearing. The M1 helmet is shaped to stay on the head while the wearer is running, and the narrower brim does not interfere with aiming or firing.

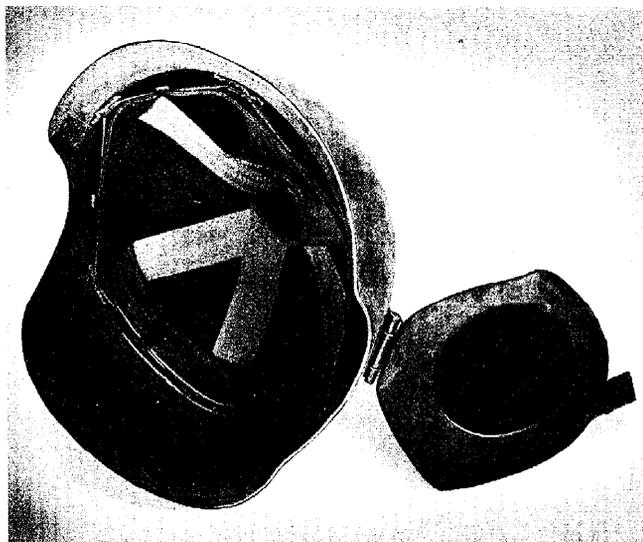
Two linings are provided; one to protect the wearer from heat in tropical operations, the other as a protection against extreme cold.

All U. S. helmets are non-magnetic, an important feature when worn by men whose duties require the use of compasses or other instruments which might be affected by magnetism.

HELMET, M3—The M3 helmet was designed for use in air operations and is satisfactory equipment for the majority of crew members of combat aircraft. It is made on the same draw dies used in the manufacture of the M1 helmet but is equipped with hinged earflaps to permit its use with the earphones of aircraft intercommunication systems.

Since it fits directly over the leather flying helmet, the M3 is not provided with a liner.

HELMET, M4, is a series of laminated steel plates shaped to fit the head and covered by leather and fabric. The original design was battle-tested by members of the Eighth Air Force and was submitted by that organization. It is for the use of turret gunners and other crew members who operate in quarters so cramped that use of the M3 helmet would be impracticable if not impossible. The M4 helmet has no liner and fits snugly over the leather flying helmet.



HELMET, M3

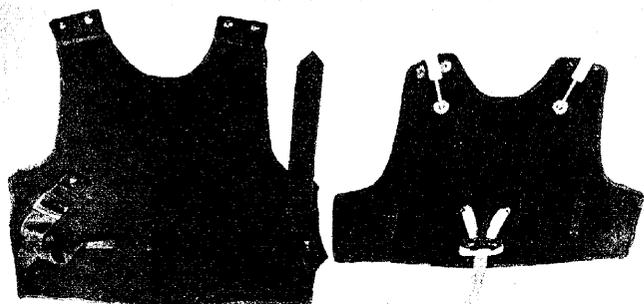


HELMET, M4

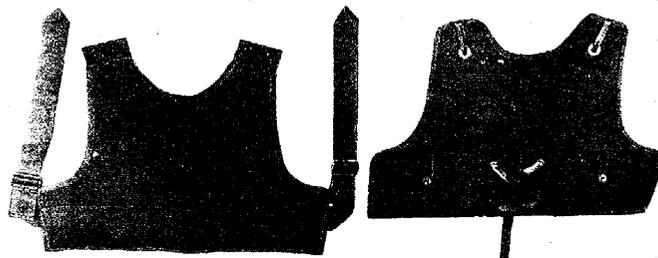
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BODY ARMOR—STANDARD

VESTS, FLYER'S, M1 AND M2—APRONS, FLYER'S, M3 AND M4—ARMOR, GROIN, M5—STANDARD



FLYER'S VEST, M1



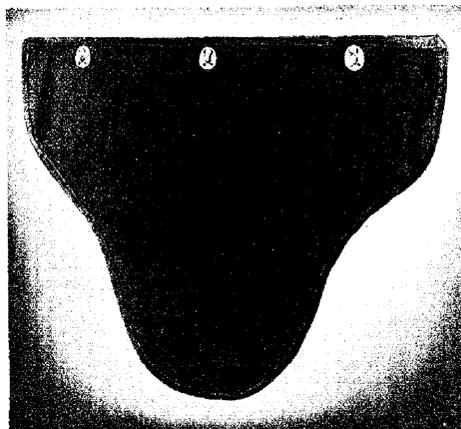
FLYER'S VEST, M2

An urgent request for body armor for pilots and crews of aircraft was received 6 July 1943. Within thirty days 3,960 armored vests and 3,320 armored aprons had been delivered for overseas shipment. More than 20,000 additional units were shipped within the five weeks following.

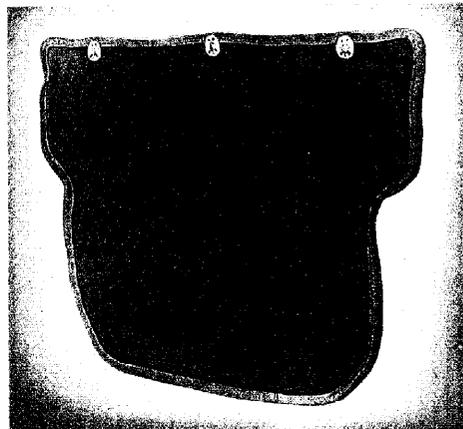
The five items listed are basically similar, being composed of overlapping steel plates, flat or curved, in pockets of elastic webbing which are covered with a backing of nylon duck. Tests proved this material superior in shock-resistant qualities to rayon, linen, or cotton duck. Corduroy and a light cotton duck are used

for the back and front facings.

Since any additional weight greatly increases the shock of landing from a parachute jump, all armor is designed so that it may be thrown aside without loss of time in case a parachute escape from a disabled plane should be necessary.



FLYER'S APRON, M4



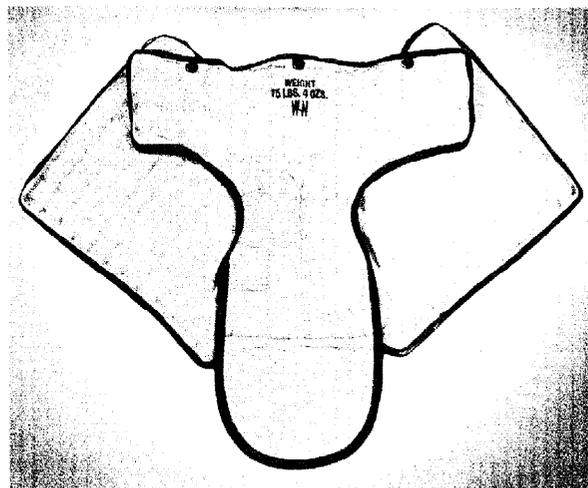
FLYER'S APRON, M3

ARMOR, FLYER'S VEST, M1—Both front and back of this garment are fully armored and afford a maximum of protection to the wearer's chest and upper dorsal region. Front and back are joined together by snap fasteners over the shoulders and by a belt about the waist. Greater flexibility is obtained by the use of an elastic shock cord securing the lower edge of the armored back.

ARMOR, FLYER'S VEST, M2—This garment is similar to the M1 vest but is shorter and is designed to protect only the upper chest. The back is unarmored. The M2 vest is intended for wear by pilots and others whose station is in a seat which in itself gives protection to the back.



ARMOR AS WORN



ARMOR, GROIN, M5

ARMOR, FLYER'S APRONS, M3 AND M4—These aprons are attached to the M1 and M2 vests as a protection to the wearer's abdomen. The M4 tapered apron protects a somewhat smaller area than the rectangular M3 apron and is worn where greater freedom of movement is required. Both aprons are of curved plates of manganese steel in a backing of nylon duck.

ARMOR, GROIN, M5—This item consists of three units, hinged one to another, and each composed of overlapping plates shaped so as to afford maximum protection to the wearer's abdomen, inguinal areas, and thighs. It attaches to the vests and replaces the aprons.

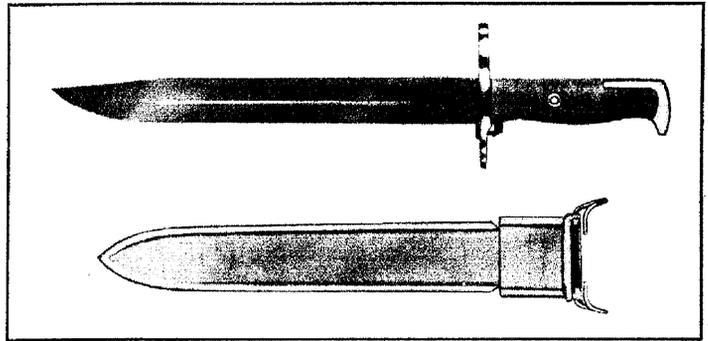
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BAYONET M1—SCABBARD, BAYONET, M7—STANDARD

This offensive and defensive weapon has replaced the M1905 bayonet on all U. S. Army rifles and incorporates various improvements which experience with the older model had shown to be desirable. The new bayonet is shorter, better balanced, and may be used if necessary as a trench knife in hand-to-hand combat. It measures 14.4 inches long overall, has a ten-inch blade, and weighs 13.5 ounces.

A bayonet is now being developed for the Carbine, M1.

SCABBARD, BAYONET, M7, has replaced the M3 scabbard issued with the M1905 bayonet. It is made of plastic, is 11.2 inches long, and weighs 5 ounces.



BAYONET, M1, AND SCABBARD, BAYONET, M7

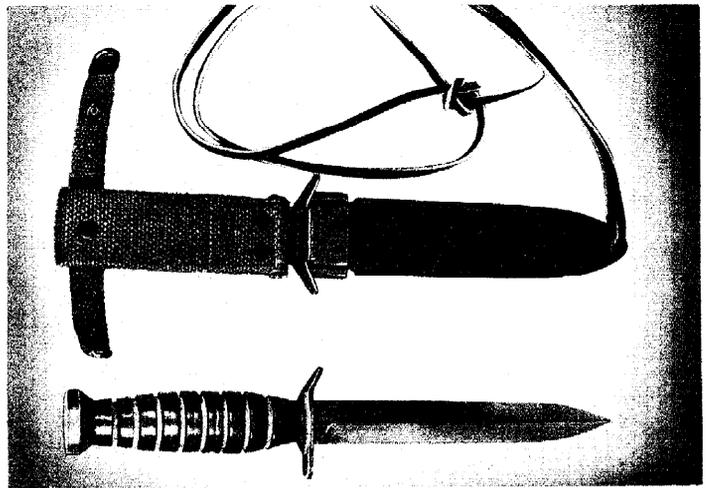
KNIFE, TRENCH, M3—SCABBARD, TRENCH KNIFE, M8—STANDARD

The Trench Knife, M3, has been developed to fill the need in modern warfare for an efficient weapon for hand-to-hand fighting. While designated for issue to soldiers not armed with the bayonet, it was especially designed for such shock units as parachute troops and rangers.

The shaped and corrugated handle is of leather washers under compression. One cutting edge runs the full length of the blade; the other edge of the blade is ground to a cutting edge for $2\frac{3}{4}$ inches from the point, then tapers to a thicker section for rigidity and strength.

The knife weighs 9 ounces and measures 11.7 inches overall. The blade is 6.7 inches long.

Experiments are being conducted with modifications of the trench knife which would permit its use as a bayonet for the Carbine, M1.



TRENCH KNIFE, M3, AND SCABBARD, M8

SCABBARD, TRENCH KNIFE, M8, is made of plastic and replaces the leather scabbard, M6, formerly issued as a sheath for this weapon. The plastic is reinforced with metal about the

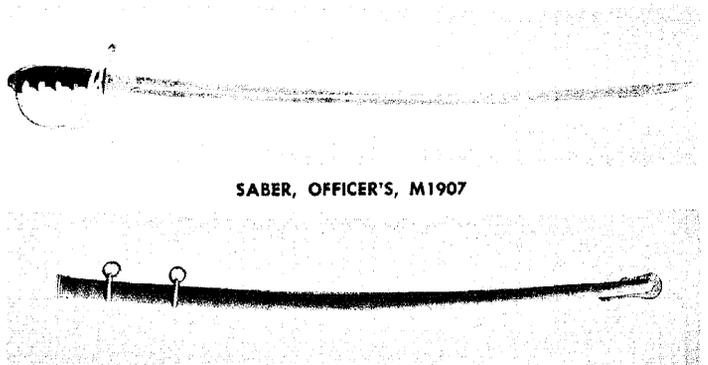
tip of the blade to protect the wearer from injury in event of a fall or other accident. The scabbard weighs approximately 4 ounces and is 14 inches long overall.

SABER, OFFICER'S, M1907—SCABBARD, SABER, OFFICER'S, M1907—STANDARD

The saber and its scabbard are maintained as standard items of officer's equipment but their use and issue have been discontinued for the period of the war. The saber is procured and stored by the Ordnance Department but is issued by the Quartermaster Corps.

The M1907 saber is furnished in three blade-lengths, 30, 32, and 34 inches; the overall lengths being $35\frac{1}{2}$, $37\frac{1}{2}$ and $39\frac{1}{2}$ inches. The grip is of hard rubber and is $5\frac{1}{2}$ inches long. The weight of the saber with 30 inch blade is 1.3 pounds.

The Scabbard, M1907, is issued in three lengths corresponding to those of the saber. It is of metal construction throughout and weighs 12 ounces in 30-inch length.



SABER, OFFICER'S, M1907

SCABBARD, SABER, OFFICER'S, M1907

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HOLSTERS, PISTOL, CAL. .45, M1916, M7—STANDARD

HOLSTER, PISTOL, CAL. .45, M1916—

This item is the standard belt holster for the caliber .45 pistol, M1911A1. It is made of heavy grain leather and fitted with metal hooks for mounting on standard web belts. Slots in the leather below the metal hook permit the insertion of a belt not fitted with eyelets.

The holster is closed by a flap which buttons over a bronze stud. An eyelet in the bottom permits the insertion of a thong for tying the lower end of the holster to the leg.

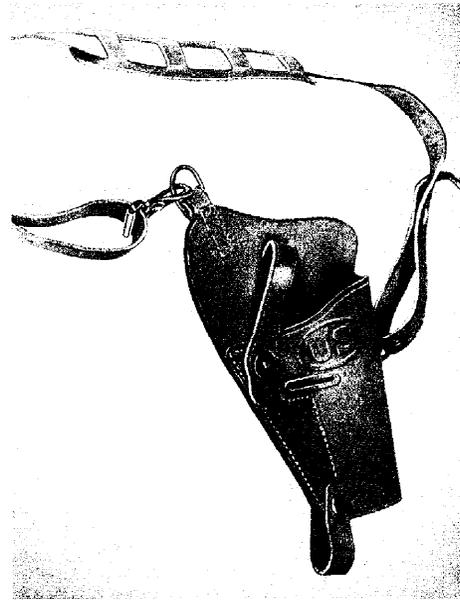
HOLSTER, PISTOL, CAL. .45, M7—

Under many conditions a pistol can be carried more advantageously in a holster slung from the shoulder than in the more conventional belt holster. Mounted men, drivers and crews of motor-driven vehicles, airplane crew members who carry the pistol as a defense weapon in the event of a forced landing, infantrymen who are called upon to ford streams, paratroops and ranger units—all these find a shoulder holster superior to one worn on the belt.

The present shoulder holster, M7, embodies certain modifications and im-



HOLSTER, PISTOL, CAL. .45, M1916



SHOULDER HOLSTER, CAL. .45, M7

provements upon the M3 holster. The shoulder strap fastens with a ring and snap and may be removed more quickly than the buckle fastening used on the M3 holster. Supplementary adjustments in the strap are made by a thong hitch instead of a buckle, a method which

insures a smooth surface between the wearer and the back of a chair or seat. If desired, the shoulder straps may be removed and the holster worn upon a waist belt.

The M7 holster was standardized by O.C.M. 21938, 28 Oct. 1943.

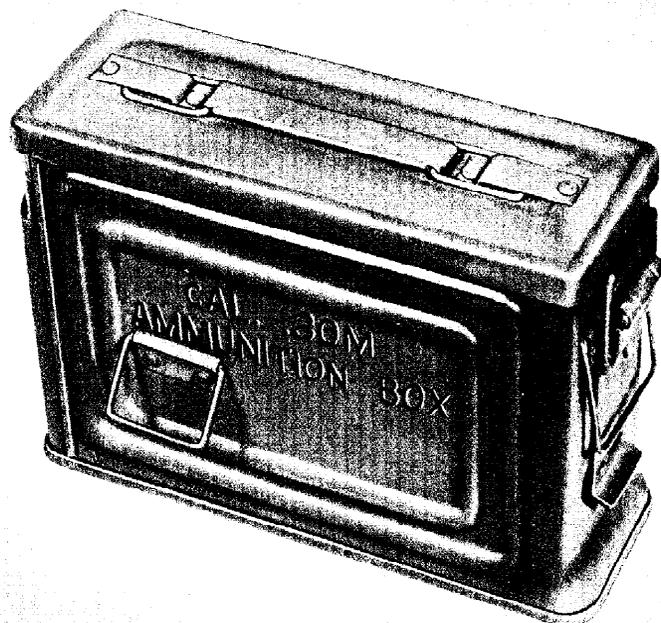
AMMUNITION BOXES—CAL. .30, M1, AND CAL. .50, M2—STANDARD

These sheet-steel containers have completely replaced the wooden boxes formerly used for small arms ammunition. They are fire-resistant, virtually moisture-proof, and since no wood is used in their construction will never be attacked by termites—a constant menace to wooden boxes in storage. Low manufacturing cost permits their being classified as expendable items yet if transportation to supply centers is available they may be refilled over and over again.

The hinged lids seal tightly but may be completely removed if necessary; hasps permit either box to be hung on the brackets of .30 caliber and .50 caliber machine gun mounts; the carrying handles fold into recesses flush with the lids and the boxes may be packed solidly one on top of another.

Illustrated herewith is Box, Ammunition, Cal. .30, M1. It weighs empty 3.5 lb.—one-half the weight of a wooden container of the same size—and is $10\frac{3}{8}$ ins. long, $3\frac{3}{4}$ ins. wide, and $7\frac{1}{2}$ ins. high. It will contain one M1917 ammunition belt loaded with 250 rounds of cal. .30 ammunition.

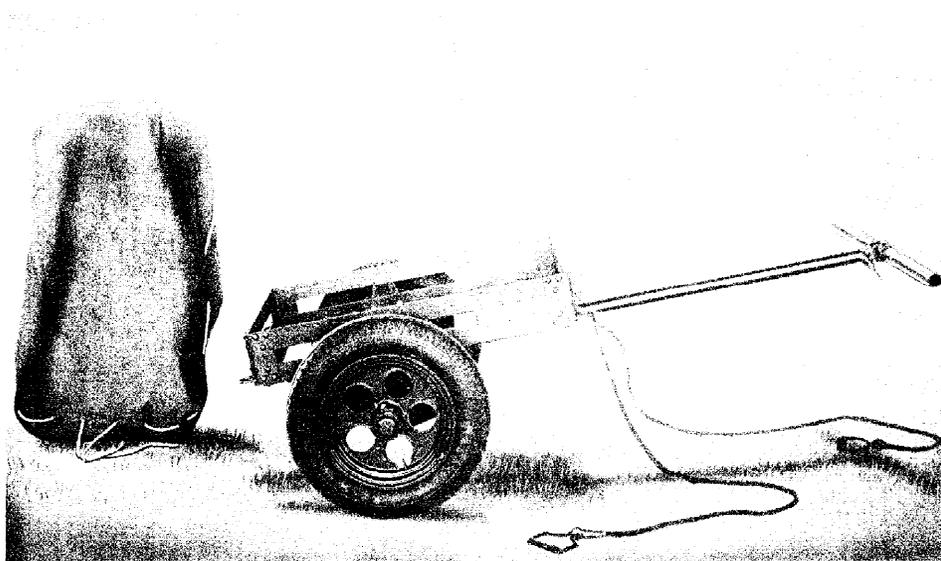
The caliber .50 box, M2, is similar in shape but of heavier construction. It weighs 4.4 lb. empty, is $12\frac{1}{4}$ ins. long, $6\frac{1}{4}$ ins. wide, and $7\frac{1}{2}$ ins. high. Its capacity is one 110-round fabric belt, M7, or 105 rounds of linked cal. .50 ammunition.



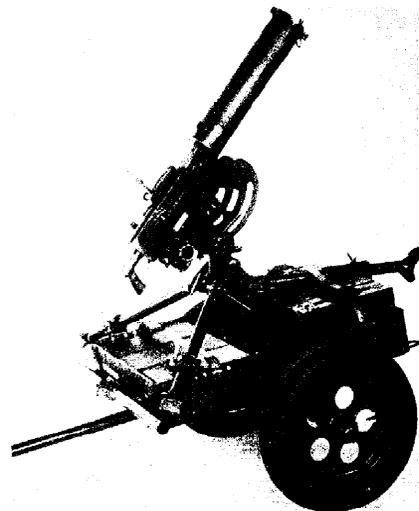
AMMUNITION BOX, CAL. .30, M1

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HAND CARTS M3A4, M4A1, M5A1—STANDARD



HAND CART, M3A4, WITHOUT FITTINGS



HAND CART, M4A1, WITH CAL. .30
MACHINE GUN ON MOUNT

All three of these carts are built upon the same basic design with superstructure varied to suit different purposes. Cart, M3A4, has a plain crate-type body. Cart, M4A1, has three clamp-type brackets to receive the legs of a tripod mount. Cart, M4A1, is adapted for transportation of a Browning Machine Gun, cal. .30, M1917, on Mount, Tripod, M1917A1, the mount being fastened to the cart by means of the brackets. Straps are provided to hold ammunition chests in place.

Cart, M5A1, has brackets to secure the

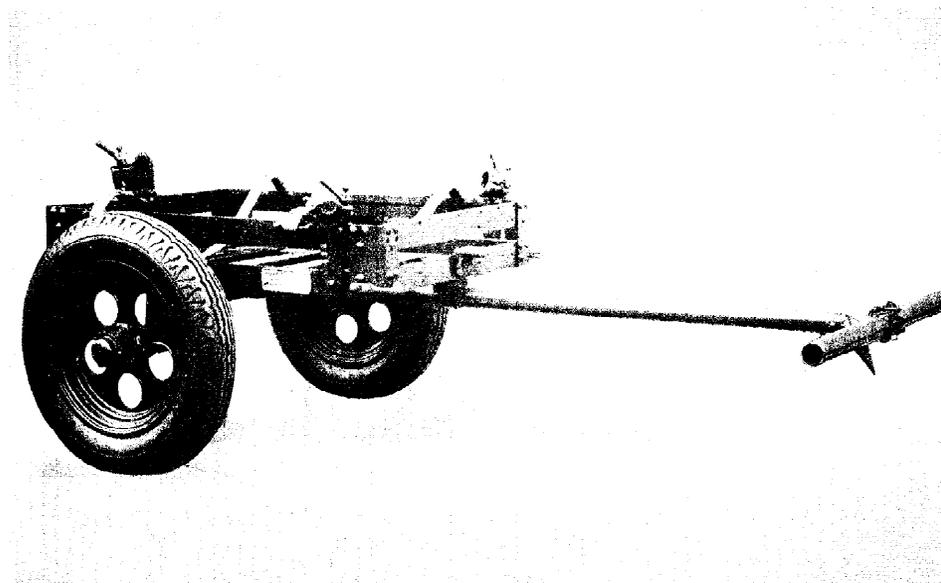
Browning machine gun, cal. .50, M2, HB, flexible, and the machine gun tripod mount, cal. .50, M3, during transit. The brackets are equipped with quick-release clamps to facilitate speedy unloading of the hand carts. With the exception of the tires, all parts of these carts are of aluminum alloy, instead of the steel formerly used in the construction of these vehicles. Tires are of the pneumatic type, 4.00 x 12, 2 ply, high-speed balloon, and are operated at 24 pounds pressure. The overall length of cart and handle is 69.5 inches; width

overall, 39.1 inches; height, 19.8 inches; wheel tread, center to center, 32.5 inches; road clearance, 12 inches.

Cart, M3A4, stripped, weighs 74 pounds. The canvas cover of the cart weighs 6 pounds. With brackets for receiving the machine gun mount, Cart, M4A1, weighs 87.5 pounds. The cal. .30, M1917A1, mount, weighs 30 pounds, and the machine gun, cal. .30, M1917, 32.5 pounds. The gun cradle and pintle weigh 21 pounds.

The remainder of the load comprises five ammunition chests, a water chest, and a spare parts chest. Weight of cover for this assembly is 7.5 pounds.

These carts can be drawn by hand-power and, in addition, are equipped with a lunette for limbering to a motorized or animal-drawn vehicle. When pulled by manpower, a drawbar is secured to the lunette with the hand cart drawbar retaining pin. When not in use, the drawbar is carried on the drawbar bracket which is riveted to the front of the body. Provision is made for attaching two ropes on the cart body when additional manpower is required to pull the load. The pneumatic tires enable the device to be towed at high speeds behind trucks or other motor vehicles. The carts are so designed that two loaded carts can be transported on trucks, placed between the seats provided for personnel.



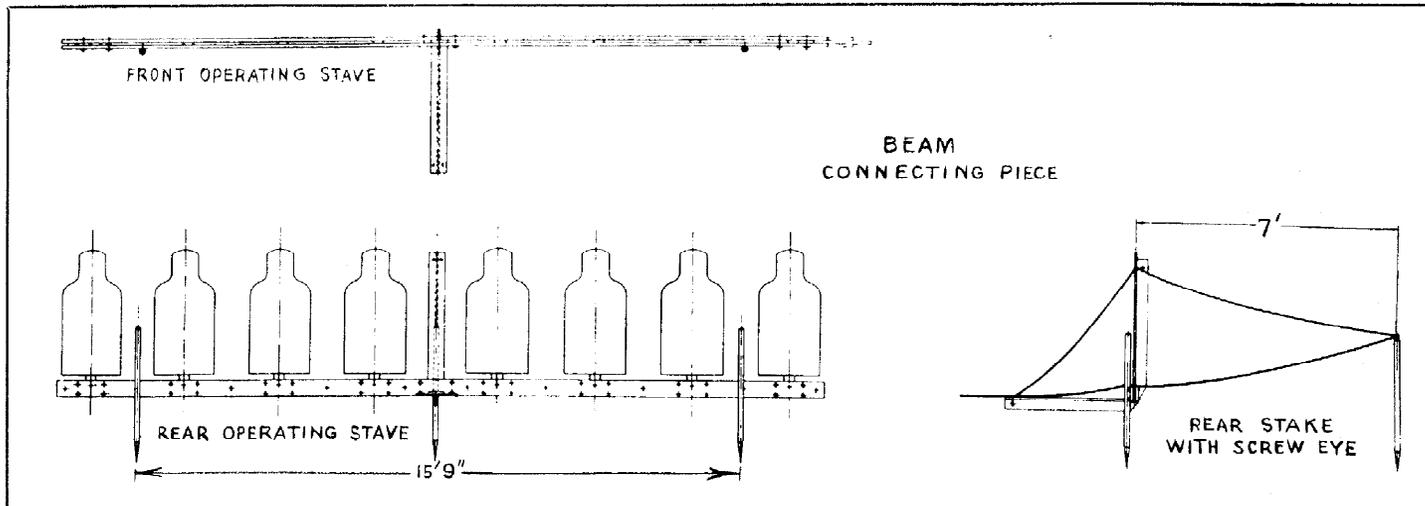
HAND CART, M4A1, WITH BRACKETS FOR RECEIVING MOUNT

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1 MARCH 1944 439

TARGETS AND TARGET MATERIALS



I TARGET, M1913—COMPLETE

The targets and target materials described in this article are used in various marksmanship courses to study technique of fire, bayonet training, and tactical training, including field firing exercises and gunnery practices.

I TARGET M1913

Target "I," M1913, is used in rifle and machine-gun training in the technique of fire. It consists, complete, of a beam in which are inserted eight individual staves, front and rear operating staves, three stakes and an operating cord. The targets may be the E, kneeling, M1917, complete, or the F, prone, M1917, complete, or a combination of the E and F targets.

The target group is set up on the training ground in a shallow trench about 5 feet wide and running the length of the beam. At right angles to the beam, opposite its center in front and rear, a transverse trench is provided of sufficient depth for the front and rear operating staves when in a horizontal position.

In the forward part of the main trench, directly in front of the beam and approximately 15½ feet apart, two stakes are driven into the ground. A third stake, with screw eye, is driven in the ground about 7 feet to the rear of the center of the beam, as shown in the accompanying drawing.

The front and rear operating staves are assembled in T-form, fastened with screws and screwed into sockets in the center of the beam.

By means of a rope, the beam is rotated to cause the targets to lie flat on the

ground or to stand in erect position, thus appearing and disappearing at the will of the operator.

One end of the rope is fastened in a hole in the rear operating stave and passed through a hole in the front operating stave and on into the operating pit. The other end of the rope is passed over the beam, through the screw eye in the stake at the rear of the beam, then through the hole in the rear operating stave, where it is tied.

The pit in which the operator is sheltered is a sufficient distance in front of the beam to clear the front operating stave and sufficiently deep to provide protection for the operator.

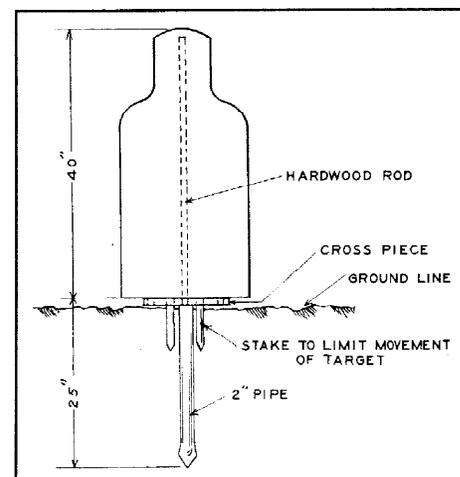
When it is desired to operate two or more beams simultaneously, they are fastened together with a connecting piece and bolts. The beam connecting piece is inserted and bolted in slots provided at each end of the beam. Beams lie in the trench so they cannot be struck by bullets.

The staves of the E, kneeling, and F, prone, targets are inserted in slots in the target beam, each stave being secured with a nail.

BOBBING TARGET M1913

Bobbing Target, M1913, is used for dismantled pistol marksmanship. Complete with accessories, it consists of a pivot stake, a crosspiece, two limit stakes, 175 feet of ¼ inch sash cord, a target rod, a target stave 37 inches long, and a pasteboard target, E, kneeling, M1917. These components are issued knocked down, and are assembled on the range. The height of this target is 5 feet, 5 inches; width, 19.5 inches; weight, 17.2 pounds.

In setting up the target, the pivot stake is driven into the ground at the point where the target is to stand. The crosspiece is placed on the target rod, just above ground line, and fastened with two nails, one on each side.



BOBBING TARGET, M1913

The two limit stakes are then driven into the ground far enough to the rear of the target to permit movement of the target in an arc of 90°. The sash cord, or operating line, is attached to the crosspiece and carried either under or over ground to the position of the operator behind the firing point.

A pasteboard target—E, kneeling, M1917—is then fastened to the target stave with double-pointed tacks and the target stave is nailed to the target rod.

When replacements of target are necessary, silhouette target, E, kneeling, is pasted on the original pasteboard target.

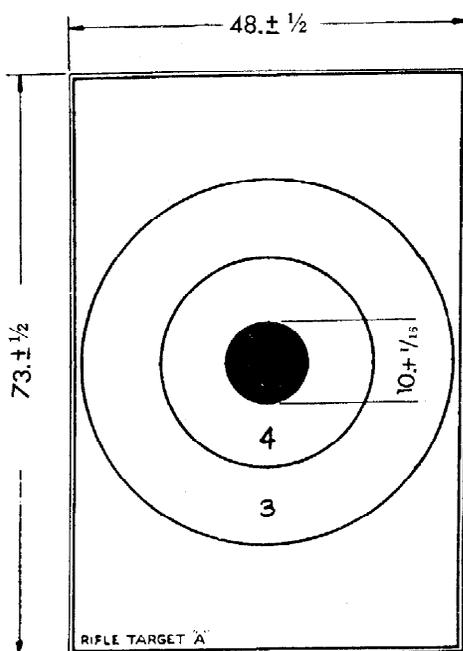
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PAPER AND PASTEBOARD TARGETS

In addition to the targets having special structural features, as illustrated in this section of the Small Arms Volume, a number of paper and pasteboard targets are described below.

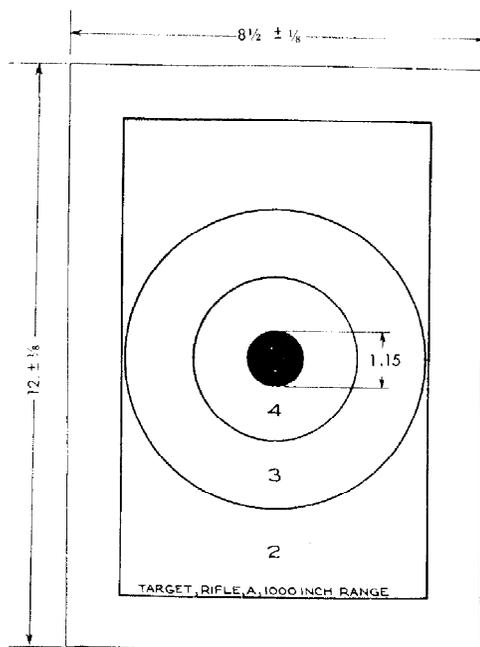
RIFLE TARGET A—Required for: (1) preparatory exercises in rifle marksmanship; (2) slow-fire practice, rifle marksmanship at 200–300 yards; (3) 37 mm tank gun subcaliber target practice at 200–300 yards; (4) 2.24 inch (6 pounder) tank gun subcaliber target practice at 500–600 yards.



RIFLE TARGET A

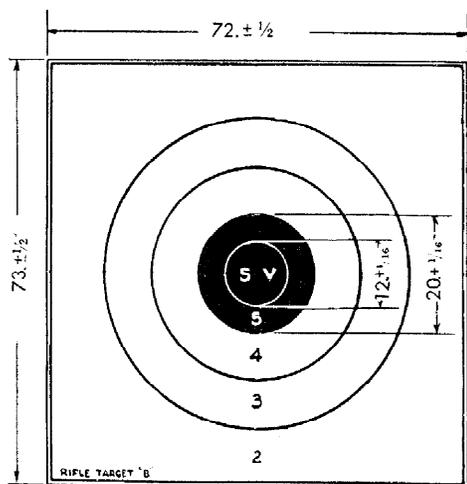
Printed in black on buff manila target paper; measures 6 feet high by 4 feet wide. Packed 50 in a roll, each roll wrapped completely and securely in paper and labeled to indicate contents of roll.

RIFLE TARGET A, 1,000 INCH—Required for firing courses A, B, C, D, with the cal. .30, M1903, and cal. .30, M1, rifles on the 1,000 inch range. Printed in black on buff manila target paper; 12 inches high by 8 1/2 inches wide. Packed 1,000 in a package, each package wrapped completely and securely in paper with label, suitably describing contents, pasted on outside of package.



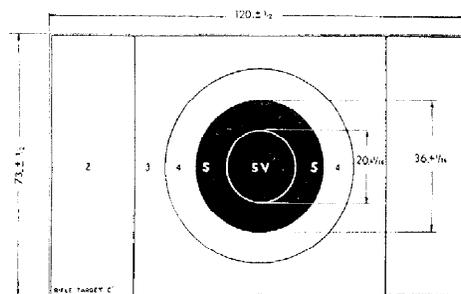
RIFLE TARGET A, 1,000 INCH

RIFLE TARGET B—Measures 6 feet by 6 feet; printed in black on buff manila target paper. Packed 50 in a roll, each roll wrapped completely and securely in paper and labeled to indicate contents. Required for: (1) preparatory exercises in rifle marksmanship; (2) 500 yard slow-fire rifle marksmanship; (3) known-distance instruction; (4) 500–600 yard machine rifle marksmanship; (5) 2.24 inch (6 pounder) tank subcaliber target practice at 500–600 yards; (6) sighting target for 2.24 inch (6 pounder) tank gun marksmanship.



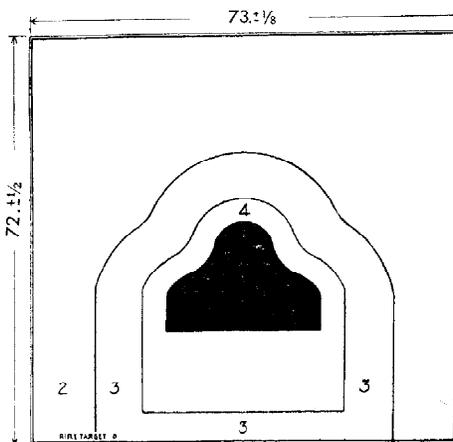
RIFLE TARGET B

RIFLE TARGET C—Required for 800–1,000 yard slow-fire practice, rifle marksmanship and fixed machine-gun aerial ground target. Size 6 feet high by 10 feet wide. Printed in black on buff manila target paper; packed 25 in a roll, each roll completely and securely wrapped in paper, with label pasted on outside of roll suitably describing contents.



RIFLE TARGET C

RIFLE TARGET D—Required for: (1) rapid-fire instruction and record practice, rifle marksmanship, with cal. .30, M1903 and M1, rifles at 200–300 yards; (2) all known-distance range firing, automatic rifle marksmanship; (3) rapid-fire instruction and record practice with automatic rifle at 200–300–500 yards; (4) 200–300–600 yard rapid-fire automatic marksmanship; (5) recording target in exercises in technique of fire; (6) as screen with target H in rifle combat practice. Made of buff target paper, printed in black; packed 50 in a roll, each roll wrapped completely and securely in paper and labeled to indicate contents.

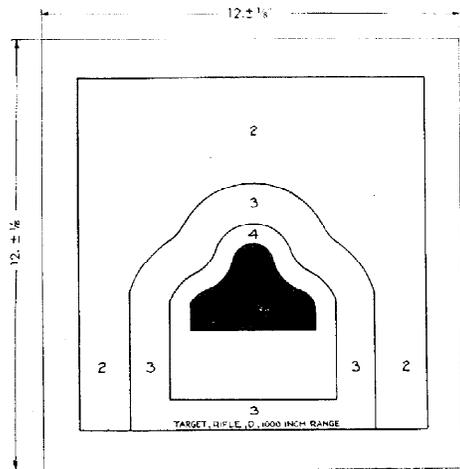


RIFLE TARGET D

UNCLASSIFIED

TARGETS AND TARGET MATERIALS (Continued)

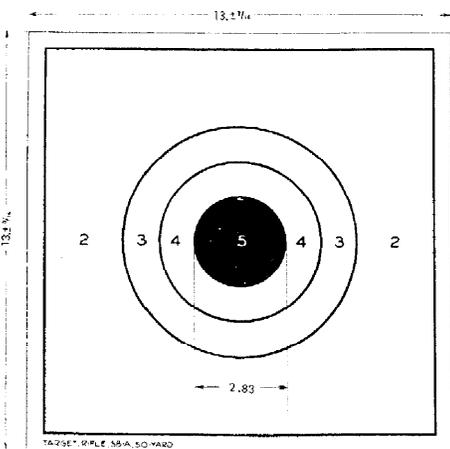
RIFLE TARGET D, 1,000 INCH—Required for firing courses A, B, C and D on the 1,000 inch range with cal. .30, M1903 and M1, rifles. Printed in black on buff manila target paper 12 inches square. Packed 1,000 in a package, each package wrapped completely and securely in paper with label pasted on outside indicating contents.



RIFLE TARGET D, 1,000 INCH

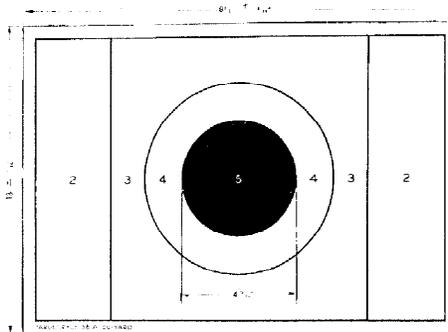
RIFLE TARGET SB-A—For 50-100-200 yard ranges. Printed in black on buff manila paper, packed 500 in a package, each package wrapped completely and securely in paper and labeled to indicate contents.

RIFLE TARGET SB-A, 50 YARDS, is 13 inches square and is required for instruction and record practice with cal. .22 rifle on the 50 yard range.



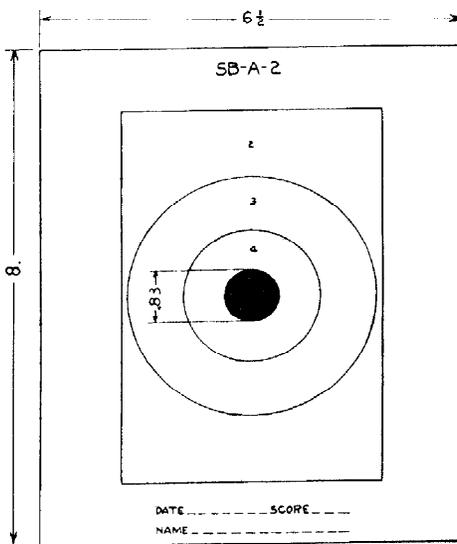
RIFLE TARGET SB-A, 50 YARDS

RIFLE TARGET SB-A, 100 YARDS, is 13 inches high by 18 1/2 inches wide and is required for instruction and record practice, slow fire, with cal. .22 rifle on the 100 yard range.



RIFLE TARGET SB-A, 100 YARDS

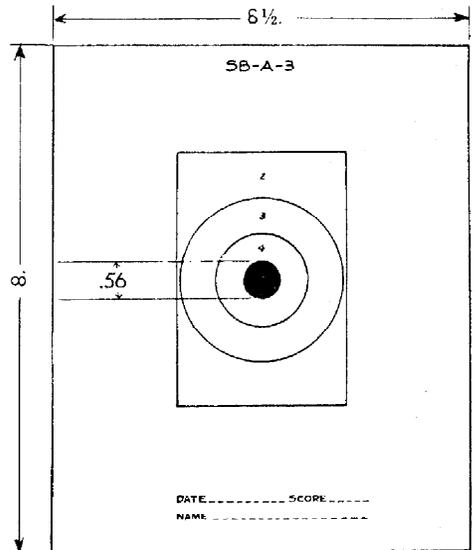
RIFLE TARGET SB-A-2—Required for instruction practice, slow fire, with cal. .22 rifle on the 50 foot range and in competitions between teams of different organizations. Printed in black on buff manila target paper. Measures 8 inches high by 6 1/2 inches wide. Packed 1,000 in a package, each package wrapped completely and securely in paper and labeled to indicate contents.



RIFLE TARGET SB-A-2

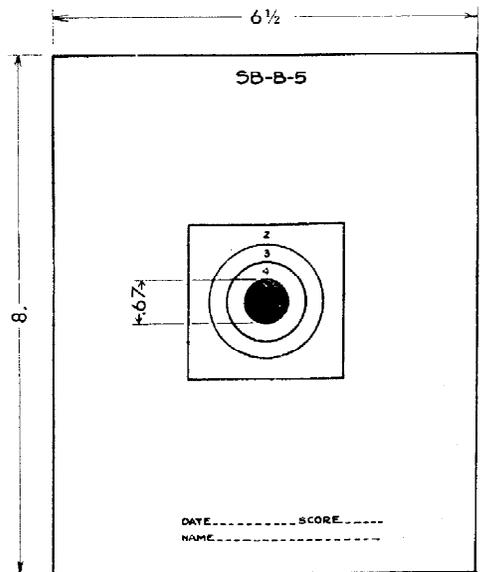
RIFLE TARGET SB-A-3—Required for instruction and record practice, slow fire, with the cal. .22 on the 50 foot range and in competitions between teams of different organizations. Printed in black on buff target paper; 8 inches high, 6 1/2

inches wide. Packed 1,000 in a package, each package wrapped completely and securely in paper and suitably labeled to indicate contents.



RIFLE TARGET SB-A-3

RIFLE TARGET SB-B-5—Required for instruction and record practice, slow fire, with cal. .22 rifle on the 50 foot range and in competitions between teams of different organizations. Size 8 inches high by 6 1/2 inches wide. Printed in black on buff manila target paper. Packed 1,000 in a package, each package wrapped completely and securely in paper, with label on outside of package describing contents.



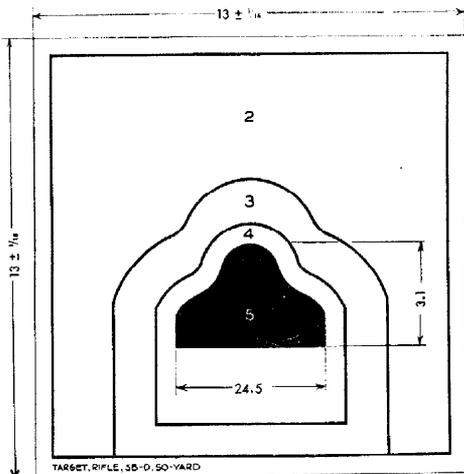
RIFLE TARGET SB-B-5

UNCLASSIFIED

TARGETS AND TARGET MATERIALS (Continued)

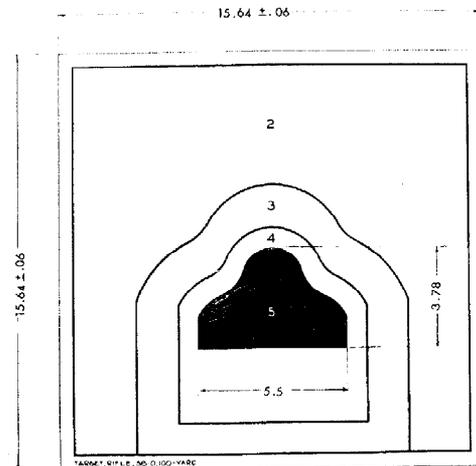
RIFLE TARGET SB-D—Made in two sizes for 50 yard and 100 yard ranges respectively. Printed in black on buff manila paper; packed 500 in a package. Each package is wrapped completely and securely in paper, with label suitably describing contents of package.

RIFLE TARGET SB-D, 50 YARDS—Required for instruction practice, rapid fire, with cal. .22 rifle on the 50 yard range. Size: 13 inches square.



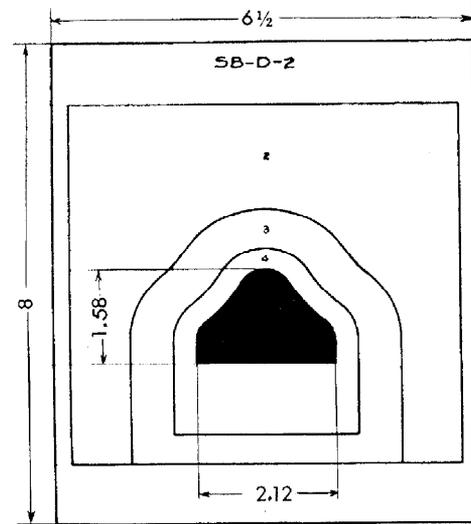
RIFLE TARGET SB-D, 50 YARDS

RIFLE TARGET SB-D, 100 YARDS—Required for instruction and record practice on the 100 yard range. Size: approximately 15 5/8 inches square.



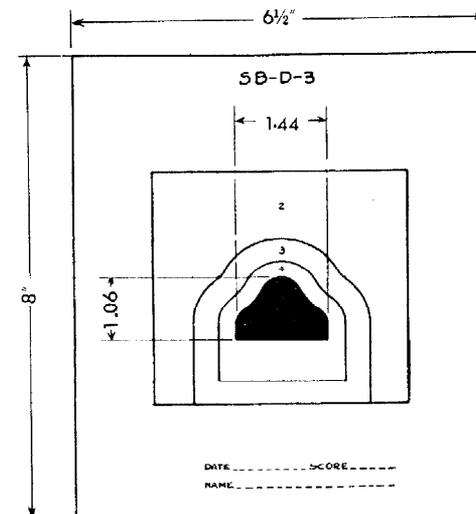
RIFLE TARGET SB-D, 100 YARDS

RIFLE TARGET SB-D-2—Printed in black on buff manila target paper. Size: 8 inches high by 6 1/2 inches wide. Required for instruction practice, rapid fire, with cal. .22 rifle on the 50 foot range. Packed 1,000 in a package, each package wrapped completely and securely in paper, with label on outside of package describing contents.



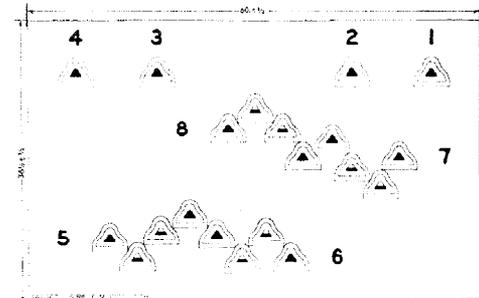
RIFLE TARGET SB-D-2

RIFLE TARGET SB-D-3—For instruction and record practice, rapid fire, with cal. .22 rifle on the 50 foot range. Measures 8 inches high by 6 1/2 inches wide. Printed in black on buff manila target paper. Packed 1,000 in a package, each package wrapped completely and securely in paper, with label pasted on outside of package describing contents.



RIFLE TARGET SB-D-3

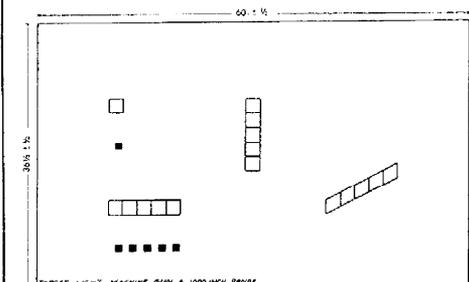
U. S. RIFLE TARGET, M1, 1,000 INCH—Required for all types of firing with the Browning automatic rifle, M1918A2, cal. .30, on the 1,000 inch range. Printed in black on buff manila target paper; measures 3 feet high by 5 feet wide. Packed 50 in a roll, each roll wrapped completely and securely in paper with label pasted on outside, describing contents of package.



U. S. RIFLE TARGET M1, 1,000 INCH

AUTOMATIC RIFLE TARGET, 1,000 INCH, measures 3 feet high by 5 feet wide. Printed on buff manila paper with black. Used for all types of firing with the Browning automatic rifle, cal. .30, M1918A1, on the 1,000 inch range. Packed 50 in a roll, each roll wrapped completely and securely in paper; package labeled to indicate contents.

MACHINE GUN TARGET A—One of a group of six different designs. The first, designated as A, is for preliminary instruction and record practice with the cal. .30 light machine gun on the 1,000 inch ground course. It is printed in black on buff manila target paper; it measures 3 feet high by 5 feet wide. Packed in rolls of 50, each roll wrapped completely in paper and labeled on the outside to indicate contents.

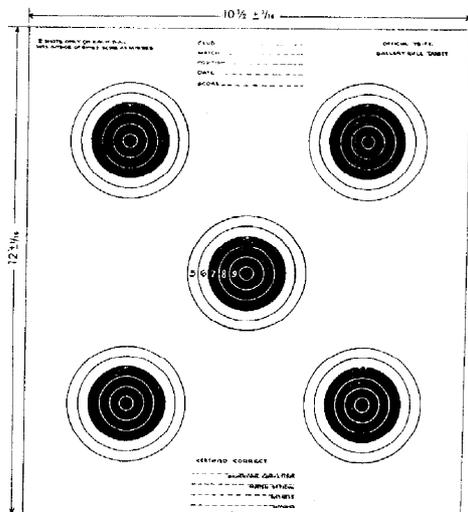


LIGHT MACHINE GUN TARGET A, 1000 INCH

UNCLASSIFIED

RIFLE TARGET, GALLERY (OFFICIAL)

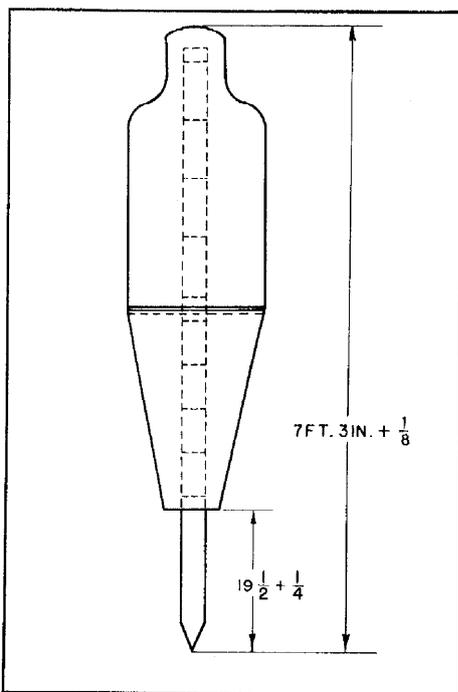
—Made in two sizes for 50 foot and 75 foot firing distances. The 50 foot target measures $10\frac{3}{8}$ inches high by 8 inches wide; the 75 foot target, 12 inches high by $10\frac{1}{2}$ inches wide. These targets are required for National Guard organizations, schools and colleges. Both are printed in black on buff manila target paper; packed 50 in a package, each package wrapped completely and securely in paper; package suitably labeled to indicate contents.



RIFLE TARGET, GALLERY (OFFICIAL)

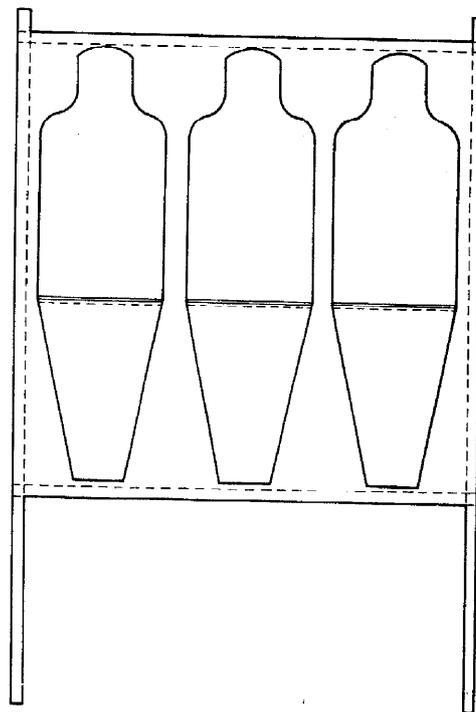
M, M1913, COMPLETE—Required for mounted pistol marksmanship and for armored car machine-gun target practice at 300 to 500 yards. Represents a figure about the height of a soldier standing.

For the upper portion of the target a pasteboard target, E, kneeling, is used;



TARGET M, M1913, COMPLETE

M, TANK, COMPLETE—Required for machine-gun target practice fired from combat, armored and scout cars on field ranges and tank machine-gun target practice on 500 yard ranges. The complete target consists of a 6 by 6 foot target frame covered with a reversed rifle paper target, B. On this are pasted three paper silhouette targets, E, kneeling, and three paper silhouette targets, trapezoidal, placed in line to represent standing figures.

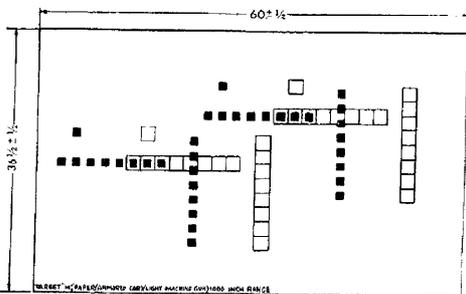


TANK TARGET M, COMPLETE

GROUND TARGET, FIXED GUN AERIAL

—Required for fixed-gun aerial gunnery practice on ground targets. Consists of a rifle paper target, C, mounted on a 6 by 10 foot target frame. Wooden supports hold the target in an inclined position at an angle of 60° from horizontal.

M (ARMORED CAR)—Required for instruction practice with the cal. .30 light machine gun on the 1,000 inch range, car course. Same size as A, made of the same stock and packed in the same manner.



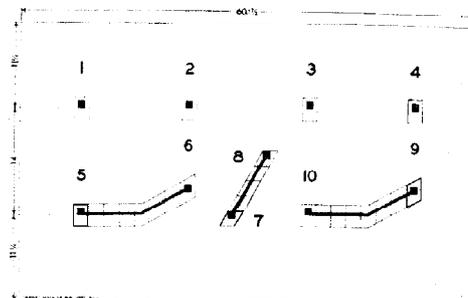
LIGHT MACHINE GUN TARGET M (ARMORED CAR)

for the lower portion, a pasteboard target, trapezoidal. These two sections are fastened to an 84 inch target stave with double-pointed tacks. The two targets are positioned on the stave with the olive drab side to the front.

OVERHEAD COLLECTIVE—Used for squad mounted pistol practice. Constructed as follows: eight pasteboard targets, E, kneeling, are suspended from a flexible wire rope stretched between poles sunk in the ground 90 feet apart and about 20 feet high, the targets being spaced $4\frac{1}{2}$ feet between centers and swung so their lower edges are about 10 feet from the ground.

One end of the wire rope is fastened to a stake in the ground, the other end is led down to a cleat. This is to permit quick loosening of the wire to lower the targets to the ground for marking or for pasting on proper silhouettes. Only the wire cable and the pasteboard target, E, kneeling, are issued; other materials being procurable locally.

1,000 INCH—Required for instruction and preliminary practice with the cal. .22 and cal. .30 machine guns, and record practice with the cal. .30 machine gun, on the 1,000 inch range. Printed in black on buff manila target paper, 3 feet high by 5 feet wide; packed 50 in a roll, each roll



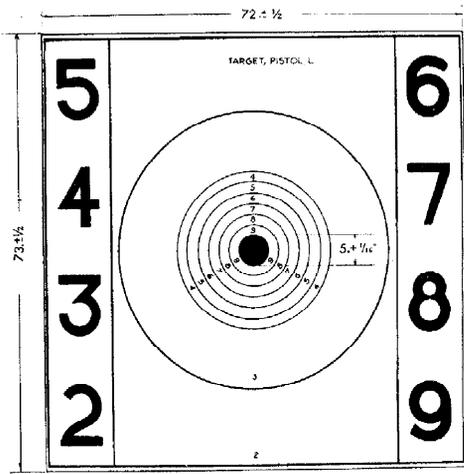
MACHINE GUN TARGET, 1,000 INCH

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wrapped completely and securely in paper, with a label fastened on the outside of the roll, suitably describing the contents.

SB, 500 INCH—Required for use with the cal. .22 machine gun on the 500 inch range. The target is 18 inches high by 30 inches wide; otherwise identical with the 1,000 inch target.

PISTOL TARGET L—A 6 foot square target of buff manila target paper printed in black. Required for the following: (1) line of targets with firing point at 15 to 25 yards, for position exercises, dismantled pistol marksmanship; (2) line of targets with firing point at 25 yards, for trigger squeeze exercises, dismantled pistol marksmanship; (3) line of targets for slow and rapid fire exercises, dismantled pistol marksmanship. Packed 50 in a roll, each roll wrapped completely and securely in paper, with label describing contents of roll.

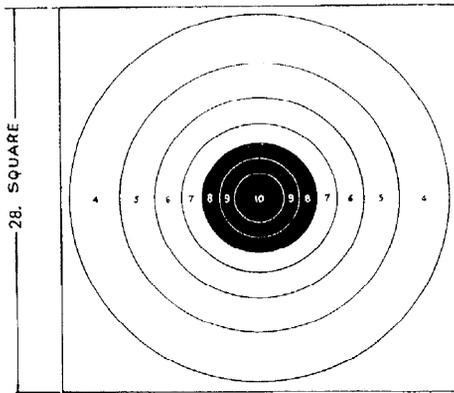


PISTOL TARGET, L

STANDARD AMERICAN—Used in pistol target practice for competitions only. Provided in two types, 25 yard and 50 yard. Both types are printed in black on buff manila target paper, 28 inches square.

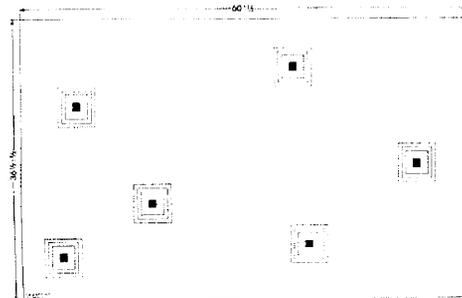
On the 25 yard target, the 9 and 10 rings are black; on the 50 yard target the 8, 9 and 10 rings are black. This is the only difference between the two. Packed

100 to a roll, each roll wrapped completely and securely in paper, the roll being labeled with description of contents.



PISTOL TARGET, 50 YARDS (STANDARD AMERICAN)

TANK TARGET, 1,000 INCH—Required for range practice on the 1,000 inch range with the cal. .30 and cal. .50 machine guns mounted in tanks (stationary). Printed in black on buff manila target paper; measures 3 feet high by 5 feet wide. Packed 50 in a roll, each roll wrapped completely and securely in paper and labeled to indicate contents.



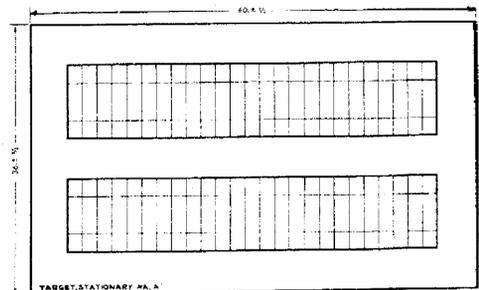
TANK TARGET, 1,000 INCH

TRAPEZOIDAL TARGET—Made of pasteboard, 1/8 inch thick, one surface being olive drab in color. Required as a component of target M, M1913, complete, in which it is used in combination with pasteboard target E, kneeling, to represent a standing figure of which the trapezoid target forms the legs. Packed 50 in a package, each package wrapped in waterproof lining paper and securely bound with cord.

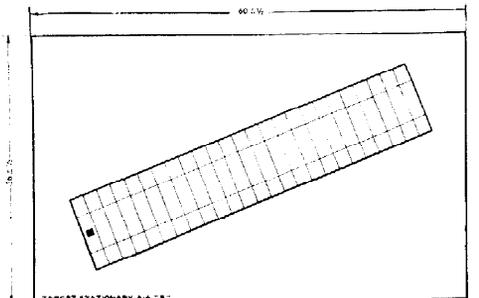
SILHOUETTE TARGETS—For pasting over appropriate pasteboard targets that have become badly perforated with bullet

holes. They are made of manila target paper, olive drab on both sides and supplied in three shapes; one used to repair pasteboard target E, kneeling, packed 1,250 in a box; another to repair target F, prone, packed 2,500 in a box; a third to repair pasteboard target, trapezoidal, packed 1,250 in a box.

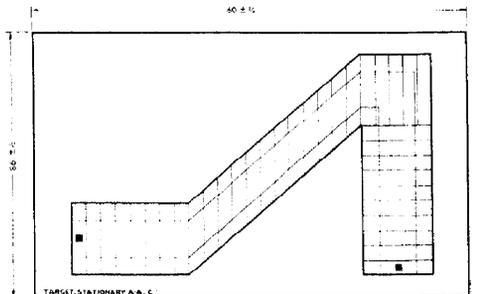
STATIONARY TARGETS, AA—Used in manipulation exercises with anti-aircraft machine guns on the 1,000 inch range. Represent the path followed by an airplane in parallel, climbing or diving and maneuvering flight; 3 feet high by 5 feet wide; printed in black on buff manila target paper. Packed 50 in a roll, each roll wrapped completely and securely in paper, labeled suitably to indicate contents. Made in three types: target, stationary, AA, "A"; target, stationary, AA, "B"; and target, stationary, AA, "C."



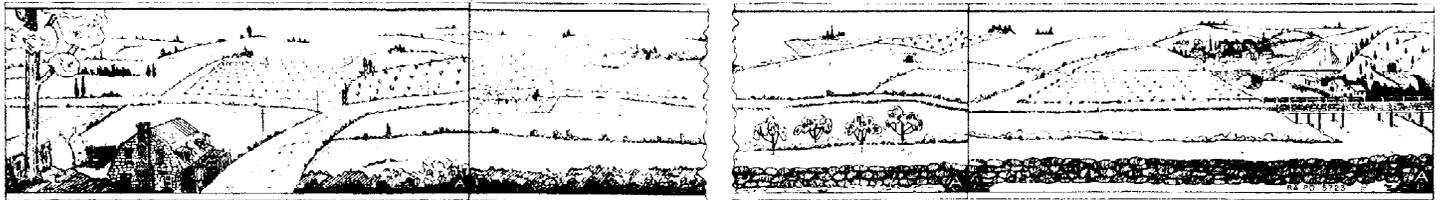
STATIONARY TARGET, AA, A



STATIONARY TARGET, AA, B



STATIONARY TARGET, AA, C



LANDSCAPE TARGET, SERIES A

TARGET, LANDSCAPE

This type of target is for use on 1,000 inch rifle practice ranges. It consists of a set of five landscape scenes. Each scene covers two sheets of machine-finished poster paper, an entire landscape requiring ten sheets. The picture is of sufficient size so that all or nearly all its salient features are recognizable at a distance of 1,000 inches.

The paper sheets are mounted on frames covered with target cloth tacked to the edges of the frames. These frames are made of dressed lumber 1 by 2 inches, with knee braces at the four corners. Each frame measures 24 by 60 inches and may be painted or unpainted.

The individual frames are set in a vertical frame consisting of six 4 by 4 inch posts of proper height placed upright in the ground spaced 5 feet from center to center, with horizontal pieces of 2 by 4 inch lumber to support the panels which are held in place by cleats and dowels to permit easy removal.

Series A landscape target is printed in black and its ten sheets are designated A-1 to A-10. Assembled, the complete set forms a panoramic picture of a New England landscape.

On these and other targets using a cloth foundation for paper targets, the cloth used is cotton and comes in two widths 40 inches and 70 inches.

COMBINATION SLIDING TARGET

With this target, the standard rifle marksmanship installation consists of one or more 6 by 6 foot or 6 by 10 foot combination sliding targets projecting from the trench. All components are identical excepting the differences in size of the two target frames used in these installations.

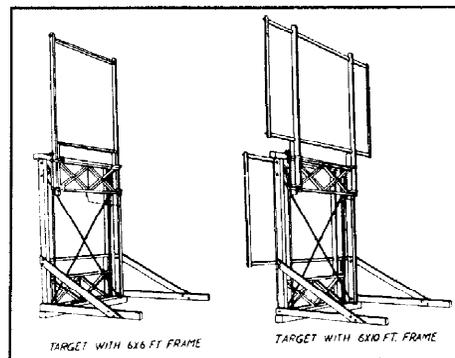
The height is approximately 16 feet. Weight of the complete target is approximately 500 pounds. The target frames are covered with 14 ounces of unbleached cotton sheeting.

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The difference in designation is determined by the range on which a target is to be used.

The target assemblies are shown in the two drawings herewith. The 6 by 6 foot combination sliding target is intended for erection on ranges of 200 to 600 yards. These targets are spaced 12 feet apart, center to center, giving a clearance of 6 feet between target frames.

The 6 by 10 foot combination sliding targets are for ranges of 200-600 yards. These are spaced 15 feet, center to center, giving a clearance of 5 feet between target frames. These clearances permit definite target designation in firing.



COMBINATION SLIDING TARGET

INSTALLATION—In erecting the combination sliding target, after the trench is prepared and a foundation thus provided for the main sill and cross sill, a fastening block and a fastening plate are attached to the main sill with a 1/2 by 6 inch lag screw inserted through a 5/16 inch hole drilled through the sill.

The fastening block is nailed to the main sill with six 10-penny nails. Two slide rod plates are attached to the main sill by 3/8 by 4 1/2 inch square head bolts, washers and square nuts so that the plates are on the same side of the main sill as the fastening plate.

The main sill is placed in position so that when facing the rear of the trench, the fastening plate is to the right of the center of the main sill.

The two slide-rod plates are attached to the upper face of the top beam with four 3/8 by 4 1/2 inch square head bolts. The four frame guides are attached with eight flat-head wood screws so they are equidistant from each end of the top beam and 5 feet, 10 3/4 inches apart, center to center.

The pulley plates and pulley bracket assemblies are attached to the timber frame support posts, with a 3/8 by 5 inch square head bolt in each upper 7/16 inch hole in each post.

The short eyebolts of the stay rod assemblies are inserted through the lower holes in the pulley plates and pulley bracket assemblies, and secured to the timber frame support posts each with a 3/8 inch hexagon nut and plain washer.

The two cross sills are attached to the timber frame support posts with long eyebolts on the stay rod assemblies, 3/8 inch hexagon nut and plain washers.

The timber frame support braces are attached to the timber frame support posts with 3/8 by 7 inch square-head bolts, plain washers and square nuts.

The top beam is fitted to the timber frame support posts and the posts are set in mortises in the main sill.

After this set-up, all nuts and bolts are tightened until the timber frame support assembly is rigid, level and plumb, braced and secured to the foundation.

Two pieces of 3/8 inch linen sash cord, each 12 1/2 feet long, are threaded through the pulley bracket assemblies.

RANGE—The 6 by 6 foot target frame is for ranges of 200 to 600 yards, inclusive. Six frames are required for each target position: two for rifle paper target, A; two for rifle paper target, B; two for rifle paper target, D.

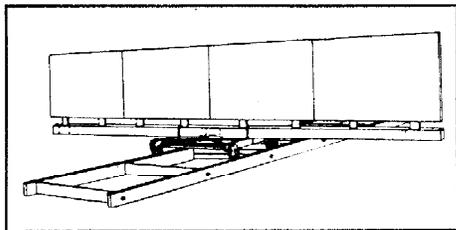
The 6 by 10 foot frame is for ranges of 600 and 1,000 yards. Two are required with each installation for mounting rifle paper target, C.

TARGET, ROLLING MACHINE-GUN

This target is installed on the 1,000 inch machine-gun range and used for machine-gun practice. It may also be used for 1,000 inch range automatic and machine rifle practice. It consists of one truck, one car, one target beam, four target frames. The total weight is 756 pounds; height approximately 5 feet; length of beam 20 feet; width of track 4½ feet; length of section of track 75 feet.

Target, less beam and target frames, can be used as the foundation for the horizontal moving target in machine-gun combat practice and for the track type anti-tank target on the 1,000 inch range.

Principal parts are a rolling target assembly, 75 feet of track (assembly), one target beam assembly, two U-bolt assemblies, one wooden tackle block, 200 feet of ½ inch diameter manila rope and four machine-gun target frames (two right assemblies and two left assemblies). The permanent equipment, which does not include target frames and paper targets, is issued knocked down and assembled at the range.



ROLLING MACHINE-GUN TARGET

INSTALLATION—In installing the machine-gun rolling target, the track is laid on the range, on level ground, with one end abutting against the bullet stop and the other end extending toward the firing point. The car is then placed upon the track, with the wooden tackle block attached to the cross rail of the track nearest the bullet stop.

The rope is run through the tackle block, one end being attached to the front end of the car, the other end to the rear end of the car, the double rope being pulled out to the firing point.

The target beam is placed on the car and run down as near to the bullet stop as possible.

With the car in this position, a stake is driven in the ground 1,000 inches from the target beam toward the firing point. This stake marks the position of the gun pintle of a machine gun in firing.

A firing point is constructed around the stake, the ground being raised about 1 foot above the level of the track and the mound made large enough for the gun and its crew.

The four machine-gun paper targets are pasted on the machine-gun target frames and the target frame assemblies are installed on the rolling target by inserting staves in openings in the target beam.

This target, less beam and target frames, can be used as the foundation for the horizontal moving target in machine-gun combat practice and for the track type anti-tank target on the 1,000 inch range.

KNEELING AND PRONE TARGETS

KNEELING TARGET E—This is a pasteboard target representing a figure about the height of a soldier in the kneeling position. It is fastened with double-pointed tacks to a target stave 45½ inches long. The pasteboard target is attached to the stave with the olive drab side to the front.

KNEELING TARGET E, M1917, is made of ⅛ inch thick pasteboard, one surface olive drab in color. It also represents a figure about the height of a soldier in the kneeling position.

Both these targets are packed 50 to a package, each package wrapped in waterproof lining paper and securely bound with cord.

PRONE TARGET F—Made of ⅛ inch pasteboard, one surface olive drab in color. It represents a figure about the height of a soldier in prone position. The targets are packed 50 to a package, each package wrapped in waterproof lining paper and securely bound with cord.

TARGET F, M1917, also represents a figure about the height of a soldier in the prone position. It is constructed by fastening pasteboard target F, prone, to a 24 inch target stave with double-pointed tacks. It is assembled with the olive drab side to the front.

BALLOON TARGET M1

This balloon is required for anti-aircraft instruction practice.

It is made of rubber of high strength and elasticity and is inflated with hydrogen. When inflated it assumes spherical shape and is approximately 30 or 42 inches in diameter.

TARGET SPOTTERS

Target spotters, to indicate the location of shot holes in paper targets, consist of cardboard disks of different diameters and wooden spindles, the disks and spindles being issued separately.

In the center of each disk is a ⅝ inch hole into which is inserted the wooden spindle measuring 3¼ inches long and not over ½ inch in diameter. The disk is white on the obverse side; black on the reverse side. The different uses of the three sizes are as follows:

3 INCH SPOTTER—This size is used for spotting shot holes on rifle paper targets, A and D.

In slow fire each shot is spotted as it hits and only one target spotter per target position is required when using paper targets.

In spotting rapid fire, 16 shots at a time are spotted with the M1 rifle and 10 shots with the M1903 rifle. Hence, for rapid fire 16 spotters should be available when firing with M1 rifle; 10 spotters when firing with M1903 rifle.

5 INCH SPOTTER—For use in spotting shot holes in rifle paper target, B. Used only in slow fire, where each shot is spotted as it hits, only one target spotter per target position is required.

10 INCH SPOTTER—Used for spotting shot holes in rifle paper target, C. Only one per target position is required as this spotter is used only for slow fire.

TARGET STAVES

Target staves are made of ¾ inch wood; measure 3½ inches wide and are provided in three lengths: 24 inch, 45½ inch and 84 inch. One end of it is pointed.

The 24 inch length is for mounting the pasteboard target, F, prone; the 45½ inch size for mounting the pasteboard target, E, kneeling and is also a component of the machine-gun target frame assembly.

The 84 inch stave is a component of Target, M1913, complete.

TARGET PASTERS

Pasters are supplied in three colors: black, buff and olive drab. They are 1 inch square and are supplied in perforated sheets of 100, not gummed.

Black and buff pasters are used for

covering shot holes in black and buff areas of paper targets; also for indicating aiming points and for covering shot holes in machine-gun and automatic-rifle targets. These are supplied in envelopes each containing 100 sheets—10,000 pasters.

The olive drab target pasters are used for covering shot holes in olive drab areas of paper targets. They are supplied in envelopes each containing 2,000 pasters.

For use in applying pasters a board, heavily coated with paste, is provided. On it the pasters are laid, face up. The pasters are easily slid off the paste-covered board and applied to the target.

TARGET REPAIR CENTERS

For the repair of badly perforated paper targets, repair centers are provided for rifle targets A, B and D, and for pistol target, L. These repair centers are quickly applied to the damaged target with target paste. The outer rings or spaces of these repair centers are in segments, to make it easy to lay on the repair center to match the rings in the appropriate paper target.

Repair centers are of buff manila target paper. Each design is packed in rolls of 100, each roll wrapped completely and securely in paper and labeled to indicate the contents of the package.

There are four designs of repair centers:

A-C—This repair center is $24\frac{3}{8}$ inches high by 24 inches wide; the ring is shown

in segments. The bull's-eye is identical with the bull's-eye on the rifle paper target, A.

B-C—This repair center is $36\frac{1}{2}$ inches high by 36 inches wide; 4-ring shown in segments. Bull's-eye identical with the bull's-eye of rifle paper target, B.

D-C—This center is 36 inches high by $36\frac{1}{2}$ inches wide. It includes all the 4 space. The upper corners contain segments of the 3 space. The bull's-eye is identical with the bull's-eye of rifle paper target, D.

L-C—For pistol paper target, L. Includes the bull's-eye and rings 9 to 5 with segments of the 4 ring. Measures $24\frac{3}{8}$ inches high by 24 inches wide.

RANGE FLAGS AND STREAMERS

To indicate that a small arms target range is in use or to signal danger, streamers and flags of three types are provided.

STREAMER—This is hoisted on the mast at the announcement of firing and lowered at the "cease firing" command.

Streamers are made of scarlet woolen bunting, measure 5 feet, $9\frac{3}{8}$ inches at the halyard end, are 18 feet in fly length and 3 feet wide at the fly end, the lower edge tapering its full length.

The halyard end of a streamer is bound with olive-drab webbing. A D-ring is sewed at each end of this binding.

DANGER FLAG—The danger flag is also made of scarlet woolen bunting. It measures 24 inches wide and has 36 inches fly. It is reinforced on one end with olive-drab webbing, 1 inch wide, with a D-ring sewed on each end of the webbing.

For use in target pits where one danger signal is required for each target position, this flag may be fastened to the target staff II, a component of target, II. This staff is also used for mounting ricochet and range flags. It is made of wood, 1 inch by $1\frac{1}{4}$ inch by 9 feet, and is painted olive drab. One end of this staff is slotted to a depth of 40 inches and has equally spaced transverse tapered holes.

Danger flags are used in target pits to signal misses and are displayed at all times when targets are not ready.

Additional danger flags are located on the outer boundaries of the target range as directed by the commanding officer.

RANGE FLAG—The primary use of the range flag is on artillery ranges but it is also used on small arms ranges. It is made of white drill and measures 24 inches wide by 36 inches fly length. Like the danger flag it is reinforced at one end with olive-drab webbing 1 inch wide, the webbing being fitted with a 1 inch D-ring sewed at each end.

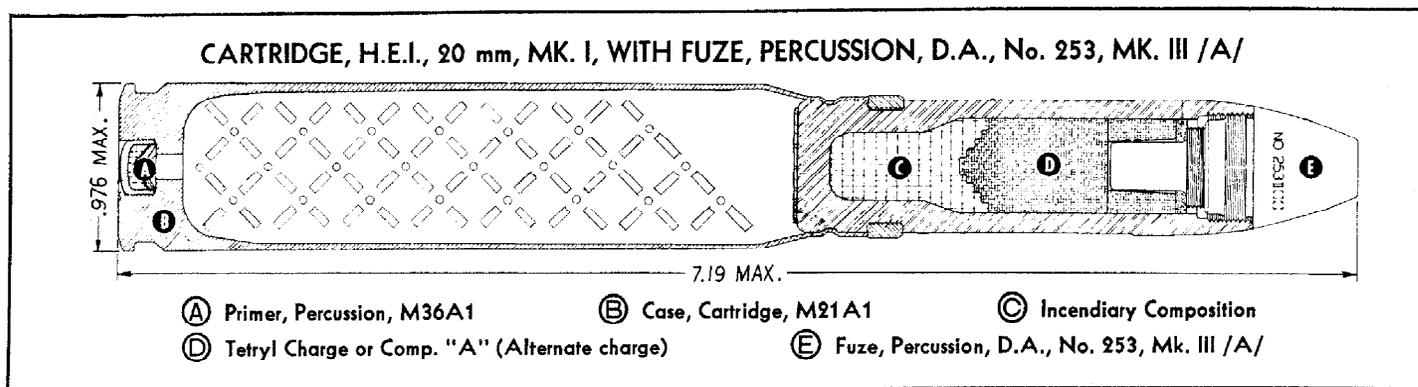
UNCLASSIFIED

ARTILLERY
AMMUNITION

ARTILLERY
AMMUNITION

SHELL, HIGH-EXPLOSIVE INCENDIARY, 20 MM, MK. I—STANDARD

ROUND FOR GUNS M1, AN-M2, AND BRITISH HISPANO-SUIZA /A/



SHELL, HIGH-EXPLOSIVE INCENDIARY, 20 mm, Mk. I—STANDARD

This shell for the 20 mm automatic guns, M1, AN-M2, and British Hispano-Suiza /A/, was adopted from the British early in 1941 and standardized in August of that year. There have been few changes except in the redesign of the cartridge case and primer.

The fuzed projectile remains essentially the same, as may be recognized from the adopted British nomenclature, Fuze, Percussion, D.A., No. 253, Mk. III /A/, which signifies that the shell is used for aircraft and has a delay action percussion fuze. The shell is designed for fire from aircraft guns against enemy aircraft, but it may be used against ground targets.

The complete round weighs 0.566 pound and consists of a cartridge case, M21A1, weighing 0.205 pound, and measuring 4.34 inches in length; a percussion primer, M36A1, weighing 0.003 pound, a propelling charge of Improved Military Rifle Powder weighing 0.072 pound, and the loaded and fuzed shell. The cartridge case is crimped to the fuzed and loaded projectile. A substitute standard for the cartridge case, M21A1, is the steel cartridge case, M21A1B1.

The projectile is of the high-explosive incendiary type. As fired, it weighs 0.286 pound and measures 3.23 inches in length by 0.784 inch in diameter. The bursting charge weighs 174.25 grains; 107.75 grains are tetryl and the remaining 66.5 grains

are incendiary composition. The alternate bursting charge consists of 100.3 grains of composition A and 66.5 grains of incendiary composition.

The propelling charge is an IMR powder formula of single-perforation grains with a web of 0.021 inch.

The standard muzzle velocity with this propelling charge is 2,800 feet per second.

A cover is fixed to the base of the shell by a continuous resistance weld, and serves as a seal to prevent gas or flash from the propelling charge from entering the shell and prematurely detonating the bursting charge. This may happen as the shell is not forged or cast, but is turned from steel bar stock which may have fissures in its center.

CHARACTERISTICS

Caliber.....	20 mm	Propelling Charge and Weight.....	IMR powder, 0.072 lb.
Model of Gun.....	†	Complete Round Weight.....	0.566 lb.
Proj. Weight.....	0.286 lb.	Muzzle Velocity.....	2,800 f/s
Proj. Charge and Weight.....	174.25 gr.*	Maximum Range.....	5,100 yards
Fuze.....	Percussion, D.A., No. 253, Mk. III /A/	Chamber Capacity.....	2.22 cu. ins.
Primer.....	M36A1	Rated Max. Pressure p.s.i.....	49,000
Cartridge Case.....	M21A1†		

*107.75 grains of tetryl, 66.5 grains of incendiary composition. (Alternate loading: 100.3 grains of Composition "A" and 66.5 grains of incendiary composition.)

†The steel cartridge case, M21A1B1, is substitute standard.

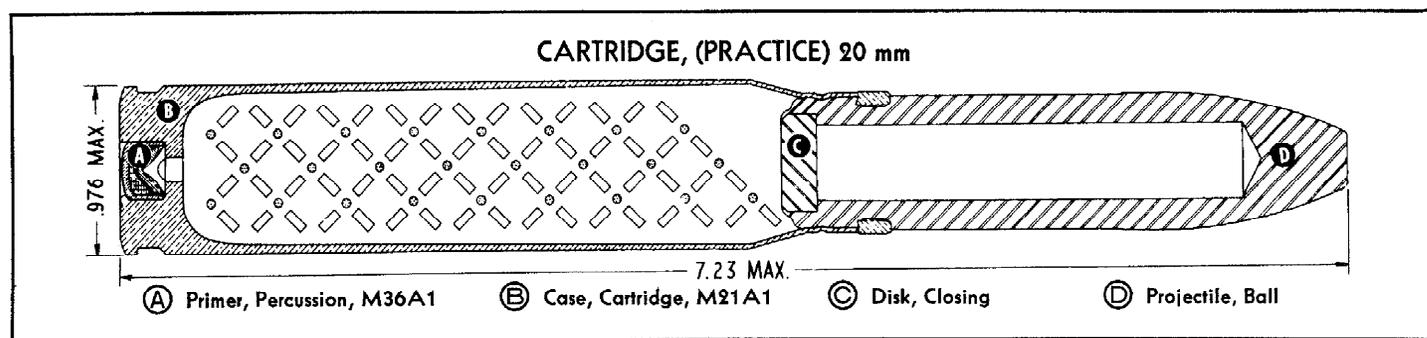
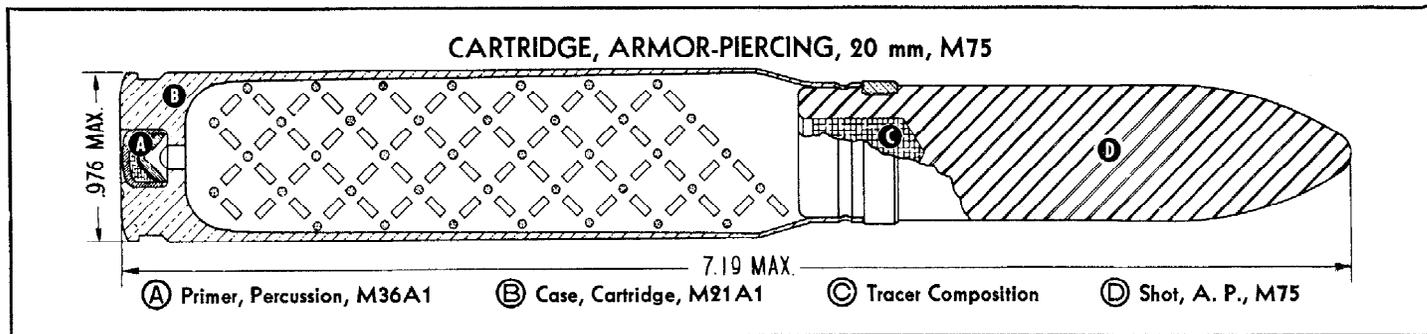
‡M1, AN-M2 and British Hispano-Suiza /A/.

UNCLASSIFIED

SHOT, ARMOR-PIERCING, 20 MM, M75—STANDARD

PROJECTILE, BALL (PRACTICE), 20 MM—STANDARD

ROUNDS FOR GUNS, M1, AN-M2, AND BRITISH HISPANO-SUIZA /A/



The armor-piercing, shot, M75, and ball projectile (practice) are standard ammunition and are turned out of steel bar stock instead of being forged or cast. The propelling charges used with these cartridges are made from IMR powder of single-perforated grains with a 0.021 inch web.

SHOT, ARMOR-PIERCING, 20 mm, M75—STANDARD—The complete round weighs 0.64 pound and measures 7.19 inches in length and consists of the M21A1

cartridge case, a 480 grain IMR powder propelling charge, and the armor-piercing shot, M75. The steel cartridge case, M21A1B1, is substitute standard for the brass cartridge case, M21A1.

The M36A1 percussion primer weighs 0.003 pound and the cartridge case into which it is inserted weighs 0.205 pound. The M75 shot has no fuze or bursting charge, but contains a tracer composition which is ignited by the propelling charge and burns for 4 seconds. The body

of this shot weighs 0.363 pound and is of monobloc construction.

PROJECTILE, BALL (PRACTICE), 20 mm,—STANDARD—This ball projectile has the same percussion primer, M36A1, and the same cartridge case, M21A1, as the A. P. Shot, M75. The steel cartridge case, M21A1B1, is substitute standard. Weight of the complete round is 0.556 pound. The ball projectile weighs 0.276 pound and is propelled by 507 grains of IMR powder. The projectile is hollow and is sealed at the base by a closing disk.

CHARACTERISTICS

	Shot, A.P., M75	Proj. Ball (Prac.)	Shot, A.P., M75	Proj. Ball (Prac.)
Caliber.....	20 mm	20 mm	Maximum Range.....	6,300 yards
Model.....	British Hispano-Suiza /A/	British Hispano-Suiza /A/	Chamber Capacity.....	2.22 cu. ins.
Proj. Weight.....	0.363 lb.	0.276 lb.	Rated Max. Pressure, p.s.i.....	48,000
Primer.....	M36A1	M36A1	Armor Penetration at 20°	
Cartridge Case.....	M21A1*	M21A1*	Homogeneous Plate	
Propelling Charge and Weight.....	IMR powder, 480 grs.	IMR powder, 507 grs.	500 yards.....	0.7 ins.
Complete Round Weight.....	0.64 lb.	0.556 lb.	1,000 yards.....	0.5 ins.
Muzzle Velocity.....	2,550 f/s	2,850 f/s	Face-Hard. Plate	
			500 yards.....	0.65 ins.
			1,000 yards.....	0.4 ins.

*The steel cartridge case, M21A1B1, is substitute standard.

UNCLASSIFIED

SHELL, HIGH-EXPLOSIVE, 37 MM, M54

SHOT, ARMOR-PIERCING, 37 MM, M80

SHELL, PRACTICE, 37 MM, M55A1

(Continued)

fuze. The tracer, which has a burning time of three seconds, sets off an igniting relay charge of 1.68 grains of Grade A-5 Army Black Powder which ignites a relay pellet to detonate the charge and destroy the shell before ground impact.

The bursting charge of tetryl weighs 0.10 pound, and the alternate Composition "A" charge 0.105 pound. The tetryl loading consists of a 200 grain tetryl pellet pressed into the shell cavity under 9,000 to 10,000 p.s.i. pressure and the remainder of the charge of two equal increments pressed under approximately 9,000 p.s.i. pressure. The Composition "A" bursting charge is loaded in the same manner as the tetryl charge, except that the relay pellet

with the Composition "A" weighs 36 grains as against 23 grains for the pellet used with the tetryl load.

SHOT, A.P., 37 mm, M80—STANDARD

—The weight of the complete round is 2.31 pounds; the weight of the A.P. shot is 1.66 pounds. The propelling charge is 0.15 pound of M2 powder of a Hercules NG formula with a single-perforated grain and a 0.030 inch web. The shot is a monobloc projectile with a tracer element of three seconds burning time and has no fuze or bursting charge.

SHELL, PRACTICE, 37 mm, M55A1—STANDARD

—This shell is the high-explosive shell, M54, modified slightly for prac-

tice purposes. It contains a red tracer and a dummy fuze, M50, M50B1, M50B2, or M50B3. The M50 dummy fuze is made from a plastic composition and the M50B1, M50B2, and M50B3 fuzes are made from low carbon steel machined to give the same contour and weight as the point-detonating fuze, M56, used with the M54 projectile.

As used in the automatic gun, M4, the complete round weighs 1.99 pounds, and as fired the shell weighs 1.34 pounds. The 0.16 pound charge of M2 powder is Hercules NG formula of single-perforated grains with a 0.030 inch web and gives the prescribed muzzle velocity of 2,000 feet per second.

CHARACTERISTICS

	Shell, H.E., M54	Shot, A.P., M80	Shell, Prac., M55A1
Caliber.....	37 mm	37 mm	37 mm
Model of Gun.....	M4	M4	M4
Proj. Weight.....	1.34 lb.	1.66 lb.	1.34 lb.
Proj. Charge and Weight.....	Tetryl, 0.10 lb.†	—	Empty
Fuze.....	P.D., M56	—	Dummy, M50, M50B1, M50B2, or M50B3
Primer.....	M38A1††	M38A1††	M38A1**
Cartridge Case.....	Mk. III A2	Mk. III A2	Mk. III A2
Propelling Charge and Weight.....	FNH powder, 0.16 lb.	FNH powder, 0.15 lb.	FNH powder, 0.16 lb.
Complete Round Weight.....	1.99 lb.*	2.31 lb.	1.99 lb.
Muzzle Velocity.....	2,000 f/s	1,825 f/s	2,000 f/s
Chamber Capacity.....	6.90 cu. ins.	8.34 cu. ins.	6.90 cu. ins.
Rated Max. Pressure, p.s.i.....	27,000	27,000	27,000
Armor Penetration at 20°			
Homogeneous Plate			
500 yards.....	—	1.0 in.	—
1,000 yards.....	—	0.6 in.	—
Face-Hard. Plate			
500 yards.....	—	0.8 in.	—
1,000 yards.....	—	0.4 in.	—

†Composition "A" 0.105 lb.

††Or M38B2, substitute standard.

*1.985 lb. with Comp. "A" bursting charge.

**The M23 A3 percussion primer is authorized for assembly to this round until present stocks are exhausted.

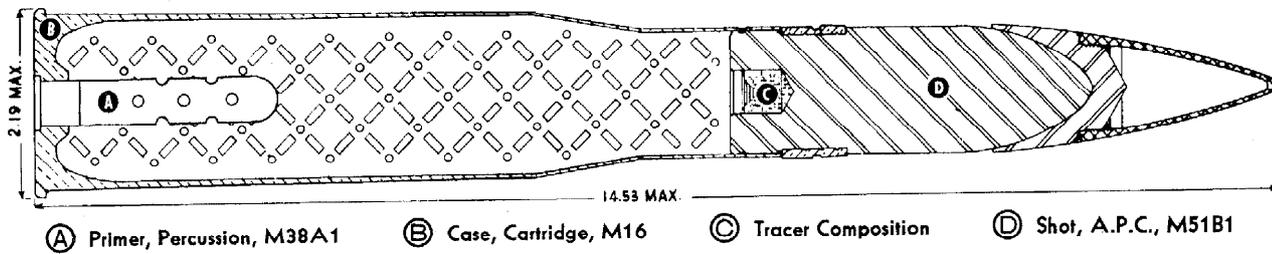
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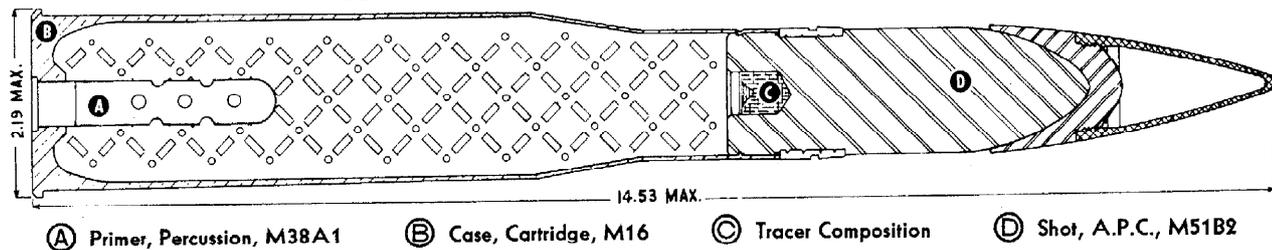
SHOT, ARMOR-PIERCING CAPPED, 37 MM, M51B1, M51B2—STANDARD

ROUND FOR ANTITANK GUN, M3A1; TANK GUNS, M5A1 AND M6

COMPLETE ROUND, SHOT, A.P.C., 37 mm, M51B1



COMPLETE ROUND, SHOT, A.P.C., 37 mm, M51B2



During World War I, slow-moving, lightly armored vehicles were extremely vulnerable to guns of 37 mm and 75 mm calibers. With increased mobility, speed, and armor protection of tanks and combat vehicles, these weapons became limited in use.

The mobile antitank guns were developed to meet the new conditions. The standardization of the mobile 37 mm antitank gun, M3A1, together with the tank guns, M5A1 and M6, with their higher muzzle velocities, compensated for the added protection which the increased mobility and thicker armor plate gave tanks and combat vehicles.

SHOT, ARMOR-PIERCING CAP, 37mm,

M51B1 and M51B2—STANDARD—The shots, A.P.C., M51B1 and M51B2, consist of three components: body, cap, and windshield. The windshield improves the ballistics of the shell and the cap gives better penetration against face-hardened armor plate. The sole difference between the two shots lies in the armor-piercing cap. The cap on the M51B1 shot comes to a point; the cap on the M51B2 shot has a rounded point. The shot includes neither fuze nor bursting charge, but contains a tracer element with a burning time of three seconds. The regular wind shield is a thin steel ogive 360° crimped onto the cap; an alternate is the aluminous windshield.

The complete round, weighing 3.48

pounds, consists of the M16 brass cartridge case, or the M16B1 substitute standard steel case; the M38A1 primer; either the M51B1 or the M51B2 A.P.C. projectile; and a propelling charge of 0.53 pound of M2 powder or 0.57 pound of M5 powder.

The M2 and M5 FNH powders are an Hercules NG formula with 7-perforation grains having a web of 0.04 inch. The standard muzzle velocity with this charge is 2900 feet per second in the M3A1 and M6 guns. In the shorter M5A1 gun the velocity is 2855 feet per second.

(Note: Target practice shot, M51A2, is listed in the Table of Characteristics below.)

CHARACTERISTICS

	Shot, A.P.C., M51B1	Shot, T.P., M51A2	Shot, A.P.C., M51B1	Shot, T.P., M51A2
	Shot, A.P.C., M51B2		Shot, A.P.C., M51B2	
Caliber.....	37 mm	37 mm		
Model of Gun.....	M3A1, M5A1, and M6	M3A1, M5A1, and M6		
Proj. Weight.....	1.92 lb.	1.92 lb.		
Primer.....	M38A1*	M38A1†††		
Cartridge Case.....	M16**	M16**		
Propelling Charge and Weight.....	FNH powder, 0.53 lb.***	FNH powder, 0.47 lb.		
Complete Round Weight.....	3.48 lb.†	3.42 lb.		
Muzzle Velocity.....	2,900 f/s††	2,600 f/s		
			Maximum Range.....	12,850 yards‡
			Chamber Capacity.....	19.35 cu. ins.
			Rated Max. Pressure, p.s.i.....	50,000
			Armor Penetration at 20°	
			Homogeneous Plate	
			500 yards.....	2.4 ins.
			1,000 yards.....	2.1 ins.
			Face-Hard. Plate	
			500 yards.....	2.1 ins.
			1,000 yards.....	1.8 ins.

*Or M38B2 Substitute Standard.

**The steel cartridge case, M16B1, is substitute standard for use in the M3A1, M5A1, and M6 guns.

***0.53 lb. of M2 powder, 0.57 lb. of M5 powder.

†3.52 lb. with M5 powder.

††2,855 f/s in M5A1 gun.

†††2,725 yds. in M5A1 gun.

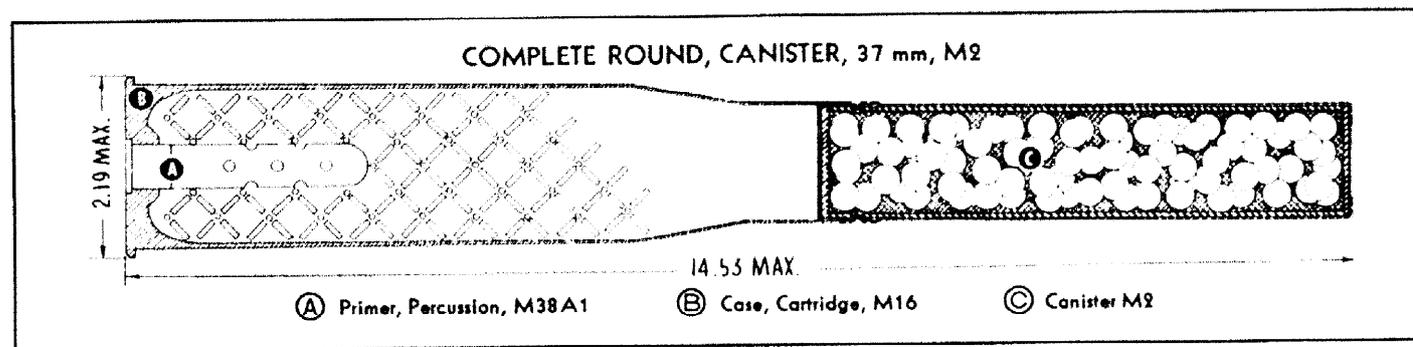
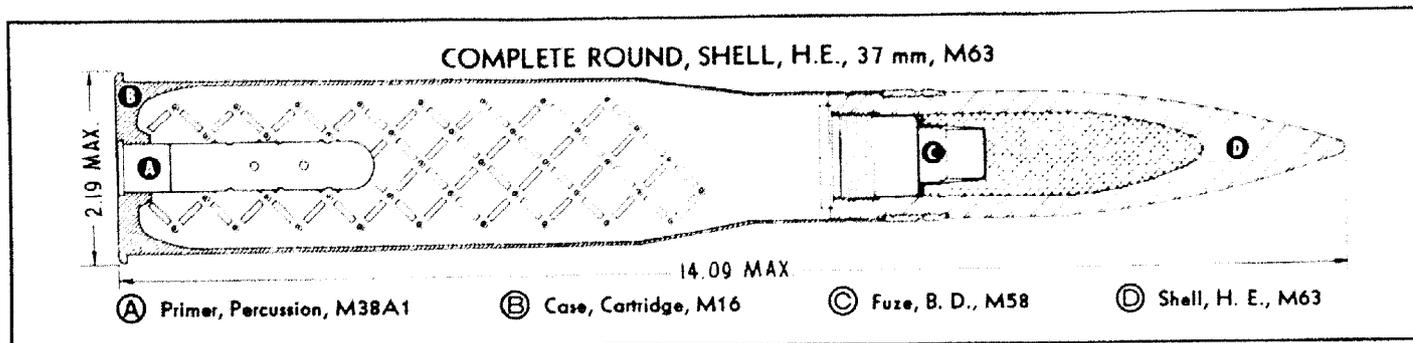
††††The M23A3 percussion primer is authorized for assembly in this round until present stocks are exhausted.

UNCLASSIFIED



SHELL, HIGH-EXPLOSIVE, 37 MM, M63— STANDARD CANISTER, 37 MM, M2—STANDARD

ROUNDS FOR ANTITANK GUN, M3A1; TANK GUNS, M5A1 AND M6



HIGH-EXPLOSIVE, 37 mm, M63— STANDARD—This shell has superseded the Mk. II high-explosive shell, now used only as subcaliber ammunition. The bursting charge is 0.085 pound of TNT, functioned by the base detonating fuze, M58. Weights of the cartridge case, M16, and propelling charge of FNH powder are 0.93 pound and 0.49 pound, respectively. The steel cartridge case, M16B1, is substitute standard for use in the M3A1, M5A1 and M6 guns.

The complete round uses the M38A1 percussion primer and a propelling charge of M1 powder with single perforation grains and 0.027 inch web.

CANISTER, 37 mm, M2—STANDARD—Canister, M2, as the designation implies, is little more than a can filled with approximately 122 lead balls which are imbedded in a resin matrix.

The canister is used primarily as tank armament against personnel. The shock

of discharge ruptures the case and the canister leaves the gun with a muzzle velocity of 2,500 feet per second. The case bursts within 100 feet after discharge.

The weight of the complete round is 3.49 pounds of which 1.94 pounds is the canister load. Weight of the propelling charge of FNH powder is 0.52 pound.

The propelling charge is an M1 class powder having an 85-10-5 formula, seven perforations per grain with a web of 0.019 inch.

CHARACTERISTICS

	Shell, H.E., M63	Canister, M2	Propelling Charge and Weight...	Shell, H.E., M63	Canister, M2
Caliber.....	37 mm	37 mm		FNH powder,	FNH powder,
Model of Gun.....	M3A1, M5A1, and M6	M3A1, M5A1, and M6		0.49 lb.	0.52 lb.
Proj. Weight.....	1.61 lb.	1.94 lb.	Complete Round Weight	3.13 lb.	3.49 lb.
Proj. Charge and Weight.....	TNT, 0.085 lb.	122 balls	Muzzle Velocity.....	2,600 f/s**	2,500 f/s
Fuze.....	B.D., M58		Maximum Range.....	9,500 yards***	
Primer.....	M38A1†	M38A1†	Chamber Capacity.....	19.19 cu. ins.	19.35 cu. ins.
Cartridge Case.....	M16*	M16*	Rated Max. Pressure, p.s.i.....	40,000	

†Or M38B2 substitute standard.
*The steel cartridge case, M16B1, is substitute standard for use in the M3A1, M5A1 and M6 guns for training only.

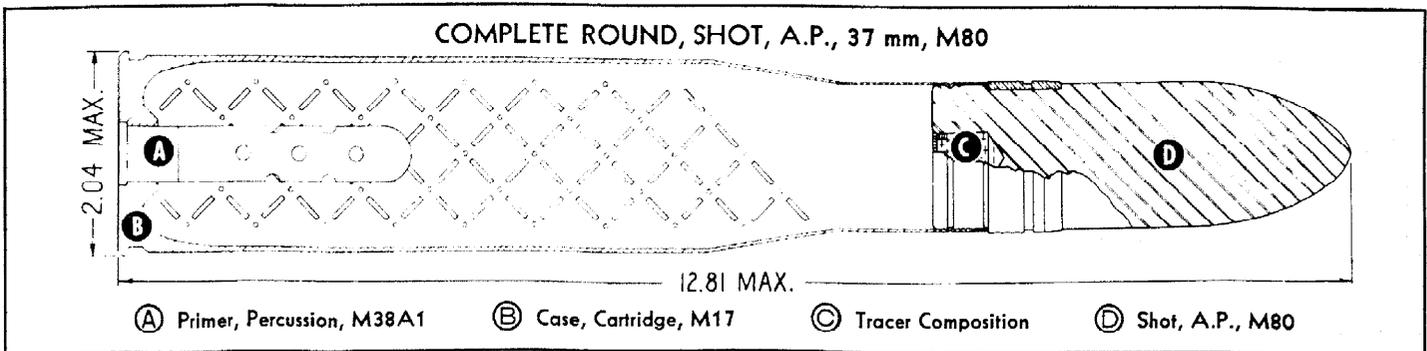
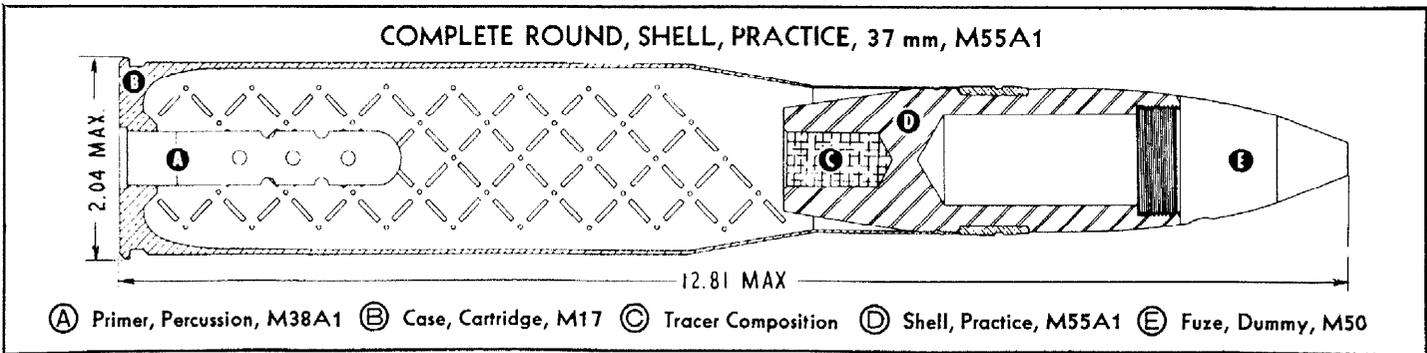
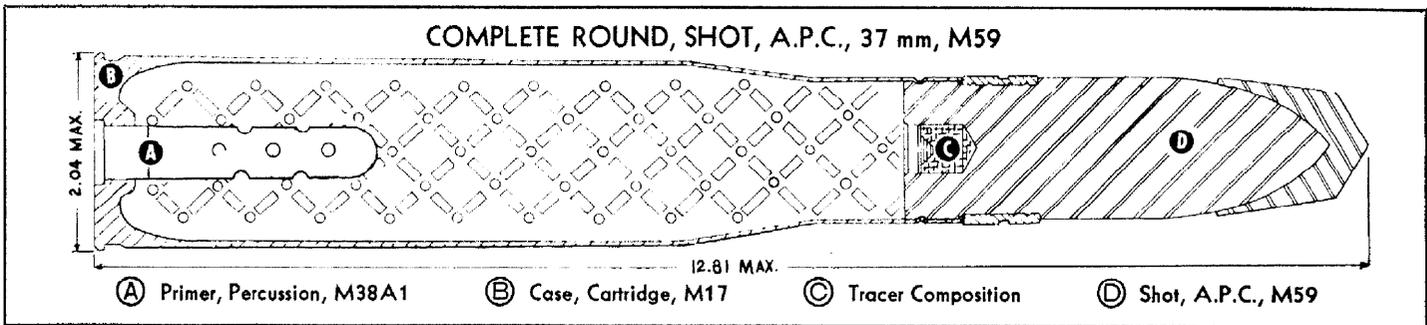
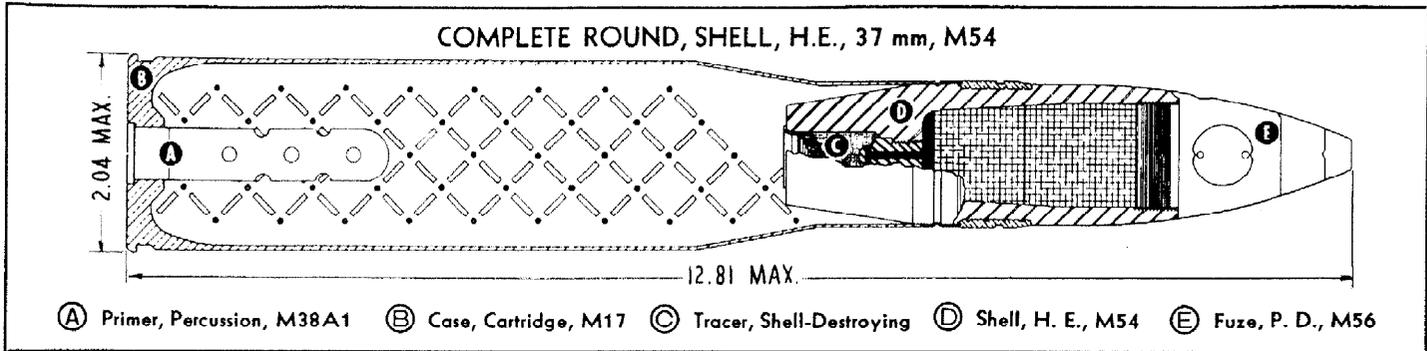
**2,565 f/s in M5A1 gun.
***9,425 yds. in M5A1 gun.

**SHELL, HIGH-EXPLOSIVE, 37 MM, M54—STANDARD
 SHOT, ARMOR-PIERCING CAPPED, 37 MM, M59—STANDARD
 SHELL, PRACTICE, 37 MM, M55A1—STANDARD**

ROUNDS FOR AUTOMATIC GUNS, M1A2 (ANTIAIRCRAFT) AND M9 (AIRCRAFT)

SHOT, ARMOR-PIERCING, 37 MM, M80—SUBSTITUTE STANDARD

ROUND FOR 37 mm AUTOMATIC GUN, M9 (AIRCRAFT)



UNCLASSIFIED

(Continued on next page)

SHELL, HIGH-EXPLOSIVE, 37 MM, M54

SHOT, ARMOR-PIERCING CAPPED, 37 MM, M59

SHELL, PRACTICE, 37 MM, M55A1

SHOT, ARMOR-PIERCING, 37 MM, M80

(Continued)

To combat low-flying, strafing or dive bombing planes, the 37 mm gun, M1A2, was developed and standardized by the Ordnance Department to meet that requirement.

Ammunition for this gun is of the fixed type, fired automatically from ten-round clips, at a rate of approximately 120 rounds per minute.

Cartridge case, M17, standard for all 37 mm ammunition fired from the automatic gun, M1A2, and the aircraft gun, M9, is a bottlenecked, tapered case weighing 0.85 pound. The steel cartridge case, M17B1, is substitute standard for the M1A2 gun, and is used exclusively for training purposes within the continental United States.

Rounds for both guns use the percussion primer, M38A1, or as an alternate the M38B2.

The Shot, A.P.C., M59, is fired from both the M1A2 and M9 guns. For better armor penetration the muzzle velocity was elevated to 2,800 feet per second by increasing the propelling charge. As the A.P., M74, Shot could not give a high enough velocity without developing excessive pressure, the A.P., M80, was made substitute standard for the M9 aircraft gun. The A.P., M80, the A.P.C., M59, the H.E., M54, and the Practice Shell, M55A1, are standard for this gun; the latter two at the same muzzle velocity and maximum rated pressure as when used in the M1A2 gun.

SHELL, HIGH-EXPLOSIVE, 37 mm, M54 — STANDARD—A direct hit must be scored on the objective for this high explosive shell to function.

Both the M1A2 and M9 guns use 0.39 pound of FNH powder, M2 class, propelling charge. In the M9 gun, the round also can be loaded with 0.29 pound of an M5 class propelling charge. The weight of the complete round is 2.68 pounds using M1 powder and 2.58 pounds using M2 or M5 powders.

The M1 powder has an 85-10-5 formula and uses single-perforation grains with a 0.022 inch web.

The M2 powder is an Hercules NG formula with single-perforation grains and a web of 0.034 inch.

The M5 powder also is an Hercules NG formula but uses seven-perforation grains and a 0.039 inch web.

SHOT, ARMOR-PIERCING, CAPPED, 37 MM, M59A1—STANDARD—The A.P.C., M59A1 is a modified A.P.C., M59 Shot. The armor-piercing cap on the former was secured to the shot body by soldering, while on the latter it is attached by a 360 degree crimp. The body of the shot and the cap are manufactured from forgings or bar stock. The built-in tracer has a three seconds burning time.

When fired from the M1A2 gun, a propelling charge of 0.33 pound is used while 0.53 pound is used in the M9 gun.

The weight of the complete round in the M1A2 gun is 3.19 pounds, and 3.39

pounds in the M9 gun. The shot itself weighs 1.91 pounds.

Both the M1 class powder, used in the M1A2 gun, and the M5 class powder, used in the M9 gun, are FNH powders. The M1 powder has an 85-10-5 formula, single-perforation grains and a web of 0.023 inch. The M5 powder has an Hercules NG formula, seven-perforation grains and a 0.039 inch web.

SHELL, PRACTICE, 37-MM, M55A1—STANDARD—This shell is similar to the High-Explosive Shell, M54, but it does not contain the shell-destroying tracer, the bursting charge or the Fuze, P.D., M56. Instead, it contains a tracer which burns for approximately 8 seconds and the Fuze, Dummy, M50 or modifications.

The propelling charges for both guns are the same as those used with the M54 Shell as fired from the M1A2 and M9 guns.

SHOT, ARMOR-PIERCING, 37 mm, M80—SUBSTITUTE STANDARD—The A.P., M80 Shot is manufactured from forgings or bar stock and has a 3-second tracer. As fired the shot weighs 1.66 pounds and the complete round 3.28 pounds.

The 0.51 pound propelling charge of FNH powder gives the shot a muzzle velocity of 3,050 feet per second in the M9 gun. This round is not fired in the M1A2 gun.

The M5 class powder of the propelling charge has an Hercules NG formula, seven-perforation grains and a web of 0.039 inch.

CHARACTERISTICS

	Shell, H.E., M54	Shot, A.P.C., M59	Shot, A.P.C., M59	Shell, Practice, M55A1	Shot, A.P., M80
Caliber	37 mm	37 mm	37 mm	37 mm	37 mm
Model of Guns	M1A2 & M9	M1A2	M9	M1A2 & M9	M9
Proj. Weight	1.34 lb.	1.91 lb.	1.91 lb.	1.34 lb.	1.66 lb.
Proj. Charge and Weight	Tetryl, 10 lb.†	—	—	—	—
Fuze	P.D., M56	—	—	Dummy M50*	—
Primer	M38A1	M38A1	M38A1	M38A1††	M38A1
Cartridge Case	M17**	M17**	M17	M17**	M17
Propelling Charge and Weight	FNH powder, 0.39 lb.†	FNH powder, 0.33 lb.	FNH powder, 0.53 lb.	FNH powder, 0.39 lb.†	FNH powder, 0.54 lb.
Complete Round Weight	2.68 lb.‡	3.19 lb.	3.39 lb.	2.68 lb.‡	3.15 lb.
Muzzle Velocity	2,600 f/s	2,050 f/s	2,800 f/s	2,600 f/s	3,050 f/s
Max. Horiz. Range	8,875 yds.‡	5,790 yds.	—	8,875 yds.‡	—
Chamber Capacity	17.91 cu. ins.	19.35 c.i.	19.35 c.i.	17.91 c.i.	19.35 c.i.
Rated Max. Pressure, p.s.i.	30,000	30,000	46,000	30,000	46,000
Armor Penetration at 20°					
Homogeneous Plate					
500 yards	—	1.0 ins.	2.2 ins.***	—	3.1 ins.****
1,000 yards	—	0.6 ins.	1.3 ins.***	—	2.2 ins.****
Face-Hard. Plate					
500 yards	—	1.9 ins.	1.9 ins.***	—	2.6 ins.****
1,000 yards	—	0.6 ins.	1.2 ins.***	—	2.0 ins.****

* Alternate, Comp. "A" 0.105 lb.

† Alternates M50B1, M50B2, and M50B3.

** The steel cartridge case, M17B1, is Substitute Standard for use in the M1A2 gun.

‡ Steel cartridge case is not used with M9 aircraft gun.

*** For 2,800 f/s M. V. plus 350 m.p.h. airspeed.

**** For 3,050 f/s M. V. plus 350 m.p.h. airspeed.

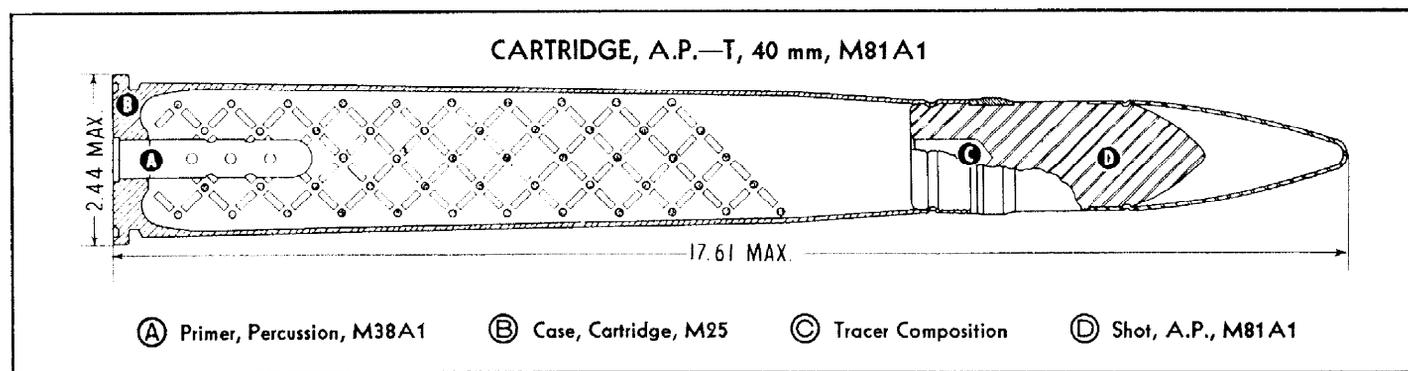
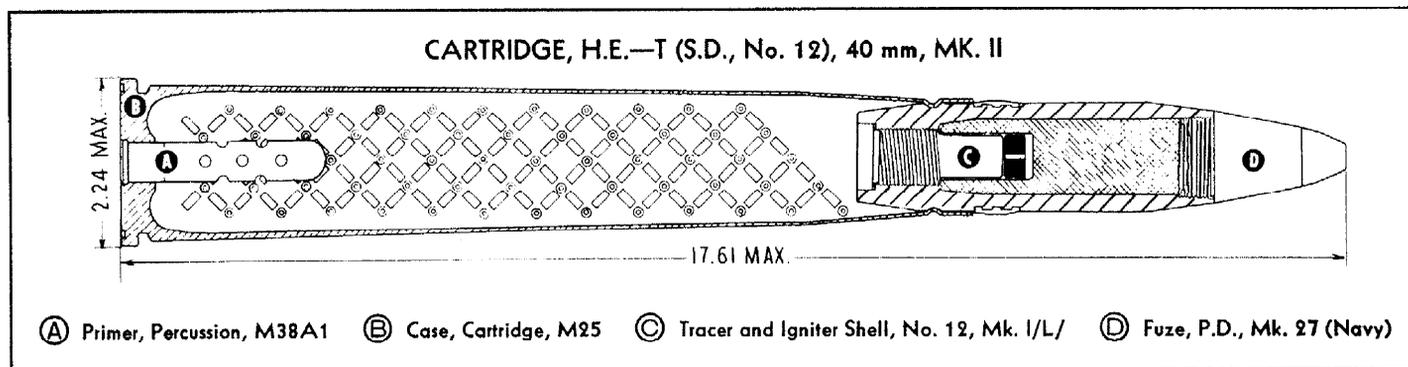
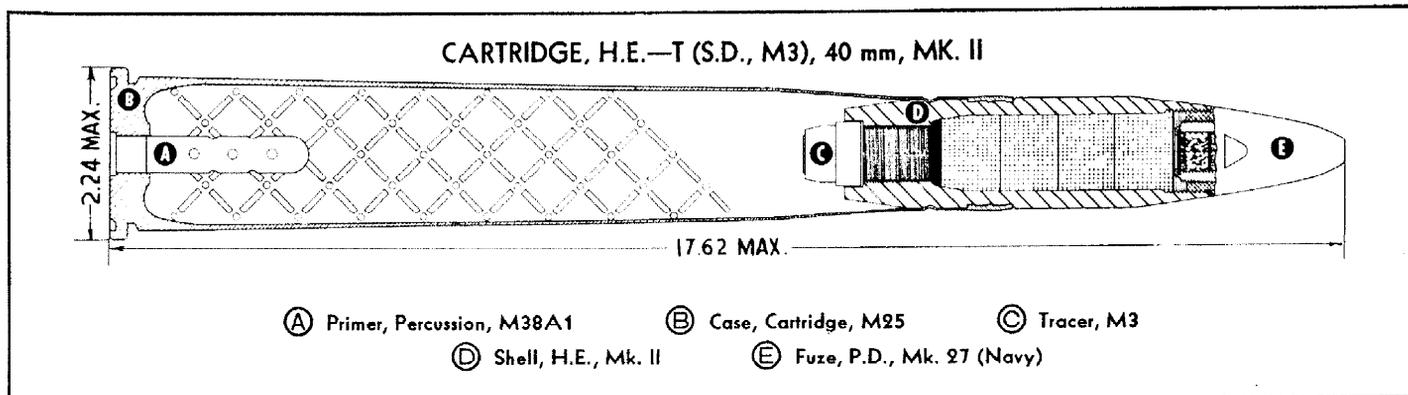
†† M1 powder indicated.

‡‡ 2,900 yds. vertical range.

§ With M2 or M5 powder 2.58 lb., M1 powder indicated.

§§ M203 percussion primer may be used until present stocks are exhausted.

SHELL, H.E.—T (S.D., M3), 40 mm, MK. II—STANDARD
SHELL, H.E.—T (S.D., NO. 12), 40 mm, MK. II—LIMITED STANDARD
SHOT, ARMOR-PIERCING, 40 mm, M81A1—STANDARD
ROUNDS FOR 40 mm BOFORS GUN, M1 (ANTI-AIRCRAFT)



SHELL, H.E.—T (S.D., M3), 40 mm, MK. II—STANDARD—This shell was developed and standardized as an improvement on the Mk. II, H.E. Shell. The only difference between the two lies in the shell-destroying tracer. The newer shell uses the recently developed tracer, M3, which does not depend on set-back to ignite the tracer composition, but is ignited directly by the burning propelling

gases. Due to the difference in tracer construction, the shell contains a heavier bursting charge than the limited standard H.E. Mk. II shell. The complete round components are: cartridge case M25 or M25B1, which is the substitute standard steel case; percussion primer, M38A1, Navy primer Mk. 22, or the substitute standard primer, M38B2; an FNII propelling charge; and the loaded and fuzed

shell, Mk. II, H.E.—T (SD, M3). Either the Navy P.D. fuze, Mk. 27 or the P.D. fuze, M71, is used with the round.

SHELL, H.E.—T (S.D., No. 12), Mk. II—LIMITED STANDARD—These quick-firing, high-explosive shells are used in the 40 mm Bofors anti-aircraft gun, M1.

The P.D. fuze, M71, and the Navy fuze, Mk. 27, are standard with these

(Continued on next page)

UNCLASSIFIED

SHELL, H.E.—T (S.D., M3), 40 MM, MK. II

SHELL, H.E.—T (S.D., NO. 12), 40 MM, MK. II

SHOT, ARMOR-PIERCING, 40 MM, M81A1

(Continued)

shells. The P. D. fuze, M64A1, and D.A. No. 251, Mk. I L, have been reclassified as limited standard.

The complete round includes the D. A. No. 251, Mk. I L, fuze, the tracer and igniter shell No. 12, the M22 cartridge case, and the percussion primer, Q.F. cartridge No. 12, Mk. I L. It is an adaptation of the British complete round for the 40 mm Bofors gun. This round, however, is an "issue only" item.

The same round equipped with the M22A1 cartridge case and the percussion primer, M38A1, is an "issue only" item.

The round fuze with the P.D. M71 fuze or the Navy Mk. 27 fuze and using

the M25 cartridge case and the percussion primer, M38A1, is also an "issue only" item, and is also a limited standard round. The steel cartridge case, M25B1, is substitute standard for the M25 cartridge case.

Differences between the booster cavities for the several fuzes causes the TNT bursting charges to vary. For the shell with the D.A. No. 251, Mk. I L, fuze, the TNT charge is 0.150 pound; the P.D. M64A1 fuze, 0.140 pound; and for the Navy Mk. 27 fuze, 0.168 pound. All three shells use also a black-powder pellet weighing 0.005 pound as a booster.

These shells use the tracer and igniter,

No. 12, which destroys the projectile if the target is missed. The self-destroying feature functions in the same manner as that used with the 37 mm H.E. Shell, M54, except that the set-back energy of the shell forces a primer against a firing pin and ignites the tracer.

SHOT, ARMOR-PIERCING, 40 mm, M81A1—STANDARD—The M81A1 shot has a monobloc type body to which a windshield is attached by a 360° crimp. The tracer composition used has a burning time of approximately twelve seconds.

The weight of the M81A1 complete round is 4.58 pounds; the shot weighs 1.96 pounds.

CHARACTERISTICS

	Shell, Mk. II, H.E.—T (S.D., M3)	Shell, Mk. II, Q.F., H.E.	Shell, Mk. II, H.E.—T (S.D. No. 12)	Shot, M81A1, A.P.
Caliber	40 mm	40 mm	40 mm	40 mm
Model of Gun	Bofors (A.A.), M1	Bofors (A.A.), M1	Bofors (A.A.), M1	Bofors (A.A.), M1
Proj. Weight	2.061 lb.	1.93 lb.	1.95 lb.	1.96 lb.
Proj. Charge and Weight	Tetryl, 0.05 lb. B.P.P., 0.008 lb.	TNT, 0.15 lb.	TNT, 0.130 lb. B.P.P., 0.005 lb.	—
Fuze	P.D., Mk. 27††	Mk. I/L*	P.D., M71†	—
Primer	M38A1‡	M38A1	M38A1	M38A1
Cartridge Case	M25	M22	M25	M25
Propelling Charge and Weight	FNH powder, 0.72 lb.	FNH powder, 0.65 lb.	FNH powder, 0.65 lb.	FNH powder, 0.65 lb.
Complete Round Weight	4.823 lb.	4.69 lb.	4.71 lb.	4.72 lb.
Muzzle Velocity	2,870 f/s	2,870 f/s	2,870 f/s	2,870 f/s
Maximum Range	—	H. 10,850 yards V. 7,625 yards	H. 10,850 yards V. 7,625 yards	9,475 yards
Chamber Capacity	—	28.97 cu. ins.	29.54 cu. ins.	30.73 cu. ins.
Rated Max. Pressure, p.s.i.	40,000	40,000	40,000	40,000
Armor Penetration at 20				
Homogeneous Plate				
500 yards	—	—	—	2.05 ins.
1,000 yards	—	—	—	1.65 ins.
Face-Hard. Plate				
500 yards	—	—	—	1.75 ins.
1,000 yards	—	—	—	1.40 ins.

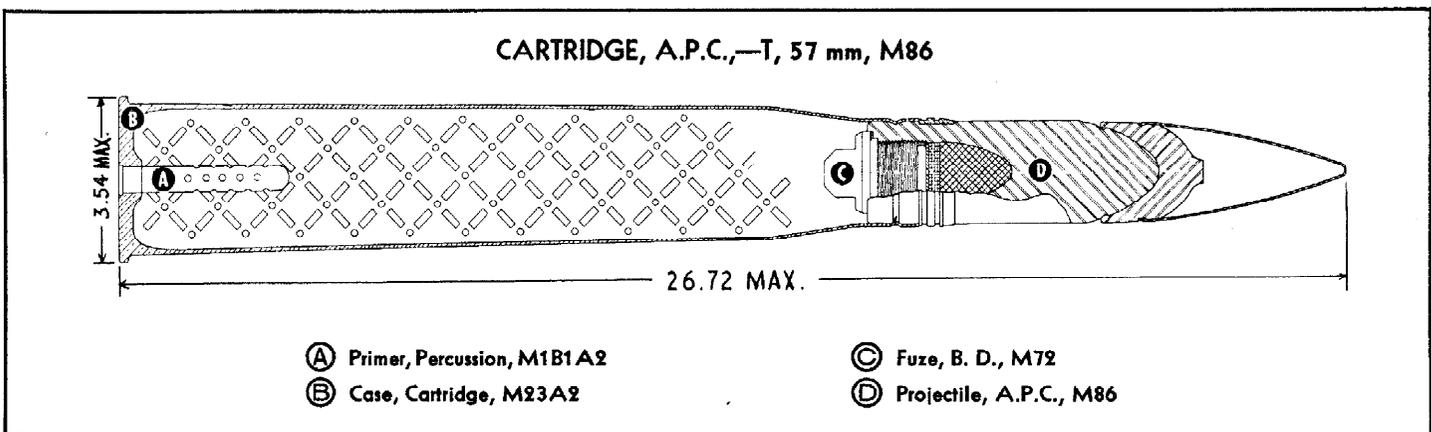
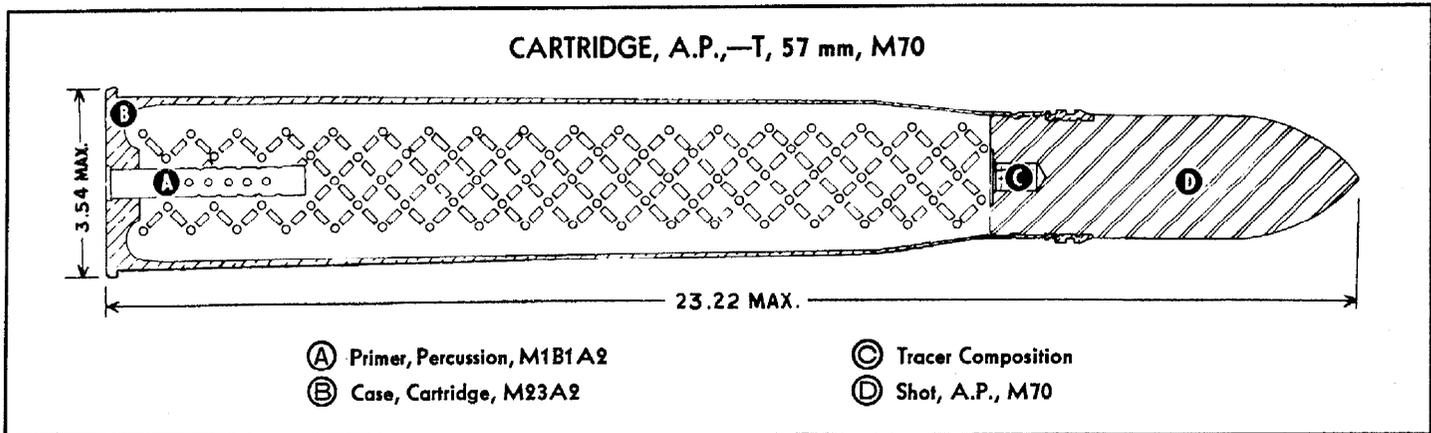
*Percussion fuze, D.A. No. 251, Mk. I/L.
†Fuze, P.D. M71, or Navy Mk. 27 fuze.
‡Alternate P.D. M71.
§Alternate Navy Mk. 27 or M38B2.

UNCLASSIFIED

SHOT, ARMOR-PIERCING, 57 MM, M70—SUBSTITUTE STANDARD

PROJECTILE, A. P. C., 57 MM, M86—STANDARD

ROUNDS FOR GUN, 57 mm, M1 (ANTITANK)



SHOT, ARMOR-PIERCING, 57 mm, M70
— SUBSTITUTE STANDARD — The ammunition for the 57 mm gun is issued in complete rounds of the fixed type. The round consists of a cartridge case, con-

taining a primer and propelling charge, firmly attached by crimping to a solid projectile which has a built-in tracer.

The shot, M70, is particularly suited for firing against targets protected by

homogeneous armor plate, especially in view of the muzzle velocity of 2,950 feet per second.

The complete round weighs 12.82 pounds and is 23.22 inches long. The cartridge

(Continued on next page)

CHARACTERISTICS

	Shot, A.P., M70	Projectile, A.P.C., M86	Shot, A.P., M70	Projectile, A.P.C., M86	
Caliber.....	57 mm	57 mm	Muzzle Velocity.....	2,950 f/s	2,700 f/s
Model of Gun.....	M1 (Antitank)	M1 (Antitank)	Maximum Range.....	9,275 yards	13,555 yards
Proj. Weight.....	6.28 lb.	7.27 lb.	Chamber Capacity.....	100.05 cu. ins.	98.87 cu. ins.
Proj. Charge and Weight.....	—	Explosive "D," 0.076 lb., Tetryl, 0.018 lb.	Pressure, p.s.i.....	44,000	44,000
Fuze.....	—	B.D., M72	Armor Penetration at 20°		
Primer.....	M1B1A2	M1B1A2	Homogeneous Plate		
Cartridge Case.....	M23A2*	M23A2*	500 yards.....	3.9 ins.	3.3 ins.
Propelling Charge and Weight.....	FNH powder, 2.61 lb.	FNH powder, 2.58 lb.	1,000 yards.....	2.9 ins.	2.9 ins.
Complete Round Weight.....	12.82 lb.	13.88 lb.	Face-Hard. Plate		
			500 yards.....	3.2 ins.	3.4 ins.
			1,000 yards.....	2.4 ins.	3.1 ins.

*Steel cartridge case, M23A2B1, is substitute standard.
 †At 15° elevation.

UNCLASSIFIED

SHOT, ARMOR-PIERCING, 57 MM, M70—SUBSTITUTE STANDARD

PROJECTILE, A. P. C., 57 MM, M86—STANDARD

(Continued)

case, M23A2, is standard for all rounds of 57 mm ammunition. This case is 17.40 inches long, and weighs 3.9 pounds. The base is reamed to receive the M1B1A2 primer.

The cartridge case M23A2B1, is substitute standard for the same rounds. This case is made of steel with the same exterior dimensions as the brass case. However, the base of the steel case is thinner and weighs only 0.3 pound less than the brass case.

To give the shot the required muzzle velocity of approximately 2,950 feet per second, a charge of 2.61 pounds of FNH smokeless powder is packed loosely into the cartridge case. The propelling charge is an M1 class powder having an 87-10-3 formula, seven-perforation grains and a web of 0.037 inch. The 2.58 pounds of FNH powder give the projectile a muzzle velocity of 2,700 feet per second.

The shot, A.P., M70, consists of a solid shot of hardened steel with a tracer cavity

in the base. The shot itself is 6.81 inches long and weighs 6.28 pounds. The tracer cavity is 0.5 inch in diameter. The tracer charge consists of approximately 73 grains of red tracer composition in three solid pellets, set off by a 20-grain igniter pellet. Both tracer and igniter charges are enclosed in a cup of clear celluloid. The entire tracer assembly weighs approximately 0.1 pound and is designed to burn for approximately 4.5 seconds.

PROJECTILE, ARMOR-PIERCING CAPPED, 57 mm, M86—STANDARD—The A.P.C. projectile, M86, and base detonating fuze, M72, were developed to meet the demands for an A.P.C. round containing a high-explosive charge similar to 75 mm, M61, and 3", M62.

The projectile is similar in appearance to the 75 mm and 3" A.P.C. projectiles in that it has a blunt nose and a cavity to contain a bursting charge. The base end of the cavity is threaded for the base detonating fuze, M72. The cap differs from the 75 mm and 3" projectile caps in that

instead of having a rounded nose, it has an approximate $\frac{1}{2}$ inch width "wart" on the nose.

The windshield is held to the cap and the cap to the body of the projectile by 360° crimps.

The base detonating fuze, M72, operates on the inertia principle which permits the projectile completely to penetrate the armor plate before detonating the bursting charge.

Measuring 26.72 inches in length, the complete round weighs 13.88 pounds; the projectile itself weighs 7.27 pounds.

As with the A.P. 57 mm M70 round, the M1B1A2 primer and the M23A2 brass cartridge case or the M23A2B1 steel cartridge case are used.

A tracer with a burning time of approximately 4.5 seconds is built into the body of the fuze.

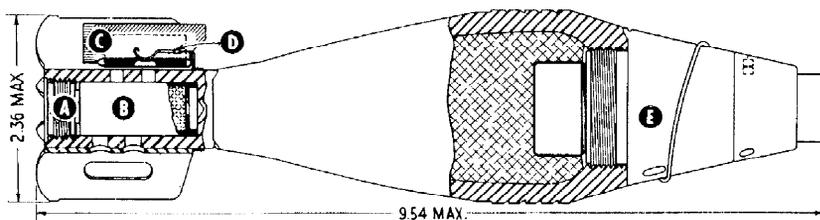
The 0.094 pound of bursting charge consists of 0.018 pound of tetryl to facilitate the detonation of 0.076 pound of Explosive "D."

UNCLASSIFIED

SHELL, HIGH-EXPLOSIVE, 60 MM, M49A2—STANDARD
SHELL, ILLUMINATING, 60 MM, M83—STANDARD
SHELL, PRACTICE, 60 MM, M50A2—STANDARD
PROJECTILE, DRILL, 60 MM, M69—STANDARD

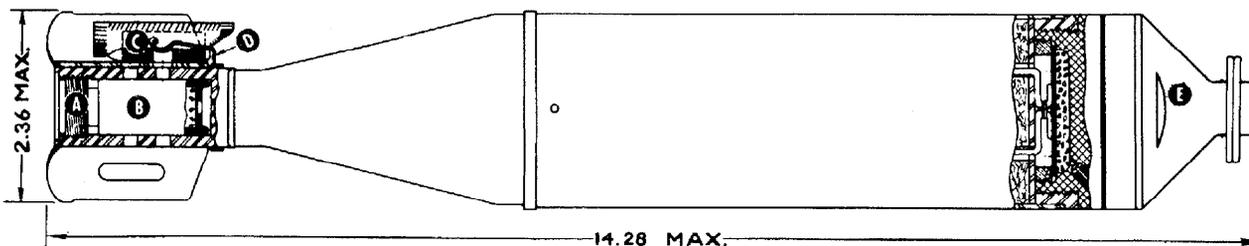
ROUNDS FOR MORTAR M2

COMPLETE ROUND, SHELL, H.E., 60 mm, M49A2



- Ⓐ Primer, Percussion, M32 Ⓑ Cartridge, Ignition, M5A1 Ⓒ Increment, Propellant, M3
 Ⓓ Holder, Increment Propellant, M1A1 Ⓔ Fuze, P.D., M52

COMPLETE ROUND, SHELL, ILLUMINATING, 60 mm, M83



- Ⓐ Primer, Percussion, M32 Ⓑ Cartridge, Ignition, M5A1 Ⓒ Increment, Propellant, M4
 Ⓓ Holder, Increment Propellant, M1A1 Ⓔ Fuze, Time, M65

CHARACTERISTICS

	Shell, H.E., M49A2	Shell, Ill., M83	Shell, Prac., M50A2	Projectile, Drill, M69
Caliber	60 mm	60 mm	60 mm	60 mm
Model of Mortar	M2	M2	M2	M2
Proj. Weight	2.90 lb.	3.70 lb.	2.90 lb.	2.90 lb.
Proj. Charge and Weight	TNT, 0.34 lb.	Expelling Charge, 0.06 lb., black powder.	Inert, 0.29 lb., B.P.P. 0.05 lb.	—
Fuze	P.D., M52*	Time, M65	P.D., M52*	—
Primer	M32	M32	M32	—
Cartridge (Ignition)	M5A1	M5A1	M5A1	—
Propelling Charge and Weight	(Wt. of 4), 0.024 lb.	(Wt. of 4), 0.018 lb.	(Wt. of 4), 0.024 lb.	—
Complete Round Weight	2.94 lb.	3.72 lb.	2.94 lb.	2.94 lb.
Muzzle Velocity	518 f/s†	390 f/s	518 f/s†	—
Maximum Range	45° 0'—1,985 yds.‡ 85° 30'—300 yds.	—	45° 0'—1,985 yds.‡ 85° 30'—300 yds.	—
Rated Max. Pressure, p.s.i.	6,000	6,000	6,000	—

*Alternate, Fuze, P.D., M52B1.
 †535 f/s with M52B1 fuze.
 ‡Ranges with M52B1 fuze, firing in 5th zone:
 45° 0'—2,017 yds.
 85° 40'—300 yds.

(Continued on next page)

UNCLASSIFIED

SHELL, HIGH-EXPLOSIVE, 60 MM, M49A2

SHELL, ILLUMINATING, 60 MM, M83

SHELL, PRACTICE, 60 MM, M50A2

PROJECTILE, DRILL, 60 MM, M69

(Continued)

The Mortar, M2, fires projectiles weighing approximately three to four pounds and is accurate up to 1,985 yards at 45° elevation.

A round consists of projectile, fuze, propellant charges for zone ranging, primer, and a cartridge loaded with ballistite explosive.

The primer strikes a firing pin (or anvil) at the base of the mortar tube. This action ignites the primer, setting off the charge in the ignition cartridge and firing the propellant charges attached to the fin assembly.

SHELL, H.E., 60 mm, M49A2—STANDARD—The complete round, weighing 2.94 pounds, consists of the fuzed and finned Shell, H.E., M49A2, the M32 percussion primer, the M5A1 ignition cartridge, and the M3 propellant increment.

The shell body is manufactured from either a steel casting or forging. A bursting charge of 0.34 pound of flake TNT is loaded into the shell body in two 0.17 pound increments. The first increment is consolidated at 2,000 p.s.i. pressure, and the second under 5,000 p.s.i. pressure.

The propelling charge consists of a Hercules NG formula powder in sheet form having a single perforation. Several

sheets are sewn together and assembled in a cellophane bag, the purpose of the cellophane being to keep the powder dry and to facilitate attaching the increments to the shell. The number of increments depends on the range desired. Four of the M3 increments weigh 0.024 pound. Each M3 increment weighs approximately 35 grains.

The increment propellant holder, M1, is used to attach the increments between the fins. The holder is a ring fitted with metal clips each of which has a loop on the end. The loop is pushed through the hole in the increment, thereby holding it in place between the fins.

SHELL, ILLUMINATING, 60 mm, M83—STANDARD This shell has been designed for use in illuminating a target. Upon functioning of the time fuze, M65, an expelling charge is ignited which starts the flare burning, shears a number of pins holding the tail of the shell to the body and then expels the flare and parachute assembly from the shell body. The expelling charge is 0.06 pound of black powder.

The M83 shell is 4.74 inches longer than the high-explosive, M49A2, and the complete round weighs 3.72 pounds. The propelling charge is a Hercules NG

formula of several perforated sheets sewn together. The charge is assembled in a cellophane bag which is attached between the fins by the increment propellant holder, M1A1. The maximum pressure is obtained with 130 grains of this powder.

The range at the maximum setting (14 seconds) of the time fuze, M65, is 1,040 yards at 50° elevation.

SHELL, PRACTICE, M50A2—STANDARD—Loaded and fuzed, the projectile weighs 2.90 pounds, of which 0.34 pound is the weight of the charge which includes 0.29 pound of inert loading and 0.05 pound of black-powder pellet. Practice shells are filled with sand to make their weight approximately the same as high-explosive shells in order to obtain identical ballistic properties. The propelling charge for this shell is a Hercules NG formula, in sheet form, perforated and with several sheets sewn together. There is one hole in the middle of each sheet. The increments are attached to the shell by the M1A1 increment propellant holder after being assembled in a cellophane bag. The maximum pressure is obtained with 168 grains of this powder.

PROJECTILE, DRILL, 60 mm, M69—STANDARD—(See Table of Characteristics.)

UNCLASSIFIED

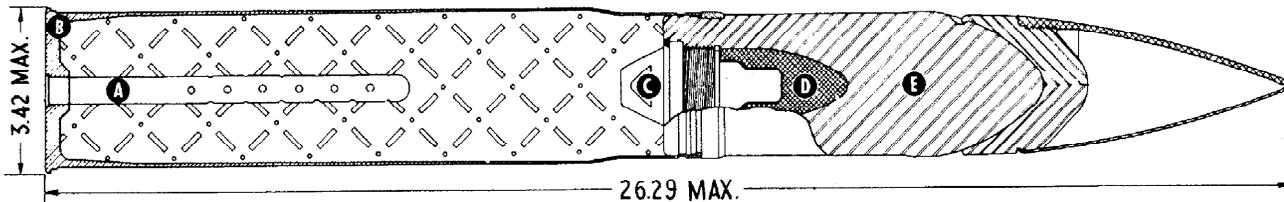
PROJECTILE, ARMOR-PIERCING CAPPED, 75 MM, M61—STANDARD

ROUND FOR GUNS, M1897A4, M1916, M1917, M2, M3 (TANK), M4 (AIRCRAFT)

SHELL, SMOKE (BASE EMISSION), 75 MM, M89—SUBSTITUTE STANDARD

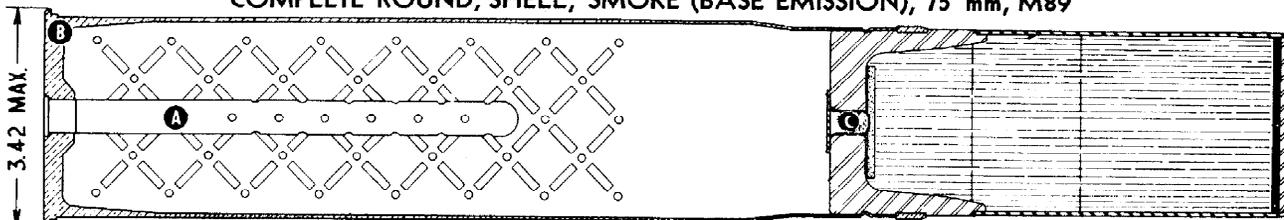
ROUND FOR GUNS, M2 AND M3 (TANK)

COMPLETE ROUND, PROJECTILE, A.P.C., 75 mm, M61



- (A) Primer, Percussion, M31A2 (B) Case, Cartridge, M18 (C) Fuze, B.D., M66A1
(D) Charge, Bursting (E) Projectile, A.P.C., M61

COMPLETE ROUND, SHELL, SMOKE (BASE EMISSION), 75 mm, M89



- (A) Primer, Percussion, M31A2 (B) Case, Cartridge, M18 (C) Flash Relay Assembly

CHARACTERISTICS

	Proj. A.P.C., M61	Proj. A.P.C., M61	Proj. A.P.C., M61	Shell, Smoke M89
Caliber.....	75 mm	75 mm	75 mm	75 mm
Model of Guns.....	M1897A4	M3, M4	M2, M1916, M1917	M2, M3
Proj. Weight.....	14.96 lb.	14.96 lb.	14.96 lb.	6.61 lb.
Proj. Charge and Weight.....	Expl. "D" 0.144 lb.	Expl. "D" 0.144 lb.	Expl. "D" 0.144 lb.	H.E., 1.68 lb.
Fuze.....	B.D., M66A1	B.D., M66A1	B.D., M66A1	—
Primer.....	M31A2	M31A2	M31A2	M31A2
Cartridge Case.....	M18*	M18*	M18*	M18*
Propelling Charge and Weight.....	FNH powder, 2.16 lb.	FNH powder, 2.16 lb.	FNH powder, 2.16 lb.	FNH powder, 0.16 lb.
Complete Round Weight.....	20.02 lb.	20.02 lb.	20.02 lb.	9.83 lb.
Muzzle Velocity.....	2,000 f/s	2,024 f/s	1,926 f/s	850 f/s**
Maximum Range.....	13,870 yds.	14,000 yds.	13,600 yds.	—
Chamber Capacity.....	88.05 cu. ins.	88.05 cu. ins.	88.05 cu. ins.	—
Rated Max. Pressure, p.s.i.....	38,000	38,000	38,000	8,000
Armor Penetration at 20°				
Homogeneous Plate				
500 yards.....	2.8 ins.	2.9 ins.	2.6 ins.	—
1,000 yards.....	2.5 ins.	2.6 ins.	2.3 ins.	—
Face-Hard. Plate				
500 yards.....	3.4 ins.	3.4 ins.	3.1 ins.	—
1,000 yards.....	3.0 ins.	3.1 ins.	2.7 ins.	—

*Steel cartridge case, M18B1 is substitute standard for M1897A4, M2, M3, guns.
Not used with M4 gun.
**In M3 gun, 820 f/s in M2 gun.

UNCLASSIFIED

(Continued on next page)

PROJECTILE, ARMOR-PIERCING CAPPED, 75 MM, M61

SHELL, SMOKE (BASE EMISSION), 75 MM, M89

(Continued)

PROJECTILE, ARMOR-PIERCING CAPPED, 75mm, M61—STANDARD—The projectile contains the Fuze, B.D., M66A1, which detonates a 0.144 pound bursting charge of explosive "D." Cartridge case, M18, contains the percussion primer, M31A2, and a propelling charge of 2.16 pounds of FNH powder. The steel cartridge case, M18B1, is substitute standard for use in the M1897, M1916, M1917, M2, M3, and M4 guns. The percussion primer, M31B1A2, can be used as an alternate for the M31A2. Weight of the complete round is 20.02 pounds. The projectile weighs 14.96 pounds.

The 2.16 pounds of M1 class propelling

charge is an 85-10-5 formula, has a web size of 0.025 inch, and seven perforations per grain.

To the nose of the projectile is soldered a steel armor-piercing cap on which is screwed a ballistic cap or windshield giving the projectile an over-all length of 14.47 inches.

This method of attaching the windshield is one of four which may be used. The steel windshield may be brazed to a steel adapter and the whole assembly screwed onto the cap and staked to it. A third method uses a windshield adapter that is forced onto the cap after the windshield is brazed to it. The fourth method is

to crimp the windshield directly to the cap.

The B.D. fuze, M66A1, used with this projectile is an inertia type fuze and has a built-in tracer which burns for approximately three seconds.

SHELL, SMOKE (BASE EMISSION), 75 mm, M89—SUBSTITUTE STANDARD

—This shell, which has been made substitute standard for the tank guns M2 and M3, functions in the same manner as the M88 round described under the 76 mm gun, M1.

The propelling charge uses an M2 powder, Hercules NG formula, with a single perforation and a web size of 0.015 inch.

UNCLASSIFIED

SHELL, HIGH-EXPLOSIVE, 75 MM, M48—STANDARD

ROUND FOR GUNS, M1897A4, M1916, M1917, M2 M3, (TANK) AND FOR GUN, M4 (AIRCRAFT)

SHELL, CHEMICAL (W.P.), 75 MM, M64, WITH FUZE, P.D., M57—STANDARD

ROUND FOR 75 MM GUNS, M1897, M2, M3

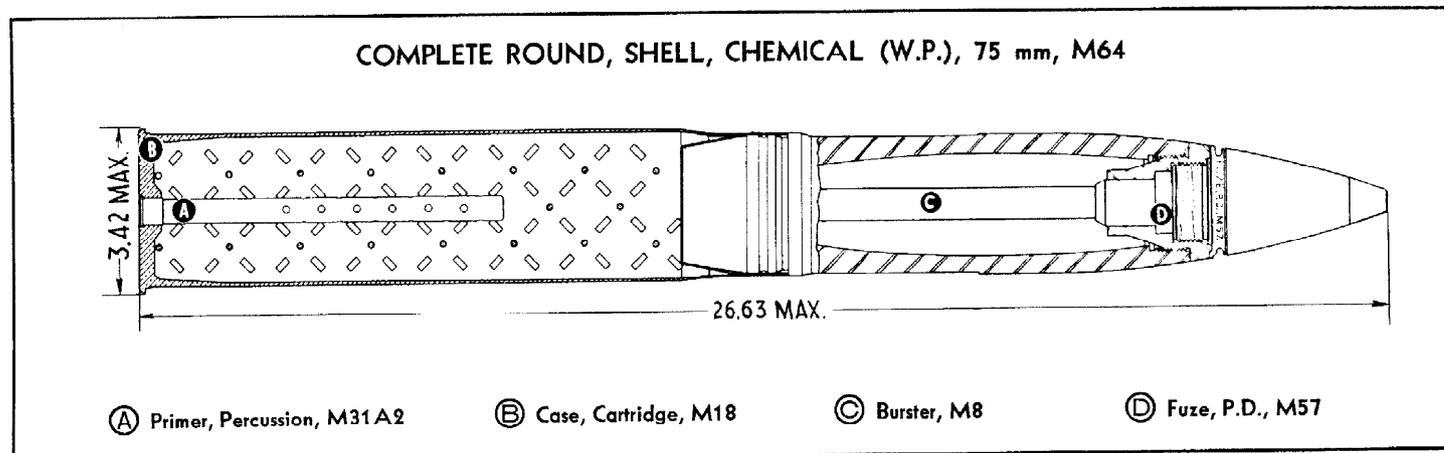
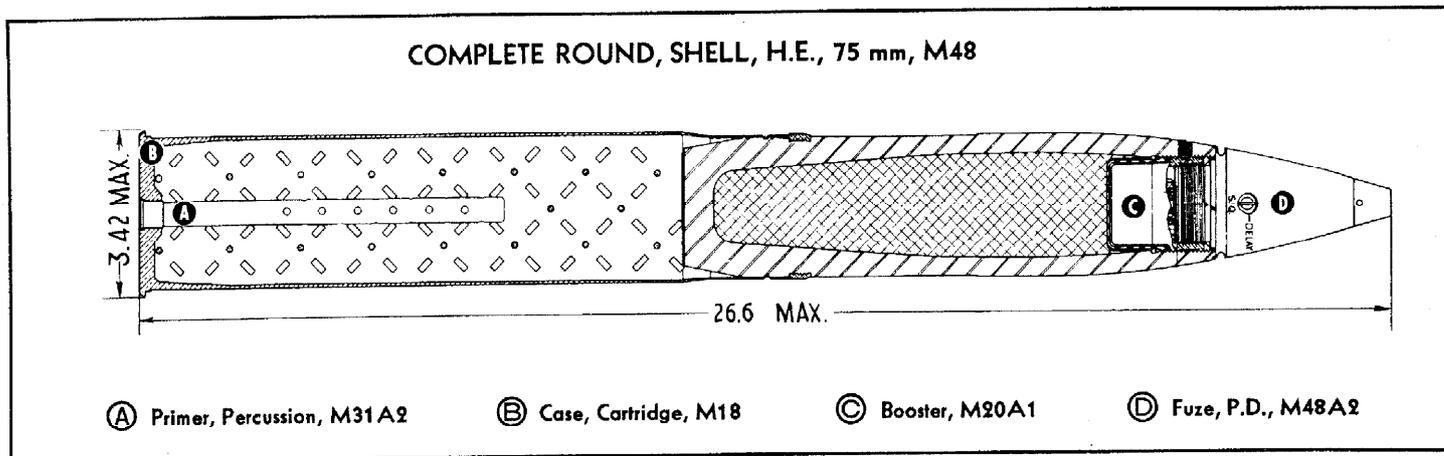


TABLE A

(SHELL, H. E., M48)

GUN	PROPELLING CHARGE	MUZZLE VELOCITY	MAXIMUM RANGE	FUZE	PRIMER
M1897A4.....	Super, 1.93 lb.	1,950 f/s	13,953 yds.	P.D., M48A2 (.05 sec.) & T & SQ., M54	M31A2
	Normal, 1.05 lb.	1,500 f/s	11,195 yds.	P.D., M48A2 (.15 sec.) & T. & SQ., M54	M22A3
	Reduced, 0.38 lb.	950 f/s	6,960 yds.	P.D., M48A2 (.15 sec.) & T. & SQ., M54	M22A3
M1916, M1917, & M2.....	Super, 1.93 lb.	1,889 f/s	13,305 yds.	P.D., M48A2 (.05 sec.)	M31A2
	Normal, 1.05 lb.	1,468 fs	10,995 yds.	P.D., M48A2 (.15 sec.)	M22A3
	Reduced, 0.38 lb.	923 f/s	6,735 yds.	P.D., M48A2 (.15 sec.)	M22A3
M3.....	Super, 1.93 lb.	1,974 f/s	14,000 yds.	P.D., M48A2 (.05 sec.)	M31A2
	Normal, 1.05 lb.	1,518 f/s	11,400 yds.	P.D., M48A2 (.15 sec.)	M22A3
	Reduced, 0.38 lb.	960 f/s	7,200 yds.	P.D., M48A2 (.15 sec.)	M22A3
M4.....	Super, 1.93 lb.	1,974 f/s	14,000 yds.	P.D., M57	M31A2

SHELL, HIGH-EXPLOSIVE, 75 mm, M48—STANDARD—The components of a complete round consist of: the loaded and fuzed shell, the M18 cartridge case, containing either the M22A3 or M31A2

percussion primer and a propelling charge of FNH powder. A steel cartridge case M18B1 is substitute standard for the M18 case, however, the steel case is not to be used in the M4 aircraft gun.

The shell contains 1.47 pounds of TNT bursting charge or as an alternate, 1.36 pounds of 50-50 Amatol with 0.11 pound of Cast TNT surrounding the booster. The fuze is screwed into the Booster,

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SHELL, HIGH-EXPLOSIVE, 75 MM, M48

SHELL, CHEMICAL (W.P.), 75 MM, M64, WITH FUZE, P.D., M57

(Continued)

M20A1, which is assembled and staked into the shell after loading operations are concluded. The base of the shell is protected by a base cover, which either is spot or circumferentially welded to the shell.

Various fuzes and primers are authorized for this round, depending upon the gun from which the shell is fired and the propelling charge that is being employed. Table A gives the proper fuzes and primers to be used.

The 1.93 pounds supercharge is an M1 class powder of an 85-10-5 formula, the grains having seven perforations and a web of 0.025 inch.

The normal charge, weighing 1.05 pounds, also is an M1 class powder having the same formula as the supercharge, however, the grains have a single perforation and a web of 0.014 inch.

The 0.38 pound reduced charge is an M2 class powder of an Hercules NG formula, with single-perforation grains having a web of 0.015 inch.

SHELL, CHEMICAL (W.P.), 75 mm, M64 --STANDARD In view of the Ordnance Department's requirements for a W.P. Smoke Shell for use in 75 mm Guns, the Shell, Chemical (W.P.), 75 MM, M64, with Fuze, P.D., M57, was tested and found to be more efficient than the Shell, Chemical, Mk. II.

The exterior ballistic characteristics of the M64 Shell are superior to those of the Mk. II Shell. However, due to the difference in the cavity shape the M64 shell contains a slightly smaller amount of W.P. than the Mk. II shell.

The stability factor of the M64 is equivalent to the M48 Shell, from which it was patterned. Both shells have the same shape and the same firing table may be used. The weight variation is approximately 1/2 pound. The difference in weight is corrected by the usual firing table values.

The Shell, M64, may be used without altering existing tank reticles.

A complete round consists of the loaded and fuze'd M64 Chemical shell cartridge case, M18, containing the M31A2 percussion primer and the FNH propelling charge. Supercharge is the only charge authorized for this round. Using this charge, 1.93 pounds of M1 class powder, the muzzle velocity is 1950 f/s in the M1897A4 gun.

CHARACTERISTICS

	Shell, H.E., M48	Shell, Chem. (W.P.), M64
Caliber	75 MM	75 MM
Model of guns	M1897A4, M7, M1916, M1917, M3 & M4	M1897A4, M2, M3
Proj. Weight	14.70 lbs.	15.95 lbs.
Fuze	See Table A	P.D., M57
Primer	See Table A	M31A2
Complete round weight	19.59 lbs.*	20.04 lbs.
Propelling charge	See Table A	FNH powder, 1.93 lb.
Muzzle Velocity	See Table A	1950 f/s****
Max. Range	See Table A	13,730 yds.†
Cartridge case	M18**	M18**
Chamber Capacity	80.57 cu. ins.	80.57 cu. ins.
Rated Max. pressure, p.s.i.	36,000***	36,000***

*Supercharge indicated, normal charge, 12.64 lbs.; reduced charge, 11.99 lbs.

**Steel cartridge case, M1891, is substitute standard for use in all guns except the M48 gun.

***Supercharge indicated.

****In M1897A4 gun, 1929 f/s to M2 gun and 1974 f/s to M3 gun.

†In M1897A4 gun, 12,490 yds. to M2 gun and 14,130 yds. to M3 gun.

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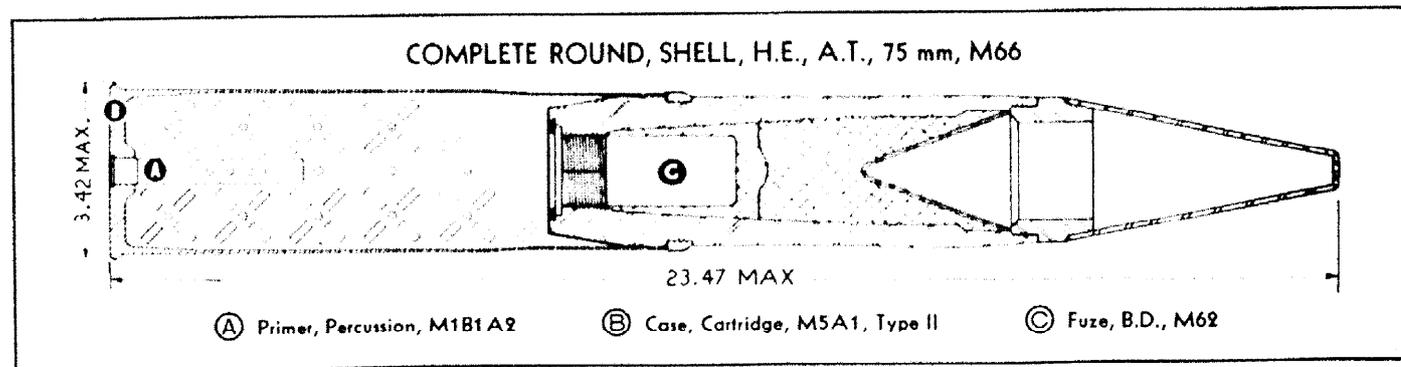
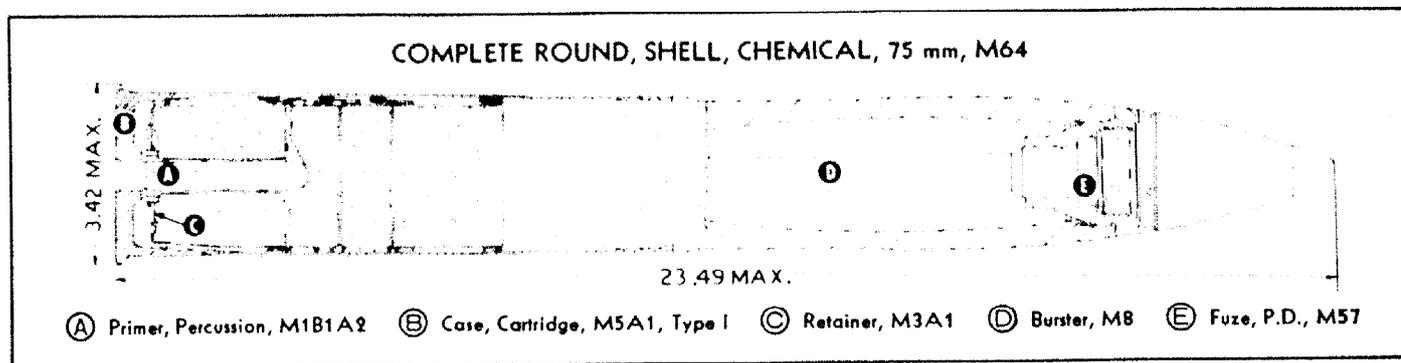
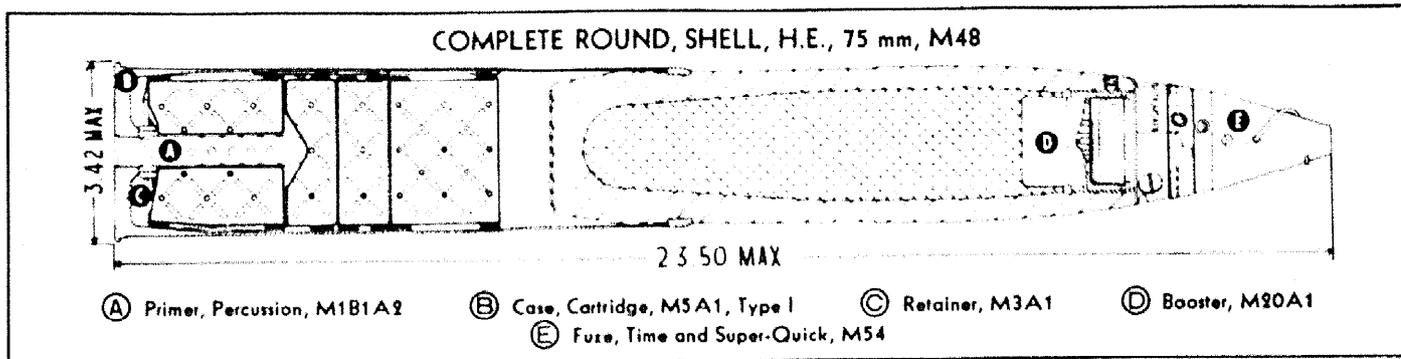
SHELL, HIGH-EXPLOSIVE, 75 MM, M48—STANDARD

SHELL, CHEMICAL, 75 MM, M64—STANDARD

WITH SMOKE (F.S.), SMOKE (W.P.) OR GAS, PERSISTENT (H.) FILLERS

SHELL, HIGH-EXPLOSIVE, ANTITANK, 75 MM, M66—STANDARD

ROUNDS FOR HOWITZERS, 75 mm, M1, M1A1, M2 AND M3



The propelling charge for the M48 and M64 rounds is contained in four-section powder bags. In the M66 round the propelling charge is in loose form. The powder bags are held in place in the cartridge case by the M3A1 retainer. The retainer is forced over the primer, and then is tied to the base charge of the four-section powder bag.

SHELL, HIGH-EXPLOSIVE, 75 mm, M48—STANDARD—The standard components of the complete round consist of the following: the M48 projectile, the M20A1 booster, the M54 time and super-quick fuze or the M18A2 (15 Sec.) point-detonating fuze, and the M5A1 type I cartridge case containing the M1B1A2 percussion primer. The steel cartridge

case, M5A1B1, Type I, is a substitute standard.

The M5A1 cartridge case is loosely fitted to the projectile to permit ready access to the four-zone powder bags. Three increments are connected to the base charge by a cord. Any or all of the increments may be removed as required to obtain a given range. (See Table A.)

(Continued on next page)

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SHELL, HIGH-EXPLOSIVE, 75 MM, M48

SHELL, CHEMICAL, 75 MM, M64

SHELL, HIGH-EXPLOSIVE, ANTITANK, 75 MM, M66

(Continued)

The projectile weighs 14.70 pounds. The propelling charge of FNH powder weighs 0.92 pound, and the bursting charge of TNT weighs 1.47 pounds.

The propelling charge is an M1 class powder. The formula is 85-10-5 and the grains have a single perforation and a web of 0.019 inch.

SHELL, CHEMICAL, 75 mm, M64—STANDARD—The complete round for this four-zone charge chemical shell consists of the following: point-detonating fuze, M57; M8 burster; the M5A1, Type I, cartridge case containing the M1B1A2 percussion primer and the FNH powder propelling charge of 0.92 pound. The burster contains 0.11 pound of tetryl. The steel cartridge case, M5A1B1, Type I, is substitute standard. The formula of the M1 class propelling charge is 85-10-5 and the grains have a single perforation and a web of 0.019 inch.

The following table gives the weights of the complete round, the shell as fired, and the chemical charge for each type of shell:

	(W.P.) Smoke	(H.) Gas, Pers.	(F.S.) Smoke
COMPLETE ROUND.....	18.77 lb.	18.46 lb.	18.93 lb.
SHELL, AS FIRED.....	15.25 lb.	14.94 lb.	15.41 lb.
CHARGE, CHEMICAL..	1.35 lb.	1.04 lb.	1.51 lb.

SHELL, HIGH-EXPLOSIVE, ANTI-TANK, 75 mm, M66—STANDARD—This projectile embodies the "hollow charge,"

or "Munroe," principle. It is a remarkable armor-piercing round and will penetrate approximately 3½ inches of armor. A bursting charge of 0.81 pound of 50/50 Pentolite and 0.19 pound of 10/90 Pentolite is used.

The complete round consists of the M66 projectile; the base-detonating fuze, M62; the cartridge case, M5A1, Type II, which contains the percussion primer, M1B1A2. The steel cartridge case, M5A1B1, Type II, is substitute standard.

The 0.41 pound of M2 class Hercules NG formula propelling charge has a web of 0.015 inch and a single-perforated grain.

**TABLE A
FOUR-ZONE CHARGE ANALYSIS**

Charge	Powder Weight	Muzzle Velocity	Maximum Range	Elevation
ZONE 1—Base 1.....	0.37 lb.	700 f/s	4,190 yds.	43° 40'
ZONE 2—Base 1, Incr. 2.....	0.48 lb.	810 f/s	5,360 yds.	43° 40'
ZONE 3—Base 1, Incr. 2, 3.....	0.62 lb.	950 f/s	6,930 yds.	43° 0'
ZONE 4—Base 1, Incr. 2, 3, 4.....	0.92 lb.	1,250 f/s	9,610 yds.	43° 30'

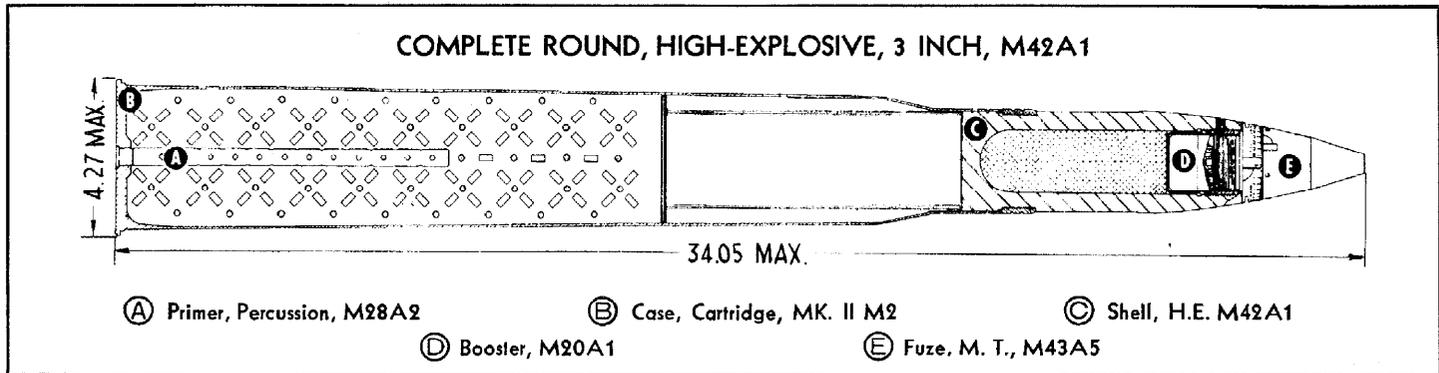
CHARACTERISTICS

	Shell, H.E., M48	Shell, Chem., M64 (FS)	Shell, H.E., A.T., M66
Caliber.....	75 mm	75 mm	75 mm
Model of Howitzers.....	M1, M1A1, M2, and M3	M1, M1A1, M2, and M3	M1, M1A1, M2, and M3
Proj. Weight.....	14.70 lb.	15.41 lb.	13.27 lb.
Proj. Charge and Weight.....	TNT, 1.47 lb.	1.51 lb.	1.00 lb.‡
Booster or Burster.....	M20A1	M8	—
Fuze.....	T. and S.Q., M54*	P.D., M57	B.D., M62
Primer.....	M1B1A2	M1B1A2	M1B1A2
Cartridge Case.....	M5A1, Type I†	M5A1, Type I†	M5A1, Type II††
Propelling Charge and Weight.....	FNH powder, 0.92 lb.	FNH powder, 0.92 lb.	FNH powder, 0.41 lb.
Complete Round Weight.....	18.22 lb.	18.93 lb.	16.30 lb.
Muzzle Velocity.....	1,250 f/s	1,250 f/s	1,000 f/s
Maximum Range.....	9,610 yds.	9,630 yds.**	7,900 yds.
Chamber Capacity.....	59.08 cu. ins.	59.08 cu. ins.	59.08 cu. ins.
Rated Max. Pressure, p.s.i.....	29,000	29,000	26,000

‡Consists of 0.81 lb. of 50/50 Pentolite, 0.19 lb. of 10/90 Pentolite.
*Or, Fuze, P.D., M48A2, (1.5 sec.)
†Steel cartridge case, M5A1B1, Type I, is substitute standard.
**For W. P. and F. S. loaded shell, 9620 yards for H. loaded shell.
††Steel cartridge case, M5A1B1, Type II, is substitute standard.

SHELL, HIGH-EXPLOSIVE, 3 INCH, M42A1—STANDARD

ROUND FOR GUN, 3 INCH (ANTIAIRCRAFT), M1917, M1917MII, M1925M1, M2 AND M4



There are two general types of 3-inch antiaircraft guns: the M1918, M1 and M3, provided with mobile mounts; and the M1917, M1925M1, M2 and M4, designed for fixed mounts.

As the fixed type of gun has a larger powder chamber than the gun of the mobile type, a larger cartridge case is required in the complete round. The cartridge case, Mk. I M2, has a volume of 293 cubic inches, and the cartridge case Mk. II M2, used in the mobile type gun, has a volume of 212 cubic inches. Because of this difference, the rounds are not interchangeable between the two types of guns even though the same projectiles are fired. The steel cartridge case, Mk. II M2B1, is a substitute standard.

The complete round of ammunition

used in antiaircraft guns consists of the loaded and fuze projectile, the cartridge case containing a primer, propelling charge and distance wad. In general, two types of service ammunition are provided for 3-inch antiaircraft guns: high-explosive and shrapnel. The M3, M1 and M1918 antiaircraft guns use also the M62, A.P.C., and the M79, A.P., rounds for anti-tank use.

Shrapnel now on hand is "Limited Standard" but is available as substitute for high-explosive shells until the supply is exhausted. It is used primarily for target practice.

SHELL, H.E., 3 INCH, M42A1—STANDARD—The 3 inch, M42A1, was designed to take the mechanical time fuze, M43A5, without using an adapter as was neces-

sary with the Mk. IX shell. The base of the M42A1 was also strengthened for additional bore safety. The use of the M43A5 fuze without an adapter gives a better ballistic outline to the M42A1 shell.

The interior of the booster body is threaded to take the mechanical time fuze, M43A5.

The complete round weighs 26.76 pounds and the weight of the projectile is 12.87 pounds. The shell contains a TNT bursting charge of 0.86 pound. The weight of the NH propelling charge is 4.56 pounds. The 21-second time fuze, Mk. IIIA2, is the approved substitute standard for the M.T., M43A5 fuze.

The propelling charge is an M1 class powder of an 87-10-3 formula. The grains have seven perforations and a web of 0.032 inch.

CHARACTERISTICS

	Shell, H.E., M42A1	Shell, H.E., M42A1	Shell, H.E., M42A1	Shell, H.E., M42A1
Caliber.....	3 inch	3 inch	Propelling Charge and Weight.....	NH powder, 4.56 lb.
Model of Guns.....*	*	*	Complete Round Weight.....	26.34 lb.
Proj. Weight.....	12.65 lb.	12.87 lb.	Muzzle Velocity.....	2,800 f/s
Proj. Charge and Weight.....	TNT, 0.86 lb.‡	TNT, 0.86 lb.‡	Maximum Range.....	H.—12,100 yds. V.—8,000 yds.
Booster.....	M20A1	M20A1	Chamber Capacity.....	284.50 cu. ins.
Fuze.....	21 sec., Mk. III A2	M.T., M43A5	Rated Max. Pressure, p.s.i.....	36,000
Primer.....	M28A2	M28A2		
Cartridge Case.....†	†	†		

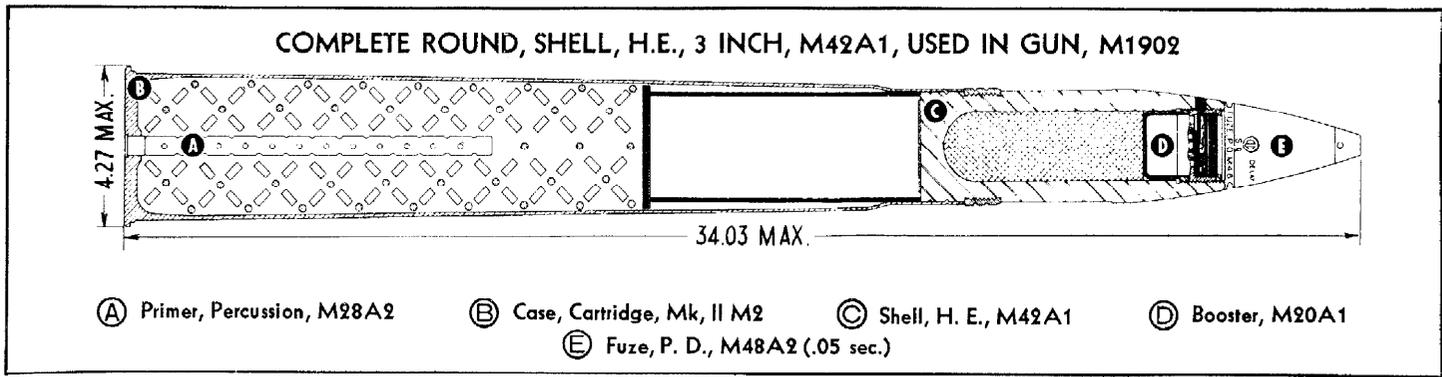
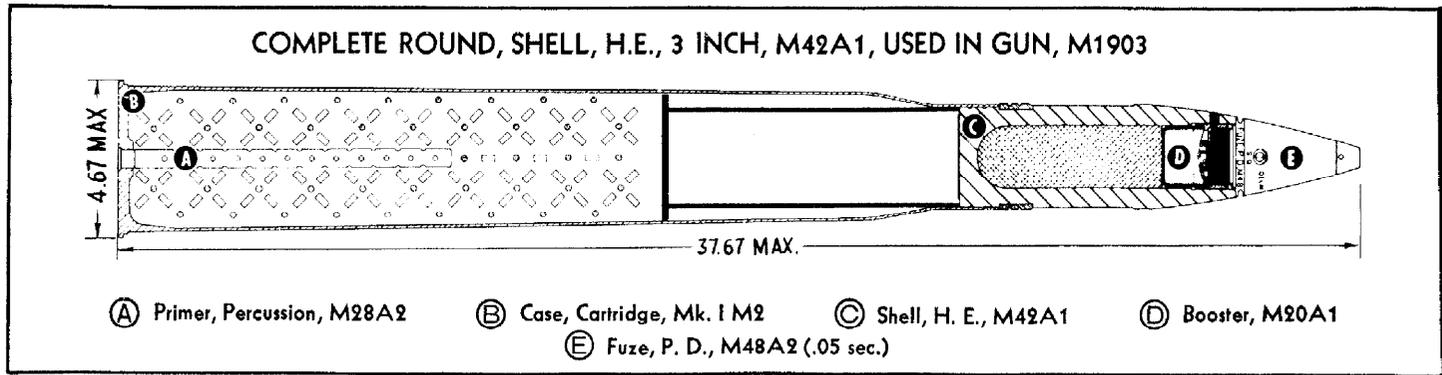
*Guns, M1917, M1917A1, M1917A2, M1917A3, M1917M1, M1917M1A1, M1917M1A2, M1917M1A3, M1917MII, M1917MIIA3, M1925M1, M1925M1A1, M2 and M4.

†Cartridge case, Mk. I M2, is used for fixed type of guns: M1917, M1925M1, M2, M4. Steel Cartridge case, Mk. I M2B1, is substitute standard. Cartridge case, Mk. II M2, is used for mobile mounts: M1918, M1 and M3. Steel cartridge case, Mk. II M2B1, is a substitute standard.

‡Or 50/50 Amatol, 0.77 lb.; cast TNT, 0.08 lb.

SHELL, HIGH-EXPLOSIVE, 3 INCH, M42A1—STANDARD

ROUND FOR 3 INCH SEACOAST GUNS, M1902 AND M1903



Ammunition for the two models of 3 inch seacoast guns, M1902 and M1903, is still known as 3 inch "15 pounder" ammunition although the older model projectiles of that weight are no longer standard. Two types of ammunition were formerly provided for the 3 inch seacoast guns, but the high-explosive shell, M42A1, is the only standard item for issue and manufacture since the armor-piercing and high-explosive shells, M1915 and Mk. I, became obsolete.

The cartridge case, Mk. I M2, is required for use with the M1903 gun due to its larger powder chamber. The chamber volume is 284.50 cubic inches as compared with 203.50 cubic inches for the M1902 gun's chamber. The M1902 takes the

smaller cartridge case, Mk. II M2. The steel cartridge case, Mk. II M2B1, is substitute standard. The shells for these two guns are issued as fixed rounds, and the ammunition is not interchangeable due to the different cartridge cases used.

SHELL, H.E., 3 INCH, M42A1—STANDARD—This is the same projectile that is used with mechanical time fuze, M43A5, for 3 inch antiaircraft guns. The complete round consists of the following: fuze, P.D., M48A2 (.05 sec.); booster, M20A1; the Mk. II M2 or Mk. II M2B1 steel cartridge case with M1902 gun, or Mk. I M2 or Mk. II M2B1 steel cartridge case containing the percussion primer, M28A2,

and the NH powder propelling charge of 4.62 pounds in M1902 gun and 4.87 pounds in M1903 gun. The bursting charge of TNT weighs 0.86 pound, or, with the alternate bursting charge of 50/50 Amatol and cast TNT booster surround, 0.85 pound. Loaded and fuzed, the projectile weighs 12.87 pounds as fired.

The NH propelling charge has an 87-10-3 formula and is an M1 class powder. The grains have seven perforations and a web size of 0.043 inch.

A distance wad is used to hold the propelling charge firmly about the 300-grain primer and to keep the charge at a uniform density. The wad is made of cardboard, in cylindrical form with a disk at each end, held in place by cord.

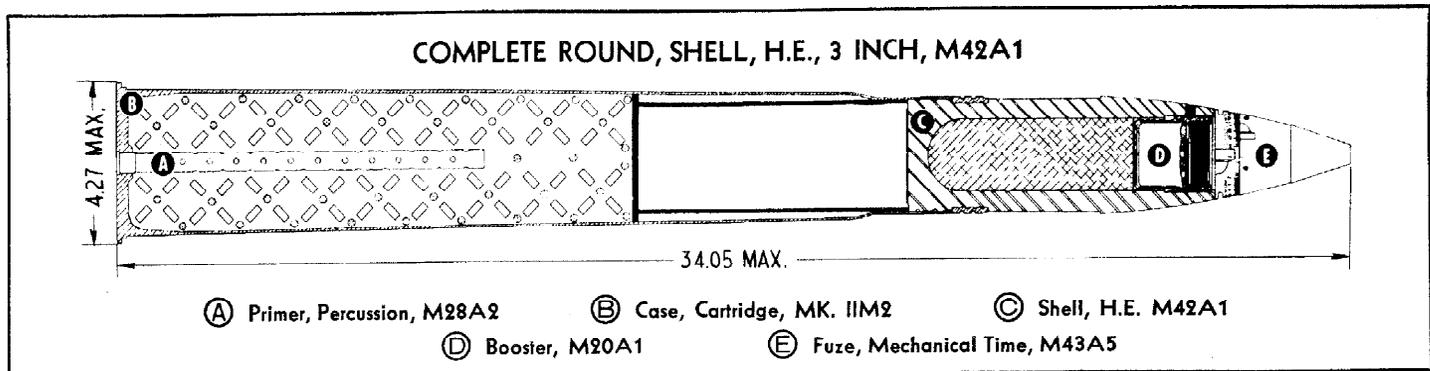
CHARACTERISTICS

Shell, H.E., M42A1		Shell, H.E., M42A1		Shell, H.E., M42A1		Shell, H.E., M42A1	
Caliber.....	3 inch	Caliber.....	3 inch	Cartridge Case.....	Mk. II M2*	Cartridge Case.....	Mk. I M2†
Model of Guns.....	M1902	Model of Guns.....	M1903	Propelling Charge and Weight NH powder,	4.62 lb.	Propelling Charge and Weight NH powder,	4.87 lb.
Proj. Weight.....	12.87 lb.	Proj. Weight.....	12.87 lb.	Complete Round Weight.....	24.42 lb.	Complete Round Weight.....	26.39 lb.
Proj. Charge and Weight.....	TNT, 0.86 lb.‡	Proj. Charge and Weight.....	TNT, 0.86 lb.‡	Muzzle Velocity.....	2,800 f/s	Muzzle Velocity.....	2,800 f/s
Booster.....	M20A1	Booster.....	M20A1	Maximum Range.....	12,100 yds.**	Maximum Range.....	12,100 yds.**
Fuze.....	P.D., M48A2 (.05 sec.)	Fuze.....	P.D., M48A2 (.05 sec.)	Chamber Capacity.....	203.50 cu. ins.	Chamber Capacity.....	284.50 cu. ins.
Primer.....	M28A2	Primer.....	M28A2	Rated Max. Pressure, p.s.i.....	36,000	Rated Max. Pressure, p.s.i.....	36,000

‡Or 50/50 Amatol, 0.77 lb.; cast TNT, 0.08 lb.
 *Steel cartridge case, Mk. II M2B1, is substitute standard.
 †Steel cartridge case, Mk. I M2B1, is substitute standard.
 **At 20°20' Elevation.

SHELL, HIGH-EXPLOSIVE, 3 INCH, M42A1—STANDARD

ROUND FOR GUNS, 3 INCH, M1918; M1 and M3 (ANTIAIRCRAFT);
M5 and M7 (ANTITANK); AND M6 (TANK)



SHELL, H.E., 3 INCH, M42A1—STANDARD—The high-explosive ammunition fired in the above antiaircraft guns consists of the M42A1 round which varies from its predecessor round, the Mk. IX high-explosive shell (now limited standard), in the following respect: the M42A1 shell's one-piece construction, with inside threading of the nose, eliminates the necessity for an adapter which the Mk. IX shell requires.

The round consists of the cartridge case, Mk. IIM2; the M28A2 percussion primer; a propelling charge of 4.56 pounds

of NH powder; a distance wad; and the loaded and fuzed projectile.

As fired, the shell weighs 12.87 pounds, of which 0.86 pound is a TNT bursting charge, or an 0.85 pound bursting charge consisting of 0.77 pound 50/50 Amatol and 0.08 pound Cast TNT booster surround. The complete round weighs 24.36 pounds.

The propelling charge uses an M1 class powder of an 87-10-3 formula. The grains have seven perforations and a web of 0.043 inch.

The mechanical time fuze, M43A5, is

used in the M1918, M1 and M3 guns. The point-detonating fuze, M48A2 (.05 sec.), is used in the M1, M3, M5, M6 and M7 guns, and the P. D. fuze M48A2 (.05 sec.) in the M1918 gun.

The mechanical time fuze, M43A5, used in this shell is driven by a pair of weights which are acted upon by the centrifugal force set up by the rotation of the shell in flight. The time ring is graduated for 30 seconds maximum setting.

The steel cartridge case, Mk. II M2B1, is a substitute standard for use in the M1918, M1, M3, M5, M6 and M7 guns.

CHARACTERISTICS

	Shell, H.E., M42A1	Shell, H.E., M42A1	Shell, H.E., M42A1
Caliber.....	3 inch	3 inch	3 inch
Model of Guns.....	M1, M3	M1, M3, M5, M6, M7	M1918
Proj. Weight.....	12.87 lb.	12.87 lb.	12.87 lb.
Proj. Charge and Weight.....	TNT, 0.86 lb.†	TNT, 0.86 lb.†	TNT, 0.86 lb.†
Booster.....	M20A1	M20A1	M20A1
Fuze.....	P.D., M48A2 (.05 sec.)	M.T., M43A5	M.T., M43A5 or P.D., M48A2 (.15 sec.)
Primer.....	M28A2	M28A2	M28A2
Cartridge Case.....	Mk. II M2*	Mk. II M2*	Mk. II M2*
Propelling Charge and Weight.....	NH powder, 4.56 lb.	NH powder, 4.56 lb.	NH powder, 4.56 lb.
Complete Round Weight.....	24.36 lb.	24.36 lb.	24.36 lb.
Muzzle Velocity.....	2,800 f/s	2,800 f/s	2,600 f/s
Maximum Range.....	Horiz., 14,780 yds. Vert., 10,100 yds.	Horiz., 14,780 yds.	Horiz., 13,500 yds. Vert., 9,420 yds.
Chamber Capacity.....	203.50 cu. ins.	203.50 cu. ins.	203.50 cu. ins.
Rated Max. Pressure, p.s.i.....	36,000	36,000	36,000

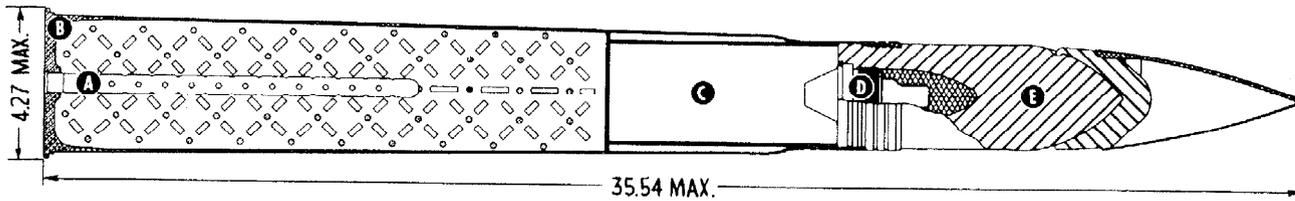
†Or 50/50 Amatol 0.77 lb.; Cast TNT 0.08 lb.

*Steel cartridge case, Mk. II M2B1, is substitute standard for use in M1918, M1, M3, M5, M6 and M7 guns.

PROJECTILE, ARMOR-PIERCING CAPPED, 3 INCH, M62A1—STANDARD SHOT, ARMOR-PIERCING, 3 INCH, M79—SUBSTITUTE STANDARD

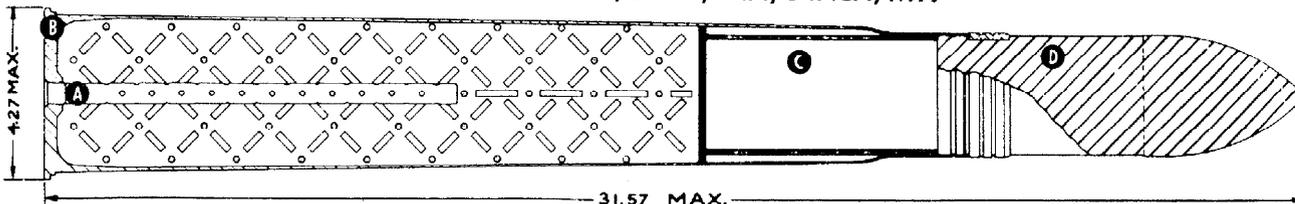
ROUNDS FOR GUNS, M1918, M3 (ANTIAIRCRAFT);
M5 (ANTITANK); M6 AND M7 (TANK)

COMPLETE ROUND, PROJECTILE, A.P.C., 3 INCH, M62A1



- (A) Primer, Percussion, M28A2 (B) Case, Cartridge, Mk. II M2 (C) Distance Wad
(D) Fuze, B.D., M66A1 (E) Projectile, A.P.C., M62A1

COMPLETE ROUND, SHOT, A.P., 3 INCH, M79



- (A) Primer, Percussion, M28A2 (B) Case, Cartridge, Mk. II M2 (C) Distance Wad (D) Projectile, A.P.C., M79

Due to the additional manufacturing steps necessary in the production of the three-piece M62A1 projectile, the easily made 3 inch monobloc projectile,

M79, was classified as substitute standard for use in the 3 inch antitank guns, M3 and M5, and the 3 inch tank gun, M7. As the M62A1 now is in full production,

the M79 shot will be manufactured and issued until the original procurement has been completed.

Both rounds use a propelling charge of

CHARACTERISTICS

	Projectile, A.P.C., M62A1	Projectile, A.P.C., M62A1	Shot, A.P., M79	Shot, A.P., M79	Projectile, Drill, M10
Caliber.....	3 inch	3 inch	3 inch	3 inch	3 inch
Model of Guns.....	M3, M5, M6, M7	M1918	M3, M5, M6, M7	M1918	All guns
Projectile Weight.....	15.43 lb.	15.43 lb.	15.0 lb.	15.0 lb.	24.50 lb.
Proj. Charge and Weight.....	Expl. "D," 0.144 lb.	Expl. "D," 0.144 lb.	—	—	Dummy, M42A1
Fuze.....	B.D., M66A1	B.D., M66A1	—	—	—
Primer.....	M28A2	M28A2	M28A2	M28A2	—
Cartridge Case.....	Mk. II M2*	Mk. II M2*	Mk. II M2*	Mk. II M2*	—
Propelling Charge and Weight.....	NH powder, 4.62 lb.	NH powder, 4.62 lb.	NH powder, 4.62 lb.	NH powder, 4.62 lb.	—
Complete Round Weight.....	27.23 lb.	27.23 lb.	26.80 lb.	26.80 lb.	24.50 lb.
Muzzle Velocity.....	2,600 f/s	2,400 f/s	2,600 f/s	2,400 f/s	—
Maximum Range.....	16,100 yds.	15,300 yds.	12,770 yds.	11,000 yds.	—
Chamber Capacity.....	205.585 cu. ins.	205.585 cu. ins.	203.50 cu. ins.	203.50 cu. ins.	—
Rated Max. Pressure, p.s.i.....	38,000	36,000	38,000	36,000	—
Armor Penetration at 20°					
Homogeneous Plate					
500 yards.....	4.3 ins.	3.8 ins.	4.7 ins.	4.1 ins.	—
1,000 yards.....	3.9 ins.	3.4 ins.	3.9 ins.	3.5 ins.	—
Face-Hard. Plate					
500 yards.....	4.5 ins.	4.0 ins.	3.2 ins.	2.8 ins.	—
1,000 yards.....	4.0 ins.	3.6 ins.	2.8 ins.	2.4 ins.	—

*Steel cartridge case, Mk. II M2B1, is substitute standard.

(Continued on next page)

PROJECTILE, ARMOR-PIERCING CAPPED, 3 INCH, M62A1

SHOT, ARMOR-PIERCING, 3 INCH, M79

(Continued)

the same type and weight—4.62 pounds of NH powder. The M1 class powder used in the propelling charge has an 87-10-3 formula. The grains have seven perforations and a web of 0.043 inch. For powder-burning uniformity a distance wad insures that the propelling charge is confined around the primer.

PROJECTILE, ARMOR-PIERCING CAPPED, 3 INCH, M62A1—STANDARD

—This projectile is standard for issue to using forces with the 3 inch, M3, antiaircraft and M5 antitank guns, and the tank gun, M7. It also is used in the M1918, M1 and M6 guns.

The projectile measures 14.47 inches overall and consists of the projectile body to which the armor-piercing cap is soldered or crimped. The windshield nose

is threaded to the cap. Alternate windshield-attachment methods are discussed under Projectile, A.P.C., 75 mm, M61, as both projectiles use the same methods.

The complete round consists of the projectile which weighs 15.43 pounds as fired and contains a bursting charge of 0.144 pound of explosive "D," the base-detonating fuze, M66A1; the Mk. II M2 cartridge case, with a 212 cubic inch volume, which contains the M28A2 percussion primer to detonate 4.62 pounds of NH powder. The steel cartridge case, Mk. II M2B1, is substitute standard for use in the M1918, M1, M3, M5 and M7 guns.

SHOT, ARMOR-PIERCING, 3 INCH, M79—SUBSTITUTE STANDARD—The complete round for this shot is composed

of the A.P. Shot and the Mk. II M2 cartridge case containing the M28A2 percussion primer and a propelling charge of NH powder. The Mk. II M2B1 steel cartridge case is substitute standard.

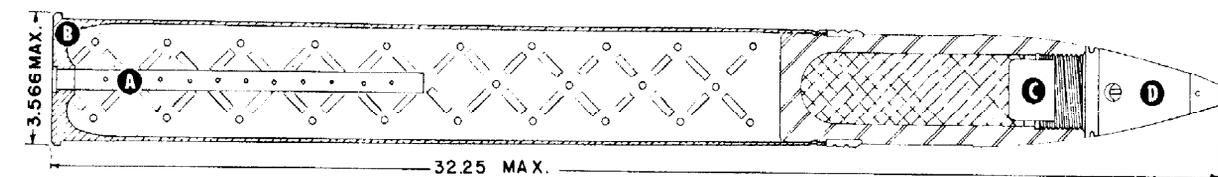
The shot is manufactured from WD-4150 steel bar stock and is given a special heat treatment to improve its armor-penetration properties. Red tracer composition is pressed into a cavity in the base of the shot. The burning time of the tracer is 3 seconds.

A complete round of this shot measures 31.57 inches in length and weighs 26.8 pounds. The shot itself measures 9.22 inches in length and weighs 15 pounds.

PROJECTILE, DRILL, M10—STANDARD
—(See Table of Characteristics.)

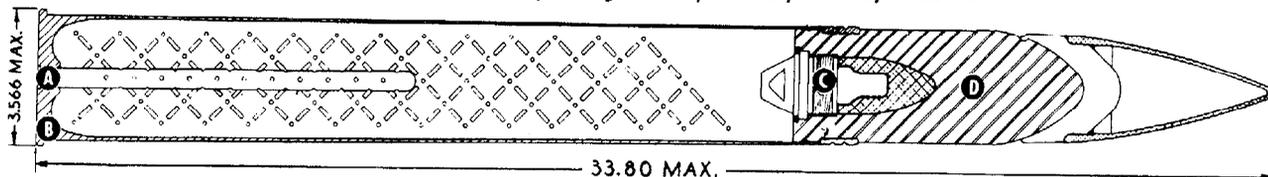
SHELL, HIGH-EXPLOSIVE, 3 INCH, M42A1—STANDARD
PROJECTILE, ARMOR-PIERCING CAPPED, 3 INCH, M62A1—STANDARD
SHELL, SMOKE, 3 INCH, M88—STANDARD
SHOT, ARMOR-PIERCING, 3 INCH, M79—SUBSTITUTE STANDARD
ROUNDS FOR GUNS, 76 mm, M1, M1A1, AND M1A2

COMPLETE ROUND, SHELL, H.E., 76 mm, M42A1



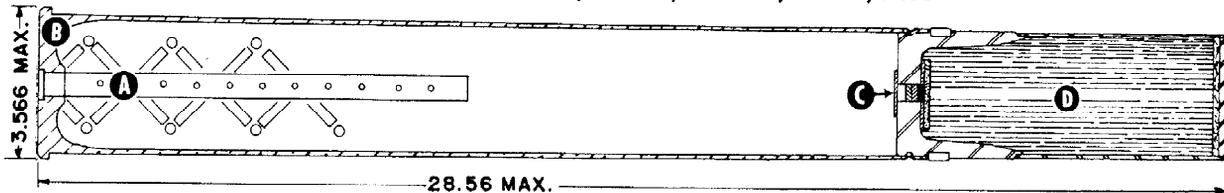
- (A) Primer, Percussion, M28A2 (B) Case, Cartridge, M26 (C) Booster, M20A1
 (D) Fuze, P.D., M48A2 (.05 sec.) (E) Shell, H.E., M42A1

COMPLETE ROUND, PROJECTILE, A.P.C., 76 mm, M62A1



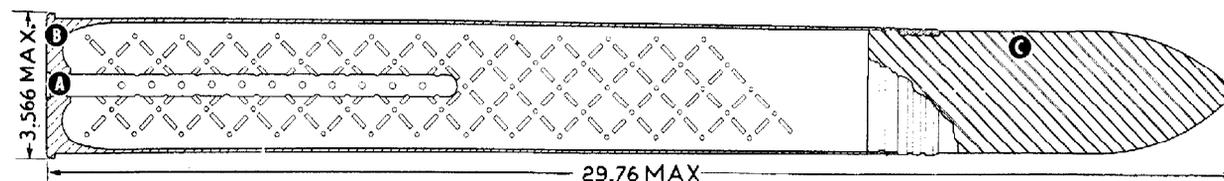
- (A) Primer, Percussion, M28A2 (B) Case, Cartridge, M26 (C) Fuze, B.D., M66A1 (D) Projectile, A.P.C., M62A1

COMPLETE ROUND, SHELL, SMOKE, 76 mm, M88



- (A) Primer, Percussion, M28A2 (B) Case, Cartridge, M26 (C) Relay Pellets (D) Shell, Smoke, M88

COMPLETE ROUND, SHOT, A.P., 76 mm, M79



- (A) Primer, Percussion, M28A2 (B) Case, Cartridge, M26 (C) Shot, A.P., M79

SHELL, HIGH-EXPLOSIVE, 3 INCH, M42A1

PROJECTILE, ARMOR-PIERCING CAPPED, 3 INCH, M62A1

SHELL, SMOKE, 3 INCH, M88

SHOT, ARMOR-PIERCING, 3 INCH, M79

(Continued)

The three projectiles above are classified as standard for use in the guns, 76 mm, M1, M1A1, and M1A2. Three-inch shells may be used since the gun is actually 76.2 mm, or 3 inches, in caliber. The principal difference between the 3 inch and the 76 mm complete rounds is in the capacity of the cartridge case. Due to this, the rounds are not interchangeable between the 3 inch and 76 mm guns.

SHELL, H.E., 3 INCH, M42A1—STANDARD—This round uses the M26 cartridge case with a chamber capacity of 140.50 cubic inches. A complete round of this ammunition for the 76 mm gun consists of the high-explosive shell, M42A1, fuze with the P.D. fuze, M48A2 (.05 sec.); the M26 cartridge case containing the percussion primer, M28A2; and the FNH propelling charge.

With a propelling charge of 3.62 pounds of FNH powder in the 76 mm gun the shell attains a muzzle velocity of 2,700 feet per second; in the 3 inch gun the shell, propelled by 4.56 pounds of NH powder, attains a muzzle velocity of

2,800 feet per second. Maximum range of the 76 mm gun is 14,650 yards; that of the 3 inch gun is 14,780 yards at 42° 45' elevation when firing the M42A1 shell.

The 3.62 pounds of M1 powder for the 76 mm gun has an 87-10-3 formula. The powder grains have seven perforations and a 0.0395 inch web.

Weight of the bursting charge is 0.86 pound of TNT, or an alternate charge of 0.85 pound, consisting of 0.77 pound 50/50 Amatol and 0.08 pound cast TNT booster surround. The shell as fired weighs 12.87 pounds. Complete round weights are 22.11 pounds for the 76 mm round, and 24.61 pounds for the 3 inch round.

PROJECTILE, ARMOR-PIERCING, CAPPED, 3 INCH, M62A1—STANDARD

—This round uses the M26 cartridge case with a chamber capacity of 142.6 cubic inches compared with the 203.5 cubic inch chamber capacity of the Mk. II M2 cartridge case used with the 3 inch round. The 76 mm round develops a muzzle velocity of 2,600 feet per second and a

maximum range of 16,100 yards at 45° elevation. The 3 inch round develops the same muzzle velocity and maximum range.

The weight of the armor-piercing cap round is 15.43 pounds. The shot uses the base-detonating fuze, M66A1, to ignite 0.144 pound of explosive "D" bursting charge. Complete round weights are 24.55 pounds for the 76 mm round, and 27.23 pounds for the 3 inch round.

The 3.62 pounds of M1 powder has an 87-10-3 formula. The grains have seven perforations and a web of 0.0395 inch.

For description of projectile, see 3 inch gun rounds.

Comparative data on armor penetration at 20° for the 76 mm, 75 mm, and 3 inch armor-piercing cap rounds follow:

	At 500 yds.	Homo. Plate	Face-Hard. Plate
76 mm, M62 Projectile*	4.3 ins.	4.3 ins.	4.5 ins.
75 mm, M61 Projectile	2.9 ins.	2.9 ins.	3.5 ins.
3 inch, M62 Projectile*	4.3 ins.	4.3 ins.	4.5 ins.
	At 1,000 yds.	Homo. Plate	Face-Hard. Plate
76 mm, M62 Projectile*	3.8 ins.	3.8 ins.	4.0 ins.
75 mm, M61 Projectile	2.6 ins.	2.6 ins.	3.1 ins.
3 inch, M62 Projectile*	3.8 ins.	3.8 ins.	4.0 ins.

CHARACTERISTICS

	Shell, H.E., M42A1	Proj. A.P.C., M62A1	Shell, Smoke, M88	Shot, A.P., M79
Caliber.....	76 mm	76 mm	76 mm	76 mm
Model of Guns.....	M1, M1A1, M1A2	M1, M1A1, M1A2	M1, M1A1, M1A2	M1, M1A1, M1A2
Proj. Weight.....	12.87 lb.	15.43 lb.	7.60 lb.	15.00 lb.
Proj. Charge and Weight.....	TNT, 0.86 lb.**	Expl. "D," 0.144 lb.	H.C., 3.13 lb.	—
Booster.....	M20A1	—	—	—
Fuze.....	P.D., M48A2	B.D., M66A1	—	—
Primer.....	M28A2	M28A2	M28A2	M28A2
Cartridge Case.....	M26†	M26†	M26†	M26†
Propelling Charge and Weight.....	FNH powder, 3.62 lb.	FNH powder, 3.62 lb.	FNH powder, 0.219 lb.	FNH powder, 3.62 lb.
Complete Round Weight.....	22.11 lb.	24.55 lb.	13.43 lb.	24.24 lb.
Muzzle Velocity.....	2,700 f/s	2,600 f/s	900 f/s	2,600 f/s
Maximum Range.....	14,650 yds.	16,100 yds.	2,000 yds.***	12,770 yds.
Chamber Capacity.....	140.50 cu. ins.	142.6 cu. ins.	143.6 cu. ins.	143.66 cu. ins.
Rated Max. Pressure, p.s.i.....	43,000	43,000	4,000	43,000
Armor Penetration at 20°				
Homogeneous Plate				
500 yards.....	—	4.3 ins.	—	4.6 ins.
1,000 yards.....	—	3.8 ins.	—	4.0 ins.
Face-Hard. Plate				
500 yards.....	—	4.5 ins.	—	3.2 ins.
1,000 yards.....	—	4.0 ins.	—	2.8 ins.

*Same Projectile.
 **Or 50/50 Amatol 0.77 lb. plus Cast TNT 0.08 lb.
 ***At 15° Elevation.
 †The M26B1 steel cartridge case is substitute standard.

SHELL, HIGH-EXPLOSIVE, 3 INCH, M42A1

PROJECTILE, ARMOR-PIERCING CAPPED, 3 INCH, M62A1

SHELL, SMOKE, 3 INCH, M88

SHOT, ARMOR-PIERCING, 3 INCH, M79

(Continued)

SHOT, ARMOR-PIERCING, 3 INCH, M79 — SUBSTITUTE STANDARD — The M79 Shot is authorized as a substitute standard for the M62A1 Projectile. It is a solid monobloc construction shot containing a built-in tracer, which has a burning time of 3 seconds. For a more complete description of shot see 3 inch gun rounds.

A complete round consists of the M79 A.P. Shot, the M26 or M26B1 cartridge case, containing the M28A2 percussion primer and a propelling charge of FNH powder.

The shot weighs 15.0 pounds and when assembled to form a complete round the weight is 24.24 pounds. As fired the

round measures 29.76 inches in length.

The same charge and type of propellant as used with the Projectile, A.P.C., M62A1 is used.

SHELL, SMOKE, 3 INCH, M88 — STANDARD — This unfuzed, base-emission round differs completely from other standard rounds fired in this gun. In appearance the shell resembles a canister. It was adapted from the British base-emission type shell and has the advantage of emitting smoke from the base of the projectile toward the end of the shell's trajectory.

This effect is obtained by use of a set of special composition pellets which are

ignited when the shell is fired. They burn for a specific length of time, enough to insure that the H. C. smoke filler is ignited, and allowed to escape through the hole in the base of the shell, toward the end of its trajectory.

The advantage of this round is that it uses no burster in the shell but disperses the smoke cloud gradually, forming a more concentrated "curtain" than the fuzed smoke shells which produce the "puff" type cloud.

The 0.219 pound of M2 powder is a Hercules NG formula. The web size is 0.015 inch and the grain has a single perforation.

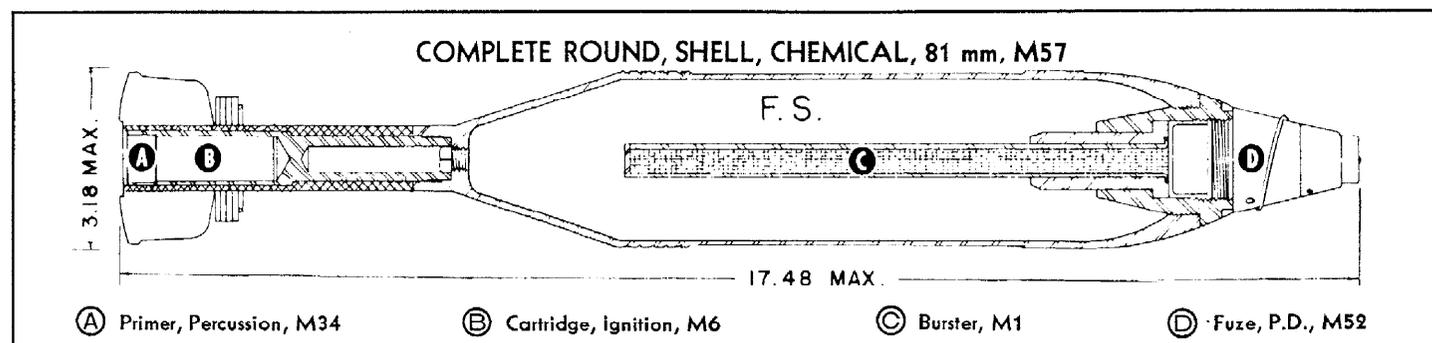
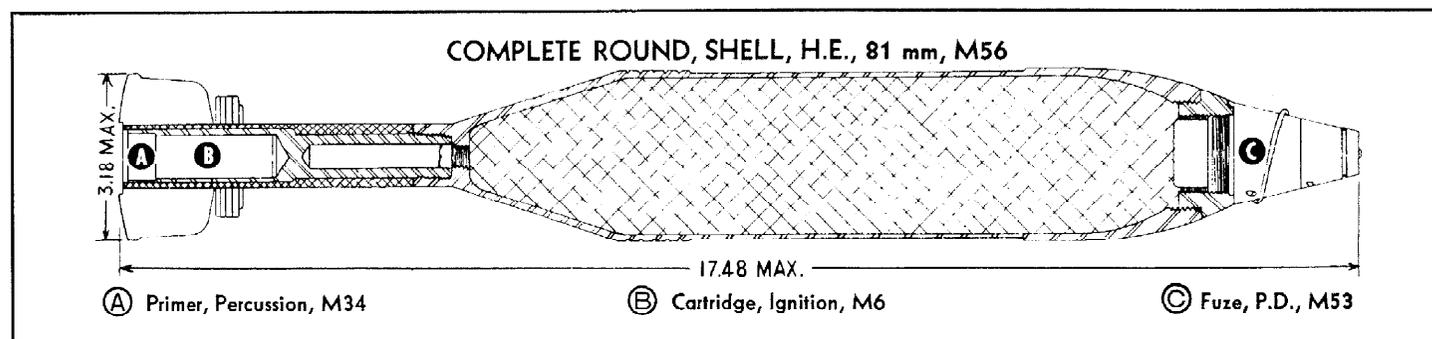
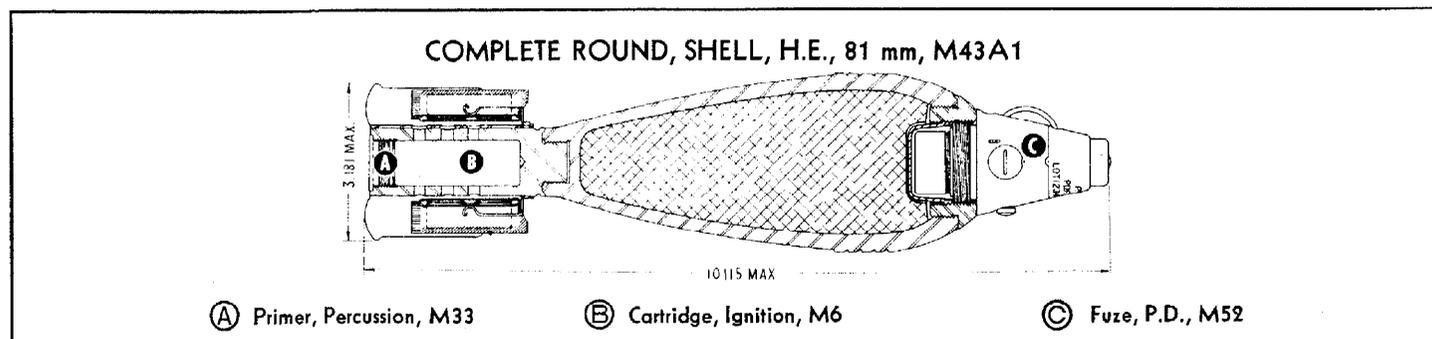
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SHELL, HIGH-EXPLOSIVE, 81 MM, M43A1—STANDARD

SHELL, HIGH-EXPLOSIVE, 81 MM, M56—STANDARD

SHELL, CHEMICAL, 81 MM, M57—STANDARD

ROUNDS FOR MORTAR, 81 mm, M1, AND MORTAR, 3 INCH, MK. IA2



Since the last war, vast changes in design have been made in the old "Stokes" mortar projectiles to improve their ballistics and functioning.

All the existing 3 inch and 81 mm mortar shells have a fin assembly to give greater stability to the shell in flight. Due to the improved stability, the present standard projectiles use a point-detonating fuze, the M52 or M53, in place of the "all ways" fuze that was necessary in World War I shells.

The interior of the fin assembly is machined to take the ignition cartridge and is perforated by a number of holes to permit the flame from the ignition cartridge to flash through to the propelling increments which are clipped between

the fins by the M2A1 propellant increment holder in the M43A1 high-explosive round. On the M56 and M57 rounds the increments are placed around the cartridge holder tube. The shells are loaded through the muzzle of the mortar and ignition occurs when the primer strikes the fixed firing pin in the base of the barrel.

Both the 81 mm and 3 inch mortars are smoothbored. The 81 mm mortar, M1, is the present standard for manufacture and issue, and it has superseded the 3 inch mortar, Mk. IA2. The ammunition is the same for both although a larger propelling charge can be used in the 81 mm mortar.

SHELL, HIGH-EXPLOSIVE, M43A1—STANDARD—This high-explosive shell is intended primarily for use against

enemy personnel. As fired, the shell with fuze, P.D., M52, weighs 6.92 pounds. Of this the TNT bursting charge weighs 1.22 pounds; an alternate charge consists of 0.98 pound of 50/50 Amatol and 0.19 pound Cast TNT booster surround. Another loading consists of 1.28 pounds of trinitite. The weight of six M1 increments of sheet powder propellant is 0.097 pound. The sheet powder used has a Hercules NG formula. Several of the sheets are sewn together, each sheet having five perforations, one in the middle and one in each corner, the web size being 0.008 inch. Each increment is contained in a Cellophane bag which protects the charge and insures dry powder. The complete round weighs 7.05 pounds.

(Continued on next page)

SHELL, HIGH-EXPLOSIVE, 81 MM, M43A1

SHELL, HIGH-EXPLOSIVE, 81 MM, M56

SHELL, CHEMICAL, 81 MM, M57

(Continued)

An alternate method of manufacture is a one piece shell body which does away with the adapter needed with the M43A1 round. This is the M43A1B1 shell. The shell body is produced by any of the following methods: forging, cupping of specially rolled plates, welded longitudinally, or casting. Firing data are given in Table A.

SHELL, HIGH-EXPLOSIVE, M56—STANDARD—The M56 projectile embodies a relatively large charge, 4.30 pounds of TNT, in relation to the total weight, 10.62 pounds, of the shell as fired with the fuze, P.D., M53. It is designed primarily for use against light emplacements. Alternate bursting charges are: 3.89 pounds of 50/50 Amatol and 0.20 pound of Cast TNT booster surround, or 4.46 pounds of trimonite. The maximum range is less than the M43A1. Ranges are listed in Table B. The M2 increment powder used in this round comes in sheets and is a Hercules NG formula. Several sheets are sewn together and each sheet has one perforation and a web of 0.008 inch.

SHELL, CHEMICAL, M57—STANDARD

—The chemical shell, M57, with WP or FS filler, is used to make a smoke screen. When the shell is detonated, the burster charge fragments the shell body, scattering the filler to form the smoke cloud. The round uses the same increment powder as the M56, HE, shell.

As fired, the shell weighs 11.86 pounds when FS filled, and 11.33 pounds when WP filled. The weights of the chemical charge are 4.59 pounds with FS, and 4.06 pounds with WP filler. The weight of the tetryl burster charge is 0.08 pound. Complete round weights are as follows: 12 pounds when FS filled, and 11.47 pounds when WP filled. Firing table data for these shells are given in Tables C and D.

SHELL, TARGET PRACTICE, M44—STANDARD

—Loaded and fuzed, the cast-iron shell of this round weighs 6.92 pounds, the same as the high-explosive shell, M43A1. The charge used is 0.2 pound of black powder. Fuze, P.D., M52, is used. A propelling charge consists of

sheet powder in 6 increments of approximately 172 grains each. Only four increments are used in the 3 inch trench mortar, due to the lower pressures allowed in this mortar.

The sheet powder used has a Hercules NG formula. Several of the sheets are sewn together, each sheet having five perforations, one in the center and one in each corner, the web size being 0.008 inch. The round is assembled with percussion primer, M33.

SHELL, PRACTICE, M43A1—STANDARD

—O.C.M. 12734 approved this round as an alternative to the M44 practice round. The M43A1 practice shell uses a black powder charge of 0.16 pound in place of the 1.22lb. TNT charge used in the high-explosive round, M43A1. In all other respects the M43A1 practice shell is identical with the high-explosive shell, M43A1. The round is assembled with percussion primer, M33.

PROJECTILE, DRILL, M68—STANDARD

—(See Table of Characteristics.)

(TABLE A) SHELL, HIGH-EXPLOSIVE, M43A1 WITH FUZE, P.D., M52

Charge	Muzzle Velocity	Maximum Range	Elevation
Zone 0..... Cartridge	235 F/S	541 yds.	45°
Zone 1..... Cartridge + 1 Incr.	332 F/S	1,020 yds.	45°
Zone 2..... Cartridge + 2 Incr.	419 F/S	1,500 yds.	45°
Zone 3..... Cartridge + 3 Incr.	499 F/S	2,042 yds.	45°
Zone 4..... Cartridge + 4 Incr.	572 F/S	2,517 yds.	45°
Zone 5*..... Cartridge + 5 Incr.	638 F/S	2,963 yds.	45°
Zone 6*..... Cartridge + 6 Incr.	700 F/S	3,288 yds.	45°

*Not to be used in 3 inch mortar, Mk. IA2.

(TABLE B) SHELL, HIGH-EXPLOSIVE, M56

Charge	Muzzle Velocity	Maximum Range	Elevation
Zone 1..... Cartridge + 1 Incr.	306 F/S	875 yds.	45° 00'
Zone 2..... Cartridge + 2 Incr.	412 F/S	1,474 yds.	45° 00'
Zone 3..... Cartridge + 3 Incr.	502 F/S	2,046 yds.	45° 00'
Zone 4*..... Cartridge + 4 Incr.	583 F/S	2,558 yds.	45° 00'

*Not to be used in 3 inch mortar, Mk. IA2.

(TABLE C) SHELL, CHEMICAL, M57 (FS)

Charge	Muzzle Velocity	Maximum Range	Elevation
Zone 1..... Cartridge + 1 Incr.	291 F/S	808 yds.	45° 00'
Zone 2..... Cartridge + 2 Incr.	390 F/S	1,374 yds.	45° 00'
Zone 3..... Cartridge + 3 Incr.	472 F/S	1,916 yds.	45° 00'
Zone 4*..... Cartridge + 4 Incr.	544 F/S	2,431 yds.	45° 00'

*Not to be used in 3 inch mortar, Mk. IA2.

(TABLE D) SHELL, CHEMICAL, M57 (WP)

Charge	Muzzle Velocity	Maximum Range	Elevation
Zone 1..... Cartridge + 1 Incr.	297 F/S	833 yds.	45° 00'
Zone 2..... Cartridge + 2 Incr.	399 F/S	409 yds.	45° 00'
Zone 3..... Cartridge + 3 Incr.	484 F/S	1,952 yds.	45° 00'
Zone 4*..... Cartridge + 4 Incr.	560 F/S	2,466 yds.	45° 00'

*Not to be used in 3 inch mortar, Mk. IA2.

CHARACTERISTICS

	Shell, H.E., M43A1†	Shell, H.E., M56	Shell, Chem., M57	Shell, T.P., M44	Shell, Training, M68
Caliber.....	81 mm and 3 in.	81 mm and 3 in.	81 mm and 3 in.	81 mm and 3 in.	81 mm and 3 in.
Model of Mortars.....	M1, Mk. IA2**	M1, Mk. IA2**	M1, Mk. IA2**	M1, Mk. IA2**	M1, Mk. IA2**
Proj. Weight.....	6.92 lb.‡	10.62 lb.‡‡	11.33 lb.‡‡	6.92 lb.	—
Proj. Charge and Weight.....	TNT, 1.22 lb.§	TNT, 4.30 lb.‡‡	Chem. (FS) 4.59 lb. Chem. (WP) 4.06 lb.	BP, 0.2 lb.	—
Burster.....	—	—	M1	—	—
Fuze.....	P.D., M52¶	P.D., M53	P.D., M52¶	P.D., M52¶	—
Primer.....	M33	M34	M34	M33	M34
Ignition Cartridge.....	M6	M6	M3	M6	M6
Propelling Charge and Weight.....	Sheet pwdr., 0.097 lb.	Flake prop. pwdr., 0.116 lb.	Flake prop. pwdr., 0.116 lb.	Sheet pwdr., 0.097 lb.	NG pwdr., 120 grs.
Complete Round Weight.....	7.05 lb.***	10.77 lb.§§	11.59 lb.¶¶	7.05 lb.	—
Muzzle Velocity.....	700 f/s	583 f/s	560 f/s	700 f/s	172.8 f/s
Maximum range.....	3,288 yds.	2,558 yds.	2,466 yds.¶¶	3,288 yds.	310 yds.
Rated Max. Pressure, p.s.i.....	6,000	6,000	6,000	6,000	—

**81 mm Mortar, M1, 3 inch Mortar, Mk. IA2.

†The Shell, Practice, M43A1, not listed in above table, differs only in the amount of charge:

0.16 lb. of black powder as against 1.22 lb. of TNT.

‡6.86 lb. with Amatol and TNT loading and 7.02 lb. with trimonite loading.

‡‡1.17 lb. consisting of 0.98 lb. 50/50 Amatol and 0.19 lb. Cast TNT or 1.28 lb. trimonite.

¶P.D., M52B1, alternate fuze.

***6.99 lb. with Amatol and TNT loading and 7.11 lb. with trimonite loading.

††10.41 lb. with Amatol and TNT loading and 10.79 lb. with trimonite loading.

§§10.56 lb. with Amatol and TNT loading and 10.94 lb. with trimonite loading.

¶¶Alternate bursting charges: 3.89 lb., 50/50 Amatol and 0.20 lb. Cast TNT booster surround;

4.46 lb. of trimonite.

¶¶¶For W.P. Chemical Shell.

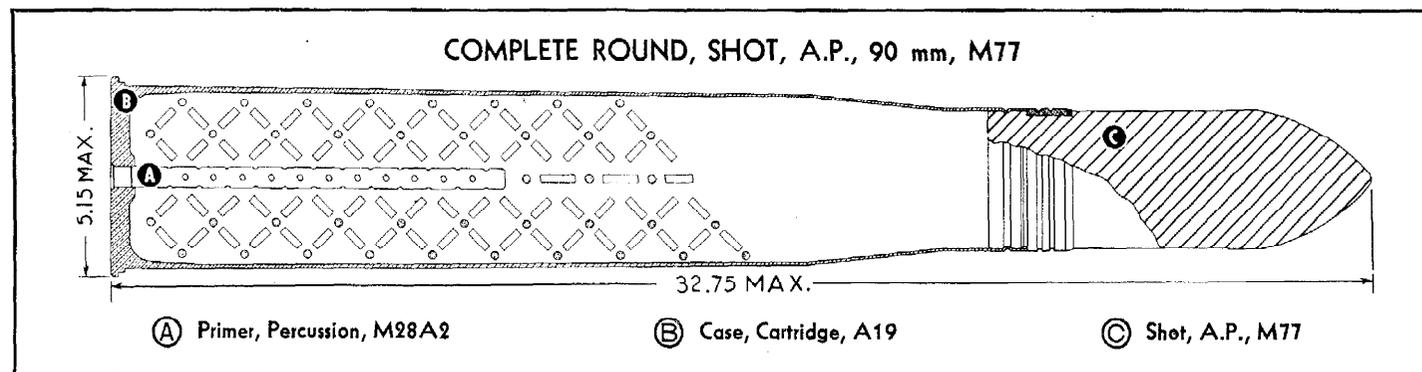
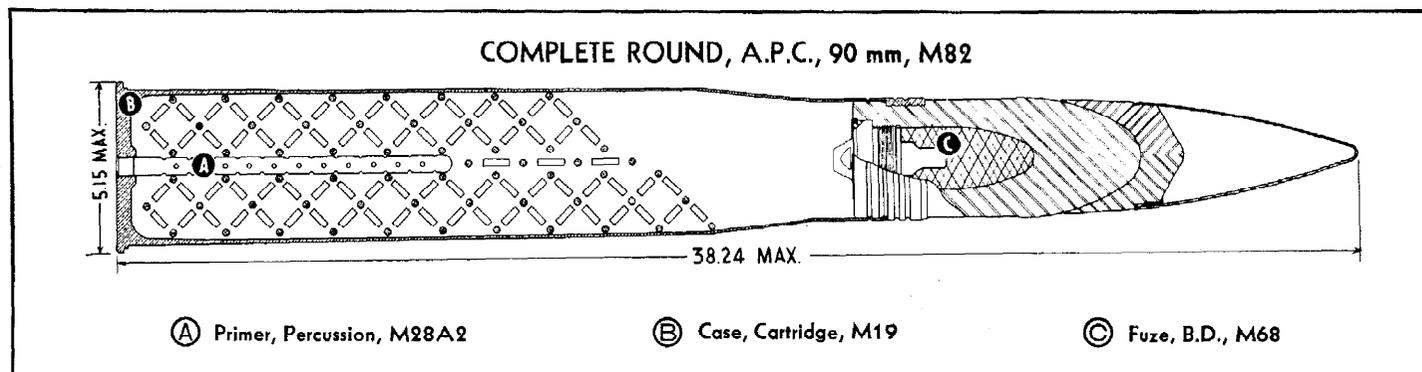
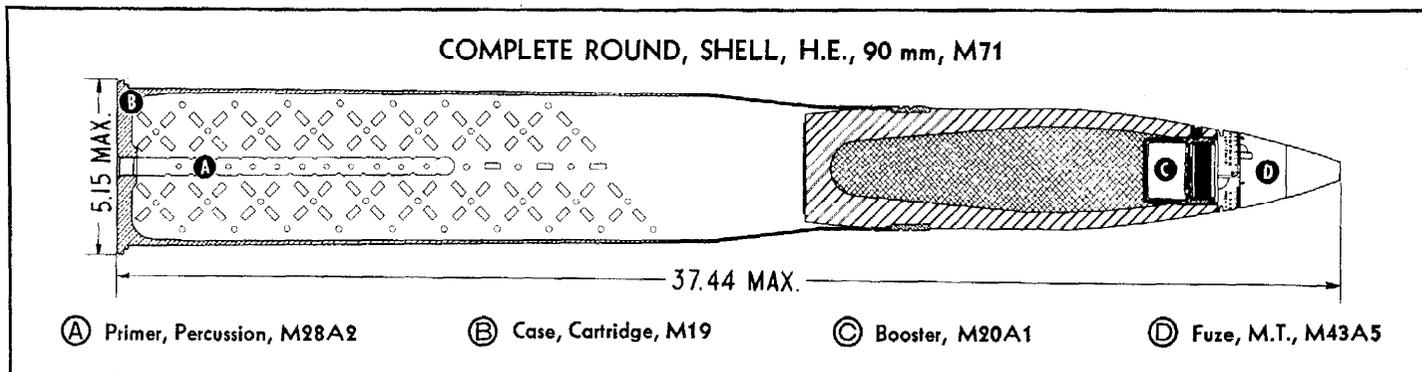
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SHELL, HIGH-EXPLOSIVE, 90 mm, M71—STANDARD

PROJECTILE, ARMOR-PIERCING CAPPED, 90 mm, M82—STANDARD

SHOT, ARMOR-PIERCING, 90 mm, M77—SUBSTITUTE STANDARD

ROUNDS FOR GUNS, 90 mm, M1, M1A1, M2 AND M3 (ANTIAIRCRAFT)



These rounds use an NH propelling charge of M1 class powder with a formula of 87-10-3. The grains of this powder have seven perforations and a web of 0.049 inch.

SHELL, HIGH-EXPLOSIVE, 90 mm, M71—STANDARD—The 90 mm high-explosive shell, M71, was designed and standardized

to replace the now obsolete 90 mm, M58, when it was discovered that the latter when manufactured from high - sulfur, high - manganese, free - machining steel without a final heat treatment would not stand up under the strain of firing.

The shell, M71, is of the streamlined type with a tapered or boat-tailed base. This streamlining is completed by a con-

tinuation of the projectile's radius of ogive over the exterior surface of the fuze, M.T., M43A5.

When used for antitank purposes, the M71 shell is also furnished with the P.D. fuze, M48A2 (.05 sec.). The Fuze, P.D. M48A2 (.15 sec.) is used against motor torpedo boats.

The bursting charge consists of 2.04

SHELL, HIGH-EXPLOSIVE, 90 MM, M71

PROJECTILE, ARMOR-PIERCING CAPPED, 90 MM, M82

SHOT, ARMOR-PIERCING, 90 MM, M77

(Continued)

pounds of TNT in the shell which weighs 23.40 pounds as fired, and has an over-all length of 16.34 inches. Alternate loadings consist of 1.81 lbs. of 50/50 Amatol and 0.15 lb. of TNT booster surround, or 2.13 lbs. of Composition "B."

A propelling charge of 7.31 pounds of NH powder is used in the M19 cartridge case. (See † under "Characteristics.") The complete round weighs 42.04 pounds.

The booster, M20A1, in combination with the mechanical time fuze, M43A5, or with the P.D. fuze, M48A2, provides a bore-safe combination, since the rotor of the booster holds the detonator out of line with the flash hole until the shell has cleared the muzzle of the weapon.

The M28A2 percussion primer contains 300 grains of black powder and extends well up into the cartridge case to insure uniform ignition of the propelling charge.

PROJECTILE, ARMOR-PIERCING, CAPPED, 90 mm, M82—STANDARD—This projectile has been standardized as the companion projectile to the M71. The components of the complete round consist of the M82 projectile, loaded and fuzed with the B.D. fuze, M68; the M19 cartridge case containing the M28A2 percussion primer; and a propelling charge of 7.31 pounds.

Soldered to the nose of the body is a mild steel armor-piercing cap to which a windshield assembly is screwed. The assembly consists of a windshield adapter made from cold drawn seamless steel tubing, and attached to it by brazing a cold rolled steel windshield ogive. An alternate manufacture of windshield permits direct 360° crimping to the cap. The over-all length of the shot is 15.49 inches and as fired weighs 24.06 pounds. The complete round weighs 42.75 pounds.

SHOT, ARMOR-PIERCING, 90 mm, M77 — SUBSTITUTE STANDARD—The M77 shot is substitute standard for the M84 projectile. It is a solid monobloc shot and does not contain a bursting charge or armor-piercing cap. It has a tracer plug which is screwed into the body of the shot. The tracer consists of 49 grains of red tracer composition and 20 grains of igniter composition. A celluloid closing cup seals the tracer into the plug. The tracer has a 3 second burning time. A complete round consists of the Shot, A.P., M77, it measures 32.75 inches in length and weighs 42.04 pounds. The shot measures 10 inches and weighs 23.4 pounds.

PROJECTILE, DRILL, 90 mm, M12—STANDARD—(See Table of Characteristics.)

CHARACTERISTICS

	Shell, H.E., M71	Proj., A.P.C., M82	Proj., Drill, M12	SHOT, A.P., M77
Caliber.....	90 mm	90 mm	90 mm	90 mm
Model of Gun.....	M1, M1A1, M2, and M3	M1, M1A1, M2, and M3	M1, M1A1, M2, and M3	M1, M1A1, M2, and M3
Proj. Weight.....	23.40 lb.†	24.06 lb.	—	23.40 lb.
Proj. Charge and Weight.....	TNT, 2.04 lb.§	Expl. "D", 0.31 lb.	—	—
Booster.....	M20A1	—	—	—
Fuze.....	M.T., M43A5*	B.D., M68	M44A2, Dummy	—
Primer.....	M28A2	M28A2	—	M28A2
Cartridge Case.....	M19†	M19†	—	M19†
Propelling Charge and Weight.....	NH powder, 7.31 lb.	NH powder, 7.31 lb.	—	NH powder, 7.31 lb.
Complete Round Weight.....	42.04 lb.¶	42.75 lb.	39.15 lb.	42.04 lb.
Muzzle Velocity.....	2,700 f/s	2,670 f/s	—	2700 f/s
Maximum Range.....	H-18,960 yds., V-13,170 yds.	13,540 yds.	—	12,790 yds.
Chamber Capacity.....	298.04 cu. ins.	312.185 cu. ins.	—	312.185 cu. ins.
Rated Max. Pressure, p.s.i.....	38,000	38,000	—	38,000
Armor Penetration at 20°				
Homogeneous Plate				
500 yards.....	—	5.12 ins.	—	5.6 ins.
1,000 yards.....	—	4.8 ins.	—	4.8 ins.
Face-Hard. Plate				
500 yards.....	—	5.5 ins.	—	4.8 ins.
1,000 yards.....	—	5.1 ins.	—	4.0 ins.

*Or P.D. Fuze, M48A2 (.05 sec.) for antitank use; for anti-motor torpedo boat use P.D. Fuze, M48A2 (.15 sec.)

†The steel cartridge case, M19B1, is substitute standard.
‡23.32 lb. with Amatol and TNT loading and 23.49 lb. with Composition "B" loading.

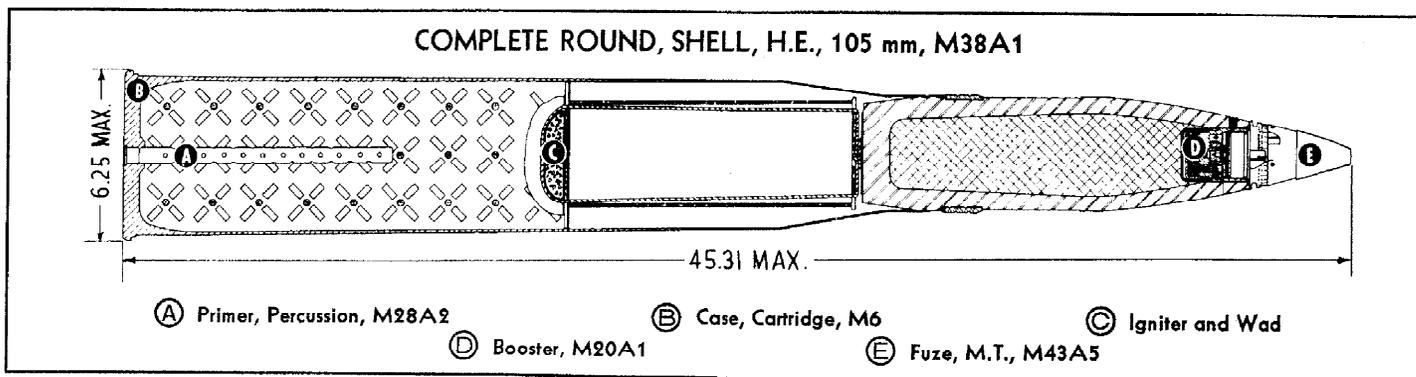
§Or 2.13 lb. of Composition "B" or 1.96 lb. consisting of 1.81 lb. 50/50 Amatol and 0.15 lb. TNT.

¶41.96 lb. with Amatol and TNT loading and 42.13 lb. with Composition "B" loading.

UNCLASSIFIED

SHELL, HIGH-EXPLOSIVE, 105 MM, M38A1—STANDARD

ROUND FOR GUN, 105 mm, M3 (ANTIAIRCRAFT)



The ammunition used in the 105 mm antiaircraft gun is issued to the using arms in complete rounds of the fixed type. The round consists of a cartridge case, containing a primer and propelling charge, and a fuze and loaded high-explosive shell.

Owing to the availability at the time of the M2 mechanical time fuze, approximately 18,000 of the M38 high-explosive shells were issued as complete rounds with this fuze. When these shells were exhausted, the M38 was modified and standardized as the M38A1 with the fuze, M.T., M43. The modification consisted of increasing the ogive length of the shell to take the M20A1 booster into which the M43 mechanical time fuze was screwed. In other respects the present M38A1 is identical with the M38.

SHELL, H.E., 105 mm, M38A1—STANDARD—The M38A1 is of the streamlined

type with a tapered base and long ogive. The radius of ogive is approximately 8.3 calibers. An inch below the rotating band, the shell body tapers at a 6.75° angle for approximately two inches to the base. The cone-shaped fuze, M.T.-M43A5, completes the projectile's streamlining. Thus, the sharp nose and tapered base reduce the air resistance and add greatly to the ballistic efficiency of the shell in flight.

The M6 cartridge case as provided for the 105 mm anti-aircraft gun has a volume of 638 cubic inches. The 300-grain percussion primer, M28A2, is standard. As fired the shell weighs 32.77 pounds and is propelled by 10.56 pounds of FNH powder. The bursting charge of TNT weighs 3.59 pounds. An alternate charge consists of 3.37 lb. of 50/50 Amatol and 0.15 lb. of Cast TNT booster surround. Still another bursting charge is 3.68 lb. of trimonite. The weight of the complete round is 63.29 pounds.

The M1 class propelling charge has an 85-10-5 formula and has seven perforations per grain, the web size being 0.039 inch.

SHELL, PRACTICE, M38A1—STANDARD—This shell is identical with the live ammunition of the same designation except that it contains a practice loading of 0.80 pound of black powder in a bag. This charge is exploded by action of the Fuze, M.T., M43A5, and the booster, M20A1, and is sufficient to rupture the forward portion of the shell and produce a cloud of white smoke. The practice shell is inert loaded to give it a weight comparable to that of the live shell.

The M1 class propelling charge has an 85-10-5 formula and has seven perforations per grain, the web size being 0.039 inch.

DRILL PROJECTILES—STANDARD
—(See Table of Characteristics.)

CHARACTERISTICS

	Shell, H.E., M38A1	Shell, Prac., M38A1	Proj. Drill, M11	Proj. Drill, M8
Caliber.....	105 mm	105 mm	105 mm	105 mm
Model of Gun.....	M3 (AA)	M3 (AA)	M3 (AA)	M3 (AA)
Proj. Weight.....	32.77 lb.*	32.85 lb.	—	—
Proj. Charge and Weight.....	TNT, 3.59 lb.†	BP, 0.80 lb.	—	—
Booster.....	M20A1	M20A1	—	—
Fuze.....	M.T., M43A5	M.T., M43A5	M.T., M44A2, Dummy	T23, Dummy
Primer.....	M28A2	M28A2	—	—
Cartridge Case.....	M6	M6	—	—
Propelling Charge and Weight.....	FNH powder, 10.56 lb.	FNH powder, 10.56 lb.	—	—
Complete Round Weight.....	63.29 lb.‡	63.37 lb.	63.55 lb.	63.55 lb.
Muzzle Velocity.....	2,800 f/s	2,800 f/s	—	—
Maximum Range.....	H-20,000 yds. V-14,000 yds.	H-20,000 yds. V-14,000 yds.	—	—
Chamber Capacity.....	600.22 cu. ins.	600.22 cu. ins.	—	—
Rated Max. Pressure, p.s.i.....	36,000	36,000	—	—

*32.70 lb. with 50/50 Amatol loading and 32.86 lb. with trimonite loading.

†Alternate bursting charges: 3.37 lb. of 50/50 Amatol with 0.15 lb. of Cast TNT booster surround, or 3.68 lb. of trimonite.

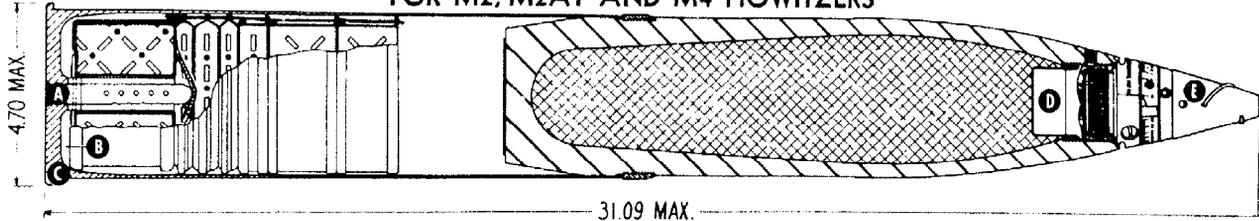
‡63.22 lb. with Amatol bursting charge or 63.38 lb. with trimonite charge.

SHELL, HIGH-EXPLOSIVE, 105 MM, M1—STANDARD

SHELL, HIGH-EXPLOSIVE, ANTITANK, 105 MM, M67—STANDARD

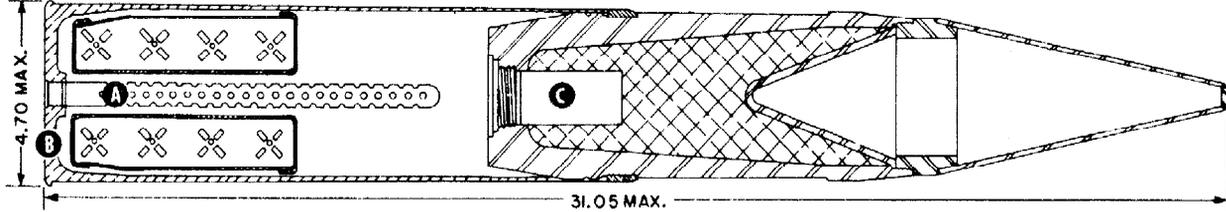
ROUNDS FOR HOWITZERS, 105 mm, M2, M2A1, M3 AND M4

COMPLETE ROUND, SHELL, H.E., 105 mm, M1
FOR M2, M2A1 AND M4 HOWITZERS



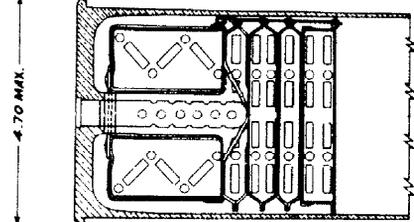
- Ⓐ Primer, Percussion, M1B1A2
- Ⓑ Retainer, M3A1
- Ⓒ Case, Cartridge, M14, Type I
- Ⓓ Booster, M20A1
- Ⓔ Fuze, T. & S. Q., M54

COMPLETE ROUND, SHELL, H.E., A.T., 105 mm, M67
FOR M2, M2A1 AND M4 HOWITZERS

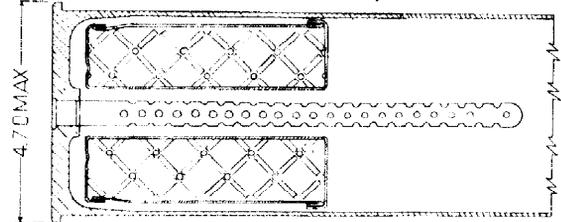


- Ⓐ Primer, Percussion, M28A2
- Ⓑ Case, Cartridge, M14, Type II
- Ⓒ Fuze, B.D., M62A1

ZONE CHARGES, 1 TO 5, IN M1 ROUND
FOR HOWITZER, M3



CHARGE FOR M67, H.E., A.T., ROUND
FOR HOWITZER, M3



The M2 and M2A1 howitzers were developed to take the place of the 75 mm pack howitzers of World War I. To provide an airborne weapon heavier and more powerful than existing airborne matériel the M3 howitzer was standardized. As the M2 and M2A1 howitzers proved so successful on the howitzer motor carriage a tank mount with the 105 mm howitzer was developed. The M4 howitzer was standardized for use in the Medium Tanks, M4 and M4A3. The M2, M2A1 and M4 howitzers fire the same complete rounds of ammunition,

while the M3 howitzer uses different complete rounds due to its shortened barrel. The ammunition used in the 105 mm howitzers, M2, M2A1 and M4, is issued in complete rounds of the semi-fixed type. The M1 shell round includes a cartridge case containing a primer and propelling charge, consisting of a base charge and six increments. The projectile may be easily removed from the cartridge case in order to adjust the propelling charge for the desired range. The propelling charge for the 105 mm howitzer rounds are in powder bags.

Instead of the old method of tying the zone charges to screw eyes in the base of the cartridge case, the bags are held in the retainer, M3A1, which is pushed down over the percussion primer, M1B1A2, to prevent the bags from slipping forward. In the case of the H.E., A.T., M67, round, a long primer, the M28A2, is used. The retainer is eliminated as this primer is long enough to prevent the propelling charge bag from shifting within the case. The cartridge cases for the 105 mm howitzers are M14, Type I and Type II,

(Continued on next page)

SHELL, HIGH-EXPLOSIVE, 105 MM, M1

SHELL, HIGH-EXPLOSIVE, ANTITANK, 105 MM, M67

(Continued)

which differ only in the diametral taper of the wall of the case.

In addition, the chemical and smoke shells described separately, the high-explosive shell, M1, and the high-explosive antitank shell, M67, are authorized at the present time for use in the 105 mm howitzers, M2, M2A1 and M4.

SHELL, H.E., 105 mm, M1—STANDARD

The H.E., 105 mm, M1, round for the new howitzer, M3, is identical to the round as fired in the howitzers, M2, M2A1 and M4, except that the zone charges used are only 1 to 5 instead of 1 to 7.

The 105 mm H.E. shell, M1, is of stream-lined design with a long pointed nose and tapered base. Either the point-detonating fuze, M48A2 (.15 sec.), or the time and superquick fuze, M54, is authorized for use with this shell. Both fuzes are assembled with the M20A1 booster and are considered bore-safe.

The shell as fired weighs 33 pounds and contains a TNT bursting charge of 4.80 pounds. The complete round weighs 42.07 pounds. The M14, Type I, cartridge case is used and contains a 100-grain

percussion type primer, M1B1A2. The steel cartridge case, M14B1, is substitute standard. The fuze, P.D., M48A2 (.15 sec.), is a selective point-detonating fuze which may be set for superquick action or for a short delay action. The fuze, T. & S. Q., M54, is a point-detonating combination superquick and 25-second delay powder time-train fuze.

The propelling charge for the M2, M2A1 and M4 howitzers is the M1 class powder, having an 85-10-5 formula with seven perforations per grain and a web of 0.025 inch.

In the M3 howitzer the charge is the M1 class powder, having an 85-10-5 formula with single-perforation grains and a web of 0.014 inch.

The propelling charge consists of a base charge and six increments, the zone ranges of which are tabulated below.

SHELL, H.E., A. T., 105 mm, M67—

STANDARD—This howitzer shell is identical in design with the 75 mm high-explosive, antitank howitzer shell, M66.

The complete round consists of the cartridge case, M14, Type II, containing

the M28A2 primer, a propelling charge of 1.50 pounds of FNH powder and the loaded and fuzed projectile. The steel cartridge case, M14B1, is substitute standard. The complete round weighs 36.95 pounds, of which the shell accounts for 29.22 pounds.

The explosive charge is detonated on impact by the fuze, base-detonating, M62A1. The charge consists of 2.93 pounds of Pentolite. Good penetration of armor plate is obtained with this shell due to the shaped-charge or "Monroe" principle used. The shell will penetrate about 4½ inches of homogeneous armor plate at any range.

In the M2, M2A1 and M4 howitzers the propelling charge is an M1 class powder with a formula of 85-10-5 and has seven perforations per grain and a web of 0.025 inch.

The charge for the M3 howitzer has an 85-10-5 formula and is an M1 class powder with single-perforated grains having a web of 0.014 inch.

PROJECTILE, DRILL, M14—STANDARD—(See Table of Characteristics.)

Charge	Powder Charge	M2, M2A1 & M4 Howitzers			M3 Howitzer	
		MV. (F/S)	Range (yds.)	Elevation	Range (yds.)	Elevation
1	Base Sec. No. 1	650	3,825	43.5°	3,825	43.5°
2	Base & Incr. No. 2	710	4,475	43.6°	4,475	43.5°
3	Base & Incr. No. 2, 3	780	5,280	43.4°	5,280	43.9°
4	Base & Incr. No. 2, 3, 4	875	6,430	43.4°	6,430	43.9°
5	Base & Incr. No. 2, 3, 4, 5	1,020	8,295	43.2°	8,295	43.0°
6	Base & Incr. No. 2, 3, 4, 5, 6	1,235	10,150	43.3°	—	—
7	Base & Incr. No. 2, 3, 4, 5, 6, 7	1,550	12,205	43.7°	—	—

CHARACTERISTICS

	Shell, H.E., M1	Shell, H.E., A.T., M67	Shell, H.E., M1	Shell, H.E., A.T., M67	Proj. Drill, M14
Caliber	105 mm	105 mm	105 mm	105 mm	105 mm
Models of Howitzers	M2, M2A1, M4	M2, M2A1, M4	M3	M3	M2, M2A1, M4
Proj. Weight	33.0 lb.	29.22 lb.	33.0 lb.	29.22 lb.	—
Proj. Charge and Weight	TNT, 4.8 lb.	Pentolite, 2.93 lb.	TNT, 4.8 lb.	Pentolite, 2.93 lb.	—
Booster	M20A1	—	M20A1	—	—
Fuze	P.D., M48A2* (.15 sec.)	B.D., M62A1	P.D., M48A2* (.15 sec.)	B.D., M62A1	Dummy, M59
Primer	M1B1A2	M28A2	M1B1A2	M28A2	†
Cartridge Case	M14, Type I‡	M14, Type II‡‡	M14, Type I‡	M14, Type II‡‡	—
Propelling Charge and Weight	FNH pwr., 2.94 lb.	FNH pwr., 1.50 lb.	FNH pwr., 1.32 lb.	FNH pwr., 1.90 lb.	—
Complete Round Weight	42.07 lb.	36.95 lb.	40.36 lb.	36.65 lb.	41.35 lb.
Muzzle Velocity	1,550 f/s	1,250 f/s	1,020 f/s	1,020 f/s	—
Maximum Range	12,205 yds.	8,590 yds.	8,295 yds.	8,490 yds.	—
Chamber Capacity	153.80 cu. ins.	153.80 cu. ins.	153.80 cu. ins.	153.80 cu. ins.	—
Rated Max. Pressure, p.s.i.	30,000	26,000	25,000	20,000	—

*Or Combination T. & S.Q., M54.

†Either the inert 100-grain primers, M1B1A1 or M1A1, may be used.

‡Steel cartridge case, M14B1, Type I, is substitute standard.

‡‡Steel cartridge case, M14B1, Type II is substitute standard.

SHELL, CHEMICAL, 105 MM, (H.S.), M60—STANDARD

SHELL, CHEMICAL, 105 MM, (F.S.), M60—SUBSTITUTE STANDARD

ROUNDS FOR HOWITZERS, 105 MM, M2, M2A1, M3 AND M4

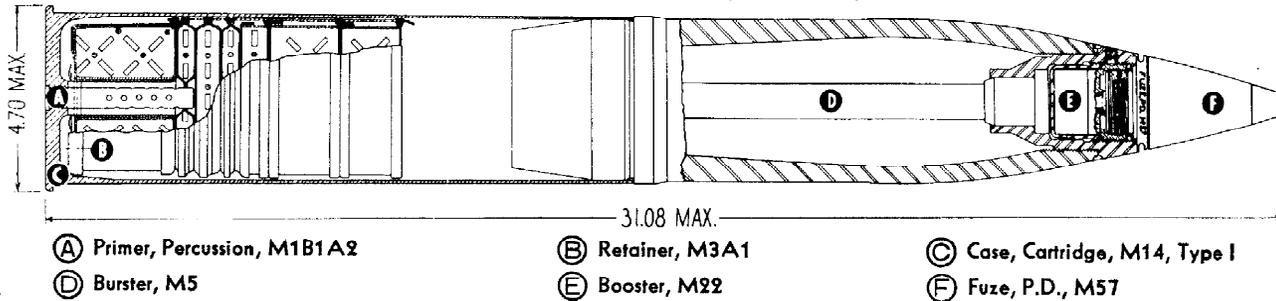
SHELL, CHEMICAL, 105 MM, (W.P.), M60—SUBSTITUTE STANDARD

ROUND FOR HOWITZERS, 105 MM, M2, M2A1, M3 AND M4

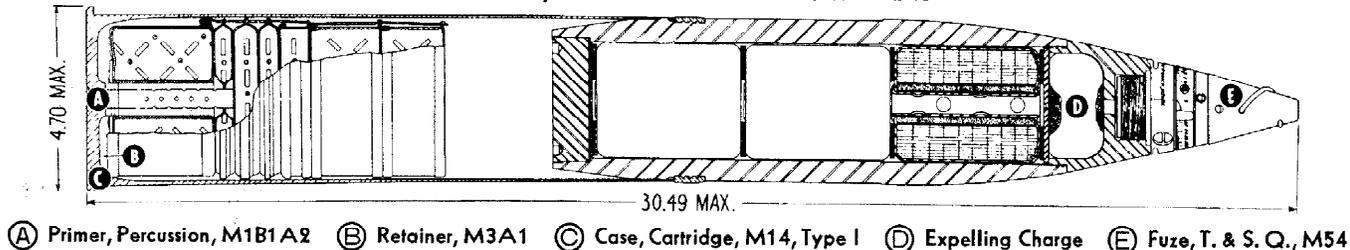
SHELL, SMOKE, 105 MM, (B.E.), M84 AND M84B1—STANDARD

ROUND FOR HOWITZERS, 105 MM, M2, M2A1, M3 AND M4

COMPLETE ROUND, SHELL, CHEMICAL, 105 mm, M60, FOR M2, M2A1 AND M4 HOWITZERS



COMPLETE ROUND, SMOKE SHELL (BASE EJECTION), 105 mm, M84, FOR M2, M2A1 AND M4 HOWITZERS



SHELL, CHEMICAL, 105 mm, (W.P.), M60—SUBSTITUTE STANDARD

This shell is authorized for use in the 105 mm howitzer and may be loaded with any of the three following chemical fillers: F.S. (Smoke), W.P. (Smoke) or H.S. (Persistent Gas). The F.S. (Smoke) chemical shell is substitute standard for the M2, M2A1 and M4 howitzers, the W.P. (Smoke) loaded shell is substitute standard for the M2, M2A1, M3 and M4 howitzers while the H.S. (Persistent Gas) is standard for the M2, M2A1 and M4 howitzers.

The weights of the loaded and fuzed projectiles vary with the chemical fillers used, as the following table indicates:

Chemical Filler	Weight of Chem. Filler	Proj. Weight Loaded and Fuzed
F.S.	4.61 lb.	34.86 lb.
W.P.	4.10 lb.	34.35 lb.
H.S.	3.17 lb.	33.42 lb.

After loading, the M5 burster well tube is pressed into place. This tube forms a gas-tight seal at the shell's nose. It has a cavity through the center of the shell into which the tetryl burster charge is placed after the burster well tube has been seated. The P.D. fuze, M57, with booster, M22, is used. The M57 fuze is similar to the P.D. fuze, M48A2, except that it contains no delay element and provides superquick action only.

The propelling charges for the M2, M2A1 and M4 howitzers are contained in

seven-section powder bags which are held in the cartridge case by the M31A1 retainer.

The propelling charge is an M1 class powder having an 85-10-5 formula with seven perforations per grain and a web of 0.025 inch. The round as fired in the M3 howitzer is identical except that a five-section propelling charge is used instead of seven. Consequently the muzzle velocity and powder pressures in the M3 howitzer are not so great as in the M2, M2A1 and M4. The M1 powder used with the M3 howitzer round has an 85-10-5 formula. The grains are single perforated and have a web of 0.014 inch. The maximum ranges for the shell are indicated in Tables A and B.

SHELL, CHEMICAL, 105 MM, (H.S.), M60
 SHELL, CHEMICAL, 105 MM, (F.S.), M60
 SHELL, CHEMICAL, 105 MM, (W.P.), M60
 SHELL, SMOKE, 105 MM, (B.E.), M84 AND M84B1

(Continued)

CHARACTERISTICS

	Shell, Chem., Smoke (F.S.), M60	Shell, Chem., Smoke (W.P.), M60	Shell, Chem., Gas (H.S.), M60	Shell, Chem., Smoke (B.E.), M84 and M84B1
Caliber.....	105 mm	105 mm	105 mm	105 mm
Models of Howitzers.....	M2, M2A1, M3 and M4	M2, M2A1, M3 and M4	M2, M2A1 and M4	M2, M2A1, M3 and M4
Proj. Weight.....	34.86 lb.	34.34 lb.	33.42 lb.	32.87 lb.
Proj. Charge and Weight.....	Smoke (F.S.), 4.61 lb.	Smoke (W.P.), 4.10 lb.	Gas (H.S.), 3.17 lb.	(Smoke, 7.50 lb.) (TNT, 0.14 lb.)
Booster.....	M22	M22	M22	T. and S. Q., M54
Fuze.....	P.D., M57	P.D., M57	P.D., M57	M1B1A2
Primer.....	M1B1A2	M1B1A2	M1B1A2	M14, Type I†
Cartridge Case.....	M14, Type I†	M14, Type I†	M14, Type I†	M14, Type I†
Propelling Charge and Weight.....	FNH powdr., 2.94 lb.*	FNH powdr., 2.94 lb.	FNH powdr., 2.94 lb.	FNH powdr., 3.04 lb.*
Complete Round Weight.....	43.85 lb.	43.35 lb.‡	42.41 lb.	41.84 lb.¶
Muzzle Velocity.....	1,550 f/s	1,550 f/s**	1,550 f/s	1,550 f/s**
Maximum Range.....	12,319 yds.	12,281 yds.††	12,243 yds.	12,243 yds.‡‡
Chamber Capacity.....	153.80 cu. ins.	153.80 cu. ins.	153.80 cu. ins.	153.80 cu. ins.
Rated Max. Pressure, p.s.i.....	30,000	30,000§	30,000	30,000§

*1.33 lb. for M3 howitzer.

†Steel cartridge case, M14B1, Type I, is substitute standard.

‡41.71 lb. in M3 howitzer.

§95,000 p.s.i. in M3 howitzer.

¶40.92 lbs. in M3 howitzer.

**1,020 f/s in M3 howitzer.

††8,197 yds. in M3 howitzer.

‡‡8,246 yds. in M3 howitzer.

SMOKE SHELL (BASE EJECTION), 105 mm, M84 AND M84B1—STANDARD—

This shell contains three chemical charges with an aggregate weight of 7.50 pounds. It is propelled by 3.04 pounds of FNH powder—slightly more than is used in the M60 chemical shell.

The point-detonating combination superquick and 25-second delay powder time-train fuze, M54, detonates the expelling charge of 0.14 pound of TNT. This amount of expelling charge is sufficient to blow out the closing disk at

the base of the shell and to eject the three smoke canisters.

The propelling charges for the M2, M2A1 and M4 howitzers are contained in seven-section powder bags which are held in the cartridge case by the M3A1 retainer.

The propelling charge is an M1 class powder of 85-10-5 formula. The grains have seven perforations and a web of 0.025 inch.

As fired, the M84 shell weighs 32.87 pounds. The complete round weight is 41.84 pounds. The round fired in the M3

howitzer is identical except for a five-section propelling charge. The M1 powder has the same characteristics as that used with the M60 smoke shell in the M3 howitzer.

The M84 shell body is manufactured from steel tubing and consequently an adapter is needed to receive the fuze. An alternate method of manufacture is to make the shell body from a forging. In this case the ogive is continued so that the fuze may be assembled to the shell without the use of an adapter.

TABLE A: (SHELL, CHEMICAL, 105 mm, (H.S.), M60)

Charge	Powder Charge	M2, M2A1 and M4 Howitzers		
		M.V. (f/s)	Range (yds.)	Elevation
1	Base Sect. No. 1.....	650	3,789	43.5°
2	Base and Incr. No. 2.....	710	4,433	43.6°
3	Base and Incr. No. 2, 3.....	780	5,232	43.4°
4	Base and Incr. No. 2, 3, 4.....	875	6,387	43.4°
5	Base and Incr. No. 2, 3, 4, 5.....	1,020	8,246	43.2°
6	Base and Incr. No. 2, 3, 4, 5, 6.....	1,235	10,138	43.3°
7	Base and Incr. No. 2, 3, 4, 5, 6, 7.....	1,550	12,243	43.7°

(SHELL, CHEMICAL, 105 mm, (F.S.), M60)

M2, M2A1 and M4 Howitzers	
Range (yds.)	Elevation
3,717	43.5°
4,349	43.6°
5,136	43.4°
6,301	43.4°
8,148	43.2°
10,114	43.3°
12,319	43.7°

TABLE B: (SHELL, CHEMICAL, 105 mm, (W.P.), M60)

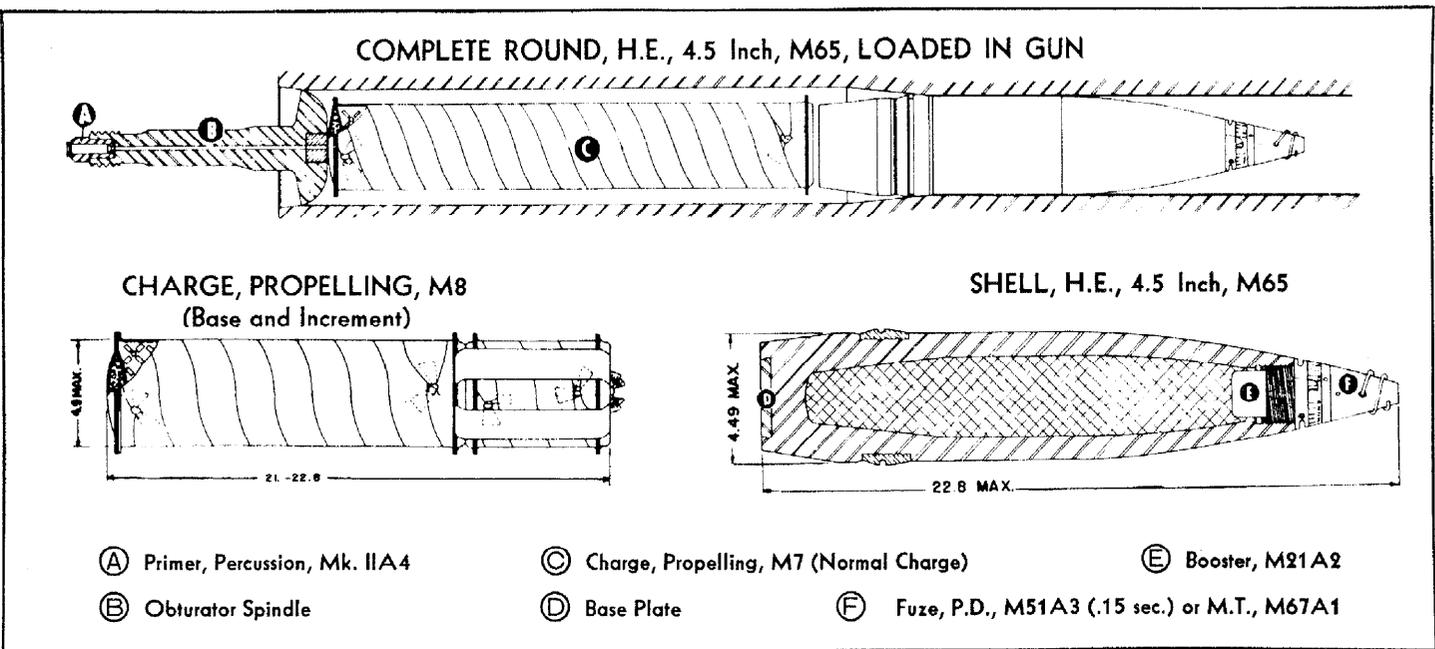
Charge	Powder	M2, M2A1 and M4 Howitzers		
		M.V. f/s	Range (yds.)	Elevation
1	Base Sect. No. 1.....	650	3,753	43.5°
2	Base and Incr. No. 2.....	710	4,391	43.6°
3	Base and Incr. No. 2, 3.....	780	5,184	43.4°
4	Base and Incr. No. 2, 3, 4.....	875	6,344	43.4°
5	Base and Incr. No. 2, 3, 4, 5.....	1,020	8,197	43.2°
6	Base and Incr. No. 2, 3, 4, 5, 6.....	1,235	10,126	43.3°
7	Base and Incr. No. 2, 3, 4, 5, 6, 7.....	1,550	12,281	43.7°

M3 Howitzer	
Range (yds.)	Elevation
3,753	43.5°
4,391	43.5°
5,184	43.2°
6,344	43.2°
8,197	43.0°
—	—
—	—

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SHELL, HIGH-EXPLOSIVE, 4.5 INCH, M65, M65B1 AND M65B2—STANDARD

ROUND FOR FIELD GUN, 4.5 INCH, M1



SHELL, HIGH-EXPLOSIVE, 4.5 INCH, M65, M65B1 and M65B2—STANDARD

—These shells are classified as standard ammunition for the 4.5 inch field gun, M1. The separate loaded complete round consists of the loaded and fuze shell, M65, M65B1 or M65B2, with either the normal base-propelling charge, M7, or the supercharge, M8, and the percussion primer MK. II A4.

The percussion primer, 17 grains, Mk. IIA4, is seated in the base of the obturator spindle and the propelling charge fits against the face of the percussion primer MK. II A4 spindle. The propelling charge, M7, measures 22.8 inches in length and 3.9 inches in diameter. The M8 propelling charge base section measures 16.1 inches in length and 4.9 inches in diameter and the increment measures 6.7 inches in length. The base and increment together measure 22.8 inches in length. The shell is 22.8 inches in length and 4.49 inches in diameter.

As fired the shell weighs 54.90 pounds

and contains a bursting charge of 4.49 pounds of TNT. Assembled in the gun, the complete round weighs 65.99 pounds with the M7 powder as it would exceed the rated maximum pressure. Hence, the M8 powder was necessary and was made up in base charge and increment so that it could be used in place of the M7 if the M7 were not available.

The M7 charge is the normal charge and weighs 7.44 pounds. The base section of the M8 charge weighs 8.328 pounds. The M8 powder has an 85-10-5 formula with a web of .054 and seven perforations. The M7 charge and the M8 charge base section give a muzzle velocity of 1,820 feet per second, and at 45° elevation, a maximum range of 16,650 yards. The M8 supercharge gives a muzzle velocity of 2,275 feet per second and a range at 45° elevation, of 21,125 yards.

The M7 normal charge will give more accurate fire than the M8 (base charge alone) although each has the same range

and muzzle velocity. However, a higher muzzle velocity was unobtainable with the M7 powder as it would exceed the rated maximum pressure. Hence, the M8 powder was necessary and was made up in base charge and increment so that it could be used in place of the M7 if the M7 were not available.

The M65, M65B1 and M65B2 shell are identical in appearance, weight and contour. However, the M65 is made from a steel casting and has a steel base plate. The M65B1 also has a steel base plate but the shell is made from a steel forging. The M65B2 is made from a steel forging, but no base plate is used. It does have a base cover. The base plate and cover both serve the same purpose, preventing gas leakage into the shell. The English method is used with the M65 and M65B1 and shells made with the base plate are manufactured in Canada. The base cover type, M65B2, is American.

CHARACTERISTICS

	Shell, H.E., M65, M65B1, M65B2	Shell, H.E., M65, M65B1, M65B2			
Caliber	4.5 inch	4.5 inch	4.5 inch	4.5 inch	4.5 inch
Model of Gun	M1	M1	M1	M1	M1
Proj. Weight	54.90 lb.	54.90 lb.	54.90 lb.	54.90 lb.	54.90 lb.
Proj. Charge and Weight	TNT, 4.49 lb.	TNT, 4.49 lb.	TNT, 4.49 lb.	M8, Base Sec., FNH pwr., 8.328 lb.	M8, Base and Incr., FNH pwr., 11.06 lb.
Booster	M21A2	M21A2	M21A2	M8, Base Sec., FNH pwr., 8.328 lb.	M8, Base and Incr., FNH pwr., 11.06 lb.
Fuze	M.T.M67A1*	M.T.M67A1*	M.T.M67A1*	M8, Base Sec., FNH pwr., 8.328 lb.	M8, Base and Incr., FNH pwr., 11.06 lb.
Primer	Mk. IIA4	Mk. IIA4	Mk. IIA4	M8, Base Sec., FNH pwr., 8.328 lb.	M8, Base and Incr., FNH pwr., 11.06 lb.
Complete Round Weight	61.36 lb.	63.258 lb.	65.96 lb.	61.36 lb.	65.96 lb.
Muzzle Velocity	1,820 f/s	1,820 f/s	2,275 f/s	1,820 f/s	2,275 f/s
Maximum Range	16,650 yds.	16,650 yds.	21,125 yds.	16,650 yds.	21,125 yds.
Chamber Capacity	531.00 cu. ins.	531.00 cu. ins.	531.00 cu. ins.	531.00 cu. ins.	531.00 cu. ins.
Rated Max. Pressure, p.s.i.	40,000	24,000	40,000	40,000	40,000

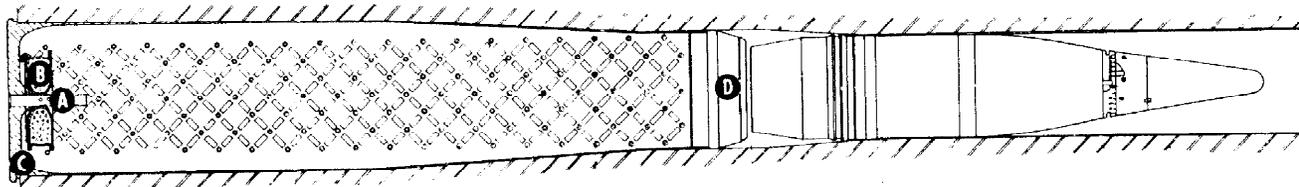
* Or P. D. Fuze, M51A3 (.15 sec.)

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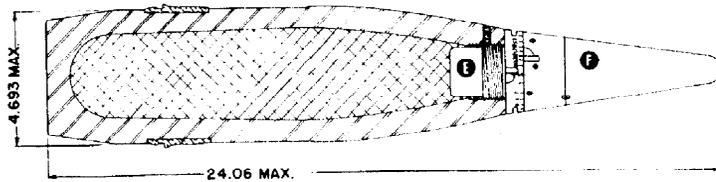
SHELL, HIGH-EXPLOSIVE, 120 MM, M73—STANDARD

ROUND FOR GUN, 120 MM, M1 (ANTIAIRCRAFT)

COMPLETE ROUND, H.E., 120 MM, M73, LOADED IN GUN



SHELL, H.E., 120 MM, M73



- (A) Primer, Percussion, M1B1A2
- (B) Igniter Assembly
- (C) Case, Cartridge, M24
- (D) Plug, Closing, M2
- (E) Booster, M20A1
- (F) Fuze, M.T., M61A1

SHELL, HIGH-EXPLOSIVE, 120 MM, M73—STANDARD—This shell is standard ammunition for the 120 MM anti-aircraft gun, M1.

The round consists of a loaded and fuzeed projectile and a cartridge case containing the propelling charge and a primer. The standard closing plug, M2, which replaces the cork plug, M1, is made of palmatex. This plug serves as a cushion between the cartridge case and the shell and prevents the loss of powder.

The round is separate-loaded, but the propelling charge is in the cartridge case instead of in a bag. This was adopted because a cartridge case and fixed powder charge are desirable for

rapid-fire antiaircraft use; but a fixed type round weighing 100 pounds was considered too unwieldy.

In firing, the projectile and the cartridge case are loaded into the chamber and rammed home by the power rammer.

The shell as fired weighs 49.74 pounds and employs the M61A1 mechanical time fuze and M20A1 booster. The shell contains a bursting charge of 5.26 pounds of TNT. Cartridge Case, M24, is used with the M1B1A2 percussion primer, an igniter assembly and a propelling charge of 23.62 pounds of NH powder. The complete round weighs 98.54 pounds. Alternate bursting charges are 4.80 lb. of 50/50 amatol with 0.19 lb. of cast TNT booster

surround or 5.42 lb. of trimonite. With the trimonite loading a booster cavity cup is used.

As the M1B1A2 primer does not insure complete burning of the propelling charge, an igniter is attached to the primer. The igniter contains 0.54 pound of black powder.

The propelling charge is M1 powder of an 87-10-3 formula with seven perforations per grain and a web of 0.068 inch.

The shell develops a muzzle velocity of 3,100 feet per second and has a maximum horizontal range of 27,160 yards and a maximum vertical range of 19,150 yards.

CHARACTERISTICS

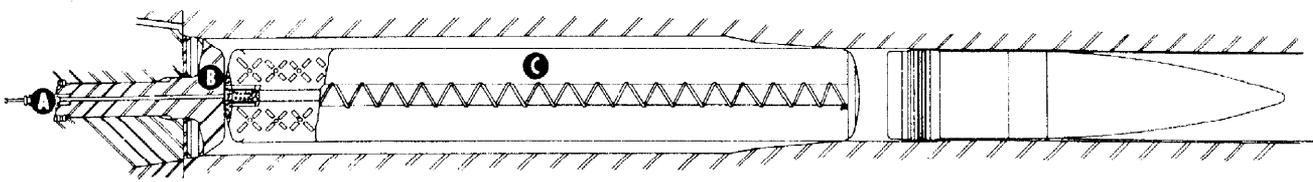
Shell, H.E., M73		Shell, H.E., M73	
Caliber.....	120 MM	Cartridge Case.....	M24
Model of Gun.....	M1	Propelling Charge and Weight.....	NH powder, 23.62 lb.
Proj. Weight.....	49.74 lb.	Complete Round Weight.....	98.41 lb.
Proj. Charge and Weight.....	TNT, 5.26 lb.*	Muzzle Velocity.....	3,100 f/s
Booster.....	M20A1	Maximum Range.....	Horiz.—27,160 yds.
Fuze.....	M. T., M61A1		Vert.—19,150 yds.
Primer.....	M1B1A2	Chamber Capacity.....	1,048 cu. ins.
		Rated Max. Pressure, p.s.i.....	38,000

*Alternate loadings 4.80 lb. 50/50 Amatol with 0.19 lb. Cast TNT booster surround or 5.42 lb. of trimonite.

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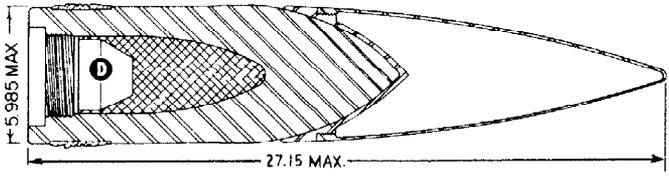
PROJECTILE, ARMOR-PIERCING, 6 INCH, MK. XXXIII—STANDARD SHELL, HIGH-EXPLOSIVE, 6 INCH, MK. IIA2—LIMITED STANDARD ROUND FOR 6 INCH SEACOAST GUNS, M1900A2, M1903A2, M1905A2

COMPLETE ROUND, PROJECTILE, A.P., 6 INCH, MK. XXXIII, LOADED IN GUN, M1905

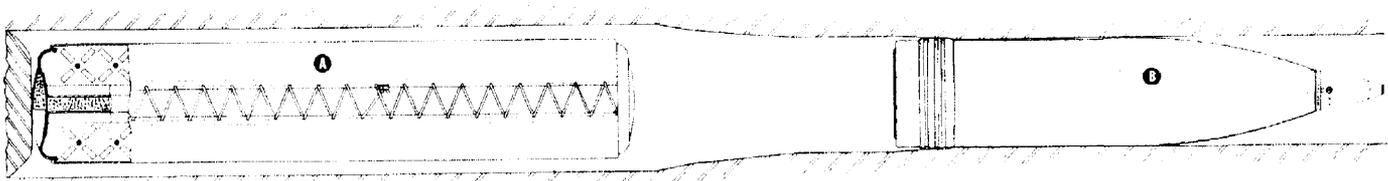


PROJECTILE, A.P., 6 INCH, MK. XXXIII

- (A) Primer, Electric, M30
- (B) Obturator Spindle
- (C) Bag, Powder, Single-Section Type
- (D) Fuze, B.D., M60

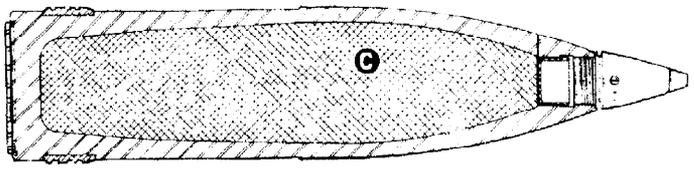


COMPLETE ROUND, SHELL, H.E., 6 INCH, MK. IIA2, LOADED IN GUN, M1905A2



SHELL, H.E., 6 INCH, MK. IIA2

- (A) Bag, Powder, Single-Section Type
- (B) Bursting Charge
- (C) Fuze, P. D., M51A3



PROJECTILE, ARMOR - PIERCING, 6 INCH, MK. XXXIII—STANDARD—This, the only standard combat ammunition for the 6 inch seacoast guns, is a Navy design projectile. The projectile is identical in design with the Projectile, A.P.C., 155 mm, M112.

A bursting charge of 2.17 pounds of explosive "D" is detonated by the M60 base-detonating fuze. To improve the flight characteristics a ballistic windshield is attached to the projectile body. This windshield is screwed onto an adapter which is soldered and crimped

in five places to the projectile body. A single-section type powder bag contains the propelling charge—37 pounds of NH powder. This charge gives the 105 pound projectile a muzzle velocity of 2,800 f/s. The propellant is an M1 class powder, 87-10-3 formula. The web size

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PROJECTILE, ARMOR-PIERCING, 6 INCH, MK. XXXIII
SHELL, HIGH-EXPLOSIVE, 6 INCH, MK. IIA2 (Continued)

is 0.068 inch and the grains have seven perforations. The electric primer, M30, is used to ignite the propelling charge.

The projectile measures 27 inches in length and the powder bag a maximum of 42 $\frac{3}{8}$ inches by 6 $\frac{1}{2}$ inches in diameter.

SHELL, HIGH-EXPLOSIVE, 6 INCH, MK. IIA2—LIMITED STANDARD—This shell was developed by the redesign of the MK. II high-explosive shell. The Mk. II shell was manufactured so that an adapter was required to assemble the Fuze, P.D., M47, to the shell, resulting in a shell contour that was unsatisfactory ballistically. To rectify this the shell was modified and was designated the Shell, H.E., MK. IIA1. The modification consisted of lengthening the ogive so that the P.D., fuze, M51A3, could be assembled directly to the shell without using an adapter. With the new shell and fuze contour the ballistic characteristics were improved. A further modification, this time to the rotating band, resulted in the MK. IIA2 shell.

The shell is manufactured from steel forging, and to insure that no gases leak into the bursting charge the base of the shell is protected by a steel base cover.

Two different bursting charges are permitted, 13.98 pounds of Grade I, Cast TNT or 13.11 pounds of 50-50 Amatol with 0.20 pound of Grade I, Cast TNT surrounding the booster. Both type loadings require fuze well cups to prevent broken pieces of the charge interfering with the assembly of the Fuze, P.D., M51A3. The shell is shipped with an eye-bolt closing plug and the fuze assembled prior to firing.

The 89.53 pound shell is propelled by 32.5 pounds of NH powder. The propelling charge, contained in a single-section type powder bag, is ignited by the M30 electric primer. The propellant is an M1 class powder, 87-10-3 formula. The grains have seven perforations and a web of 0.055 inch.

Fuze, P.D., M51A3 is a selective super-quick or delay (0.15 sec.) fuze.

The fuzed shell measures 25.22 inches in length and the powder bag a maximum of 42 $\frac{3}{8}$ inches by 6 $\frac{1}{2}$ inches in diameter.

PROJECTILE, TARGET PRACTICE, 6 INCH, M911—STANDARD—This projectile is used as a target practice shell to simulate the 108 pound, M1911, A.P.

Shell and A.P. Shot. It weighs 108 pounds, measures approximately the same in length as the A.P. shell and shot and has the same body contour. As a result the T.P. projectile has the same exterior ballistic characteristics as the simulated projectiles.

The projectile is manufactured from cast iron and is hollow to give the desired weight. The same propelling charge that is used with the MK. IIA2 shell also is used with this projectile.

PROJECTILE, TARGET PRACTICE, 6 INCH, MK. XXIX—STANDARD—The projectile is used, in target practice, to simulate the MK. XXXIII projectile. It is the same weight and has the same exterior ballistic characteristics as the MK. XXXIII.

PROJECTILES, DUMMY, 6 INCH, MK. IA1 and MK. IIA1—STANDARD—These dummy projectiles are used to teach the gun crew handling and loading techniques. The projectile has a built-up body. Bronze is used for those portions of the projectile body that might come in contact with the bore of the gun. This protects the gun tube from rough loading.

CHARACTERISTICS

	Proj., A.P., Mk. XXXIII	Shell, H.E., Mk. IIA2	Proj., T.P., M1911	Proj., Drill Mk. 1A1	Proj., Drill Mk. IIA1	Proj., T. P. Mk. XXIX
Caliber.....	6 inch	6 inch	6 inch	6 inch	6 inch	6 inch
Model of Guns.....	M1900A2, M1903A2, M1905A2	M1900A2, M1903A2, M1905A2	M1900A2, M1903A2, M1905A2	M1900A2, M1903A2, M1905A2	M1900A2, M1903A2, M1905A2	M1900A2, M1903A2, M1905A2
Proj. Weight.....	105 lb.	89.53	108 lb.	85 lb.	102 lb.	105 lb.
Proj. Charge and Weight.....	Expl. "D," 2.17 lb.	TNT, 13.98 lb.	—	—	—	—
Fuze.....	B.D., M60	M51A3	—	—	—	—
Primer.....	M30, Elec.	M30, Elec.	M30, Elec.	M30, Elec.	M30, Elec.	M30, Elec.
Propelling Charge and Weight.....	Single-sec., NH pwr., 37.00 lb.	Single-sec., NH pwr., 32.50 lb.	Single-sec., NH pwr., 32.50 lb.	—	Dummy, Mod. 1917, 29.00 lb.	Single-sec., NH pwr., 37.00 lb.
Complete Round Weight.....	142.00 lb.	122.06 lb.	140.50 lb.	85.00 lb.	131.00 lb.	142.00 lb.
Muzzle Velocity.....	2,800 f/s	2,770 f/s	2,600 f/s	—	—	2,800 f/s
Maximum Range.....	27,150 yds.	20,995 yds.	17,000 yds.	—	—	27,150 yds.
Chamber Capacity.....	2,082 cu. ins.*	2,082 cu. ins.*	2,077 cu. ins.†	—	—	2,082 cu. ins.*
Rated Max. Pressure, p.s.i.....	38,000	38,000	38,000	—	—	38,000

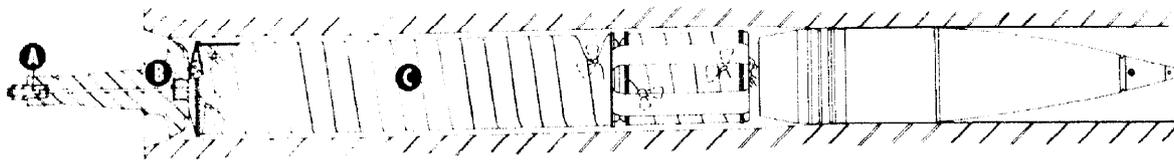
*2,144 cu. ins. in M1905 gun.
 †2,122 cu. ins. in M1905 gun.

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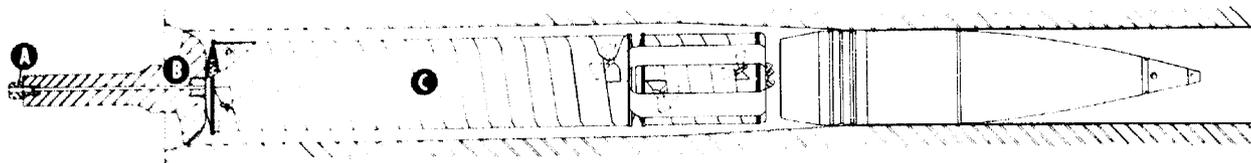
SHELL, HIGH-EXPLOSIVE, 155 mm, M101—STANDARD

ROUND FOR GUNS, M1917, M1918M1, M1 AND M1A1

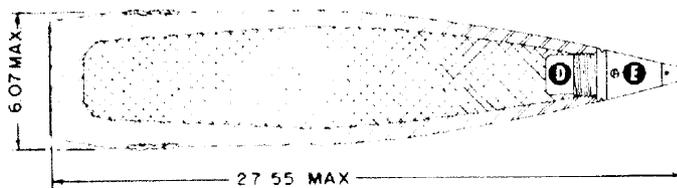
COMPLETE ROUND, H.E., 155 mm, M101, LOADED IN GUN, M1918M1



COMPLETE ROUND, H.E., 155 mm, M101, LOADED IN GUN, M1A1



SHELL, H.E., 155 mm, M101



- (A) Primer, Percussion, Mk. IIA4
- (B) Obturator Spindle
- (C) Charge, Propelling, Base and Increment
- (D) Booster, M21A2
- (E) Fuze, P.D., M51A3 (.15 sec.) or M.T., M67A1

The 155 mm guns, M1917, M1918M1, M1 and M1A1, take the same separate-loading projectiles. Loading is accomplished in three operations: (1) inserting the projectile in the gun, (2) inserting the propelling charge and (3) inserting the primer in the breech mechanism of

the gun. Five general types of ammunition are provided: (1) high-explosive shell, (2) armor-piercing shot, (3) chemical shell, (4) target-practice projectile and (5) drill projectile.

The high-explosive and chemical rounds are issued unfuzed; the armor-piercing

round is issued fuzed. An eye-bolt lifting plug or an adapter plug is shipped assembled in the fuze seat with unfuzed rounds. This type of projectile is also issued unboxed, and shipped with the rotating band protected by a rope grommet.

Propelling charges are shipped com-
(Continued on next page)

CHARACTERISTICS

	Shell, H.E., M101	Shell, H.E., M101	Shell, H.E., M101	Shell, H.E., M101	Proj., Target, Mk. III
Caliber	155 mm	155 mm	155 mm	155 mm	155 mm
Models of Guns	M1917, M1918M1	M1917, M1918M1	M1, M1A1	M1, M1A1	All
Proj. Weight	94.70 lb.	94.70 lb.	94.70 lb.	94.70 lb.	95.33 lb.
Proj. Charge and Weight	TNT, 15.13 lb.	TNT, 15.13 lb.	TNT, 15.13 lb.	TNT, 15.13 lb.	Inert, 15.13 lb.
Booster	M21A2	M21A2	M21A2	M21A2	MIII AM2
Fuze	P.D., M51A3 (.15 sec.) or M.T., M67A1	P.D., M46 or M47 inert			
Primer	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.			
Propelling Charge and Weight	(Base) NH pwr., 18.66 lb.	(Base & Incr.) NH pwr., 24.45 lb.	(Base) NH pwr., 20.35 lb.	(Base & Incr.) NH pwr., 30.74 lb.	(Base & Incr.) NH pwr., 24.75 lb.
Complete Round Weight	113.80 lb.	119.48 lb.	115.17 lb.	125.48 lb.	121.53 lb.
Muzzle Velocity	1,955 f/s	2,410 f/s	2,100 f/s	2,800 f/s	2,410 f/s
Maximum Range	16,100 yds. at 35° 30' elev.	20,100 yds. at 35° 24' elev.	18,605 yds. at 45° elev.	25,715 yds. at 46° 49' elev.	17,900 yds. at 35° 15' elev.
Chamber Capacity	1,330 cu. ins.	1,330 cu. ins.	1,640 cu. ins.	1,640 cu. ins.	—
Rated Max. Pressure, p.s.i.	31,500	31,500	40,000	40,000	—

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SHELL, HIGH-EXPLOSIVE, 155 MM, M101 (Continued)

plete with igniting charges in waterproof fiber containers, one complete charge being packed in each cartridge storage case.

Before discussing the present standard item, Shell, H.E., M101, a comparative tabulation of the shell's antecedents will clarify the major points of difference and modifications which developed into the present M101 shell as shown in Table A.

The high-explosive shell, Mk. III, was adapted from a French design and had a sharp nose and tapered base to add to its efficiency in flight. The explosive charge was about 15.2 pounds of TNT. Some rounds were loaded with 50/50 or 80/20 amatol.

The Mk. IIIA1 high-explosive shell is a modification of the Mk. III shell. The modification consists of changing the ogival length to take the M51A1 point-detonating fuze and the M21A2 booster. This modification makes it possible to use the bore-safe fuze, M51A1, instead of the M46 or M47 point-detonating fuze. The modification of the ogive and the use of a better ballistic shape fuze improve the ballistic characteristics of the shell, as can be seen in Table A.

SHELL, HIGH-EXPLOSIVE, 155 mm, M101—STANDARD—This standard issue and manufacture round was developed from the Mk. III high-explosive round (now classified as limited standard) and from the Mk. IIIA1 high-explosive round (now classified as substitute standard).

The M101 shell may be fired in either the M1918M1 guns or the new M1 and M1A1 guns. The shell is similar in appearance and construction to the Mk. IIIA1 high-explosive shell. The M51A3 point-detonating fuze or M67A1 mechanical time fuze is used with the M21A2 booster. The shell weighs 94.70 pounds as fired. The weight of the TNT bursting charge is 15.13 pounds. This projectile is shipped and issued unfuzed; the fuzes, with booster attached, are shipped separately in fiber containers.

When fired in the M1918M1 gun, with the normal base-propelling charge, the complete round weighs 113.80 pounds. The weight of the NH powder base-section

charge is 18.66 pounds, giving a muzzle velocity of 1,955 feet per second and a maximum range of 16,100 yards at 35° 30' elevation. When fired with the base and increment charge, the weight of the NH powder charge is 24.45 pounds, giving a muzzle velocity of 2,410 feet per second and a maximum range of 20,100 yards at 35° 24' elevation. The weight of the complete round then becomes 119.48 pounds.

When fired in the M1A1 gun, with the normal base-section charge, the complete round weighs 115.17 pounds. The weight of the NH powder base-section is 20.35 pounds, giving a muzzle velocity of 2,100 feet per second and a maximum range of 18,605 yards at 45° elevation. When fired with the base-increment charge, the weight of the NH powder charge is 31.25 pounds, giving a muzzle velocity of 2,800 feet per second and a maximum range of 25,715 yards at 46° 49' elevation. The weight of the complete round then becomes 126.37 pounds.

The propelling charge for the 155 mm gun, M1918M1, is nonhygroscopic smokeless powder. The cartridge bags containing the propelling charge are the "base and increment type" consisting of a base section and one increment section, permitting two zones of fire. The base section has an 8 ounce black powder igniter pad attached. Both base section and increment section are wrapped spirally with strips of cartridge-bag cloth to make the bags firm and compact for handling.

The propelling charge for use in the new 155 mm guns, M1 and M1A1, is similar to the M1918M1 propelling charge. The base section of the charge used in the M1 and M1A1 guns is 25.25 inches in length and weighs approximately 20.35 pounds. The increment section is 11.75 inches in length and weighs approximately 10.90 pounds. The total length of the charge is approximately 37 inches and the total weight is 31.25 pounds. In addition to being slightly longer and heavier than the M1918M1 propelling charge, the charges for the M1 and M1A1 guns are larger in diameter and can be used only in those guns.

The base and increment charges are made from class M1 powder with an 87-10-3 formula. Grains of this powder have a web of 0.057 inch and seven perforations.

The projectile measures 23.62 inches in length.

PROJECTILE (SPECIAL TARGET), MK. III—STANDARD

This shell consists of an empty high-explosive Mk. III shell body, an inert adapter-booster, and an inert fuze. The shell is shipped empty and must be sand loaded to the proper weight of 95.33 pounds before it is issued to using troops. The complete round weighs 121.53 pounds.

PROJECTILE, DUMMY (DRILL), MK. I

—STANDARD—(See Table of Characteristics.)

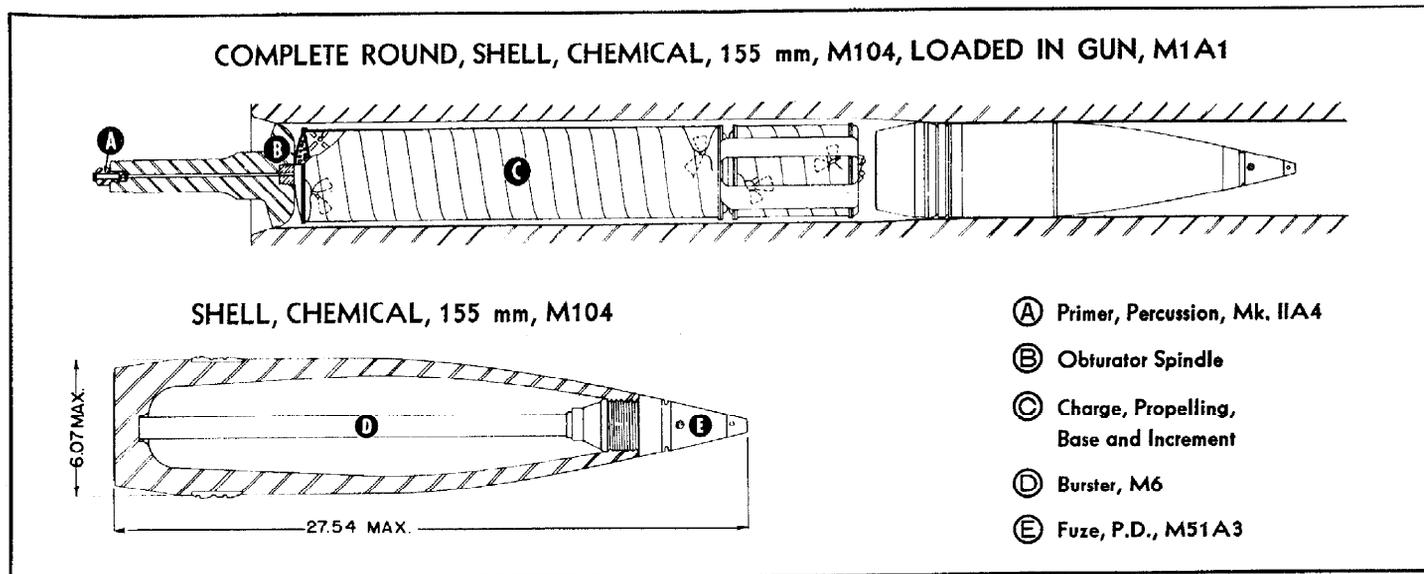
TABLE A

	Mk. III (Limited Standard)	Mk. IIIA1 (Substitute Standard)
Model of guns	M1917, M1918M1	M1917, M1918M1
Weight of complete round	120.11 lb.	120.93 lb.
Weight of shell, as fired	95.33 lb.	96.15 lb.
Weight of bursting charge (TNT)	15.17 lb.	15.21 lb.
Weight of normal charge (NH powder, base section)	21.00 lb.	21.00 lb.
Muzzle velocity, normal charge	1,955 f/s	1,955 f/s
Maximum range, normal charge	14,900 yds. (35° elev.)	15,500 yds. (35° 38' elev.)
Weight of supercharge (NH powder, base and increment)	24.75 lb.	24.75 lb.
Muzzle velocity, supercharge	2,410 f/s	2,410 f/s
Maximum range, supercharge	17,900 yds. (35° 15' elev.)	19,100 yds. (35° 22' elev.)
Adapter and booster	Mk. IIIAM2	M21A1
Fuze	P.D., M46 or M47	P.D., M51A1, or M.T., M67
Primer	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.

UNCLASSIFIED

SHELL, CHEMICAL, 155 mm, M104—STANDARD

ROUND FOR GUN, 155 mm, M1917, M1918M1, M1 AND M1A1



SHELL, CHEMICAL, 155 mm, M104—STANDARD—This is a standard issue and manufacture round for use in the M1 and M1A1 guns and consists of the chemical shell, M104, with burstier, M6,

booster, M22, and fuze, P.D., M51A3. The shell measures 27.54 inches in length. The 17 grain, percussion primer, Mk. IIA4, is used to fire the normal or supercharge propelling charge of NH powder.

In the M1 and M1A1 guns, the normal base charge weighs 20.00 pounds and develops a muzzle velocity of 2,100 feet per second with maximum range of 18,605 yards at 45° elevation when the HS

(Continued on next page)

CHARACTERISTICS

	Shell, (FS) M104	Shell, (WP) M104	Shell, (HS) M104	Shell, (FS) M104	Shell, (WP) M104	Shell, (HS) M104
Caliber.....	155 mm	155 mm	155 mm	155 mm	155 mm	155 mm
Models of Guns.....	M1917 M1918M1	M1917 M1918M1	M1917 M1918M1	M1, M1A1	M1, M1A1	M1, M1A1
Proj. Weight.....	99.73 lb.	98.18 lb.	94.53 lb.	99.73 lb.	98.18 lb.	94.53 lb.
Proj. Charge & Weight.....	16.90 lb. Chem., 0.59 lb. TNT	15.68 lb. Chem., 0.36 lb. Tetryl	11.70 lb. Chem., 0.36 lb. Tetryl	16.90 lb. Chem., 0.36 lb. Tetryl	15.60 lb. Chem., 0.36 lb. Tetryl	11.70 lb. Chem., 0.36 lb. Tetryl
Booster.....	M22	M22	M22	M22	M22	M22
Fuze.....	P.D., M51A3	P.D., M51A3	P.D., M51A3	P.D., M51A3	P.D., M51A3	P.D., M51A3
Burster.....	M6	M6	M6	M6	M6	M6
Primer.....	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.
Propelling Charge & Weight...*		*	*	§	§	§
Complete Round Weight.....	124.51 lb.	122.96 lb.	119.31 lb.	130.51 lb.	128.96 lb.	125.31 lb.
Muzzle Velocity.....**		††	†	†††	§§	‡
Maximum Range.....**		††	†	†††	§§	‡
Chamber Capacity.....	1,330 cu. ins.	1,330 cu. ins.	1,330 cu. ins.	1,640 cu. ins.	1,640 cu. ins.	1,640 cu. ins.
Rated Max. Pressure, p.s.i.....	31,500	31,500	31,500	40,000	40,000	40,000

*Normal charge, base section, NH powder, 21.00 lb. Supercharge, base and increment, NH powder, 24.75 lb.

†With normal charge: M.V., 1,955 f/s; max. range, 16,100 yds. With supercharge: M.V., 2,410 f/s; max. range, 20,100 yds.

‡With normal charge: M.V., 2,100 f/s; max. range, 18,605 yds. With supercharge: M.V., 2,800 f/s; max. range, 25,715 yds.

§Normal charge, base section, NH powder, 20.35 lb. Supercharge, base and increment, NH powder, 31.25 lb.

**With normal charge: M.V., 1,955 f/s; max. range, 16,260 yds. With supercharge: M.V., 2,410 f/s; max. range, 20,296 yds.

††With normal charge: M.V., 1,955 f/s; max. range, 16,220 yds. With supercharge: M.V., 2,410 f/s; max. range, 20,247 yds.

‡With normal charge: M.V., 2,100 f/s; max. range, 18,701 yds. With supercharge: M.V., 2,800 f/s; max. range, 25,940 yds.

§With normal charge: M.V., 2,100 f/s; max. range, 18,733 yds. With supercharge: M.V., 2,800 f/s; max. range, 26,015 yds.

UNCLASSIFIED

SHELL, CHEMICAL, 155 MM, M104 (Continued)

loaded shell is used. Using the same shell the base and increment supercharge weighs 31.25 pounds and develops a muzzle velocity of 2,800 feet per second with a maximum range of 25,715 yards at 47° elevation.

In the M1918M1 gun, the normal base charge of 21 pounds develops a muzzle velocity of 1,955 feet per second and a maximum range, with the HS loaded shell, of 16,100 yards at 35° 30' elevation. The supercharge weighs 24.75 pounds and develops a muzzle velocity of 2,410 feet per second and a maximum range of 20,100 yards at 35° 14' elevation.

The base and increment charge for the M1917 and M1918M1 guns is 37 inches in length and 5.8 inches in diameter. The charge for the M1 and M1A1 guns measures 37.4 inches in length and 6.5 inches in diameter. The base and increment charges are made from class M1 powder with an 87-10-3 formula. Grains of this powder have a web of 0.057 inch and seven perforations.

The shell may be loaded with either WP (Smoke), FS (Smoke), or HS (Persistent Gas) filler. The chemical filler is loaded into the shell and the burster well tube is pressed into place, forming a gas-tight seal. At the time of loading the chemical filler and assembling the burster well tube into the shell, no explosive charge is present. The explosive charge of the burster is contained in a cardboard or thin aluminum casing and is loaded into the shell either at the depot or in the field at the time of fuzing.

After the shell has been loaded and the burster well tube assembled in place, a bakelite cup is placed over the empty burster cavity to prevent the entrance of foreign matter and an eyelet lifting plug screwed into the nose of the shell. The tetryl bursting charge weighs 0.36 pound.

The weights of the shell, as fired in the M1917, M1918M1, M1 and M1A1 guns,

with the various loadings, are as follows:

Kind	Filler Weight	Weight of Shell Loaded and Fuzed
WP	15.68 lb.	98.18 lb.
FS	16.90 lb.	99.73 lb.
HS	11.70 lb.	94.53 lb.

Complete round weights with base section charge and base and increment charge follow:

Filler	Gun	Weight with Base Section Charge	Weight with Base & Incr. Chg.
WP	M1917, M1918M1	119.05 lb.	122.96 lb.
FS	M1917, M1918M1	120.27 lb.	124.51 lb.
HS	M1917, M1918M1	115.07 lb.	119.31 lb.
WP	M1 and M1A1	118.40 lb.	128.96 lb.
FS	M1 and M1A1	119.62 lb.	130.51 lb.
HS	M1 and M1A1	114.42 lb.	125.31 lb.

The following data for the limited standard, Mk. VIIA1, may be compared with those for the M104 standard round in the M1917 and 1918M1 guns (the Mk. VIIA1 shell being the antecedent of the M104 shell).

	HS	FS	WP
Weight of complete round	119.63 lb.	124.46 lb.	123.03 lb.
Weight of shell, as fired	94.88 lb.	99.71 lb.	98.28 lb.
Weight of charge, chemical	11.40 lb.	16.23 lb.	14.84 lb.
Weight of normal charge (NH powder, base section)	21.00 lb.	21.00 lb.	21.00 lb.
Muzzle velocity, normal charge	1,955 F/S	1,955 F/S	1,955 F/S
Maximum range, normal charge	15,500 yds.	15,500 yds.	15,500 yds.
Weight of supercharge (NH powder, base and increment)	24.75 lb.	24.75 lb.	24.75 lb.
Muzzle velocity, supercharge	2,410 F/S	2,410 F/S	2,410 F/S
Maximum range, supercharge	20,100 yds.	20,296 yds.	20,247 yds.

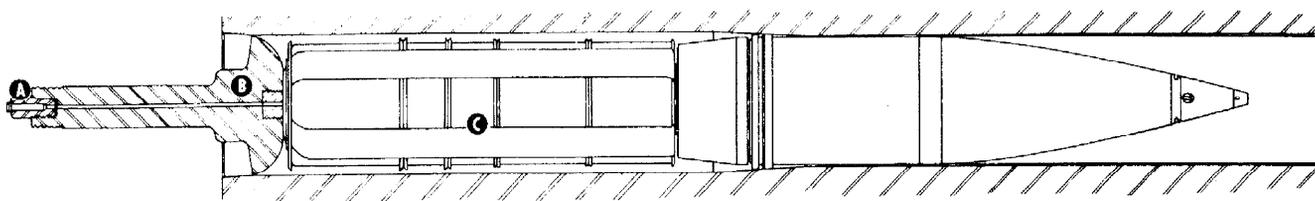
SHELL, HIGH-EXPLOSIVE, 155 MM, M107—STANDARD

ROUND FOR HOWITZER, 155 mm, M1

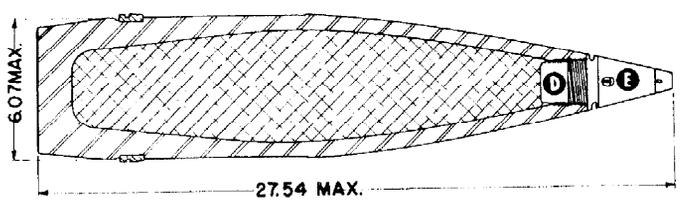
SHELL, HIGH-EXPLOSIVE, 155 MM, M102—STANDARD

ROUND FOR HOWITZER, 155 mm, M1917, M1917A1, M1918

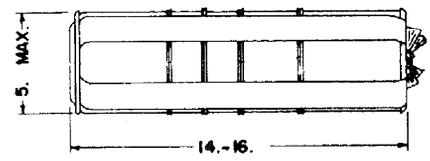
COMPLETE ROUND, SHELL, H.E., 155 mm, M107, LOADED IN HOWITZER, M1



SHELL, H.E., 155 mm, M107



CHARGE, PROPELLING, M3

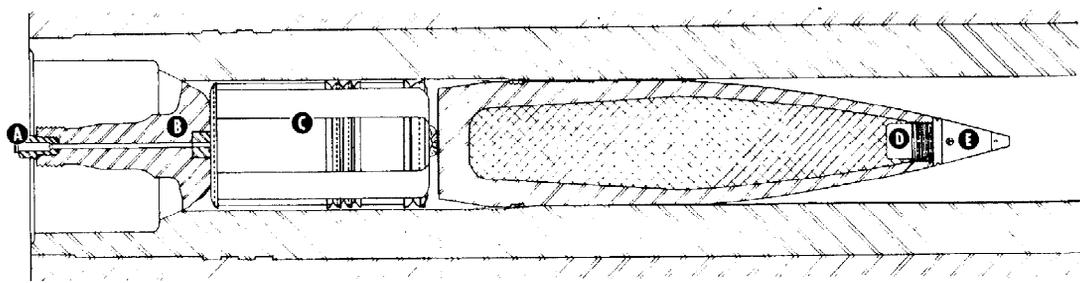


- (A) Primer, Percussion, Mk. IIA4
- (B) Obturator Spindle

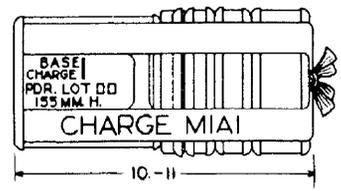
- (C) Charge, Propelling, M4A1
- (D) Booster, M21A2

- (E) Fuze, P.D., M51A3 (.15 sec.), or Fuze, M.T., M67A1

COMPLETE ROUND, SHELL, H.E., 155 mm, M102, LOADED IN HOWITZER, M1918



CHARGE, PROPELLING, M1A1



- (A) Primer, Percussion, Mk. IIA4
- (B) Obturator Spindle
- (C) Charge, Propelling, M2A1
- (D) Booster, M21A2
- (E) Fuze, P.D., M51A3 (.15 sec.), and Fuze, T. & S.Q., M55A1

Standard ammunition for the M1, M1917, M1917A1, and M1918 howitzers is issued with high explosive or chemical fillings and with an inert filling for drill purposes.

UNCLASSIFIED

The 155 mm gun shells should not be fired in the 155 mm howitzer, as these projectiles would seat differently in the howitzer—thus reducing the chamber space for the propelling charge and giving

different interior and exterior ballistics. The high-explosive round M102 was developed from the Mk. I high-explosive shell which is now classified as Limited Standard. The Mk. I became the Mk. I (Continued on next page)

SHELL, HIGH-EXPLOSIVE, 155 MM, M107 AND M102 (Continued)

IA1 when modified to take the M21A1 booster and fuze P.D., M51A1, or Fuze T. & S.Q., M55A1.

SHELL, HIGH-EXPLOSIVE, 155 mm, M107—STANDARD—This round is used in the howitzer, M1, and has the same general characteristics as the M102 round. The M107 shell takes the M21A2 booster and the fuze, P.D., M51A3 (.15 sec.), or the fuze, M.T., M67A1. As fired the shell weighs 95.01 pounds. The weight of the TNT bursting charge is 15.13 pounds. The complete round weighs 108.14 pounds (with propelling charge, M4A1).

The M3 propelling charge uses an M1 class powder, the grains of which have a web of 0.015 inch and are single perforated. The formula for this powder and that for the M4A1 charge is 85-10-5. The M4A1 charge also uses M1 class powder

with seven perforations per grain and a web size of 0.034 inch.

The shell measures 27.54 inches in length; the M3 propelling charge is 16 inches long and 5 inches in diameter and the M4A1 propelling charge is 21 inches in length and 5.8 inches in diameter.

The propelling charges consist of the base charges and increments for the various zone charges as used in the howitzer, M1.

SHELL, HIGH-EXPLOSIVE, 155 mm, M102—STANDARD—This round has the same general characteristics as the high-explosive shell, Mk. IA1. The M102 shell takes the M21A2 booster and the fuze, P.D., M51A3 (.15 sec.), or the fuze, T. & S.Q., M55A1. The weight of the shell as fired is 95.30 pounds. The weight of the complete round is 103.58 pounds with the M2A1 propelling charge.

The M1A1 propelling charge uses an M1 class powder, the grains of which have a web of 0.016 inch and are single perforated. The formula for this powder and that for the M2A1 charge is 85-10-5. The M2A1 charge also uses M1 class powder with seven perforations per grain and a web size of 0.033 inch.

The shell as fired is 27.54 inches in length; the M1A1 propelling charge measures 11 inches in length and 5 inches in diameter, while the M2A1 charge is 11 inches in length and 6 inches in diameter.

The propelling charges consist of the base charges and increments for the various zone charges as used in the howitzer, M1918 (Table A).

PROJECTILE, DRILL, MK. I—STANDARD—(See Table of Characteristics.)

TABLE A

Shell, H.E., 155 mm, M102, in M1917, M1917A1, M1918 Howitzers

Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M1A1	Base 1	1.78 lb.	679 f/s	4,305 yds.	45° 5'
2	M1A1	Base 1 Incr. 2	2.05 lb.	741 f/s	5,035 yds.	45° 0'
3	M1A1	Base 1 Incrs. 2 & 3	2.52 lb.	831 f/s	6,155 yds.	43° 30'
4	M1A1	Base 1 Incrs. 2, 3, & 4	3.06 lb.	938 f/s	7,555 yds.	43° 30'
5	M1A1	Base 1 Incrs. 2, 3, 4 & 5	4.00 lb.	1,082 f/s	9,415 yds.	43° 30'
3	M2A1	Base 3	3.63 lb.	831 f/s	6,155 yds.	43° 30'
4	M2A1	Base 3 Incr. 4	4.37 lb.	938 f/s	7,555 yds.	43° 30'
5	M2A1	Base 3 Incr. 4 & 5	5.37 lb.	1,082 f/s	9,415 yds.	43° 30'
6	M2A1	Base 3 Incrs. 4, 5, & 6	7.27 lb.	1,357 f/s	11,735 yds.	43° 45'
7	M2A1	Base 3 Incrs. 4, 5, 6 & 7	8.09 lb.	1,476 f/s	12,775 yds.	44° 15'

TABLE B

Shell, H.E., 155 mm, M107, in M1 Howitzer

Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M3	Base	2.19 lb.	680 f/s	4,290 yds.	43° 51'
2	M3	Base plus Incr. 1	2.71 lb.	770 f/s	5,365 yds.	43° 41'
3	M3	Base plus Incr. 2	3.39 lb.	880 f/s	6,780 yds.	43° 33'
4	M3	Base plus Incr. 3	4.35 lb.	1,020 f/s	8,620 yds.	43° 41'
5	M3	Base plus Incr. 4	5.13 lb.	1,220 f/s	10,780 yds.	43° 41'
3	M4A1	Base 3	4.12 lb.	880 f/s	6,780 yds.	43° 33'
4	M4A1	Base 3 Incr. 4	5.30 lb.	1,020 f/s	8,620 yds.	43° 41'
5	M4A1	Base 3 Incr. 4 & 5	7.06 lb.	1,220 f/s	10,780 yds.	44° 16'
6	M4A1	Base 3 Incr. 4, 5, & 6	9.88 lb.	1,520 f/s	13,435 yds.	44° 44'
7	M4A1	Base 3 Incr. 4, 5, 6 & 7	13.26 lb.	1,850 f/s	16,355 yds.	45° 17'

CHARACTERISTICS

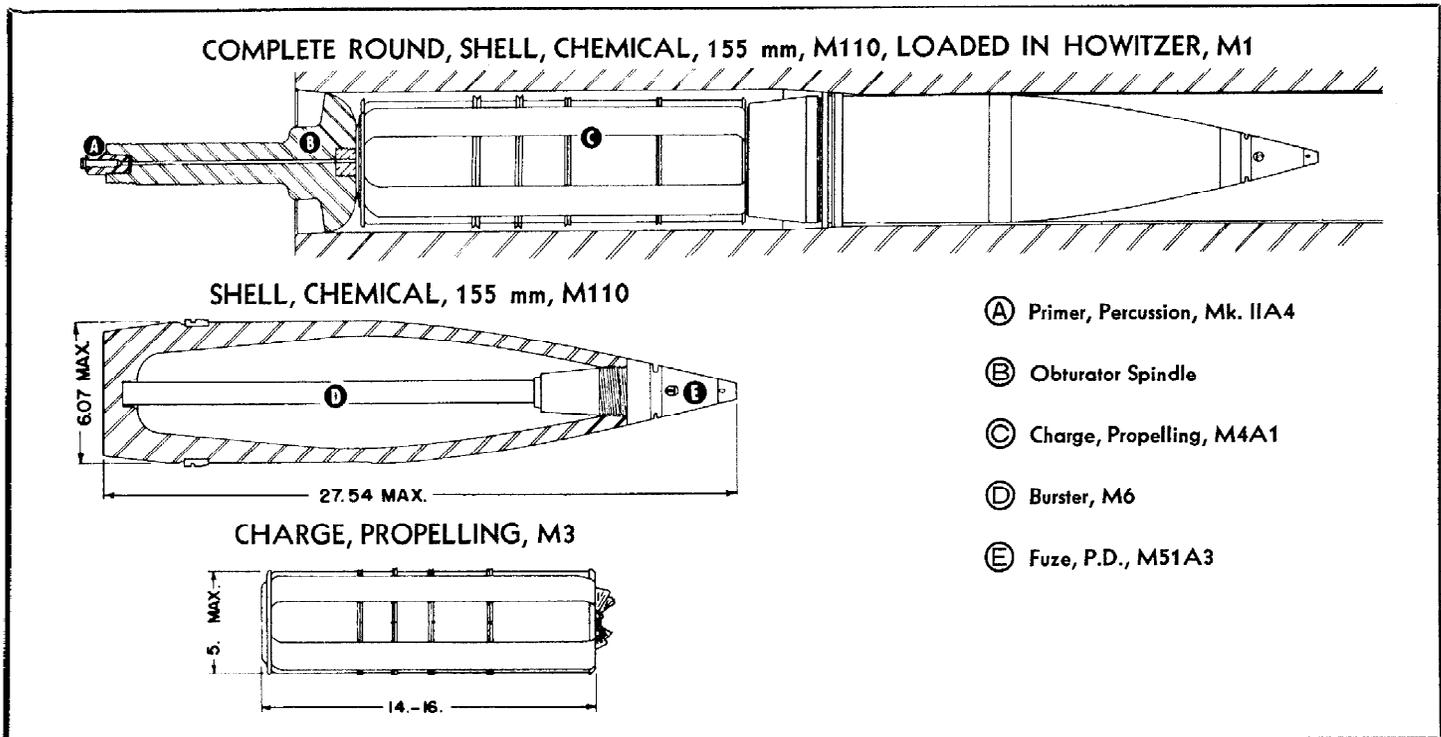
	Shell, H.E., M107	Shell, H.E., M102	Proj., Drill, Mk. I		Shell, H.E., M107	Shell, H.E., M102	Proj., Drill, Mk. I
Caliber.....	155 mm	155 mm	155 mm	Propelling Charge and Weight.....	M4A1, FNH pwr., 13.26 lb.*	M2A1, FNH pwr., 8.09 lb.*	26.5 lb. (Base & Incr.)
Models of Howitzers.....	M1	M1917, M1917A1, M1918	All	Complete Round Weight.....	108.14 lb.	103.58 lb.	121.50 lb.
Proj. Weight.....	95.01 lb.	95.30 lb.	95.0 lb.	Muzzle Velocity.....	1,850 f/s†	1,476 f/s†	—
Proj. Charge and Weight.....	TNT, 15.13 lb.	TNT, 15.13 lb.	—	Maximum Range.....	16,355 yds.†	12,775 yds.†	—
Booster.....	M21A2	M21A2	—	Chamber Capacity.....	795 cu. ins.	355 cu. ins.	—
Fuze.....	P.D., M51A3 (.15 sec.) or M.T., M67A1	P.D., M51A3 (.15 sec.) or T. & S.Q., M55A1	—	Rated Max. Pressure, p.s.i.....	32,000	30,000	—
Primer.....	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	—				

*For other propelling charge weights refer to zone range table under description of round.
†For other muzzle velocities and maximum ranges refer to zone range table under description of round.

UNCLASSIFIED

SHELL, CHEMICAL, 155 mm, M110—STANDARD

ROUND FOR HOWITZER, M1



SHELL, CHEMICAL, 155 mm, M110—STANDARD—The M110 chemical shell uses the M6 burster and the fuze, P.D., M51A3 with the M21A2 booster.

The shell is loaded with HS (Persistent Gas) filler. The chemical filler is loaded into the shell and the burster well tube pressed into place, forming a gas-tight seal. At the time of loading the chemical filler and assembling the burster well tube into the shell, there is no explosive charge present.

The explosive charge of the burster is contained in a cardboard or thin aluminum casing and is loaded into the shell at the depot or in the field at the time of fuzing. After the shell has been loaded and the burster well tube assembled in place, a bakelite cup is placed over the empty burster cavity to prevent the entrance of foreign matter, and an eyebolt lifting plug assembled in the nose of the shell. The weight of the tetryl bursting charge is 0.36

pound; the weight of the loaded HS shell is 11.70 pounds.

Two propelling charges—M3 and M4A1—are used in the M1 howitzer. The weight of the M3 charge is 5.31 pounds of FNH powder; the weight of the M4A1 charge is 13.26 pounds of FNH powder.

The shell measures 27.54 inches in length. The M3 propelling charge has a length of 16 inches and a diameter of 5

(Continued on next page)

CHARACTERISTICS

	Shell, Chem., M110 (HS)	Shell, Chem., M110 (HS)
Caliber.....	155 mm	Propelling Charge & Weight..... †
Model of Howitzer.....	M1	Complete Round Weight..... †
Proj. Weight.....	94.21 lb.	Muzzle Velocity..... §
Proj. Charge & Weight*.....	HS, 11.70 lb.	Maximum Range..... §
Booster.....	M21A2	Chamber Capacity.....
Primer.....	Mk. IIA4, 18 grs.	Rated Max. Pressure, p.s.i.....
Fuze.....	P.D., M51A3	

*Does not include 0.36 lb. of tetryl bursting charge.

†M3, FNH powder, propelling charge, weighs 5.31 lb.; M4A1, FNH powder, propelling charge, weighs 13.26 lb.

‡With M4A1 propelling charge.

§Charge, M3: muzzle velocity, 1,220 f/s; maximum range, 10,812 yds. at 43° 41' elevation. Charge M4A1: muzzle velocity, 1,850 f/s; maximum range, 16,374 yds. at 45° 17' elevation.

UNCLASSIFIED

SHELL, CHEMICAL, 155 MM, M110 (Continued)

inches, and the M4A1 charge is 21 inches in length and 5.8 inches in diameter.

The M3 propelling charge uses an M1 class powder, the grains of which have a

web of 0.015 inch and are single perforated. The formula for this powder and that for the M4 charge is 85-10-5. The M4A1 charge also uses M1 class powder with

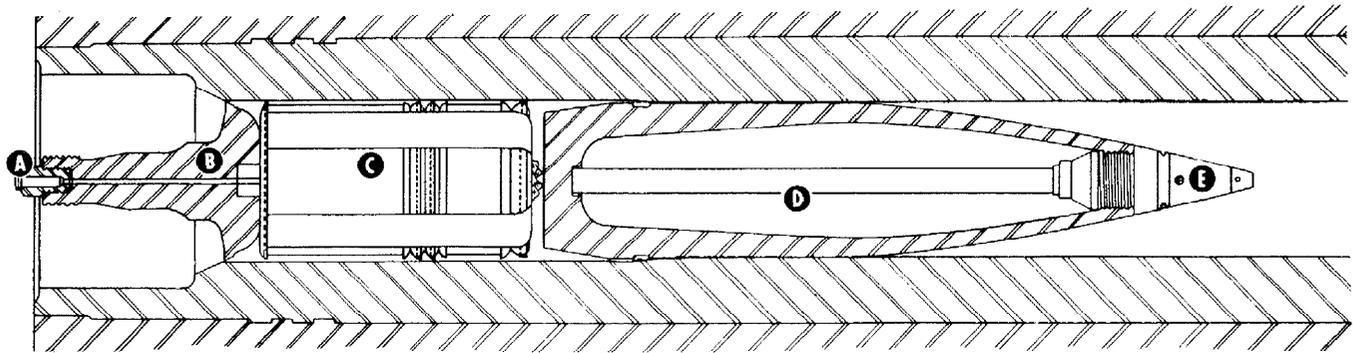
seven perforations per grain and a web size of 0.034 inch.

The zone ranges for the M3 and M4A1 propelling charges are as follows:

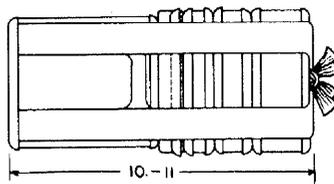
Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M3	Base 1	2.19 lb.	680 f/s	4,327 yds.	43° 51'
2	M3	Base 1 plus Incr. 2	2.71 lb.	770 f/s	5,423 yds.	43° 41'
3	M3	Base 1 plus Incr. 2 and 3	3.39 lb.	880 f/s	6,829 yds.	43° 33'
4	M3	Base 1 plus Incr. 2, 3, and 4	4.35 lb.	1,020 f/s	8,666 yds.	43° 41'
5	M3	Base 1 plus Incr. 2, 3, 4 and 5	5.31 lb.	1,220 f/s	10,812 yds.	43° 41'
3	M4A1	Base 3	4.12 lb.	880 f/s	6,817 yds.	43° 33'
4	M4A1	Base 3 Incr. 4	5.30 lb.	1,020 f/s	8,654 yds.	43° 41'
5	M4A1	Base 3 Incr. 4 & 5	7.06 lb.	1,220 f/s	10,800 yds.	44° 16'
6	M4A1	Base 3 Incr. 4, 5, & 6	9.88 lb.	1,520 f/s	13,435 yds.	44° 44'
7	M4A1	Base 3 Incr. 4, 5, 6, & 7	13.26 lb.	1,850 f/s	16,374 yds.	45° 17'

SHELL, CHEMICAL, 155 MM, (F.S.), M105—LIMITED STANDARD
SHELL, CHEMICAL, 155 MM, (H.S.), M105—STANDARD
SHELL, CHEMICAL, 155 MM, (W.P.), M105—LIMITED STANDARD
ROUND FOR HOWITZER, M1917, M1917A1 AND M1918

COMPLETE ROUND, SHELL, CHEMICAL, 155 mm, M105, LOADED IN HOWITZER, M1918



CHARGE, PROPELLING, M1A1



- (A) Primer, Percussion, Mk. IIA4
- (B) Obturator Spindle
- (C) Charge, Propelling, M2A1
- (D) Burster, M6
- (E) Fuze, P.D., M51A3

The present standard chemical shell, M105, was developed from the Mk. IIA1 limited standard chemical round now an issue only item.

SHELL, CHEMICAL, 155 mm, (F.S.), M105 — LIMITED STANDARD; (H.S.), M105 — STANDARD; (W.P.), M105 — LIMITED STANDARD — This standard round is used in the M1917, M1917A1 and M1918 howitzers. It takes the M6 burster and the fuze, P.D., M51A3, with the M21A2 booster.

The shell is loaded with either WP (Smoke), FS (Smoke) or HS (Persistent Gas) fillers. As with the M110 shell, the

chemical filler is loaded into the shell and the burster well tube is pressed into place, forming a gastight seal. The weight of the tetryl bursting charge is 0.36 pound; the weights of the various chemical charges are: WP, 15.60 pounds; FS, 16.90 pounds; HS, 11.70 pounds.

The M1A1 and the M2A1 propelling charges are used in the M1918 howitzer. The weight of the M1A1 charge is 3.06 pounds of FNH powder; the weight of the M2A1 charge is 8.09 pounds of FNH powder.

The shell measures 27.56 inches in length and the propelling charge, M1A1,

measures 11 inches in length and 5 inches in diameter. The M2A1 propelling charge is also 11 inches in length, but measures 6 inches in diameter.

The M1A1 propelling charge uses an M1 class powder, the grains of which have a web of 0.016 inch and are single perforated. The formula for this powder and that for the M2A1 charge is 85-10-5. The M2A1 charge also uses M1 class powder with seven perforations per grain and a web size of 0.033 inch.

The zone ranges for the M1A1 and M2A1 propelling charges are shown in the table on the following page.

CHARACTERISTICS

	Shell, Chem., M105 (W.P.)	Shell, Chem., M105 (F.S.)	Shell, Chem., M105 (H.S.)	Fuze	Shell, Chem., M105 (W.P.) P.D., M51A3	Shell, Chem., M105 (F.S.) P.D., M51A3	Shell, Chem., M105 (H.S.) P.D., M51A3
Caliber	155 mm	155 mm	155 mm				
Models of Howitzers	M1917, M1917A1, M1918	M1917, M1917A1, M1918	M1917, M1917A1, M1918				
Proj. Weight	97.68 lb.	99.23 lb.	93.78 lb.				
Proj. Charge and Weight*	WP, 15.60 lb.	FS, 16.90 lb.	HS, 11.70 lb.				
Booster	M21A2	M21A2	M21A2				
Primer	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.				
				Propelling Charge and Weight			
				Complete Round Weight	† 105.77 lb.†	† 107.51 lb.†	† 101.87 lb.†
				Muzzle Velocity	§	§	§
				Maximum Range	§	§	§
				Chamber Capacity	355 cu. ins.	355 cu. ins.	355 cu. ins.
				Rated Max. Pressure, p.s.i.	30,000	30,000	30,000

*Does not include 0.36 lb. of tetryl bursting charge.
 †M1A1, FNH powder, propelling charge, weighs 3.06 lb., M2A1, FNH powder, propelling charge, weighs 8.09 lb.
 ‡With M2A1 propelling charge.

§Charge M1A1: muzzle velocity, 1,082 f/s, maximum range: (W.P.) 9,321 yds., (F.S.) 9,227 yds., (H.S.) 9,462 yds.
 Charge M2A1: muzzle velocity, 1,476 f/s, maximum range: (W.P.) 12,783 yds., (F.S.) 12,791 yds., (H.S.) 12,773 yds.

SHELL, CHEMICAL, 155 MM, (F.S.), M105

Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M1A1	Base 1	1.78 lb.	679 f/s	4,157 yds.	45° 5'
2	M1A1	Base 1 Incr. 2	2.05 lb.	741 f/s	4,859 yds.	45° 0'
3	M1A1	Base 1 Incrs. 2 & 3	2.52 lb.	831 f/s	5,955 yds.	43° 30'
4	M1A1	Base 1 Incrs. 2, 3 & 4	3.06 lb.	938 f/s	7,330 yds.	43° 30'
5	M1A1	Base 1 Incrs. 2, 3, 4 & 5	4.00 lb.	1,082 f/s	9,227 yds.	43° 30'
3	M2A1	Base 3	3.63 lb.	831 f/s	6,023 yds.	43° 30'
4	M2A1	Base 3 Incr. 4	4.37 lb.	938 f/s	7,402 yds.	43° 30'
5	M2A1	Base 3 Incrs. 4 & 5	5.37 lb.	1,082 f/s	9,335 yds.	43° 30'
6	M2A1	Base 3 Incrs. 4, 5 & 6	7.27 lb.	1,357 f/s	11,739 yds.	43° 45'
7	M2A1	Base 3 Incrs. 4, 5, 6 & 7	8.09 lb.	1,476 f/s	12,791 yds.	44° 15'

SHELL, CHEMICAL, 155 MM, (H.S.), M105

Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M1A1	Base 1	1.78 lb.	679 f/s	4,342 yds.	45° 5'
2	M1A1	Base 1 Incr. 2	2.05 lb.	741 f/s	5,079 yds.	45° 0'
3	M1A1	Base 1 Incrs. 2 & 3	2.52 lb.	831 f/s	6,205 yds.	43° 30'
4	M1A1	Base 1 Incrs. 2, 3 & 4	3.06 lb.	938 f/s	7,610 yds.	43° 30'
5	M1A1	Base 1 Incrs. 2, 3, 4 & 5	4.00 lb.	1,082 f/s	9,462 yds.	43° 30'
3	M2A1	Base 3	3.63 lb.	831 f/s	6,188 yds.	43° 30'
4	M2A1	Base 3 Incr. 4	4.37 lb.	938 f/s	7,593 yds.	43° 30'
5	M2A1	Base 3 Incrs. 4 & 5	5.37 lb.	1,082 f/s	9,435 yds.	43° 30'
6	M2A1	Base 3 Incrs. 4, 5 & 6	7.27 lb.	1,357 f/s	11,734 yds.	43° 45'
7	M2A1	Base 3 Incrs. 4, 5, 6 & 7	8.09 lb.	1,476 f/s	12,773 yds.	44° 15'

SHELL, CHEMICAL, 155 MM, (W.P.), M105

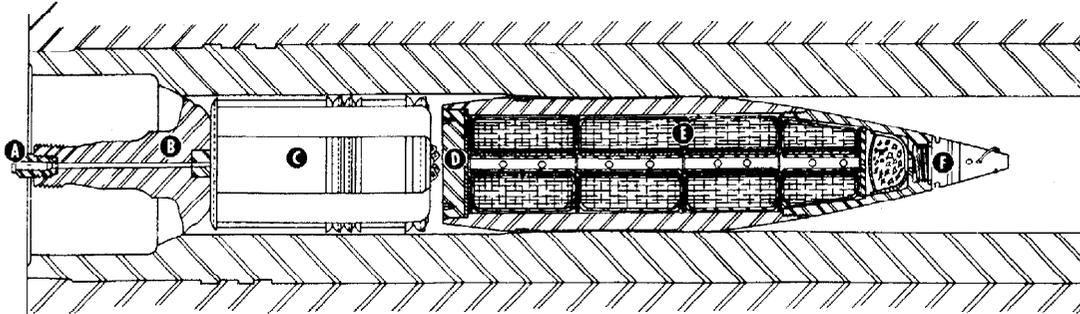
Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M1A1	Base 1	1.78 lb.	679 f/s	4,231 yds.	45° 5'
2	M1A1	Base 1 Incr. 2	2.05 lb.	741 f/s	4,947 yds.	45° 0'
3	M1A1	Base 1 Incrs. 2 & 3	2.52 lb.	831 f/s	6,055 yds.	43° 30'
4	M1A1	Base 1 Incrs. 2, 3 & 4	3.06 lb.	938 f/s	7,445 yds.	43° 30'
5	M1A1	Base 1 Incrs. 2, 3, 4 & 5	4.00 lb.	1,082 f/s	9,321 yds.	43° 30'
3	M2A1	Base 3	3.63 lb.	831 f/s	6,089 yds.	43° 30'
4	M2A1	Base 3 Incr. 4	4.37 lb.	938 f/s	7,479 yds.	43° 30'
5	M2A1	Base 3 Incrs. 4 & 5	5.37 lb.	1,082 f/s	9,375 yds.	43° 30'
6	M2A1	Base 3 Incrs. 4, 5 & 6	7.27 lb.	1,357 f/s	11,737 yds.	43° 45'
7	M2A1	Base 3 Incrs. 4, 5, 6 & 7	8.09 lb.	1,476 f/s	12,783 yds.	44° 15'

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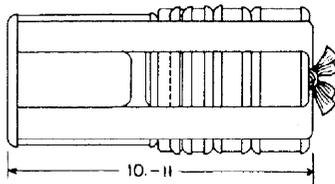
SHELL, SMOKE (BASE-EJECTION), 155 MM, M115 & M115B1—STANDARD ROUNDS FOR HOWITZERS, M1917, M1917A1 AND M1918

SHELL, SMOKE (BASE-EJECTION), 155 MM, M116 & M116B1—STANDARD ROUNDS FOR HOWITZER, M1

COMPLETE ROUND, SHELL, SMOKE, 155 mm, M115, LOADED IN HOWITZER, M1918

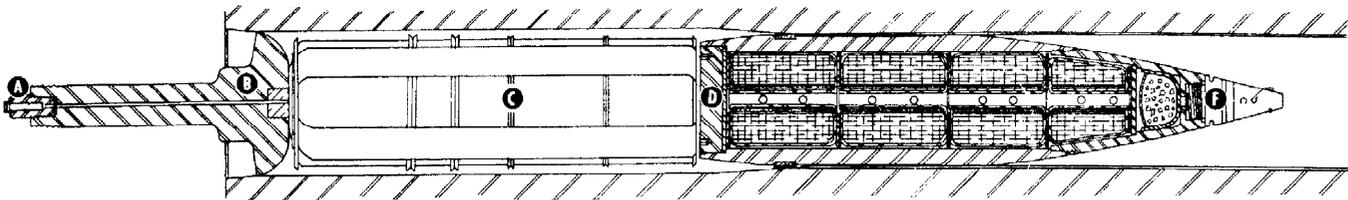


CHARGE, PROPELLING, M1A1

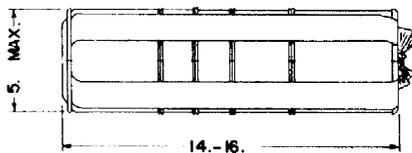


- (A) Primer, Percussion, Mk. IIA4
- (B) Obturator Spindle
- (C) Charge, Propelling, M2A1
- (D) Base Plug
- (E) Canisters
- (F) Fuze, Time and Superquick, M54

COMPLETE ROUND, SHELL, SMOKE, 155 mm, M116, LOADED IN HOWITZER, M1



CHARGE, PROPELLING, M3



- (A) Primer, Percussion, Mk. IIA4
- (B) Obturator Spindle
- (C) Charge, Propelling, M4A1
- (D) Base Plug
- (E) Canisters
- (F) Fuze, Time and Superquick, M54

SHELL, SMOKE (BASE-EJECTION), 155 mm, M115 AND M115B1—STANDARD

—These standard rounds are used in the M1917, M1917A1 and M1918 howitzers. As fired, the M115 shell weighs 94.88

pounds, and the M115B1 shell weighs 94.14 pounds.

Upon functioning of the time and superquick fuze, M54, the black powder charge is ignited, creating sufficient pressure to

shear the threads holding the base plug and eject the three M1 canisters and M2 canister containing the smoke filler. The burning of the powder gives sufficient heat to ignite the smoke canisters before

(Continued on next page)

SHELL, SMOKE (BASE-EJECTION), 155 MM, M115 AND M116 (Continued)

ejection. They follow the trajectory of the shell, usually falling so that the individual smoke clouds merge as one large cloud. The combined weight of the three smoke canisters comprising the M1 charge is 22.05 pounds. The weight of the M2 smoke canister, a single unit, is 3.79 pounds.

The M115 and M115B1 shells differ only in the construction of the ogive section of the body. This section of the M115 is an adapter which is screwed into the shell body. The M115B1 shell is of one piece construction.

The M115 complete round weighs 103.08 pounds with the M2A1 charge and is fired with either the M2A1 propelling charge (base charge 3 plus increments 4, 5, 6, and 7) weighing 8.25 pounds, or the M1A1 propelling charge (base 1 plus increments 2, 3, 4 and 5) weighing 3.06 pounds.

The M2A1 propelling charge uses an M1 class powder with an 85-10-5 formula. The grains have seven perforations and a web of 0.033 inch. The propelling charge, M1A1, uses a powder which has single-perforated grains with a web of 0.016 inch. The powder is an M1 class with a formula of 85-10-5.

The projectile as fired is 27.19 inches in length. The M2A1 propelling charge measures 11 inches, maximum length, and 6 inches in diameter. The M1A1 charge is 11 inches in length and 5 inches in diameter.

SHELL, SMOKE (BASE-EJECTION), 155 mm, M116 AND M116B1—STANDARD

—This round is standard for use in the M1 howitzer. It is the same as the M115 round except for the rotating band. The weight of the M116 shell as fired is 95.1

pounds; that of the M116B1 shell is 94.36 pounds. The complete round weighs 108.36 pounds with the M4A1 charge and is fired by either the M4A1 propelling charge, weighing 13.26 pounds, or the M3 propelling charge, weighing 5.31 pounds.

The M3 propelling charge uses an M1 class powder, the grains of which have a web of 0.015 inch and are single perforated. The formula for this powder and that for the M4A1 charge is 85-10-5. The M4A1 charge also uses M1 class powder with seven perforations per grain and a web size of 0.034 inch.

The projectile as fired is 27.19 inches in length. The M4A1 propelling charge measures 21 inches, maximum length, and 5.8 inches in diameter. The M3 charge is 16 inches in length and 5 inches in diameter.

CHARACTERISTICS

	Shell, Smoke, M115	Shell, Smoke, M116	Shell, Smoke, M115B1	Shell, Smoke, M116B1
Caliber.....	155 mm	155 mm	155 mm	155 mm
Models of Howitzers.....	M1917, M1917A1, M1918	M1	M1917, M1917A1, M1918	M1
Proj. Weight.....	94.88 lb.	95.10 lb.	94.14 lb.	94.36 lb.
Proj. Charge & Weight.....	TNT, 0.28 lb.*	TNT, 0.28 lb.*	TNT, 0.28 lb.*	TNT, 0.28 lb.*
Fuze.....	T. & S.Q., M54	T. & S.Q., M54	T. & S.Q., M54	T. & S.Q., M54
Primer.....	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.
Propelling Charge & Weight.....	NH pwdr., 8.09 lb.†	NH pwdr., 13.26 lb.‡	NH pwdr., 8.09 lb.†	NH pwdr., 13.26 lb.‡
Complete Round Weight.....	103.08 lb.§	108.23 lb.¶	102.23 lb.§§	107.62 lb.¶¶
Muzzle Velocity.....	1,476 f/s**	1,850 f/s††	1,476 f/s**	1,850 f/s††
Maximum Range.....	12,405 yds.	16,355 yds.	12,405 yds.	16,355 yds.
Chamber Capacity.....	360 cu. ins.	795 cu. ins.	360 cu. ins.	795 cu. ins.
Rated Max. Pressure, p.s.i.....	30,000	32,000	30,000	32,000

*H. C. Chemical filler, 25.84 lb.
†M1A1 propelling charge, 3.06 lb.
‡M3 propelling charge, 5.31 lb.
§97.89 lb. with M1A1 charge.
¶100.41 lb. with M3 charge.

**1,082 f/s with M1A1 charge.
††1,220 f/s with M3 charge.
§§97.20 with M1A1 charge.
¶¶99.67 with M3 charge.

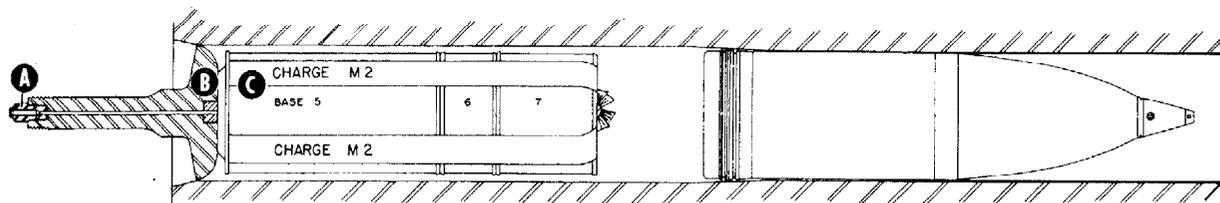
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SHELL, HIGH-EXPLOSIVE, 8 INCH, MK. IA1—STANDARD

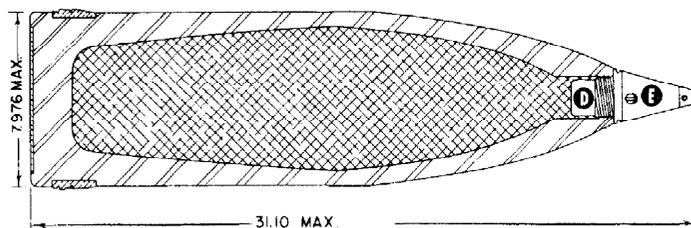
SHELL, HIGH-EXPLOSIVE, 8 INCH, M106—STANDARD

ROUNDS FOR HOWITZER, 8 INCH, M1

COMPLETE ROUND, SHELL, H.E., 8 INCH, MK. IA1, LOADED IN HOWITZER, M1

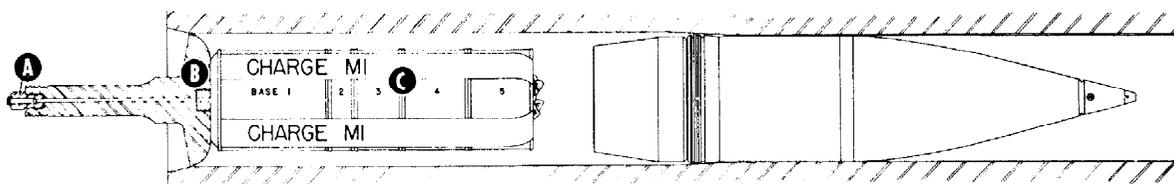


SHELL, H.E., 8 INCH, MK. IA1

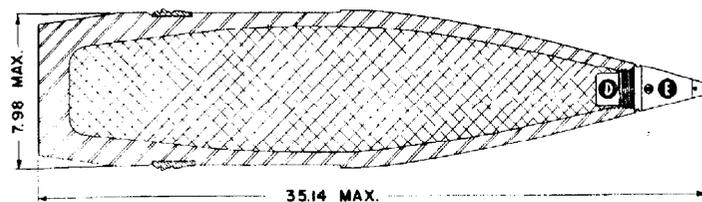


- (A) Primer, Percussion, Mk. II A4
- (B) Obturator Spindle
- (C) Charge, Propelling, M2
- (D) Booster, M21 A2
- (E) Fuze, P.D., M51 A3 or M.T., M67A2

COMPLETE ROUND, SHELL, H.E., 8 INCH, M106, LOADED IN HOWITZER, M1



SHELL, H.E., 8 INCH, M106



- (A) Primer, Percussion, Mk. II A4
- (B) Obturator Spindle
- (C) Charge, Propelling, M1
- (D) Booster, M21 A2
- (E) Fuze, P.D., M51 A3 or M.T., M67A2

The Mk. I high-explosive shell used in the 8 inch guns was modified to take either the point-detonating fuze, M51A3, or the mechanical time fuze, M67A2. This modification was designated high-explosive shell, Mk. IA1, and is used in the M1 howitzer.

The M1 propelling charge (base and increment type) measures 21 inches in length and 6.5 inches in diameter and the M2 charge is 24 inches in length and 7.5 inches in diameter. The M1 or the M2 propelling charges are used with all rounds in the M1 howitzer. The M1 charge contains an M1 class powder weighing 13.19 pounds. The formula of

this powder is 85-10-5 and the grains have a web of 0.015 inch and are single perforated. The M2 charge weighs 28.19 pounds and has the same class powder and formula as the M1 charge. The grains have seven perforations and a web of 0.043 inch.

(Continued on next page)

SHELL, HIGH-EXPLOSIVE, 8 INCH, MK. IA1 AND M106 (Continued)

The shell weighs 200 pounds as fired and contains a bursting charge of 30.08 pounds of TNT. The complete round, with M1 charge, weighs 213.19 pounds and with the M2 charge, 228.19 pounds.

The zone ranges for the various weight propelling charges are as indicated in Table A.

SHELL, H.E., 8 INCH, M106—STANDARD—The separate-loading high-explosive round is standard for use in the 8 inch howitzer, M1. The shell weighs 200 pounds as fired and contains a bursting charge of 36.98 pounds of TNT.

The complete round weight, with M1 propelling charge, is 213.19 pounds, and with the M2 charge, 228.19 pounds.

Either the fuze, P.D., M51A3, or the M.T., M67A2, is used with the M21A2 booster. As with the Mk. IA1 round, the Mk. IIA4 17 grain percussion primer is seated in the base of the obturator spindle.

The zone ranges are as indicated in Table B.

PROJECTILE, DUMMY (DRILL), MK. I—STANDARD—(See Table of Characteristics.)

TABLE A—SHELL, H.E., 8 INCH, MK. IA1

Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M1	Base 1	4.41 lb.	795 f/s	5,475 yds.	42° 55'
2	M1	Base 1, Incr. 1	5.77 lb.	873 f/s	6,415 yds.	42° 55'
3	M1	Base 1, Incr. 2 & 3	7.68 lb.	970 f/s	7,630 yds.	42° 48'
4	M1	Base 1, Incr. 2, 3, 4	10.24 lb.	1,115 f/s	9,260 yds.	43° 0'
5	M1	Base 1, Incr. 2, 3, 4, 5	13.19 lb.	1,339 f/s	11,170 yds.	43° 36'
5	M2*	Base 5	16.50 lb.	—	—	—
6	M2*	Base 5, Incr. 6	21.72 lb.	—	—	—
7	M2*	Base 5, Incr. 6, 7	28.19 lb.	—	—	—

*At the present time range firings have not been conducted.

TABLE B—SHELL, H.E., 8 INCH, MK. IA1

Charge Zone	Charge	Section	Weight	M.V.	Max. Range	Elev.
1	M1	Base 1	4.41 lb.	820 f/s	6,230 yds.	44°
2	M1	Base 1, Incr. 2	5.77 lb.	900 f/s	7,385 yds.	44°
3	M1	Base 1, Incr. 2	7.68 lb.	1,000 f/s	8,850 yds.	44°
4	M1	Base 1, Incr. 2, 3, 4	10.24 lb.	1,150 f/s	10,705 yds.	44° 10'
5	M1	Base 1, Incr. 2, 3, 4, 5	13.19 lb.	1,380 f/s	12,975 yds.	44° 30'
5	M2	Base 5	16.50 lb.	1,380 f/s	12,975 yds.	44° 30'
6	M2	Base 5, Incr. 6	21.72 lb.	1,640 f/s	15,390 yds.	44° 50'
7	M2	Base 5, Incr. 6, 7	28.19 lb.	1,950 f/s	18,510 yds.	44° 50'

CHARACTERISTICS

	Shell, H.E., Mk. IA1	Shell, H.E., M106	Proj. Drill, Mk. I
Caliber.....	8 inch	8 inch	8 inch
Model of Howitzer.....	M1	M1	M1
Proj. Weight.....	200 lb.	200 lb.	200 lb.
Proj. Charge & Weight.....	TNT, 30.08 lb.	TNT, 36.98 lb.	—
Booster.....	M21A2	M21A2	—
Fuze.....	P.D., M51A3, or M.T., M67A2	P.D., M51A3, or M.T., M67A2	—
Primer.....	Mk. IIA4, 17 grs.	Mk. IIA4, 17 grs.	Mk. IIA4, 18 grs.
Propelling Charge and Weight.....	M1 Chg., FNH pwr., 13.19 lb. M2 Chg., FNH pwr., 28.19 lb.	M1 Chg., FNH pwr., 13.19 lb. M2 Chg., FNH pwr., 28.19 lb.	Mk. I, Dummy, 11.00 lb.
Complete Round Weight.....	213.19 lb. (with M1 Chg.) 228.19 lb. (with M2 Chg.)	213.19 lb. (with M1 Chg.) 228.19 lb. (with M2 Chg.)	211.00 lb.
Muzzle Velocity.....	1,339 f/s (with M1 Chg.)	1,380 f/s (with M1 Chg.) 1,950 f/s (with M2 Chg.)	—
Maximum Range.....	11,170 yds. (with M1 Chg.)	12,975 yds. (with M1 Chg.) 18,510 yds. (with M2 Chg.)	—
Chamber Capacity.....	1,757 cu. ins.	1,527 cu. ins.	—
Rated Max. Pressure, p.s.i.....	33,000	33,000	—

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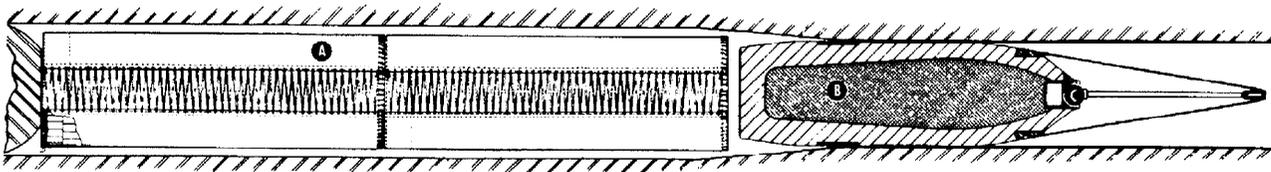
SHELL, H.E., 8 INCH, M103—STANDARD

ROUND FOR 8 INCH GUNS, MK. VI, MOD. 3A2, AND 8 INCH GUNS, M1

PROJECTILE, ARMOR-PIERCING, 8 INCH, MK. XX, MOD. 1—STANDARD

ROUND FOR 8 INCH GUNS, MK. VI, MOD. 3A2, M1888, M1888MI AND M1888MII

COMPLETE ROUND, SHELL, H.E., 8 INCH, M103, LOADED IN GUN, M1

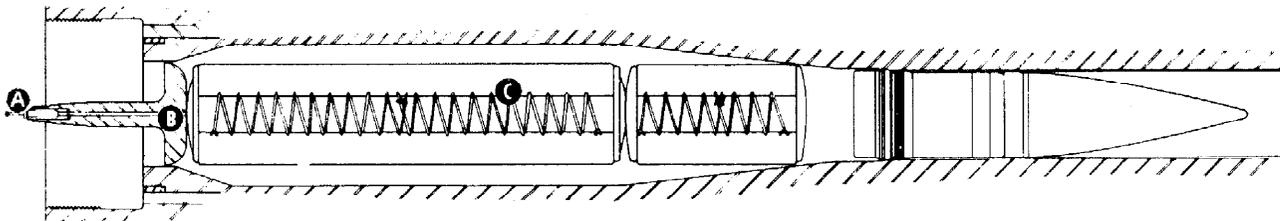


(A) Propelling, Charge, M9 (stacked type)

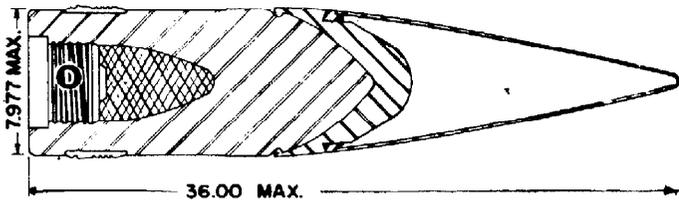
(B) Bursting Charge

(C) Fuze, P.D., M51A2, Mod. 3

COMPLETE ROUND, PROJECTILE, A.P., 8 INCH, MK. XX, MOD. 1, LOADED IN GUN, MK. VI, MOD. 3A2



PROJECTILE, A.P., 8 INCH, MK. XX, MOD. 1



(A) Comb. Primer, Mk. XV, M1

(B) Obturator Spindle

(C) Base and Increment Charge

(D) Fuze, B.D., Mk. X

SHELL, H.E., 8 INCH, M103—STANDARD

The Shell, H.E., M103, is standard for 8 inch Guns, Mk. VI, Mod. 3A2, and M1. As fired the shell weighs 240 pounds and contains a bursting charge of 20.9 pounds of cast TNT which is detonated by a Fuze, P.D., M51A2, Mod. 3, or Fuze, Mechanical, Time, M67A1. The shell is shipped fuze with a Fuze, P.D., M51A2, Mod. 3. When the Mechanical Time Fuze, M67A1, is used, it is necessary that the false ogive be removed and replaced after the shell has been refuzed with the mechanical time fuze.

For the 8 inch Gun, M1, two types of charges are provided for use with the Shell, H.E., M103. One is identified as the M9 (green bag) and the other as M10 (white bag). Both types are of the base and increment type.

The powder in the M9 charge is in the M1 class with an 87-10-3 formula. The grains have seven perforations and a web of .0695 inch. The complete charge weighs 76 pounds.

The powder in the M10 charge is also in the M1 class with an 87-10-3 formula.

The grains have seven perforations and a web of .1000 inch. The complete charge weighs 106 pounds.

PROJECTILE, A. P., 8 INCH, MK. XX, MOD. 1—STANDARD

This projectile was standardized to replace the M1911 armor-piercing round when the latter was made Limited Standard and an issue only item.

Separate-loading ammunition, the Mk. XX projectile, is used in the 8 inch, M1888, the M1888MI, M1888MII and Mk. VI, Mod. 3A2, guns. As fired, the

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SHELL, H.E., 8 INCH, M103

PROJECTILE, ARMOR-PIERCING, 8 INCH, MK. XX, MOD. 1 (Continued)

projectile weighs 261.8 pounds and contains a bursting charge of 3.4 pounds of explosive "D" which is detonated by the fuze, B.D., Mk. X.

The supercharge (base and increment) of 108 pounds of NH powder is fired by the M30 electric primer. The normal base section weighs 74.251 pounds. The complete round, including supercharge, weighs 369.8 pounds as fired in the Mk. VI, Mod. M3A2, gun.

The base and increment charge used with this projectile in the Mk. VI, Mod. 3A2, gun is 57 inches in length, and 9.25 inches in diameter. The powder in this charge is in the M1 class with an 87-10-3 formula. The grains have seven perforations and a web of 0.1 inch.

The stacked type, two-section propelling charge of NH powder used with this projectile in the M1888 series guns weighs 85.62 pounds. This charge measures 48.5

inches in length, and 8.75 inches in diameter.

The M1 class powder used in these charges has an 87-10-3 formula. The grains have seven perforations and a web size of 0.092 inch.

PROJECTILE, TARGET, 8 INCH, M109—STANDARD—See description of shell, high-explosive, 8 inch, Mk. I, round for M1888 guns.

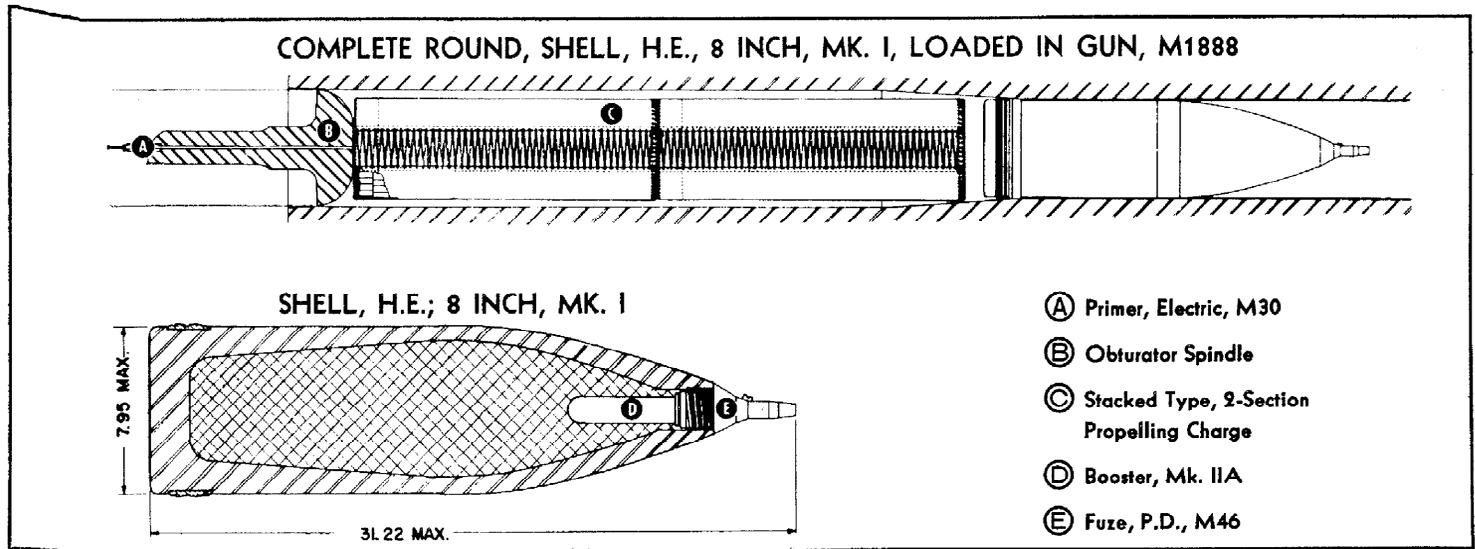
CHARACTERISTICS

	Proj., A.P., Mk. XX	Proj., A.P., Mk. XX	Proj., A.P., Mk. XX	Proj., Target, M109	Shell, H.E., M103	Shell, H.E., M109
Caliber.....	8 inch	8 inch	8 inch	8 inch	8 inch	8 inch
Models of Guns.....	Mk. VI, Mod. 3A2	Mk. VI, Mod. 3A2	M1888, M1888M1, M1888M11	Mk. VI, Mod. 3A2	M1	Mk. VI, Mod. 3A2
Proj. Weight.....	261.8 lb.	261.8 lb.	261.8 lb.	260.0 lb.	240 lb.	240 lb.
Proj. Charge and Weight.....	Expl. "D," 3.4 lb.	Expl. "D," 3.4 lb.	Expl. "D," 3.4 lb.	—	TNT, 20.9 lb.	TNT, 20.9 lb.
Fuze.....	B.D., Mk. X	B.D., Mk. X	B.D., Mk. X	—	P.D., M51A2, Mod. 3, or M.T., M67A1	P.D., M51A2, Mod. 3, or M.T., M67A1
Primer.....	M30, Elec.	M30, Elec.	M30, Elec.	Comb. Mk. XV, M1	Mk. IIA4	Comb. Mk. XV, M1
Propelling Charge and Weight.....	Normal Chg., NH powdr., 74.251 lb.	Superchg., NH powdr., 108.0 lb.	Two-Sec., NH powdr., 85.6 lb.	Base & Incr., NH powdr., 107.0 lb.	M9 Base Sec., 54.896 lb.* M10 Base Sec., 93.1 lb.†	Base Sec., 74.251 lb.§
Complete Round Weight.....	336.05 lb.	369.8 lb.	345.80 lb.	367.00 lb.	315 lb. (M9 Chg.) 346 lb. (M10 Chg.)	314.24 lb. (with Base Sec.) 348.00 lb. (with Base Sec. & 2 Incr.)
Muzzle Velocity....	2,100 f/s	2,750 f/s	2,450 f/s	2,750 f/s	2,100 f/s (M9 Base Sec.)‡ 2,100 f/s (M10 Base Sec.)**	2,150 f/s (Base Sec.) 2,840 f/s (Base Sec. & Incr.)
Maximum Range....	22,180 yds. at 45° 5' Elev.	32,980 yds. at 47° 55' Elev.	23,917 yds.	32,980 yds. at 47° 55' Elev.	22,775 yds. (M9 Base Sec.)†† 30,315 yds. (M10 Base Sec.)§§	23,200 yds. (Base Sec.) 35,630 yds. (Base & Incr.)
Chamber Capacity....	5,362.94 cu. ins.	5,362.94 cu. ins.	3,627.00 cu. ins.	5,362.94 cu. ins.	5,156 cu. ins.	5,188 cu. ins.
Rated Max. Pressure, p.s.i.....	38,000	38,000	38,000	38,000	38,000	38,000

*76.013 lb. with M9 Base Sec. & increment.
 †106.1 lb. with M10 Base Sec. & increment.
 §108.000 lb. with Base and 1 increment.
 ‡2,600 f/s with M9 Base Sec. & increment.
 **2,850 f/s with M10 Base Sec. & increment.
 ††30,315 yds. with M9 Base Sec. & increment.
 §§35,630 yds. with M10 Base Sec. & increment.

SHELL, HIGH-EXPLOSIVE, 8 INCH, MK. I—STANDARD

ROUND FOR 8-INCH GUNS, M1888, M1888MI, M1888MII



SHELL, HIGH-EXPLOSIVE, 8 INCH, MK. I—STANDARD—The Mk. I round is used in the M1888, M1888MI and M1888MII guns. As fired, the shell weighs 200 pounds and contains a bursting charge of 29.6 pounds of TNT which is detonated by the fuze, P.D., M46, or P.D., M47, with the Mk. IIA booster.

The two section, stacked propelling charge of 85.6 pounds of smokeless nitrocellulose powder is fired by the M30 electric primer. (Guns in emplacements fitted with electrical equipment are provided with friction primer for emergency use.) The complete round, including two section propelling charge, weighs 285.6 pounds.

The propelling charge uses an M1 class powder the grains of which have a web of 0.076 inch and seven perforations. The formula is 87-10-3.

The propelling charge measures 49 inches in length and 8.25 inches in diameter.

PROJECTILE, TARGET, 8 INCH, M1911—STANDARD—This shot is standardized for target-practice use, although the M1911 armor-piercing rounds are now Limited Standard for issue only. The 8 inch, H.E. Shell, Mk. I, may also be used for a target projectile when specially authorized and in such cases it is sand loaded and assembled with an inert fuze.

The M1911 separate-loading projectile is used in the M1888, M1888MI and M1888MII guns. As fired the shot weighs

323 pounds and contains a bursting charge of 5.1 pounds of explosive "D," detonated by the fuze, B.D., Mk. V.

The projectile is 33 inches in length. The armor-piercing cap is soldered to the nose of the shot and the windshield is threaded to the armor-piercing cap.

The propelling charge is a single-section type powder bag containing 82.38 pounds of smokeless powder and is fired by the M30 electric primer. The complete round weighs 405.43 pounds.

The charge develops a muzzle velocity of 2,200 feet per second and a maximum range of 17,000 yards at 19° 34' elevation.

PROJECTILE, TARGET, 8 INCH, M109—STANDARD—This target projectile is

standardized for use in the following 8 inch guns: M1888, M1888MI, M1888MII and Mk. VI, Mod. 3A2. It is made of cast iron and weighs 260 pounds. Propelling charges and primers are of two types and the weights of the charges vary as follows: 85.6 pounds of smokeless powder in a two-section bag, fired by the M30 electric primer when used with the M1888, M1888MI and M1888MII guns; 107 pounds of smokeless powder in a base and increment charge, fired by the Mk. XVMI Navy electric primer, when used with the Mk. VI, Mod. 3A2, gun.

PROJECTILE, DUMMY, DRILL, MK. I—STANDARD—(See Table of Characteristics.)

CHARACTERISTICS

	Shell, H.E., Mk. I	Proj., Target, M1911	Proj., Target, M109	Proj., Drill, Mk. I
Caliber.....	8 inch	8 inch	8 inch	8 inch
Models of Guns.....	M1888 M1888MI M1888MII	M1888 M1888MI M1888MII	M1888 M1888MI M1888MII	M1888 M1888MI M1888MII
Proj. Weight.....	200 lb.	323 lb.	260 lb.	200 lb.
Proj. Charge and Weight.....	TNT, 29.6 lb.	Expl. "D," 5.1 lb.	—	—
Fuze.....	P.D., M46 or M47	B.D., Mk. V	—	—
Primer.....	M30, Elec.	M30, Elec.	M30, Elec.	—
Propelling Charge and Weight.....	Two-Sec., Smokeless, 85.6 lb.	Single-Sec., Smokeless, 82.38 lb.	Two-Sec., Smokeless, 85.6 lb.	Single-Sec., Dummy, 80.0 lb.
Complete Round Weight.....	285.6 lb.	405.43 lb.	345.6 lb.	280.0 lb.
Muzzle Velocity.....	2,600 F/S	2,200 F/S	2,450 F/S	—
Maximum Range.....	21,300 yds.	17,000 yds.	25,146 yds.	—
Chamber Capacity.....	3,643 cu. ins.	3,571.7 cu. ins.	3,627 cu. ins.	—
Rated Maximum Pressure, p.s.i.....	38,000	38,000	38,000	—

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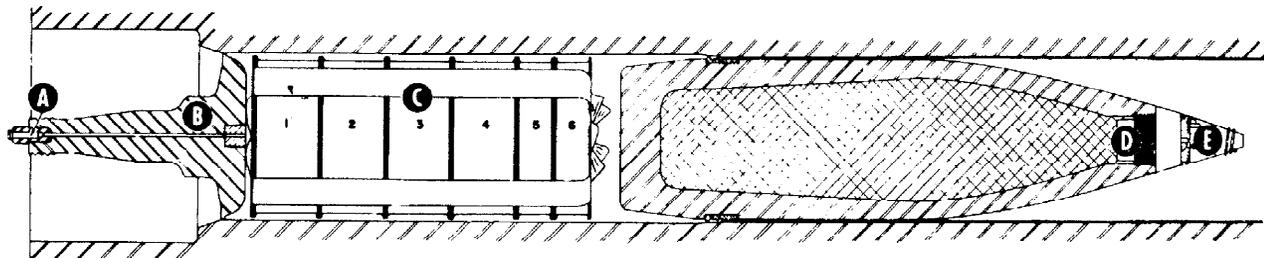
SHELL, HIGH-EXPLOSIVE, 240 MM, MK. IIIA1—STANDARD

ROUND FOR HOWITZER, 240 mm, M1918M1

SHELL, HIGH-EXPLOSIVE, 240 MM, M114—STANDARD

ROUND FOR HOWITZER, 240 MM, M1

COMPLETE ROUND, SHELL, H.E., 240 mm, MK. IIIA1, LOADED IN HOWITZER, 240 mm, M1918M1



(A) Primer, Percussion, Mk. IIA4

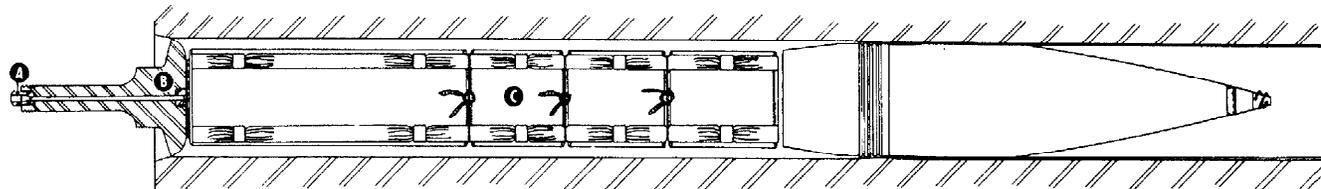
(C) Charge, Propelling, Mk. I

(E) Fuze, M.T., M67A1, or
P.D., M51A3

(B) Obturator Spindle

(D) Booster, M21A2

COMPLETE ROUND, SHELL, H.E., 240 mm, M114, LOADED IN HOWITZER, 240 mm, M1



SHELL, H.E., 240 mm, M114

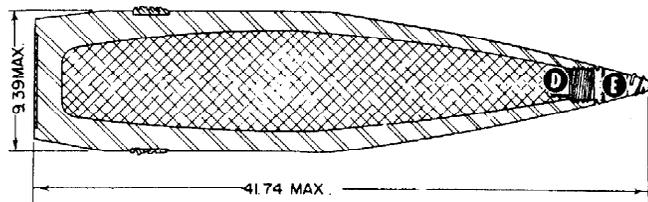
(A) Primer, Percussion, Mk. IIA4

(B) Obturator Spindle

(C) Charge, Propelling
(Stacked Type)

(D) Booster, M21A2

(E) Fuze, M.T., M67A1
or P.D., M51A3



The projectiles provided for use in the 240 mm howitzers, M1918M1 and M1 are of three types: high-explosive—for use against personnel and structures; target-practice—sand loaded; and dummy—for drill purposes.

The high-explosive and practice projectiles are issued unfuzed, an eyebolt lifting plug or an adapter plug being assembled in the fuze seat. To prepare the

high-explosive shell for firing, it is necessary to remove the rope grommet which protects the rotating band and the plug in the nose of the shell, before inserting a fuze. In the case of the practice shell, the inert adapter-booster must be removed and the shell loaded to weight with sand.

The Mk. IIIA1 is a modification of the Mk. III to permit assembly of either the point-detonating fuze, M51A3, or the

mechanical time fuze, M67A1, instead of the point-detonating fuzes, M46 or M47. The use of these bore-safe fuzes of better ballistic shape increased the range and safety in firing.

SHELL, H.E., 240 mm, MK. IIIA1—STANDARD—This high-explosive shell has a fairly sharp nose, the radius of the ogive being approximately $4\frac{1}{2}$ calibers.

(Continued on next page)

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SHELL, HIGH-EXPLOSIVE, 240 MM, MK. IIIA1 AND M114 (Continued)

The shell has a boat-tail base, tapered at an angle of 7°. The combination of sharp nose and tapered base adds to the efficiency of the shell in flight. The explosive charge is 49.79 pounds of TNT.

As fired the shell weighs 345 pounds and measures 37.9 inches in length. The complete round weighs 380.81 pounds.

The propelling charge is NH powder. A base-pad igniter pad is used, containing 5 ounces of black powder and placed to the rear of the charge.

The charges used are of the multi-section, aliquot part type (illustrated) and contain 35.81 pounds of powder. They are composed of four 1/5 equal weight sections, and two 1/10 equal weight sections.

The Mk. I propelling charge is 20.75

inches in length and 9.025 inches in diameter. The M1 class powder for this charge has an 87-10-3 formula and grains that have seven perforations. The web size of the grains is 0.051 inch.

The complete round weights vary from 352.41 pounds to 380.81 pounds, depending upon the zone charges used. (Note: the Table of Characteristics lists only the maximum zone charge with pertinent data.) See Table A for zone ranges.

SHELL, H.E., 240 mm, M114—STANDARD—This high-explosive round is used in the M1 howitzer. As fired the shell weighs 360 pounds and with the maximum propelling charge, 78.25 pounds of NH powder (4 sections), the complete round weighs 438.78 pounds.

Either the fuze, P.D., M51A3, or the

fuze, M.T., M67A1, is used to detonate the TNT bursting charge of 54.06 pounds.

The M1 class of powder used in this charge has an 87-10-3 formula and grains with seven perforations.

The projectile as fired measures 41.74 inches in length.

The Table of Characteristics lists only the maximum zone charge with pertinent data. The table of zone ranges which follows gives data for the four sections of propelling charge:

Muzzle Velocity	Range
1,500 f/s	15,175 yds.
1,740 f/s	17,995 yds.
2,020 f/s	21,560 yds.
2,300 f/s	25,255 yds.

PROJECTILE, TARGET, PRACTICE, MK. III—STANDARD

When specially authorized, the Mk. III shell, sand loaded, may be used. The projectile is made up by using the empty body of the shell, Mk. III, which, although listed as standard, is now an issue only item and no longer manufactured. The shell is shipped empty and later sand loaded to the proper weight prior to issue to the using troops. All components of this projectile are inert.

PROJECTILE, DUMMY, DRILL, MK. I—STANDARD—(See Table of Characteristics.)

TABLE A

Zone	Powder Charge	Wt.	Powder Type	M.V.	Max. Range	Elev.	Time of Flight
2	.2	7.16 lb.	FNH-NH	615 f/s	3,594 yds.	43° 39'	25.9 sec.
3	.3	10.74 lb.	FNH-NH	770 f/s	5,464 yds.	43° 15'	32.2 sec.
4	.4	14.31 lb.	FNH-NH	910 f/s	7,368 yds.	43° 24'	38.2 sec.
5	.5	17.90 lb.	FNH-NH	1,045 f/s	9,316 yds.	43° 45'	42.6 sec.
6	.6	21.48 lb.	FNH-NH	1,180 f/s	11,300 yds.	44° 20'	47.6 sec.
7	.7	25.06 lb.	FNH-NH	1,310 f/s	12,657 yds.	44° 49'	51.1 sec.
8	.8	28.64 lb.	FNH-NH	1,435 f/s	13,905 yds.	45° 5'	54.3 sec.
9	.9	32.22 lb.	FNH-NH	1,570 f/s	15,168 yds.	45° 15'	57.4 sec.
10	1.00	35.81 lb.	FNH-NH	1,700 f/s	16,390 yds.	45° 10'	60.0 sec.

CHARACTERISTICS

	Shell, H.E., Mk. IIIA1	Shell, H.E., M114	Proj., T.P., Mk. III	Proj., Drill, Dummy, Mk. I
Caliber	240 mm	240 mm	240 mm	240 mm
Models of Howitzers	M1918M1	M1	All How.	All How.
Proj. Weight	345 lb.	360 lb.	345 lb.	356 lb.
Proj. Charge & Weight	TNT, 49.79 lb.	TNT, 54.06 lb.	Inert	—
Booster	M21A2	M21A2	—	—
Fuze	P.D., M51A3 or M.T., M67A1	P.D., M51A3 or M.T., M67A1	Dummy	—
Primer	Mk. IIA4	Mk. IIA4	Mk. IIA4	—
	17 grs.	17 grs.	17 grs.	
Propelling Charge & Weight	FNH-NH, 35.81 lb. (Zone 10)	FNH-NH, 78.75 lb. (4 sections)	FNH-NH, 35.81 lb. (Zone 10)	Dummy, 36.00 lb.
Complete Round Weight	380.81 lb.	438.78 lb.	380.81 lb.	392.00 lb.
Muzzle Velocity	1,700 f/s	2,300 f/s	1,700 f/s	—
Maximum Range	16,390 yds.	25,255 yds.	16,390 yds.	—
Chamber Capacity	1,790.0 cu. ins.	4,430.0 cu. ins.	1,790.0 cu. ins.	—
Rated Max. Pressure, p.s.i.	32,000	36,000	32,000	—

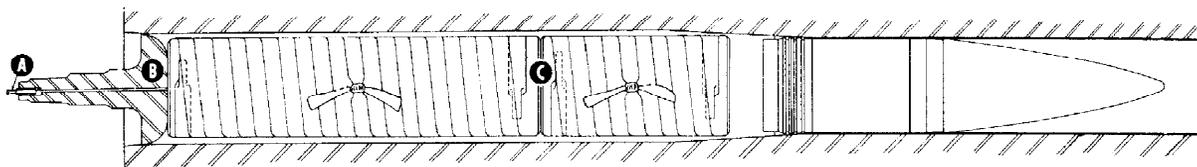
SHELL, HIGH-EXPLOSIVE, 12 INCH, MK. X—STANDARD

ROUND FOR SEACOAST GUNS, 12 INCH, M1895, M1895M1

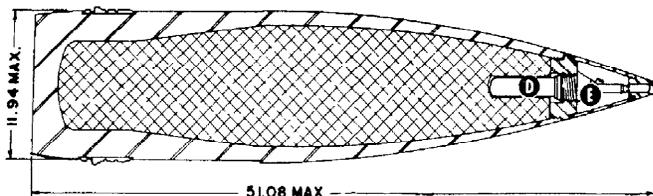
PROJECTILE, ARMOR-PIERCING, 12 INCH, MK. XVI—STANDARD

ROUND FOR SEACOAST GUNS, 12 INCH, M1888, M1888MI, M1888MII, M1895, M1895M1, AND M1900

COMPLETE ROUND, SHELL, H.E., 12 INCH, MK. X, LOADED IN SEACOAST GUN, M1895

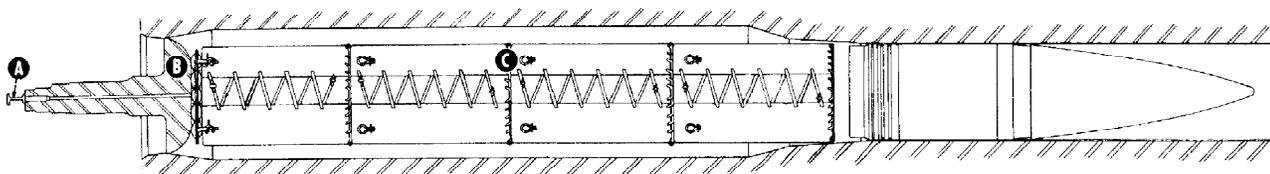


SHELL, H.E., 12 INCH, MK. X

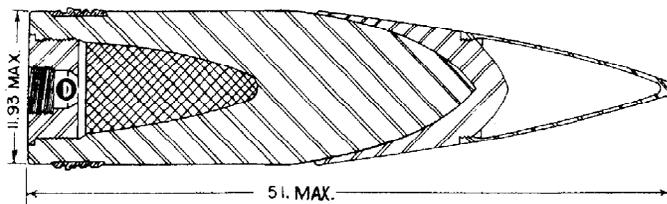


- (A) Primer, Electric, M30
- (B) Obturator Spindle
- (C) Charge, Propelling (Base and Increment)
- (D) Booster, Mk. IIA
- (E) Fuze, P.D., M46, or M47

COMPLETE ROUND, PROJECTILE, A.P., 12 INCH, MK. XVI, LOADED IN SEACOAST GUN, M1900



PROJECTILE, A.P., 12 INCH, MK. XVI



- (A) Primer, Electric, M30
- (B) Obturator Spindle
- (C) Charge, Propelling, 4 Section Stacked Type
- (D) Fuze, B.D., Mk. X

The 12 inch separate loading ammunition is used in the 12 inch seacoast guns M1888, M1888MI, M1888MII, M1895, M1895MI and M1900.

Four types of projectiles have been standardized for use in those guns: high-explosive, armor-piercing shot, target-practice projectile and dummy drill projectile.

SHELL, HIGH-EXPLOSIVE, 12 INCH, MK. X—STANDARD—This round is used in the M1895, M1895MI guns and represents the only issue and manufacture high-explosive round which is standard today for use in guns on railway mounts for firing against land targets.

The Mk. X shell is a modification of the now limited standard Mk. VI for use

in seacoast guns of the M1895 series. It is 12 pounds heavier than its predecessor and there are 31.88 pounds more of bursting charge. The Mk. X shell has a hollow windshield over the point-detonating M46 or M47 fuzes to improve ballistic qualities. The shape of this shell and increased weight improves its ballistic characteristics. This gives the Mk. X shell an ad-

(Continued on next page)

SHELL, HIGH-EXPLOSIVE, 12 INCH, MK. X

PROJECTILE, ARMOR-PIERCING, 12 INCH MK. XVI

(Continued)

vantage in range of 2,300 yards over the Mk. VI at maximum range.

The electric primer, M30, is seated in the base of the obturator spindle and the propelling charge fits against the face of the spindle.

The base and increment propelling charge measures 71.5 inches in length, and 12.625 inches in diameter. Powder used in this charge is in the M1 class with an 87-10-3 formula. The grains have 7 perforations.

The shell as fired is 51.08 inches in length and weighs 712 pounds. It contains a bursting charge of 118.28 pounds of TNT. The maximum propelling charge consists of a base and increment charge of NC powder which weighs 300 pounds. This gives a muzzle velocity of 2,600 feet per second and a maximum range of 30,000 yards at 37° 57' elevation. The minimum base charge of NC powder weighs 225 pounds. As illustrated, the complete round weighs 1,012 pounds.

PROJECTILE, ARMOR-PIERCING, 12 INCH, MK. XVI—STANDARD—This round is used in the M1888, M1888MI, M1888MII, M1895, M1895MI and the M1900 seacoast guns.

The Mk. I armor-piercing shell, now

classified as limited standard and used in the M1888 and M1895 series of seacoast guns, is the predecessor projectile from which the Mk. XVI armor-piercing projectile was developed. The Mk. XVI projectile is 75 pounds heavier than the Mk. I armor-piercing shell and the projectile contains 21.14 pounds less of explosive "D" bursting charge.

Data on the types of propelling charge and their weights follow:

	M1888, '88MI, '88MII, '95, '95MI	M1900
Type.....	NH powder	NH powder
Sections.....	Stacked, 4	Stacked, 4
Weight.....	268 lb.	334 lb.

The four-section propelling charge used with the M1888 series guns and the M1895 series guns uses an M1 class powder with a formula of 87 10 3. The grains of this powder have seven perforations and a web of 0.138 inch. The propelling charge used with the M1900 gun has the same powder characteristics as above except that the web size is 0.170 inch.

The projectile is 51 inches in length.

PROJECTILES, TARGET, PRACTICE, M1911, MK. XV, MK. XXI—STANDARD—There are three standard issue and manufacture rounds for target practice use.

The M1911 cast-iron projectile, weighing 1,070 pounds, is used in the M1888 series of guns, in the M1895 series and in the M1900 gun. The Mk. XV cast-iron projectile, weighing 900 pounds, is used in the M1895 gun. The Mk. XXI cast-iron projectile, weighing 975 pounds, is used in the M1888 and M1895 guns.

All target-practice rounds are fired by four-section NH powder charges weighing 270 pounds. The exception is when the M1911 projectile is fired in the M1900 gun, in which case the four-section charge weighs 334 pounds.

When specially authorized, a sand-filled common steel shell (the Mk. VI or the Mk. X) may be used for target practice with railway mount if suitable cast-iron projectiles are not provided.

All target-practice projectiles are shipped empty and later sand loaded to the proper weight prior to issue to the using troops. All components (loading, fuzes) of these projectiles are inert. Advantages of using the inert-loaded practice rounds are in the saving of the high-explosive filler normally used, and in the safety of the gun crew during training.

PROJECTILE, DUMMY, DRILL, M6—STANDARD—(See Table of Characteristics.)

CHARACTERISTICS

	Shell, H.E., Mk. X	Proj., A.P., Mk. XVI	Proj., A.P., Mk. XVI	Proj., T.P., M1911	Proj., T.P., Mk. XV	Proj., T.P., Mk. XXI	Proj., Drill, M6
Caliber.....	12 inch	12 inch	12 inch	12 inch	12 inch	12 inch	12 inch
Model of Guns.....	M1895 M1895M1	M1888 M1888MI M1888MII M1895 M1895M1	M1888 M1900	All guns	M1895 M1895M1	M1888 M1888MI M1888MII M1895	All guns
Proj. Weight.....	712 lb.	975 lb.	975 lb.	1,070 lb.	900 lb.	975 lb.	975 lb.
Proj. Charge and Weight.....	TNT, 118.28 lb.	Expl. "D," 22.2 lb.	Expl. "D," 22.2 lb.	—	—	—	—
Booster.....	Mk. IIA	—	—	—	—	—	—
Fuze.....	P.D., M46 or M47	B.D., Mk. X	B.D., Mk. X	—	—	—	—
Primer.....	M30, Elec.	M30, Elec.	M30, Elec.	M30, Elec.	M30, Elec.	M30, Elec.	M30, Elec.
Propelling Charge and Weight.....	NC pwr., 300 lb.	NH pwr., 268 lb.	NH pwr., 334 lb.	NH pwr., 270 lb.	NH pwr., 268 lb.	NH pwr., 268 lb.	—
Complete Round Weight.....	1,012 lb.	1,243 lb.	1,309 lb.	1,338 lb.†	1,168 lb.	1,243 lb.	—
Muzzle Velocity.....	2,600 F/S	2,260 F/S‡	2,275 F/S	2,250 F/S‡‡	2,325 F/S	2,260 F/S§	—
Maximum Range.....	30,000 yds.	30,100 yds.	30,100 yds.	27,000 yds.	29,200 yds.	30,100 yds.	—
Chamber Capacity.....	11,810 cu. ins.	11,840 cu. ins.**	16,300 cu. ins.	11,840 cu. ins.††	11,728 cu. ins.	11,840 cu. ins.**	—
Rated Maximum Pressure, p.s.i....	38,000	38,000	38,000	38,000	38,000	38,000	—

†334 lb. NH powder in M1900 gun.

††1,404 lb. in M1900 gun.

‡2,275 f/s in M1895 and M1895M1 guns.

§2,275 f/s in M1895 and M1895M1 guns.

**11,900 cu. ins. in M1895 and M1895M1 guns.

†††11,900 in M1888 series, 16,300 in M1900.

‡‡2,235 f/s in M1888 series.

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PROJECTILE, ARMOR-PIERCING, 16 INCH, MK. XII, MOD. 1—STANDARD

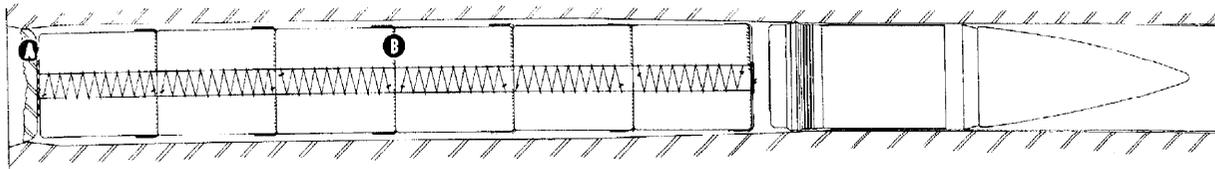
PROJECTILE, TARGET PRACTICE, 16 INCH, M108—STANDARD

ROUNDS FOR 16 INCH SEACOAST GUN, MK. IIM1 (NAVY)

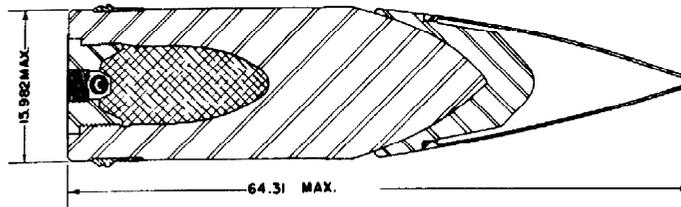
PROJECTILE, TARGET PRACTICE, 16 INCH, M100—STANDARD

ROUND FOR 16 INCH SEACOAST GUNS, M1919 AND MK. IIM1 (NAVY)

COMPLETE ROUND, PROJECTILE, A.P., 16 INCH, MK. XII, MOD. 1,
LOADED IN CANNON, 16 INCH, MK. IIM1 (NAVY)



PROJECTILE, A.P., 16 INCH, MK. XII, MOD. 1



- Ⓐ Obturator spindle
- Ⓑ Propelling charge (stacked type)
- Ⓒ Fuze, B.D., Mk. X

Of the projectiles that have been made for 16 inch cannon only one is now standard for issue and manufacture—the 16 inch, Mk. XII, Mod. 1. The Mk. V, the Mk. II, Mod. 2, and the Mk. IX, 16 inch, projectiles are limited standard and are only for issue until present stocks are exhausted.

The Mk. XII, Mod. 1 projectile is used in the 16 inch cannon, Mk. II, Mod. 1 (Navy), and is of Navy design.

PROJECTILE, A.P., 16 INCH, MK. XII, MOD. 1—STANDARD—The projectile has an armor-piercing cap that is crimped and soldered to the body. A windshield

is welded to the cap to improve ballistic shape.

An explosive “D” bursting charge of 34.18 pounds is detonated by the Mk. X base-detonating fuze. The volume of the bursting charge cavity with plug and fuze in place is 644.27 cu. ins.

To insure against the propelling charge

(Continued on next page)

CHARACTERISTICS

	Proj., A.P., Mk. XII, Mod. 1	Proj., T.P., M108	Proj., T.P., M100	Proj., T.P., M100	Proj., Drill, M5
Caliber.....	16 inch	16 inch	16 inch	16 inch	16 inch
Models of Guns.....	Mk. IIM1 (Navy)	Mk. IIM1 (Navy)	Mk. IIM1 (Navy)	M1919	Mk. IIM1 (Navy)
Proj. Weight.....	2,240 lb.	2,240 lb.	2,100 lb.	2,100 lb.	2,240 lb.
Charge and Weight.....	Expl. “D,” 34.18 lb.	Inert	Inert	Inert	—
Fuze.....	B.D., Mk. X	—	—	—	—
Primer.....	Mk. XV, Mod. I Comb.	Mk. XV, Mod. I Comb.	Mk. XV, Mod. I Comb.	Mk. XV, Mod. I Comb.	Mk. XV, Mod. I Comb.
Propelling Charge and Weight.....	6-sec., NH pwrdr., 675 lb.	6-sec., NH pwrdr., 675 lb.	6-sec., NH pwrdr., 709 lb.	4-sec., NH pwrdr., 870 lb.	6-sec., Dummy, 720 lb.
Complete Round Weight.....	2,915 lb.	2,915 lb.	2,809 lb.	2,970 lb.	2,960 lb.
Muzzle Velocity.....	2,650 f/s*	2,650 f/s*	2,750 f/s	2,750 f/s	—
Range.....	45,155 yds. at 47° 20' elev.*	45,155 yds. at 47° 20' elev.*	44,680 yds. at 50° 56' elev.	44,680 yds. at 50° 56' elev.	—
Chamber Capacity.....	29,525 cu. ins.	29,525 cu. ins.	30,000 cu. ins.	40,900 cu. ins.	—
Rated Maximum Pressure, p.s.i.....	38,000	38,000	38,000	38,000	—

*1,900 f/s and 24,910 yds. at 47° elevation with 2/3 powder charge.

PROJECTILE, ARMOR-PIERCING, 16 INCH, MK. XII, MOD. 1

PROJECTILE, TARGET PRACTICE, 16 INCH, M108

PROJECTILE, TARGET PRACTICE, 16 INCH, M100

(Continued)

flame entering the cavity and prematurely igniting the bursting charge, the plug is screwed down against a rubber gasket. As a further protection a lead disc is placed over the base of the assembled projectile and held in place by a copper base plate.

As fired the projectile measures 64.31 inches in length.

The Mk. XV, Mod. 1 combination percussion and electric primer is used to ignite the six-section powder bag. The M1 class powder used in this charge has an 87-10-3 formula. The grains have seven perforations and a web of 0.195 inch. The six-section stacked type powder bag is 109.5 inches long, 16 inches in diameter, and weighs 675 pounds. The complete round as fired weighs 2,915 pounds.

PROJECTILE, T.P., 16 INCH, M108—STANDARD—This target-practice projectile is fired in the 16 inch cannon, Mk. II, Mod. 1, and is an issue and manufac-

ture item. The projectile is made from cast iron and is the same length and weight as the Mk. XII, Mod. 1. The projectile has a cavity but the only purpose it serves is to insure the same weight as the Mk. XII, Mod. 1 projectile. The cavity is closed by a base plug.

The same propelling charge used with the Mk. XII, Mod. 1, projectile is used with this target practice projectile.

PROJECTILE, T.P., 16 INCH, M100—STANDARD—Made of cast iron and weighing 2,100 pounds, this target practice projectile is used with both the Mk. II, Mod. 1 and the M1919, 16 inch cannon.

This projectile, like the M108, is inert, the only purpose of the cavity being to govern weight. The projectile is 57.04 inches long.

When used in the Mk. II, Mod. 1 cannon, a six-section stacked type propelling charge weighing 709 pounds is used. The

NH powder used in this charge is M1 class powder with an 87-10-3 formula. The grains have seven perforations and a web of 0.195 inch. The powder bags are 109.5 inches long and 16 inches in diameter.

In the M1919 cannon a four-section stacked type propelling charge is used. The charge weighs 870 pounds and is 123.5 inches long and 16.25 inches in diameter. The M1 class powder used in this charge has an 87-10-3 formula. The grains have seven perforations and a web of 0.206 inch.

The Mk. XV, Mod. 1 combination percussion and electric primer is used to ignite the propelling charges in both cannon.

The complete round as fired weighs 2,809 pounds in the Mk. II, Mod. 1 cannon and 2,970 pounds in the M1919 cannon.

PROJECTILE, DUMMY, DRILL, M5—STANDARD—(See Table of Characteristics.)

BOMBS
ADAPTER CLUSTERS

CLUSTER, FRAGMENTATION BOMB, M1 (100 LB. SIZE) — LIMITED STANDARD

(6 BOMBS, FRAGMENTATION, 20 LB., M41)

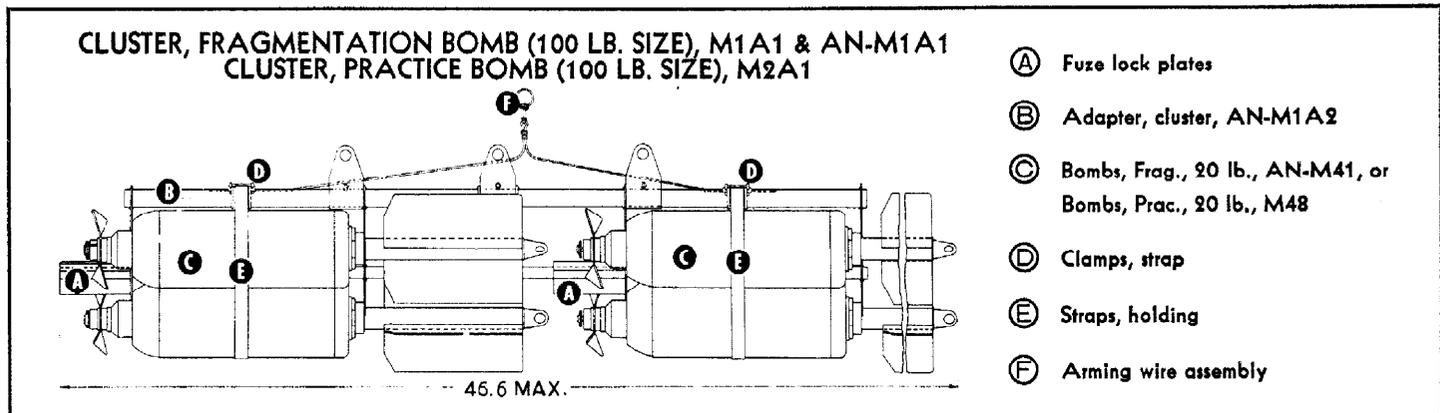
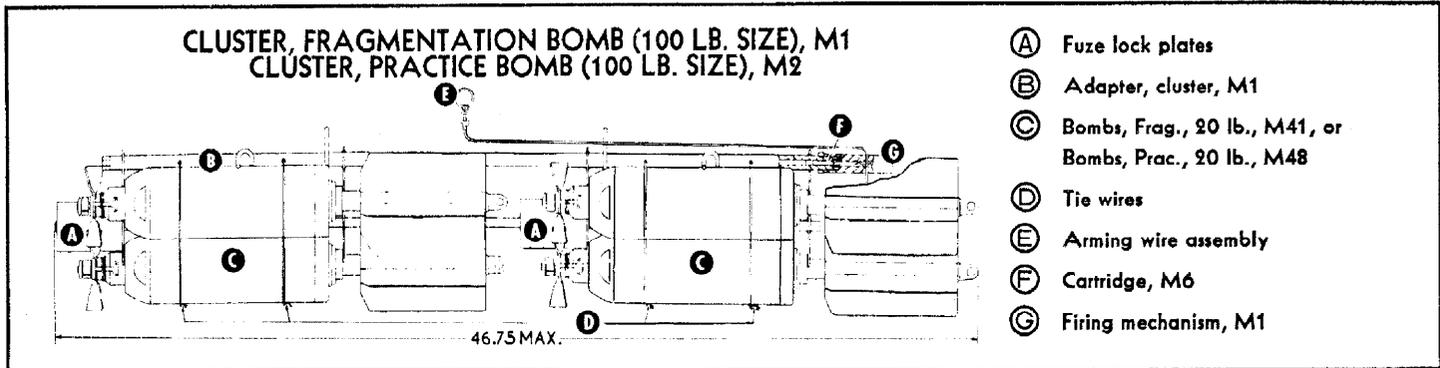
CLUSTER, FRAGMENTATION BOMB, M1A1 LIMITED STANDARD, AN-M1A1 (100 LB. SIZE) — STANDARD

(6 BOMBS, FRAGMENTATION, 20 LB., AN-M41)

CLUSTER, PRACTICE BOMB, M2 (100 LB. SIZE) — LIMITED STANDARD

CLUSTER, PRACTICE BOMB, M2A1 (100 LB. SIZE) — LIMITED STANDARD

(BOTH WITH 6 BOMBS, PRACTICE, 20 LB., M48)



The assembly of bombs in clusters permits a large number of small bombs to be carried in stations designed for larger bombs. In operations, the release of bombs from cluster assemblies is equivalent to salvo bombing.

CLUSTER, FRAGMENTATION BOMB, M1—LIMITED STANDARD—The cluster consists of an adapter, six 20 pound fragmentation bombs, M41, tie wires to hold the bombs in place, a cartridge, M6, a firing mechanism and an arming wire assembly.

For suspension in bomb racks two lugs are provided. As the bombs are assembled into the clusters without vane locks, two fuze lock plates are used to prevent the arming vanes from rotating until the bombs are released from the cluster. Upon dropping the cluster, the arming wire is pulled free and a firing pin is free to be shot forward by a spring. The firing pin

hits the primer of cartridge, M6, which contains a black powder charge. The explosion of this black powder drives a plunger forward through the adapter tube, cutting the tie wires and releasing the bombs.

The cluster measures $46\frac{3}{4}$ inches in length and weighs 125 pounds. The bombs used in this cluster are described in another section of this Catalogue.

CLUSTER, FRAGMENTATION BOMB, M1A1—LIMITED STANDARD & AN-M1A1—STANDARD—It consists of an adapter, six 20 pound fragmentation bombs, AN-M41, two holding straps, and strap clamps.

For suspension in bomb racks, three lugs are provided. Two fuze lock plates prevent the vanes from rotating until the bombs are released. Upon releasing the cluster, the arming wire is pulled free and releases the strap clamps which hold the straps in place. This allows the

straps to fly loose under pressure of the retaining spring, thus releasing the bombs.

The cluster measures 46.6 inches in length, and weighs approximately 125 pounds.

Bombs used in this cluster are described elsewhere.

CLUSTER, PRACTICE BOMB, M2—LIMITED STANDARD—This cluster is identical with the M1 fragmentation bomb cluster except that six practice bombs, M48, are used instead of six fragmentation bombs, M41. These bombs are also described elsewhere in this Catalogue.

CLUSTER, PRACTICE BOMB, M2A1—LIMITED STANDARD—The cluster for the fragmentation bomb, AN-M41, is identical with this except that the M2A1 cluster uses either six practice bombs, M48, or six inert-loaded fragmentation bombs, AN-M41. The bombs are described in another section of this Catalogue.

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CLUSTER, FRAGMENTATION BOMB, M3 (100 LB. SIZE)—LIMITED STANDARD

(6 BOMBS, FRAGMENTATION, 30 LB., M5)

CLUSTER, FRAGMENTATION BOMB, AN-M4 (100 LB. SIZE)—STANDARD

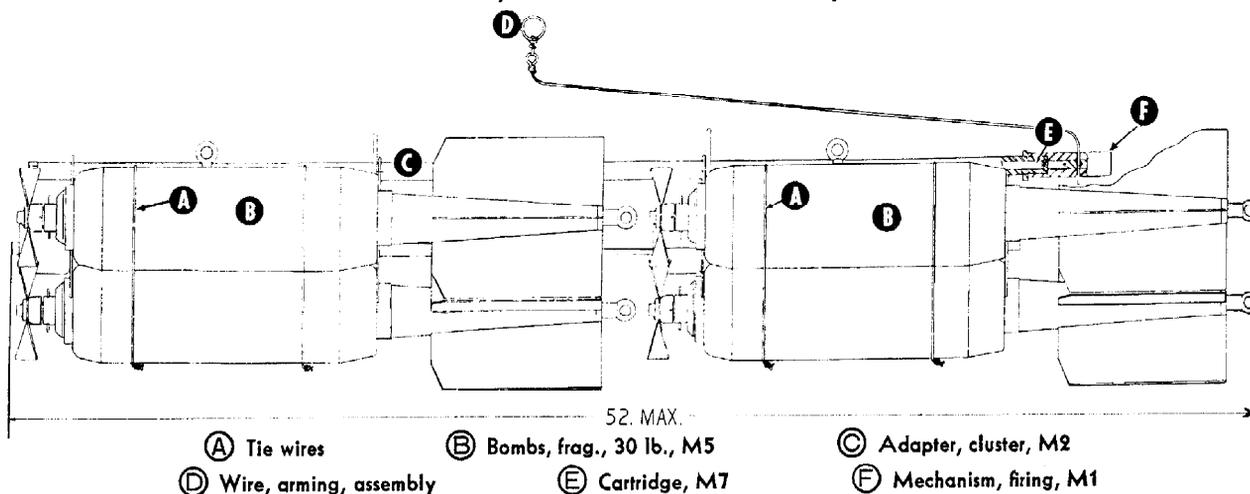
(3 BOMBS, FRAGMENTATION, 23 LB., AN-M40)

CLUSTER, PRACTICE BOMB, M5 (100 LB. SIZE)—STANDARD

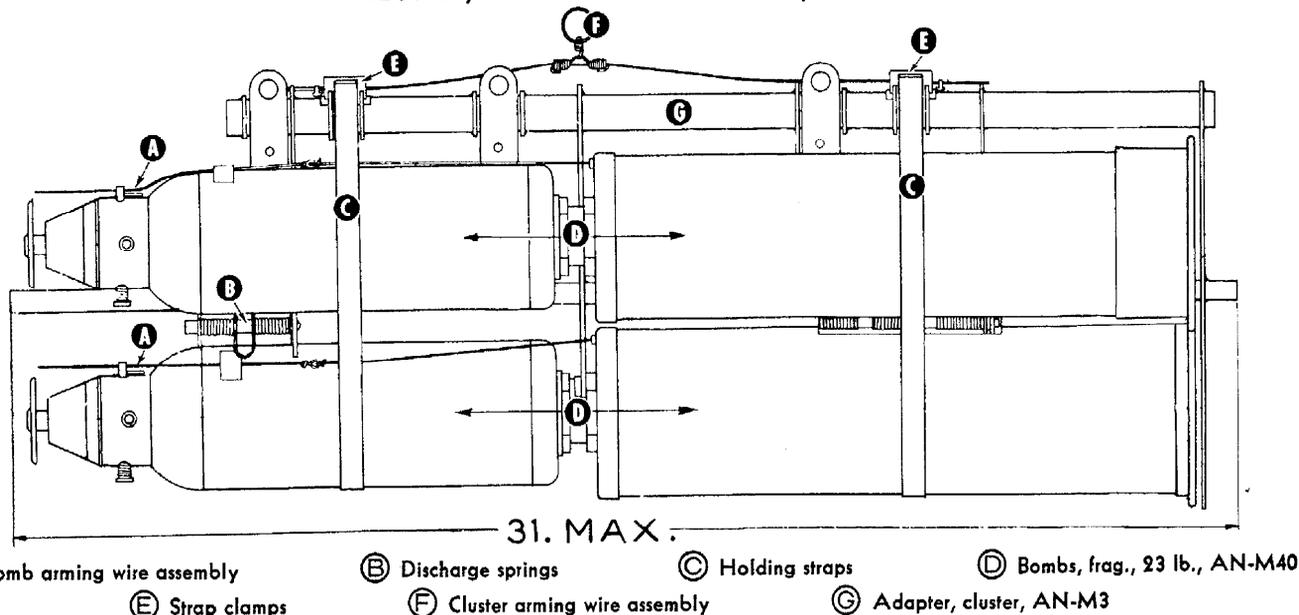
(3 BOMBS, PRACTICE, 23 LB., M71)

ADAPTER, CLUSTER, M12—STANDARD

CLUSTER, FRAGMENTATION BOMB, M3



CLUSTER, FRAGMENTATION BOMB, AN-M4



CLUSTER, FRAGMENTATION BOMB, M3—LIMITED STANDARD—The M3 cluster operates similarly to M1 and M2 clusters except that a delay cartridge is used.

As no vane locks are used when the bombs are assembled in the cluster, two

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fuze lock plates are provided to secure the arming vanes of the fuzes until the bombs fall clear of the cluster.

When the cluster is released, the arming wire is pulled loose and allows the firing pin to strike the primer of the M7

cartridge. This cartridge has a 5-second delay in order to permit the cluster to fall free of the airplane before the tie wires are cut and the bombs released.

The cluster weighs approximately 190 pounds and is 52 inches in length.

(Continued on next page)

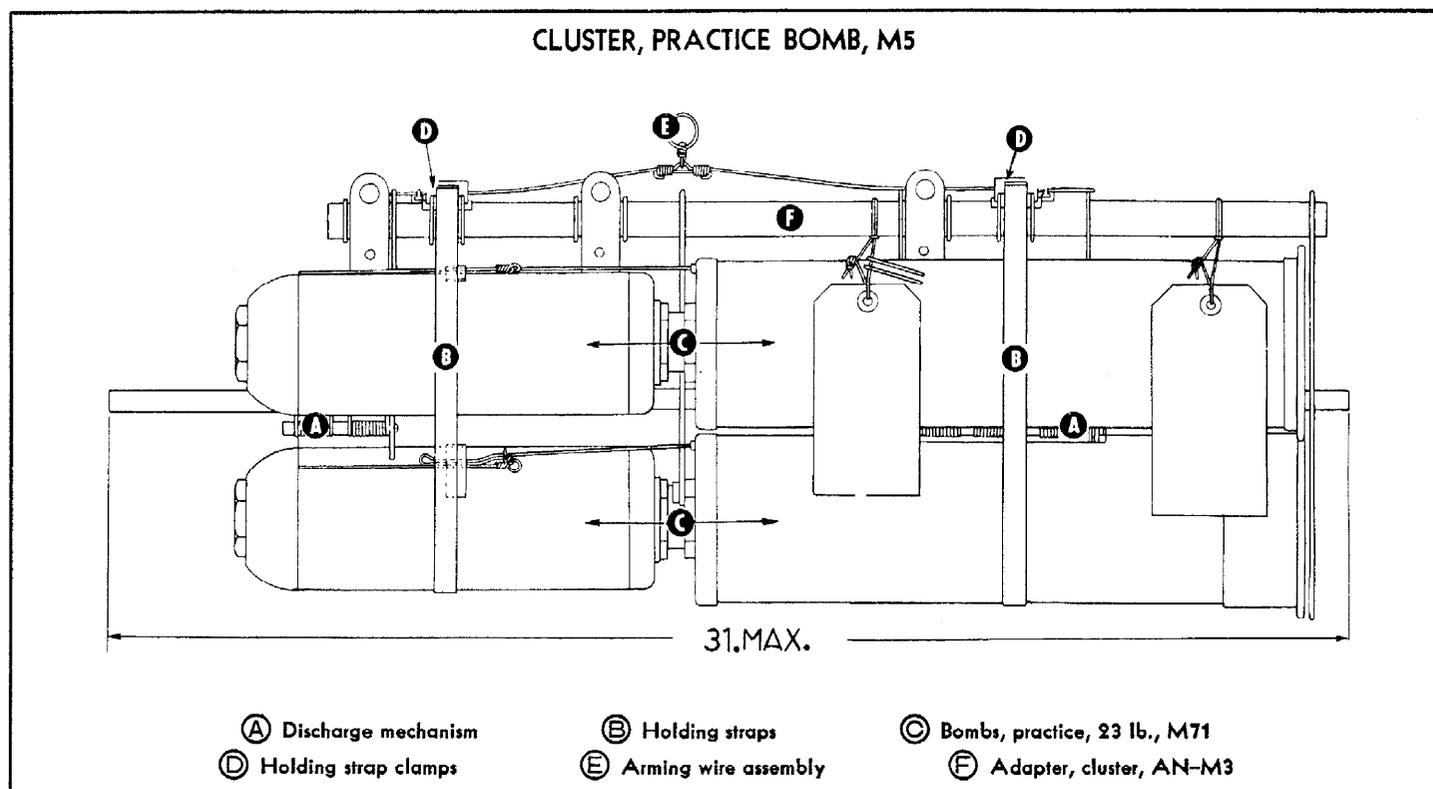
CLUSTER, FRAGMENTATION BOMB, M3 (100 LB. SIZE)

CLUSTER, FRAGMENTATION BOMB, AN-M4 (100 LB. SIZE)

CLUSTER, PRACTICE BOMB, M5 (100 LB. SIZE)

ADAPTER, CLUSTER, M12

(Continued)



CLUSTER, FRAGMENTATION BOMB, AN-M4—STANDARD—The adapter, cluster, AN-M3, used in this cluster is similar to the AN-M1A2 cluster adapter. However, as these clusters are used with the parachute fragmentation bomb the fuze arming wires are assembled to each bomb. Also provided for in this cluster is a spring discharging mechanism to throw the bombs clear of the cluster before the parachute opens. This is designed to prevent the parachutes from tangling with the cluster or with one another. The regular covers on the parachute assemblies are replaced by loose-fitting covers that fall off when the bombs leave the cluster. For suspension in bomb racks three suspension lugs are provided.

The cluster arming wire is assembled so that when the cluster is released from the airplane the strap clamps are released, allowing the holding straps to fly free.

This releases the discharging mechanism, the bombs are thrown clear of the cluster and the covers fall from the parachute containers, allowing the para-

chutes to open and withdraw the fuze arming wires.

The cluster measures 31 inches in length and weighs 87.2 pounds.

CLUSTER, PRACTICE BOMB, M5—STANDARD—This practice bomb cluster was standardized to provide a cluster for the 23 pound practice bomb, M71. It is similar to the AN-M4 cluster for the AN-M40 fragmentation bombs.

When the cluster is dropped from the airplane, the arming wire is pulled from the cluster adapter release mechanisms. This releases the holding strap clamps which allows the holding straps to fly free. The front and rear discharge springs then fling the bombs clear of the falling cluster.

The cluster measures 31 inches in length and weigh 76 pounds.

ADAPTER, CLUSTER, M12—STANDARD—In order to increase the load carrying capacity of aircraft, a system of hooks and cables was adopted by the

Army Air Forces for clustering 100 lb. demolition bombs, 100 lb. M47A1 or M47A2 chemical bombs, 115 lb. M70 chemical bombs and M1, AN-M1A1, or AN-M4 fragmentation bomb clusters. The same system can also be used with the 260 lb. fragmentation bomb, M81.

The cluster adapter consists of a hook that can withstand a pull of 2,000 pounds without distortion, and a flexible steel cable loop also of 2,000 pound strength. A National Telephone Supply Co. "Nico-press" sleeve is used to join the ends of the cable, forming the loop.

Clustering is accomplished in the following manner: one bomb is suspended from the airplane in the usual way except that the loop of an M12 adapter is placed over each suspension lug of the bomb before it is secured to the shackle. The second bomb is attached to the first by means of the adapter hooks which are fastened to the lugs of the second bomb.

As these bomb assemblies are not issued as clusters, only the metal parts involved have been standardized.

BOMB, FRAGMENTATION, 23 LB., AN-M40—STANDARD

BOMB, FRAGMENTATION, 20 LB., AN-M41—STANDARD

BOMB, FRAGMENTATION, 23 LB., M72—STANDARD

BOMB, FRAGMENTATION, 260 LB., M81—STANDARD

The fragmentation type bombs are used mainly against enemy personnel and such light matériel targets as motor transports and airplanes on the ground or in flight. They are particularly effective against this type of target because of the great number of small fragments traveling at high velocities. When intended for low-flying bombing attacks the bombs are fitted with a parachute assembly to retard the speed of descent in order to allow the airplane to get out of the danger space of the bomb fragments. For bombing altitudes outside the danger space the bombs are equipped with a fin stabilizer assembly.

Due to their light weight a great many can be carried in an airplane, and a large target area can be effectively swept by fragments.

BOMB, FRAGMENTATION, 23 LB., AN-M40—STANDARD—This bomb, for use on low-flying bombing missions, is equipped with a parachute assembly and the bomb nose fuze, AN-M104 or AN-M120. The fuze is of the arming-pin type in which the primer-detonator and booster are integral parts. The fuze has a delay-arming element which is initiated when the arming-pin is ejected.

The AN-M120 fuze is a mechanical time type of delay arming fuze set for a 2.5 second delay.

The body of the bomb is made from a closely wound helix of bar steel over an inner steel sleeve. The bar steel produces fragments of more uniform size.

For suspension in horizontal positions a lug is provided on the side of the bomb.

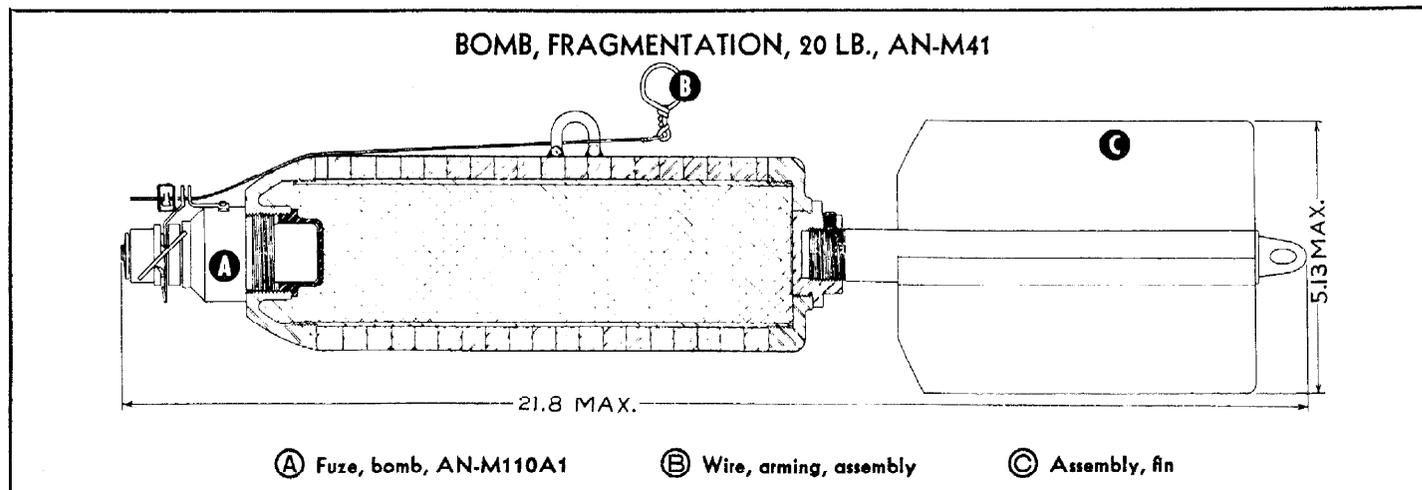
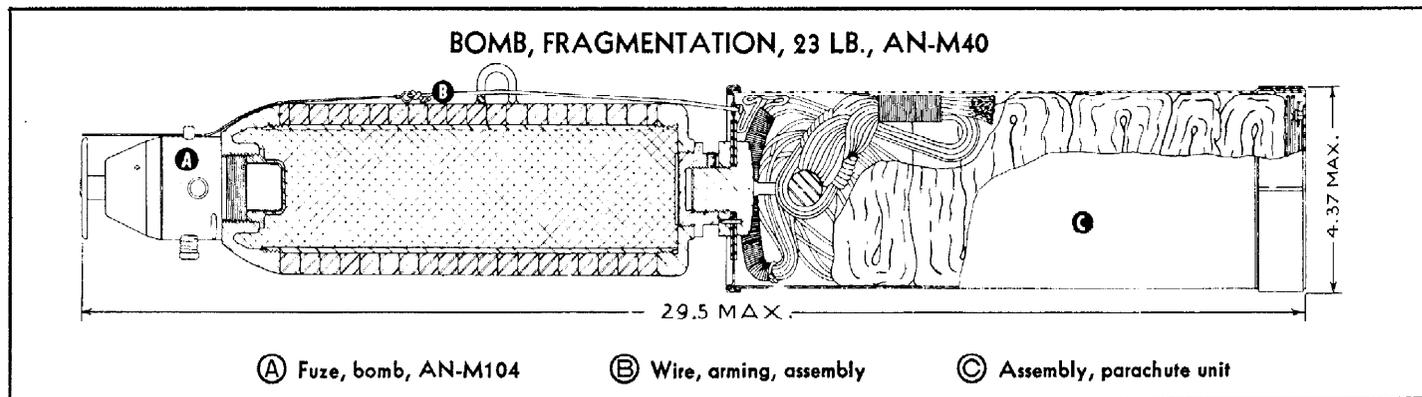
The percentage of TNT bursting charge to the weight of the bomb is 11.0%. The

bomb as dropped measures 29.5 inches in length and 4.37 inches in diameter.

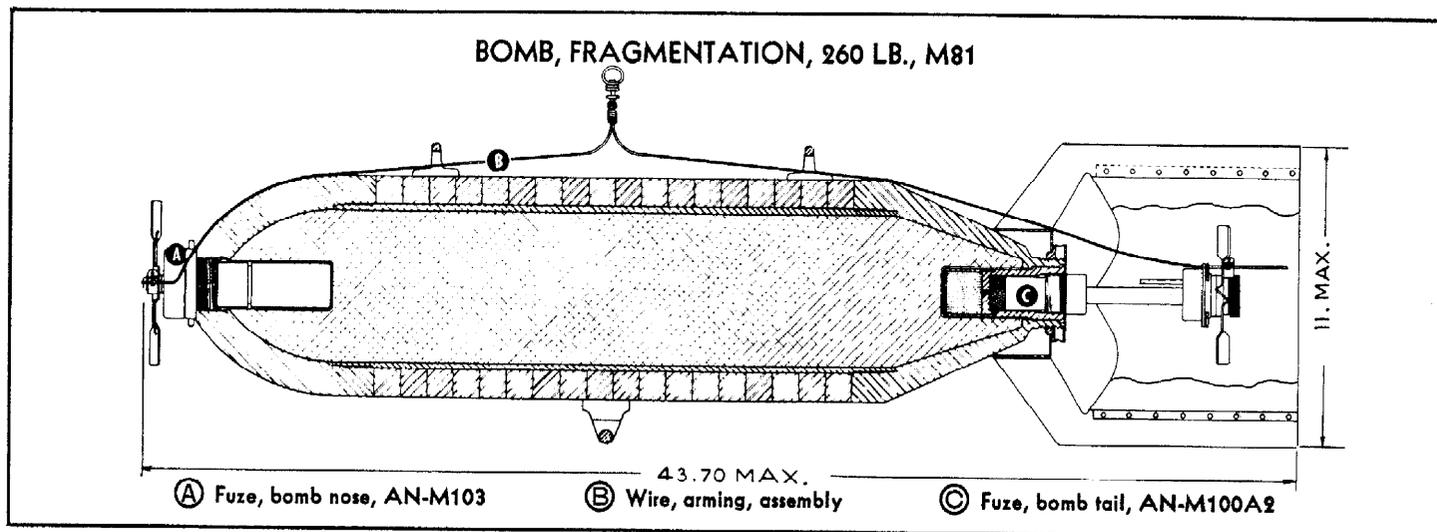
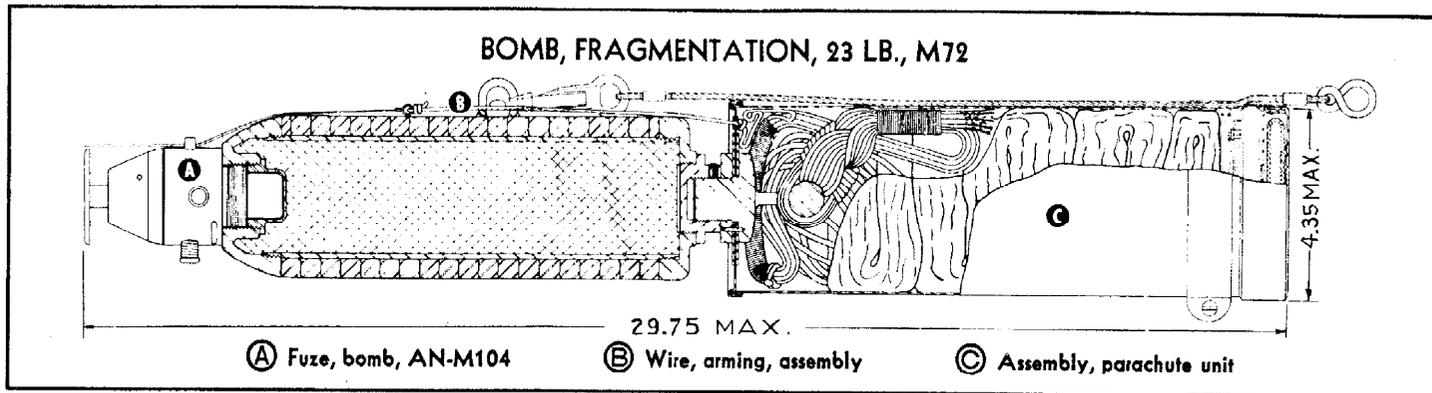
Weights of various components are:

Bomb, loaded and fuzed	
(AN-M120).....	24.6 lb.
Charge, bursting, TNT.....	2.7 lb.
Body, bomb.....	14.9 lb.
Assembly, parachute.....	5.9 lb.
Fuze, bomb nose, AN-M104.....	1.15 lb.
Fuze, bomb nose, AN-M120.....	1.1 lb.

BOMB, FRAGMENTATION, 20 LB., AN-M41—STANDARD—This bomb is issued and manufactured for both Army and Navy. It is used on bombing missions where it is not possible to get down to an altitude low enough for use of the AN-M40 parachute bomb. The body of this bomb is identical with that of the AN-M40 body, but instead of the para-



BOMB, FRAGMENTATION, 23 LB., AN-M40; BOMB, FRAGMENTATION, 20 LB., AN-M41;
BOMB, FRAGMENTATION, 23 LB., M72; BOMB, FRAGMENTATION, 260 LB., M81 (Continued)



chute assembly of the AN-M40 bomb a fin stabilizer assembly is used.

For suspension in airplanes in either vertical or horizontal position two suspension lugs are provided—one on the side and one at the tail.

On dropping the bomb the arming wire pulls free from the AN-M110A1 fuze, which is of the arming vane mechanical arming type. Removal of the arming wire permits the arming vane to rotate in the airstream and release the safety block under the striker. The fuze is then armed and set to detonate on impact.

The AN-M41 is now used for practice as well as in combat. It replaces the 20 lb. practice bomb, M48, which has been reclassified to the limited standard category.

The length of the bomb loaded and fuzed is 21.8 inches; the distance across the fins is 5.13 inches.

The percentage of TNT bursting charge to the weight of the bomb is 13.

Weights of the various components are:
 Bomb, loaded and fuzed 19.8 lb.
 Charge, bursting, TNT 2.7 lb.
 Body, bomb 14.9 lb.

Assembly, fin 1.6 lb.
 Fuze, bomb nose, AN-M110A1 . . . 1.02 lb.

BOMB, FRAGMENTATION, 23 LB., M72—STANDARD—This bomb is identical with the AN-M40 bomb except that the parachute assembly is so made that the bomb can be suspended in vertical racks.

The same fuzes, AN-M104 or AN-M120, are used. Weights of the various components are:

Bomb, loaded and fuzed
 (AN-M104) 24.6 lb.
 Charge, bursting, TNT 2.7 lb.
 Body, bomb 14.9 lb.
 Assembly, parachute 5.8 lb.
 Fuze, bomb nose, AN-M104 1.15 lb.
 Fuze, bomb nose, AN-M120 1.1 lb.

BOMB, FRAGMENTATION, 260 LB., M81—STANDARD—The M81 fragmentation bomb, used against heavily resistant and concentrated targets such as light armored motor vehicles, PT boats, and landing barges, is similar in structure to the 20 lb. AN-M41 bomb. The case which is 1¼" thick consists of a closely wound helix of bar steel over an inner

steel cylinder; the ends of the case are forged.

There is an alternate construction which calls for a longer tube. The wire is wound the full length of the tube, and then the case is forged at the ends forming the nose and tail of the bomb. Fuze adapters are welded in at both ends.

This heavy case reduces the vulnerability of the explosive charge to enemy small arms fire. The bomb has a box type fin assembly and a standard double and single suspension lug. It is also equipped with an AN-M103 nose fuze and an AN-M100A2 non-delay tail fuze.

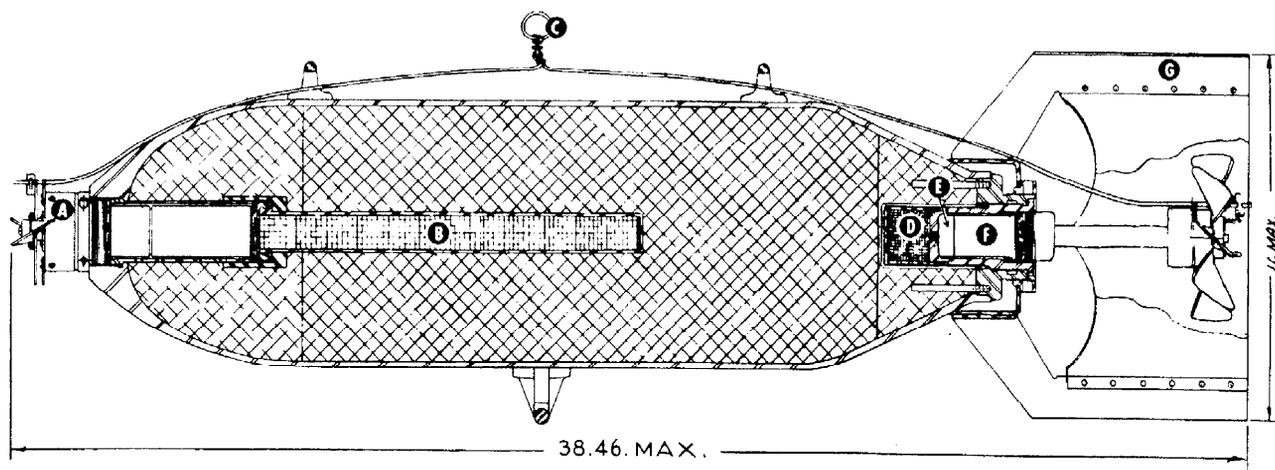
The overall length is 43.75 inches and the diameter, 8⅝ inches. The M81 is loaded with composition B; alternate loadings are Ednatol and TNT. It can be released from an altitude of 25,000 feet with satisfactory functioning.

Weights of the various components are:

Bomb, loaded and fuzed 263.4 lb.
 Charge, bursting, Comp. B 36.6 lb.
 Body, bomb 214.5 lb.
 Fuze, bomb nose, AN-M103 4 lb.
 Fuze, bomb tail, AN-M100A2 . . . 2.70 lb.

BOMB, GENERAL PURPOSE, 100 LB., AN-M30A1—STANDARD

BOMB, G.P., 100 LB., AN-M30A1—STANDARD



- (A) Fuze, bomb nose, M103 or AN-M103 (B) Booster, auxiliary, M104 (C) Wire, arming, assembly (D) Adapter-booster, M102A1
 (E) Primer-detonator, M14 (F) Fuze, bomb tail, AN-M100A1 or AN-M100A2 (G) Fin assembly

The general purpose bomb is used for destruction or demolition of matériel targets, the destructive effect being produced by the blast of the detonation. If the detonation occurs above the ground, additional damage will be caused by fragments of the bomb.

When the fuzes are set for instantaneous action, the bomb is particularly effective against targets that can be destroyed by the blast of the explosion. A short delay setting will make the bomb effective when mining effect or the penetration of a target before detonation is desired.

The 100 pound general purpose bomb is effective against railroad equipment and trackage, railroad terminals, etc.

BOMB, G. P., 100 LB., AN-M30A1—STANDARD—The standard complete round assembly requires: Bomb, G. P., 100 pound, AN-M30A1, unfuzed; Fuze, bomb nose, M103 or AN-M103; Fuze, bomb tail, AN-M100A1 or AN-M100A2; and Wire, arming, assembly, pc. mk. 82-3-234 FB.

Fuzed, the bomb measures 38.46 inches in length and 11 inches across the fins.

The center of gravity is 14 inches from the nose.

For suspension on dive bombers a single suspension lug is provided. Two suspension lugs, approximately 14 inches apart, are provided for use in horizontal bomb-racks.

The explosive filler weighs 54.2 pounds, of which 42.3 pounds is cast 50-50 amatol, and 11 pounds is cast TNT surrounding the fuzes. The remaining weight is in the auxiliary booster and the adapter-booster.

Of the total weight of the bomb, the explosive filler is 54.2%. An alternate loading of TNT consists of 56.8 pounds of TNT.

The bomb tail fuzes, AN-M100A1 and AN-M100A2, are arming vane types with mechanical-delay arming. The M14 primer-detonator used in this fuze is made with four different delays. Normally the 0.025 second delay comes assembled to the fuze, and this can be replaced with the 0.01 second, 0.1 second, or non-delay as desired.

The bomb nose fuzes, M103 and AN-M103, are selective, instantaneous or short delay arming vane types. The fuze can be set for either superquick or 0.1 second delay.

For delays not obtainable with the AN-M100A2 fuze, the bomb tail fuze, M112A1, is used. This fuze gives delays of from 8 to 15 or from 4 to 5 seconds using either the M16 or M16A1 primer-detonator.

Similar to the M112A1 fuze, the M115 tail fuze is used to give delays of from 8 to 15 or from 4 to 5 seconds. The main difference between the M112A1 and M115 fuzes is in the arming mechanism. The M112A1 arms directly while the M115 has a gear train in the arming mechanism to increase the air travel required for arming.

Fuze, M123, also may be used. (See page 574.)

The components of the bomb weigh as follows:

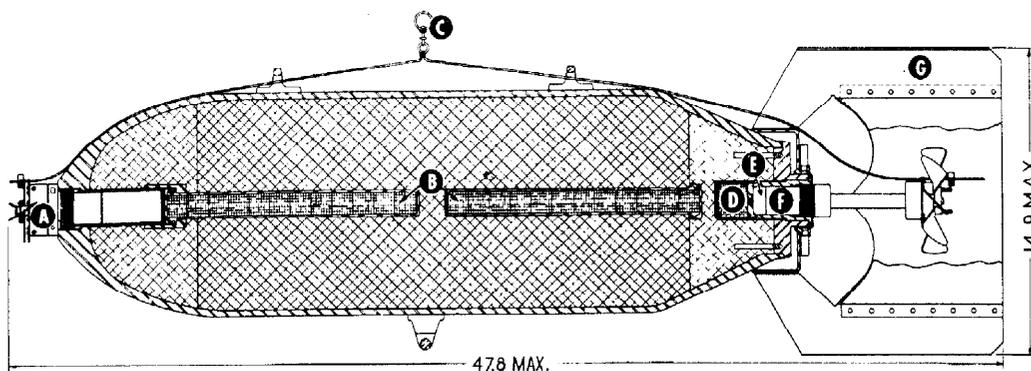
Bomb, as dropped (50-50 amatol).....	107.80 lb.
Bomb, as dropped (TNT).....	111.30 lb.
Filler, explosive (50-50 amatol).....	54.20 lb.
(includes aux. booster and surround)	
Fuze, bomb nose, AN-M103..	4.00 lb.
Fuze, bomb tail, AN-M100A2..	2.70 lb.
Fuze, bomb tail, M112A1.....	2.30 lb.
Fuze, bomb tail, M115.....	2.70 lb.
Fin, assembly.....	3.50 lb.
Wire, arming, assembly.....	.07 lb.

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BOMBS, GENERAL PURPOSE

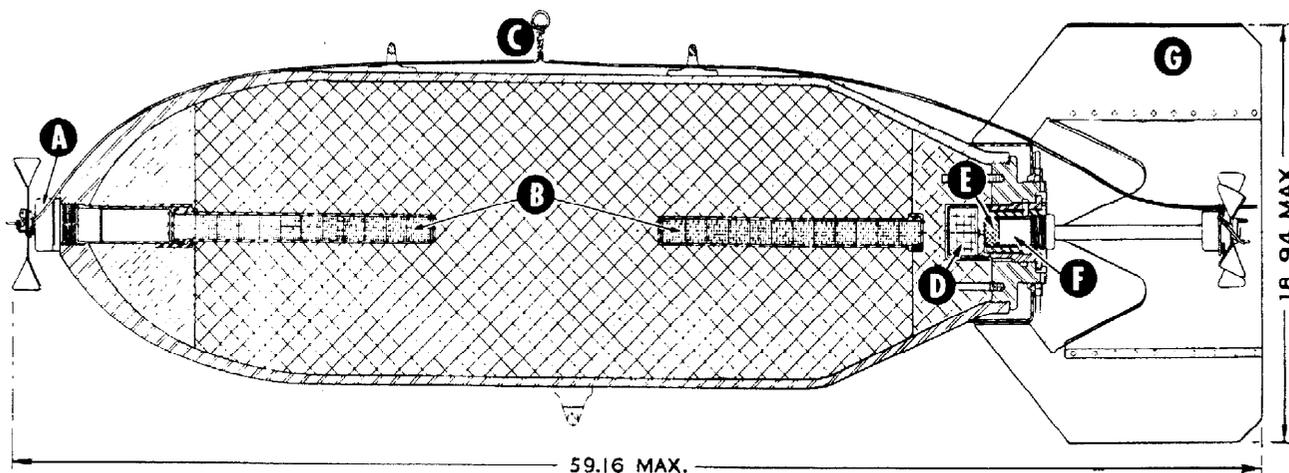
250 LB., AN-M57A1, AND 500 LB., AN-M64A1—STANDARD

BOMB, G.P., 250 LB., AN-M57A1—STANDARD



- (A) Fuze, bomb nose, AN-M103 (B) Booster, auxiliary, M104 (C) Wire, arming, assembly (D) Adapter booster, tail, M102A1
 (E) Primer-detonator, M14 (F) Fuze, bomb tail, AN-M100A2 (G) Fin assembly

BOMB, G.P., 500 LB., AN-M64A1—STANDARD



- (A) Fuze, bomb nose, AN-M103 (B) Booster, auxiliary, M104 (C) Wire, arming, assembly (D) Adapter booster, tail, M115A1
 (E) Primer-detonator, M14 (F) Fuze, bomb tail, AN-M101A2 (G) Fin assembly

BOMB, G. P., 250 LB., AN-M57A1—STANDARD—This bomb is particularly effective when used against railroad equipment and trackage, railroad terminals and similarly constructed buildings, ammunition dumps and seacraft such as submarines, transports, destroyers, etc.

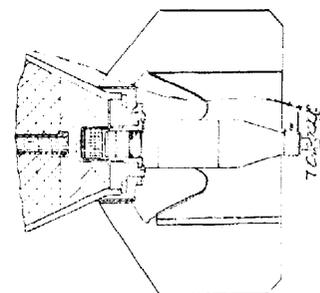
The complete round requires: Bomb, G. P., 250 pound, AN-M57A1, unfuzed and without fin assembly; Fin assembly; Fuze, bomb nose, AN-M103; Fuze, bomb tail, AN-M100A2; Wire, arming, assembly, pc. mk. 82-3-234 FB, Forty-

nine per cent of the weight of the bomb is in the explosive filler. An average filler load consists of 22.5 pounds of cast TNT surrounding the fuzes, and 98.4 pounds of cast 50-50 amatol bursting charge. An alternative loading is 124.9 pounds of cast TNT.

The bomb is 47.8 inches long and 14.9 inches across the fins. The center of gravity is 17.7 inches from the nose. The two suspension lugs are 14 inches apart.

The nose fuze, AN-M103, is an arming vane type with selective instantaneous or

FUZE, HYDROSTATIC, AN-Mk. 230 (TAIL)



BOMBS, GENERAL PURPOSE, 250 LB., AN-M57A1, AND 500 LB., AN-M64A1 (Continued)

short-delay action, and may be set for superquick or 0.1 second delay. The tail fuze, AN-M100A2, is of the arming vane type with mechanical delay arming. By using the 0.025 second, the 0.01 second, the 0.1 second or the non-delay primer-detonator, M14, a great variation in the delay element may be obtained.

For special purposes where longer delay is needed, the tail fuze, M112A1, is used. This fuze gives delay elements of from 4 to 5 seconds or from 8 to 15 seconds depending upon which of the M16 primer-detonators is used. This long delay time enables the bomb to be used against seacraft by "skip" bombing tactics. As an alternate to the M112A1 fuze, the M115 fuze may be used.

Fuze, M123, also may be used.

The bomb components and their weights are as follows:

Bomb, as dropped.....	252.00 lb.
Filler, explosive (approximately).....	122.50 lb.
Fuze, bomb nose, AN-M103 ..	4.00 lb.
Fuze, bomb tail, AN-M100A2 ..	2.70 lb.
Fuze, bomb tail, M112A1	2.30 lb.
Fuze, bomb tail, M115	2.70 lb.
Adapter-booster, M102A1 (tail)	1.37 lb.
Fin assembly	6.00 lb.
Wire, arming, assembly.....	.08 lb.

BOMB, G. P., 500 LB., AN-M64A1—STANDARD—Since this bomb is heavier than the 250 pound general purpose bomb, it can be used against such larger and more massive targets as steel railroad bridges, underground railroads, and against such seacraft as light cruisers, concrete docks, etc.

The complete round assembly includes: Bomb, G. P., 500 pound, AN-M64A1, unfuzed and without fin assembly; Fin assembly; Fuze, bomb nose, AN-M103; Fuze, bomb tail, AN-M101A2; or Fuze, hydrostatic, AN-Mk. 230 (tail), or fuze, bomb tail, M113A1; and Wire, arming assembly, pc. mk. 82-3-234 HB.

The bomb is cylindrical and has box fins. It is 59.16 inches long and 18.94 inches across the fins. The center of gravity is 22.6 inches from the nose.

Approximately 51% of the weight is in the explosive filler. This includes 24.4 pounds of cast TNT around the fuzes and a bursting charge of 236 pounds of cast 50-50 amatol. An alternate filler is 260 pounds of cast TNT.

For suspension in horizontal bomb racks, two lugs are provided, 14 inches apart, on each bomb. For use on dive bombers the M1 trunnion band is provided.

The nose fuze, AN-M103, is the same as that used with the 250 pound G. P. Bomb, AN-M57A1. Bomb tail fuze, AN-M101A2, has the same characteristics as

the AN-M100A2 fuze used in the 250 pound bomb except that the arming stem on the M101A2 fuze is 3 inches longer in order that the arming vane will be properly positioned in the airstream.

The hydrostatic fuze, AN-Mk. 230, is used when the bomb is to be employed against floating targets. This fuze can be set to function at various depths and is very effective against ships or submarines.

As with the 250 pound general purpose bomb, the tail fuze, M113A1, with from 4 to 5 seconds or from 8 to 15 seconds delay elements is substituted for the fuze, AN-M101A2, when the bomb is to be used in "skip" bombing tactics. As an alternate to the M113A1 fuze, the M116 fuze may be used.

Fuze, M124, also may be used.

The bomb components and weights are as follows:

Bomb, as dropped (with M101A2 fuze).....	512.00 lb.
Bomb, as dropped (with Mk. 230 fuze).....	522.00 lb.
Explosive filler.....	262.00 lb.
Fuze, bomb nose, AN-M103 ..	4.00 lb.
Fuze, bomb tail, AN-M101A2 ..	2.90 lb.
Fuze, bomb tail, M113A1	2.50 lb.
Fuze, bomb tail, M116	2.90 lb.
Fuze, hydrostatic, AN-Mk. 230 (tail).....	14.50 lb.
Adapter-booster, M115A1 (tail)	3.36 lb.
Fin assembly.....	12.30 lb.
Wire, arming, assembly.....	10 lb.

FUZES, BOMB TAIL, M123, M124, M125

Fuze, M123, for Bomb, G.P.,	100 lb., AN-M30A1
for Bomb, G.P.,	250 lb., AN-M57A1
Fuze, M124, for Bomb, G.P.,	500 lb., AN-M64A1
for Bomb, S.A.P.,	500 lb., AN-M58A2
Fuze, M125, for Bomb, G.P.,	1,000 lb., AN-M65A1
for Bomb, G.P.,	2,000 lb., AN-M66A1
for Bomb, S.A.P.,	1,000 lb., AN-M69A1

The M123, M124, and M125 Fuzes are of the long-delay type: 1, 2, 6, 12, 24, 36, 72 and 144 hours. The delay is marked on each. These fuzes differ only in the length of the arming stems. The variation is similar to that of the AN-M100A2, AN-M101A2 and AN-M102A2 Fuzes.

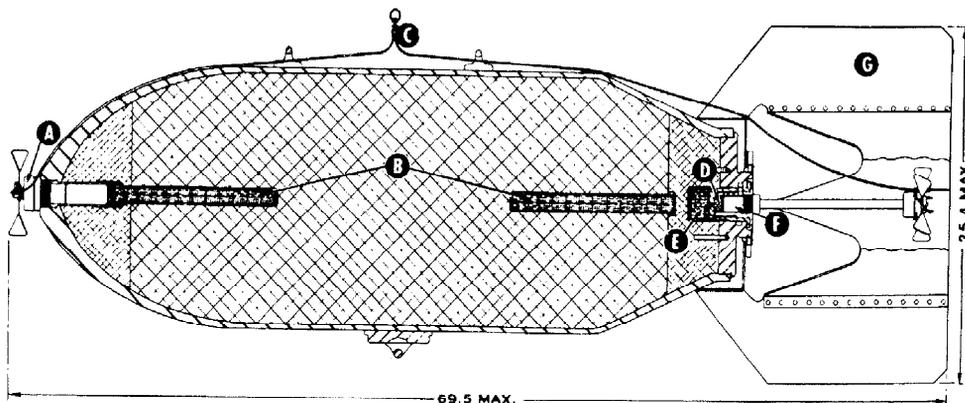
The M123, M124, and M125 Fuzes also have a "booby-trap" arrangement for instantaneous detonation when the fuze is withdrawn by the enemy. Extreme care must be used in handling these fuzes and all precautions, shown on the tags attached to each, should be followed carefully.

UNCLASSIFIED

BOMBS, GENERAL PURPOSE

1,000 LB., AN-M65A1 AND 2,000 LB., AN-M66A1—STANDARD

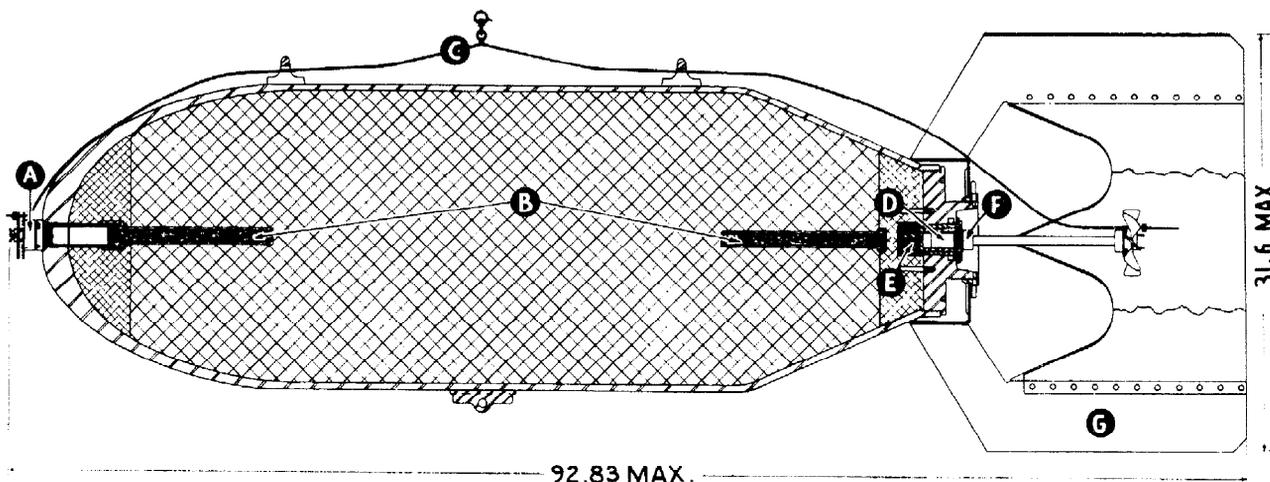
BOMB, G.P., 1,000 LB., AN-M65A1—STANDARD



AN-M65A1 AND AN-M66

- (A) Fuze, bomb nose, AN-M103
- (B) Booster, auxiliary, M104
- (C) Wire, arming, assembly
- (D) Primer-detonator, M14
- (E) Adapter-booster, M115A1 (tail)
- (F) Fuze, bomb tail, AN-M102A2, 0.1 sec. delay
- (G) Fin assembly

BOMB, G. P., 2,000 LB., AN-M66A1—STANDARD



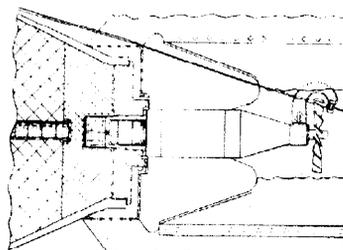
The large general purpose bombs are used against reinforced concrete bridges, dams, steel railroad bridges, piers, approach spans, such seacraft as heavy cruisers, etc.

BOMB, G. P., 1,000 LB., AN-M65A1—STANDARD—A complete round assembly includes: Bomb, G. P., 1,000 pound, AN-M65A1, unfuzed, and without fin assembly; Fin assembly; Fuze, bomb nose, AN-M103; Fuze, bomb tail, AN-M102A2, or Fuze, hydrostatic, AN-Mk. 230 (tail); Wire, arming, assembly, per mk. 82-3-234ZA.

The bomb is made of steel with cylindrical body and box-type fins. It is 69.5 inches long and 25.4 inches across the fins. The center of gravity is 26 inches from the nose. Two suspension lugs, 14 inches apart, are provided for suspension in horizontal racks.

The explosive filler consists of 489 pounds of cast 50-50 amatol, and 39.6 pounds of cast TNT surrounding the fuze boosters. An alternative filler is 547.1 pounds of cast TNT. Still another loading is 571.4 pounds of Composition "B."

FUZE, TAIL, HYDROSTATIC, AN-Mk. 230



UNCLASSIFIED

BOMBS, GENERAL PURPOSE

1,000 LB., AN-M65A1 AND 2,000 LB., AN-M66A1

(Continued)

The nose fuze, AN-M103, has selective, instantaneous or short-delay arming and is of the arming vane type. Settings of either 0.1 second delay or superquick may be made.

The tail fuze, AN-M102A2, with the primer-detonator, M14, is used. This fuze is of the arming vane type.

When the bombs are dropped on water targets, the hydrostatic fuze, AN-Mk. 230, is used. This fuze may be set to function at various depths.

Like the 250 pound and 500 pound general purpose bombs, the 1,000 pound and 2,000 pound bombs may be equipped with special purpose tail fuzes.

When assembled with the tail fuze, M114A1, and M16 primer-detonator with from 4 or 5 seconds delay or from 8 to 11 seconds delay, these bombs are used primarily for "skip" bombing tactics.

The M112A1, M113A1, and M114A1 fuzes differ in the length of the arming vane stems. Stems of different lengths are required to set the vanes properly in relation to the airstream. The M117 fuze may be used as an alternate to the M114A1.

Fuze, M125, also may be used. (See page 574.)

Bomb components and their weights are as follows:

Bomb, as dropped (Amatol 50-50 loading)	997.00 lb.
Bomb, as dropped (cast TNT loading)	1,008.00 lb.

Bomb, as dropped (Composition "B" loading)	1,038.40 lb.
Explosive filling (Amatol 50-50)	530.00 lb.
Explosive filling (cast TNT)	547.10 lb.
Explosive filling (Composition "B")	571.40 lb.
Fuze, bomb nose, AN-M103	4.00 lb.
Fuze, bomb tail, AN-M102A2	3.20 lb.
Fuze, bomb tail, M114A1	2.80 lb.
Fuze, bomb tail, M117	3.20 lb.
Adapter-booster M115A1 (AN-M102A2 fuze)	3.36 lb.
Fuze, hydrostatic, AN-Mk. 230 (tail)	14.50 lb.
Adapter-booster, M115A1 (AN-Mk. 230 fuze)	2.16 lb.
Fin assembly	21.50 lb.
Wire, arming, assembly10 lb.

BOMB, G. P., 2,000 LB., AN-M66A1—

STANDARD—The complete round assembly includes: Bomb, G. P., 2,000 pound, AN-M66A1, unfuzed and without fin assembly; Fin assembly; Fuze, bomb nose, AN-M103; Fuze, bomb tail, AN-M102A2, 0.1 second delay, or Fuze, tail, hydrostatic, AN-Mk. 230; Wire, arming, assembly, pc. mk. 82-3-234 AB.

The 2,000 pound general purpose bomb is cylindrical in shape with box-type fins. It is 92.83 inches long and 31.6 inches across the fins. The center of gravity is 33.5 inches from the nose.

The explosive filler is 1,014 pounds of cast 50-50 amatol and 45.2 pounds of

cast TNT surrounding the fuze boosters. The filler is 52% of the total weight of the bomb. An alternate filler is 1,095.0 pounds of cast TNT. A second alternate filling consists of 1,144.5 pounds of Composition "B."

Fuzes used are those described under the 1,000 pound general purpose bomb, AN-M65A1.

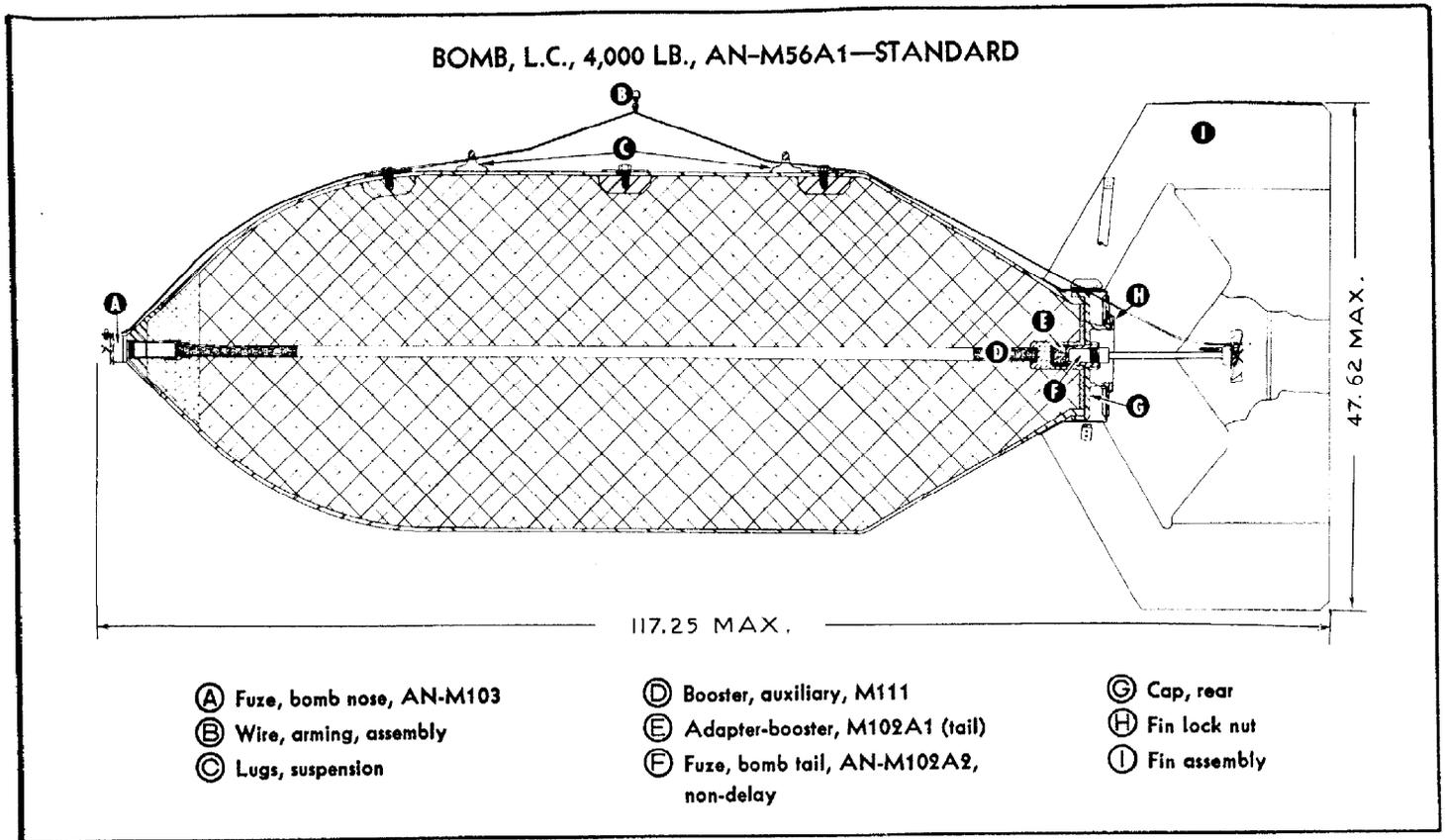
Fuze, M125, also may be used. (See page 574.)

Bomb components and their weights are as follows:

Bomb, as dropped (50-50 amatol loading)	2,052.00 lb.
Bomb, as dropped (Cast TNT)	2,096.90 lb.
Bomb, as dropped (Composition "B")	2,145.50 lb.
Explosive filler (50-50 amatol)	1,061.00 lb.
Explosive filler (Cast TNT)	1,095.90 lb.
Explosive filler (Composition "B")	1,144.50 lb.
Fuze, bomb nose, AN-M103	4.00 lb.
Fuze, bomb tail, AN-M102A2	3.20 lb.
Fuze, bomb tail, M114A1	2.80 lb.
Fuze, bomb tail, M117	3.20 lb.
Adapter-booster, M115 (AN-M102A2 fuze)	3.36 lb.
Fuze, tail, hydrostatic, AN-Mk. 230	14.50 lb.
Adapter-booster, M115A1 (AN-Mk. 230)	2.16 lb.
Fin assembly	38.60 lb.
Wire, arming, assembly13 lb.

BOMB, LIGHT CASE, 4,000 LB., AN-M56A1—STANDARD

BOMB, DEPTH, AIRCRAFT, 350 LB., AN-MK. 47—STANDARD



BOMB, L. C., 4,000 LB., AN-M56A1—STANDARD—This is one of the heaviest bombs manufactured, and is known as the “block buster.” Its large explosive charge and thin wall case make it effective against buildings and naval targets. It depends upon its blast effect for the amount of damage. The fact that very little metal, in relation to the total weight, is used places the bomb in the light case class with the explosive filler approximating 77% of the total weight.

A complete round assembly includes: Bomb, light case, 4,000 pounds, AN-M56A1, unfuzed and without fin assembly; Fin assembly; Fuze, bomb nose, AN-M103; Fuze, bomb tail, AN-M102-A2, non-delay; Wire, arming, assembly, pc. mk. 82-3-234 UA; Booster, auxiliary, M111, pc. mk. 82-3-307 A.

The nose fuze, AN-M103, is a selective instantaneous or short-delay arming vane type fuze. Settings of superquick or 0.1 second delay may be made.

Fuze, bomb tail, AN-M102A2, non-delay, is an arming vane type fuze.

The bursting charge is amatol and weighs approximately 3,205 pounds. Surrounding the fuzes is approximately 28.6 pounds of cast TNT, with the auxiliary booster weighing 4.39 pounds. An alternative filling is 3,350 pounds of cast TNT.

The fuzed bomb measures 117.25 inches in length and 47.62 inches across the fins. The center of gravity is 48 inches from the nose. The two suspension lugs are located 30 inches apart.

The bomb is shipped with the explosive

filler and the fuze threads protected by closing plugs. The fuzes are inserted in the field and the fin assembly is attached and locked to the bomb with the fin lock nut.

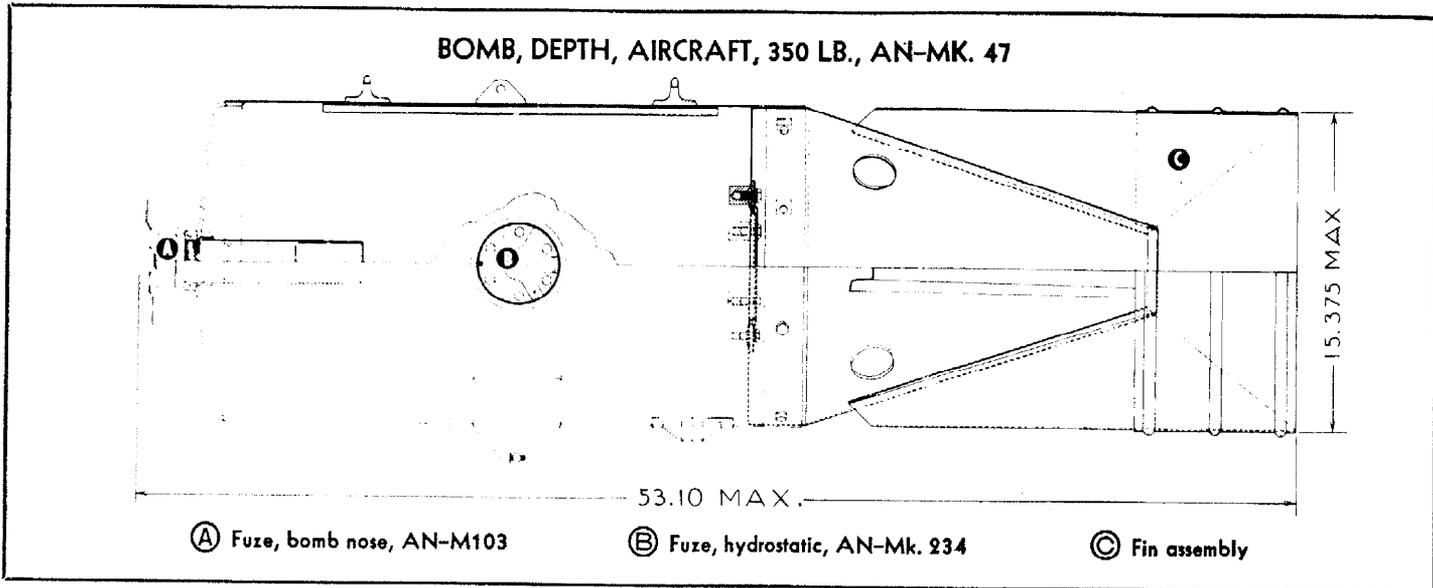
The bomb components and their weights are as follows:

Bomb, as dropped.....	4,232.00 lb.
Fin assembly.....	108.00 lb.
Adapter-booster, M102 (tail).....	1.37 lb.
Booster, auxiliary, M111..	4.39 lb.
Fuze, bomb nose, AN-M103	4.00 lb.
Fuze, bomb tail, AN-M102-A2.....	3.15 lb.
Wire, arming, assembly...	.14 lb.
Explosive (50-50 amatol) incl. auxiliary boosters and surrounds.....	3,238.00 lb.

BOMB, LIGHT CASE, 4,000 LB., AN-M56A1

BOMB, DEPTH, AIRCRAFT, 350 LB., AN-MK. 47

(Continued)



BOMB, DEPTH, AIRCRAFT, 350 LB., AN-MK. 47—STANDARD—This is the only depth bomb standard for issue and manufacture. It was originally a Navy item but has been standardized for both Army and Navy use. The AN-Mk. 47 bursting charge is torpex but a substitute standard 325 pound bomb, AN-Mk. 41, is TNT loaded.

The two bombs are identical except for the bursting charges. Until facilities are available to load all depth bombs with torpex, both TNT and torpex bombs are being manufactured.

The complete round assembly includes: Bomb, depth, aircraft, 350 pound, AN-Mk. 47, without fuzes and fin assembly;

Fin assembly; Fuze, bomb nose, AN-M103; Fuze, hydrostatic, AN-Mk. 234.

With fuzes and fins assembled the bomb measures 53.1 inches in length and 15.375 inches across the fins.

The bomb has two lugs for double suspension and one lug for single suspension. It is also equipped with a hoisting lug and a seat for the bomb-rack steadying fork.

The fuze, hydrostatic, AN-Mk. 234, goes completely through the bomb and water pressure can act on both sides of it to activate the fuze.

The nose fuze, AN-M103, is of the selective instantaneous or short-delay arming vane type.

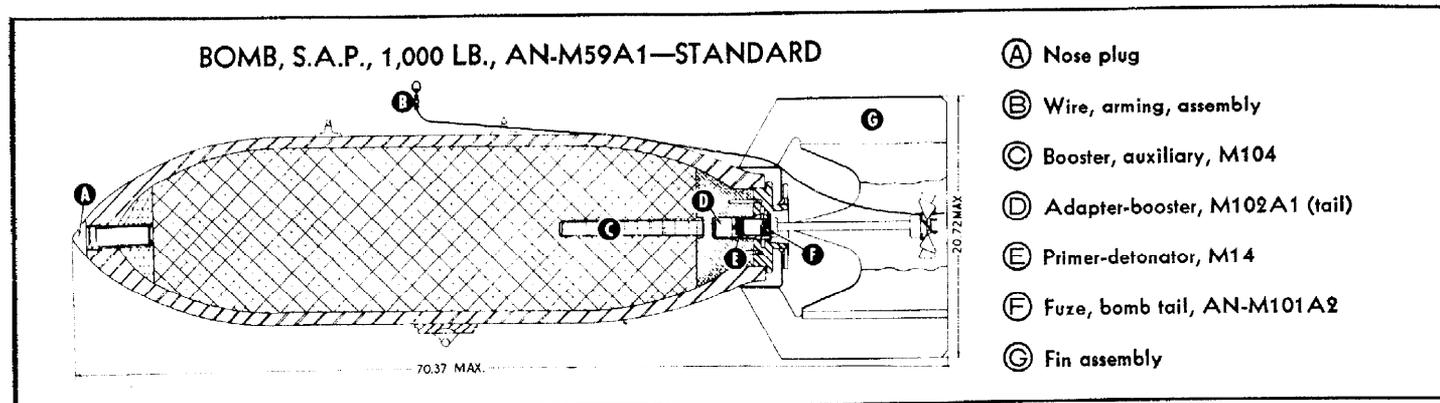
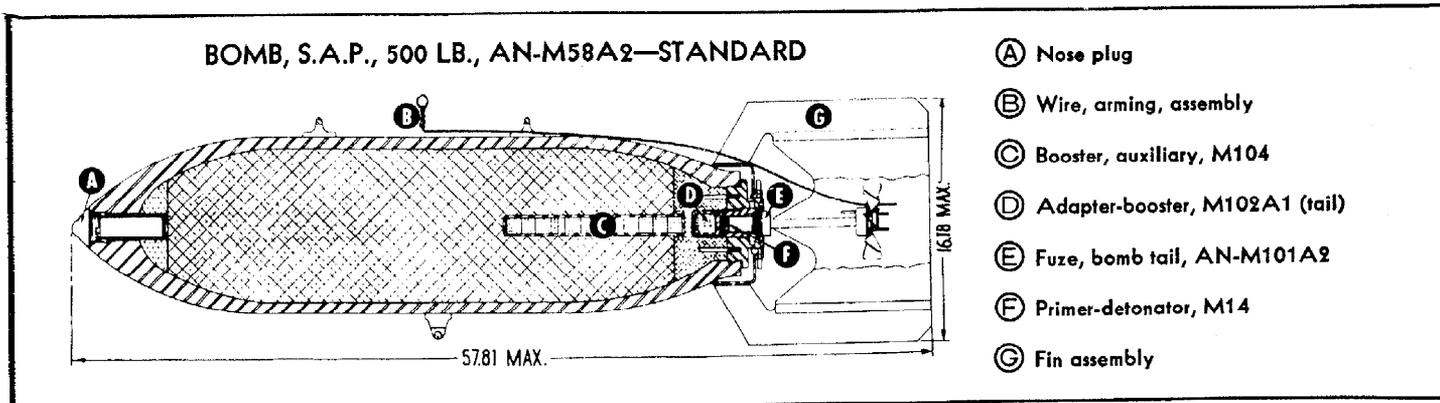
Loaded with 252 pounds of torpex, the bomb is the AN-Mk. 47; loaded with 227 pounds of Grade "A" cast TNT, it is the AN-Mk. 41. The torpex filler is 71.09% of the weight of the 350 pound bomb, and the TNT filler is 68.89% of the 325 pound bomb.

The bomb components and their weights are as follows:

Bomb, as dropped (AN-Mk. 47)	354.50 lb.
Bursting charge (torpex)	252.00 lb.
Bomb, as dropped (AN-Mk. 41)	329.50 lb.
Bursting charge (TNT)	227.00 lb.
Fuze, bomb nose (AN-M103)	4.00 lb.

BOMB, SEMI-ARMOR-PIERCING, 500 LB., AN-M58A2—STANDARD

BOMB, SEMI-ARMOR-PIERCING, 1,000 LB., AN-M59A1—STANDARD



Semi-armor-piercing bombs are highly effective against armor plate, reinforced concrete and similar resistant targets. They have a heavy-case construction of special steel and are of conventional shape with cylindrical body and box-type fins. The nose adapter is usually filled with a steel plug.

BOMB, S.A.P., 500 LB., AN-M58A2—STANDARD—Components of a complete round assembly are: Bomb, S.A.P., 500 pounds, AN-M58A2, unfuzed and without fin assembly; Fin assembly; Fuze, bomb tail, AN-M101A2; Wire, arming, assembly, pc. mk. 82-3-234 VA.

The bomb measures 57.8 inches in length and 16.18 inches across the fins. The suspension lugs are approximately 14 inches apart, and the center of gravity is 23.5 inches from the nose.

The tail fuze, AN-M101A2, has mechanical delay arming and is of the arming vane type. With the M14 primer-detonator, delays of 0.025 second, 0.01 second, 0.1 second, or non-delay may be obtained.

Alternate tail fuzes, M113A1 or M116, are to be used to give longer delays of 4

to 5 seconds or 8 to 15 seconds, according to the primer-detonator used. These primer-detonators are M16 and M16A1.

Fuze, M124, also may be used. (See page 574.)

The explosive filler consists of 139 pounds of cast 50-50 amatol and 5.5 pounds of cast TNT around the fuze. The explosive filler is 30% of the total weight of the bomb. An alternative filling is 150.5 pounds of TNT.

Components and weights are:

Bomb, as dropped	499.50 lb.
Explosive filler	144.50 lb.
Fuze, bomb tail, AN-M101A2	2.90 lb.
Fuze, bomb tail, M113A1	2.50 lb.
Fuze, bomb tail, M116	2.90 lb.
Adapter-booster, M102A1 (tail)	1.37 lb.
Fin assembly	11.40 lb.
Wire, arming, assembly	0.06 lb.

BOMB, S.A.P., 1,000 LB., AN-M59A1—STANDARD—A complete round assembly includes: Bomb, S.A.P., 1,000 pounds, AN-M59A1, unfuzed and without fin assembly; Fin assembly; Fuze, bomb tail, AN-M102A2; Wire, arming, assembly, pc. mk. 82-3-234 VA.

The bomb is 70.4 inches long and 20.72 inches across the fins. The center of gravity is 28.6 inches from the nose.

The explosive filler is 292.25 pounds of cast 50-50 amatol and 10.7 pounds of cast TNT. The filler comprises 31% of the bomb weight. An alternate filler is 311.6 pounds of cast TNT.

The fuze, bomb tail, AN-M102A2, has characteristics identical with the AN-M100A2 fuze except that the vane stem is 7 inches longer to permit proper placement of the arming vane in the airstream. Two alternate tail fuzes are the M114A1 and M117.

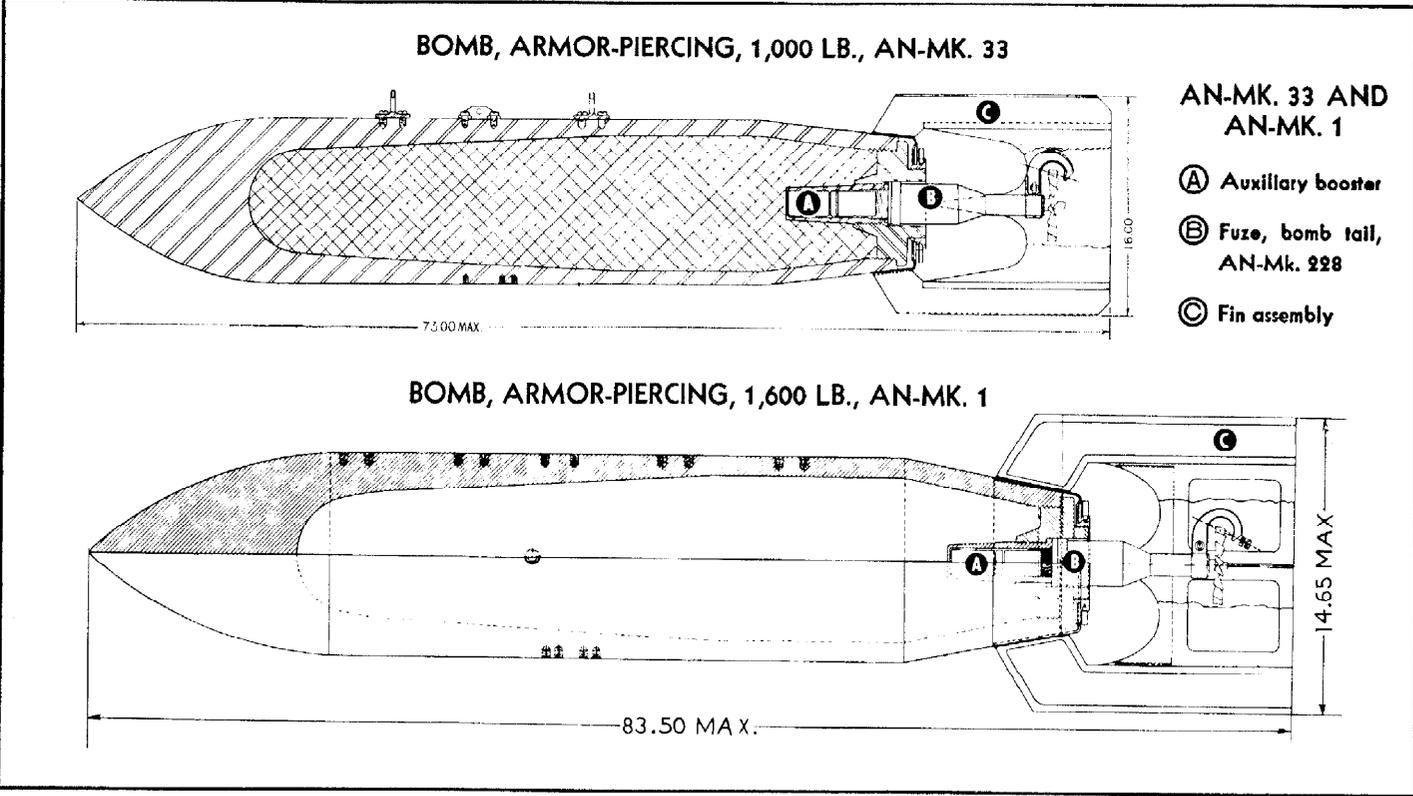
Fuze, M125, also may be used. (See page 574.)

The following are the bomb components and weights:

Bomb, as dropped	987.50 lb.
Explosive filler	303.25 lb.
Fuze, bomb tail, AN-M102A2	3.20 lb.
Fin assembly	17.00 lb.
Adapter-booster, M102A1 (tail)	1.37 lb.
Arming wire assembly	0.06 lb.
Fuze, bomb tail, M114A1	2.80 lb.
Fuze, bomb tail, M117	3.20 lb.

BOMB, ARMOR-PIERCING, 1,000 LB., AN-MK. 33—STANDARD

BOMB, ARMOR-PIERCING, 1,600 LB., AN-MK. 1—STANDARD



- AN-MK. 33 AND AN-MK. 1**
- (A) Auxiliary booster
 - (B) Fuze, bomb tail, AN-Mk. 228
 - (C) Fin assembly

BOMB, ARMOR-PIERCING, 1,000 LB., AN-MK. 33—STANDARD—The complete round assembly of this bomb consists of:

- Bomb, A. P., 1,000 lb., AN-Mk. 33, without fuze and fin assembly;
- Fin assembly;
- Fuze, bomb tail, AN-Mk. 228;
- Arming wire assembly;
- Base plug assembly.

The bomb is 73 inches long and 16.6 inches across the fins. The center of gravity is 29.65 inches from the nose.

The armor-piercing qualities of this bomb are derived from the heavy weight, the thick steel pointed nose section, and the special high-stress steel from which the bomb is manufactured.

For suspension in Navy airplanes two lugs are provided on the side of the bomb, 14 inches apart. When used in Army airplanes the lugs are 30 inches apart. For use in British airplanes a single suspension is provided at the center of gravity at a point 180° from the Navy and Army suspension lugs. A hoisting lug is provided for loading the bomb into the airplane. All lugs are bolted to the bomb and may be removed if not needed.

Two loadings of bursting charge are

used: Explosive "D" and TNT. When loaded with 140 pounds of Explosive "D," the bomb weighs 1,008 pounds; when 144 pounds of TNT are used the bomb weighs 1,012 pounds. The Explosive "D" filler is 14.1 percent of the weight of the bomb, and the TNT filler is 14.5 percent.

The AN-Mk. 228 tail bomb fuze is an arming vane type fuze with a delay element to permit penetration of armor plate before detonation.

Weight of the bomb components are as follows:

Bomb (as dropped, Explosive "D" loaded)	1,008 lb.
Bomb (as dropped, TNT loaded)	1,012 lb.
Explosive "D" filler	140 lb.
TNT filler	144 lb.
Metal parts	868 lb.

BOMB, ARMOR-PIERCING, 1,600 LB., AN-MK. 1—STANDARD—A complete round assembly for this bomb consists of the following:

- Bomb, A. P., 1,600 pound, AN-Mk. 1, unfuzed and without tail assembly;
- Fin assembly;
- Fuze, bomb tail, AN-Mk. 228;
- Wire, arming, assembly;
- Auxiliary boosters.

This bomb is used by the United States Army and Navy and by the British Air Forces. The suspension lugs may be positioned so as to permit securing the bomb in any racks, inside or outside the plane, used by those services.

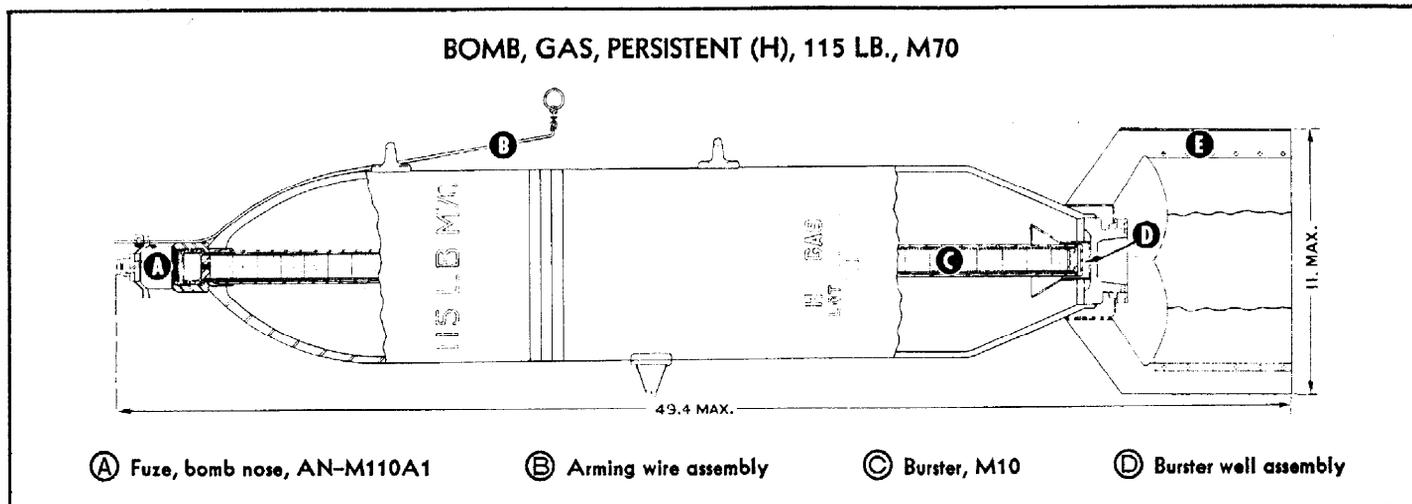
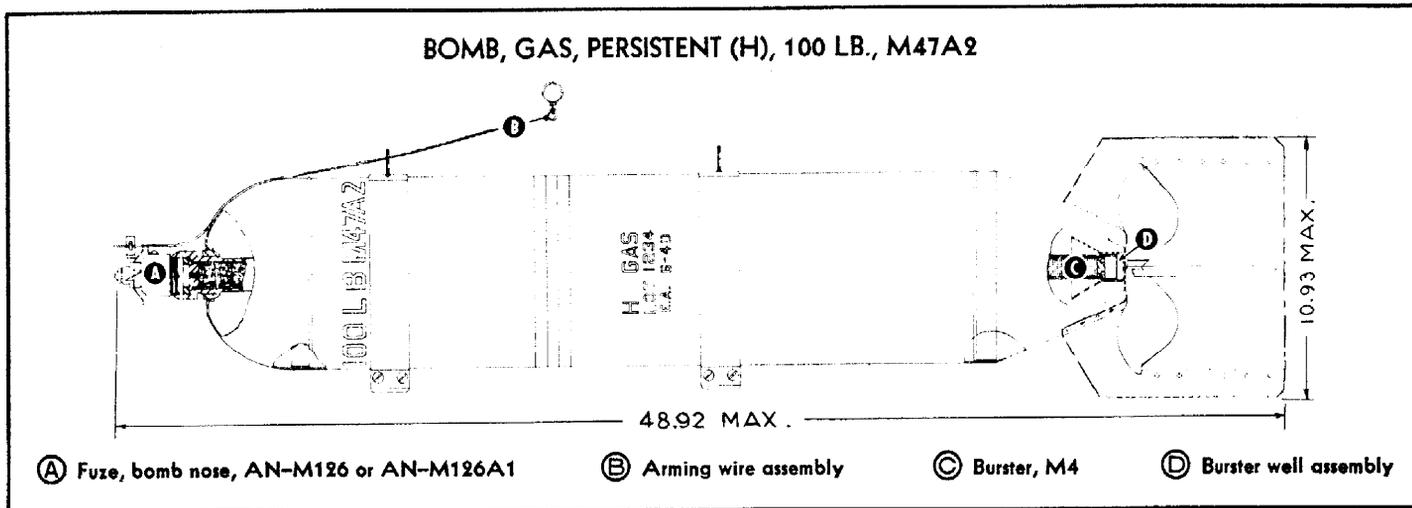
The bomb measures 83.5 inches in length and 14.65 inches across the fins. The center of gravity is 33.58 inches from the nose.

Loaded with Explosive "D," the bomb weighs 1,601 pounds, the 216 pounds of explosive being 13.5 percent of the bomb weight. The alternate TNT loading of 228 pounds gives a bomb weight of 1,613 pounds of which the TNT is 14.1 percent.

The fixed delay fuze, AN-Mk. 228, Mod. 1, has an 0.08 second delay after impact, making this bomb highly effective against heavily armored warships. The bomb will penetrate 6.5 inches of homogeneous armor plate set at 35°. Weights are as follows:

Bomb, loaded (Explosive "D") and fuzed	1,601.00 lb.
Bomb, loaded (TNT) and fuzed	1,613.00 lb.
Explosive "D" charge	216.00 lb.
TNT (alternate) charge	228.00 lb.

BOMB, GAS, PERSISTENT (H), 100 LB., M47A2—STANDARD
BOMB, INCENDIARY LIQUID, 100 LB., M47A2—STANDARD
BOMB, SMOKE (WP), 100 LB., M47A2—STANDARD
BOMB, GAS, PERSISTENT (H), 115 LB., M70—STANDARD



Chemical bombs are of two classes: those for nonpersistent gases (smoke), and those for persistent gases (H).

Since wide diffusion of the nonpersistent gases is not desired, a small burster which merely splits the case is used with chemical charges of that type. A larger burster is used with persistent fillers since the tactical employment of that gas requires its diffusion over as wide an area as possible.

Use of an instantaneous fuze permits the bomb to function upon impact with the ground without burying itself.

BOMB, GAS, PERSISTENT (H), 100 LB., M47A2—STANDARD—The complete round assembly of this bomb includes: Bomb, gas, persistent (H), 100 pound, M47A2, unfuzed and without burster; Fuze, bomb nose, AN-M126 or AN-M126A1; Burster assembly, M4; Wire, arming, assembly, pc. mk. 82-3-234 KC.

The bomb is shipped loaded and filled and the burster assembly and fuze are inserted in the field.

This bomb does not follow the shape of most of the bombs made today in that, although it is cylindrical in shape and

has box fins, the nose is blunt and spherical in shape. It is 48.92 inches long and 10⁹/₁₆ inches across the fins. The center of gravity is 18.5 inches from the nose. Constructed of sheet metal, the bomb is of welded construction with the fins welded to the body. Because of the light-weight metal used, 70% of the bomb weight is persistent gas (H).

The AN-M126 (Substitute Standard) and AN-M126A1 (Standard) fuzes are used with this bomb. The AN-M126 fuze is made of aluminum and weighs 0.68 pound. The AN-M126A1 fuze is of all-steel con-

BOMB, GAS, PERSISTENT (H), 100 LB., M47A2

BOMB, INCENDIARY LIQUID, 100 LB., M47A2

BOMB, SMOKE (WP), 100 LB., M47A2

BOMB, GAS, PERSISTENT (H), 115 LB., M70

(Continued)

struction and weighs 1.10 pounds. These fuzes are screwed into the burster tube instead of being held in place by two steel balls under spring pressure, the retaining method used on the old nose fuze, M108, which they replace.

The bomb components and their weights are as follows:

Bomb, as dropped.....	98.00 lb.
Fuze, bomb nose, AN-M126 .	0.68 lb.
Fuze, bomb nose, AN-M126A1	1.10 lb.
Burster, M4.....	2.40 lb.
Burster well assembly.....	3.50 lb.
Charge, gas (H).....	68.50 lb.
Arming wire assembly.....	0.02 lb.

BOMB, INCENDIARY LIQUID, 100 LB.,

M47A2—STANDARD—A complete round assembly of this bomb includes: Bomb, incendiary liquid, 100 pound, M47A2, unfuzed and without burster; Fuze, bomb nose, AN-M126 or AN-M126A1; Burster assembly, M7; Wire, arming, assembly, pc. mk. 82-3-234 KC.

The bomb is shipped empty and the incendiary liquid, a gasoline and rubber solution, is added in the field. The burster contains 1 pound of black powder, the amount required to burst the bomb and spread the incendiary liquid over a large area.

The shape and size of this bomb are the same as the M47A2 persistent gas bomb. The same fuzes are used. The incendiary liquid weighs 39 pounds or 57% of the weight of the bomb. Because of the light weight of the liquid the bomb

does not weigh 100 pounds as the nomenclature indicates but only 68 pounds.

The bomb components and their weights are as follows:

Bomb, as dropped.....	68.00 lb.
Fuze, bomb nose, AN-M126 .	0.68 lb.
Fuze, bomb nose, AN-M126A1	1.10 lb.
Burster, M7.....	2.00 lb.
Burster well assembly.....	3.50 lb.
Charge, incendiary liquid . . .	39.00 lb.
Arming wire assembly.....	0.02 lb.

BOMB, SMOKE (WP), 100 LB., M47A2

—STANDARD—The complete round assembly includes: Bomb, smoke (WP), 100 pound, M47A2, unfuzed and without burster; Fuze, bomb nose, AN-M126 or AN-M126A1, Burster assembly, M4; Wire, arming, assembly, pc. mk. 82-3-234 KC.

This bomb is also similar in shape and size to the 100 pound persistent gas bomb, M47A2, using the same fuzes and burster. The difference is in the smoke charge (WP). The charge weighs 100 pounds and is 77.2% of the weight of the bomb.

The bomb components and their weights are as follows:

Bomb, as dropped.....	129.50 lb.
Fuze, bomb nose, AN-M126 .	0.68 lb.
Fuze, bomb nose, AN-M126A1	1.10 lb.
Burster, M4.....	2.40 lb.
Burster well assembly.....	3.50 lb.
Charge, smoke (WP).....	100.00 lb.
Arming wire assembly.....	0.02 lb.

BOMB, GAS, PERSISTENT (H), 115 LB.,

M70—STANDARD—The complete round assembly includes: Bomb, gas, persistent (H), 115 pound, M70, unfuzed, without burster, and without fin assembly; Fuze, bomb nose, AN-M110A1; Burster assembly, M10; Fin assembly; Wire, arming, assembly, pc. mk. 82-3-234 KC.

This bomb differs from the other chemical bombs in that the body is made from steel tubing and has a separate fin assembly. It measures 49.4 inches in length and 11 inches across the fins. The center of gravity is 19 inches from the nose. Two lugs, 14 inches apart, are provided for double suspension and a single lug is located at the center of gravity for single suspension.

The bomb is shipped loaded and with closing plugs to seal the bomb and to protect the fuze threads. The burster and fuze are inserted and the fin assembly is attached in the field.

In comparison with other chemical bombs the percentage of chemical filler to the weight of the bomb is small—only 48.1% of the total weight.

The bomb components and their weights are as follows:

Bomb, as dropped.....	126.00 lb.
Fuze, bomb nose, AN-M110A1	1.02 lb.
Burster, M10.....	2.32 lb.
Burster well assembly.....	3.66 lb.
Charge, gas, persistent (H) . .	60.60 lb.
Fin assembly.....	3.50 lb.
Arming wire assembly.....	.02 lb.

UNCLASSIFIED

BOMBS, PRACTICE (MINIATURE), 3 LB., AN-MK. 5, MOD. 1;

3 LB., AN-MK. 23; 4½ LB., AN-MK. 43—STANDARD

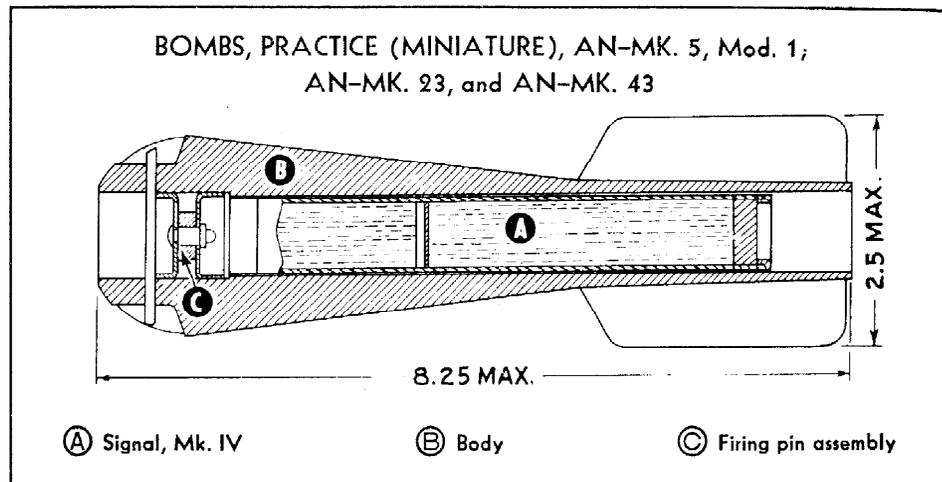
BOMBS, PRACTICE (MINIATURE), 3 LB., AN-MK. 5, Mod. 1, 3 LB., AN-MK. 23, 4½ LB., AN-MK. 43—STANDARD—These three miniature practice bombs are identical in shape and appearance. They measure 8.25 inches in length and 2.5 inches across the fins.

All three of the bombs have the same firing pin assembly. The firing pin assembly is held in the bomb by a cotter pin. Each of these bombs also has the Mk. IV signal which ignites when it slams down against the firing pin upon the bomb striking the target. This fires the primer which in turn ignites the signal.

The difference in weights of these three bombs and the difference in designation is due to the composition of the bombs.

The 3 pound, AN-Mk. 5, Model 1, miniature practice bomb is made from a cast-zinc base alloy. A.S.T.M., designation B86-33T alloy XXIII, 95 percent by weight being zinc.

Cast iron is used in the 3 pound, AN-Mk. 23, bomb, and a lead alloy in



the 4½ pound, AN-Mk. 43, bomb. The composition of this alloy is 90 percent to 88 percent lead A.S.T.M., common, and 12 percent to 10 percent antimony, by weight.

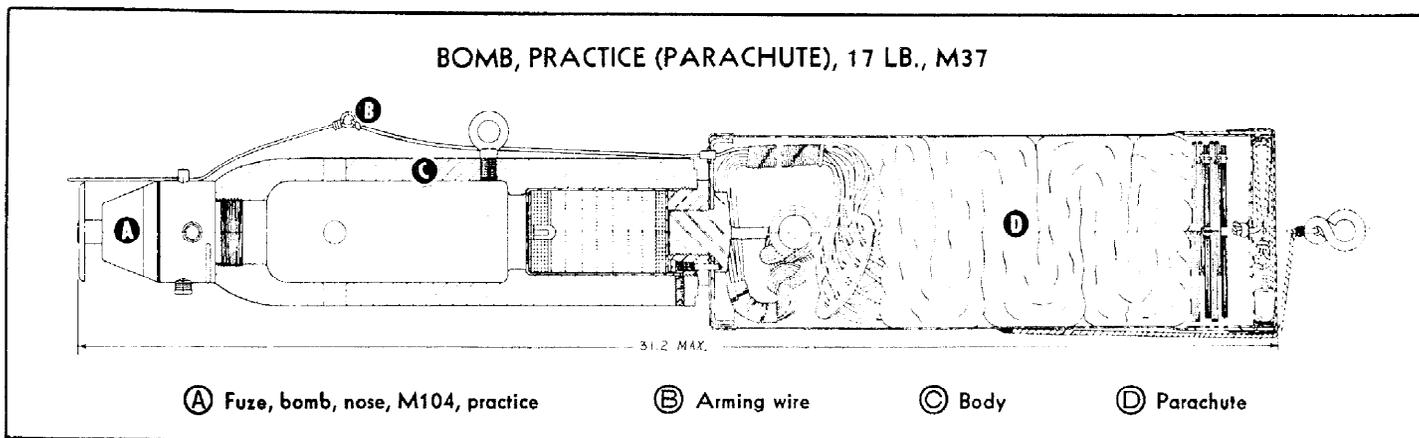
A shortage of zinc used in the Mk. 5, Model 1, bomb necessitated the design of

the cast-iron and the lead-alloy bombs.

Weights of the bombs, with and without the signal, Mk. IV, are as follows:

	With	Without
AN-MK. 5, Mod. 1.....	2.69 lb.	2.56 lb.
AN-MK. 23.....	3.00 lb.	2.87 lb.
AN-MK. 43.....	4.50 lb.	4.37 lb.

BOMB, PRACTICE (PARACHUTE), 17 LB., M37—LIMITED STANDARD



BOMB, PRACTICE (PARACHUTE), 17 LB., M37—LIMITED STANDARD—The complete round assembly consists of the following components:

Bomb, practice, 17 lb., M37 (without parachute and case assembly, fuze and smoke charge):

Parachute and case assembly for 17 lb.

practice bomb, M37 (arming wire is attached to parachute and case assembly).

This bomb is similar to the 23 lb., M40, fragmentation bomb. It permits safe handling by inexperienced personnel until they become trained in the handling and use of the bomb.

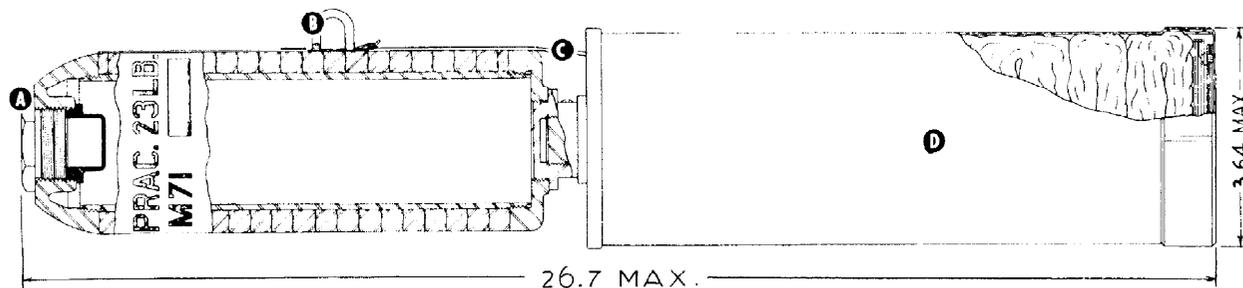
Either the bomb body or the para-

chute and case assembly may be used repeatedly until either component becomes unserviceable whereupon the part can be replaced.

For suspension in vertical racks, suspension wires with an S-hook are provided; for horizontal suspension, a lug is used on the side of the bomb.

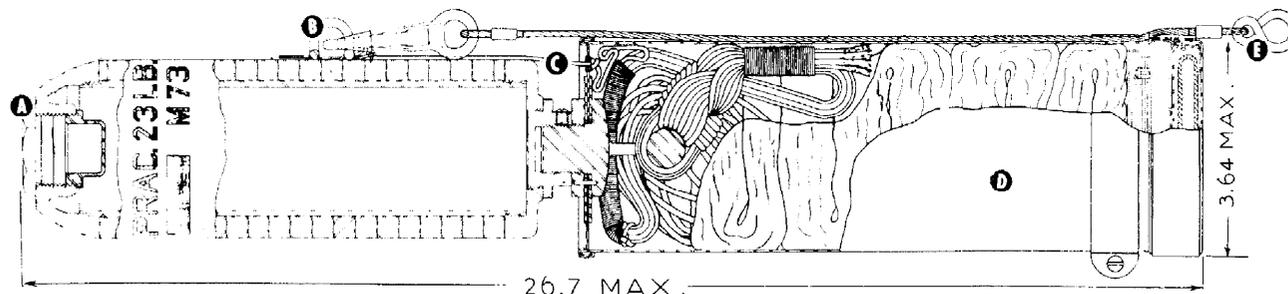
BOMBS, PRACTICE, 23 LB., M71 AND M73—STANDARD

BOMB, PRACTICE, 23 LB., M71



- (A) Closing plug (B) Horizontal suspension lug (C) Arming cord (D) Parachute assembly unit (E) S-hook (vertical suspension)

BOMB, PRACTICE, 23 LB., M73



- (A) Closing plug (B) Horizontal suspension lug (C) Arming cord (D) Parachute assembly unit (E) S-hook (vertical suspension)

BOMBS, PRACTICE, 23 LB., M71 AND M73—STANDARD—Due to the fact that the 17 pound practice bomb, M37, could be used only in aircraft where vertical suspension was available (and therefore could not be used for clustering), the M71 and M73 practice bombs were standardized.

The M71 practice bomb as standard-

ized is used with the M5 practice bomb cluster, and the M73 practice bomb is provided with an S-hook for vertical suspension.

The body of both these bombs is the same as that used with the 23 pound, AN-M40, practice bomb. The parachute assembly for the M71 bomb is the same as that used with the AN-M40 bomb;

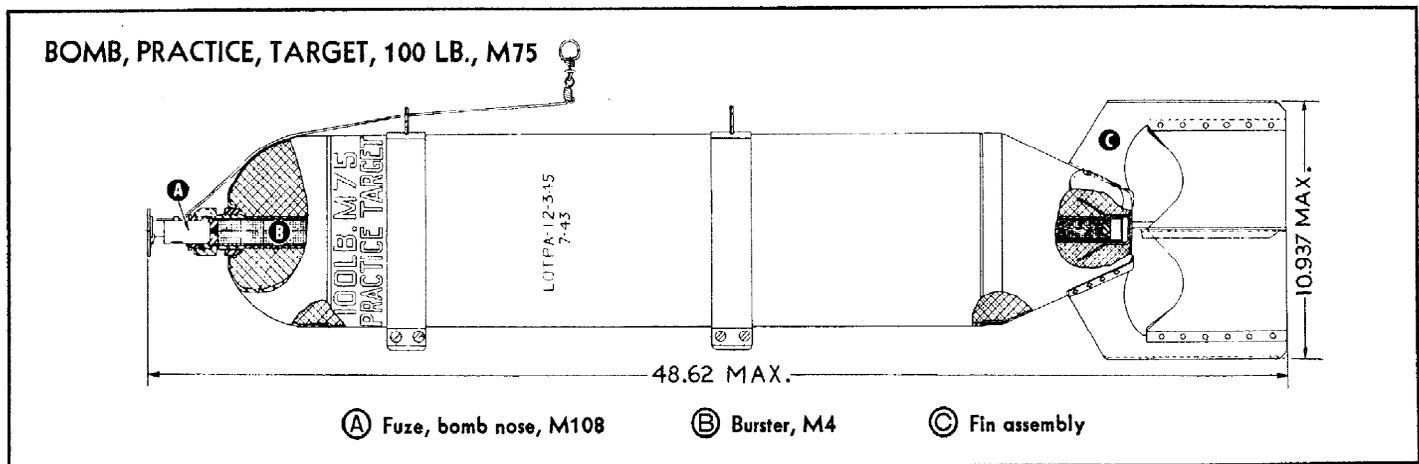
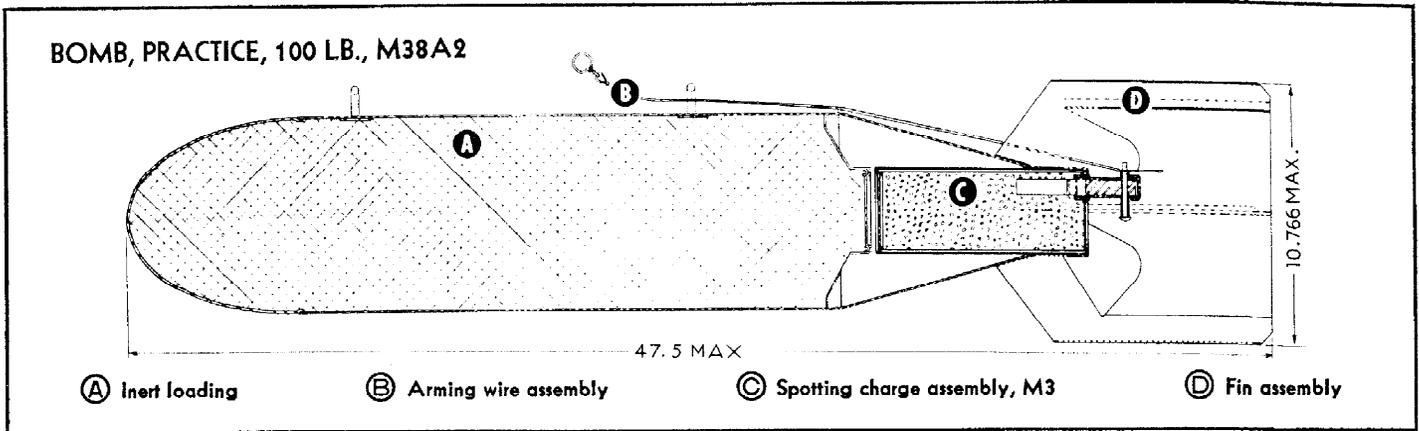
whereas, the parachute assembly for the M73 bomb is the same as that used with the M72 bomb.

The bodies of the bombs are not loaded and, instead of a fuze, a closing plug is used.

Both bombs measure 26.7 inches in length, 3.64 inches in diameter, and both weigh 21.0 pounds.

BOMB, PRACTICE, 100 LB., M38A2—STANDARD

BOMB, PRACTICE, TARGET, 100 LB., M75—SUBSTITUTE STANDARD



BOMB, PRACTICE, 100 LB., M38A2—STANDARD—This bomb is designed for general practice purposes in order to minimize so far as possible danger to personnel and matériel. The complete round assembly includes: Bomb, practice, 100 pound, M38A2, without spotting charge; Charge, spotting, assembly, M3; Wire, arming, assembly, pc. mk. 82-3-213 D for bombing when snow covers the ground. The bomb is made of sheet metal, and the box fins are welded to it. The conical nose is also welded to the body of the bomb.

The bomb is loaded with 80 pounds of sand, and the spotting charge assembly,

M3, is then inserted. This assembly consists of a fuze, primer, initial igniting charge, igniting charge, and a spotting charge. The charge itself is a 2.3-pound mixture of hexachlorethane, magnesium powder, anthracene, and black powder.

When the bomb is dropped, the arming wire is pulled out and the firing pin is free to strike the primer of a blank loaded 28-gage shotgun shell when the bomb hits the target.

The bomb measures 47.5 inches in length and 10⁴/₁₆ inches across the fins. The center of gravity is 18 inches from the nose.

BOMB, PRACTICE, TARGET, 100 LB., M75—SUBSTITUTE STANDARD—The practice bomb, M75, has been adopted by the Army Air Forces for laying out targets on snow covered terrain. A modification of the chemical bomb, M47A2, it has a sheet metal cylindrical body and box type fins. An M108 fuze is used with this bomb, but the striker plate of the fuze was enlarged so that functioning of the bomb might be obtained on or near the surface of the snow.

The bomb is loaded with 72 pounds of red iron oxide, and contains an M4 burster. It is 48.62 inches long, 8 inches in diameter, and weighs 101.3 pounds.

GRENADES

HAND GRENADES

TYPES

1. **FRAGMENTATION HAND GRENADES** containing a high-explosive charge in a metallic body which is shattered by the explosion of the charge.
2. **OFFENSIVE HAND GRENADES** containing a high-explosive charge in a paper body, designed for demolition or lethal shock effect.
3. **CHEMICAL HAND GRENADES** containing a chemical agent which produces a toxic or irritant effect, a screening smoke, incendiary action or any combination of these actions.
4. **PRACTICE HAND GRENADES** containing a reduced charge; simulate fragmentation grenades.
5. **TRAINING HAND GRENADES** used in training troops; do not contain explosives or chemicals.

The filler in a grenade may be a powerful explosive, a gas, a smoke-producing or an incendiary agent. The filler in fragmentation grenades is either TNT (trinitrotoluene) or EC Blank Fire Smokeless Powder. The latter is used in loading blank ammunition for small arms weapons.

CHARACTERISTICS OF FILLERS

EC powder is less powerful than TNT and usually is exploded by an igniting rather than a detonating agent. Grenades loaded with EC powder are issued fuzeed and ready for use. They are not susceptible to mass detonation.

The standard filler for offensive grenades is pressed TNT.

Fillers in chemical grenades consist of various chemical mixtures and solutions. The manufacturing, storage and issue of Chemical Grenades is a function of the Chemical Warfare Service.

Practice Grenades contain a small amount of black powder and are designed to give an indicating puff of smoke when the igniting type fuze functions.

TIME AND AUTOMATIC FUZES

The fuze is the device which causes the grenade to function. All standard hand grenade fuzes (including most of the chemical hand grenade fuzes) are Time and Automatic types. A "time" fuze fires the grenade after a lapse of time and not upon percussion or impact. Grenades which contain an "automatic" fuze function automatically as soon as the grenade leaves the hand, provided the safety pin has been removed and the safety lever held close to the body of the grenade prior to throwing. This lever provides a safety feature by eliminating the necessity of manually starting the fuze action before the grenade is thrown toward the target.

FUZE CLASSIFICATION

Hand grenade fuzes are either detonating or igniting types.

A detonating fuze is used when shock is necessary to initiate the action of the explosive filler.

Igniting fuzes are used when the filler is one which requires heat initiation. This type of fuze will ignite the filler as though it had been lighted by a match.

All detonating and igniting hand grenade fuzes have the same general form and appearance. The fuze assembly consists primarily of a fuze body, having a threaded portion to permit insertion into the grenade body, a safety lever which restrains a striker, a safety pin to hold the lever in place, and a deep cup which is crimped to the lower portion of the fuze body and extends inside the

grenade body when the fuze is assembled. The compound in the cup determines whether the final action of the fuze will be one of detonation or ignition.

OPERATION

The safety device is a cotter pin with a ring attached which enables it to be withdrawn easily. One end of the safety lever covers the top of the fuze body, sealing it against foreign bodies, and hooks over a lip in the fuze body. The other end of the safety lever extends downward and follows the contour of the grenade.

A grenade should be held with the safety lever pressed close to the grenade body by the palm of the hand. The thrower must take every precaution after withdrawing the safety pin, not to release his grip on the safety lever.

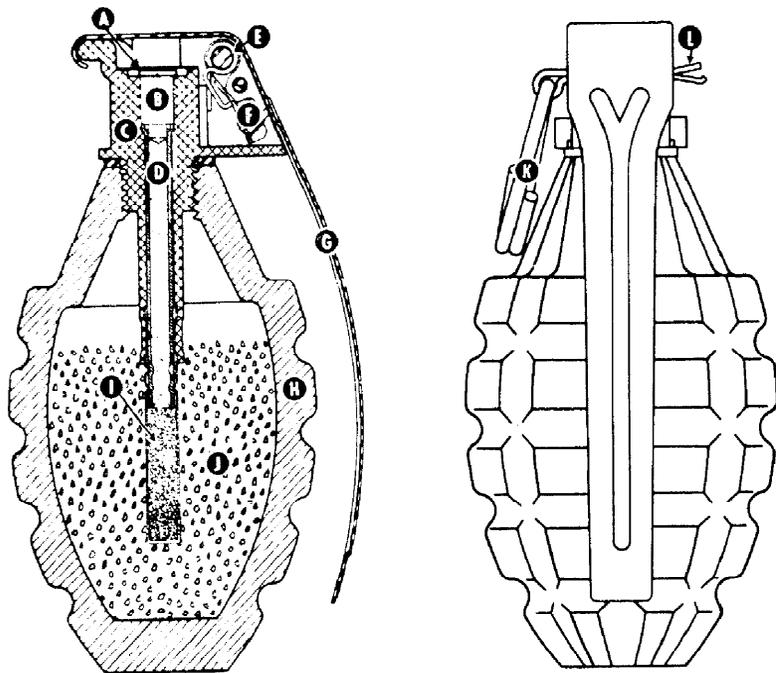
When the grenade is thrown, the safety lever is detached by the release of the striker spring and the impact of the striker. When no longer restrained by the lever, the striker rotates about a hinge pin and strikes a primer in the upper part of the fuze body.

The primer is a center-fire type similar to a shotgun shell primer. The flame from the primer charge ignites a delay charge which in the M6A3 and M10A3 fuzes consists of a powder column compressed in a lead tube. The burning time varies from 4.0 to 5.0 seconds.

The delay charge ignites a black powder igniting charge in the M10A3 fuze and a tetryl detonator in the M6A3 fuze. The igniter or detonator initiates the filler charge. The total burning time of the assembly is the same as the fuze, namely from 4.0 to 5.0 sec.

GRENADES: HAND, FRAGMENTATION, MK. IIA1—STANDARD

GRENADE, HAND, FRAGMENTATION, MK. IIA1



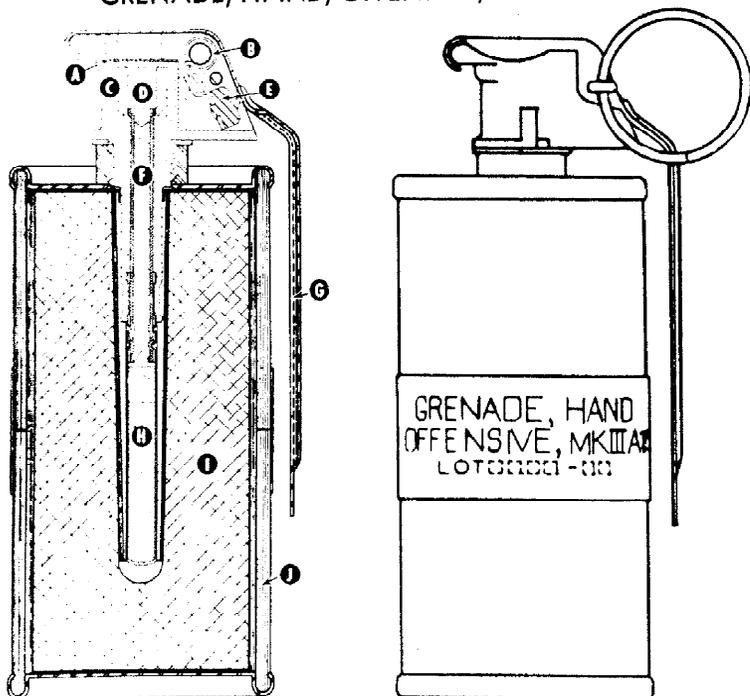
GRENADE, HAND, FRAGMENTATION, MK. IIA1—STANDARD

The body of this grenade is made of cast-iron and is about the size of a large lemon. The outside surface is deeply serrated horizontally and vertically to assist in producing uniform fragments when the grenade explodes. The bursting charge is 0.74 ounce of EC Blank Fire Powder initiated by the M10A3 igniting fuze.

- | | |
|--------------------|-----------------------------------|
| (A) Tin-foil disk | (G) Safety lever |
| (B) Primer | (H) Cast-iron body |
| (C) Fuze body | (I) Metal powder cap or detonator |
| (D) Powder train | (J) Charge |
| (E) Striker spring | (K) Pull ring |
| (F) Striker | (L) Safety pin |

GRENADE, HAND, OFFENSIVE, MK. IIIA1—LIMITED STANDARD

GRENADE, HAND, OFFENSIVE, MK. IIIA1



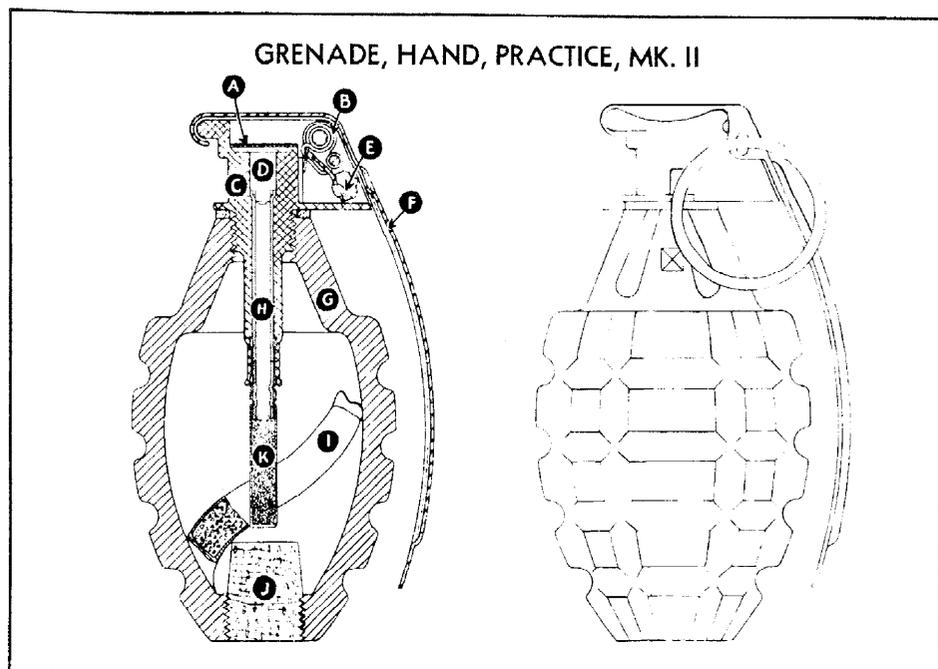
GRENADE, HAND, OFFENSIVE, MK. IIIA1—LIMITED STANDARD

This grenade consists of a sheet-metal top, threaded to receive the detonating fuze, M6A3, and a body of laminated cartridge paper which contains the high-explosive TNT charge. This grenade is for demolition. It may be used in the open more safely than the fragmentation grenade because there is no marked fragmentation. The grenade bodies and fuzes are shipped separately. The loaded and fuzed Mk. IIIA1 grenade weighs 14 ounces, 6.83 ounces of which is the TNT charge.

- | | |
|--------------------|------------------------|
| (A) Moisture cap | (F) Powder train |
| (B) Striker spring | (G) Safety lever |
| (C) Fuze body | (H) Detonator |
| (D) Primer | (I) Pressed TNT filler |
| (E) Striker | (J) Paper body |

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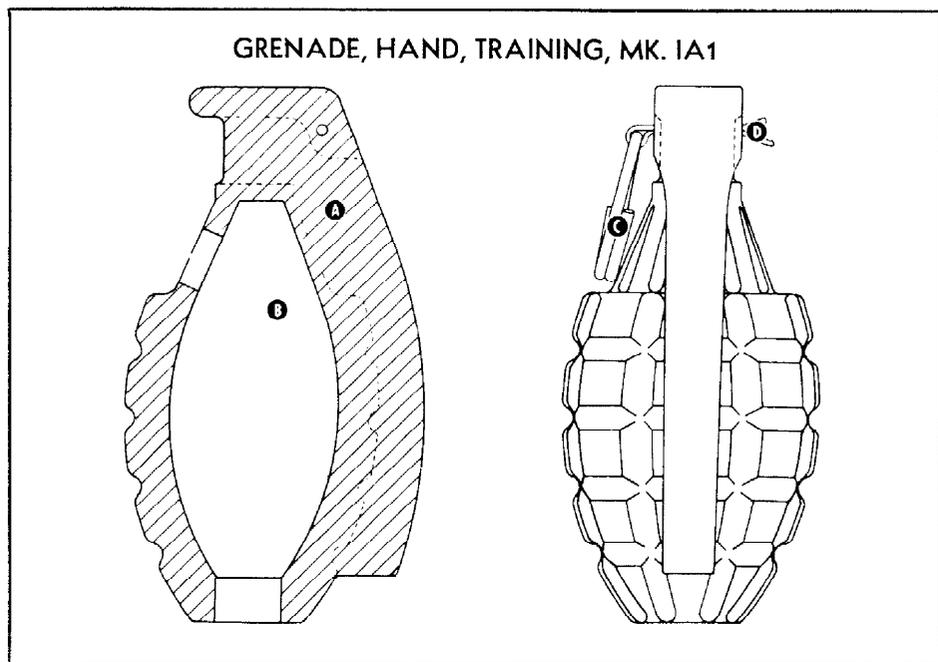
HAND, PRACTICE, MK. II—STANDARD



GRENAD, HAND, PRACTICE, MK. II—STANDARD—This is a standard practice grenade and is equipped with the igniting fuze, M10A3. The grenade is loaded with a small charge of black powder in a cloth bag.

- (A) Tin-foil disk
- (B) Striker spring
- (C) Fuze body
- (D) Primer
- (E) Striker
- (F) Safety lever
- (G) Cast-iron body
- (H) Powder train
- (I) Black powder charge in paper tube
- (J) Filling hole plug
- (K) Metal powder cap or detonator

HAND, TRAINING, MK. IA1—STANDARD



GRENAD, HAND, TRAINING, MK. IA1—STANDARD—This grenade is the current standard for practice and training. It consists of a one piece cast-iron body in the shape of a Mk. II fuzed fragmentation grenade and a removable safety pin and ring. It is inert. The grenade weighs 22 ounces, 1 ounce more than the Mk. II.

- (A) One piece cast-iron body
- (B) Inert load
- (C) Pull ring
- (D) Safety pin

CHARACTERISTICS

	Mk. IIA1	Mk. IIIA1	MK. II	MK. IA1
Type and Use.....	Frag., casualty	Offensive, casualty	Practice	Dummy, training
Fuze.....	M10A3, igniting	M6A3, detonating	M10A3, igniting	—
Weight Loaded and Fuzed.....	21.0 oz.	14.0 oz.	20.5 oz.	22.0 oz.
Charge and Weight.....	EC smokeless pwr., 0.74 oz.	TNT, 6.83 oz.	Black pwr.	—
Bursting Radius.....	30 yds.	—	—	—
Delay Time.....	4-5 sec.	4-5 sec.	4-5 sec.	—

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RIFLE GRENADES

GRENADE, ANTITANK, M9A1; GRENADE, ANTITANK, PRACTICE, M11A2; ADAPTER, GRENADE-PROJECTION, M1; GRENADE, RIFLE, FRAGMENTATION, IMPACT, M17—STANDARD

Rifle grenades are designed to be fired from the U. S. rifle and carbine by a launcher which the soldier attaches to the muzzle. A special blank cartridge, issued with the grenade, must be used.

The Mk. IIA1 fragmentation hand grenade, with 5 seconds delay fuze, can be fired from the rifle or carbine by the M1 grenade-projection adapter.

Rifle grenades are divided into two general classes: (1) high-explosive grenades, containing an explosive charge, and (2) practice grenades, designed for training or practice.

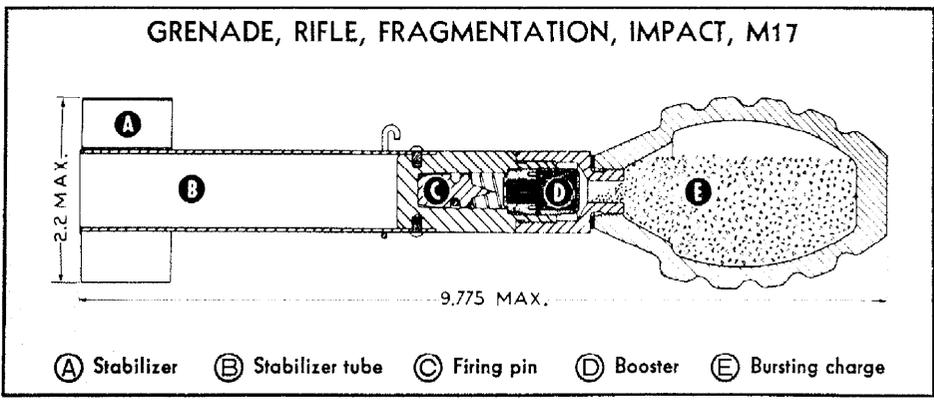
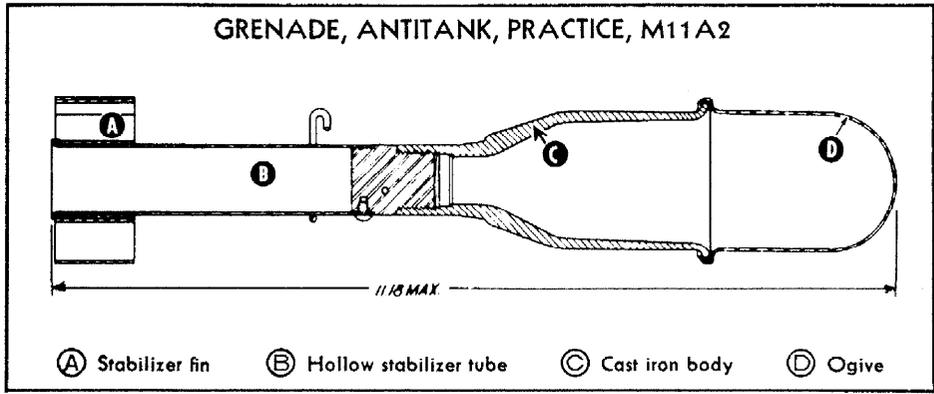
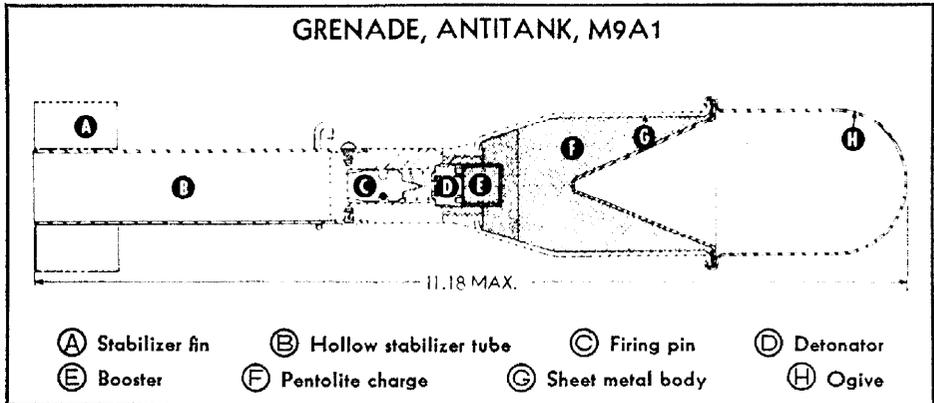
GRENADE, ANTITANK, M9A1—STANDARD—The antitank grenade, M9A1, has a sheet steel body and tail assembly and weighs 1.23 pounds. The

body is filled with 4 ounces of Pentolite using the "hollow charge" principle. The tail contains the impact fuze and the stabilizing fin is spot welded on a stabilizer tube screwed to the head. The impact fuze consists of a firing pin held by a spring in flight. When shipped, the firing pin is retained by a safety pin. When the grenade strikes a target the pin moves forward to activate the detonator and explode the charge. The hollow or shaped charge of this grenade has remarkable armor-penetrating qualities. The M9A1 anti-tank rifle grenade supersedes the grenade, A.T., M9.

GRENADE, ANTITANK, PRACTICE, M11A2—STANDARD—This is an inert-loaded dummy grenade similar in shape and weight to the antitank grenade, M9A1. This practice grenade superseded the M11 and M11A1 practice grenades. The M11A2 differs from the M9A1 in that the fin is replaceable. Extra fins are shipped with each grenade in the event the original one is bent or wears out.

GRENADE, RIFLE, FRAGMENTATION, IMPACT—M17—This grenade consists of a fin stabilizer assembly with impact type fuze similar to that used for Grenade, AT, M9A1. The head consists of a Mk. IIA1 hand grenade fuze body which is screwed in the fuze adapter on the stabilizer assembly. The M17 grenade is used in a manner identical with that of the Adapter, Grenade-Projection, M1, however, it offers a unit ready for firing without assembly in the field as is required for the M1 adapter.

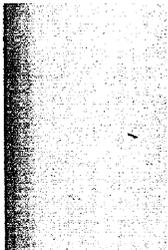
ADAPTER, GRENADE-PROJECTION, M1—STANDARD—The grenade-projection adapter, M1, was designed to permit the projection of the Mk. IIA1 fragmentation grenade from the rifle. It has a fin assembly similar to that of the M9A1 grenade. The head of the fin assembly has four claws which clip around and hold the body of the Mk. IIA1 fragmentation grenade with the 5-second time fuze. One of the claws has an arming clip which holds the safety lever of the Mk. IIA1 grenade. Upon setback the arming clip releases the safety lever of the Mk. IIA1 fragmentation grenade and the fuze explodes the grenade after 5 seconds. The adapter with Mk. IIA1 fragmentation grenade is fired from the same launcher used to launch the M9A1 and other rifle grenades.



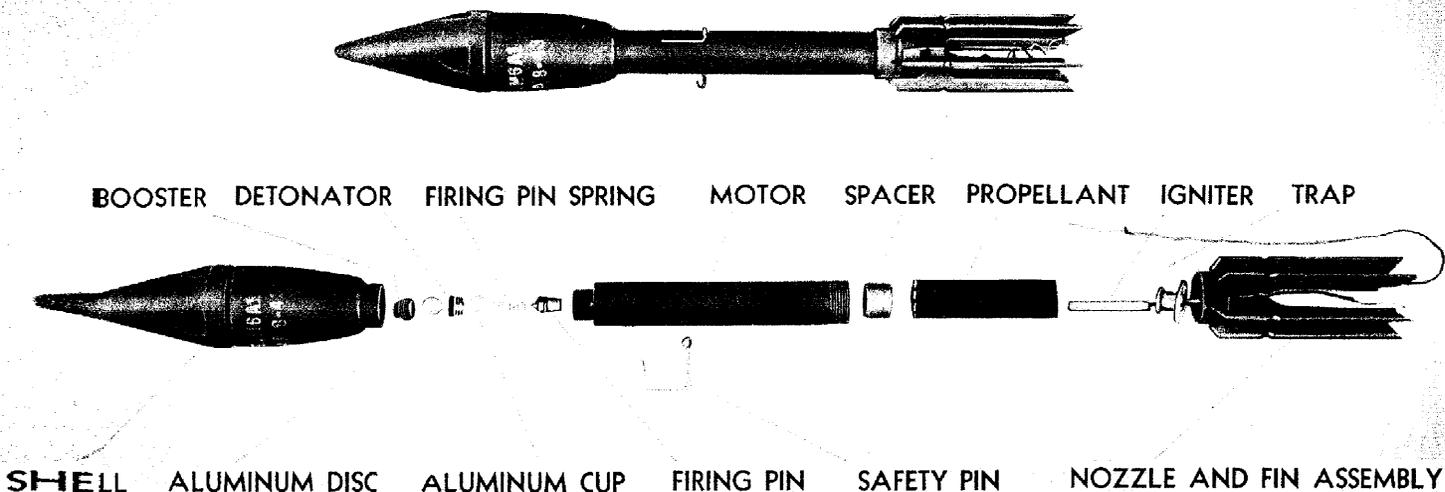
UNCLASSIFIED



ROCKETS



2.36 INCH H.E.A.T. ROCKET M6A1—LIMITED STANDARD



2.36 INCH H.E.A.T. ROCKET, M6A1

The 2.36 inch H.E.A.T. Rocket, M6A1, with shaped-charge loading is fired from a bazooka-type launcher at ground targets. The rocket is effective against the armor plate of tanks and armored vehicles. After penetration it has the effect of throwing white hot metal spray.

This round is a modification of the original M6 rocket, now obsolete. Changes were made as follows: improved ignition, involving removal of the contact ring from the ogive, reduced powder charge, and inserted obturator disc.

The practice round, inert loaded to conform to the live round, is the 2.36 inch Practice Rocket, M7A1.

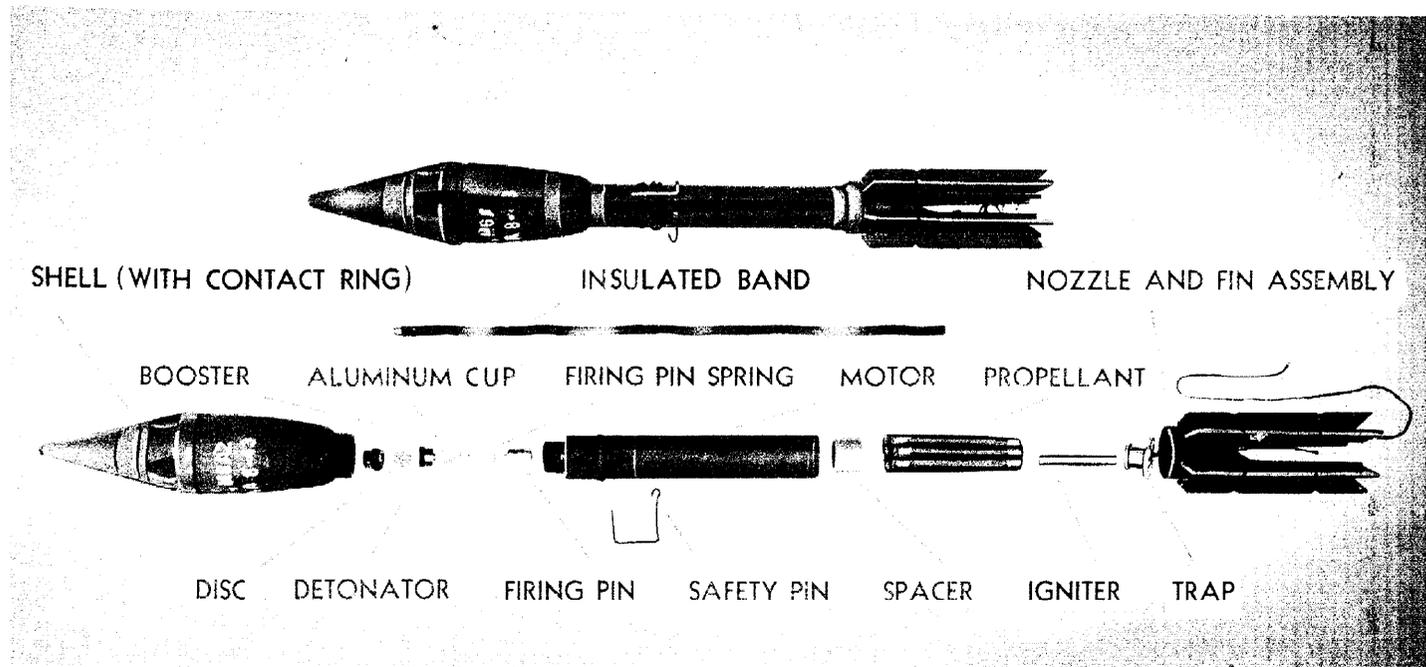
CHARACTERISTICS

Range	600 yd.	Propellant	0.136 lb. solvent extruded double base powder, 0.375 in. O.D. by 0.08 in. I.D. by 4.15 in. long
Dispersion	8.5 mils	Type of loading	Five sticks held by pulpit trap and cardboard spacer
Velocity	265 f/s	Shell assembly:	
Service temperature limits	0° to 120° F.	Caliber	2.36 in.
Burning time:		Length	8.8 in.
At 0° F.	0.08 sec.	Filler	Pentolite
At 120° F.	0.03 sec. (estimated)	Weight, filler	0.5 lb.
Type of stabilization	Fixed fins	Weight, total	1.57 lb.
Length, overall	21.6 in.	Type of ignition	Electric squib in aluminum case, centered in motor
Weight of round, loaded	3.4 lb.	Launchers	M1A1, M9, M9A1
Fuze	B.D.—simple impact type	Packaging	Packed fuzed, one per fiber container, 20 containers per wooden box
Motor assembly:			
Diameter, outside	1.25 in.		
Length	8.32 in.		
Weight (less propellant)	1.82 lb. w/fuze and fins		
Material	WD 1025 or WD X1025 C.D. steel		

DECLASSIFIED - DOD Directive No. 5200.9,
27 September 1958

UNCLASSIFIED

2.36 INCH H.E.A.T. ROCKET M6A2—LIMITED STANDARD



2.36 INCH H.E.A.T. ROCKET, M6A2

The 2.36 inch H.E.A.T. Rocket, M6A2, with shaped-charge loading is fired from a Bazooka-type launcher at ground targets. The rocket is effective against the armor plate of tanks and armored vehicles. After penetration it has the effect of throwing a white hot metal spray.

This round is a modification of the original M6 rocket, now obsolete. Except that the contact ring was not removed from the ogive, the changes are the same as for the M6A1. This modification was performed in a Theater of Operations, and the designation M6A2 was applied to distinguish it from the M6A1 modification performed at arsenals in the Zone of the Interior.

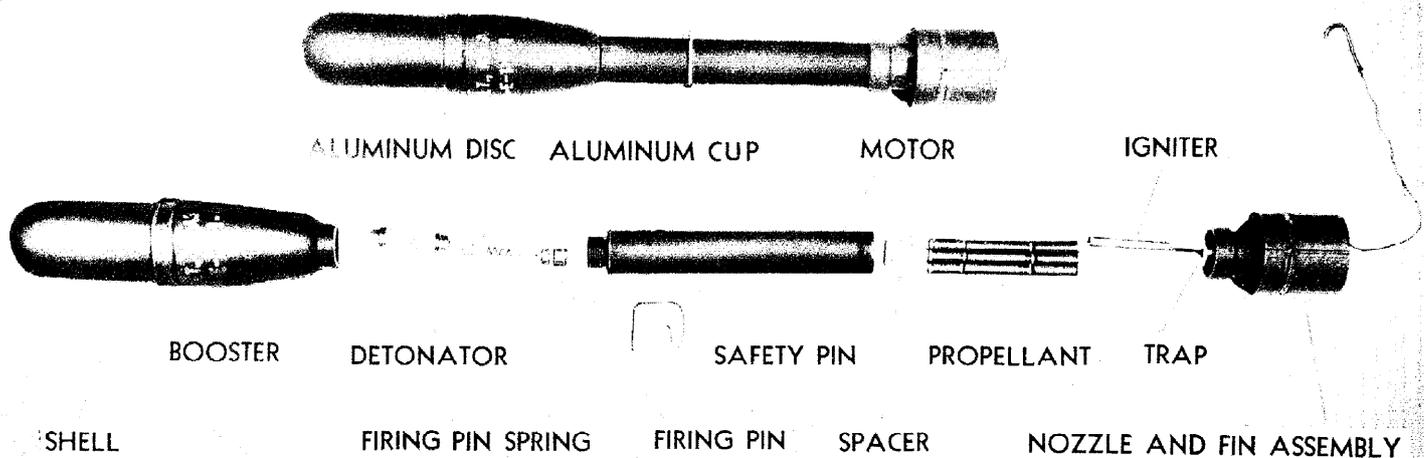
The practice round, inert loaded to conform to the live round, is the 2.36 inch Practice Rocket, M7A2.

CHARACTERISTICS

Range	600 yd.	Propellant	0.136 lb. solvent extruded double base powder, 0.375 in. O.D. by 0.08 in. I.D. by 4.15 in. long
Dispersion	8.5 mils	Type of loading	Five sticks held by pulpit trap and cardboard spacer
Velocity	265 f/s	Shell assembly:	
Service temperature limits	0° to 120° F.	Caliber	2.36 in.
Burning time:		Length	8.8 in.
At 0° F.	0.08 sec.	Filler	Pentolite
At 120° F.	0.03 sec. (estimated)	Weight, filler	0.5 lb.
Type of stabilization	Fixed fins	Weight, total	1.57 lb.
Length, overall	21.6 in.	Type of ignition	Electric squib in aluminum case, centered in motor
Weight of round, loaded	3.4 lb.	Launchers	M1, M1A1, M9, M9A1
Fuze	B.D.—simple impact type	Packaging	Packed fuzed, one per fiber container, 20 containers per wooden box
Motor assembly:			
Diameter, outside	1.25 in.		
Length	8.32 in.		
Weight (less propellant)	1.82 lb. w/fuze and fins		
Material	WD1025 or WD X1025 C.D. steel		

UNCLASSIFIED

2.36 INCH H.E.A.T. ROCKET M6A3—STANDARD



2.36 INCH H.E.A.T. ROCKET, M6A3

The 2.36 inch H.E.A.T. Rocket, M6A3, with shaped-charge is fired from a Bazooka-type launcher at ground targets. The rocket is effective against the armor plate of tanks and armored vehicles. After penetration it has the effect of throwing a white hot metal spray.

This round is the same as the M6A1 rocket except for a hemispherical ogive and cylindrical fins.

The practice round, inert loaded to conform to the live round, is the 2.36 inch Practice Rocket, M7A3.

CHARACTERISTICS

Range.....600 yd.
Dispersion.....6 mils
Velocity.....265 f/s

Service temperature limits.....0° to 120° F.

Burning time:

At 0° F.....0.08 sec.

At 120° F.....0.03 sec. (estimated)

Type of stabilization.....Fixed ring shroud fin

Length, overall.....19.4 in.

Weight of round, loaded.....3.4 lb.

Fuze.....B.D.—simple impact type

Motor assembly:

Diameter, outside.....1.25 in.

Length.....8.32 in.

Weight (less propellant).....1.74 lb. w/ fuze and fins

Material.....WD X4130 or WD 8630 steel tubing

Propellant.....0.136 lb. solvent extruded double base powder, 0.375 in. O.D. by 0.08 in. I.D. by 4.15 in. long

Type of loading.....Five sticks held by pulpit trap and cardboard spacer

Shell assembly:

Caliber.....2.36 in.

Length.....8.8 in.

Filler.....Pentolite

Weight, filler.....0.5 lb.

Weight, total.....1.64 lb.

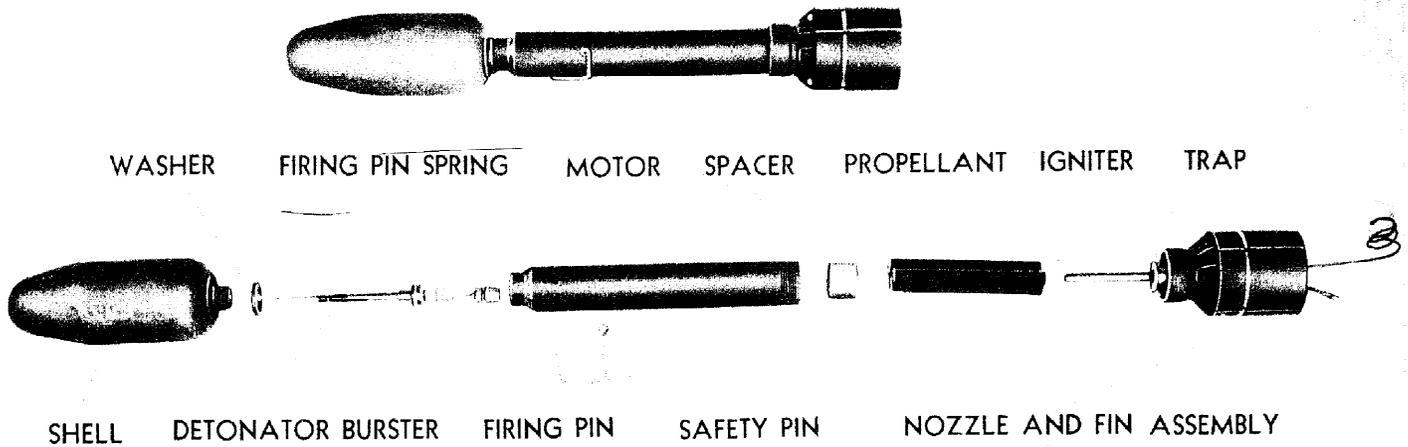
Type of ignition.....Electric squib in aluminum case, centered in motor

Launchers.....M1A1, M9, M9A1

Packaging.....Packed fuze, one per fiber container, 20 containers per wooden box or one per fiber container, 10 containers per wooden box

UNCLASSIFIED

2.36-INCH WP SMOKE ROCKET M10—STANDARD



2.36-INCH WP SMOKE ROCKET M10

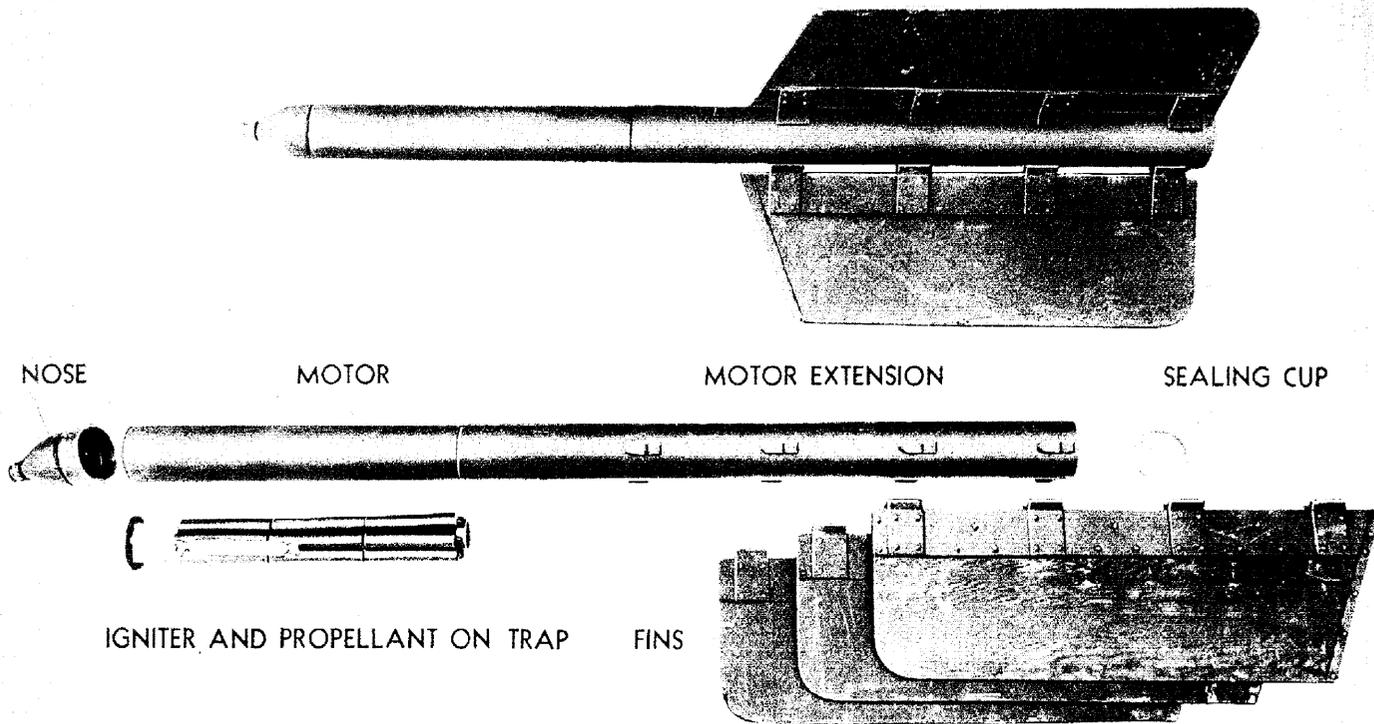
The 2.36-Inch WP Smoke Rocket M10 (formerly the T26E2) is a WP filled shell with the M6A3 rocket motor. It embodies a special burster assembly not present in the T26 and T26E1 rockets and supersedes and cancels these two former developmental rockets. The rocket is used for laying down smoke screens and as an effective casualty producing weapon against enemy personnel in foxholes, trenches, pillboxes, etc.

CHARACTERISTICS

Range.....	600 yd.	Propellant.....	0.136 lb. solvent extruded double base powder, 0.375 in. O.D. by 0.08 in. I.D. by 4.15 in. long
Dispersion.....	6 mils	Type of loading...	Five sticks held by pulpit trap and cardboard spacer
Velocity.....	265 f/s	Shell assembly:	
Service temperature limits.....	0° to 120° F.	Caliber.....	2.36 in.
Burning time:		Length.....	5.9 in.
At 0° F.....	0.08 sec.	Filler.....	WP
At 120° F.....	0.03 sec. (estimated)	Weight, filler.....	0.9 lb.
Type of stabilization.....	Fixed ring shroud fin	Weight, total.....	1.64 lb.
Length, overall.....	17.1 in.	Type of ignition.....	Electric squib in aluminum case, centered in motor
Weight of round, loaded.....	3.4 lb.	Launchers.....	M1A1, M9, M9A1
Fuze.....	B.D.—simple impact type	Packaging.....	Packed fuzed, one per fiber container, 12 containers per wooden box
Motor assembly:			
Diameter, outside.....	1.25 in.		
Length.....	8.32 in.		
Weight (less propellant).....	1.74 lb. w/fuze and fins		
Material.....	WD X4130 or WD 8630 steel tubing		

UNCLASSIFIED

3.25-INCH A.A. TARGET ROCKET M2—LIMITED STANDARD



3.25-INCH A.A. TARGET ROCKET M2

The 3.25-Inch A.A. Target Rocket M2 is designed to simulate low flying aircraft in the training of antiaircraft gun crews. The large fins act as a target.

This rocket has not been fired for specific data on range and dispersion.

CHARACTERISTICS

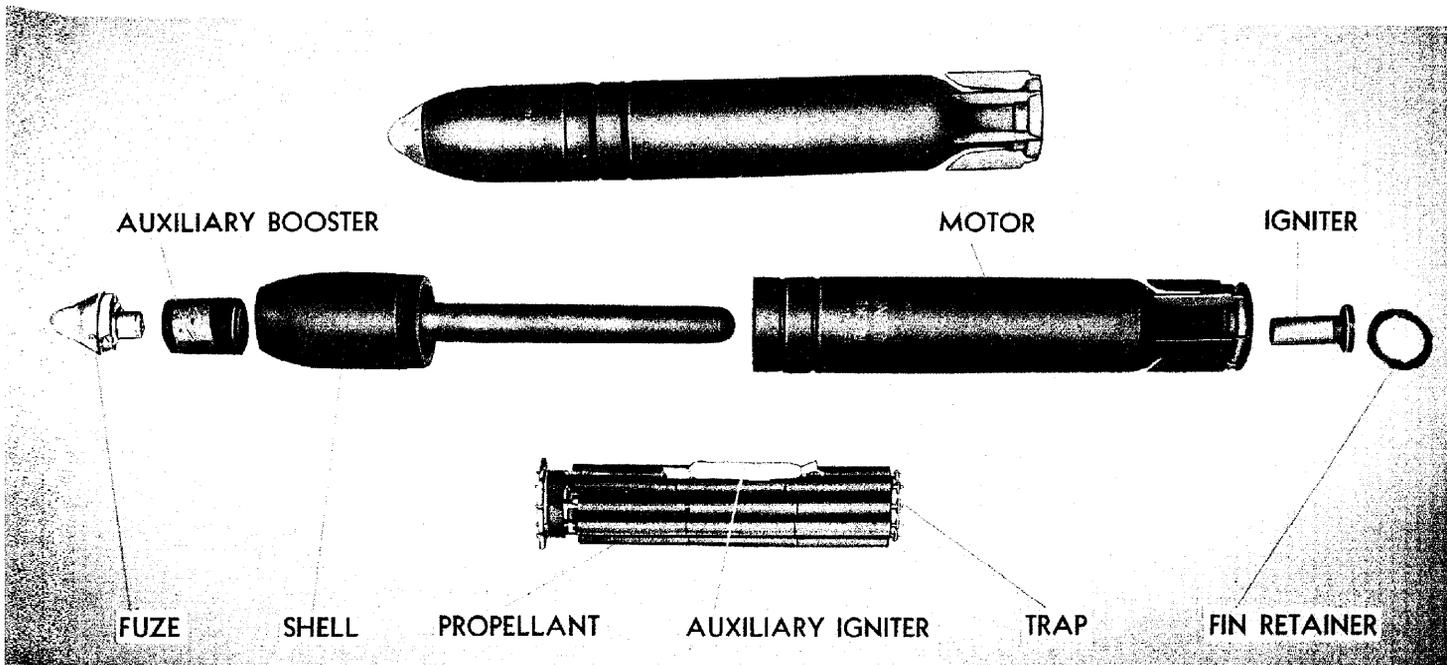
Range 1,700 yd. (estimated)
 Dispersion No data
 Velocity 530 f/s (estimated)
 Service temperature limits 30° to 120° F.

Burning time:
 At 30° F. 0.25 sec. (estimated)
 At 120° F. 0.10 sec. (estimated)
 Type of stabilization Fixed fins
 Length, overall 59.1 in.
 Weight of round, loaded 35.1 lb.
 Fuze No fuze
 Motor assembly:
 Diameter, outside 3.25 in.
 Length 25.25 in.
 Weight (less propellant) 8.44 lb.
 Material WD 1010 to WD 1025 steel tubing
 Propellant 3.2 lb. solvent extruded double base powder, 0.875 in. O.D. by 0.281 in. I.D. by 5 in. long

Type of loading 18 sticks strung on a 6-wire cage
 Shell assembly:
 Caliber 3.25 in.
 Length 4.1 in.
 Filler Solid cast nose except for 1 1/8 in. axial hole
 Weight, filler None
 Weight, total 5.83 lb.
 Type of ignition Electric squib contained in cardboard cartridge in nose. Ignition aided by auxiliary igniter bag tied to cage
 Launchers Target Rocket Projector M1
 Packaging Either two or three rounds per wooden box

UNCLASSIFIED

4.5 INCH H.E. ROCKET M8—LIMITED STANDARD



4.5 INCH H.E. ROCKET, M8

The 4.5 inch H.E. Rocket, M8, is used for attacking lightly fortified ground targets and against personnel from aircraft or ground launchers.

The practice round, inert loaded to conform to the live round, is the 4.5 inch Practice Rocket, M9.

CHARACTERISTICS

Range.....4,000 yd.
 Dispersion.....15 mils
 Velocity:
 Full charge.....850 f/s
 Reduced charge.....760 f/s
 Service temperature limits:
 20° to 90° F.—Full Charge
 50° to 130° F.—Reduced Charge
 Burning time:
 At 20° F.....0.3 sec. (estimated)
 At 130° F.....0.12 sec. (estimated)

Type of stabilization.....Folding fins opened by acceleration

Length, overall.....31.1 in. w/o fuze
 Weight of round, loaded.....38.1 lb.
 Fuze.....P.D. M4, M4A1, M4A2, selective SQ or delay, P.D. T4

Motor assembly:
 Diameter, outside.....4.5 in.
 Length.....23.29 in.
 Weight (less propellant).....11.65 lb.
 Material.....WD 1025 welded steel tubing

Propellant:
 Full charge...4.65 lb. solvent extruded double base powder $\frac{7}{8}$ in. O.D. by $\frac{9}{32}$ in. I.D. by 5 in. long
 Reduced charge.....4.2 lb. solvent extruded double base powder $\frac{7}{8}$ in. O.D. by $\frac{9}{32}$ in. I.D. by 5 in. long

Type of loading:
 Full charge...30 sticks strung on 10-wire cage
 Reduced charge. 27 sticks strung on 10-wire cage

Shell assembly:

Caliber.....4.5 in.
 Length.....7.5 in.
 Filler.....TNT
 Weight, filler.....4.3 lb.
 Weight, total.....14.5 lb. to 15.25 lb.

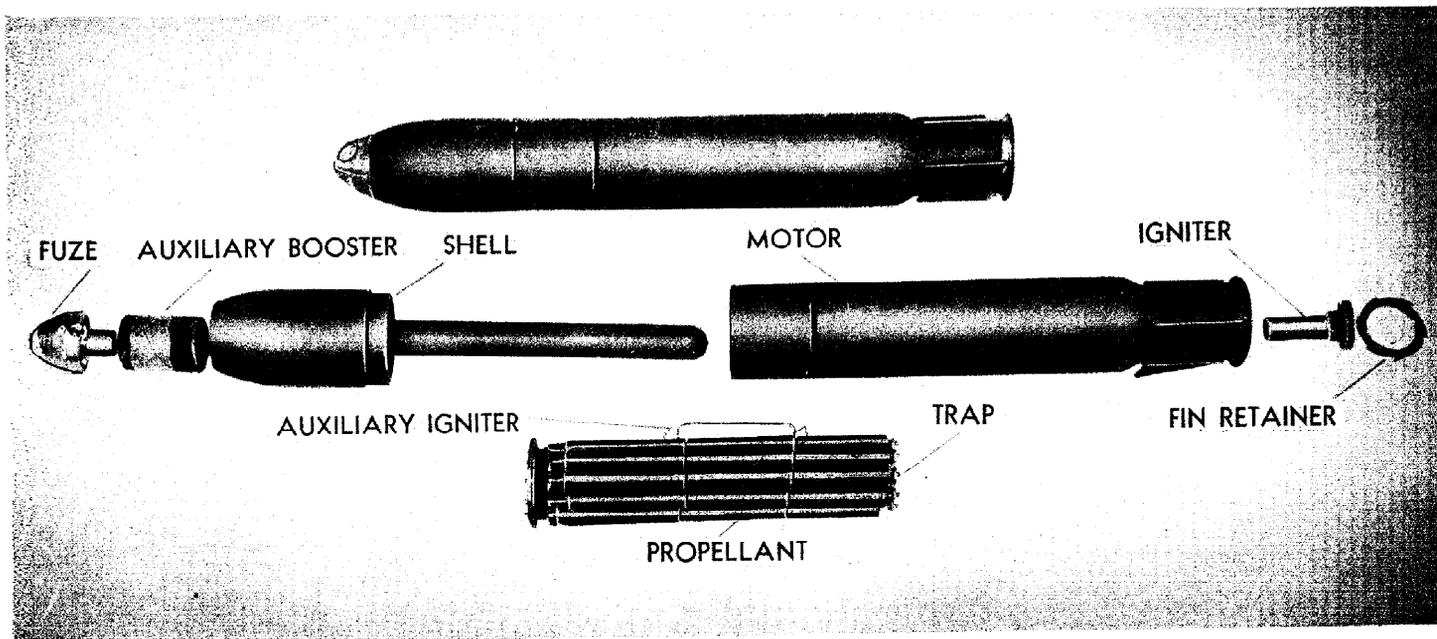
Type of ignition.....Cardboard igniter cartridge containing electric squib and backed by plastic cup pressed into motor venturi. Two auxiliary ignition bags tied to wire cage

Launchers...M10, M12, M14, T27, T27E1, T31, T33, T34, T36, T38, T46, T46E1, T47, T57, T58, T60, T61

Packaging.....Packed unfuzed, one per fiber container, two containers per wooden box. One fuze and one auxiliary booster per fiber container or metal can, 15 containers or cans per metal box

UNCLASSIFIED

4.5 INCH H.E. ROCKET M8A1—LIMITED STANDARD



4.5 INCH H.E. ROCKET, M8A1

The 4.5 inch H.E. Rocket, M8A1, is used for attacking lightly fortified ground targets and against personnel from aircraft or ground launchers.

This rocket differs from the M8 by an increased thickness at the threaded end of the rocket motor, use of a rocket motor steel with greater yield point strength, and coarser threads remachined in the base of the rocket shell.

The practice round, inert loaded to conform to the live round, is the 4.5 inch Practice Rocket, M9A1.

CHARACTERISTICS

Range.....4,000 yd.
Dispersion.....15 mils
Velocity.....840 f/s

Service temperature limits.....-10° to +105° F.

Burning time:
At -10° F.....0.3 sec.
At +105° F.....0.13 sec.

Type of stabilization.....Folding fins opened by acceleration

Length, overall.....31.5 in. w/o fuze

Weight of round, loaded.....38.8 lb.

Fuze....P.D. M4, M4A1, M4A2, selective SQ or delay; P.D. T4

Motor assembly:

Diameter, outside.....4.5 in.

Length.....23.49 in.

Weight (less propellant).....13.2 lb.

Material.....WD 1025 to WD 1030 welded steel tubing

Propellant.....4.65 lb. solvent extruded double base powder, 7/8 in. O.D. by 3/2 in. I.D. by 5 in. long

Type of loading...30 sticks strung on 10-wire cage

Shell assembly:

Caliber.....4.5 in.

Length.....7.5 in.

Filler.....TNT

Weight, filler.....4.3 lb.

Weight, total.....15.7 to 16.1 lb.

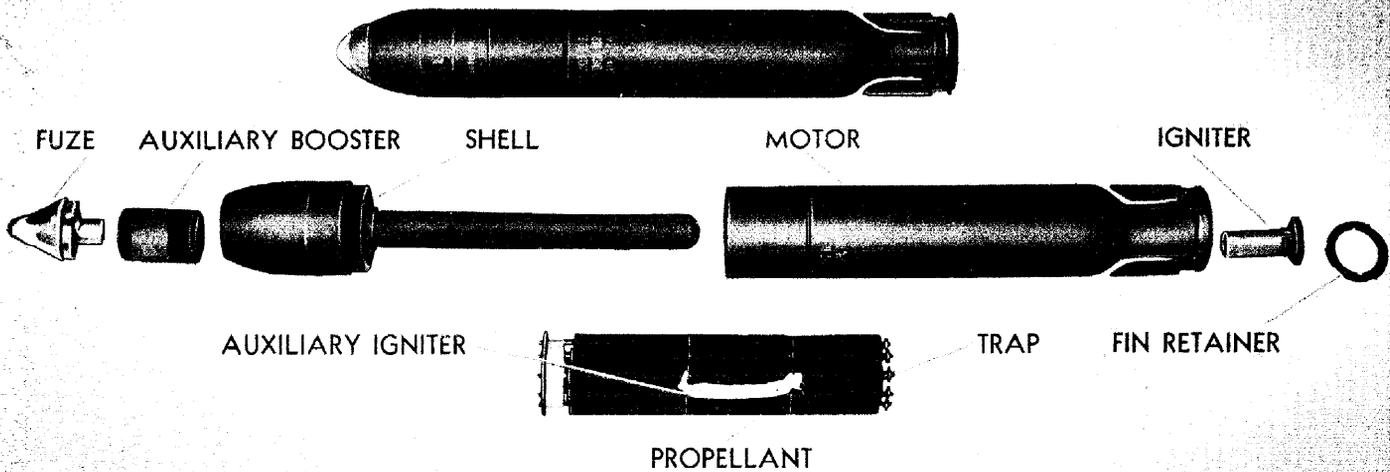
Type of ignition...Cartridge igniter containing electric squib backed by plastic cup is pressed into venturi. Ignition aided by two auxiliary bags tied to cage

Launchers...M10, M12, M14, T27, T27E1, T31, T33, T34, T36, T38, T46, T46E1, T47, T57, T58, T60, T61

Packaging...Packed unfuzed, one per fiber or metal container, two containers per wooden box. One fuze and one auxiliary booster per fiber container or metal can, 15 containers or cans per metal box

UNCLASSIFIED

4.5 INCH H.E. ROCKET M8A2—LIMITED STANDARD



4.5 INCH H.E. ROCKET, M8A2

The 4.5 inch H.E. Rocket, M8A2, is used for attacking lightly fortified ground targets and against personnel from aircraft or ground launchers.

This rocket represents a change from the M8A1 as the strength of the rocket shell was increased at the base to prevent deflection of the metal under pressure of the burning propellant gases. The length of the rocket shell and rocket motor thread engagement is greater than in the M8A1 rocket.

The practice round, inert loaded to conform to the live round, is the 4.5 inch Practice Rocket, M9A2.

CHARACTERISTICS

Range..... 4,000 yd.
Dispersion..... 15 mils
Velocity..... 840 f/s

Service temperature limits..... -10° to +105° F.

Burning time:

At -10° F..... 0.3 sec.

At +105° F..... 0.13 sec.

Type of stabilization..... Folding fins opened by acceleration

Length, overall..... 30.5 in. w/o fuze

Weight of round, loaded..... 38.2 lb.

Fuze..... P.D. M4, M4A1, M4A2, selective SQ or delay; P.D. T4

Motor assembly:

Diameter, outside..... 4.5 in.

Length..... 23.49 in.

Weight (less propellant)..... 13.2 lb.

Material..... WD 1025 to WD 1030 steel—both welded and seamless tubing used

Propellant... 4.65 lb. solvent extruded double base powder, 7/8 in. O.D. by 3/2 in. I.D. by 5 in. long

Type of loading... 30 sticks strung on a 10-wire cage

Shell assembly:

Caliber..... 4.5 in.

Length..... 7.4 in.

Filler..... TNT

Weight, filler..... 4.3 lb.

Weight, total..... 15.7 lb. to 16.1 lb.

Type of ignition..... Cartridge igniter containing electric squib backed by plastic cup pressed into venturi. Ignition aided by two auxiliary bags tied to cage

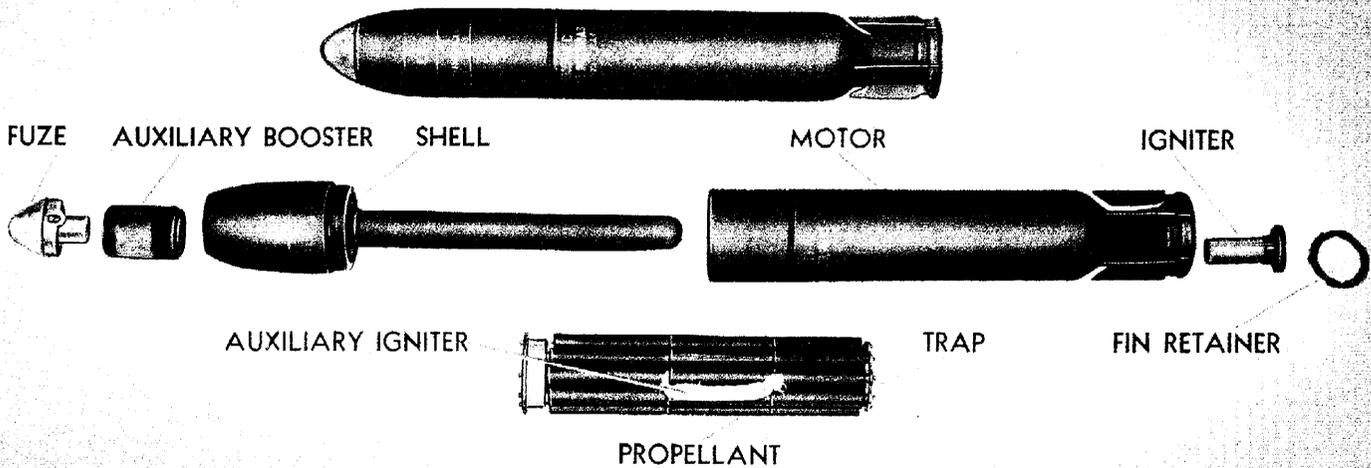
Launchers... M10, M12, M14, T27, T27E1, T31, T33, T34, T36, T38, T46, T46E1, T47, T57, T58, T60, T61

Packaging... Packed unfuzed, one per fiber or metal container, two containers per wooden box. One fuze and one auxiliary booster per fiber container or metal can, 15 containers or cans per metal box.

DECLASSIFIED - BOD Directive No. 5200.9,
27 September 1958

UNCLASSIFIED

4.5 INCH H.E. ROCKET M8A3—LIMITED STANDARD



4.5 INCH H.E. ROCKET, M8A3

The 4.5 inch H.E. Rocket, M8A3, is used for attacking lightly fortified ground targets and against personnel from aircraft or ground launchers.

This rocket is a modification of the M8A2 rocket by the addition of a locking burr to each fin blade to assist in rigidly maintaining the fin in full open position during flight.

The practice round, inert loaded to conform to the live round, is the 4.5 inch Practice Rocket, M9A3.

CHARACTERISTICS

Range.....4,000 yd.
Dispersion.....15 mils
Velocity.....840 f/s

Service temperature limits..... -10° to $+105^{\circ}$ F.
Burning time:
At -10° F.....0.3 sec.
At 105° F.....0.13 sec.
Type of stabilization.....Folding fins opened by acceleration
Length, overall.....30.5 in. w/o fuze
Weight of round, loaded.....38.2 lb.
Fuze.....P.D. M4, M4A1, M4A2, selective SQ or delay; P.D. T4
Motor assembly:
Diameter, outside.....4.5 in.
Length.....23.49 in.
Weight (less propellant).....13.2 lb.
Material.....WD 1025 to WD 1030 steel—Both welded and seamless tubing used
Propellant.....4.65 lb. solvent extruded double base powder, $\frac{7}{8}$ in. O.D. by $\frac{3}{32}$ in. I.D. by 5 in. long
Type of loading.....Thirty sticks strung on 10-wire cage

Shell assembly:

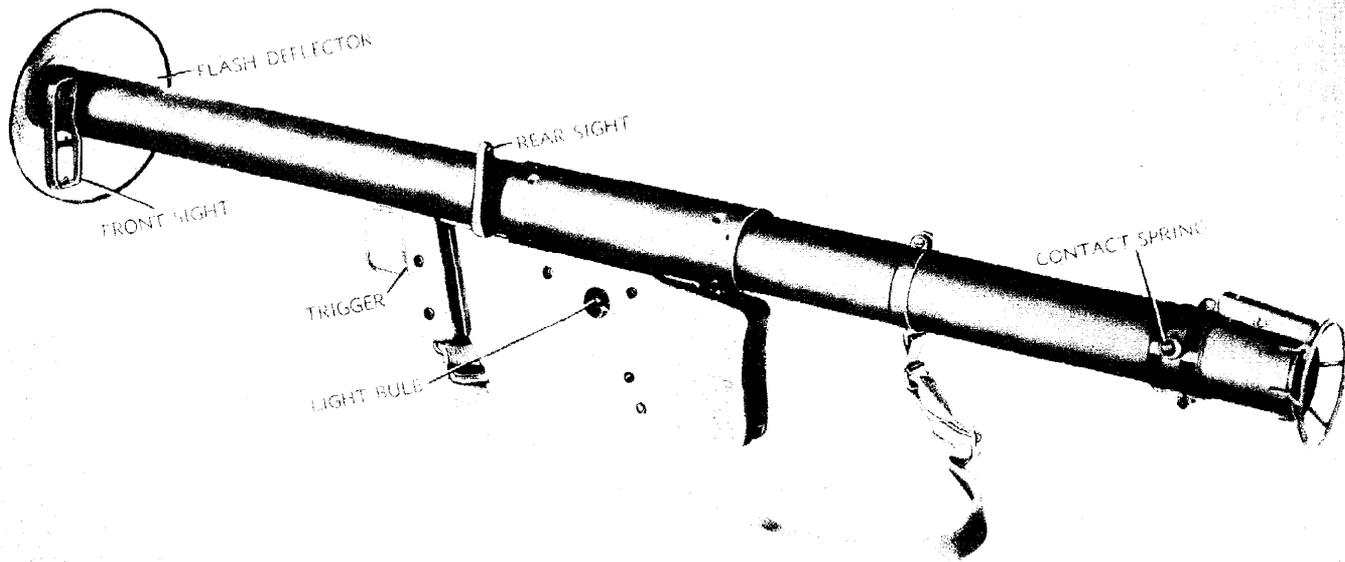
Caliber.....4.5 in.
Length.....7.4 in.
Filler.....TNT
Weight, filler.....4.3 lb.
Weight, total.....15.7 lb. to 16.1 lb.

Type of ignition.....Cartridge igniter containing electric squib backed by plastic cup. Assembly pressed into venturi. Ignition aided by two auxiliary bags tied to cage

Launchers.....M10, M12, M14, T27, T27E1, T27E2, T31, T33, T34, T36, T38, T46, T46E1, T47, T57, T58, T60, T61

Packaging.....Packed unfuzed, one per fiber or metal container, two containers per wooden box. One fuze and one auxiliary booster per fiber container or metal can, 15 containers or cans per metal box

2.36 INCH ROCKET LAUNCHER M1A1—LIMITED STANDARD



2.36 INCH ROCKET LAUNCHER, M1A1—LEFT SIDE

The 2.36 inch Rocket Launcher, M1A1, known as the "Bazooka," is an electrically operated shoulder weapon. It is employed against tanks, armored vehicles, pill-boxes, and emplacements. The launcher is operated normally by two men although it can be handled by one man in an emergency.

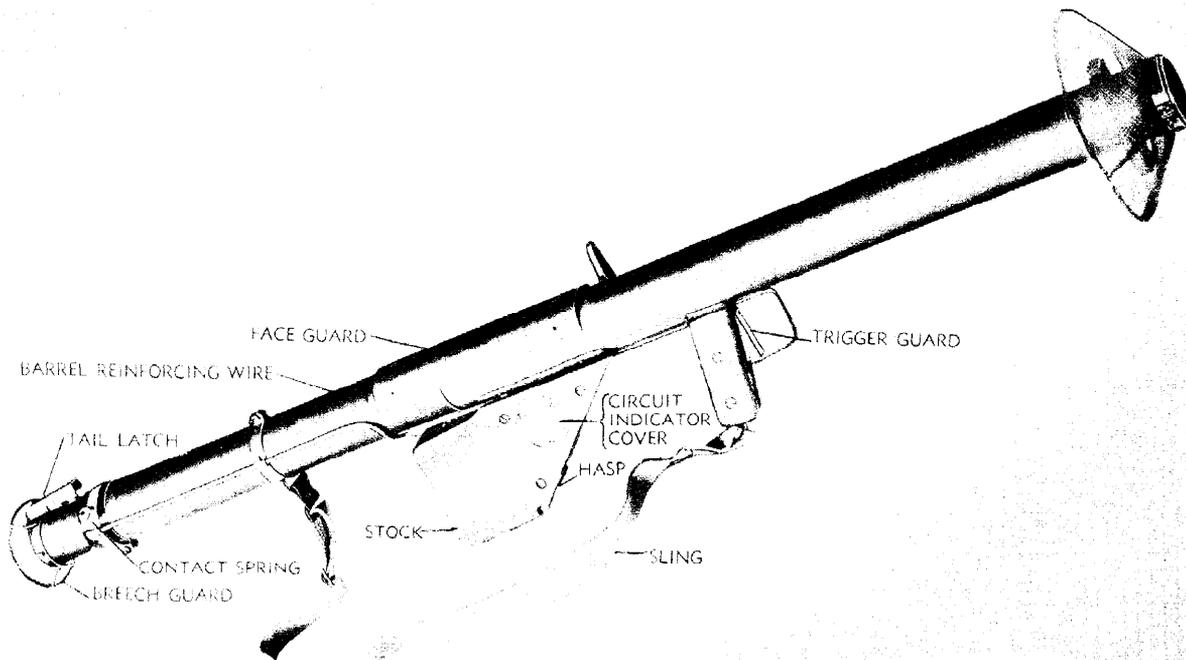
This launcher has a flash deflector to protect the operator from unburned

powder as the rocket leaves the tube. One dry cell firing battery and one spare battery are kept in the wooden stock.

CHARACTERISTICS

Weight, total.....13.3 lb.
 Rails or tubes:
 Length.....54.5 in.
 Number and arrangement.....Single tube with stock and trigger
 Composition.....Smooth bore steel tube

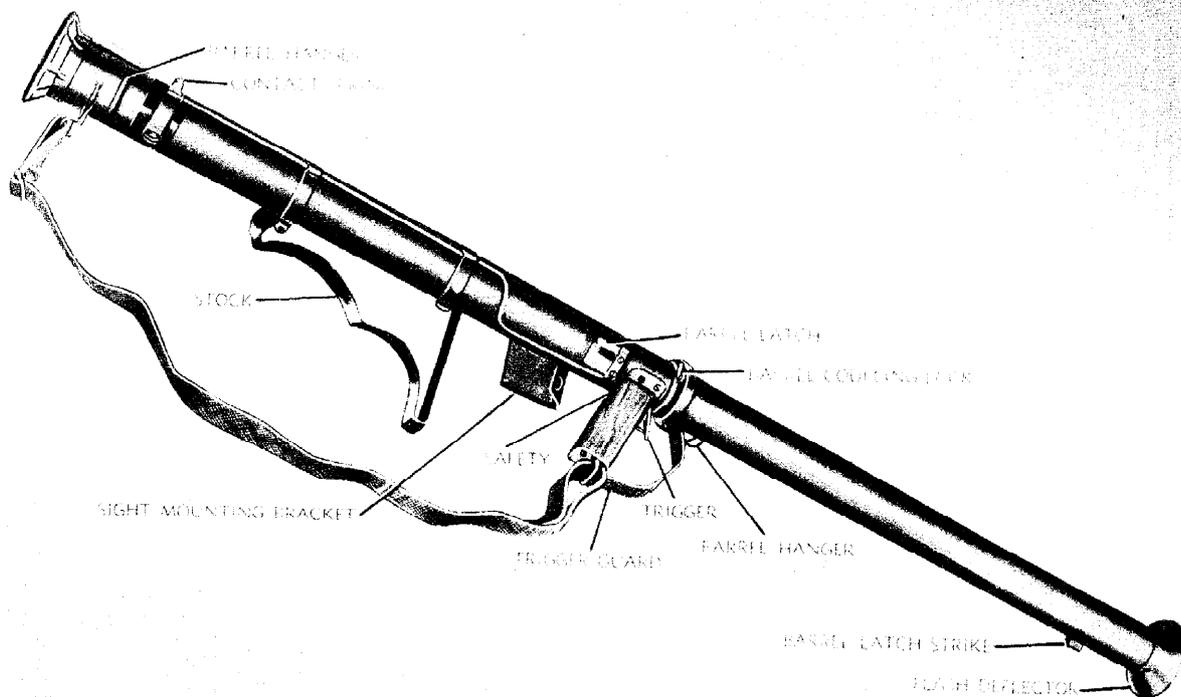
Mounting.....Fired from shoulder in standing, kneeling, or prone position
 Elevation.....By operator
 Traverse.....By operator
 Rate of fire.....Not specified. Weapon must be sighted before firing each round
 Firing mechanism.....Electric trigger switch
 Fire control equipment...Front stud sights provide for ranges of 100, 200, and 300 yds. Intermediate or greater range must be estimated. Rear sight is a peep sight.



2.36 INCH ROCKET LAUNCHER, M1A1—RIGHT SIDE

UNCLASSIFIED

2.36 INCH ROCKET LAUNCHER M9—LIMITED STANDARD

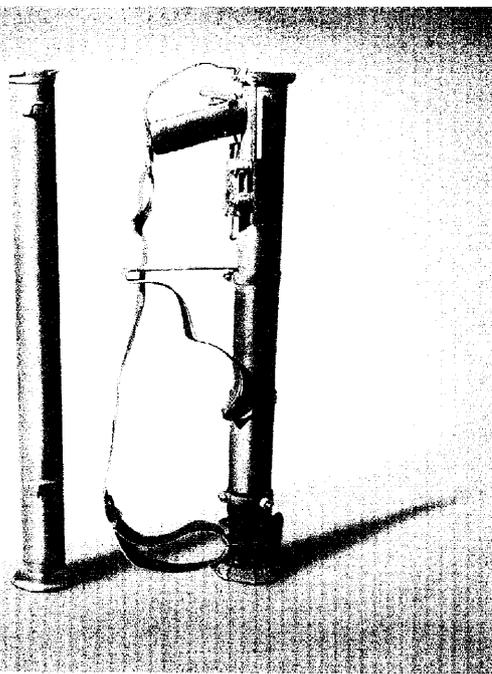


THE 2.36 INCH ROCKET LAUNCHER, M9, HAS A TUBE THAT MAY BE UNCOUPLED INTO TWO PIECES

The 2.36 inch Rocket Launcher, M9, is an electrically operated shoulder weapon. It is similar to the M1A1 launcher except for improved sighting, a tube that may be uncoupled into two pieces, and a magneto-operated instead of a battery-operated electric firing circuit.

CHARACTERISTICS

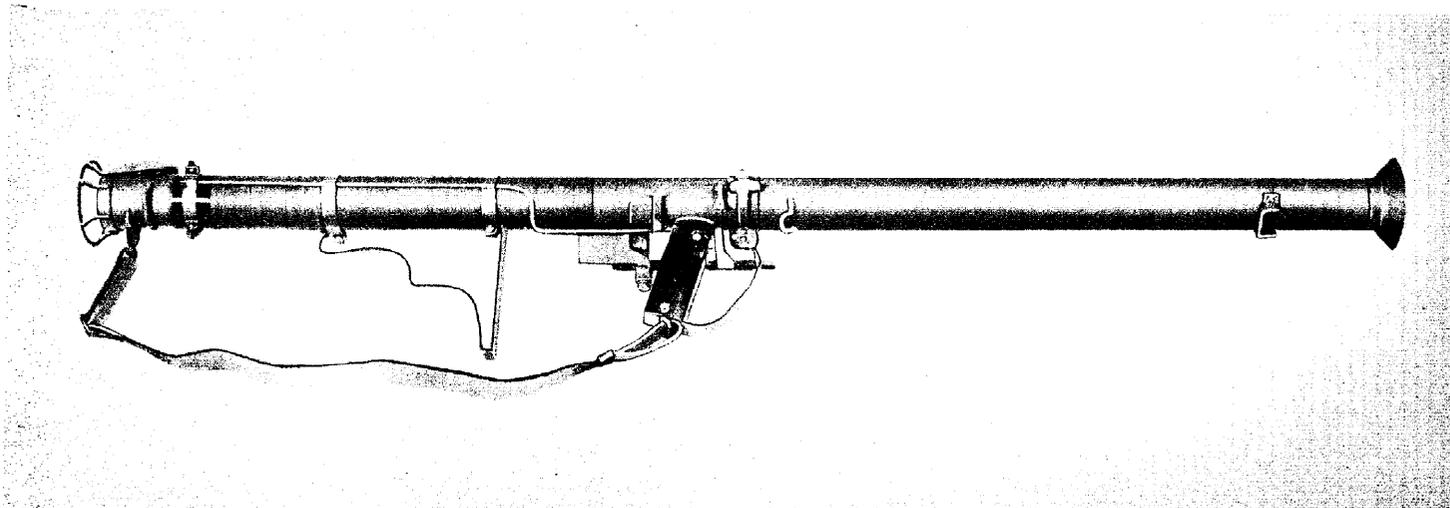
Weight, total.....	16 lb.
Rails or tubes:	
Length.....	60 in.
Number and arrangement.....	Single tube may be uncoupled into two 31-inch lengths. Stock and trigger assembly attached to rear section
Composition.....	Smooth bore steel tube
Mounting.....	Fired from shoulder in standing, kneeling, or prone position
Elevation.....	By operator
Traverse.....	By operator
Rate of fire.....	Not specified. Weapon must be sighted before firing each round
Firing mechanism.....	Pressing trigger generates current to fire the rocket
Fire control equipment.....	Horizontal bar sight with range adjustments from 0 to 700 yd.



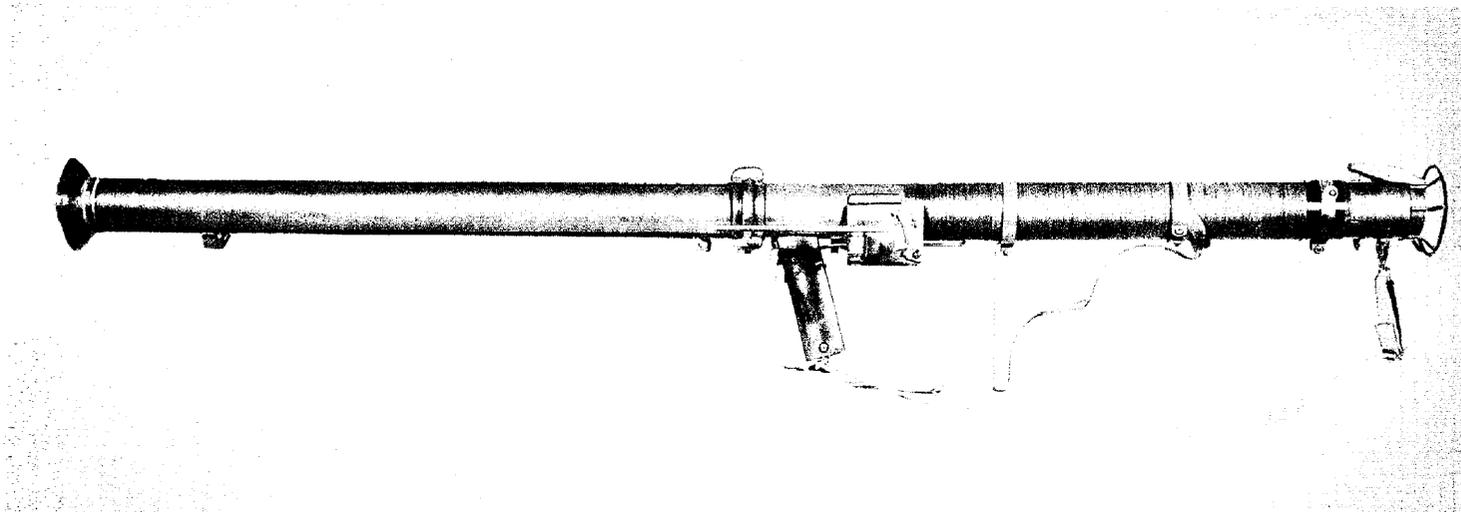
2.36 INCH ROCKET LAUNCHER, M9

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2.36 INCH ROCKET LAUNCHER M9A1—STANDARD



2.36 INCH ROCKET LAUNCHER, M9A1—RIGHT SIDE VIEW

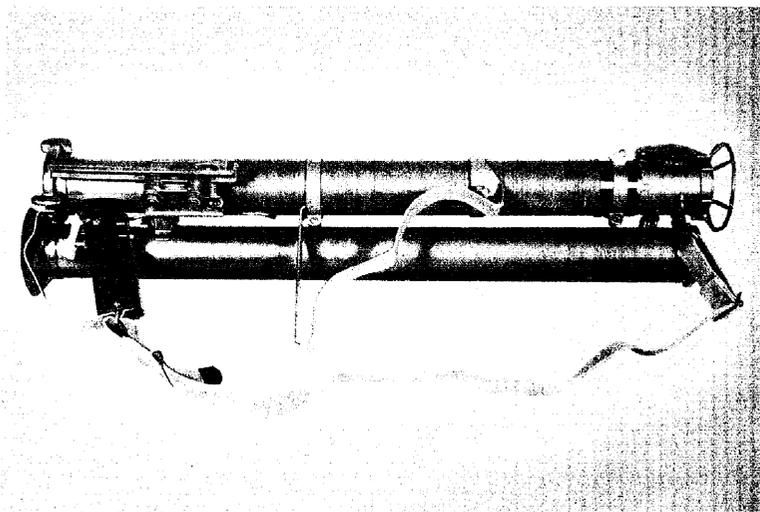


2.36 INCH ROCKET LAUNCHER, M9A1—LEFT SIDE VIEW

The 2.36 inch Rocket Launcher, M9A1, is an electrically operated shoulder weapon. It is the same as the M9 launcher except for a modified tube coupling better fitted to withstand rough usage.

CHARACTERISTICS

- Weight, total.....16 lb.
- Rails or tubes:
 - Length.....60 in.
 - Number and arrangement.....Single tube may be uncoupled into two 31-inch lengths. Stock and trigger assembly attached to rear section
- Composition.....Smooth bore steel tube
- Mounting.....Fired from shoulder in standing, kneeling, or prone position
- Elevation.....By operator
- Traverse.....By operator
- Rate of fire.....Not specified. Weapon must be sighted before firing each round
- Firing mechanism.....Pressing trigger generates current to fire rocket
- Fire control equipment.....Horizontal bar sight with range adjustments from 0 to 700 yd.

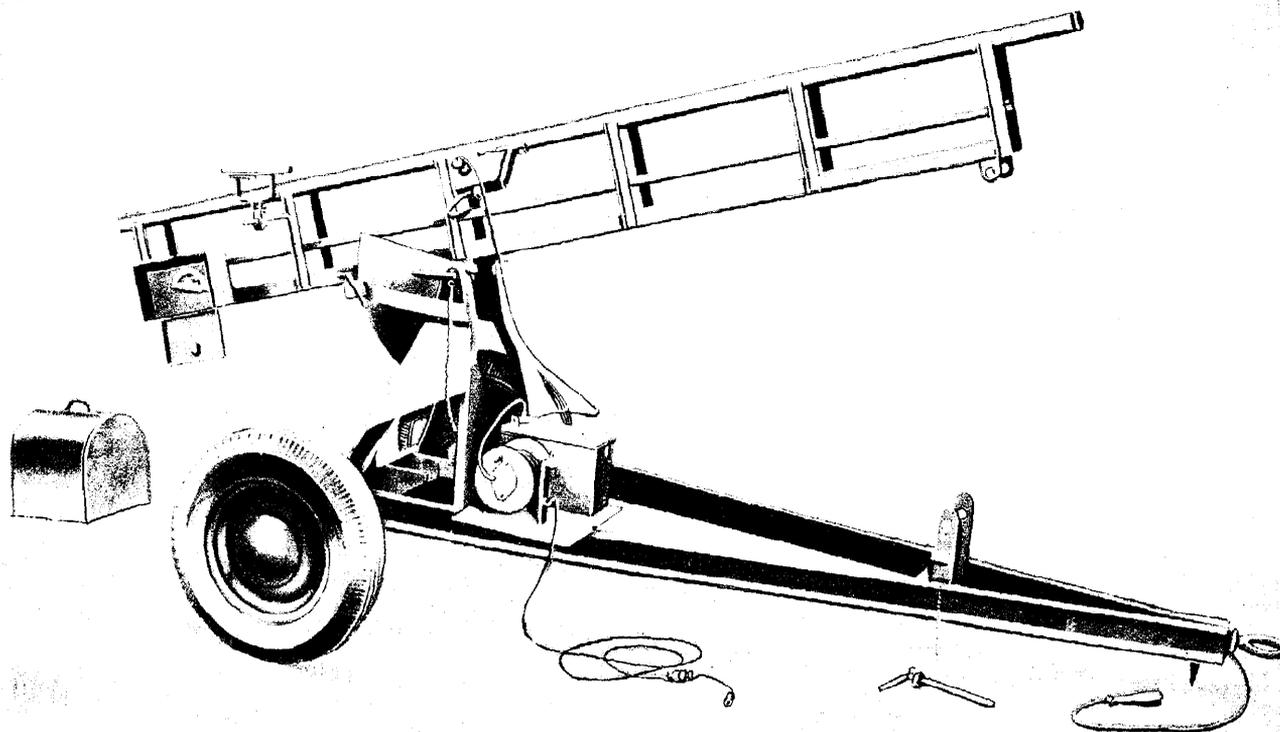


COUPLING FOR M9A1 LAUNCHER TUBE

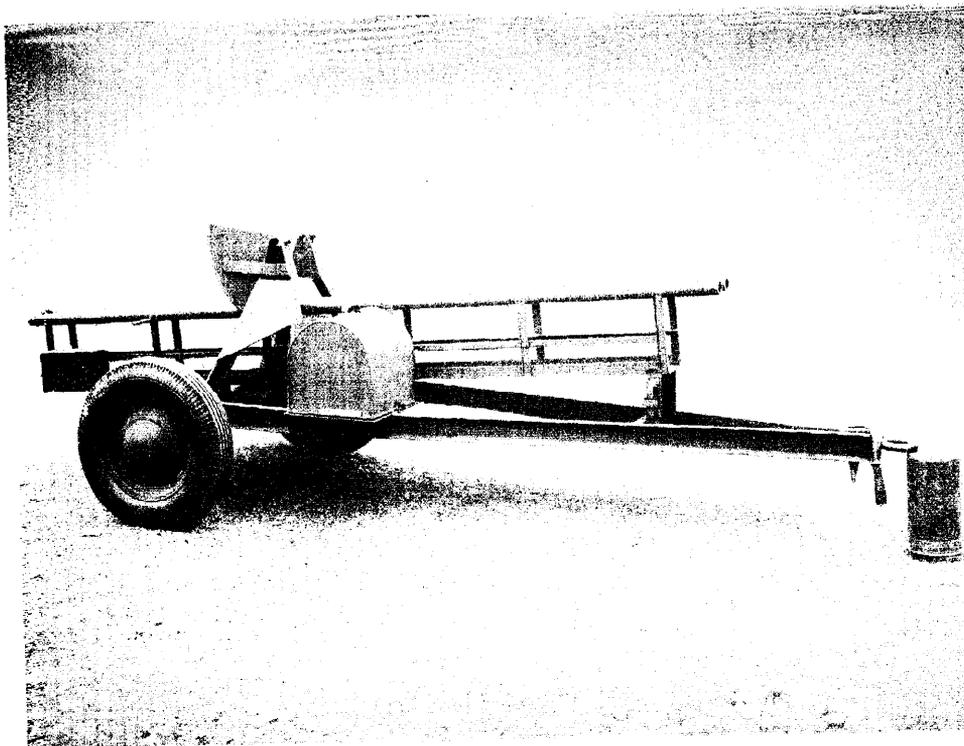
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ROCKET TARGET PROJECTOR M1—STANDARD



ROCKET TARGET PROJECTOR, M1, IN FIRING POSITION



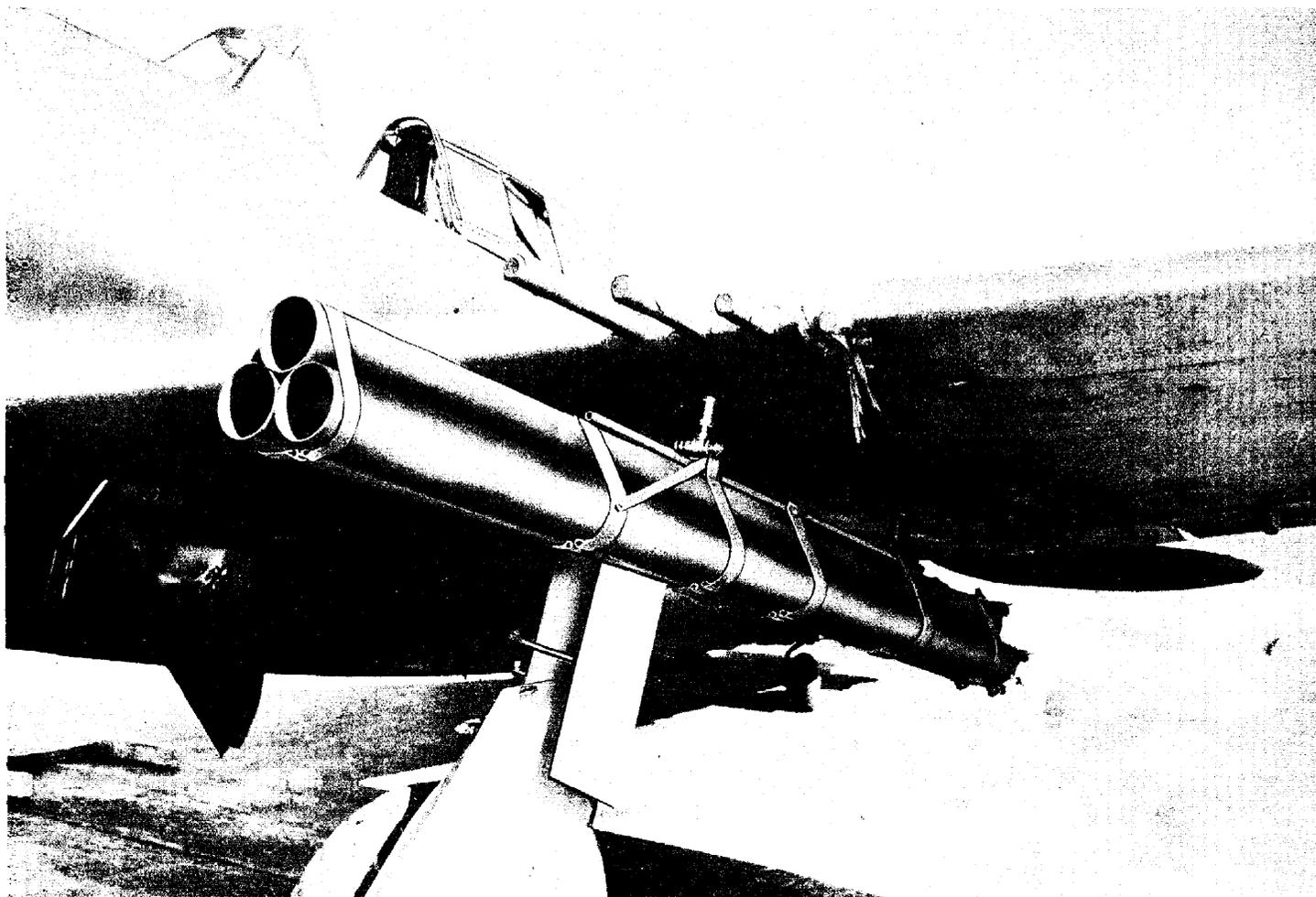
ROCKET TARGET PROJECTOR, M1, IN TRAVELING POSITION

The Rocket Target Projector, M1, is used to launch the 3.25 inch rocket target. The rails are mounted on a two-wheel carriage and are lowered into traveling position for towing. The mobility of this launcher permits firing courses to be set up quickly.

CHARACTERISTICS

Weight, total.....	750 lb.
Rail or tubes:	
Length.....	132 in.
Number and arrangement.....	Two parallel rails guide single rocket in launching
Composition.....	Steel tubing
Mounting.....	Rails mounted on two-wheel carriage with pneumatic tires
Elevation.....	0° to 60°
Traverse.....	By moving carriage
Rate of fire.....	One to two rounds per minute (estimated). Rate of fire of secondary importance. After loading personnel take cover at maximum distance permitted by firing cable
Firing mechanism.....	Electric current supplied by dry cells in reel and battery box. Cable on reel permits remote firing
Fire control equipment.....	Direct and indirect laying; sighting and leveling de- vices provided

4.5 INCH 3-TUBE A.C. ROCKET LAUNCHER M10—STANDARD



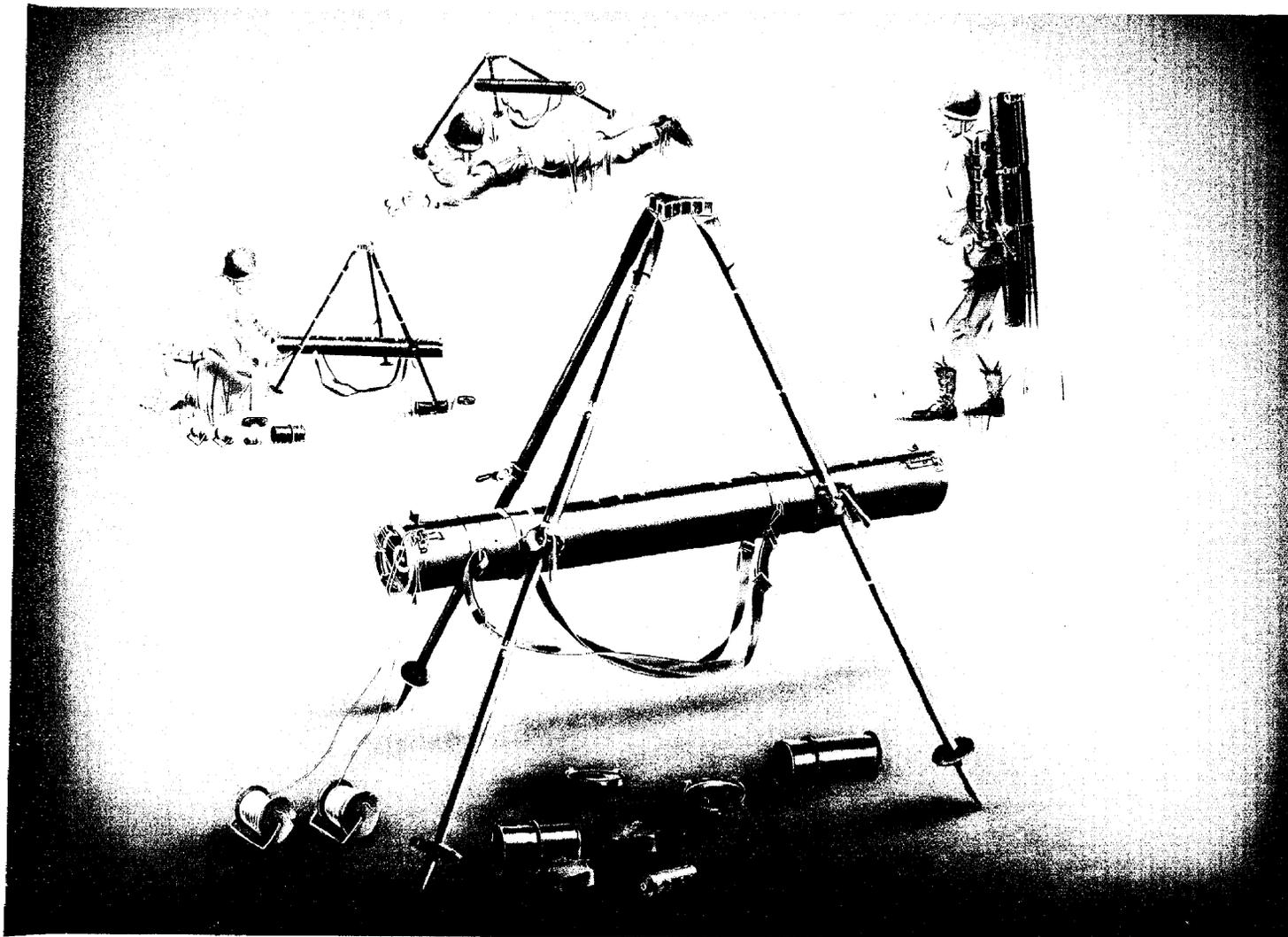
4.5 INCH 3-TUBE A.C. ROCKET LAUNCHER, M10, MOUNTED UNDER WING OF FIGHTER PLANE

The 4.5 inch 3-Tube A.C. Rocket Launcher, M10, is a cluster of three plastic tubes used for firing rockets from aircraft. One cluster is mounted under each wing of fighter aircraft. The cluster may be jettisoned after the rockets are launched. The fin-stabilized 4.5 inch rockets M8, M8A1, M8A2, M8A3, T22 and T41 may be launched from this cluster.

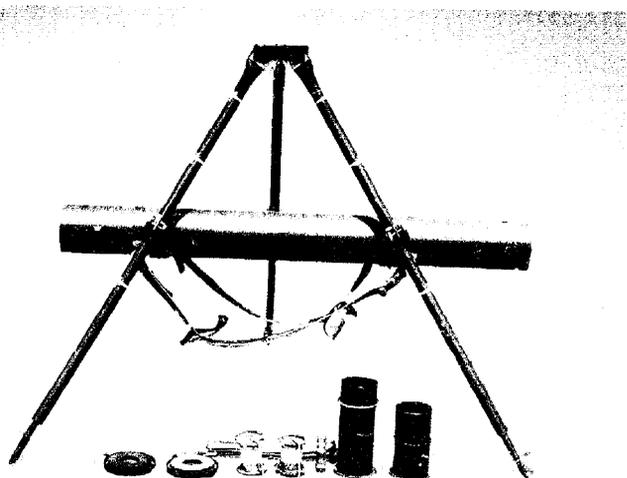
CHARACTERISTICS

Weight, total.....	82 lb.	Traverse.....	By changing direction of plane
Rail or tubes:		Rate of fire....	6 rounds released in 0.6 sec. when set for salvo
Length.....	120 in.	Firing mechanism..	Selective single round or ripple fire electric firing mechanism
Number and arrangement.....	3-tube cluster	Fire control equipment....	No special equipment. Clusters harmonized before takeoff by use of boresight equipment and quadrant of plane
Composition.....	Plastic		
Mounting.....	Clusters mounted on special brackets installed on underside of aircraft wings		
Elevation....	4° adjustment possible. Clusters harmonized with aircraft machine guns		

4.5 INCH ROCKET LAUNCHER M12—STANDARD



4.5 INCH ROCKET LAUNCHER, M12, IS AN EXPENDABLE PACKING CRATE TYPE FOR FIRING SINGLE ROUND



4.5 INCH ROCKET LAUNCHER, M12

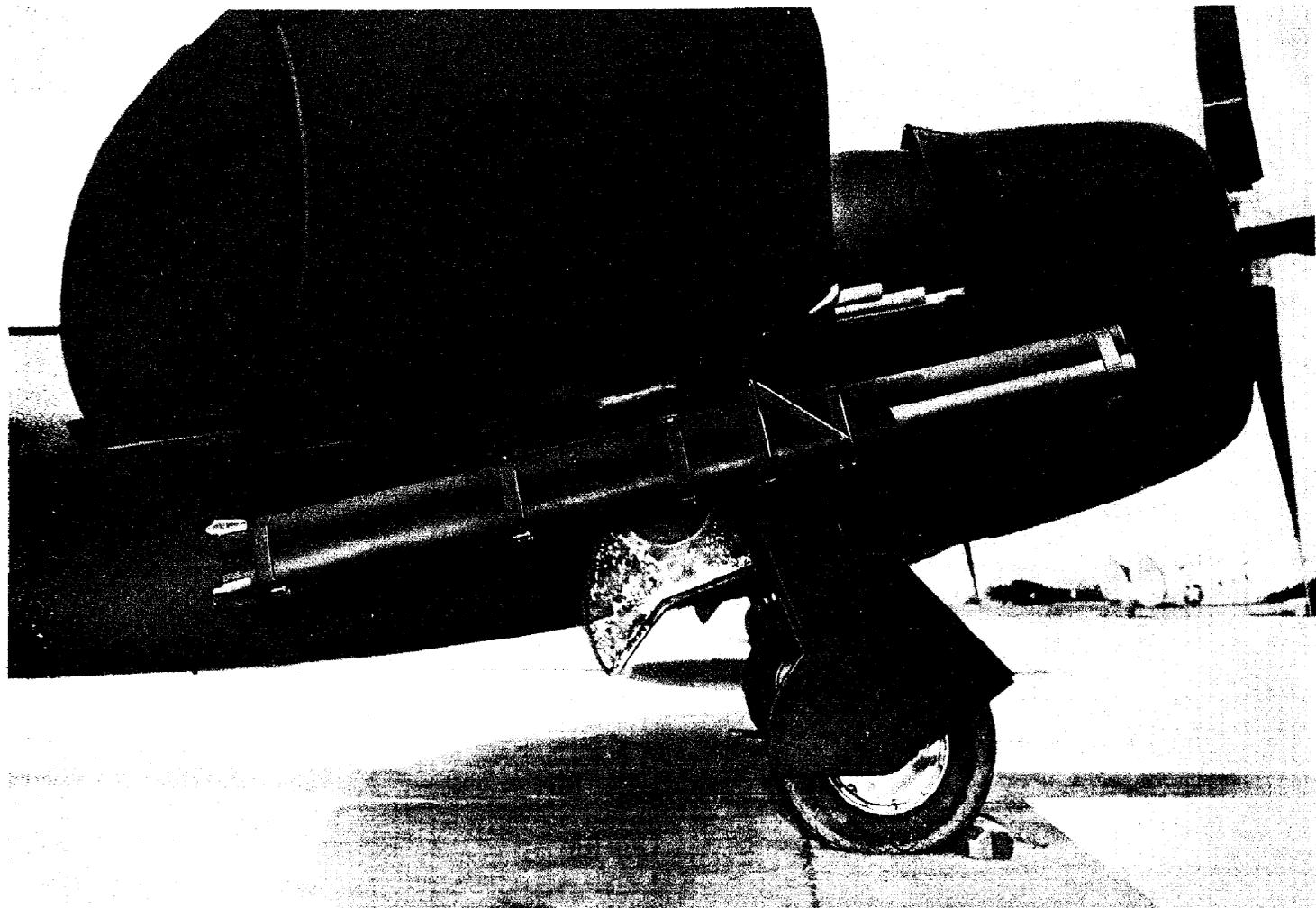
The 4.5 inch Rocket Launcher, M12, is an expendable packing crate type of launcher that is loaded and shipped complete with one M8 or M8A1 Rocket with a special igniter. In firing position the launcher is slung under the tripod which accompanies the packed launcher crate.

CHARACTERISTICS

Weight, total.....	22 lb.
Rails or tubes:	
Length.....	48 in.
Number and arrangement.....	Single tube
Composition.....	Plastic
Mounting.....	Tripod
Elevation.....	Fixed
Traverse.....	By moving tripod
Rate of fire.....	Discarded after firing one round
Firing mechanism.....	Battery packed with launcher furnishes electric current, Ten-cap exploder may be used for salvo release of several rockets at the same time
Fire control equipment.....	Folding peep sight and front stud sight

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4.5 INCH 3-TUBE A.C. ROCKET LAUNCHER M14—STANDARD



4.5 INCH 3-TUBE A.C. ROCKET LAUNCHER, M14

The 4.5 inch 3-Tube A.C. Rocket Launcher, M14, is a cluster of three steel tubes used for firing rockets from aircraft. One cluster is mounted under each wing of fighter aircraft. The cluster may be jettisoned after the rockets are launched.

This launcher is the same as the 4.5 inch M10 launcher except for steel instead of plastic tubes. This launcher may be used for fin-stabilized or spin-stabilized rockets (after slight modification).

CHARACTERISTICS

Weight, total.....	210 lb.	Traverse.....	By changing direction of plane
Rails or tubes:		Rate of fire.....	6 rounds released in 0.6 sec. when set for salvo
Length.....	120 in.	Firing mechanism..	Selective single round or ripple fire electric firing mechanism
Number and arrangement.....	3-tube cluster	Fire control equipment.....	No special equipment. Clusters harmonized before takeoff by use of boresight equipment and quadrant of plane
Composition.....	Steel		
Mounting..	Clusters mounted on special brackets installed on underside of aircraft wing		
Elevation....	4° adjustment possible. Clusters harmonized with aircraft machine guns		

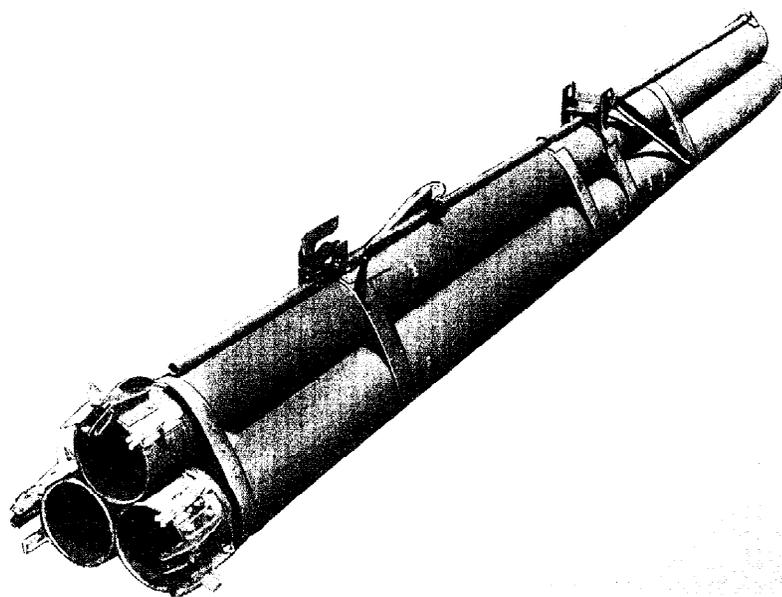
DECLASSIFIED - DOD Directive No. 5200.9,
27 September 1958

UNCLASSIFIED

4.5 INCH 3-TUBE AIRCRAFT ROCKET LAUNCHER M15—STANDARD



4.5 INCH 3-TUBE AIRCRAFT ROCKET LAUNCHER, M15, MOUNTED ON P-47 PURSUIT PLANE



4.5 INCH 3-TUBE AIRCRAFT ROCKET LAUNCHER, M15

UNCLASSIFIED

The 4.5 inch 3-tube Aircraft Rocket Launcher, M15, is a cluster of three magnesium tubes used for firing rockets from aircraft. One cluster is mounted under each wing on an aircraft. The cluster may be jettisoned after the rockets are launched. This launcher is identical to the M10 Aircraft Launcher except that it is constructed with magnesium tubing instead of plastic tubing.

CHARACTERISTICS

Weight, total 82 lb. (estimated)
Rails or tubes:
Length 120 in.
Number and arrangement . . . Three-tube cluster
Composition Magnesium
Mounting . . . Clusters mounted on special brackets installed on the underside of aircraft wings
Elevation . . 4° adjustment possible. Clusters harmonized with aircraft machine guns
Traverse By changing direction of plane
Rate of fire . . . 6 rounds released in 0.6 sec. when set for salvo
Firing mechanism . . . Selective single round or ripple fire electric firing mechanism
Fire control equipment . . No special fire control equipment. Clusters harmonized before takeoff by use of boresight equipment and quadrant of plane

MINES

MINES

LAND MINES—All combat types of land mines consist of a charge of high explosive and a device for detonating this charge under proper conditions.

In general, land mines are of the trap type, relying on unsuspected action of the enemy for initiation. Most types are simple and consist only of a container of high explosive and a firing mechanism to detonate the charge. Others are of complicated design such as the bounding mine, which projects a shell approximately five feet above ground where it explodes. Land mines are intended for antitank or anti-personnel use. Anti-

tank mines are classified as high-explosive, practice, or dummy types. Anti-personnel mines are classified as high-explosive or practice types.

METALLIC ANTITANK MINES—

An antitank mine contains a relatively large charge of explosive and is concealed or placed where it may be driven over and exploded by a vehicle. The metallic antitank mines consist of the mine body filled with explosive (with a booster charge inserted in the M1A1 and M4 mines), the spider, and the fuze.

The mine body is a squat cylindrical

container of thin steel, filled with TNT or other high explosive. The bottom is plain and attached to the sides of the mine body is a carrying handle which may be folded back when not in use.

The top extends beyond the side and the edge is bent to form a grooved flange to which the spider is attached. The spider hooks fit into two slots cut in the flange. In the top is a capped filling hole, and in the center is an opening for the fuze cup. When shipped the spider is nested in the bottom of the mine body and when assembled its hub rests on the striker head of the fuze.

MINE, ANTITANK, HIGH-EXPLOSIVE, M1A1—STANDARD

MINE, ANTITANK, HIGH-EXPLOSIVE, M1A1—STANDARD—The M1A1 mine is the present standard high-explosive antitank mine. As originally designed, it was the M1 high-explosive antitank mine which, due to its fuze construction, was found to be dangerous when shipped or stored.

The original design of the M1 mine called for shipping the fuze, with the booster as an integral part, and the mine body in the same box. This method proved dangerous as blows on shipping crates could detonate the fuze, booster and explosive charge of the mine.

As a solution, the fuze was modified so that the firing mechanism was separate from the booster and the only explosive element remaining in the fuze was the detonator. The booster now is assembled in the fuze well cavity in the mine body. The detonator fits into the hole in the booster charge when the fuze is assembled to the mine. The modified fuze was designated as Fuze, Mine, Antitank,

M1A1. It has since been replaced by the M1A2 fuze.

The same method of packing is retained with the fuze separated from the mine. If the modified fuze is set off accidentally, the explosion of the detonator is not sufficient to ignite the explosive charge of the mine.

The M1A2 fuze employs a more powerful detonator than the M1A1 fuze, but is identical in all other respects. The fuze consists of a striker assembly and a body which contains the detonator. To insure safety in shipping and handling, a safety fork with a cord attached to aid in its removal, is fitted over the collar between the striker head and the top of the fuze body. This safety fork is removed only when it is desired to arm the fuze. The firing mechanism contained within the striker assembly is restrained from firing by a thin aluminum collar placed immediately below the striker head, and by two shear pins, when in the armed condition. On the outer head of the striking assembly

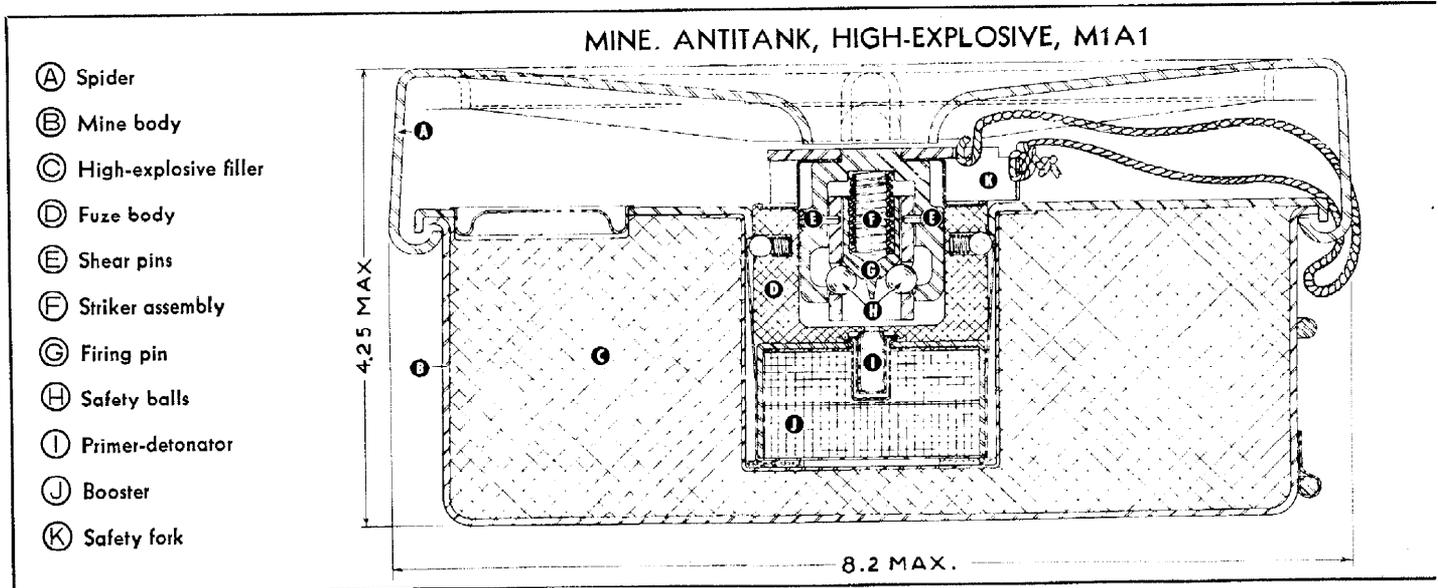
is a 2-inch head which protrudes approximately $\frac{3}{8}$ inch beyond the body of the fuze.

The M1A2 fuze firing pin normally is held away from the detonator by two steel balls. When pressure is applied to the fuze head, it moves downward, shearing the pins and aligning grooves into which the two steel balls move. The firing mechanism spring then is free to throw the firing pin forward, striking the primer of the detonator which sets off the explosive charge. A pressure of approximately 500 pounds on the striker head will function the firing mechanism. However, when the fuze is inserted and the spider attached, a pressure of 250 pounds, at any point, on the spider is sufficient to activate the fuze, as a result of the lever action afforded by the spider.

The assembled mine is 8.2 inches in diameter and 4.25 inches high.

The weights of the components are:

Mine, complete assembly (Cast TNT).....	10.67 lb
Bursting charge (Cast TNT).....	5.83 lb
Fuze, Mine, Antitank, M1A2.....	1.11 lb



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1 MARCH 1944

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MINE, ANTITANK, HIGH-EXPLOSIVE, M4—SUBSTITUTE STANDARD

MINE, ANTITANK, PRACTICE, M1—STANDARD

MINE, ANTITANK, PRACTICE, M1B1—STANDARD

MINE, ANTITANK, HIGH-EXPLOSIVE, M4, SUBSTITUTE STANDARD—This substitute standard mine is similar in appearance to the M1A1 mine. The detonator, however, is incorporated within the fuze body and no cavity is required in the booster. The shear pins and cocked firing pin of the M1A2 fuze are eliminated in the M4 mine by the use of a cricket or Belleville-type spring. This spring merely

supports the firing pin when the fuze is not under pressure and exerts no force on it. The spider rests on the striker washer at the top of the fuze and any loads on the washer are transmitted harmlessly to the fuze body by the safety fork which is removed when the mine is armed.

The spider of the armed mine moves downward under pressure of a tank or other load and the striker washer crushes

the thin aluminum cover of the fuze. The striker is prevented from moving laterally by the striker guide so it moves straight downward, centering and depressing the firing pin guide cup.

The spherical portion of the striker is so designed that off-center loads on the washer do not result in binding the striker in its guide or in deflecting the firing pin. When the cricket spring reaches the point of snap it drives the firing pin into the detonator. The force of detonation ruptures the bottom of the fuze body. The detonator blast is directed into the booster, ignition of which explodes the bursting charge of the mine.

The mine is shipped with the booster assembled in the body and held in place by fingers on the outer booster cup, in the same manner as the M1A2 booster is held into the M1A1 Mine.

MINE, ANTITANK, PRACTICE, M1, STANDARD—This mine is identical in appearance to the M1A1 and M4 mines with the exception of five one-inch holes equally spaced around the body. The fuze also is the same as the M1 antitank fuze except that a smoke-puff charge is used instead of a booster. The charge produces smoke which escapes from the mine through the holes. It consists of 60 grains of Army black powder which ignites 100 grains of red phosphorous.

A steel filler ring is inserted in the mine body so that the M1 will equal the weight of the M1A1 and M4 mines. Holes are drilled in this ring to match the holes in the mine body.

The complete assembly weighs 10.67 pounds and is 8.2 inches in diameter, 4.25 inches high.

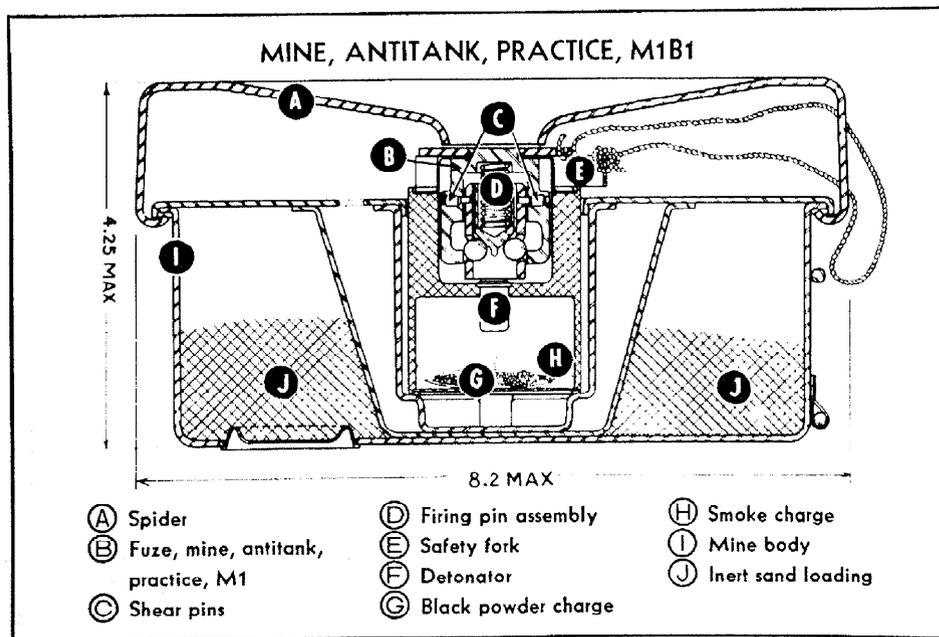
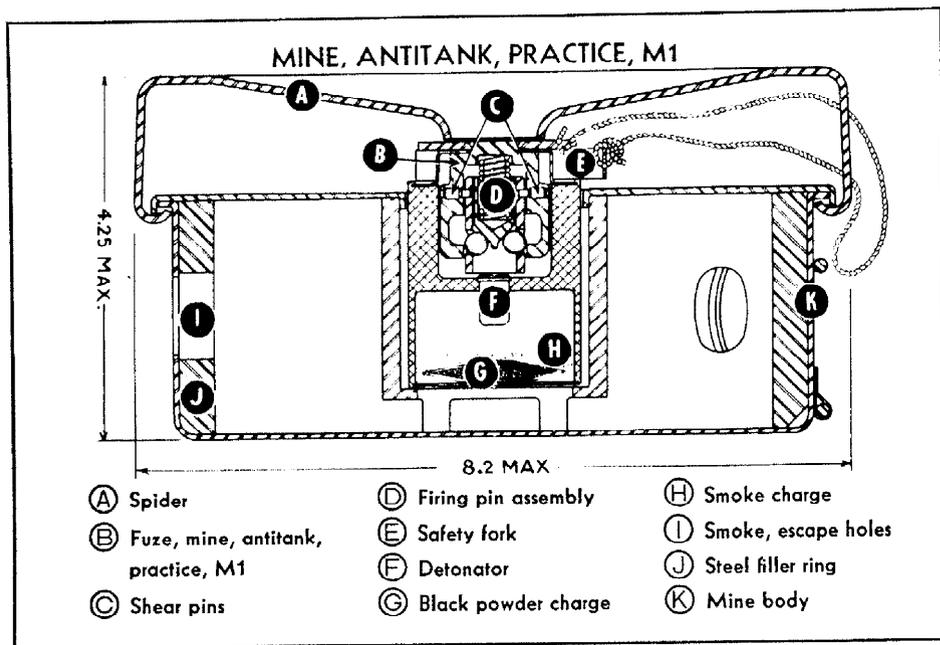
Components of the complete round weigh as follows:

Mine, complete assembly	10.67 lb.
Fuze, Mine, Antitank, M1, Practice	0.75 lb.
Metal parts assembly	9.92 lb.

MINE, ANTITANK, PRACTICE, M1B1, STANDARD—The five smoke holes are cut into the top of the M1B1 practice mine, instead of on the side as in the M1 mine, permitting the smoke to escape more readily. Both mines use the same fuze and the same smoke charge. However, instead of a steel filler ring inserted when the mine is manufactured, and shipped with it, the M1B1 mine is sand loaded in the field to save shipping weight.

The complete round components weigh as follows:

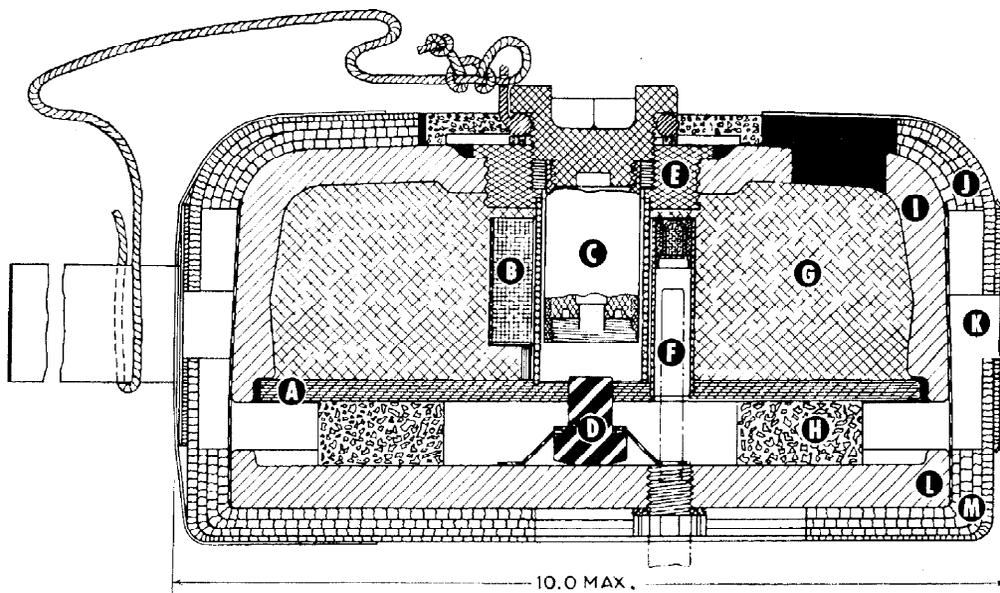
Mine, complete assembly	10.67 lb.
Fuze, Mine, Antitank, Practice, M1	0.75 lb.
Metal parts assembly	4.26 lb.
Sand loading	5.66 lb.



MINE, ANTITANK, NON-METALLIC, HIGH-EXPLOSIVE, M5—STANDARD

MINE, ANTITANK, NON-METALLIC, HIGH-EXPLOSIVE, M5

- (A) Closure plate
- (B) Booster pellet
- (C) Fuze, chemical, mine, A.T., N.M., M5
- (D) Pressure pin
- (E) Fuze adapter
- (F) Sleeve firing device
- (G) Bursting charge
- (H) Compression ring
- (I) Body
- (J) Top jacket
- (K) Rubber diaphragm
- (L) Base
- (M) Bottom jacket



MINE, ANTITANK, NON-METALLIC, HIGH-EXPLOSIVE, M5—STANDARD—

This mine is manufactured without materials which would betray its presence to an enemy using an electro-magnetic mine detector.

The mine body consists of a china or glass bowl (I) containing 5.4 pounds of TNT, or an alternate filling of 5.7 pounds of Tetrytol, and a china or glass plate (L).

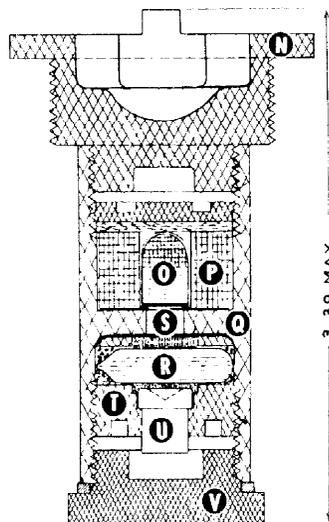
These components are separated by a cushion of rubber (H) or similar material. There is a threaded opening in the top of the mine for the fuze (C) and in the bottom a bakelite plug which may be removed for the attachment of a device to prevent removal of the placed mine by enemy personnel. The engineer firing devices, in conjunction with the U. S. Army special blasting cap Type "A," may be attached to the bottom of these mines to prevent their removal. However these devices are made of magnetic materials and their use defeats the purpose of this non-magnetic mine.

The M5 mine may be buried without fear of stones or dirt jamming the firing mechanism. It is waterproof and may be installed under water or in swampy ground.

The high-explosive antitank fuze, M5, also is constructed without metal parts. The fuze consists of a cylindrical plastic body (Q) attached to a threaded plug (N). In addition to the safety cap (V), there is a safety ring around the fuze body (against the flange of the plug) which

FUZE, CHEMICAL, MINE, A.T., N.M., M5

- (N) Plug
- (Q) Fuze detonator
- (P) Booster pellet
- (O) Body
- (R) Ampule
- (S) Primer mixture
- (T) Ampule housing
- (U) Piston
- (V) Safety Cap



prevents the fuze from being screwed into functioning position in the mine.

When the mine is laid, the safety cap (V) is removed from the fuze and the fuze is inserted in the mine. Pressure on top of the mine forces the fuze onto a plastic pressure pin (D), which in turn forces a piston (U) into a glass ampule. This ampule contains a solution of concentrated sulfuric acid and an antifreeze.

Breaking the ampule releases the acid and permits it to react with a surrounding primer mixture (S), which fires and

explodes the detonator (O) and a booster (P). An auxiliary booster of tetryl (B) sealed in the mine body with the cast TNT, transmits the detonation to the mine filler.

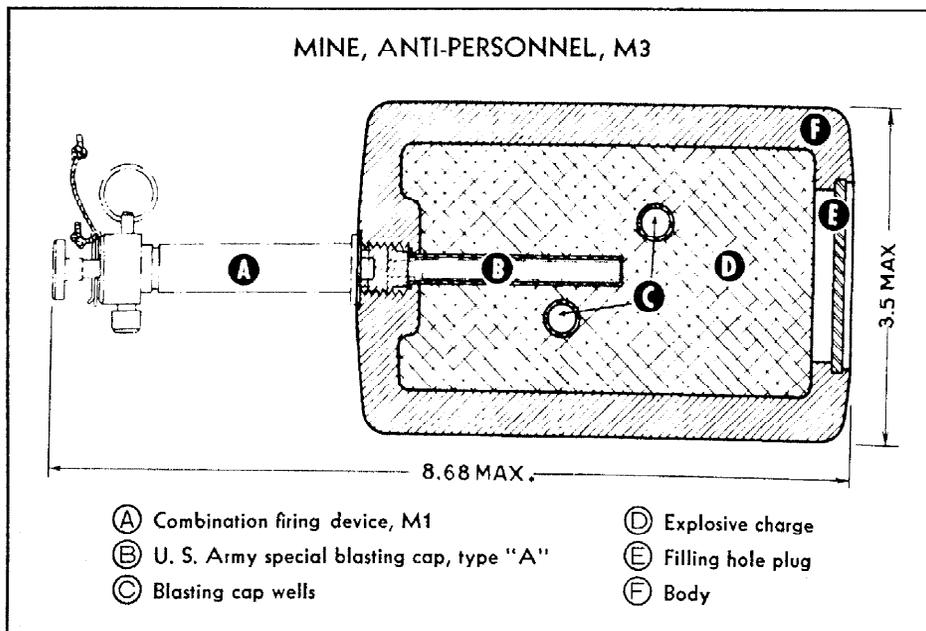
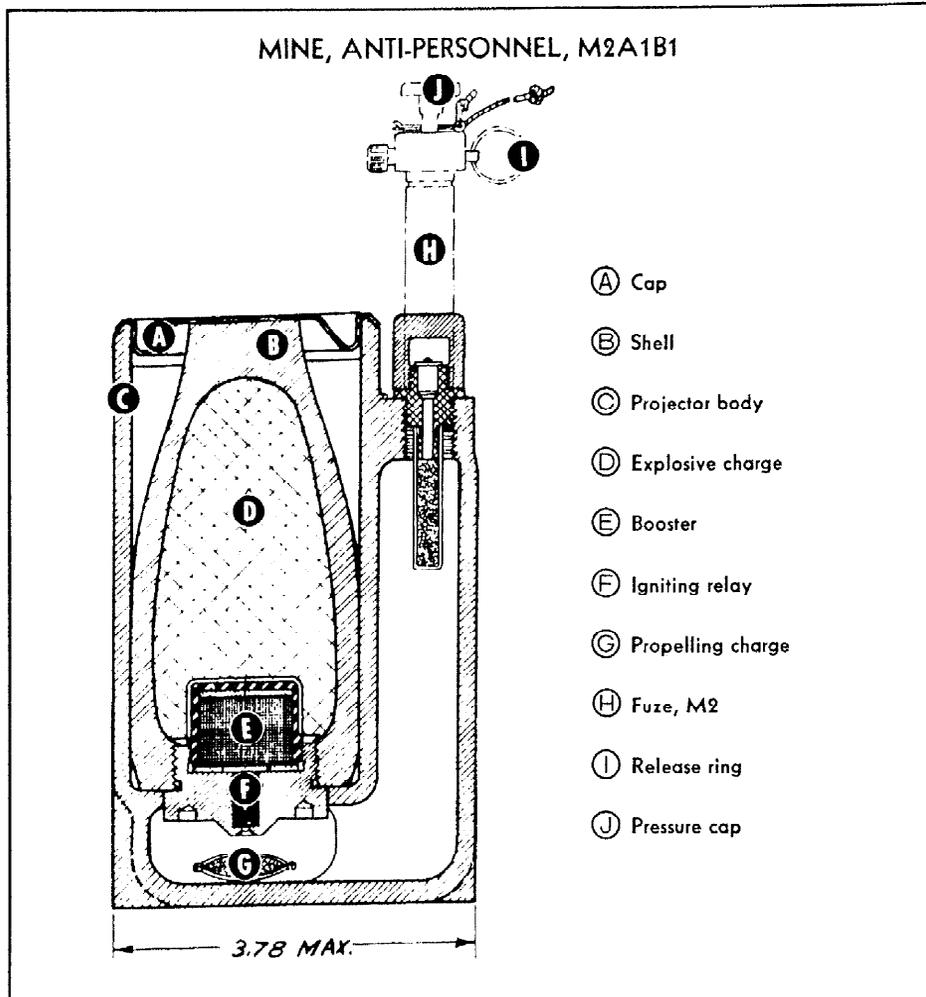
The mine is 10 inches in diameter, 5.2 inches high, and when assembled, weighs 15 pounds. Components of this mine weigh as follows:

Mine, assembled (Cast TNT loaded)	15.0 lb.
Mine, assembled (Tetrytol loaded)	15.3 lb.
TNT bursting charge	5.4 lb.
Tetrytol bursting charge	5.7 lb.
Fuze, Chemical, Mine, A.T., N.M., M5	0.2 lb.

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MINE, ANTI-PERSONNEL, M2A1B1—LIMITED STANDARD

MINE, ANTI-PERSONNEL, M3—STANDARD



ANTI-PERSONNEL MINES—All anti-personnel mines depend upon some enemy action for initiation. As enemy personnel in the open will have unrestricted vision, it is important that full advantage be taken of every opportunity to conceal mines of this type.

MINE, ANTI-PERSONNEL, M2A1B1—LIMITED STANDARD—The action of this mine is similar to the M2A3 anti-personnel mine and the same shell and fuze are used in both mines. However the M2A1B1 has a one-piece projector body in place of the M2A1 mine body.

The body of the M2A1B1 is made entirely of cast-iron instead of the stamped steel base plate, steel pipe and steel tube body of the M2A1. This design simplifies mass production. The assembled round measures approximately $8\frac{5}{8}$ inches in height and $3\frac{2}{3}$ inches across the base. The complete round assembly components weigh:

Mine, Anti-Personnel, M2A1B1, complete assembly	7.16 lb.
Shell, loaded and fuze	2.84 lb.
TNT bursting charge	0.34 lb.
Projector body	3.60 lb.
Fuze, M2, assembly	0.25 lb.

MINE, ANTI-PERSONNEL, M3—STANDARD—This is a fragmentation trap-type land mine, intended for use against personnel. The complete round consists of the mine, a hollow cast-iron block containing TNT and mine fuze, M3. It has an effective radius of 10 yards when exploded on the ground, an even greater radius when used several feet above ground and slightly less when buried. Fragments may be thrown more than 100 yards and suitable protection should be provided for friendly troops within that radius.

The fuze mine is 8.68 inches long and 3.5 inches square. The cast-iron casing (F) is filled with 0.9 pound of flaked TNT (D). Cap wells (C) closed by plastic plugs are located under holes in two opposite sides and one end of the casing. The fuze may be inserted in any one of these holes. The filling hole is closed with a metal disk (E).

The Fuze, Mine, Anti-Personnel, M3, consists of a special U. S. Army blasting cap, Type "A," crimped to the combination firing device, M1. The firing device contains a spring-loaded firing pin and a primer. As with the M2 mine, the M3 may be fired by cord or wire connected to the release pin or by pressure applied to the pressure cap. Wire is furnished to connect the pull ring to the tripping device. The pressures needed to fire the mine are the same as required by the M2 mine; 20 to 40 pounds pressure on the cap, or three to six pounds tension on the release plug.

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MINE, ANTI-PERSONNEL, M2A3—STANDARD

ANTI-PERSONNEL, M2A3—STANDARD—This mine is similar to a small mortar. It projects a shell about six feet into the air, blasting fragments among many of the personnel in the vicinity. Its effective radius is about thirty feet. The projectile is the 60 mm mortar shell, M49A2. It weighs approximately three pounds, of which twelve per cent is the high explosive bursting charge of TNT. The shell igniting relay is set off by a delay element of pressed black powder which is ignited by the propelling charge. Detonation of the shell is delayed until it has attained an effective height which varies between two feet and seven feet. The mine is fired by a pull wire or pressure device. Firing of the primer ignites a 20 grain charge of black powder which propels the shell into the air and at the same time ignites the fuze delay element.

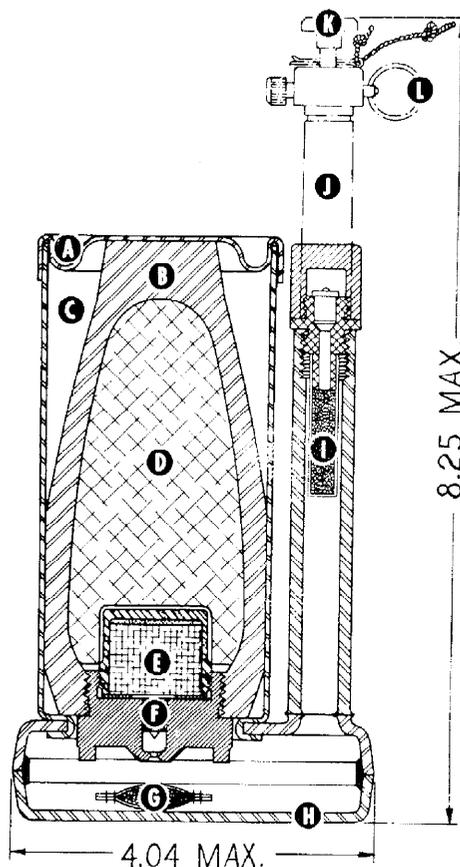
The fuze consists of a simple firing mechanism containing a spring-activated firing-pin. It may be fired by a trip wire connected to the release pin, or by pressure applied to the pressure cap. A pressure of from 20 to 40 pounds on the cap, or tension of from three to six pounds on the release pin will cause release of the firing pin and detonation of the mine. Lengths of wire are packed with the mine in order to connect it to the pull ring and to produce tripping devices. For effective camouflage, some of the wire is lustreless olive drab; the remainder is sand-colored.

The mine is shipped with the fuze, M2, disassembled. When assembled, the mine measures 8.25 inches in height and 4.04 inches across the base plate.

Weights of the components are as follows:

Mine, Anti-Personnel, M2A3, complete assembly.....	5.01 lb.
Shell, loaded.....	2.12 lb.
TNT bursting charge.....	0.34 lb.
Propelling charge.....	0.003 lb.
Fuze, M2, assembly.....	0.25 lb.

MINE, ANTI-PERSONNEL, M2A3

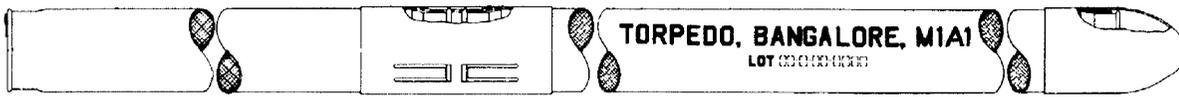


- | | |
|----------------------|-----------------------|
| (A) Cap | (G) Propelling charge |
| (B) Shell | (H) Base plate |
| (C) Tube | (I) Igniter |
| (D) Explosive charge | (J) Firing device |
| (E) Booster | (K) Pressure cap |
| (F) Igniting relay | (L) Release ring |

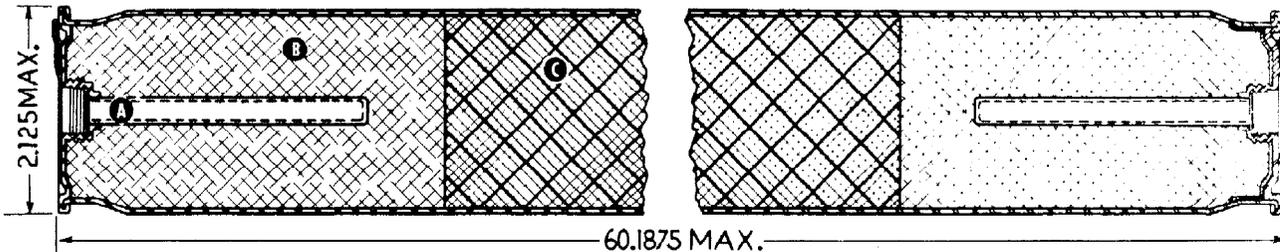
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TORPEDO, BANGALORE, M1A1—STANDARD

TORPEDO, BANGALORE, M1A1 Assembly with Connecting Sleeve



LOADING ASSEMBLY

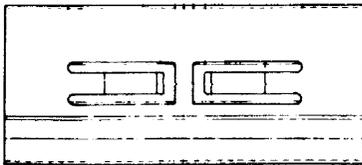


Ⓐ Detonator well assembly

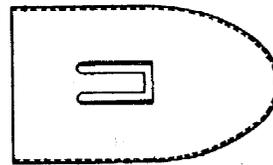
Ⓑ TNT loading

Ⓒ Amatol loading

CONNECTING SLEEVE



NOSE SLEEVE



TORPEDO, BANGALORE, M1A1—STANDARD—The Bangalore torpedo is a tube filled with high explosive and used primarily for blasting an opening through wire entanglements and for clearing mine fields. The M1A1 Bangalore torpedo consists of a steel tube, 5 feet long and 2½ inches in diameter, flanged and capped at each end.

The torpedo is loaded with four inches

of TNT at both ends of the tube and the mid-section is filled with 80–20 amatol. The complete charge weighs about 9 pounds. Each end of the tube contains a threaded recess to accommodate a blasting cap. A nose sleeve fits on the end of the torpedo and connecting sleeves are provided for assembling torpedoes in multiple lengths. This torpedo also may be used as an anti-personnel mine or as a demolition charge.

Standard Corps of Engineers special blasting caps, either electric or fuzed, may be used to detonate the torpedo. The nose sleeve is held in place by a single clip. It aids while moving the torpedo through or around obstacles. The connecting sleeve is a short tube which has six spring clamps. When assembling two torpedo tubes with a sleeve, each tube is held by three spring clamps.

PYROTECHNICS

PYROTECHNICS

In July 1919, a special board of officers was convened to study types of incendiary signal and illuminating compositions used by the various armies during World War I, so that the Ordnance Department could select the most efficient ones for future use and also develop new and improved models.

The Board attacked the many problems of modification and adaptation by first recognizing that there was a need for military pyrotechnics to produce a brilliant light for illumination and colored lights and smokes for signal purposes. Since rapid strides had been made in aviation during World War I, the Board further recognized that it would be equally important to stress the development of pyrotechnics released or fired from aircraft as those which are ground projected.

REQUIREMENTS—Pyrotechnics were developed for signaling between aircraft, ground troops and from ground to air and air to ground units. Illuminants also

were required for reconnaissance, observation, bombardment, night photography and landing of airplanes and parachute troops.

CLASSIFICATION—According to use, pyrotechnics are classified as aircraft types and ground types. These classifications are further broken down into illuminants which provide light for an appreciable time (flares); an instantaneous flash for night photography (photo-flash bombs); signals which produce lights or smokes of various colors and arrangements for the conveyance of messages; and marine markers (slicks). When any of the foregoing are provided with parachutes they are known as "parachute types."

PYROTECHNIC COMPOSITIONS—The chemical compounds used in pyrotechnics produce illuminations which range in intensity from the "dark fire" used as an element of blinker signals to the brilliant flash of photoflash bombs. Standard

compositions consist in general of perchlorates and nitrates to provide oxygen for burning; aluminum or magnesium for fuel; salts of barium, copper or strontium for color; and agents such as asphalt and paraffin for binding and waterproofing.

Pyrotechnics are functioned by an igniter train. Ignition is started by a primer mixture and intensified by a "first-fire" composition which ignites the illuminating compound.

IDENTIFICATION—In addition to the ammunition lot number and data card which accompany each pyrotechnic item, it is identified by painting and marking. The marking includes all information necessary for handling, storage and use of the item. In addition to standard markings, aircraft signals are distinguished by the color and embossing on the identification top (outer wad). Standard ground signals are distinguished either by the color and embossing on the fin or by the color and embossing on the identification top.

FLARE, AIRCRAFT, PARACHUTE, AN-M26—STANDARD

FLARE, AIRCRAFT, PARACHUTE, AN-M26—STANDARD—This flare, designed to provide illumination for night bombardment, is a parachute-supported type with a shaded candle which burns with a yellowish light 3 to 3.5 minutes. The minimum candlepower is 800,000. The same flare with a secondary pyrotechnic composition which produces a candlepower of 545,000 is used for training purposes. It has a blue band on the outside to distinguish it from the 800,000 candlepower model.

The M11A2 mechanical time fuze permits use of the AN-M26 parachute flare in high altitude bombardment because the fuze may be set to function at a predetermined number of seconds after release.

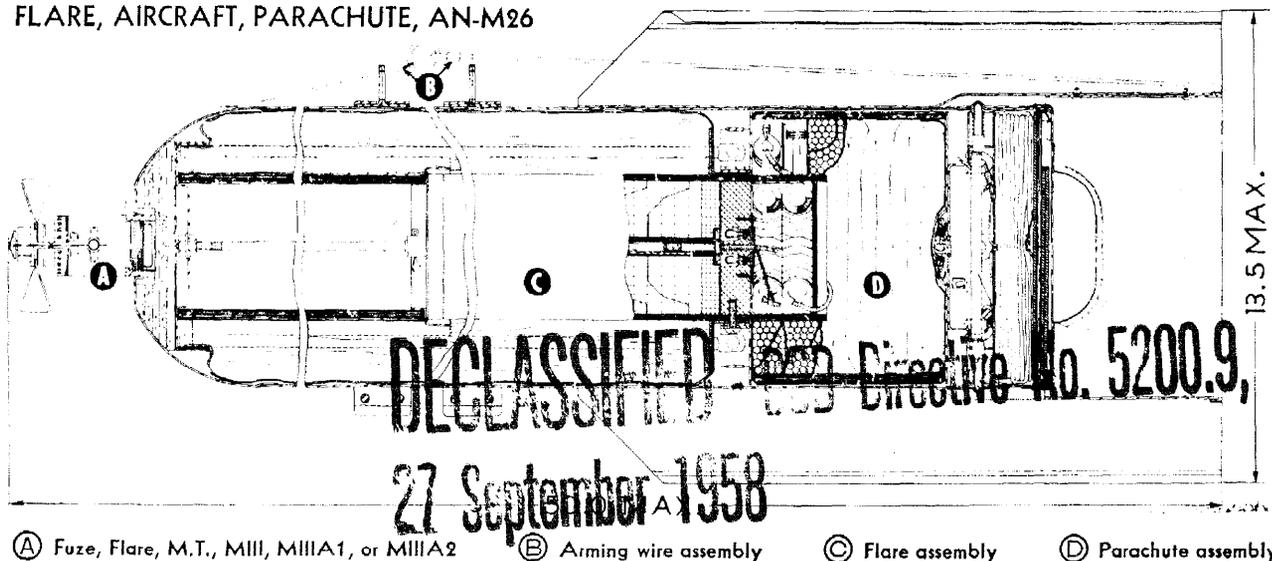
The parachute retards the rate of fall to 11.6 feet per second.

The flare should be released from horizontal racks in a plane flying at any speed up to 300 miles per hour. It is cylindrical in shape, with rounded nose and finned tail and measures 50 inches

long by 8 inches body diameter. It weighs 52.5 pounds as dropped. Two suspension lugs are used, the rear lug being located at center of gravity. A shipping cover with handle attached closes the tail end of the body and is sealed by a strip of tape.

The flare may be released safe or armed. If released safe, it may function on impact. If released armed, the fall withdraws the arming wire from the fuze, permitting the vane to rotate to arm the fuze and at the same time ejecting

FLARE, AIRCRAFT, PARACHUTE, AN-M26



(A) Fuze, Flare, M.T., M111, M111A1, or M111A2

(B) Arming wire assembly

(C) Flare assembly

(D) Parachute assembly

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FLARE, AIRCRAFT, PARACHUTE, AN-M26 (Continued)

the arming pin, thus starting the time mechanism.

When the flare has dropped the length of the hangwire, the latter breaks the seal wire and pulls out the hangwire container which drops free. Meanwhile the tear-wire attached to the hangwire pulls out the tear-wire cord and this in turn pulls out the stabilizing sleeve and

its shrouds. A short length of cord attached to the shrouds removes the lock of the cover releasing cup.

When the flare has dropped the combined length of the hangwire, tear-wire, tear-wire cord, sleeve and shrouds, its weight breaks the tear-wire and allows the flare to drop. It is stabilized in flight by its fins and sleeve. The arming vane

rotates to arm the fuze 3 or 4 seconds after release.

At the time set, the fuze functions to push out the cover releasing cup. This releases the detachable cover to which the sleeve shrouds are attached, permitting the sleeve and cover assembly to separate from the flare and pull out the parachute by the pull-out cord.

The opening parachute retards the fall of the flare sharply breaking the parachute pull-out cord, allowing the sleeve assembly to fall separately. The ignition wires are pulled through the igniting mixture starting the ignition train of igniter, quickmatch, primer, first fire, and candle, which reaches full ignition in approximately 6 seconds. This retarding also pulls the flare assembly out of the case which drops free and as the candle ignites it expels the rib retainer which allows the rib springs to open the shade.

CHARACTERISTICS

	Flare, Aircraft, Parachute, AN-M26	Flare, Aircraft, Parachute, M9A1
Color	Yellow-tinted light	White light
Delay Time (seconds)	5 to 6†	2.5
Burning Time (seconds)	195	60
Rate of Fall (f/s)	11.6	7
Candlepower (thousands)	800	60
Illuminant Weight (pounds)	14	
Complete Weight (pounds)	52.5	2.11
Length (inches)	50	15.05
Diameter (inches)	8 for case (13.5 incl. fins)	2.06

†After fuze functioning.

FLARE, AIRCRAFT, PARACHUTE, M9A1—STANDARD

FLARE, AIRCRAFT, PARACHUTE, M9A1—STANDARD—This flare was developed to satisfy the requirement for a small parachute flare for reconnaissance purposes. The complete round is supplied in cartridge form for protection from the M2 pyrotechnic pistol.

The flare consists of an extruded aluminum case (alternate material: steel), reduced in size at the base to fit in the detachable barrel. The expelling cup contains a black powder expelling charge and is attached to the inner wall of the base. The fuze train is housed in a metal flanged

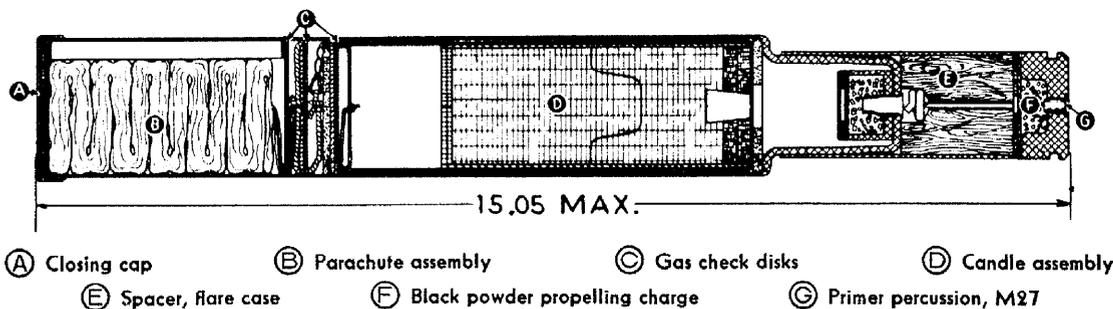
tube secured to the base of the flare case. The outward end of the case is exposed to the flame of the propelling charge which is housed in the breech of the detachable barrel.

The opposite end of the fuze is contained in the candle case. This case is glued in the candle case cover which is closed at the upper end by the candle case cap. The cap provides a means of attaching the parachute wire. Gas check disks protect the silk parachute from the flame of the expelling charge. The upper end of the flare case is provided with a closing cap.

The flare cartridge has an over-all length of 15.05 inches and a diameter of 2.06 inches. When the flare is discharged, the fuze burns for 2.5 seconds before igniting the propelling charge which in turn ignites the flare, expelling flare and parachute from the case.

The flare burns with a white light of 60,000 candlepower for one minute while dropping at an average rate of 7 feet per second. It is projected approximately 80 feet from the plane (2.5 seconds) before the delay train burns through it to ignite the expelling charge.

FLARE, AIRCRAFT, PARACHUTE, M9A1



BOMB, PHOTOFLASH, M46—STANDARD

WITH FUZE, FLARE, MECHANICAL TIME, M111

BOMB, PHOTOFLASH, M46—STANDARD—This bomb was designed to provide a light of high intensity, 500,000,000 candlepower, and short duration for high-altitude night photography. Strict classification would list the M46 photoflash bomb as a "pyrotechnic," but because of

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its explosive effect it is designated as a "bomb."

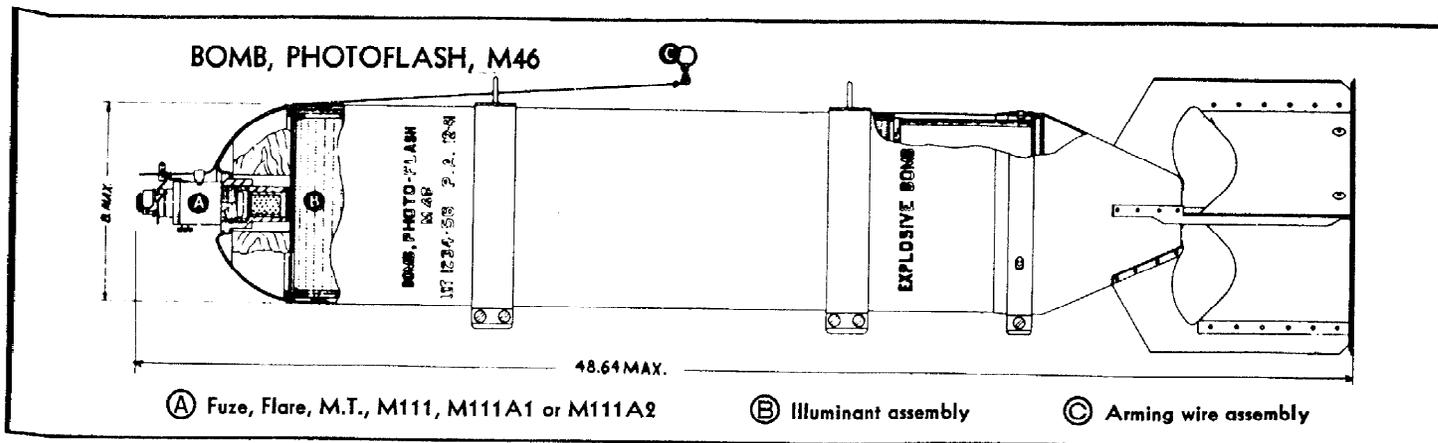
It is cylindrically shaped and measures 48.4 inches in length by 8.0 inches in body diameter. Its weight as released is 51.9 pounds of which 25.0 pounds is the photographic flash-light powder charge.

It is issued unfuzed with fins and suspension bands assembled.

In most respects the M46 bomb is similar to the limited standard M23A1 bomb except that it is adapted for a time fuze permitting its use in high-altitude photography, which is not possible with the outmoded M23 and M23A1 bombs.

(Continued on next page)

BOMB, PHOTOFLASH, M46 (Continued)



The complete round consists of the Bomb, Photoflash, M46, unfuzed, adapted for Nose Fuze, M111; Fuze, Flare, Mechanical Time, M111, M111A1 or M111A2 sealed; Arming Wire assembly, piece mark 82-3-234GB.

The estimated burning time and the candlepower values are as follows:

Maximum candlepower	800,000,000
Average candlepower	500,000,000
Total burning time	0.25 second

After the sealing tape and the shipping cover are removed, the arming wire is threaded through the forward suspension lug, then into the inner hole of the fuze

CHARACTERISTICS

Color	White light	Illuminant Weight (pounds)	25.0
Delay Time* (seconds)		Complete Weight (pounds)	51.9
Burning Time (seconds)	0.25	Length (inches)	48.39
Rate of Fall (f/s)	Free	Diameter (inches)	8.0
Candlepower (thousands)	500,000		

*Determined by setting of M.T. Fuze, M111, M111A1, or M111A2.

arming pin, and finally through the inner holes of the vane stop. The delay time between release from the rack or launching tube until the bomb functions can

be set, by loosening the thumbscrew on the M111, M111A1, or M111A2 fuze and rotating the head until the desired number of seconds, is indicated by the marker.

SIGNALS, AIRCRAFT, SINGLE STAR, AN-M43, AN-M44, AN-M45—STANDARD

SIGNALS, AIRCRAFT, SINGLE STAR, AN-M43 TO AN-M45—STANDARD
These three single-star signals are standard items for issue and manufacture and have supplanted the now limited standard single-star signals, AN-M34 to AN-M36.

The standard signals, AN-M43 to AN-M45, are assembled in shotgun-type cartridges measuring 1.537 inches in diameter and 3.58 inches in length. The shells are made of cartridge paper with a brass base. The signals are used for com-

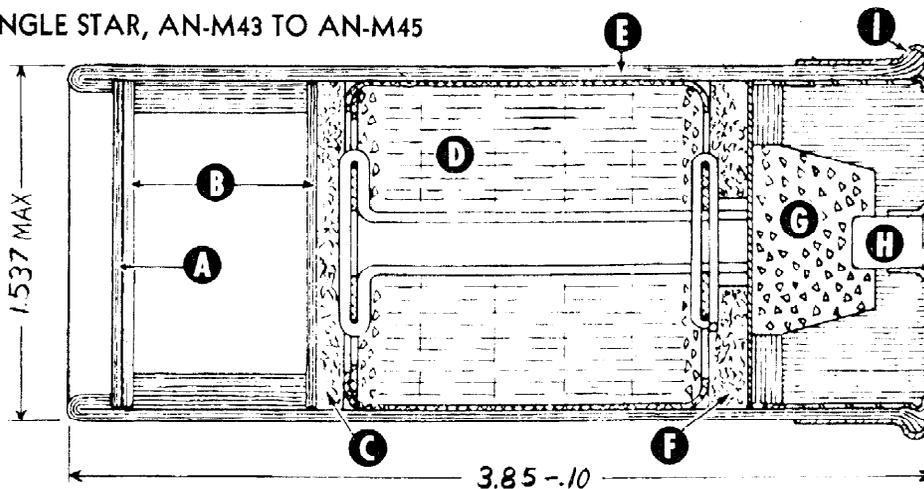
munication between aircraft or aircraft and ground.

They are fired from the breech-loading pyrotechnic projector, M8, or the six-round pyrotechnic discharger, M5.

These signals are the same as the

SIGNALS, AIRCRAFT, SINGLE STAR, AN-M43 TO AN-M45

- (A) Top closure
- (B) Spacer disks
- (C) Wad spacer
- (D) Illuminant
- (E) Cartridge paper shell
- (F) Cushioning wad
- (G) Propelling charge
- (H) Percussion primer
- (I) Brass base



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SIGNALS, AIRCRAFT, SINGLE STAR, AN-M43, AN-M44, AN-M45 (Continued)

double-star types except that each cartridge produces a single star.

The propelling charge consists of 35 grains of A-3 Army Black Powder. The burning propelling charge ignites a quickmatch at the instant of expelling the star assembly from the cartridge. The quickmatch in turn ignites a primer charge of Army Black Powder which fires the first-fire composition (rapid identification is made possible by a 1/2 inch band, the color of the signal, the printed nomenclature on the cartridge body and the printing on the identification top).

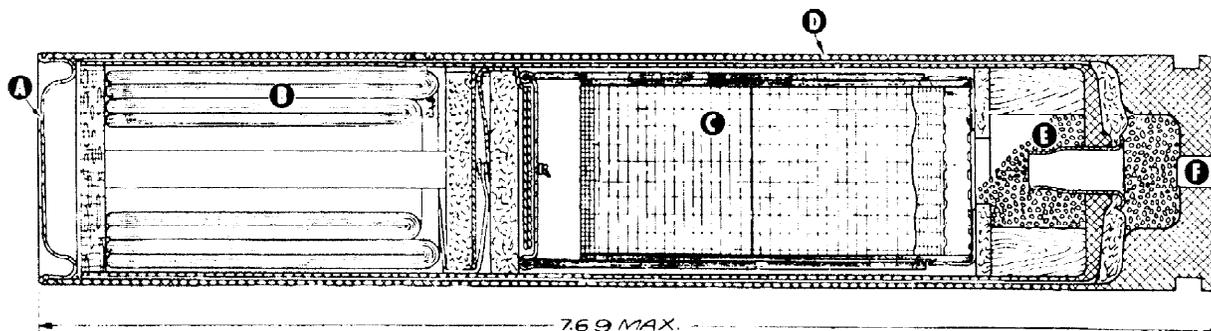
CHARACTERISTICS

	AN-M43	AN-M44	AN-M45
Color.....	Red	Yellow	Green
Delay Time* (seconds).....	0	0	0
Burning Time (seconds).....	7-13	7-13	7-13
Rate of Fall†.....	Free	Free	Free
Candlepower (thousands).....	25	15	30
Illuminant Weight (oz.).....	2.00	1.87	2.85
Complete Weight (oz.).....	4.30	4.17	5.14

*Between release and full function.
†In still air.

SIGNAL, AIRCRAFT, RED STAR, PARACHUTE, M11—STANDARD

SIGNAL, AIRCRAFT, RED STAR, PARACHUTE, M11



- (A) Top identification
- (C) Illuminant
- (E) Expelling charge
- (B) Parachute assembly
- (D) Barrel
- (F) Primer, percussion, M27

SIGNAL, AIRCRAFT, RED STAR, PARACHUTE, M11—STANDARD—This item is the only remaining standard parachute aircraft signal for issue and manufacture since the M14, red star, cluster; M15, white star, blinker; and M16, green star, blinker, signals were classified limited standard.

The M11 signal is authorized for firing from a grounded plane as a distress signal to a rescuing plane or rescuing party. It is fired from the M12 or M18 pyrotechnic pistol and burns for approximately 30 seconds with a red light of 20,000 candlepower.

The signal is 7.69 inches long by 1.56 inches in diameter. It weighs 9.6 ounces.

The signal is contained in a signal case

with an expelling charge. The signal case is in turn contained in a barrel with a propelling charge. When the pistol is fired, the 31 grains of black powder propellant project the signal case to a height of 150 feet and at the same time ignite a fuze in the case. After 2.5 seconds, the fuze ignites the expelling charge in the case. This expels the signal and ignites the pyrotechnic composition.

The candle assembly is of the same general design as that of the candle assembly for the M9A1 parachute flare except that the flare charge is a red color composition. In the parachute assembly, a protector is used to prevent the parachute from crushing on setback due to the shock of discharge. The closing wad is to retain

parachute and candle assembly in the signal case after it has been projected from the barrel. The identification top retains the signal case in the barrel.

CHARACTERISTICS

Signal, Aircraft, Parachute, M11

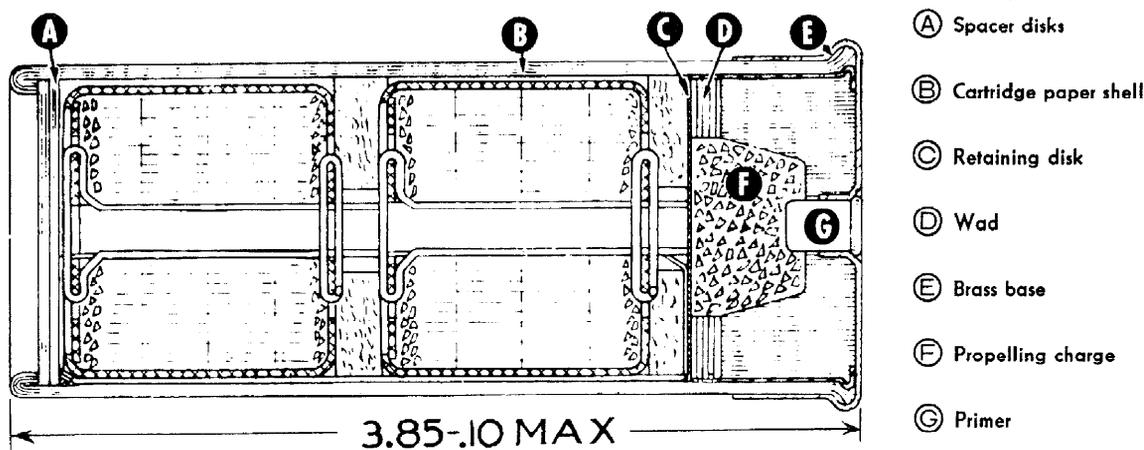
Color.....	Red
Delay Time* (seconds).....	2.5
Burning Time (seconds).....	30
Rate of Fall† (f/s).....	6.0
Candlepower (thousands).....	20
Illuminant Weight (oz.).....	2.6
Complete Weight (oz.).....	9.6

*Between release and full function.
†In still air.

UNCLASSIFIED

SIGNALS, AIRCRAFT, DOUBLE STAR—STANDARD AN-M37 TO AN-M42 AND AN-M53 TO AN-M58 WITH TRACER

SIGNALS, AIRCRAFT, DOUBLE STAR, AN-M37 TO AN-M42



SIGNALS, AIRCRAFT, DOUBLE STAR, AN-M37 TO AN-M42—STANDARD
—These signals are standard items for issue and manufacture and have supplanted the now limited standard double star signals, AN-M28 to AN-M33, used with the pyrotechnic pistol, M2.

This type signal is assembled in a cylindrical paper shell; crimped to the shell is a metal or plastic head containing a primer. The cartridges are 1.537 inches in diameter and 3.85 inches in length. The AN-M37 to AN-M42 series is used for signaling between aircraft or aircraft and ground troops. They are designed for use in the breech-loading pyrotechnic pistol, M8, the six-round discharger, M5, the British pistol, or the projector, M9.

Ignition of the propelling charge projects two freely falling stars of the same or different colors. These stars which are

contained in sheet aluminum cups have a burning time of from 7 to 13 seconds. Color and intensity of the illuminants are as follows:

Red.....25,000 candlepower minimum
Green.....20,000 candlepower minimum
Yellow.....12,000 candlepower minimum

Without illuminant or propelling charge the unfilled case weighs 1.6 ounces; the grade A4 Army black powder propellant, 0.03 ounce; the No. 4 percussion primer, 0.04 ounce; the spacer disks, 0.06 ounce; and the closing wad, 0.06 ounce.

The cartridges are marked by 1/4-inch bands, the color of the bands indicating the colors of the stars, starting 1/16 inch from the top of the shell and by markings on the identification top such as "RED-RED" to correspond with the color of the illuminant. Regular commercial lacquer enamels are used for marking.

SIGNALS, AIRCRAFT, TRACER, DOUBLE STAR, AN-M53 TO AN-M58—STANDARD—This series of signals has been adopted by both the Army and Navy. As they are similar in size and contour to the AN-M37 series, these newer signals may be launched from the same projectors.

Their function is much the same manner as the AN-M37 series, except that a tracer has been added. There also is a small powder charge inserted between containers of the pyrotechnic compositions to provide sufficient separation of the stars after the signal has been projected from the pistol. The tracer burning time is from 3 to 4.75 seconds; that of the stars from 3 to 4.5 seconds. Maximum length of each signal is 3.85 inches, and the diameter is 1.545 inches.

(Continued on next page)

CHARACTERISTICS

	AN-M37	AN-M38	AN-M39	AN-M40	AN-M41	AN-M42
Colors.....	Red-Red	Yellow-Yellow	Green-Green	Red-Yellow	Red-Green	Green-Yellow
Delay Time* (seconds).....	0	0	0	0	0	0
Burning Time (seconds).....	7-13	7-13	7-13	7-13	7-13	7-13
Rate of Fall† (f/s).....	Free	Free	Free	Free	Free	Free
Candlepower (thousands).....	25-25	12-12	20-20	25-12	25-20	20-12
Illuminant Weight (ounces).....	3.32	3.32	5.00	3.32	3.91	3.91
Complete Weight (ounces).....	5.6	5.6	6.8	5.6	6.2	6.2

*Between release and full function, still air.

UNCLASSIFIED

SIGNALS, GROUND, PARACHUTE AND SIGNALS, GROUND, CLUSTER (Continued)

quickmatch threaded through the central hole in each star and brought back alongside the group. The ends of the quickmatch are tied together with a cord facilitating assembly and ignition. Each star burns approximately 5 to 7 seconds with a minimum candlepower of 18,000.

Identification of these signals is made by the embossed identification top and the printed nomenclature on the body of the signal.

SIGNAL, GROUND, WHITE STAR, PARACHUTE, M17A1—STANDARD

The M17A1 parachute signal measures 10.40 inches over-all and has a maximum fin diameter of 1.88 inches. When assembled it weighs 16.71 ounces. It is supplied with an M3 or AN-M6 blank cartridge which is shipped in the packing boxes containing the signals. The base

of the stabilizer tube is closed by a cork to protect the propelling charge contained in the body of the signal.

At the base of the signal body is a housing which contains a propelling charge; 17 grains (1.11 grams) of smokeless powder. A circular time train groove between the propelling charge chamber and the expelling charge cavity is loaded with pressed black powder. The end of the star assembly containing the first fire composition is seated on a wad which cushions the assembly against the shock of discharge. The M19A1 green star parachute signal and the M21A1 amber star parachute signal do not require a first fire composition charge. The illuminant star assembly is attached to the parachute by braided wire cable. A chipboard disk between the illuminant assembly and the parachute prevents the flash of the expel-

ling pellet from damaging the parachute. A second disk is fitted on top of the parachute beneath the pressed metal cap which retains parachute and illuminant assembly in the signal body.

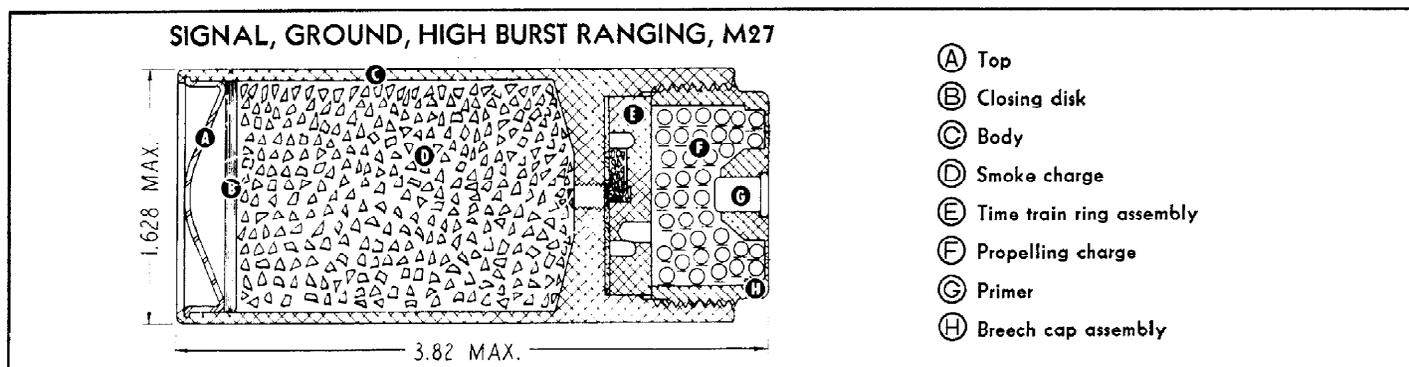
Upon firing, gas pressure generated by the blank cartridge ruptures the retaining disk, which seals the propellant in the case, and ignites the propelling charge. The signal then is discharged from the rifle launcher and sets off the time train which burns for approximately 5.5 seconds, and then ignites the expelling charge.

The expelling charge forces the illuminant assembly out of the signal body by pushing off the closing cover, and simultaneously ignites the stars. These signals can be identified by the embossed identification top and the printed nomenclature upon the signal body.

	M17A1	M19A1	M21A1	M51A1	M18A1	M20A1	M22A1	M52A1
Type of Signal	Parachute	Parachute	Parachute	Parachute	Cluster	Cluster	Cluster	Cluster
Color	White	Green	Amber	Red	White	Green	Amber	Red
Delay Time (seconds)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Burning Time (seconds)	20 to 30	20 to 30	20 to 30	20 to 30	5 to 7	5 to 7	5 to 7	5 to 7
Projection Height (feet)	600							
Rate of Fall (f/s)	7	7	7	7	Free	Free	Free	Free
Minimum Candlepower (thousands)	20	5	4	20	18*	7*	2*	35*
Illuminant Weight (ounces)	2.55	2.50	2.12	2.00	4.00	4.00	3.50	3.75
Complete Weight (ounces)	16.71	16.36	15.98	16.36	17.49	17.49	16.96	17.49
Length (inches)	10.40	10.40	10.40	10.40	10.14	10.14	10.14	10.14
Fin Diameter (inches)	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88

*For each of the five star assemblies.

SIGNAL, GROUND, HIGH BURST RANGING, M27—STANDARD



CHARACTERISTICS

Designation	Color	Delay Time (minutes)	Burning Time (seconds)	Rate of Fall (F/S)	Illuminant Weight (ounces)	Complete Weight (ounces)	Length (inches)	Diameter (inches)
Signal, Ground, High Burst Ranging, M27	Smoke	5	Instantaneous	†	2.20	6.8	3.82	1.63
Signal, Drift, Night, AN-Mk. 4	Flame-smoke	10	3	Free	5.3	32	13.6	2.90
Signal, Drift, Night, AN-Mk. 5, Mod. 1	Flame-smoke	9	16	Free	15.8	65	19	3
Signal, Drift, Day, AN-Mk. 1	Metallic slick	*	—	Free	16	40	10.0	3.50

*None. Upon striking water shall break open forming slick.

†Bursts at top of its rise.

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UNCLASSIFIED

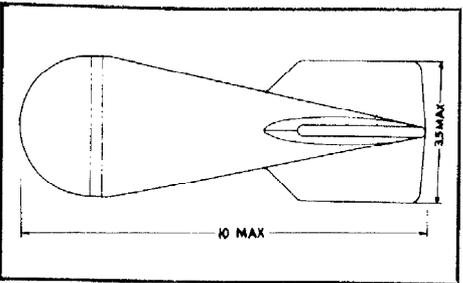
SIGNAL, GROUND, HIGH BURST RANGING, M27 (Continued)

SIGNAL, GROUND, HIGH BURST RANGING, M27—STANDARD—This signal is used to simulate the high burst of artillery shells by producing a smoke puff at the top of its rise—approximately 550 feet. It is fired from the M1A1 projector.

The ground signal measures 3.82 inches in length and 1.628 inches in diameter. A propelling charge of 32 grains (0.07 ounce) of smokeless powder is adjusted to give a minimum height of projection of 550 feet. The smoke charge weighs 2.20 ounces and

consists of 2.0 ounces of grade A4 black powder with 0.20 ounce of grade A aluminum. Assembled, the M27 signal weighs 6.8 ounces.

SIGNAL, DRIFT, DAY, AN-MK. I—STANDARD



SIGNAL, DRIFT, DAY, AN-MK. I—STANDARD—This signal consists of a streamlined paper shell containing a metallic powder and is used as a daytime reference point for aerial navigation when dropped on the water. The shell breaks open upon impact and the metallic contents of the tube form a bronze slick on the surface.

$3\frac{1}{2}$ inches in diameter. The 10-inch body tapers to a blunt point. The cone of the tail has four integral paper fins to give stability in flight.

CHARACTERISTICS

Color.....	Bronze slick
Complete weight.....	2.5 lb.
Length.....	10.0 ins.
Body diameter.....	3.50 ins.

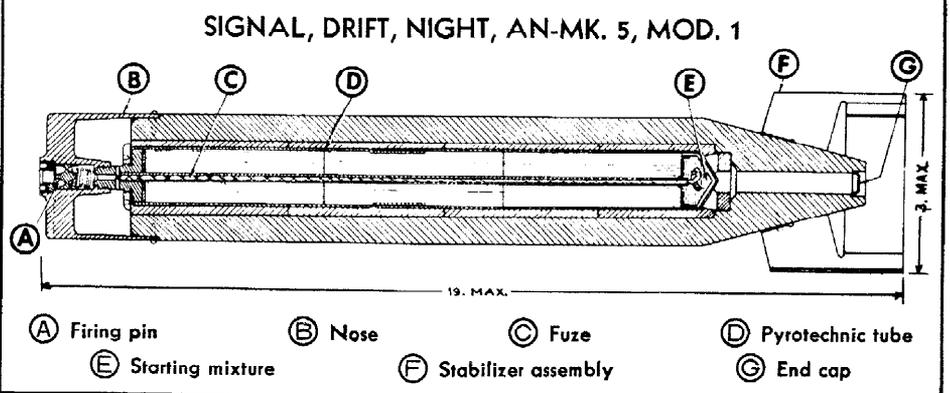
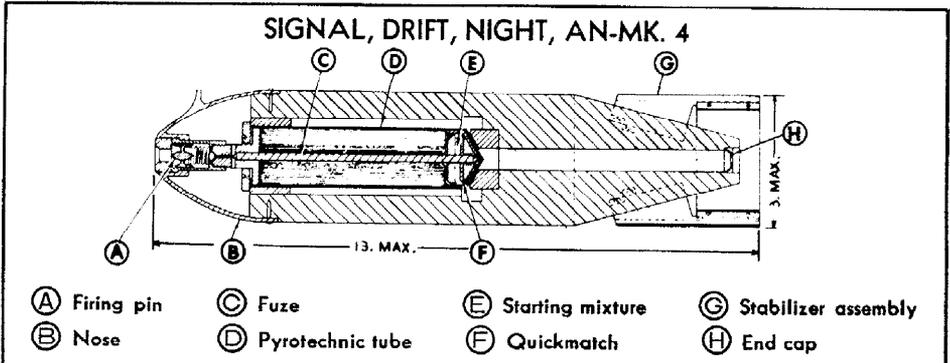
The shell is made of waterproof paper, $\frac{1}{16}$ inch thick, with a hemispherical nose,

SIGNALS, DRIFT, NIGHT, AN-MK. 4 AND AN-MK. 5, MOD. 1—STANDARD

Night drift signals which are standard equipment for all Army and Navy aircraft serve a manifold purpose. They can be used for obtaining the drift of the plane from which they are dropped; for marking any object or area to which the aircraft crew desires to call to the attention of surface vessels; for determining the wind direction before landing; and, in emergencies, to illuminate the surface of the water for night landings.

The signal is thrown over the side of the aircraft, preferably in a horizontal position with the nose end forward, and upon impact with the water produces a bright flame from 12 to 15 inches high and a white smoke cloud. In clear weather, the flame can be seen at night a distance of 6 or 7 miles. Under some conditions, the signal cannot be seen in daylight because the smoke is white. Signals may not function properly if while in storage they are exposed to the direct rays of the sun, excessive heat, spray, or moisture.

SIGNAL, DRIFT, NIGHT, AN-MK. 4—STANDARD—This signal is 13 inches long, 3 inches in diameter, and weighs 2 pounds. The wooden body is tapered at the fin end to one inch in diameter to which a sheet metal tail assembly is attached. The bronze nose, containing a water impact fuze, is die-cast, and has an ogival shape. A lug attached to the nose prevents the signal from striking bottom in shallow water.



to protect it from any moisture that might be absorbed through the wooden body.

When the signal is thrown into the water, the impact breaks a paraffined-paper sealing disk and drives a firing pin back against the primer. Flame from the primer ignites the time fuze which runs the length of the hole in the center of the pyrotechnic pellet. This fuze has a burn-

ing time of from 8 to 12 seconds, which gives the signal time to return to the surface and right itself. Directly behind the pellet is a small chamber containing a piece of quickmatch and a powder charge. The time fuze ignites the quickmatch, which, in turn, ignites the powder (starting mixture) and the heat generated is sufficient to ignite the pyrotechnic

SIGNALS, DRIFT, NIGHT, AN-MK. 4 AND AN-MK. 5, MOD. 1 (Continued)

pellet. The gases evolved break open the pyrotechnic tube and force out a cap which seals the end of a discharge tube in the tail. The pyrotechnic composition then bursts into flame and burns for about 3 minutes. This signal is not recommended for release from an altitude lower than 500 feet.

SIGNAL, DRIFT, NIGHT, AN-MK. 5, MOD. 1—STANDARD—The Mk. 5, Mod. 1 night drift signal functions in the same

manner as the Mk. 4, but there are several differences in construction and appearance. The Mk. 5, Mod. 1 has a flat die-cast nose, weighs 4 pounds, and is six inches longer than the Mk. 4. It also contains three pyrotechnic pellets, placed end to end in the pyrotechnic tube. The fuze has a burning time of 9 seconds, and the pellet when ignited burns for from 15 to 17 minutes. This signal is recommended for use at altitudes lower than 500 feet.

CHARACTERISTICS

	AN-MK. 4	AN-MK. 5, Mod. 1
Color.....	Flame-smoke	Yellow flame-smoke
Delay time (seconds).....	8 to 12	9
Burning time (minutes).....	3 to 3.5	15 to 17
Complete weight (pounds).....	2	4
Length (inches).....	13	19
Body diameter (inches).....	3	3

FLARES, TRIP, M48 AND M49—STANDARD

FLARES, TRIP, M48 AND M49—STANDARD—These trip ground flares were developed to reveal movements of hostile troops at night. The requirements were that they light automatically on being tripped by wire and that they illuminate hostile troops in night operations at a minimum distance of 300 yards.

The M48 trip flare consists of an illu-

minating projectile in a modified M2 anti-personnel mine projector. The projector is buried three inches in the ground with only the trip wire projecting above the surface. The trip firing mechanism is the same as that used with M2 anti-personnel mines; M2 or M3 anti-personnel mine fuze. The propelling charge consists of 75 grains of A4 black powder.

The 75 grain propelling charge projects

the illuminant shell to an altitude of approximately 250 to 400 feet. The propelling charge also activates a three-second delay fuze which at the end of the delay time ejects the illuminant assembly, similar to that of the Shell, illuminant, 60 mm, M83. The illuminant burns for about 20 seconds while drifting earthward attached to a parachute. The flare burns with approximately 110,000 candlepower. The effective illumination is designed to cover a radius of 300 yards.

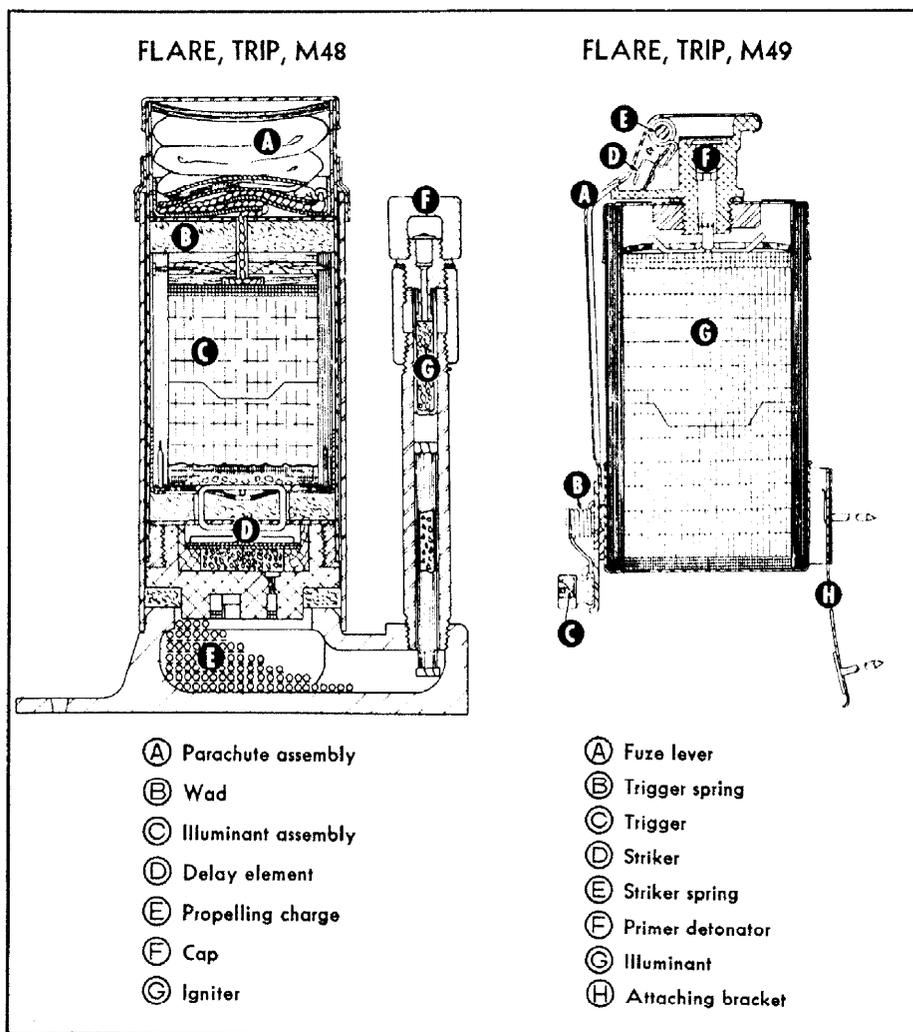
Four lengths of trip wire, each 26 feet long, are shipped with each M48 trip flare. Wires are coated with lusterless olive drab paint unless otherwise ordered.

The M49 trip flare is similar in construction and appearance to a smoke hand grenade with a small bracket so that it may be nailed to a tree or stake. The most effective position is 15 to 18 inches above ground. The end of the grenade fuze lever is held down by a spring-loaded rotating trigger to which the trip wire is attached. Upon activation, the fire burns in place with approximately 40,000 candlepower for about 1 minute. There is no time delay. The flare operates as soon as the trip wire is disturbed. The flare also may be used as a position light or thrown as an illuminating grenade. Forty feet of trip wire is shipped with each M49 trip flare.

The M49 flare remains on the ground and intensely illuminates a relatively small area, while the M48 flare projects the illuminant to an altitude of several hundred feet, resulting in less intense illumination of a greater area and visibility of the light from a greater distance. The two so supplement one another that either or both may be used according to local conditions and needs.

CHARACTERISTICS

	Flare, Trip, M48 White light	Flare, Trip, M49 White light
Color.....	White light	Instantaneous
Delay time (seconds).....	3	—
Burning time (seconds).....	20	60
Rate of fall (f/s).....	7	—
Candlepower (thousands).....	110	40
Altitude (feet).....	400	—

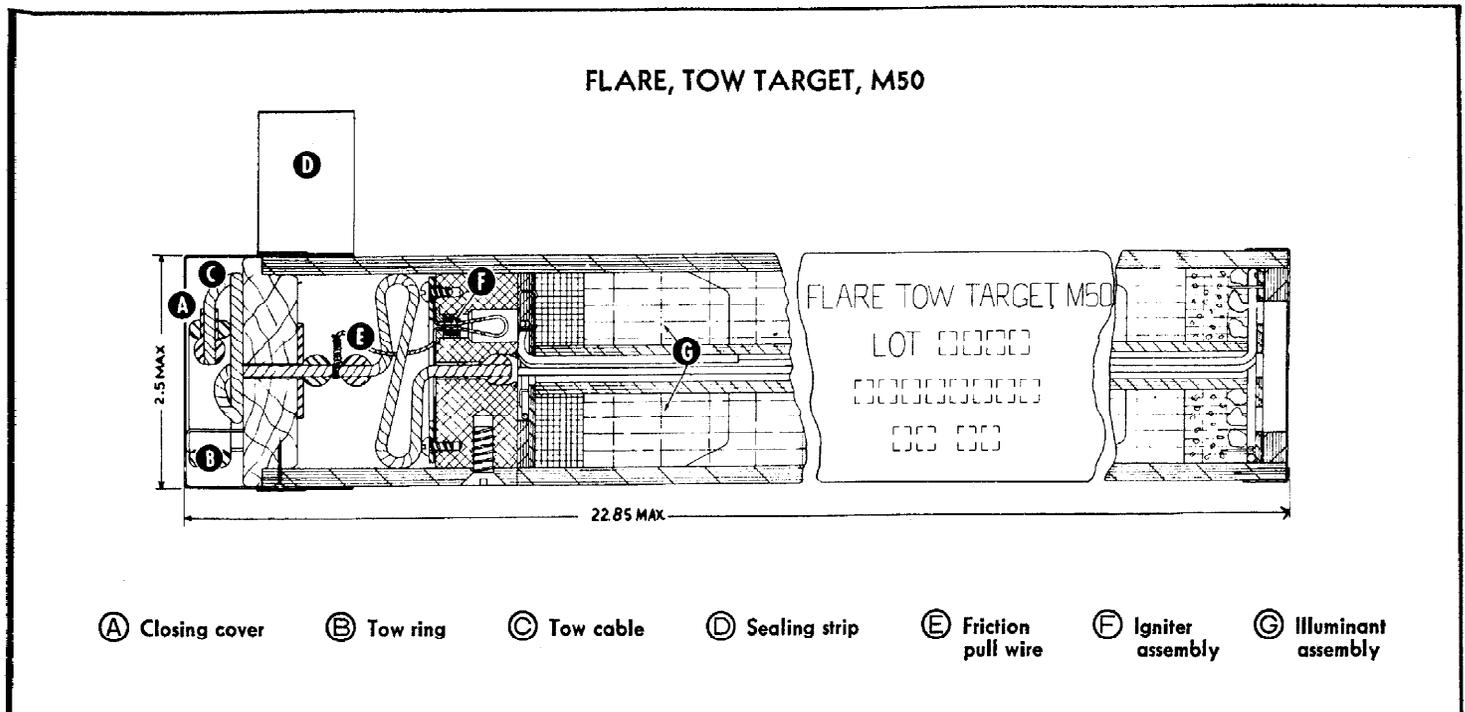


- (A) Parachute assembly
- (B) Wad
- (C) Illuminant assembly
- (D) Delay element
- (E) Propelling charge
- (F) Cap
- (G) Igniter

- (A) Fuze lever
- (B) Trigger spring
- (C) Trigger
- (D) Striker
- (E) Striker spring
- (F) Primer detonator
- (G) Illuminant
- (H) Attaching bracket

UNCLASSIFIED

FLARE, TOW TARGET, M50—STANDARD



FLARE, TOW TARGET, M50—STANDARD—Flare, tow target, M50, provides a target for both night and day practice firing of antiaircraft guns. The flare is towed by a plane at the end of a steel cable. When one flare burns out, another may be released from the plane to take its place. The flare is not so bright that it will obscure the navigation lights of the plane, or that it will require the use of filters in fire control instruments.

The flare candle is contained in a cylindrical case of laminated paper with sheet metal caps on both ends. The closing cap on the head end is sealed with a strip of adhesive tape. Under this cap, the case is closed by a wooden plug fastened in place with four wire nails. A flexible steel suspension cable passes through the center of the plug and is attached to the base block of the flare. The slack of the suspension cable is coiled in the cavity between the base block and the closing plug. Two ball fittings are clamped to the cable just inside the closing plug and serve for the attachment of the ignition wire. They also prevent the coiled suspension cable being pulled

through the plug, thus pulling the ignition wire. When the flare functions, the holding nails shear and the plug is pulled from the case. The ignition wire passes through a cup of primer mixture in the base block. Two strands of quickmatch connect the ignition cup with the primer and first-fire composition on the outer end of the flare by passing through a paper tube in the axis of the flare candle.

The flare burns with a yellowish light of 60,000 candle-power for approximately 6 minutes. The assembled flare is 22.85 inches in length by 2.5 inches in diameter and weighs 7.13 pounds. It may be used effectively on a 6,000-foot towline at any combination of altitude or slant range up to 20,000 yards. The flare should not be released from a plane flying in excess of 120 miles per hour nor should it be released while the towing plane and the cable are completing a turn. Once the flare has become properly engaged on the exchange release trigger, the speed of the towing plane may be increased to any practical speed desired.

To prepare the flare for launching, the sealing tape and closing cap are removed.

The ring at the end of the suspension cable is tied to the lead rope. When the flare is launched, it travels down the towline until the ring of the lead rope strikes the exchange release trigger. The sudden stop jerks the suspension cable taut, pulling out the closing plug and pulling the ignition wire through the primer. The primer ignites the quickmatch which flashes through the central tube, blowing off the base cap and igniting the flare.

In opening Flare, tow target, M50, and attaching it to the lead rope, care will be exercised not to pull on the suspension cable so as to loosen or pull out the closing plug. If a flare should be found with a loose plug, the flare will not be used. In such a case, the suspension cable should not be pulled; the closing cap will be replaced and resealed and the flare marked and set aside for disposal.

The flare is painted blue gray and is marked on the side with type and model, lot number, date loaded, and manufacturer's initials.

Flare, tow target, M50, is packed one per fiber container, 16 such containers per wooden box.

AMMUNITION
MISCELLANEOUS

SUBCALIBER AMMUNITION FOR FIELD ARTILLERY, SEACOAST GUNS, AND MORTARS

Subcaliber ammunition is fixed ammunition, with special projectiles, used in a subcaliber tube for training in elevating, traversing, sighting the piece to which the tube is attached and in the use of firing tables.

The object of subcaliber firing is to train personnel and to check the orientation and adjustment of fire control and sighting equipment.

The advantages of subcaliber ammunition are it is economical and may be

used in the vicinity of populated areas.

The tabulation in Table A lists the use of subcaliber projectiles in subcaliber guns:

TABLE A

Cannon, Subcalibered	Caliber of Subcaliber Gun	Projectile	Cannon, Subcalibered	Caliber of Subcaliber Gun	Projectile
3 inch (15 pdr.), M1902 and M1903	.30 rifle	Cartridge, sub-cal., cal. .30, M1925	6 inch, M1897, M1897M1, M1908, M1908M1, M1908M11	1.457 inch gun	Shell, Practice, M94
			6 inch, M1900, M1903		
			8 inch, M1888		
			10 inch, M1888, M1895, M1900		
			12 inch, M1888, M1895, M1900	2.95 inch gun	Fixed shot
			14 inch, M1907, M1907M1, M1909		
			12 inch mortar, M1890, M1890M1, M1908, M1912	75 mm gun	Shell, H.E., M48 (inert loaded)
2.95 Inch, V. M.*	37 mm**†	Practice shell, M63, Mod. 1, and M92	12 inch, M1895A2*, M1895M1A2*		
75 mm How., M1*, M2** and M3**					
75 mm, M1897*, M1897A1*, M1916, M1917					
105 mm How., M2A1,† M3† and M4†					
155 mm How., M1917, M1918, M1					
155 mm gun*, M1917, M1918, M1A1			14 inch, M1910*, M1910M1*		
8 inch How., M1*			14 inch, M1920, M1920M11*		
			16 inch, M1919, M1919M11 and M1919M111*		
			16 inch Howitzer, M1920*		

*Exterior mount.

**Uses 37 mm subcaliber mount M12.

†Uses 37 mm subcaliber mount M13.

(Note: Where not otherwise stated, the subcaliber guns are in-bore mounted.)

CARTRIDGE, BALL, CAL. .22, LONG RIFLE

This cartridge, standard in the cal. .22 U. S. rifles and the machine gun trainers, M3 and M4, also is used in the subcaliber tube of the 75 mm gun, M1897.

These cartridges are regular commercial products and measure 0.984 inch overall. The complete round weighs approximately 53 grains and consists of a cartridge case, priming composition, propelling charge and bullet.

The cartridge case is of the rim-fire type, i.e., the priming composition is

spun into a circular recess inside the rim instead of being seated in the head as a separate component. A blow from the firing pin at any position on the rim will ignite the powder charge. The charge weighs 1.7 grains.

The lead bullet weighs 40 grains. The maximum range is approximately 1,500 yards at 30° elevation. The average muzzle velocity is 1,100 feet per second and chamber pressure averages 16,000 p.s.i.

This cartridge is fired from a subcaliber tube inserted in the bore of the 3 inch seacoast (15 pounder) guns, M1902 and M1903.

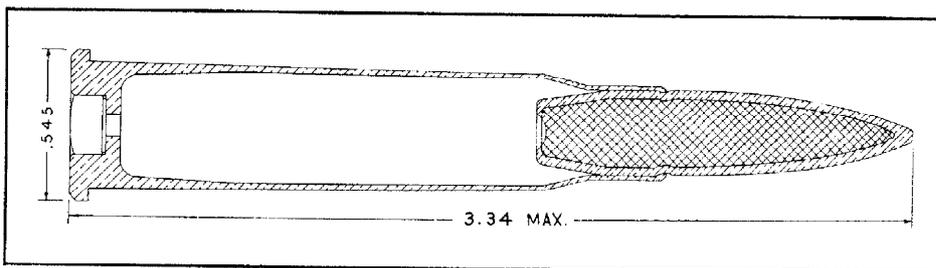
There are two types of cal. .30 subcaliber cartridges: the cartridge, subcaliber, cal. .30, M1925, and the cartridge, subcaliber, cal. .30, old stock. Both types are limited standard and the old stock on hand is given priority of issue. The cartridge is rimmed and must be used in "Krag"-type chambers.

CARTRIDGE, SUBCALIBER, CAL. .30, M1925

The M1925 subcaliber round consists of a cartridge case, primer, propelling charge and bullet. The primer is assembled in a monel metal primer cup so that it may function on the light blow of a rifle firing pin as well as the heavy blow of the gun's firing pin.

The propelling charge consists of approximately 35 grains of pyro D.G. powder. The bullet of the M1925 is boat-tailed and pointed, and consists of a gliding metal jacket surrounding a hardened lead filler. The bullet weighs 174 grains and the complete cartridge weighs 385.5 grains.

The ammunition is loaded in a cal. .30 barrel which is mounted axially in a 3 inch bronze subcaliber cartridge case which resembles, in weight and exterior



dimensions, the ammunition regularly used with the gun. To the base of the subcaliber cartridge case are fitted two flat steel extractor springs, secured by one screw each, which serve to eject the subcaliber ammunition.

The 3 inch subcaliber cartridge case (with the rifle barrel inserted) is set and

pushed home in the gun. The subcaliber ammunition, cal. .30, then is inserted in the chamber of the subcaliber barrel until its rim comes in contact with the extractor springs. Finally the breech of the gun is closed, the face of the breechblock meeting the subcaliber round, and shoving it into its seat.

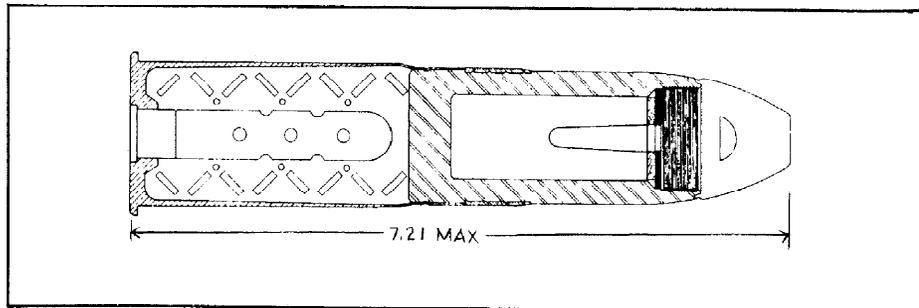
SHELL, PRACTICE, M92

WITH FUZE, P.D., M74, AND SHELL, PRACTICE, M63, MOD. 1, WITH FUZE, BASE, PRACTICE, M58

Subcaliber equipment for larger guns includes the 37 mm guns, M1916, M12, M13, and M14. These are used as subcaliber equipment for 75 mm and 155 mm guns and howitzers and 105 mm howitzers.

The fixed complete round standard for issue and manufacture with this gun is Shell, Practice, M92. Shell, Practice, M63, Model 1, is substitute standard for issue.

When loaded and fuzed the M92 shell weighs 1.21 pounds and is propelled by .07 pound of FNH powder which is ignited by the 20 grain, M23A2, percussion primer. The M63 Model 1 prac-



tice shell when loaded and fuzed weighs 1.63 pounds and is propelled by .056 pound of FNH powder which is ignited

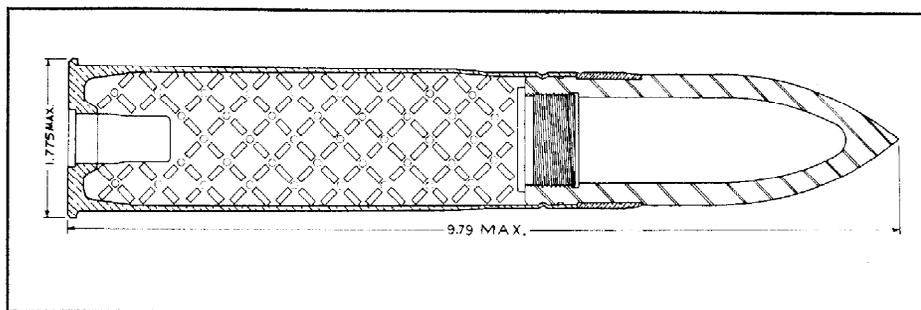
by an M23A2 percussion primer.

The standard cartridge case used is the Mk. 1A2, which is 3.64 inches in length.

SHELL, PRACTICE, 37 MM, M94

This fixed complete round, standard for issue and manufacture for the 1.457 inch subcaliber gun, is used with seacoast guns of 6 inch caliber or higher. The shell weighs 1.057 pounds, including the base plug.

The round requires the Mk. IIIA2 cartridge case which is 5.69 inches in length. The overall length of the round is 9.26 inches. The shell is propelled by 1,110 grains of FNH powder, fired by the M25A1, 20 grain, igniting primer.

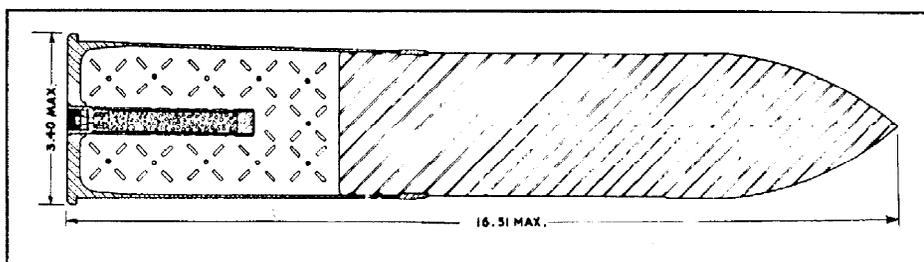


SHOT, FIXED, SOLID, SUBCALIBER FOR THE 2.95 INCH SUBCALIBER GUN

This fixed complete round, standard for issue and manufacture for the 2.95 inch subcaliber gun, consists of the fixed shot weighing 18 pounds and the cartridge case containing the 100 grain igniting primer, M24A2. The complete round weighs 20 pounds of which from 0.27 to 0.38 pound constitutes the propelling charge.

The rounds are fixed, in that separate complete rounds are needed for each of the three zones, as each round is loaded for a certain zone and then the shot is crimped into the cartridge case.

The over-all length of the complete round is 16.57 inches when the shot is made from steel. When made from cast



iron the complete round measures 17.39 inches in length.

Three different zones are provided to simulate the three zones of fire of the 12 inch mortars in subcaliber practice. This is accomplished by varying the powder

charge to give different muzzle velocities as follows:

Zone 1 . . . 550 f/s—4.5 oz., FNH powder

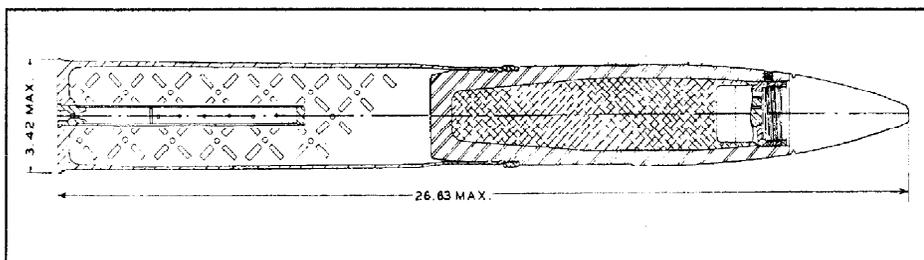
Zone 2 . . . 625 f/s—5.0 oz., FNH powder

Zone 3 . . . 700 f/s—6.0 oz., FNH powder

SHELL, HIGH-EXPLOSIVE, 75 MM, SUBCALIBER, M48

This standard fixed complete round, for issue and manufacture for the 75 mm subcaliber gun, is now the inert-loaded shell, high-explosive, 75 mm M48. It has superseded the sand-loaded, Mk. I, high-explosive shell.

The complete round weighs 19.04 pounds. The shell weighs 14.70 pounds, inert loaded. Components of the complete round of the M48 shell consist of the projectile with dummy fuze, the M18 cartridge case containing the normal charge of 1.35 pounds of FNH powder ignited by the M22A3 percussion primer.



The normal charge gives a muzzle velocity of 1,470 f/s and a pressure of 26,000 p.s.i.

The M18 cartridge case is 13.82 inches in length. The shell is 15 inches and the complete round 26.6 inches in length.

UNCLASSIFIED

BLANK AMMUNITION

Blank ammunition is used to fire salutes, morning and evening guns, during maneuvers and wherever it is desired to simulate actual gunfire.

Blank ammunition is issued to the using forces and services in complete rounds.

Rounds for issue and manufacture have been standardized for small arms and the following guns: 37 mm, 75 mm, 3 inch, 90 mm, and 105 mm.

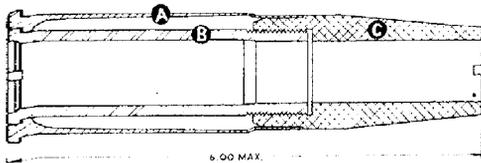
With the exception of blank rounds for 37 mm Field Guns M1916 which are of adapter type construction, a complete round of blank ammunition consists of: a drawn cartridge case into which is fitted a primer and a molded black powder charge or a loose charge contained in a cloth bag.

To prevent powder from leaking out and to hold the charge in place, a chipboard closing cup is sealed in the mouth of the cartridge case.

Cartridge cases for blank ammunition usually are made by trimming service cases to the proper length. Obturation is improved by reducing the thickness of the metal at the mount after trimming.

The M1B1A2 percussion primer is used for all rounds except in the M1 adapter for the 37 mm field gun, M1916, and the M2 adapter for the 37 mm tank and antitank guns, M3, M5, and M6. The M23A1 percussion primer, 20 grain, is used in 37 mm tank and antitank guns, M3, M5, and M6. The closing cup or wad, used in all rounds except the M1 and M2 adapters, is made from heavy chipboard sized to fit the case snugly when seated against the powder charge. A felt pad is assembled under the closing cup. Identification of the rounds is made by stamping pertinent information on the base of the case and by ink markings on the side.

ADAPTER, M1, FOR 37 MM GUN, M1916

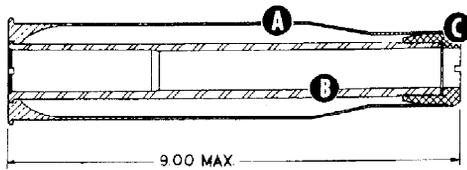


- (A) Case, cartridge, Mk. IA2, modified
- (B) Liner
- (C) Bushing

The 10 gage blank-loaded commercial shotgun shell, requiring the adapter, M1, is used for the 37 mm field gun, M1916. The adapter serves to reduce the bore of the gun to the 0.775 inch diameter of the 10 gage shell.

A bushing, machined from WDX1112 steel (alternate material for aluminum bar stock), 3.0 inches in length by 1.48 inches in diameter, is threaded to fit a liner tube into which the shotgun shell is inserted. The assembled bushing and liner seat snugly into the cartridge case, 37 mm, Mk. IA2, modified. No percussion primer is required as the shotgun shell's primer serves this purpose. The assembled adapter is 6 inches in length and weighs 0.87 pound.

ADAPTER, M2, FOR 37 MM GUNS, M3, M5, AND M6

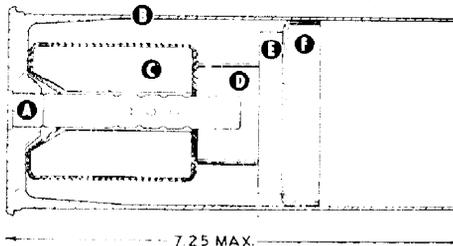


- (A) Case, cartridge, M16, modified
- (B) Liner
- (C) Bushing

The adapter, M2, is basically of the same construction as the adapter, M1. The M2 uses the 10 gage blank-loaded commercial shotgun shell for the tank and antitank guns, M3, M5, and M6.

The bushing is 1.85 inches shorter than that of the M1 adapter but the liner is 4.9 inches longer. Assembled, the M2 adapter is 9 inches in length and weighs 2 pounds.

SINGLE PELLET CHARGE, FOR 75 MM FIELD GUNS, M1897, M1916, M1917; AND FOR 3 INCH FIELD GUNS, M1902, M1904, M1905



- (A) Primer, percussion, 100-gr. M1B1A2
- (B) Case, cartridge, M9A1
- (C) Single pellet charge
- (D) Protecting tube
- (E) Wad
- (F) Closing cup

DOUBLE PELLET CHARGE, FOR 75 MM FIELD GUNS, M1897, M1916, M1917, AND 75 MM HOWITZER, M1A1, AND FOR 3 INCH FIELD GUNS, M1902, M1904, M1905

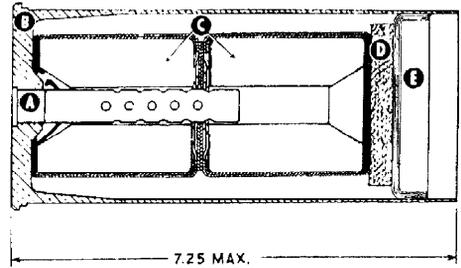


FIGURE 2

- (A) Primer, percussion, 100-gr. M1B1A2
- (B) Double pellet charge
- (C) Case, cartridge, M9A1
- (D) Wad
- (E) Closing cup

Figure 1 shows the assembled single pellet round of the blank ammunition used in the 75 mm field guns, M1897, M1916, M1917, and the 3 inch field guns, M1902, M1904, and M1905. Figure 2 shows the double pellet complete round for use in those guns and the 75 mm howitzer, M1A1.

The single pellet complete round consists of the M9A1 brass cartridge case or the M9A1B1 steel cartridge case; the M1B1A1 percussion primer; the single pellet black powder charge; the hard hair felt wad; the pulpboard closing cup; and the chipboard protecting tube.

The primer punctures the wrapper around the 0.43 pound single pellet charge against which the one inch protecting tube rests. The tube is positioned against the hard hair felt wad when the closing cup is cemented in the case.

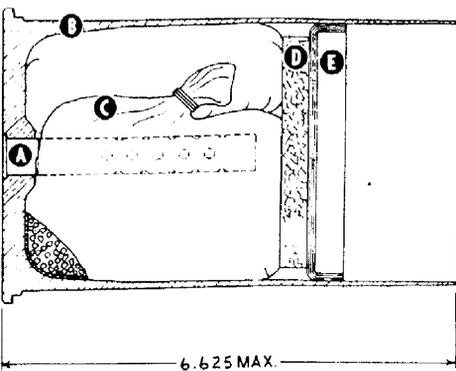
The round is 7.25 inches long and weighs 2.68 pounds assembled.

The double pellet complete round is identical except that two single pellets are used and no protecting tube is required to hold the double pellet charge against the closing cup. Total weight of the double pellet black powder charge is 0.87 pound.

The round is 7.25 inches long and weighs 3.11 pounds assembled.

BLANK AMMUNITION (Continued)

FOR 3 INCH (15 PDR.) GUNS, M1898, M1902, AND 3 INCH A.A. GUNS, M1918, M1, M3



- (A) Primer, percussion, 100-gr., M1B1A1 or M1B1A2
- (B) Case, cartridge, M13
- (C) Class "A" black powder charge
- (D) Wad
- (E) Closing cup

This is the standard complete round of blank ammunition for the 3 inch (15 pounder) guns, M1898, M1902, M5, M6, and M7, and for the 3 inch anti-aircraft guns, M1918 and M3.

The round consists of the M13 brass or the M13B1 steel cartridge case, 6.625 inches long, which contains 1 pound of class "A" (commercial blasting) black powder in a cotton sheeting bag wrapped around the 100-grain percussion primer, M1B1A1.

When the alternative charge of grade A-1 Army black powder is used, the felt wad is omitted because this powder gives sufficient report with normal confinement. Omission of the wad reduces the weight of the round by 0.02 pound.

Weights of the complete round with regular and alternative charges are 4.21 pounds and 4.19 pounds, respectively.

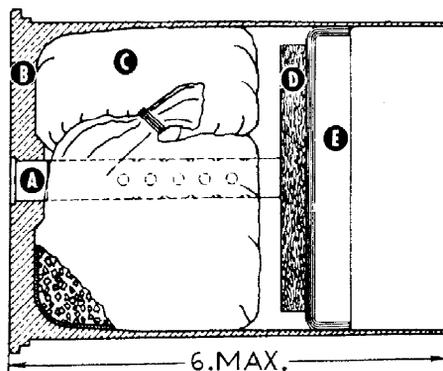
FOR 3 INCH (15 PDR.) GUN, M1903, AND 3 INCH A.A. GUNS, M1917 SERIES, M1925M1, M2, M4

This is the standard complete round of blank ammunition for the 3 inch (15 pounder) gun, M1903, and the 3 inch anti-aircraft guns, M1917, M1917A2, M1917M1, M1917M1A2, M1917M2LII, M1925M1, M2 and M4.

The round consists of the M12 brass or the M12B1 steel cartridge case, six

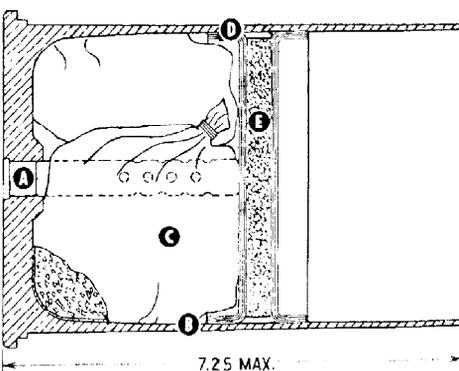
inches long; the 100-grain percussion primer, M1B1A1 or M1B1A2; and 1 pound of class "A" black powder in a cotton sheeting bag wrapped around the primer. The felt wad is not used with the alternative charge of 1 pound of grade A-1 Army black powder.

Weights of the complete round with regular and alternative charges are 4.47 pounds and 4.45 pounds, respectively.



- (A) Primer, percussion 100-gr., M1B1A1 or M1B1A2
- (B) Case, cartridge, M12
- (C) Class "A" black powder charge
- (D) Wad
- (E) Closing cup

FOR 90 MM GUN, M1

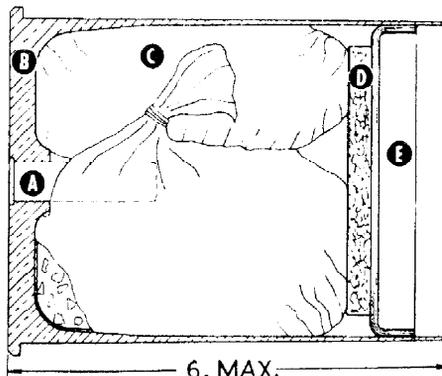


- (A) Primer, percussion, 100-gr., M1B1A2
- (B) Case, cartridge, M27
- (C) Class "A" black powder charge
- (D) Wad

This is the standard complete round of blank ammunition for the 90 mm gun, M1. The round consists of the M27 brass

or the M27B1 steel cartridge case, 7.25 inches long, containing the 100-grain percussion primer, M1B1A2, around which is wrapped a cotton sheeting powder bag containing 1.5 pounds of class "A" black powder.

FOR 105 MM HOWITZER, M2



- (A) Primer, percussion, 100-gr., M1B1A2
- (B) Case, cartridge, M15
- (C) Class "A" black powder charge
- (D) Wad
- (E) Closing cup

This standard round of blank ammunition for the 105 mm howitzers, M2, M3, and M4, is a two pound charge. The blank cartridge consists of the M15 brass of the M15B1 steel cartridge case, a charge of black powder in a cotton bag, a percussion primer and a closing cup assembly.

The round is six inches long and weighs 6.23 pounds with the two pound black powder charge and 5.69 pounds with the alternate charge of 1.5 pounds of grade A-1 Army black powder.

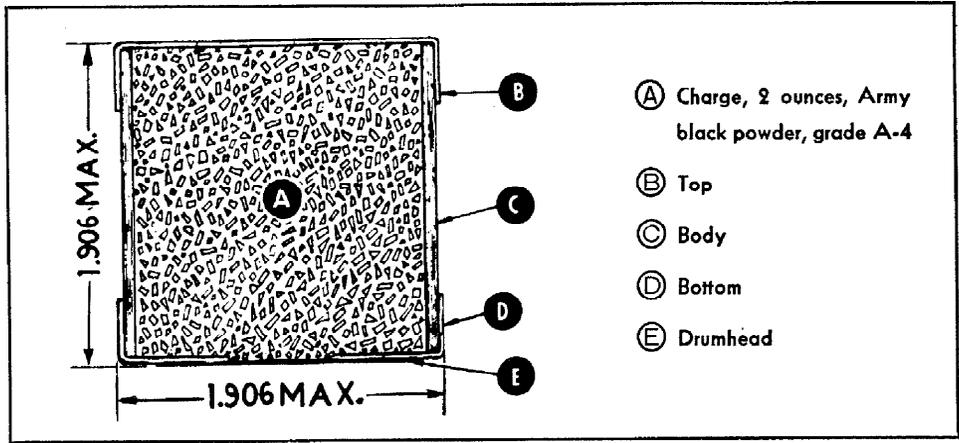
The M15 cartridge case is made either by cutting down the M14 case or by original manufacture. The charge is in a 12 inch bag wrapped around the primer and held in place by the closing cup assembly. Next to the charge is a wad of hair felt $\frac{3}{8}$ inch thick cemented to the pulpboard closing cup.

The wad and closing cup then are cemented firmly in place near the mouth of the cartridge case. When the alternate charge is used, the felt wad is omitted and the closing cup is brought into direct contact with the charge assembly. The alternate charge provides sufficient report with normal confinement.

SMOKE PUFF AMMUNITION

CHARGE, WHITE SMOKE PUFF—STANDARD—This item is standard for use to simulate artillery and grenade fire and for policing target ranges.

The charge is made of commercial strawboard and chipboard, and when assembled is slightly less than two inches square. The body is of chipboard tubing, capped top and bottom by closing cups of sheet strawboard. The bottom closing cup has a die-cut center hole $\frac{5}{8}$ inch in diameter, covered by a drumhead of Kraft wrapping to retain the charge of two ounces of Army black powder, Grade A-4. The top and bottom are glued to the body and the assembled unit is dipped in melted paraffin wax.



DEMOLITION EXPLOSIVES

Standard Engineer Corps demolition matériel for issue includes the following items: Blocks, Explosive, TNT; commercial size containers of Explosive, Ammonium Nitrate; Blocks, Demolition Chain, M1; Block, Demolition, M2; Cap, Blasting, Electric; Cap, Blasting, Non-Electric; and Fuze, Time or Safety.

The Engineer Corps has set the following requisites for military demolition explosives:

1. Not too sensitive to shock or friction
2. High velocity of detonation
3. High power per unit of weight
4. High density (high weight per unit of volume)
5. Stable
6. Not too difficult to detonate
7. Unaffected by changes of temperature or by moisture
8. Convenient form for packing and loading
9. Obtainable in large quantities commercially

Triton or TNT (trinitrotoluene) possesses more of these characteristics than any other explosive.

HALF-POUND BLOCK, TNT—STANDARD—As issued, the TNT block has a density of 1.46, is rectangular in shape and 1.75 inches by 3.25 inches high. Each block is packed in a cardboard container closed at each end by lacquered tin. At one end is a cylindrical hole 2.125 inches deep in which the cap may be placed. The explosive is detonated by special issue tetryl caps and detonating cords.

In the event of a shortage of TNT, ammonium nitrate, sensitized by the addition of TNT, has been designated as substitute standard. It has similar properties to TNT except that it is highly hygroscopic and must be sealed in an airtight container.

Ammonium nitrate is packed in a cylindrical metal container 8.25 inches in diameter and 18.0 inches long. The weight is 40 pounds.

Two tubes are attached to the container, parallel to the longitudinal axis, one to receive the detonating cord and the other the special tetryl detonating cap which may be of non-electric or electric type.

Ammonium nitrate is especially suited for blowing road craters by the multiple charge method.

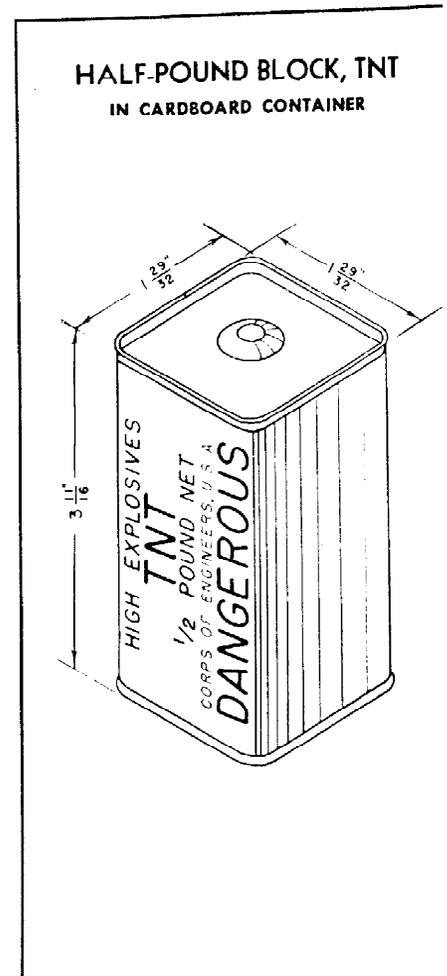
BLOCKS, DEMOLITION, CHAIN, M1—STANDARD—The assembly consists of eight 2 x 2 x 11 inch blocks of cast tetrytol assembled on a detonating cord (primacord) which passes through the longitudinal axis of the blocks. Each block, which is inclosed in a paper-backed, asphalt-impregnated crinklecraft paper wrapping,

consists of 2½ pounds of Tetrytol, a mixture of 75% tetryl and 25% TNT, with a cylindrical pellet of tetryl at each end. The blocks are placed with 8 inches of detonating cord between units and two feet of free detonating cord at each end of the chain.

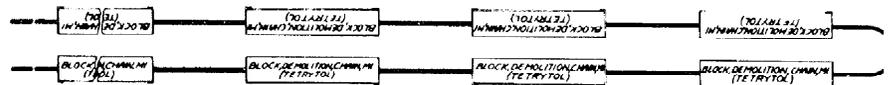
The Blocks, Demolition, Chain, M1, may be used in various ways. They may be laid in a line, wrapped about an object, or detonated as packed in a light-weight haversack. It is necessary to set off the detonating cord by means of a blasting cap in order to fire the chain of blocks. These blocks are not affected by moisture and can stand submergence in water for 24 hours without appreciably altering their characteristics.

BLOCK, DEMOLITION, M2—STANDARD—The Block, Demolition, M2, is a tetrytol charge weighing approximately 2½ pounds and measuring 2 x 2 x 11 inches. At each end of the block is a cap-well containing a threaded bushing that will receive either an electric or non-electric blasting cap. The wells are lined with a thin waterproof paper tube, surrounded by 2 tetryl pellets.

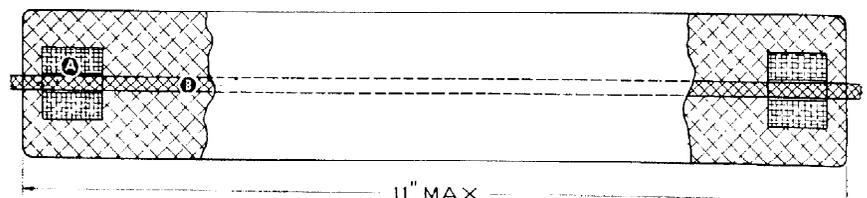
The block is wrapped in a paper-backed, asphalt impregnated, olive-drab crinklecraft paper. The wrapping is waterproof, mildew proof, and highly durable. At each end of the cartridge, a circular section of the wrapper is weakened to permit easy priming of the block. Eight blocks are packed in an inexpensive haversack.



BLOCKS, DEMOLITION, CHAIN, M1



ASSEMBLY OF PELLET AND PRIMACORD IN BLOCK



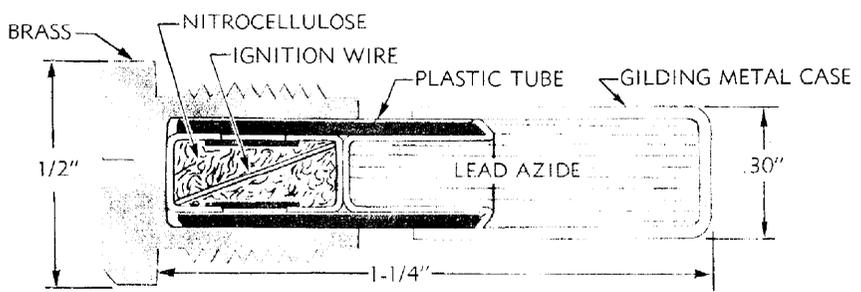
(A) Tetryl pellet

(B) Primacord

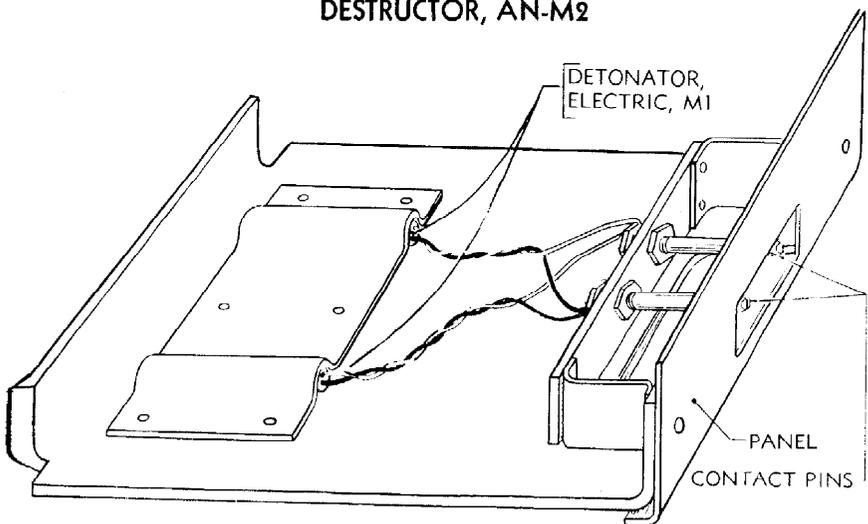
INCENDIARY DEMOLITION

DESTRUCTORS, AN-M1, AN-M2, AN-M3—STANDARD

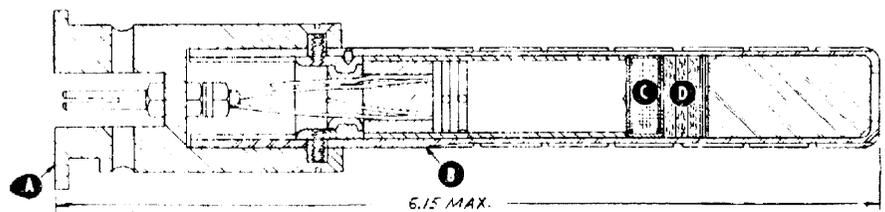
DESTRUCTOR, AN-M1



DESTRUCTOR, AN-M2



DESTRUCTOR, AN-M3



- (A) Socket assembly
- (B) Tube
- (C) Tetryl pellet
- (D) Cushioning disks

The Destructors, AN-M1, AN-M2, and AN-M3, are electrically fired explosive charges used for the destruction of radio equipment and other confidential matériel to obviate the danger of this equipment being captured by the enemy. Fittings and adapters hold the destructors in place in the matériel and provide electrical circuits and connections through which a minimum voltage of 6 volts may be passed.

DESTRUCTOR, AN-M1—The destructor, AN-M1, is 1.25 inches in length. The brass head is 0.5 inch in diameter, has a screwdriver slot and is threaded for screwing into the adapter. The explosive charge consists of lead azide contained in a gilding metal case fitting tightly over a plastic tube which holds in its upper portion a container of nitrocellulose which acts as an igniter for the lead azide. This upper portion of the plastic tube fits securely in the hollow brass head.

An ignition wire runs through the nitrocellulose. Insulation is established between the metal components by means of the plastic tube, and when the units are mounted in the proper electrical circuit, the destructor is detonated by current passing through the ignition wire.

DESTRUCTOR, AN-M2—This unit consists of a sheet metal assembly holding two electric detonators, M1. This detonator resembles an electric blasting cap, is approximately 1.5 inches in length by 0.25 inch in diameter and contains a tetryl charge with other high explosives to initiate firing.

Connected to the detonators are two contact pins used for making an electrical connection with the detonator.

DESTRUCTOR, AN-M3—This destructor is cylindrical and is approximately 6 inches long by 1.12 inches in diameter. The tube contains two electric detonators, and a 1.44 gram pellet of tetryl. Two contact pins are mounted in the plastic socket of the destructor and the detonators are electrically connected to the pins.

The plastic socket of the destructor fits over the tube and is locked in place by a pin passing through the transverse hole in the socket.

The complete assembly weighs 0.373 pound.

FUZES

ARTILLERY FUZES

A fuze may be defined as a mechanical device used with a projectile to detonate it at the time or under the circumstances desired.

Artillery fuzes are classified here as base-detonating (B.D.), point-detonating (P.D.), powder-train time (T.), or mechanical time (M.T.). They may be given additional classification as supersensitive, superquick (S.Q.), delay or non-delay, the various designations depending

on the speed with which the fuze functions after impact.

Supersensitive fuzes are designed to function instantly on impact with such light and unsubstantial targets as air-plane fabric. Superquick fuzes detonate immediately on impact with the ground or a solid target. Delay fuzes are designed to function after impact and when penetration into the target has reached the point desired, the delay period being

determined mechanically or by an explosive train. Nondelay fuzes incorporate mechanical or explosive elements calculated to insure detonation just as penetration into the target begins.

Fuzes representing combinations of the above types are also used, such as time and superquick (T-SQ). The designation AN indicates fuzes which have been adopted as standard for use by both the Army and the Navy.

FUZE, BASE, PRACTICE, M38—LIMITED STANDARD

The M38 fuze is a nondelay, base-detonating fuze which contains no booster and requires but few parts for its functioning. The plunger assembly contains the firing-pin and a resistance ring which fits over the shoulder of the firing-pin in the unarmed position.

Upon firing of the propelling charge, setback moves the plunger to the rear and forces the resistance ring over the shoulders of the firing-pin until it seats in a groove in the pin. This action locks

plunger and pin together. The plunger unit is now armed but held away from the detonating charge by a spring.

When the projectile strikes, the weight of the plunger and firing-pin unit compresses the spring. The pin strikes the detonator which ignites the bursting charge in the shell.

ROUND

Shell, Practice, Subcaliber, Mk. IIA1

CHARACTERISTICS

Length overall.....1.5 ins.
Weight.....0.125 lb.
Thread size.....0.72-18NS-1

FUZE, B.D., M58—STANDARD

This fuze is identical mechanically with the base practice fuze, M38, but includes an integral booster pellet.

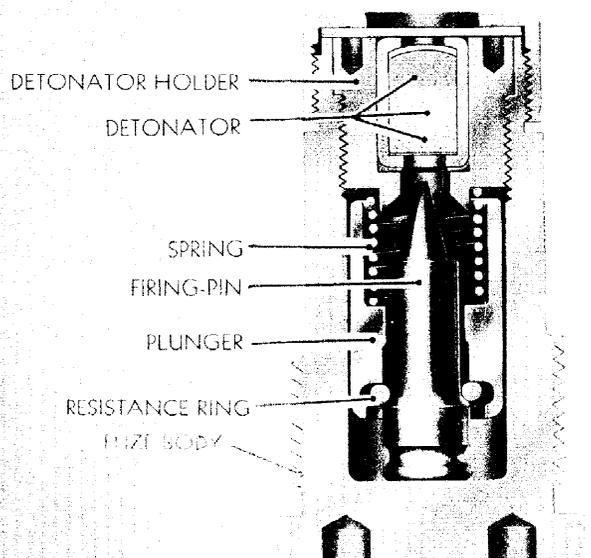
It is larger than the M38 fuze because of the larger projectile cavity of the 37 mm H.E. shell, M63, with which it is used.

ROUND

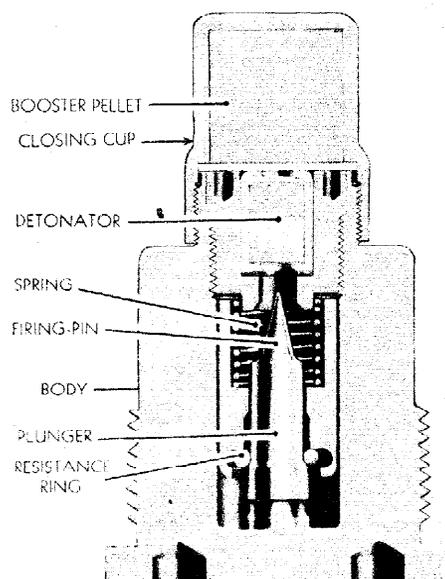
Shell, H.E., 37 mm, M63

CHARACTERISTICS

Length overall.....2.02 ins.
Weight.....0.30 lb.
Thread size.....1.02-18NS-3 L.H.

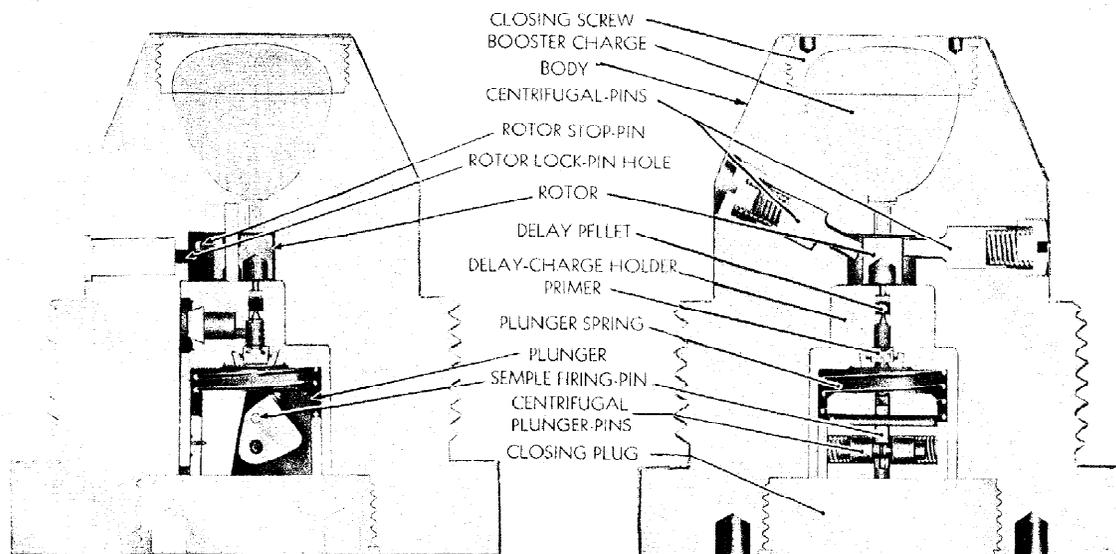


FUZE, BASE, PRACTICE, M38



FUZE, B.D., M58

ARTILLERY FUZES (Continued)



FUZE, B.D., M60

FUZE, B.D., M60—STANDARD

This base-detonating fuze is standard for use in projectiles fired from 155 mm and 6 inch seacoast guns. It is of somewhat unusual construction in that it uses two rotors: one to hold the Semple firing-pin in the safe or unarmed position, the other holding the detonator out of line with the explosive train. Both rotors are released and move to their armed posi-

tions when the projectile's rotation reaches 1,450 r.p.m.

When the shell strikes its target the centrifugal plunger moves forward against the compression of its restraining spring and the firing-pin strikes the primer. The flash is communicated to a black-powder delay pellet and thence to the detonator which, in turn, ignites the booster charge of the fuze to function the main explosive charge of the projectile.

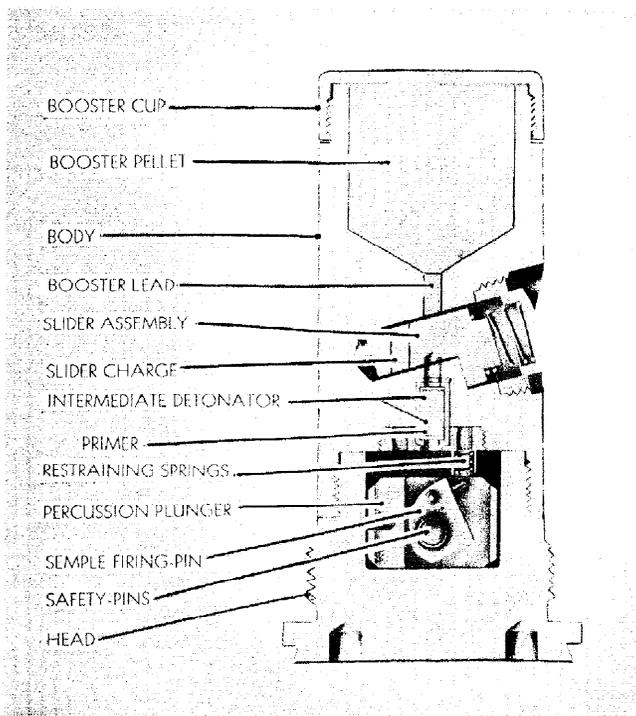
ROUNDS

Projectile, A.P., 155 mm, M112
 Projectile, A.P., 155 mm, M112B1
 Projectile, A.P., 6 inch, M1911
 Projectile, A.P., 6 inch, Mk. XXXIII
 Shell, H.E., 6 inch, M1911

CHARACTERISTICS

Length overall.....4.28
 Weight.....9.22
 Thread size.....3.6-6NS-2 L

FUZES, B.D., M62, LIMITED STANDARD—M62A1, STANDARD



FUZE, B.D., M62
 UNCLASSIFIED

This fuze incorporates a plunger assembly of the Semple centrifugal plunger type. The firing-pin is mounted in the percussion plunger which is held in the unarmed position by two safety-pins which compress their springs and move out of the rotor when the shell attains sufficient rotating speed. The rotor is then free to turn and the pin snaps into the armed position, where it is held away from the primer by two restraining springs.

Upon impact the plunger compresses the restraining springs and the firing-pin strikes the primer and fires successively the intermediate detonator charges.

The next element in the explosive train is the slider charge. It is contained in an interrupter assembly which is moved to the outer wall of the fuze by the rotation of the shell. When the slider is in the latter position the explosive element is aligned with the detonator and is fired by it. This ignites the booster lead charge and the booster which explodes the bursting charge of the projectile.

A new model of the M62 fuze incorporating a heavier plunger and a single large restraining spring has been designated as the M62 (Drawing 73-2-160, revision of 8 January 1944).

ROUND

M62
 Shell, H.E., A.T., 75 mm, M66

M62A1

Shell, H.E., A.T., 105 mm, M

CHARACTERISTICS

M62 and M62A1
 Length overall.....3.54
 Weight.....1.28
 Thread size.....1.5-12NS-1 L

FUZE, B.D., M66A1— STANDARD

The mechanism of the M66A1 fuze consists only of a plunger firing-pin which is held safe in transportation, firing, and flight by a metal washer. Upon impact the force of inertia causes the firing-pin assembly to crash through the washer and strike the primer cup below.

The resulting flash is carried to a delay pellet of black powder which ignites the detonator, the booster charge, and the bursting charge.

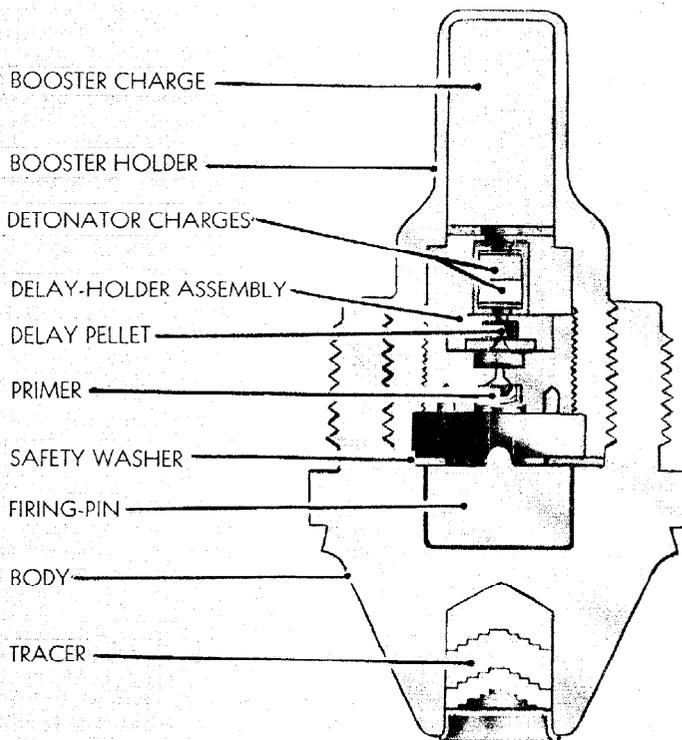
A tracer composition is incorporated in the base of this fuze. This tracer is completely independent of the fuze and is ignited by the flame of the propelling charge.

ROUNDS

Projectile, A.P.C., 75 mm, M61A1

Projectile, A.P.C., 76 mm, M62A1

Projectile, A.P.C., 3 inch, M62A1



FUZE, B.D., M66A1

FUZE, B.D., M68—STANDARD

The M68 is identical in mechanism and operation with the M66A1, but is made with a larger body so as to seat in the larger cavity of the 90 mm projectile.

The diameter of the M68 is 2.00 inches across the threaded portion of the body—that of the M66A1 is 1.65 inches.

A tracer composition in the base of this fuze is ignited by the propelling charge.

ROUND

Projectile, A.P.C., 90 mm, M82

CHARACTERISTICS

Length overall..... 3.463 ins.

Weight..... 1.56 lb.

Thread size..... 2.00-10NS-1 L.H.

CHARACTERISTICS—M66A1

Length overall..... 3.463 ins.

Weight..... 1 lb.

Thread size..... 1.65-10NS-1 L.H.

CHARACTERISTICS—M72

Length overall..... 2.167 ins.

Weight..... 0.86 lb.

Thread size..... 1.375-10NS-2 L.H.

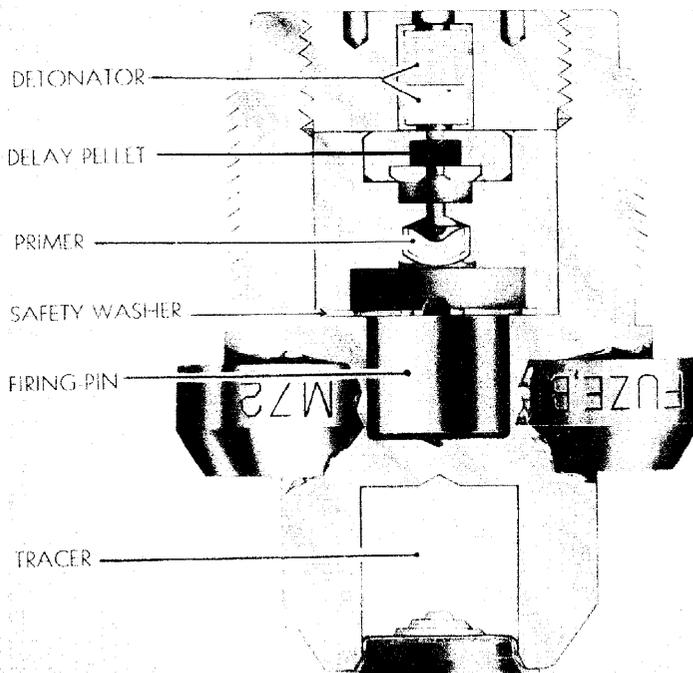
FUZE, B.D., M72—STANDARD

The M72 is similar in mechanism and the operation of its explosive train to the M66A1 and M68 but does not contain an integral booster. The diameter of the threaded part of the body is 1.375 inches—less than the diameter of the other fuzes mentioned.

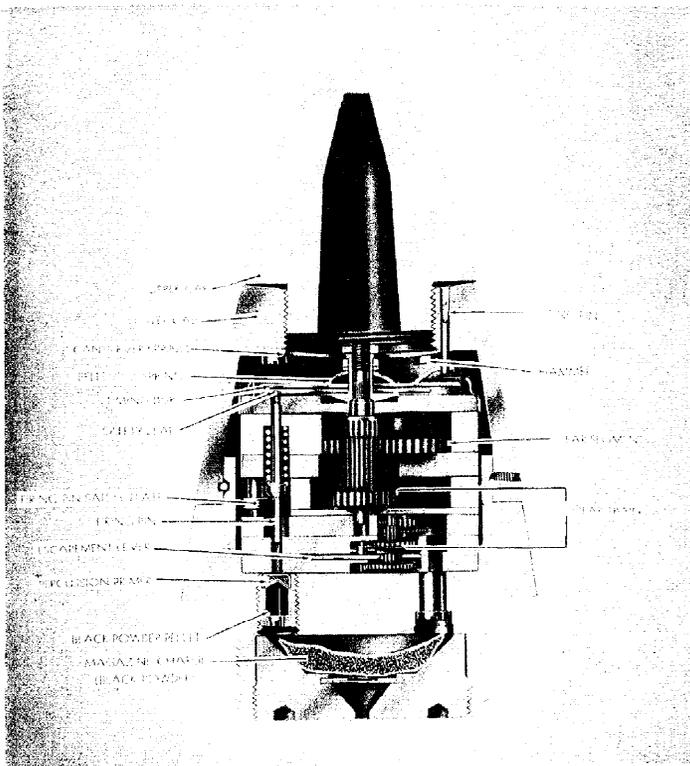
This fuze has a tracer composition in the base which is ignited by the propellant.

ROUND

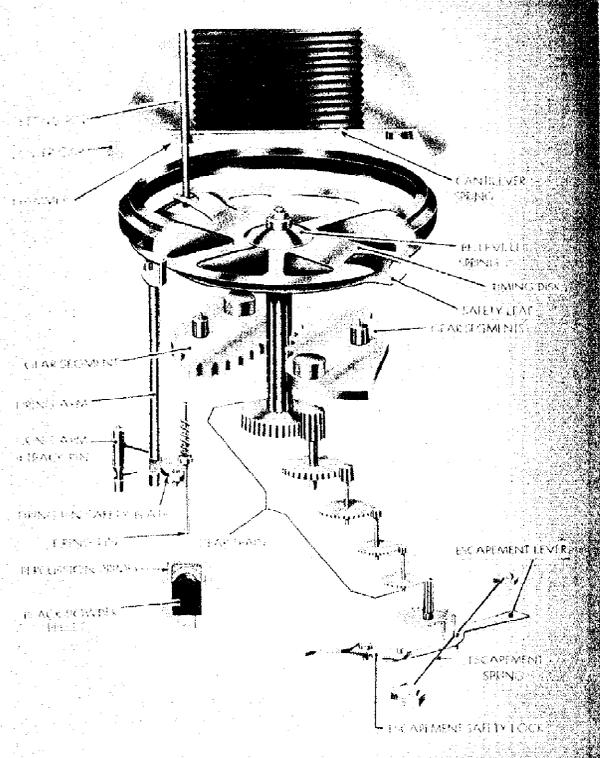
Projectile, A.P.C., 57 mm, M86



FUZE, B.D., M72



FUZE, M.T., M43A4



FUZE, M.T., M43A4—MECHANISM

FUZES, MECHANICAL TIME, M43A5, STANDARD—M43, M43A1, M43A2, M43A3, M43A4, LIMITED STANDARD

All fuzes of the M43 series are mechanical time fuzes which contain no provision for detonation upon impact. The time mechanism may be set to ignite the explosive train at any period from 0.8 second to 30.0 seconds in increments of 0.2 second. This time period is determined by the position of an indicator (set line) on the movable ogive in relation to a graduated scale on the fixed base. The fuze is shipped with the indicator against the "S" (for "Safe") on the graduated scale. All elements are then effectively locked and the mechanism cannot be set in motion accidentally.

In assembling the fuze, the upper cap is staked to the lower and the two turn as a unit in the setting operation. A setting-pin in the lower cap engages the timing disk and serves to rotate the disk until the indicator stands at the desired time setting on the graduated scale.

The timing disk is mounted on the top of the vertical main pinion by a nut and washer screwed down on a Belleville spring. This assembly permits the timing disk to be slipped during the setting operation but holds it tightly to the main pinion when released from the setting-pin. In later models of the M43 fuzes a safety leaf has been added below

the timing disk to prevent functioning at dangerously short time-settings.

The time mechanism of the fuze is a gear train resembling that of a watch. Instead of a mainspring like that of a watch, however, there are two weighted gear segments which engage the main pinion and are actuated in flight by the centrifugal force of the projectile's rotation.

The complete gear train is illustrated in an exploded view. As assembled, it is placed as closely as possible about the axis of rotation. The escapement at the end of the train has a beat much more rapid than that of a watch escapement movement and is actuated by a flat spring instead of the more conventional spiral type.

The firing mechanism includes a firing-arm with setback-pin, a firing-pin safety plate, and a firing-pin and spring.

When the projectile is fired, setback force drives a hammer on a transverse cantilever spring against a raised lug on the timing disk and releases the disk from the setting-pin. Setback also frees the pin holding the firing-arm, leaving the arm free to rotate when the finger on its upper end is tripped by the notch in the firing disk.

After the shell has left the muzzle, centrifugal force turns the escapement safety lock and releases the escapement. The same force moves the weighted gear segments in their arcs to drive the time mechanism. The pinion and the timing disk rotate together and as the notch in the disk trips the finger on the firing-arm, the arm rotates and the safety plate turns from under the shoulder of the firing-pin. This releases the firing-pin spring to drive the pin into the percussion primer, igniting the black-powder pellet and magazine charge.

Illustrated herewith is the M43A4. The latest model is the M43A5 with malleable iron body and stamped steel cap.

ROUNDS M43A5

Shell, H.E., 3 inch, M42A1
Shell, H.E., 3 inch, Mk. IX
Shell, H.E., 90 mm, M71
Shell, H.E., 105 mm, M38A1

CHARACTERISTICS

	M43A5
Length overall.....	4.55 ins.
Weight.....	1.41 lb.
Thread size.....	1.7-14NS-1

FUZE, P.D., M46—LIMITED STANDARD

The M46 is a superquick, point-detonating fuze.

A cavity in the forward end contains a firing-pin supported by a metal cup. The cup is sufficiently strong to resist the setback force produced by acceleration in the gun, but is crushed when the firing-pin is driven into the primer on impact.

The flash tube of this fuze is equipped with an interrupter of conventional type as a bore-safety measure. Setback holds the interrupter in place while the shell is in the bore, but after the projectile leaves the muzzle and its rotation reaches 1,800 r.p.m., centrifugal force causes the interrupter plunger to compress its retaining spring and move outward. This move-

ment clears the flash tube and the fuze is armed.

When the firing-pin strikes the upper detonator the flash passes through the tube to the lower detonator and to the bursting charge in the projectile.

ROUNDS

- Shell, Chemical, 75 mm, Mk. II
- Shell, H.E., 75 mm, Mk. I
- Shell, H.E., 155 mm, Mk. III
- Shell, H.E., 8 inch, Mk. I
- Shell, H.E., 12 inch, Mk. X

CHARACTERISTICS

- Length overall.....5.66 ins.
- Weight.....0.72 lb.
- Thread size.....12.7 per in., Löwenherz

FUZE, P.D., M47—LIMITED STANDARD

This fuze is similar in appearance and in ballistic characteristics to the P.D. Fuze, M46, but is used when a slight delay element (0.05 second) is required. Mechanism and functioning of the two fuzes are alike except for the introduction in the M47 fuze of a delay element which is set off by the flash from the upper detonator. This delay element consists of a black-powder pellet which burns for the desired delay period before igniting the lower detonator.

rotation is less than 1,300 r.p.m. Compression of the spring and arming of the fuze is positive when rotation reaches 1,800 r.p.m.

ROUNDS

- Shell, H.E., 75 mm, Mk. I
- Shell, H.E., 6 inch, Mk. II
- Shell, H.E., 155 mm, Mk. III
- Shell, H.E., 8 inch, Mk. I
- Projectile, H.E., 12 inch, Mk. X

CHARACTERISTICS

- Length overall.....5.66 ins.
- Weight.....0.74 lb.
- Thread size.....12.7 per in., Löwenherz

FUZES, P.D.,

M48, M48A1, LIMITED STANDARD—M48A2, STANDARD

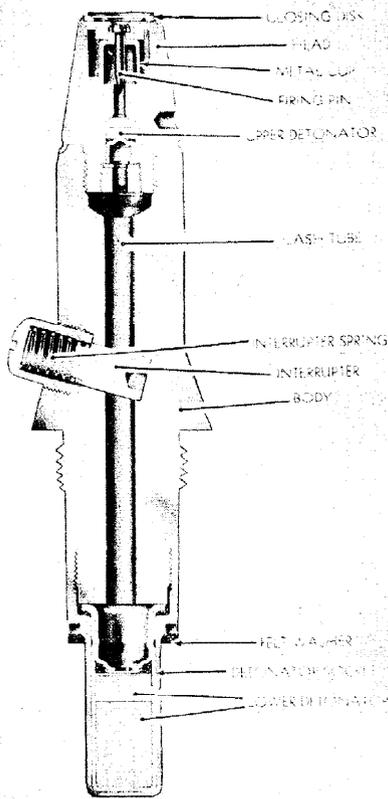
These are selective superquick or delay point-detonating fuzes which may be set to function immediately on impact or with a delay of 0.15 second for the M48A1 and 0.05 second for the M48. Delays of 0.05 second and 0.15 second are used in the M48A2. They have a standard weight of 1.41 pounds, standard streamlined contour, and standard location of the center of gravity.

Bore safety is obtained with all these fuzes when used in conjunction with the M20 booster.

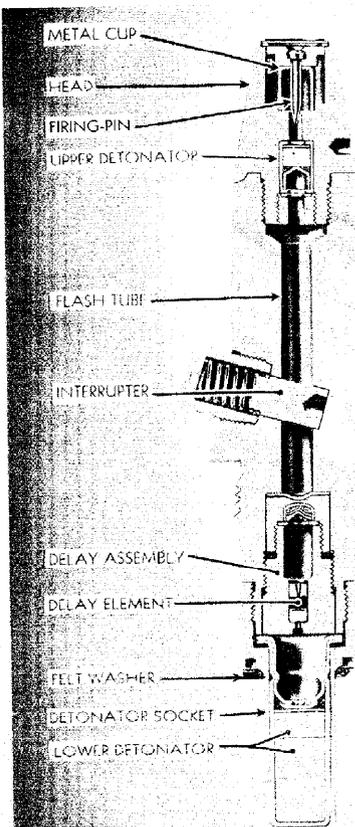
The fuze is set for superquick action by adjusting a setting sleeve which permits the interrupter to move to its armed position when the shell has left the muzzle and is acted upon by centrifugal force. When set for delay action the off-center interrupter is prevented from moving to the armed position by the setting sleeve, hence upon impact the superquick action is checked by the solid mass of the interrupter.

The mechanisms of the three fuzes are similar except for the addition of a centrifugal plunger-pin lock (noted below) to the M48A1 and M48A2. The M48A2 differs from the M48A1 in that the delay action is redesigned to provide additional insurance against premature detonation. The M48A2 has a modified plunger assembly, a weakened plunger-restraining spring, and uses the M29 primer.

SUPERQUICK ACTION—With the setting sleeve adjusted to the superquick position, the firing-pin in the nose of the fuze is supported by a metal cup sufficiently strong to withstand the force of setback while the projectile is in the bore.

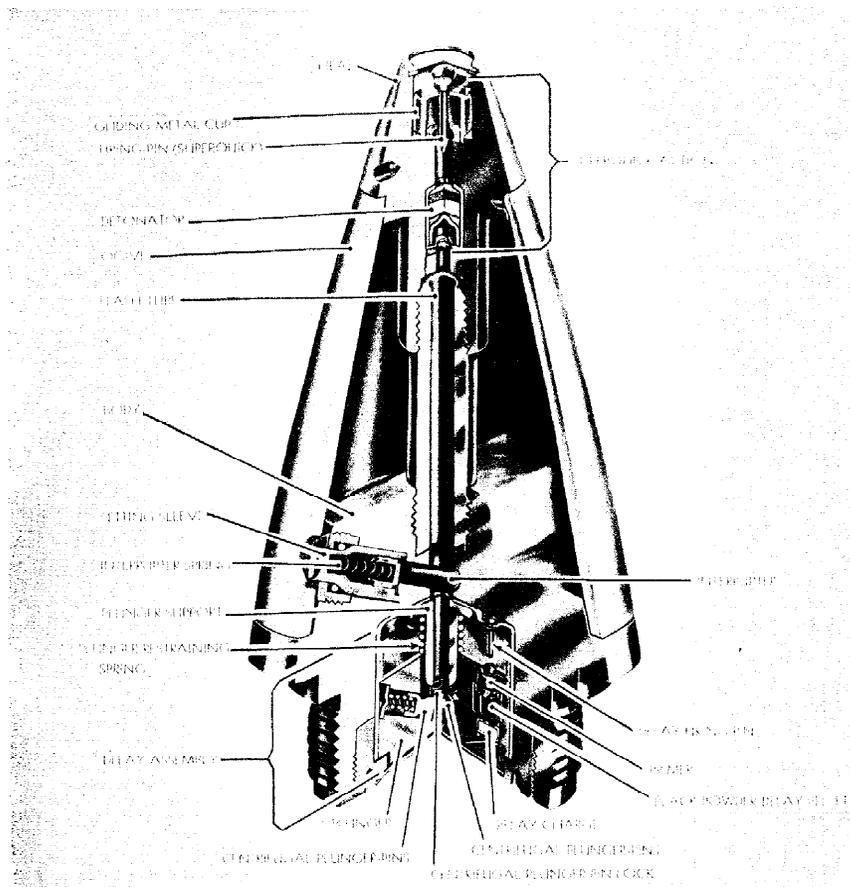


FUZE, P.D., M46



FUZE, P.D., M47
UNCLASSIFIED

ARTILLERY FUZES (Continued)



FUZE, P.D., M48A2



FUZE, P.D., M51A3

Upon impact this cup is smashed and the firing-pin driven into the detonator.

During the flight of the projectile the interrupter moves to the armed position, clearing the flash tube for the flash to pass from the detonator to the booster. The delay action is also set off upon impact but is negated by the prior action of the superquick element.

DELAY ACTION—When the setting sleeve is adjusted to the delay position, the firing of the detonator by the firing-pin in the nose of the fuze transmits no flash to the booster because of blocking by the unarmed interrupter. The delay element in the base of the fuze is actuated by the impact of the projectile.

The delay assembly consists of a fixed delay firing-pin, a plunger support, a plunger, a plunger-restraining spring, two centrifugal plunger-pins and springs, and a centrifugal plunger-pin lock. The delay explosive train is incorporated in the plunger body below the delay firing-pin.

During the period of setback the delay firing-pin in the M48 and M48A1 is restrained from striking the explosive train by the contact of the plunger support with the centrifugal plunger-pins. The firing-pin in the M48A2 fuze

is rigidly mounted and upon setback the plunger body naturally assumes the safe position.

When the projectile leaves the muzzle, centrifugal force moves the centrifugal plunger-pins to their outermost position. These pins are held by the lock which rotates and prevents them from returning to the unarmed position. The plunger head is held away from the delay firing-pin by the plunger-restraining spring.

Upon impact the plunger compresses the restraining spring and strikes the delay firing-pin, igniting the primer, and firing the delay pellet which burns for either 0.15 second or 0.05 second before igniting the relay pellet which transmits the explosion to the booster.

ROUNDS

M48A2

Shell, H.E., 75 mm, M41A1
Shell, H.E., 75 mm, M48
Shell, H.E., 3 inch, Mk. IX
Shell, H.E., 3 inch, M42A1
Shell, H.E., 105 mm, M1

CHARACTERISTICS

	M48A2
Length overall.....	4.55 ins.
Weight.....	1.41 lb.
Thread size.....	1.7-14NS-1

FUZES, P.D., M51, M51A1, M51A2—LIMITED STANDARD M51A3, M51A3 MOD. 3 —STANDARD

All fuzes of the M51 series are mechanically similar to those bearing the M48 designation, but are always used with boosters which are assembled to the base of the fuze instead of being incorporated in the nose of the shell. The M48 fuzes are used without boosters or with the M20 booster assembled in the shell. The M51 series of fuzes use boosters, M21, M21A1, and M21A2. Fuzes and boosters are attached. All fuzes of this series may be set for either superquick or for delay action.

Fuze, M51, has a 0.05 second delay action and is assembled with the M21 booster.

Fuze, M51A1, has a 0.05 second delay action and is assembled with the M21A1 booster.

ARTILLERY FUZES (Continued)

Fuze, M51A2, was originally designed for use with the M21A1 booster but before the fuze reached production the M21A2 booster was assigned to it and the designation was changed to M51A3. The delay period of this fuze was increased from 0.05 second to 0.15 second, effective with the M51A2 fuze.

The "Mod. 3" suffix applied to M51 fuzes identifies it as modified for use in the M103 8 inch H.E. shell fired from the M1 howitzer (Army) and the Mk. IX Mod. 2 (Navy) guns of the same caliber. Assembly of the fuze within the windshield of this shell requires a longer flash tube.

Since this fuze cannot be set by the setting screw when assembled in the M103 shell, two types of fuze heads are

supplied. The fuze is shipped with a dummy head in place and a live head is shipped packed in the packing container. When superquick action is required the live head is substituted.

The M51 Mod. 1 and the M51A1 Mod. 1 fuzes incorporate a time delay of 0.05 second, the M51A3 Mod. 3 fuze has a 0.15 second time delay.

CHARACTERISTICS

	M51A3	M51A3 MOD. 3
Length overall	5.93 ins.	
Weight	2.15 lb.	2.47 lb.
Thread size	1.7-14NS-1 (fuze) 2-12NS-1 (booster)	1.7-14NS-1

ROUNDS

M51A3

Shell, H.E., 4.5 inch, M65
 Shell, H.E., 4.5 inch, M65 B1
 Shell, H.E., 4.5 inch, M65 B2
 Shell, H.E., 6 inch, Mk. IIA1
 Shell, H.E., 6 inch, Mk. IIA2
 Shell, H.E., 155 mm, Mk. IA1
 Shell, Chem., 155 mm, Mk. IIA1
 Shell, H.E., 155 mm, Mk. IIIA1
 Shell, Chem., 155 mm, Mk. VIIA1
 Shell, H.E., 155 mm, M101
 Shell, Chem., 155 mm, M104
 Shell, H.E., 155 mm, M107
 Shell, H.E., 155 mm, M102
 Shell, Chem., 155 mm, M110
 Shell, Chem., 155 mm, M105
 Shell, H.E., 8 inch, M106
 Shell, H.E., 8 inch, Mk. IA1
 Shell, H.E., 240 mm, Mk. IIIA1
 Shell, H.E., 240 mm, M114

M51A3 MOD. 3

Shell, H.E., 8 inch, M103

FUZES, P.D., M52, STANDARD—M52B1, M52B2, ALTERNATES

These three fuzes may be used interchangeably and differ only in the materials used in their construction. Fuze, M52, has an aluminum head and body; Fuze, M52B1, has a plastic head, body, and booster cup; and Fuze, M52B2, has a plastic head and aluminum body. All are superquick in action.

The firing assembly is in the nose of the fuze and consists of a striker and firing-pin held in position by a spring and pin.

The detonator cup in fuzes of this series is mounted in a slider assembly which secures it in the unarmed position until after the shell has left the muzzle of the gun.

Functioning of the slider to arm the fuze is shown in the illustrations herewith. These show (A) a section of the M52

fuze through the slider, and (B) a section through the safety-pin. When the safety wire is removed from the fuze before loading, the safety-pin is held within the fuze body only by the setback-pin. When the shell is fired, setback force withdraws the setback-pin and frees the safety-pin which is thrown clear of the fuze when the projectile leaves the muzzle. This releases the slider to move into its armed position where it is locked by the lock-pin which engages the notch shown in the slider body. The firing-pin is then aligned with the detonator cup which contains a top closing disk, upper and intermediate detonating charges, a detonator pellet, and a base closing disk.

On impact with the target, the striker head collapses and the firing-pin is driven

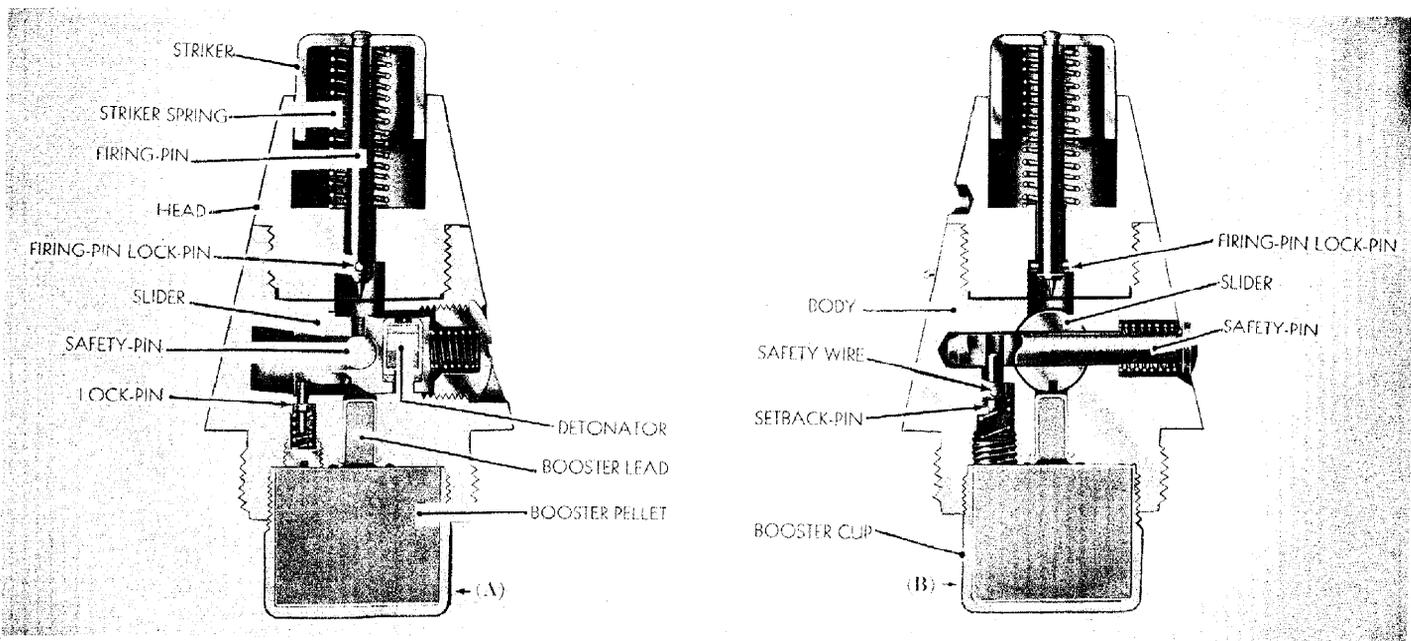
into the detonator cup, exploding all its charges. The flame passes to the booster lead and booster pellet, also shown in the illustrations, and is transmitted to the high-explosive charge of the projectile.

ROUNDS

Shell, H.E., 60 mm, M49A2
 Shell, Practice, 60 mm, M50A2
 Shell, Practice, 81 mm, M43A1
 Shell, Chem., 81 mm, M57
 Shell, H.E., 81 mm, M43A1B1

CHARACTERISTICS

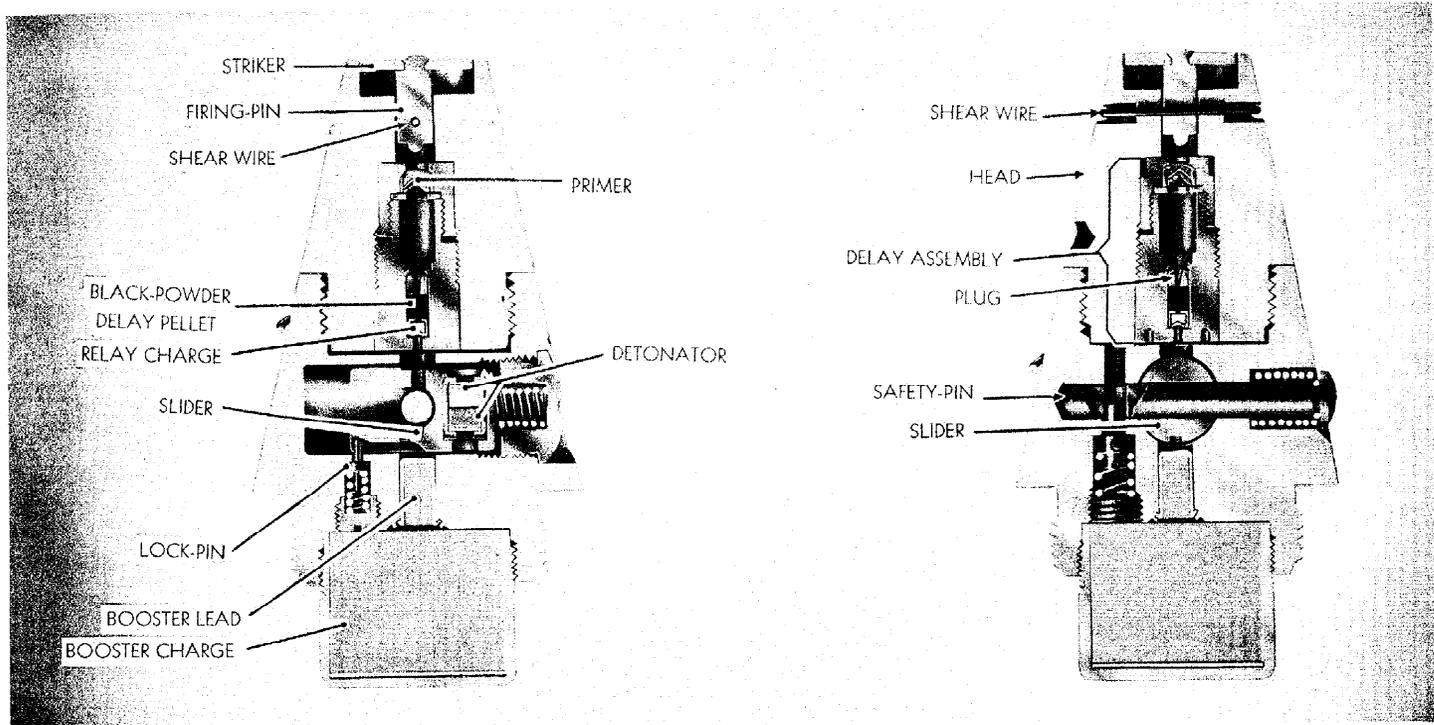
Length overall	3.47 ins.
Weight	M52, 0.45 lb.; M52B1, 0.29 lb.
Thread size	1.5-12NS-1



UNCLASSIFIED

FUZE, P.D., M52

ARTILLERY FUZES (Continued)



FUZE, P.D., M53

FUZE, P.D., M53—STANDARD

This fuze resembles the M52 superquick fuze in that the detonator cup is mounted in a slider which holds it in the unarmed position until the projectile has left the muzzle of the gun. It differs from the M53 in that a delay element is installed between the firing-pin and the detonator assembly.

A striker and short firing-pin are held in position in the nose of the fuze by a shear wire which passes through the fuze body and the pin and is secured by bend-

ing its end into a circumferential groove in the nose.

The delay element consists of a primer, an expansion chamber, a plug, a delay pellet of black powder, and the relay charge. The tapered hole in the plug forms a constriction for the release of burning gases from the delay pellet and thus controls the burning time of the pellet to 0.1 second.

The shear wire restraining the firing-pin is cut on impact with the target. The firing-pin is driven into the delay primer and the flash—after a delay of 0.1 sec-

ond—passes to the detonator which moved into its armed position when the projectile left the muzzle.

The flash from the detonator is transmitted to the booster and main explosive charges as in the M52 fuze.

ROUND

Shell, H.E., 81 mm, M56

CHARACTERISTICS

Length overall.....	3.47 ins.
Weight.....	0.54 lb.
Thread size.....	1.5-12NF-1

FUZES, P.D.,

M54, M55A2, STANDARD—M55, M55A1, LIMITED STANDARD

These are combination superquick and 25-second powder-train time fuzes which may be set to function either upon impact or after a predetermined period. So far as the fuze and its mechanism is concerned, the four are identical; the type numbers being assigned to designate the fuze as used with different boosters.

As M54, the fuze is used in conjunction with booster, M20, or booster, M20A1; as M55, with booster, M21; as M55A1, with booster, M21A1; and as M55A2, with booster, M21A2. These boosters are metal cases carrying a charge of tetryl. Exterior threads on the booster body permit its being screwed into the shell;

interior threads in the nose of the body, above the charge, receive the fuze.

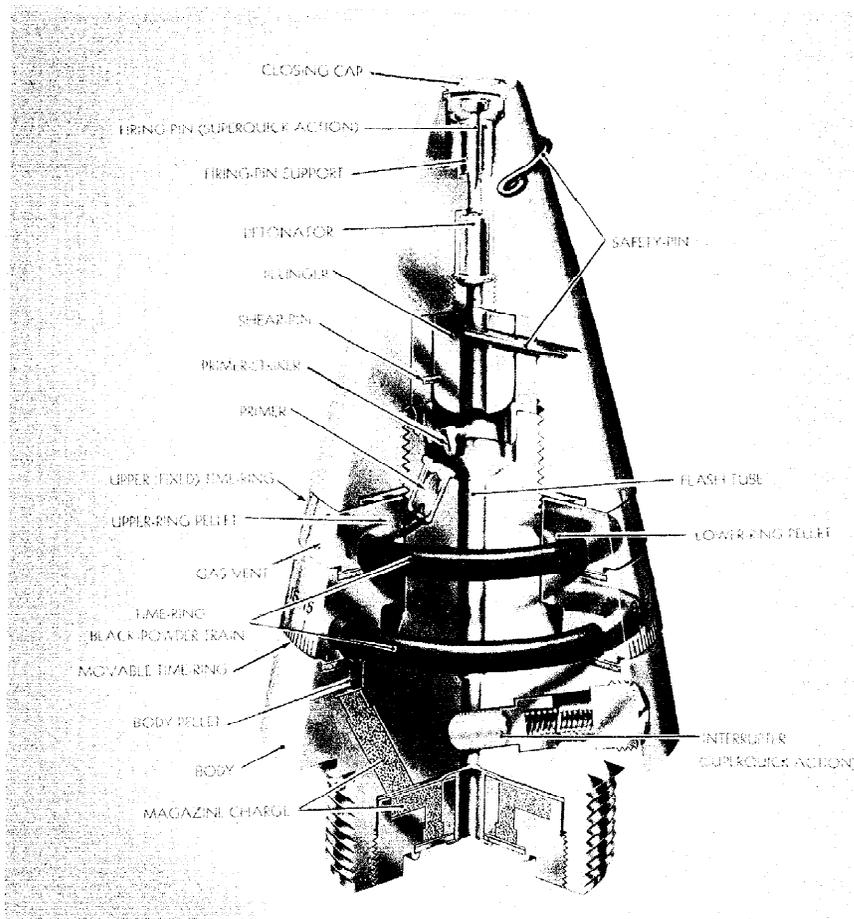
A booster supplies an intermediate detonating charge between the fuze and the high-explosive charge with which the shell is loaded. It amplifies the flash of the smaller detonating elements of the fuze and assures the explosion of the main charge. A booster cannot exert its influence over an extensive area of the charge, but it initiates a maximum high-order detonation in that portion of the charge with which it is in contact. For this reason, a comparatively small booster charge at the end of the fuze detonator train produces better results than a larger

charge placed to surround the detonator. A booster which will function successfully in a 75 mm high-explosive shell will perform equally well in a shell of 155 mm caliber or larger.

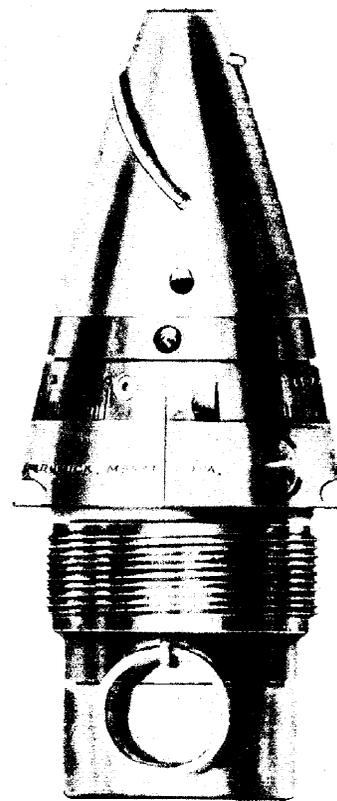
In a chemical shell the function of such a charge is to break the case of the shell into large fragments and permit the dispersion of the chemical filler without flash. It is therefore called a "burster" and is loaded with a "burster charge" larger than the booster charge used with high-explosive shell.

Boosters include their own detonator primers, loaded in a rotor which is held in the safe position until armed by set-

ARTILLERY FUZES (Continued)



FUZE, P.D., M54



FUZE, P.D., M55A1

back plus centrifugal force when the projectile is fired. This additional factor of safety permits fuzes to be shipped with boosters attached or shells to be transported with both fuze and booster assembly in place, ready for loading.

The superquick action of the M54 differs slightly from that of the M48 fuze. There is no means of locking the interrupter of the M54 fuze as is done in setting the M48 fuze for delay action, and the flash tube is always clear for superquick action on impact with the target in the event that the shell is fired with the time element set on "Safe," or if the time of flight is less than that for which the time element was adjusted before firing.

The time element assembly includes a plunger, a primer-striker and primer, two brass time-train rings, upper- and lower-ring pellets, body pellet and body charge, and magazine charge.

When the gun is fired the plunger, acted on by the force of setback, cuts through the shear-pins and rams the striker against the primer. This ignites the upper-ring pellet, setting off the upper time-train ring which burns uni-

formly until the lower-ring pellet is ignited. This pellet transmits the flame to the movable time-train ring which may be set for burning time from 1 second to 25 seconds in increments of 0.2 second. This train fires the body pellet and body charge which ignite the magazine charge.

In addition to the firing-pin support and the interrupter, the following safety measures are provided.

Before placing the round in the gun, a member of the crew must remove a safety-pin which passes through both the fuze body and the plunger and holds the plunger safe in transport. When the fuze is set at "Safe" the ends of the time trains of both upper and lower rings are covered by metal and in the event of accidental ignition the rings can burn completely without communicating their flame to the base charge of the fuze. When the time element is set at less than 0.4 second a safety disk at the ignition end of the movable time train covers the body pellet and prevents its ignition from the movable ring.

To prevent premature ignition of either time train by chamber gases a foil cover is placed over the gas vent of

each time-train ring. The foil is ruptured by pressure created by combustion of the powder in the ring and the gases escape through the vent.

ROUNDS

M54

- Shell, H.E., 75 mm, M48
- Shell, H.E., 105 mm, M1
- Shell, Smoke, 105 mm, (B.E.), M84
- Shell, Smoke, 105 mm, (B.E.), M84B1
- Shell, Smoke, 155 mm, M115
- Shell, Smoke, 155 mm, M116

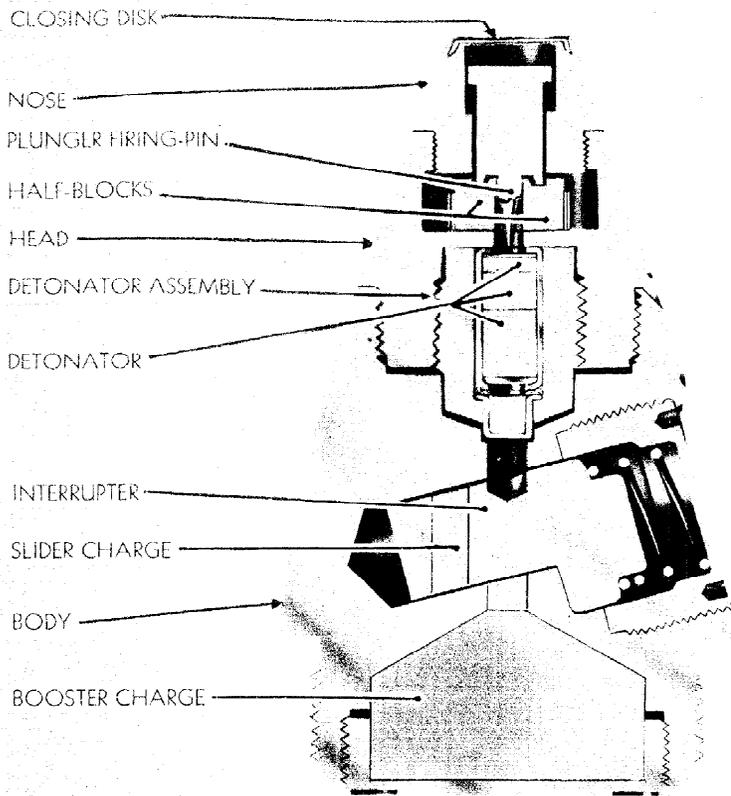
M55A1 and M55A2

- Shell, H.E., 155 mm, M102
- Shell, Chem., 155 mm, M105
- Shell, H.E., 155 mm, Mk. IA1
- Shell, Chem., 155 mm, Mk. IIA1

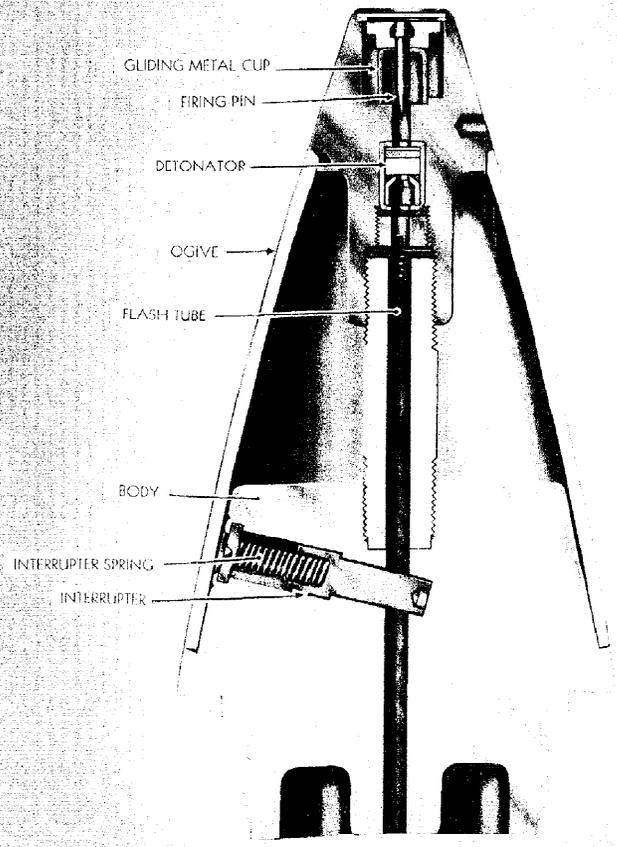
CHARACTERISTICS

	M54	M55A1 and M55A2
Length overall	4.57 ins.	5.95 ins.
Weight	1.42 lb.	2.16 lb.
Thread size	1.7-14NS-1	1.7-14NS-1

UNCLASSIFIED



FUZE, P.D., M56



FUZE, P.D., M57

FUZE, P.D., M56—STANDARD

This is a supersensitive, point-detonating fuze which will function on impact against two thicknesses of airplane fabric. A series of internal safety features renders this fuze relatively boresafe.

When the projectile is fired the fuze is completely unarmed and remains so until the force of setback is overcome. Centrifugal force causes two half-blocks supporting the plunger firing-pin to move apart. The inner edges of these half-blocks have an angular cut which serves to prevent motion of the half-blocks during setback and to lift the plunger firing-pin toward the closing disk as the blocks separate. As the blocks move farther apart an opening is provided for the firing-pin to descend against the detonator. "Creep" holds the firing-pin against the closing disk until it is driven backward by the force of impact. After the shell leaves the muzzle, centrifugal force compresses the interrupter-spring and moves the interrupter toward the nose of the fuze and outward against the outer wall, aligning the slider charge with the detonator assembly and booster.

The detonator assembly is the initial explosive element and contains a primer-detonator, intermediate detonator, and a lead cup charge of tetryl.

The nose of the projectile is crushed on impact with the target and the firing-pin is driven into the primer to detonate the explosive train.

ROUND

Shell, H.E., 37 mm, M54

CHARACTERISTICS

Length overall..... 2.21 ins.
 Weight..... 0.17 lb.
 Thread size..... 1.125-20NS-1

FUZE, P.D., M57—STANDARD

The M57 is a superquick, point-detonating fuze with no delay element. Essentially it is the M48 fuze with the delay assembly omitted and with no setting sleeve on the centrifugal interrupter. This design adapts the fuze for use in chemical shells where it is essential that the shell burst before entering the ground.

The action is identical with that of the M48 when set for superquick functioning.

ROUNDS

Shell, H.E., 75 mm, M48
 Shell, Chem., 75 mm, M64
 Shell, Chem., 105 mm, M60

CHARACTERISTICS

Length overall..... 4.55 ins., max.
 Weight..... 1.41 lb.
 Thread size..... 1.7-14NS-1

FUZE, M.T., M61A1— STANDARD

The M61A1 Fuze is identical in mechanism and functioning with the M43A4 (illustrated on page 655) but differs from it in shape and weight. These variations have been made in order to adapt it for use with the 120 mm shell, M73.

ROUND

Shell, H.E., 120 mm, M73

CHARACTERISTICS

Length overall.....7.677 ins.
Weight.....1.62 lb.
Thread size.....1.7-14NS-1

FUZE, T., M65—STANDARD

The M65 is a simple time-train fuze used in the 60 mm illuminating shell, M83A1.

During transportation and before loading the fuze striker is held in the safe position by a safety-pin and shear wire. Upon firing, the shear wire is immediately severed and the striker ignites the primer charge.

The flash from the primer passes through an orifice and a flash opening cut

at a right angle thereto and ignites a $\frac{1}{4}$ inch length of quickmatch. The time-train groove charge is ignited by the quickmatch and burns about the ring for $14 \pm \frac{3}{4}$ seconds before passing the flame on to the body pellet and the expelling charge in the base of the fuze. The flame from the expelling charge passes to the rear through apertures in the retainer disk.

The fixed burning time of this fuze permits the round, fired with full increment charge, to be at its optimum range and height when the fuze has completed its operation.

To permit powder gases to escape, a vent hole is drilled from the outer wall of the fuze to the time-train ring at the junction of the quickmatch hole. The vent hole is sealed by a lead closing disk and a washer. The disk melts on the ignition of the ring powder charge and permits the combustion gases to escape.

ROUND

Shell, Illum., 60 mm, M83A1

CHARACTERISTICS

Length overall.....2.53 ins., max.
Weight.....0.80 lb.
Thread size.....2-20NS-1

FUZES, M.T., M67, M67A1 —LIMITED STANDARD M67A2—STANDARD

These are mechanical time fuzes with selective time settings up to 75 seconds. The mechanism is the same as that of the M43 series of mechanical time fuzes. However, the escapement and gears are set to give functioning times up to 75 seconds.

The M67A1 is identical with the M67 in mechanism but has a minimum time-setting of 0.8 second instead of 0.2 second. The M67A2 model includes the M21A2 booster.

ROUNDS

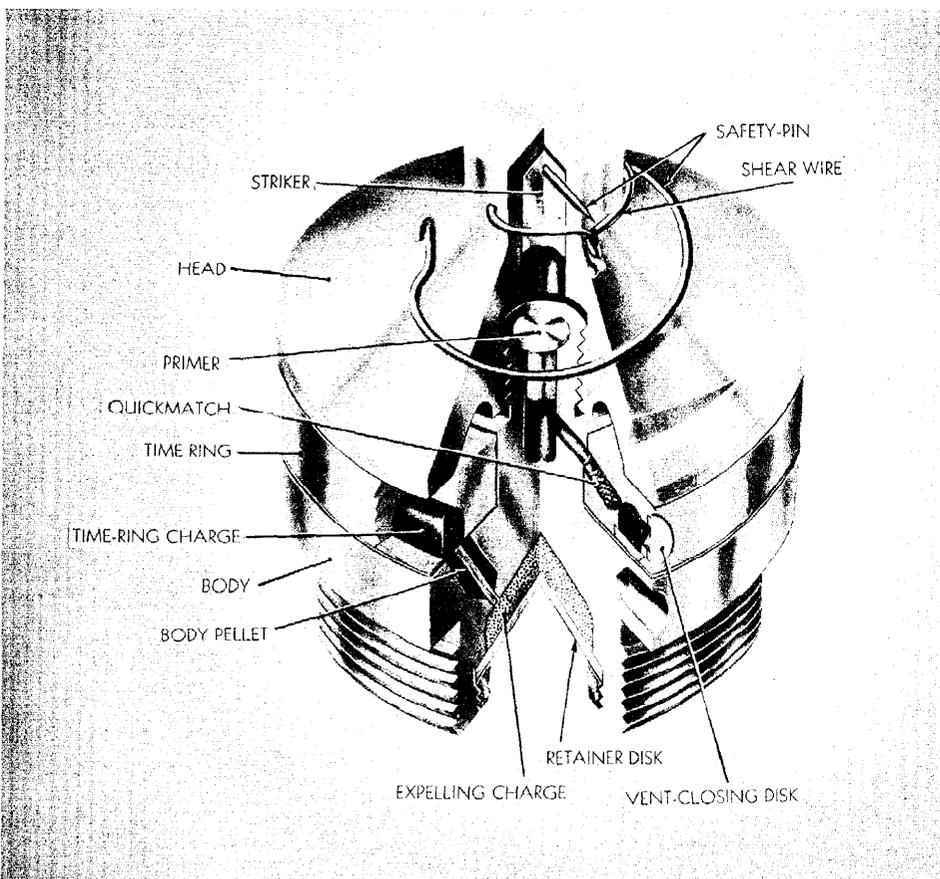
M67A2

Shell, H.E., 155 mm, M101
Shell, H.E., 155 mm, M107
Shell, H.E., 155 mm, Mk. IIIA1
Shell, H.E., 8 inch, M103
Shell, H.E., 8 inch, M106
Shell, H.E., 8 inch, Mk. IA1
Shell, H.E., 240 mm, M114
Shell, H.E., 240 mm, Mk. IIIA1

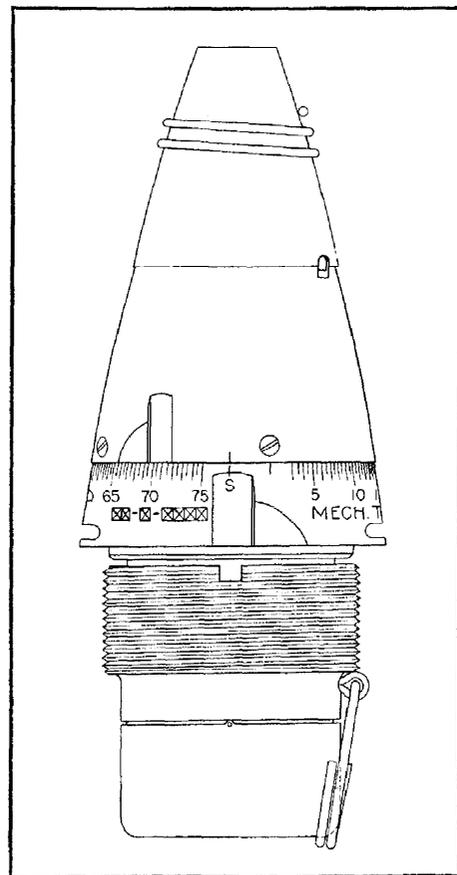
CHARACTERISTICS

M67A2

Length overall.....5.93 ins. (incl. booster)
Weight.....2.14 lb. (incl. booster)
Thread size.....2.12NS-1



FUZE, T., M65



FUZE, M.T., M67A2

ARTILLERY FUZES (Continued)

FUZE, P.D., M71—STANDARD

This is a point-detonating fuze incorporating the Semple-design rotor mechanism.

The fuze body is that of the Mk. 27 fuze. The mechanism is the same as that used in the M74 fuze.

ROUNDS

- Shell, H.E.-T, (S.D. M3), 40 mm, Mk. II
- Shell, H.E.-T, (S.D. No. 12), 40 mm, Mk. II

CHARACTERISTICS

- Length overall..... 2.45 ins.
- Weight..... 0.22 lb.
- Thread size..... 1.18-14NS-2

FUZE, P.D., M74—STANDARD

Since this fuze is used in a practice shell it contains no booster charge.

The firing-pin "floats" in the forward end of the fuze.

A cylindrical rotor, set at right angles to the fuze axis, contains the detonator charge and setback-pin. The detonator is held diagonally across the fuze axis. The force of setback moves the setback-pin into the rotor and the rotor turns to the armed position when rotation of the shell is sufficiently high. The fuze is then fully armed.

Upon impact the firing-pin strikes the detonator and sends the flash into the black-powder spotting charge of the shell.

ROUND

- Shell, Practice, 37 mm, M92

CHARACTERISTICS

- Length overall..... 1.43 ins.
- Weight..... 0.21 lb.
- Thread size..... 1.125-20NS-1

FUZE, P.D., M75—LIMITED PROCUREMENT

This fuze is similar in operation to the No. 253, Mk. III. The M75 has been adopted for limited procurement.

It consists of a brass body and a detonator assembly. The hollow head forms an air chamber at the base of which is a detonator of mercury fulminate and a magazine charge of tetryl pellets.

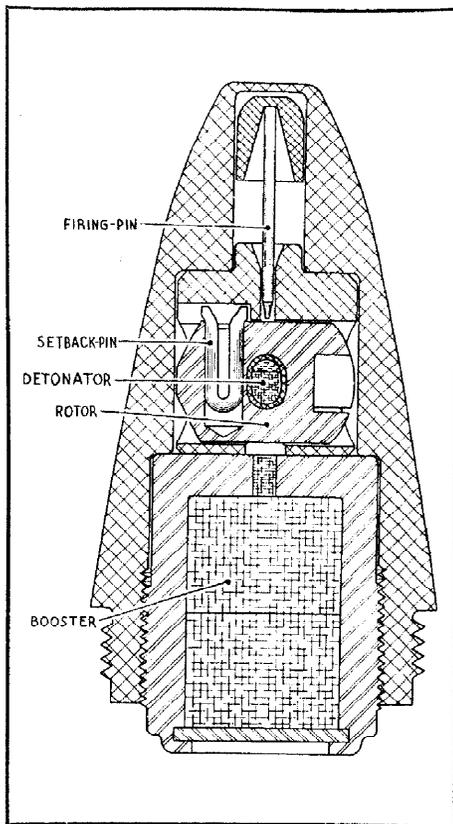
Upon impact the nose is crushed and compression of the air in the chamber ignites the detonator and pellets. The flame is then passed on to the high-explosive charge in the shell.

ROUND

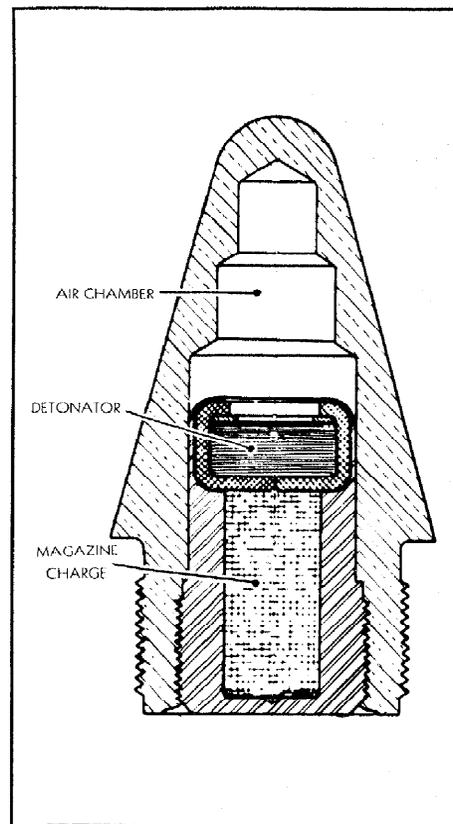
- Shell, H.E.I., 20 mm, M97

CHARACTERISTICS

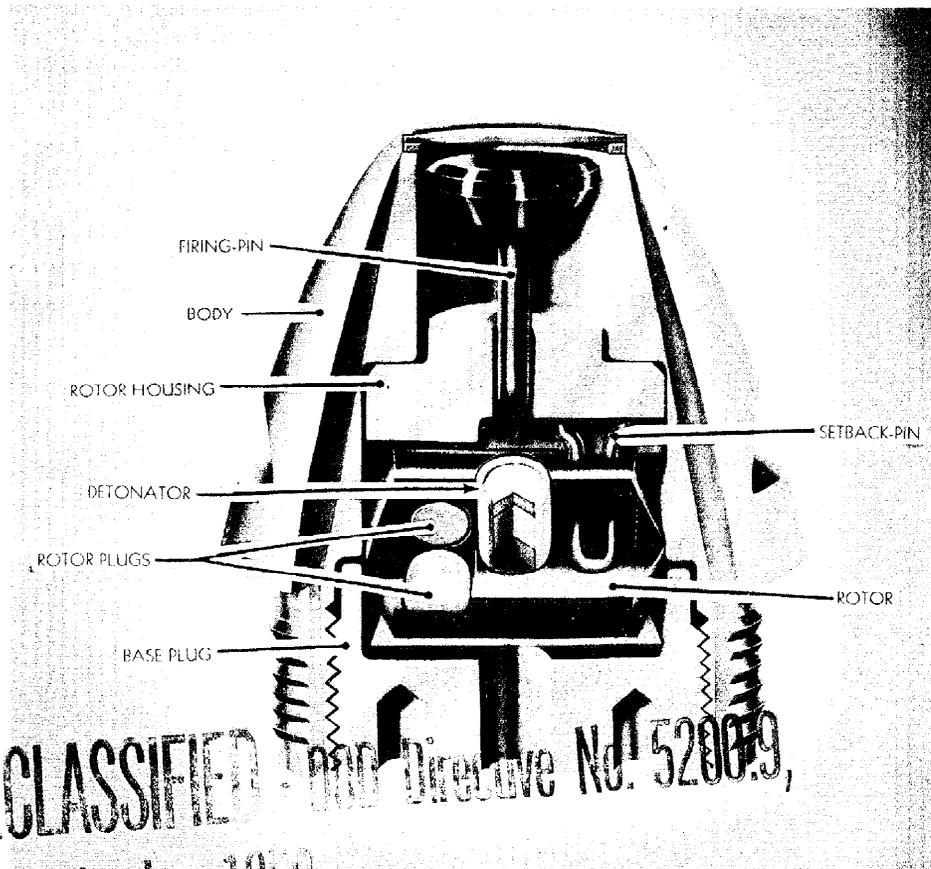
- Length overall..... 1.20 ins., max.
- Weight..... 0.5 lb.
- Thread size..... 0.56-32NS-1



FUZE, P.D., M71

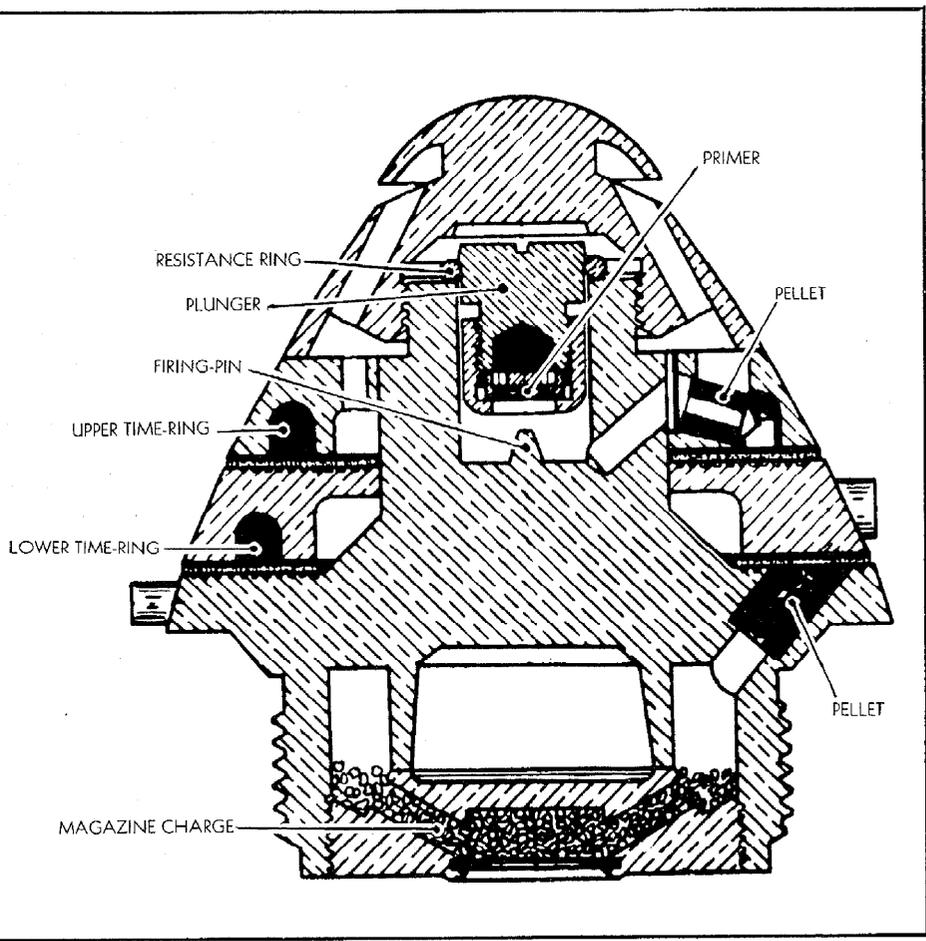


FUZE, P.D., M75



FUZE, P.D., M74

DECLASSIFIED - 000 Disposal No. 520079,
 27 September 1998
 UNCLASSIFIED



FUZE, TIME, 21-sec., Mk. IIIA2

FUZE, TIME, 21-sec., Mk. IIIA2—SUBSTITUTE STANDARD

This modification of the Mk. IIIA1 time fuze contains a black-powder charge weighing 20 grains, sufficient to actuate the Mk. X and M20 boosters.

The delay principle used in this fuze is similar to the time and superquick, M54, in that there are two time-train rings separated by pellets. The Mk. IIIA2 may be set from 0 to 21.2 seconds in increments of approximately 0.2 second.

The ignition of the explosive train varies from the M54 in having the primer attached to the bottom of the concussion plunger. The concussion primer is held in its slot and kept safe by a resistance ring fitted around its head. Upon firing, setback forces the plunger through the resistance ring and into contact with a fixed firing-pin. This action fires the primer and communicates the flame to the first powder pellet and thence to the time train, which eventually sets off the magazine charge and the base charge of the projectile.

Provisions for safety in the time-train rings are similar to those in the M54. When set on "Safe," solid metal sections stand between the pellet of the lower time train and the magazine charge. Vents are provided in the rings to allow chamber gases to escape and prevent premature ignition of the powder trains.

Since this unit is susceptible to moisture a waterproof cover protects each fuze issued.

ROUND
Shell, H.E., 3 inch, M42A1

CHARACTERISTICS

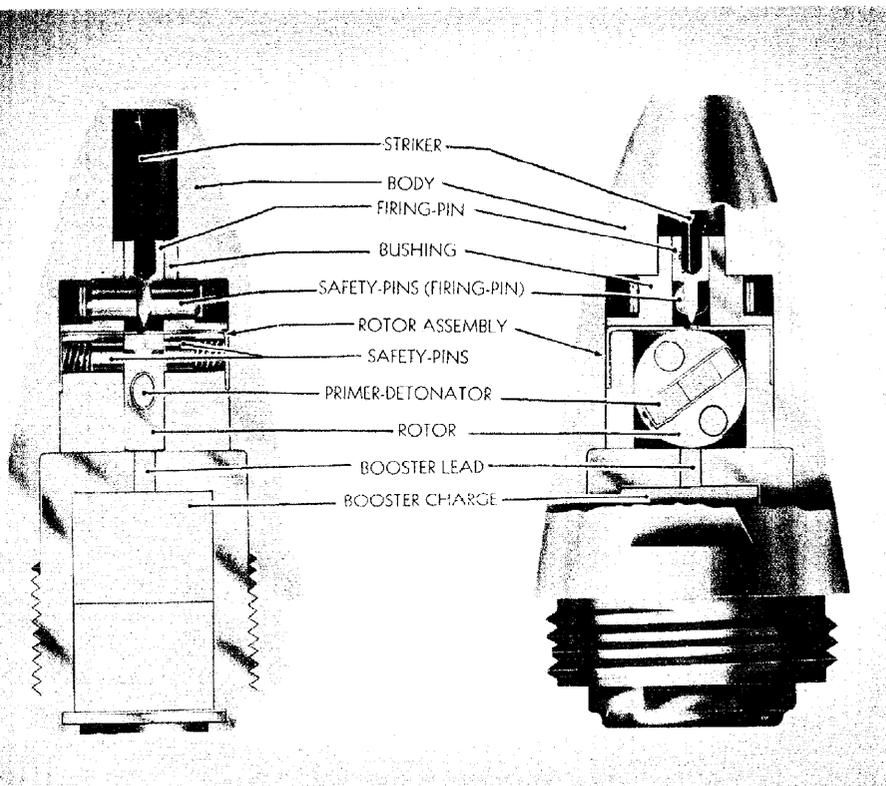
Length overall..... 2.75 ins.
Weight..... 1.25 lb.
Thread size..... 1.7-14NS-1

FUZE, P.D., Mk. 27 (NAVY) —STANDARD

This Navy fuze has been standardized for Army use because of its excellent performance and the ease with which it may be procured. It is superquick in its action.

Striker and firing-pin are held in the nose of the fuze by two safety-pins under the shoulder of the firing-pin.

A rotor located below the firing-pin contains a primer-detonator held out of



FUZE, P.D., Mk. 27 (NAVY)

line with the firing-pin and booster lead charge by two safety-pins.

After the shell has left the muzzle and attained sufficient speed of rotation, the safety-pins move out from under the shoulder of the firing-pin. The firing-pin is restrained in the forward end of the fuze by creep force.

Centrifugal force also withdraws the safety-pin holding the rotor, permitting it to turn and bring the primer into line with the firing-pin.

Upon impact the striker and firing-pin hit the primer and ignite the detonator, booster lead, and booster charge.

ROUNDS

- Shell, H.E.-T. (S.D. M3), 40 mm, Mk. II
- Shell, H.E.-T. (S.D. No. 12), 40 mm, Mk. II

CHARACTERISTICS

Length overall.....	2.45 ins.
Weight.....	0.22 lb.
Thread size.....	1.18-14NS-2

FUZE, P.D., No. 251, Mk. I—LIMITED STANDARD

This superquick fuze was originally standardized when the Bofors gun and British 40 mm ammunition were adopted. The fuze was extremely complicated and gave way eventually to the now standard Mk. 27 (Navy) fuze. The No. 251, Mk. I is now classified as Limited Standard for 40 mm ammunition.

In the forward end of the fuze is a striker resting upon a firing-pin held safe by steel balls beneath its shoulder. These steel balls are retained by the arming sleeve. Surrounding the arming sleeve is a compressed spring which is locked by the ferrule and the stirrup spring.

The explosive train is interrupted by a pair of shutters and held by a ferrule and stirrup spring.

Upon setback the ferrule and stirrup spring in the head move rearward and release the arming sleeve. The compressed spring forces the arming sleeve toward

the nose, unmasking the steel balls, and when sufficient centrifugal force has developed these fly from under the shoulders of the firing-pin, leaving it armed for functioning upon impact.

Setback also releases the ferrule and stirrup spring holding the shutters and under centrifugal force they fly outward. The detonator holder is then forced to the rear by its compressed spring and brings the detonator into direct communication with the relay charges.

Upon impact the striker and firing-pin hit the primer and ignite in turn the detonator, relay charges, and booster charge.

ROUND

Shell, quick-firing, H.E., 40 mm, Mk. II T/L/

CHARACTERISTICS

Length overall.....	2.76 ins.
Weight.....	0.219 lb.
Thread size.....	1.18-14NS-2

FUZES, P.D., No. 253, Mk. I, Mk. II, LIMITED STANDARD—No. 253, Mk. III, STANDARD

These superquick, point - detonating fuzes were developed for use with 20 mm high-explosive incendiary rounds. They differ only in minor construction details. The noses of the Mk. I and Mk. II fuzes are closed by their brass disks; the nose of the Mk. III is solid. The detonators in the Mk. II and Mk. III fuzes are covered by a pierced brass disk. A solid brass disk is used in this position in the Mk. I fuze.

The principle of functioning of the Mk. II and Mk. III fuzes is as simple as it is

radical. There is no firing mechanism whatever, firing of the explosive train being initiated by heat generated by compression of the air in the hollow nose as the fuze head is crushed by impact. The Mk. I fuze, however, functions due to retardation which causes the lead-foil disk on top of the detonator charge to move forward through the washer, carrying with it a portion of the fulminate charge. This movement causes the fulminate to ignite.

The complete explosive train consists of a mercury fulminate detonator and booster cap, and a tetryl booster charge.

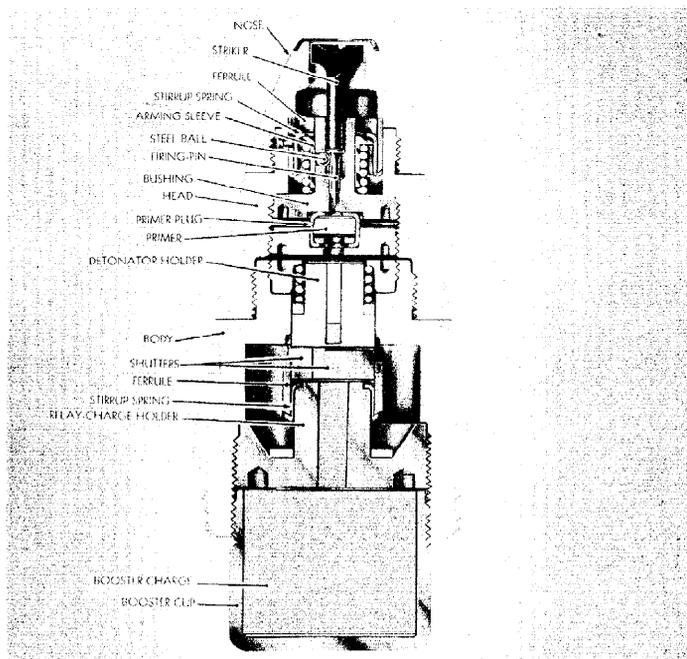
ROUND

No. 253, Mk. III
Shell, H.E.I., 20 mm, Mk. I

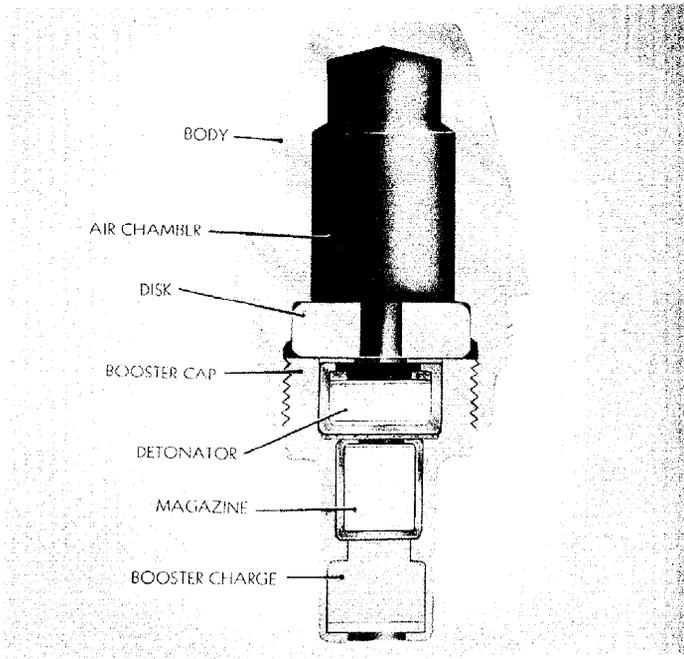
CHARACTERISTICS

No. 253, Mk. III

Length overall.....	1.41 ins.
Weight.....	0.058 lb.
Thread size.....	0.625-36NS-2



FUZE, P.D., No. 251, Mk. I



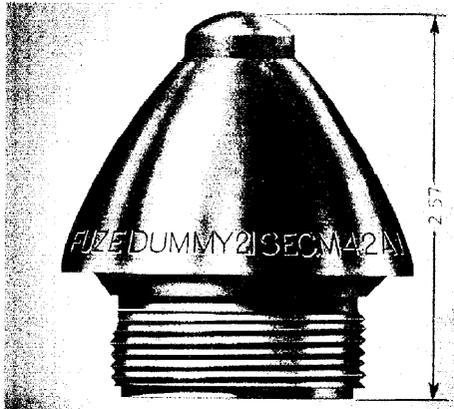
FUZE, P.D., No. 253, Mk. III

UNCLASSIFIED

ARTILLERY FUZES (Continued)

DUMMY FUZES

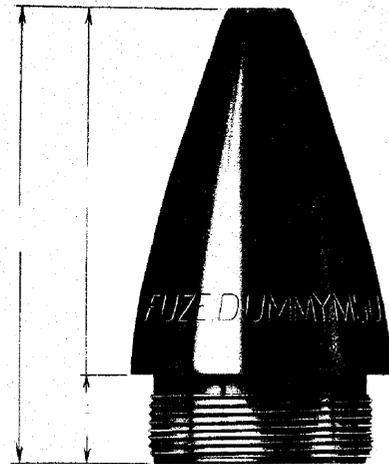
These fuzes for practice firing are designed to simulate actual models and have the same contour, size, weight, and ballistic qualities as the fuzes they simulate. Setting screws are incorporated where necessary.



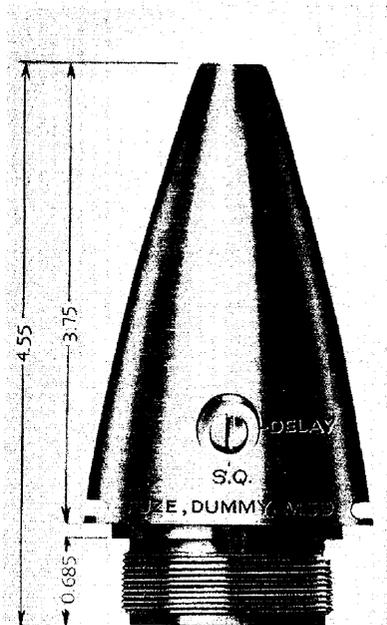
**FUZE, DUMMY, 21-SEC., M42A1—
LIMITED STANDARD**



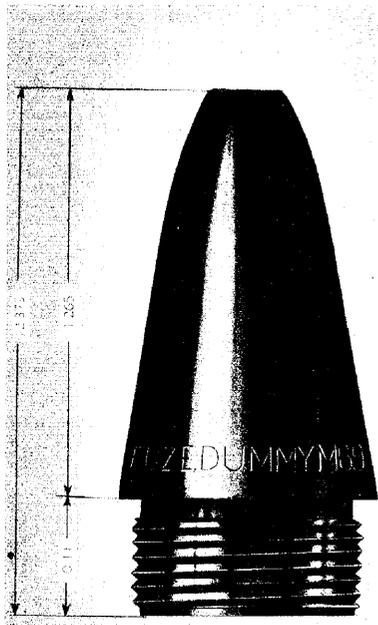
**FUZE, DUMMY, M44A2—
STANDARD**



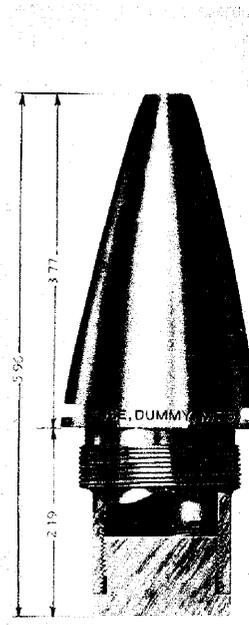
**FUZES, DUMMY, M50, STANDARD—
M50B1, M50B2, ALTERNATES**



**FUZE, DUMMY, M59—
STANDARD**



**FUZES, DUMMY, M69, STANDARD—
M69B1, ALTERNATE**



**FUZE, DUMMY, M73—
STANDARD**



**FUZE, DUMMY, T23—
EXPERIMENTAL**

UNCLASSIFIED

BOMB FUZES

Fuzes used in detonating bombs are classified as nose or tail (indicating their location in the bomb) or as hydrostatic fuzes. These last are placed in depth bombs and are operated by hydrostatic pressure. Bomb fuzes may be further classified according to the method by which the arming process is initiated—arming-pin or arming-vane. In fuzes classified as arming-pin type the arming

process is begun by removal of an arming-pin from the fuze when the bomb is released. Arming-vane fuzes are armed by rotation of vanes in the airstream after the bomb is released. Arming may be accomplished immediately upon removal of the pin or may be delayed mechanically or by the timed burning of a powder train. The actual functioning of the firing

elements of bomb fuzes may be time, superquick, delay, nondelay, or by combinations of these methods.

Hydrostatic fuzes depend upon water pressure for the functioning of their firing mechanisms. They may be set to detonate at required depths. In some designs the arming of the fuze is also accomplished by hydrostatic pressure.

FUZE, BOMB, NOSE, AN-M103—STANDARD

The AN-M103 is a nose fuze which functions on impact. It can be set for instantaneous functioning or 0.1 second delay action by means of an external setting-pin.

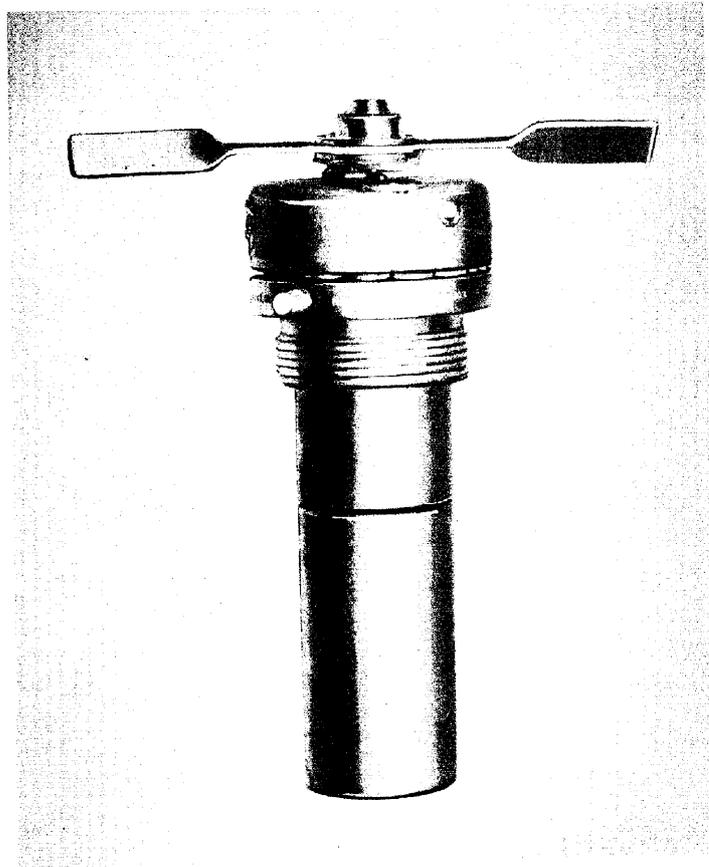
As supplied, the fuze is set for delay action (0.1 second) but instantaneous action may be obtained by removing the external setting-pin from its deep slot position, rotating it a quarter turn and inserting it in the shallow slot. As the vane cup moves away from the striker the safety blocks are exposed and ejected, leaving the striker held in the safe position by only a soft metal shear wire and the inner end of the setting-pin, which

also acts as a shear wire. Under the action of its spring the arming stem travels with the head of the fuze as the latter moves forward in the arming operation. This forward movement of the arming stem releases the detonator slider assembly.

The detonator slider assembly contains the detonator charge which is held out of line with either the delay firing-pin or the instantaneous firing-pin by the blocking action of the arming stem. As the lower end of the stem reaches the upper edge of the detonator slider in its forward movement, the slider is pushed across by its springs until the upper step of the deto-

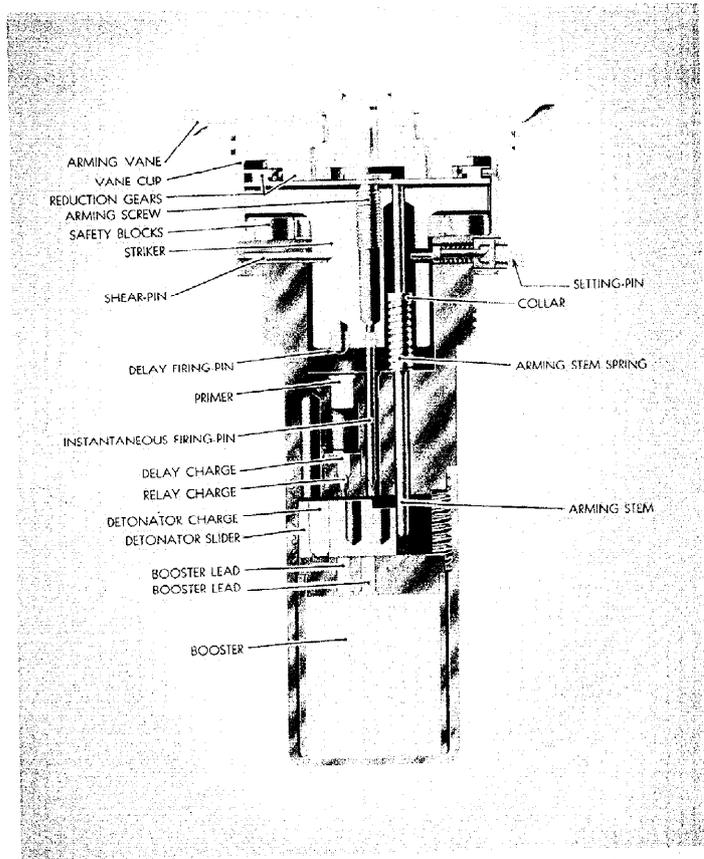
nor slider again meets the arming stem. This position of the detonator slider places the detonator charge in direct contact with the delay explosive train and one of the two booster lead charges. Should the setting-pin be adjusted for delay action the inner end of the setting-pin engages the collar on the arming stem and prevents further advance of the arming stem. The stem reaches this point after approximately 180 turns of the arming vanes.

Should the setting-pin be adjusted for instantaneous action its inner end is entirely withdrawn from the arming-stem slot and the stem is free to continue its



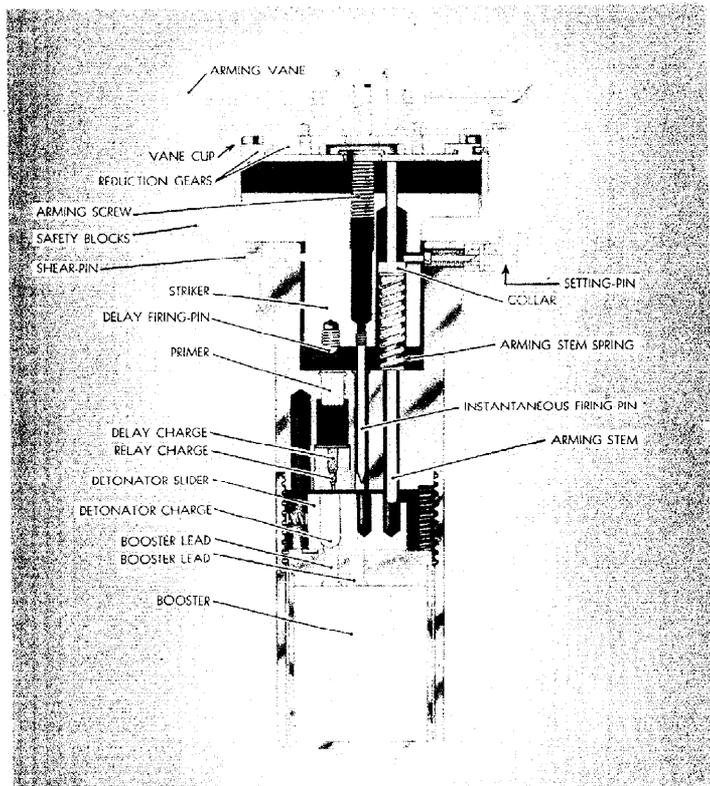
FUZE, BOMB, NOSE, AN-M103

UNCLASSIFIED

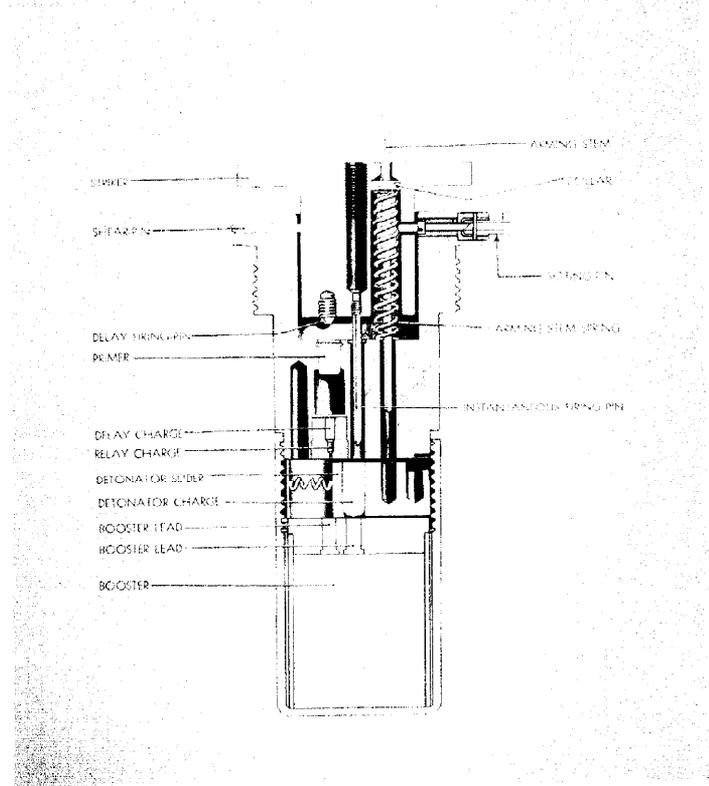


FUZE, BOMB, NOSE, AN-M103—UNARMED

BOMB FUZES (Continued)



FUZE, BOMB, NOSE, AN-M103—ARMED FOR DELAY ACTION



FUZE, BOMB, NOSE, AN-M103—ARMED FOR SUPERQUICK ACTION

forward movement. After some 300 revolutions of the arming vane the stem clears the end of the detonator slider and the slider is again pushed by its springs until the detonator is directly in line with the instantaneous firing-pin and the second booster lead charge. The detonator slider is locked in the armed position for either delay action or instantaneous action by a pin which moves from the fuze wall into a stepped-back surface on the slider.

At this point the fuze is fully armed and further rotation of the arming vane merely unscrews the delay-arming mechanism. The delay-arming mechanism will fall away from the fuze when air speed is less than approximately 150 miles per hour. At higher speeds air pressure may hold the mechanism on the nose but this does not affect the functioning of the fuze.

DELAY ACTION—Upon impact, after arming, the striker shears the shear pins and plunges the delay firing-pin into a primer which passes the flame to the delay and relay charges, the booster lead, the booster, and to the main bursting charge in the bomb. In delay action the instantaneous firing-pin is driven into a recess in the detonator slider and is inactive.

INSTANTANEOUS ACTION — When the bomb is set for instantaneous action upon impact, after arming the shear pins are sheared as above and the instantaneous firing-pin is driven directly into the detonator charge. The flash is passed to the second booster lead charge, the booster, and the bursting charge.

BOMBS

Bomb, General Purpose, 100 lb., AN-M30
 Bomb, General Purpose, 100 lb., AN-M30A1
 Bomb, General Purpose, 250 lb., AN-M57
 Bomb, General Purpose, 250 lb., AN-M57A1
 Bomb, Fragmentation, 260 lb., AN-M81
 Bomb, General Purpose, 500 lb., AN-M64
 Bomb, General Purpose, 500 lb., AN-M64A1
 Bomb, Chemical, 500 lb., M78
 Bomb, Incendiary, 500 lb., AN-M76
 Bomb, General Purpose, 500 lb., AN-M43
 Bomb, General Purpose, 1,000 lb., AN-M44
 Bomb, General Purpose, 1,000 lb., AN-M65
 Bomb, General Purpose, 1,000 lb., AN-M65A1
 Bomb, Chemical, 1,000 lb., AN-M79
 Mine, Aircraft, 1,000 lb., AN-Mk. 13 Mod. 1
 Bomb, General Purpose, 2,000 lb., AN-M66
 Bomb, General Purpose, 2,000 lb., AN-M66A1
 Bomb, General Purpose, 2,000 lb., AN-M34
 Bomb, Light Case, 4,000 lb., AN-M56
 Bomb, Light Case, 4,000 lb., AN-M56A1

CHARACTERISTICS

Length overall..... 7.08 ins.
 Weight..... 3.7 lb.
 Diameter..... 2.48 ins.

FUZE, BOMB, NOSE, AN-M104— SUBSTITUTE STANDARD

The AN-M104 is an arming-pin type of fuze with powder-train time delay arming. The firing-pin is held in direct contact with the striker assembly by a spring which also restrains the firing-pin from striking the primer until impact.

Primer and detonator are located below the firing-pin in a slider held in the unarmed position by a pin extending through the fuze. This pin also prevents the cocked delay firing-pin from striking the primer of the time train.

As the bomb parachute is pulled from its case the arming wire attached to the case is drawn from the arming-pin, which flies clear of the fuze under the impulse of the compressed spring at its other end. This allows the slider to move into contact with the delay-arming plunger and frees the cocked delay firing-pin to strike the primer of the time train and ignite the black powder train. The time train ring extends around 326° of the circumference

UNCLASSIFIED

BOMB FUZES (Continued)

of the fuze and has a burning time of approximately 2.5 seconds.

After burning around the time-train ring the flame passes to a pellet charge and a black-powder delay-arming charge which blows out a delay-arming plug. The detonator slider, impelled by its compressed spring, ejects the delay-arming plunger through the opening thus created and moves into the armed position.

On impact with the target the striker drives the firing-pin into the primer which fires the intermediate detonator, the detonator pellet, and the integral booster.

BOMBS

Bomb, Practice (Parachute), 17 lb., M37
 Bomb, Fragmentation, 23 lb., AN-M40
 Bomb, Fragmentation, 23 lb., AN-M40A1
 Bomb, Fragmentation, 23 lb., M72
 Bomb, Fragmentation, 23 lb., M72A1

CHARACTERISTICS

Length overall..... 4.4 ins.
 Weight..... 1.15 lb.
 Diameter..... 2.95 ins.

FUZE, BOMB, NOSE, M108 —LIMITED STANDARD

This is an impact fuze of the arming-pin type which arms immediately on withdrawal of the arming wire. The body of the fuze is held in the bomb by two spring-actuated balls which latch in a groove in the fuze seat.

During fuzing of the bomb, the cotter pin is replaced by the arming wire. When the bomb is dropped by the airplane the arming wire is withdrawn, releasing the arming-pin, safety plate, and safety block, which are ejected from the fuze by action of their compressed springs. The striker firing-pin is now armed but held safe by a thin shear wire.

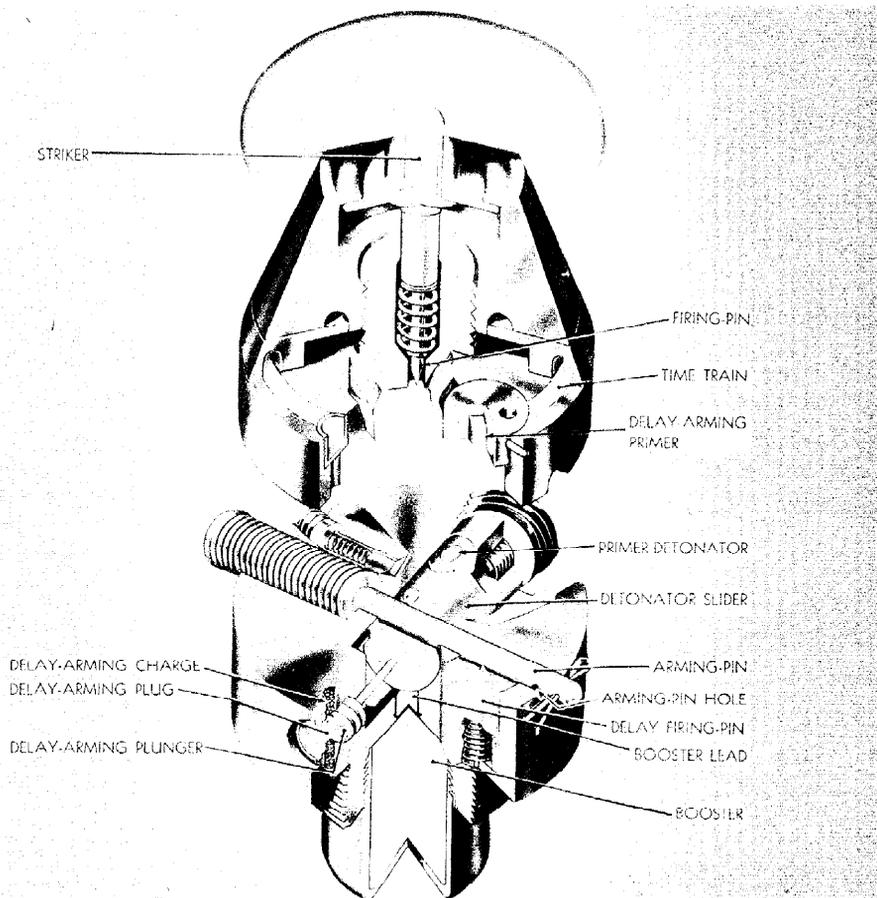
Upon impact the striker firing-pin shears the shear wire and strikes the primer-detonator.

BOMBS

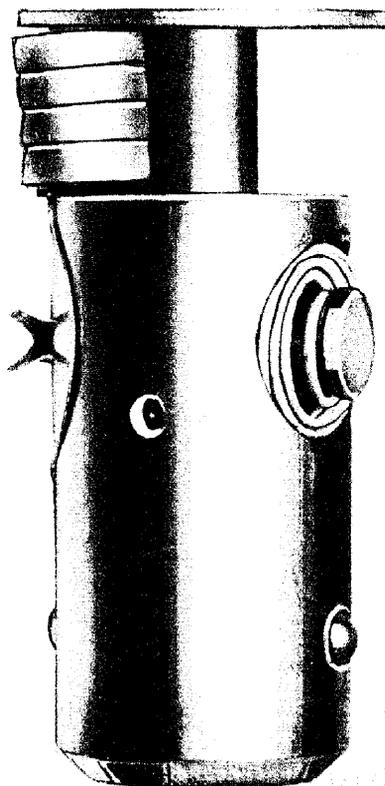
Bomb, Chemical, 100 lb., Mk. 28
 Bomb, Gas, Persistent (HS), 100 lb., M47A1
 Bomb, Incendiary Liquid, 100 lb., M47A1
 Bomb, Smoke (WP), 100 lb., M47A2
 Bomb, Practice, Target, 100 lb., M75

CHARACTERISTICS

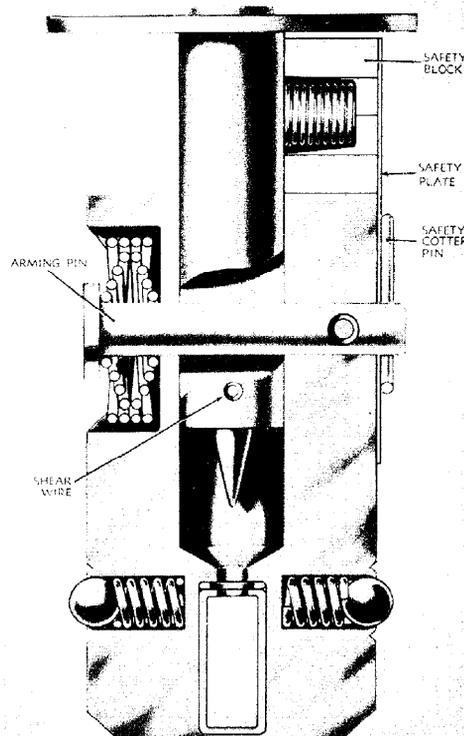
Length overall..... 2.66 ins.
 Weight..... 0.54 lb.
 Diameter..... 1.0 in.



FUZE, BOMB, NOSE, AN-M104



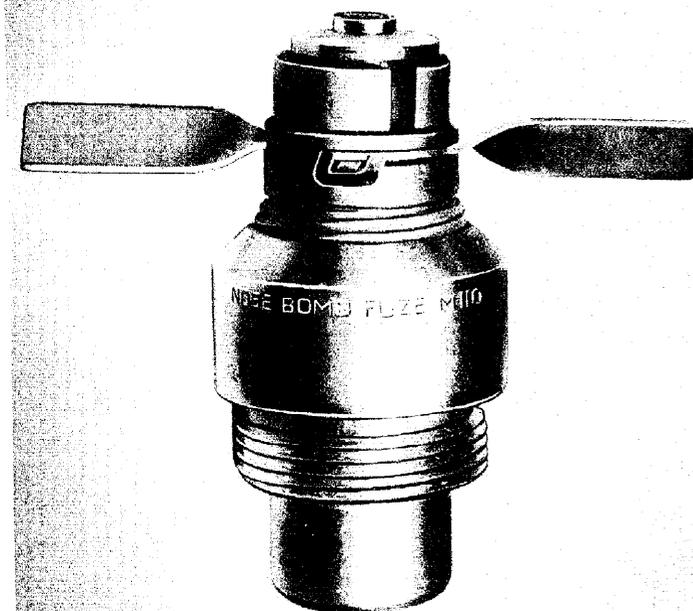
FUZE, BOMB, NOSE, M108



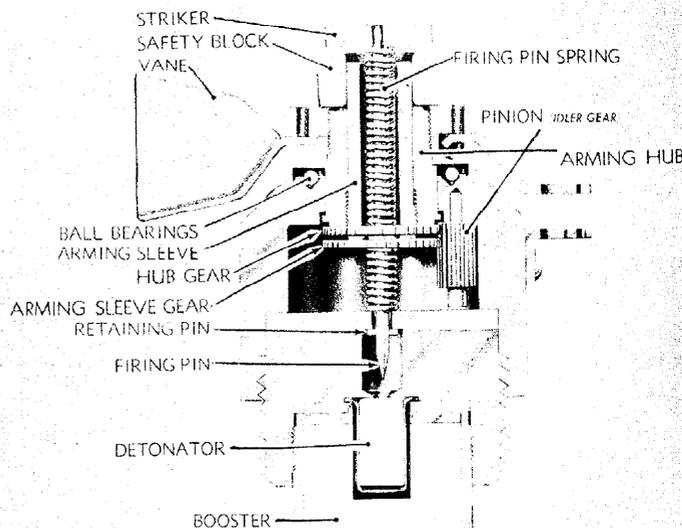
FUZE, BOMB, NOSE, M108

UNCLASSIFIED

BOMB FUZES (Continued)



FUZE, BOMB, NOSE, M110



FUZE, BOMB, NOSE, AN-M110A1

FUZES, BOMB, NOSE, AN-M110A1, STANDARD—M110, LIMITED STANDARD

These are nose fuzes of the arming vane type with mechanical delay arming and are designed to function on impact.

Striker and firing-pin form a unit held in the fuze by a pin passing through the firing-pin behind the end plate. Safety in the unarmed position is secured in the AN-M110A1 by a C-shaped safety block placed between the striker and the delay-arming mechanism. In the M110 fuze this block is made in three segments.

Operation of the delay-arming element can be understood more clearly by reference to the illustration of the AN-M110A1 fuze. The arming vanes are mounted upon a hub to the lower face of which is staked a gear with 33 teeth. The arming sleeve is threaded within the hub and turns with it on ball-bearings. A gear with 34 teeth is staked to the lower face of the sleeve and both gears mesh with an idler pinion in the fuze body.

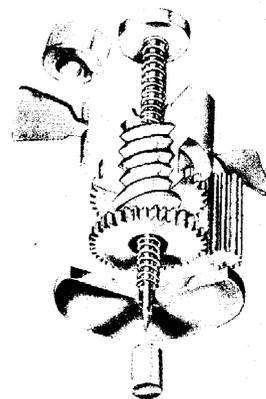
When the bomb is released from the airplane the entire arming assembly, including the sleeve and its gear, begins spinning as a unit in the air stream under the impulse of the rotating vanes. Since the sleeve gear has one tooth more than the hub gear it necessarily lags behind for the distance of that one tooth, or

1/34 revolution, for each complete turn the sleeve and hub make together. This lag serves to withdraw the sleeve, threaded into the hub, a distance corresponding to that 1/34 revolution.

The result is that of a gear train with a reduction ratio of 34 to 1 between the revolutions of the arming hub and the withdrawal of the sleeve from its threads. After 260 revolutions of the arming vanes the sleeve is completely withdrawn from the C-shaped safety block which is then thrown clear of the fuze by centrifugal force. The fuze is now fully armed and the firing-pin is held from contact with the detonator only by its spring.

When the bomb strikes the target the resistance of this spring is overcome and the pin is driven into the detonator, firing the integral booster charge and the main explosive charge of the bomb.

The AN-M110A1 differs from the M110 in being constructed of stronger parts to insure functioning when released at high air-speeds. A single C-shaped safety block is employed instead of one consisting of three segments. The M110 has reduction gears with 57 and 56 teeth and is armed after approximately 455 revolutions of the arming vanes in the air stream.



FUZE, BOMB, NOSE, AN-M110A1—MECHANISM

BOMBS

M110

Bomb, Practice, 20 lb., AN-M48
Bomb, Fragmentation, 20 lb., AN-M41
Bomb, Fragmentation, 20 lb., AN-M41A1

AN-M110A1

Bomb, Gas, Persistent (HS), 115 lb., AN-M70
Bomb, Fragmentation, 20 lb., AN-M41
Bomb, Fragmentation, 20 lb., AN-M41A1

CHARACTERISTICS

	M110	AN-M110A1
Length overall	3.58 ins.	3.7 ins.
Weight	0.62 lb. (aluminum) 1.1 lb. (steel)	1.02 lb.
Diameter	1.75 ins.	1.75 ins.

FUZES, FLARE, M.T., M111A2, STANDARD—M111, M111A1, LIMITED STANDARD

These are nose fuzes which may be set to function after a predetermined time or on impact. They represent a combination arming vane and arming pin type and are armed by a mechanical delay mechanism.

The three models are mechanically similar but vary in setting-time ranges. The M111 may be set from 15 seconds minimum to 93 seconds maximum, the M111A1 and M111A2 may be set from 5 seconds minimum to 92 seconds maximum. The safety block of the M111 and M111A1 fuzes is in three segments, the M111A2 has a single C-shaped block.

The mechanical delay-arming device of the M111 and M111A1 operates on the same principle as that employed in the M110, the M111A2 operates the same as the AN-M110A1 fuze. The arming sleeve of the M111A2 is withdrawn from the hub by the lag between a gear of 34 teeth on the sleeve and one of 33 teeth on the hub. Both gears mesh with an idler and a reduction ratio of 34 to 1 is obtained. The arming sleeve of the M111A2 fuze is withdrawn from the safety block after approximately 260 revolutions of the arming vanes; the M111 and M111A1 vanes make 455 revolutions before the fuze is armed. Centrifugal force throws the block clear of the bomb.

The fuze is now fully armed but the cocked firing-pin is restrained from striking the primer by a half-round pin under a shoulder of the firing-pin body. This half-round pin is controlled by the time mechanism.

As the flare or photoflash bomb falls away from the plane the arming wire is withdrawn from the vane stop and the arming-pin. The arming-pin is forced out by its compressed spring and withdraws the inner end of the pin from a slot in the timing disk. The disk is now released and revolves under the impulse of the clock-work mechanism. A timing-disk lever, which has been adjusted for the desired delay, bears on the edge of the timing disk. At the proper time this lever falls into the slot vacated by the arming-pin. The timing-disk lever is connected through the firing lever to the half-round pin and releases it to turn from beneath the shoulder on the firing-pin. The firing-pin spring now drives the pin into the primer. Flame from the primer passes on to the booster charge of black powder.

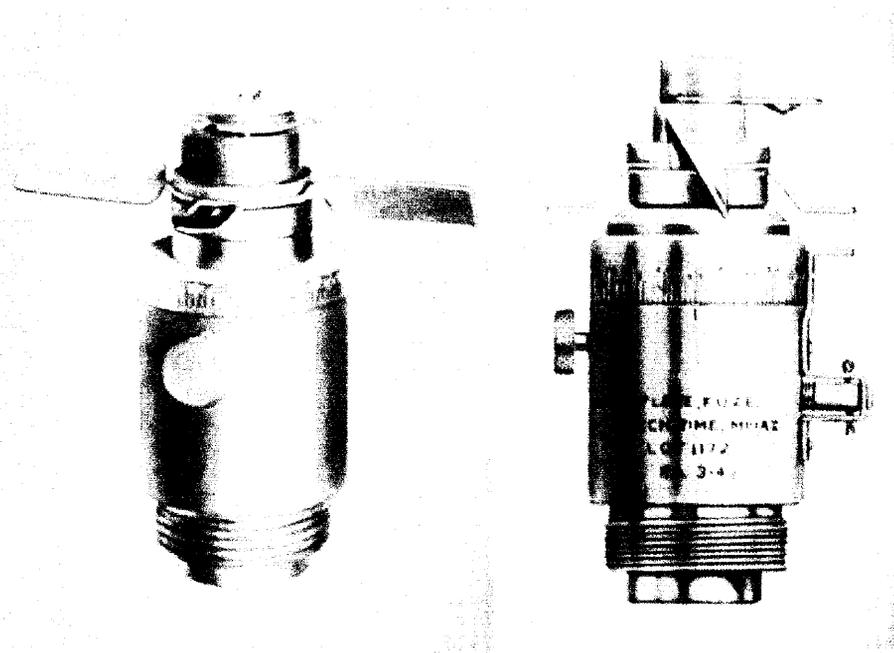
BOMBS

M111A2

Flare, Aircraft, Parachute, AN-M26
Bomb, Photoflash, M46

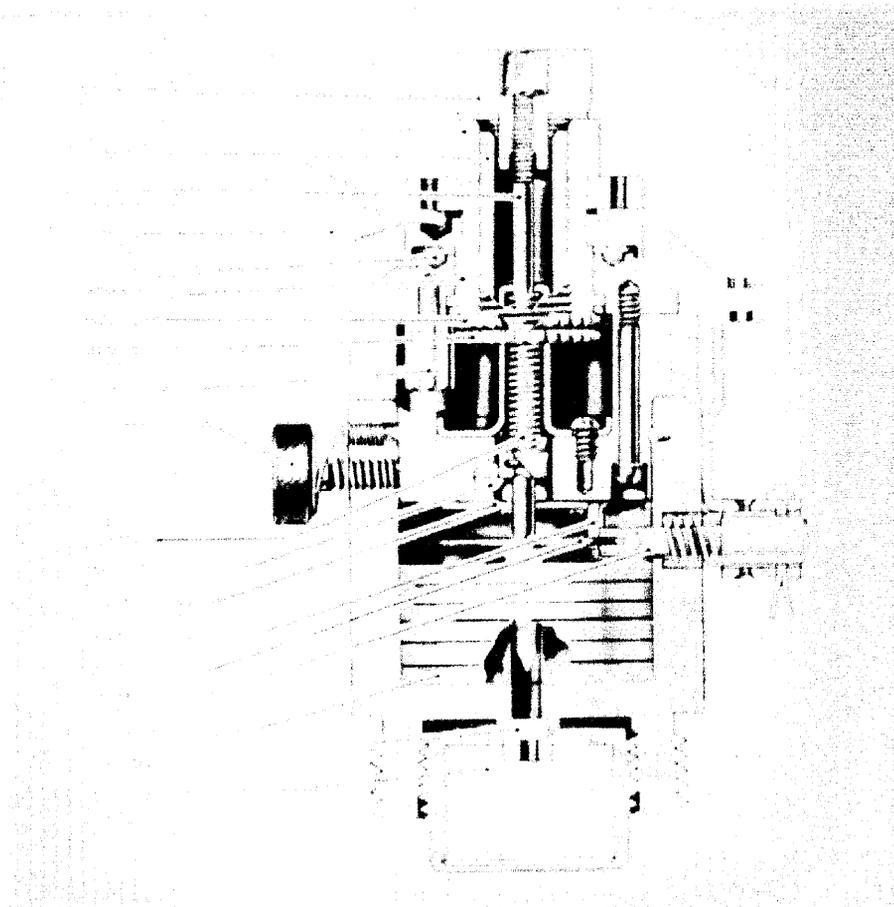
CHARACTERISTICS

	M111A2
Length overall	4.5 ins
Weight	1.4 lb
Diameter	1.75 ins



FUZE, FLARE, M.T., M111

FUZE, FLARE, M.T., M111A2



FUZE, FLARE, M.T., M111A2

UNCLASSIFIED

BOMB FUZES (Continued)

FUZES, BOMB, NOSE, AN-M120A1, STANDARD—AN-M120, LIMITED STANDARD

The AN-M120 and AN-M120A1 are impact fuzes of the arming-pin type with mechanical delay arming. Delay arming is accomplished in the AN-M120A1 by clockwork within $1.90 \pm .15$ seconds after removal of the arming-pin.

When the arming wire is removed from the arming-pin a spring ejects it from the

fuze. This frees the arbor on the time mechanism cylinder and the cylinder begins to rotate. After the cylinder has rotated for $1.90 \pm .15$ seconds the detonator slider-pin is cleared and the detonator slider is pushed by its spring until the slider lock engages a hole in the side of the slider. This locks the slider in the armed position and aligns the detonator with the firing-pin and the booster lead-in.

The firing-pin, which has been held in the safe position by a restraining spring, is driven into the detonator upon impact and ignites the explosive train.

The AN-M120A1 model contains a lead azide lead-in in place of the tetryl lead-in in the AN-M120. The primary difference between the AN-M120 and the AN-

M120A1 is that the arming time has been reduced from 2.5 seconds in the former to $1.90 \pm .15$ seconds in the latter fuze. In the AN-M120A1 the striker head and the arming elements have been strengthened.

BOMBS

AN-M120 AND AN-M120A1

Bomb, Fragmentation, 23 lb., AN-M40

Bomb, Fragmentation, 23 lb., AN-M40A1

Bomb, Fragmentation, 23 lb., M72

Bomb, Fragmentation, 23 lb., M72A1

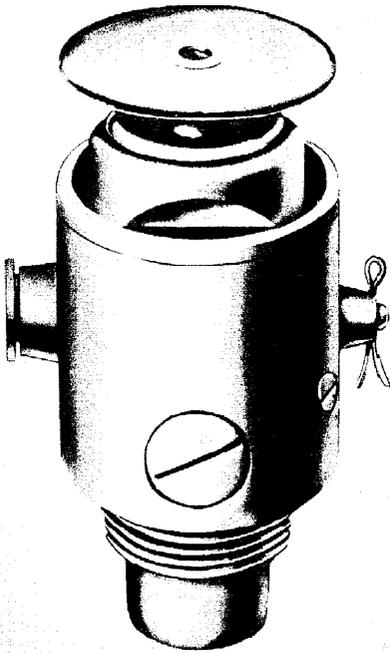
CHARACTERISTICS

AN-M120 AND AN-M120A1

Length overall.....4.6 ins.

Weight.....1.1 lb.

Diameter.....2.3 ins.



FUZE, BOMB, NOSE, AN-M120

FUZES, BOMB, NOSE,

AN-M126A1, STANDARD—AN-M126, SUBSTITUTE STANDARD

The M126 fuze is identical in mechanism and functioning to the M110 but contains a detonator instead of an integral booster. The AN-M126 will arm in approximately 1,250 feet of air travel after release.

The AN-M126A1 fuze is mechanically identical with the AN-M110A1 except for a detonator which replaces the integral booster. It is fully armed after 750 feet of air travel.

BOMBS

AN-M126 AND AN-M126A1

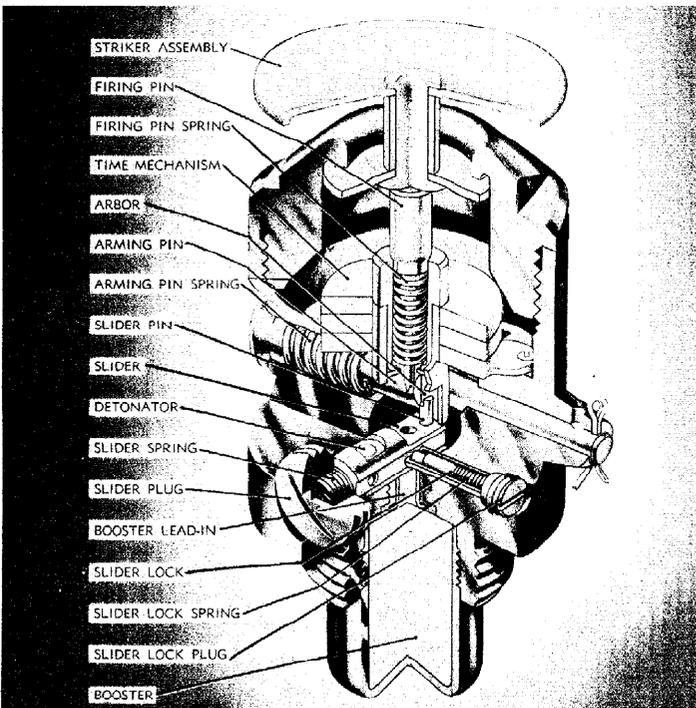
Bomb, Gas, Persistent (HS), 100 lb., M47A2

Bomb, Incendiary Liquid, 100 lb., M47A2

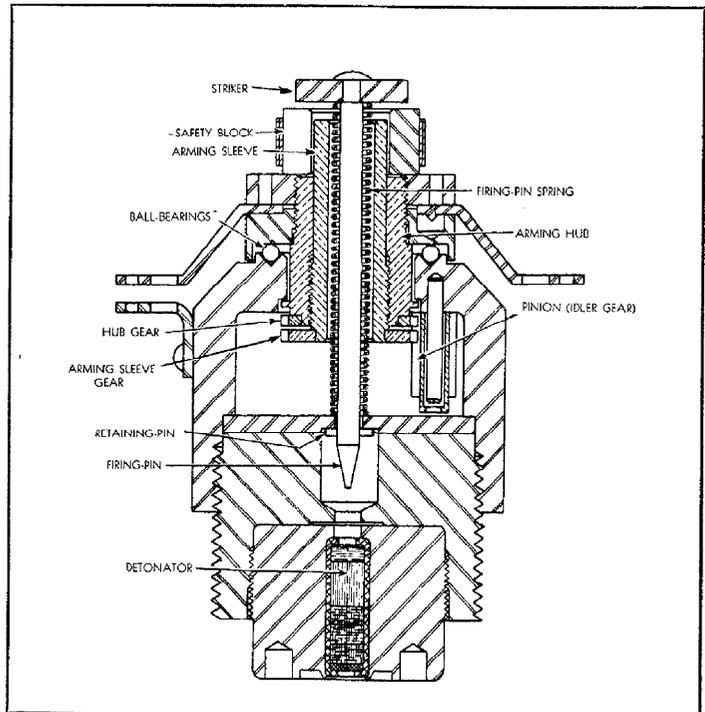
Bomb, Smoke (WP), 100 lb., M47A2

CHARACTERISTICS

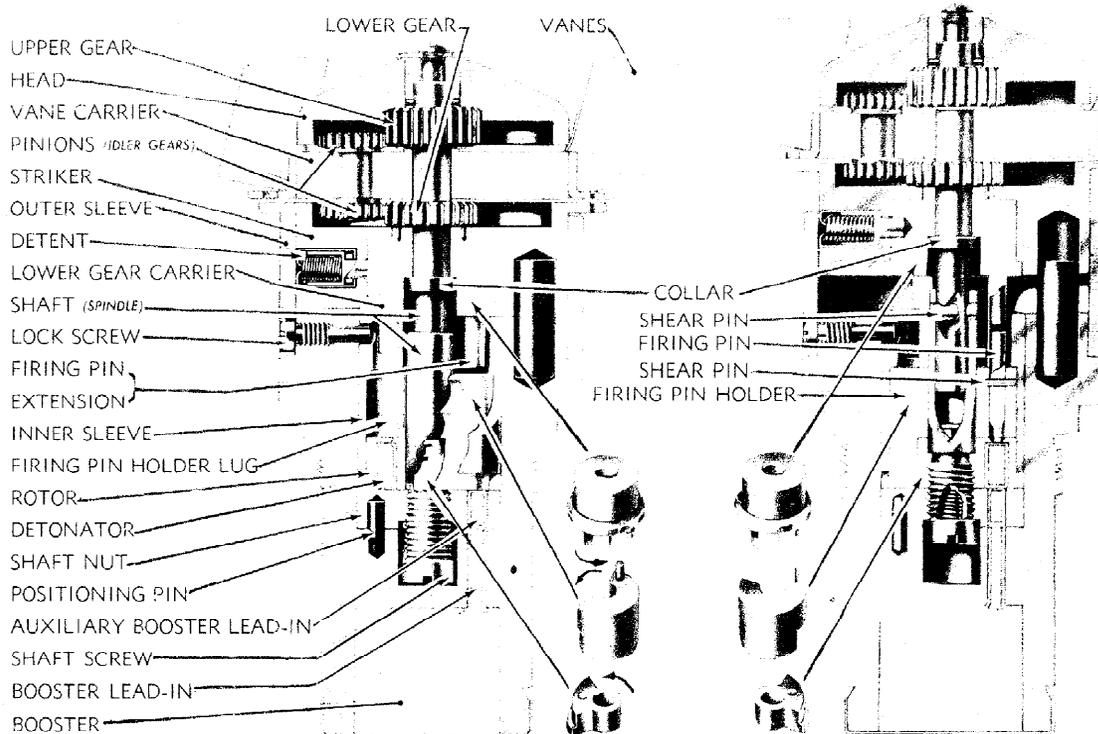
	AN-M126	AN-M126A1
Length overall.....	3.12 ins.	3.24 ins.
Weight.....	0.68 lb.	1.10 lb.
	(aluminum)	
	1.16 lb.	
	(steel)	
Diameter.....	1.75 ins.	1.75 ins.



FUZE, BOMB, NOSE, AN-M120



FUZE, BOMB, NOSE, AN-M126A1



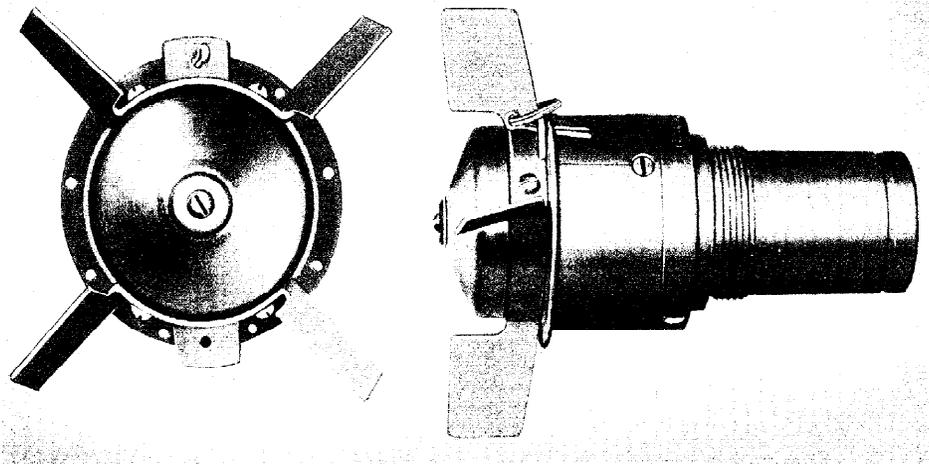
FUZE, BOMB, NOSE, AN-Mk. 219—UNARMED POSITION (LEFT), ARMED POSITION (RIGHT)

FUZE, BOMB, NOSE, AN-Mk. 219— LIMITED STANDARD

The AN-Mk. 219 is a nose fuze of the arming-vane type with mechanical delay arming.

When the arming wire is withdrawn the vanes rotate the vane carrier and drive a reduction gear train. The reduction gear train reduces the relative rotation to one turn of the shaft for 23 turns of the vane carrier. As the vane carrier revolves, the upper pinion turns the upper gear and advances the central shaft on its threads until stopped by the shoulder on the shaft screw. During this operation the lower gear carrier and striker are raised and the lug on the lower gear carrier is disengaged from a slot in the inner sleeve. The lower pinion then turns the lower gear and gear carrier through approximately 340°, bringing into alinement the firing-pin extension, firing-pin, detonator, auxiliary booster lead-in, booster lead-in, and booster. As this rotation is completed a locking detent engages the lower gear carrier to maintain proper alinement of the explosive train.

Upon impact the head, vane carrier, striker, and lower gear carrier as a unit shear the shear pin in the shaft and the



FUZE, BOMB, NOSE, AN-Mk. 219

firing-pin extension engages the firing-pin. The firing-pin cuts through its shear pin and strikes the detonator, igniting the explosive train.

BOMBS

- Bomb, Fragmentation, 30 lb., Mk. 5 Mod. 3
- Bomb, Demolition, 100 lb., Mk. 4
- Bomb, Chemical, 100 lb., Mk. 42
- Bomb, Depth, Aircraft, 325 lb., AN-Mk. 17 Mod. 1
- Bomb, Depth, Aircraft, 325 lb., AN-Mk. 17 Mod. 2
- Bomb, Depth, Aircraft, 325 lb., AN-Mk. 41
- Bomb, Depth, Aircraft, 350 lb., AN-Mk. 44

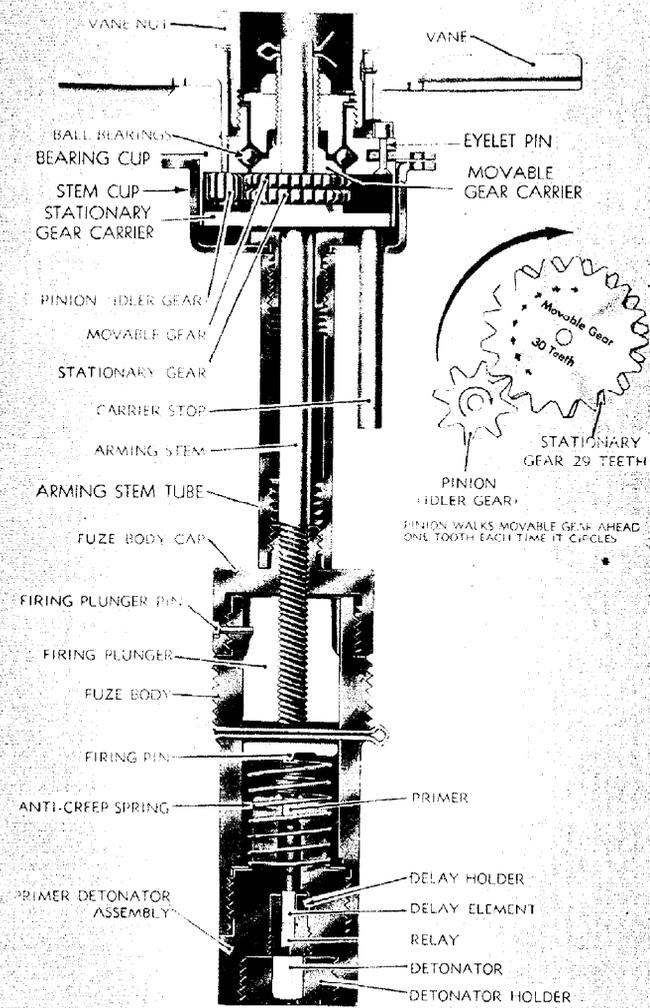
- Bomb, Depth, Aircraft, 350 lb., AN-Mk. 47
- Bomb, Demolition, 500 lb., Mk. 12
- Bomb, Demolition, Light Case, 500 lb., Mk. 9
- Bomb, Depth, Aircraft, 650 lb., Mk. 29
- Bomb, Depth, Aircraft, 650 lb., Mk. 37
- Bomb, Depth, Aircraft, 650 lb., Mk. 38
- Bomb, Demolition, 1,000 lb., Mk. 13
- Bomb, Demolition, Light Case, 1,000 lb., Mk. 9

CHARACTERISTICS

- Length overall..... 5.5 ins.
- Weight..... 4.0 lb.
- Diameter..... 2.3 ins.

UNCLASSIFIED

BOMB FUZES (Continued)



FUZES, BOMB, TAIL, AN-M100A2, AN-M101A2, AN-M102A2

**FUZE, BOMB, TAIL,
AN-M100A1—
LIMITED STANDARD**

**FUZES, BOMB, TAIL,
AN-M100A2,
AN-M101A2,**

AN-M102A2—STANDARD

These are tail fuzes which are designed to function on impact and which may be equipped with M14 primer detonators to provide delays of 0.01 second, 0.025 second, or 0.1 second, or nondelay action.

These fuzes are of the arming-vane type and have mechanical delay arming. The arming vanes, delay-arming mechanisms, firing mechanisms, and explosive components of the three fuzes are alike. The lengths of the arming-stem tubes and arming stems, and the overall lengths differ on each model. These variations are necessary to locate the arming vane in the air stream so that these vane type tail fuzes may be used in bombs of various sizes.

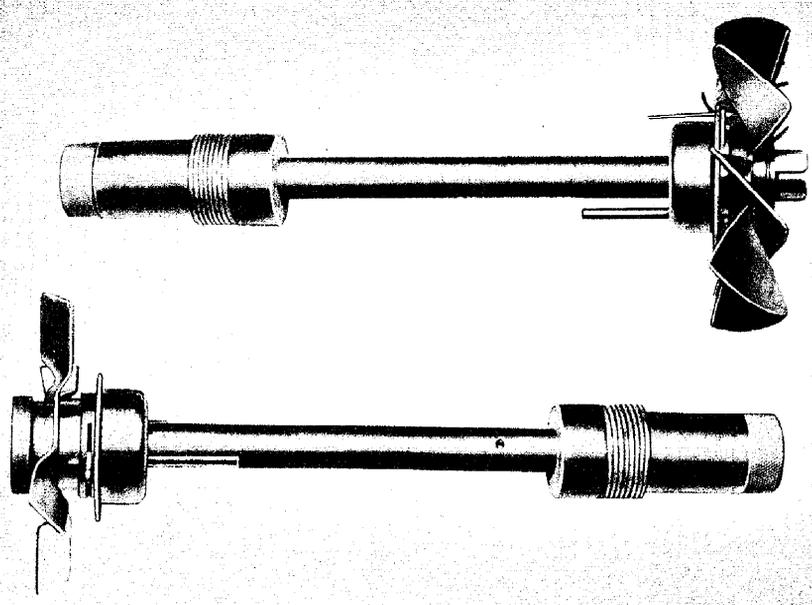
Mechanical delay arming is accomplished by a reduction gear train between the arming vane and the arming stem. This reduces the rotation (unscrewing) of the arming stem to one turn for each 30 revolutions of the arming vane.

The arming vane is fitted to the bearing cup so that the eyelet pin fits into grooves in the arming vane and vane hub. The vane is then locked on by a nut. The bearing cup contains a pinion gear and rotates with the vane on fifteen ball-bearings about the movable gear carrier.

The movable gear carrier is fastened to the arming stem by a pin. On the extended surface the movable gear carrier contains a gear which meshes with the pinion gear. The pinion gear is rotated by its contact with a stationary gear held in the stationary gear carrier. The rotation of the pinion gear is communicated to the movable gear and as the movable gear carrier and arming stem unscrews, the whole bearing-cup assembly is moved rearward.

To prevent rotation but provide for axial movement a carrier stop through the stem cup is screwed fast to the stationary gear carrier.

As the vane rotates, the arming stem is unscrewed from the firing mechanism. When the stem is completely separated



FUZE, BOMB, TAIL, AN-M101A1 (top), and AN-M101A2 (bottom)

UNCLASSIFIED

BOMB FUZES (Continued)

from the firing plunger the fuze is armed. This occurs after 175 revolutions of the arming vane.

The firing mechanism consists of a firing plunger held in the unarmed position by being screwed to the arming stem. As the arming vane rotates, the arming stem is unscrewed from the plunger. A firing-plunger pin riding in a slot in the plunger prevents the plunger from rotating but permits axial motion for firing.

When the arming stem has been completely unscrewed from the plunger the firing-pin is armed but restrained from striking the primer by an anti-creep spring.

Upon impact, the plunger firing-pin overcomes the resistance of the spring and the pin strikes the primer.

The explosive train is ignited and the flame passes successively through the primer, the black-powder delay element, the relay, the detonator, and on to the adapter-booster and bomb charge.

The A2 series require less air travel for the arming process than the A1 series. The A2 series require but 175 revolutions of the arming vane as compared to 675 revolutions in the A1 series. In addition, the arming vane in the A2 fuzes has been strengthened and the number of blades reduced from 8 to 4.

BOMBS

AN-M100A1

Bomb, General Purpose, 100 lb., AN-M30

Bomb, General Purpose, 100 lb., AN-M30A1

AN-M100A2

Bomb, General Purpose, 100 lb., AN-M30

Bomb, General Purpose, 100 lb., AN-M30A1

Bomb, General Purpose, 250 lb., AN-M57

Bomb, General Purpose, 250 lb., AN-M57A1

Bomb, Fragmentation, 260 lb., AN-M81

AN-M101A2

Bomb, General Purpose, 500 lb., AN-M43

Bomb, General Purpose, 500 lb., AN-M64

Bomb, General Purpose, 500 lb., AN-M64A1

Bomb, Chemical, 500 lb., M78

Bomb, Incendiary, 500 lb., AN-M76

Bomb, Semi-Armor-Piercing, 500 lb., AN-M58

Bomb, Semi-Armor-Piercing, 500 lb., AN-M58A1

Bomb, Semi-Armor-Piercing, 500 lb., AN-M58A2

AN-M102A2

Bomb, Chemical, 1,000 lb., AN-M79

Bomb, General Purpose, 1,000 lb., AN-M65

Bomb, General Purpose, 1,000 lb., AN-65A1

Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M59

Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M59A1

Bomb, General Purpose, 1,000 lb., AN-M44

Bomb, General Purpose, 2,000 lb., AN-M66

Bomb, General Purpose, 2,000 lb., AN-M66A1

Bomb, General Purpose, 2,000 lb., AN-M34

Bomb, Light Case, 4,000 lb., AN-M56

Bomb, Light Case, 4,000 lb., AN-M56A1

CHARACTERISTICS

	AN-M100A1	AN-M100A2	AN-M101A2	AN-M102A2
Length overall.....	9.2 ins.	9.2 ins.	12.2 ins.	16.2 ins.
Weight.....	2.7 lb.	2.7 lb.	2.9 lb.	3.2 lb.
Diameter.....	1.5 ins.	1.5 ins.	1.5 ins.	1.5 ins.

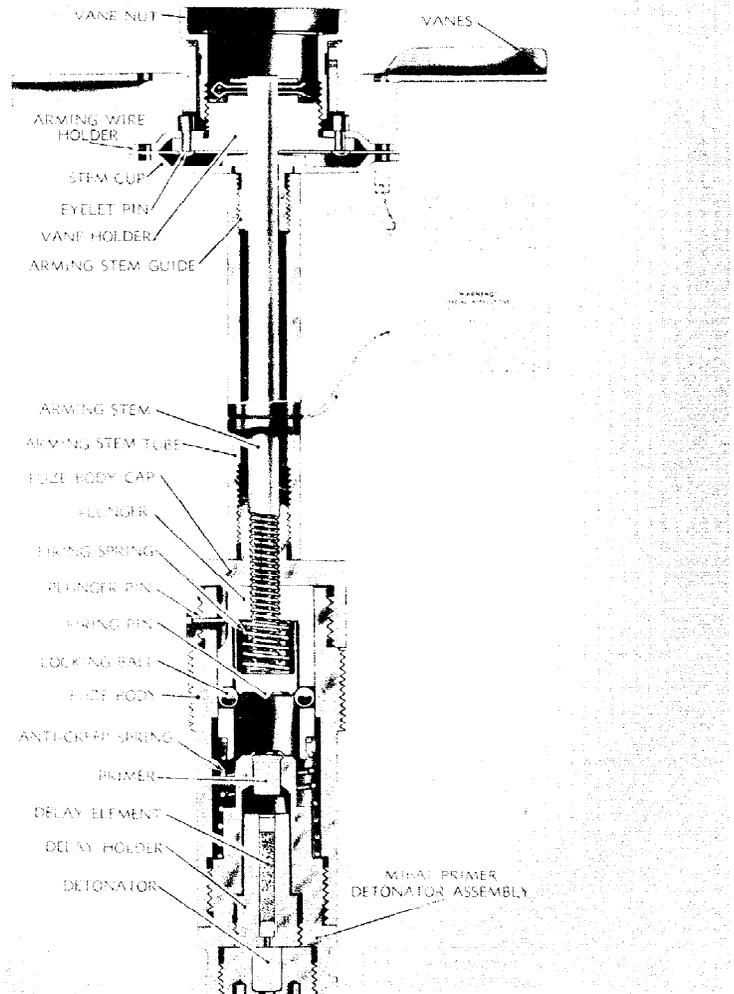
FUZES, BOMB, TAIL, M112A1, M113A1, M114A1—STANDARD

These three fuzes are identical in all respects except the lengths of their arming-stem tubes and arming stems, and the length overall. These variations permit use of these fuzes with bombs of various sizes and properly locate the arming vanes in the air stream.

These fuzes arm with approximately 80 to 100 feet of air travel and may be used in operations at extremely low levels. They have cocked firing-pins and are classed as supersensitive. However, a delay element is provided to permit the plane to leave the target area before the bomb explodes. Use of the appropriate M16A1 primer detonator permits a delay period of 4 to 5 seconds or of 8 to 15 seconds.

The fuze head includes the arming vane, vane holder, and vane nut which rotate as a unit. The arming vane is attached to the arming stem by a cotter pin which passes through the vane holder and the stem. The connection is direct and each complete turn of the arming vane rotates the arming stem a full revolution.

The arming stem provides delay arming since it is threaded to both the body cap and the plunger and must unscrew from the plunger before the plunger is ready to function. This requires approximately 18 to 21 revolutions. A pin through the fuze wall engages a groove in the plunger and prevents its rotation with the stem. When the fuze is fully armed the plunger and



FUZES, BOMB, TAIL, M112A1, M113A1, M114A1

BOMB FUZES (Continued)

firing-pin are restrained from moving forward by an anti-creep spring.

The firing mechanism is made up of a plunger, firing-pin, cocked firing-pin spring, locking balls, anti-creep spring, and retainer. The locking balls neutralize the pressure of the spring on the firing-pin until the moment of impact when plunger and pin are carried forward by the force of inertia with sufficient energy to compress the anti-creep spring and force the locking balls into recesses in the fuze wall. The unlocked firing-pin is then driven against the primer by its compressed spring.

The explosive train includes primer, delay charge, relay charge, and detonator. The flash from this train ignites a charge in an adapter booster to function the bomb charge.

FUZES, BOMB, TAIL, M115, M116, M117—STANDARD

These are tail fuzes of the arming vane type with mechanical delay arming mechanism identical with that used in the AN-M100A2 fuze previously described. Use of the proper M16A1 primer detonator permits delay firing of 4 to 5 seconds or 8 to 15 seconds after impact.

The fuzes differ one from another only in the length of the arming stems and arming tubes and in overall length. This permits use in bombs of various sizes and properly locates the arming vanes in the air stream.

The arming vanes make from 150 to 170 revolutions before the stem is completely withdrawn from the plunger and the fuze is fully armed.

The firing mechanism is identical in every respect with that of the AN-M112A1 fuze.

BOMBS

M112A1

- Bomb, General Purpose, 100 lb., AN-M30
- Bomb, General Purpose, 100 lb., AN-M30A1
- Bomb, General Purpose, 250 lb., AN-M57
- Bomb, General Purpose, 250 lb., AN-M57A1
- Bomb, General Purpose, 300 lb., M31

M113A1

- Bomb, General Purpose, 500 lb., AN-M43
- Bomb, Semi-Armor-Piercing, 500 lb., AN-M58
- Bomb, Semi-Armor-Piercing, 500 lb., AN-M58A1
- Bomb, Semi-Armor-Piercing, 500 lb., AN-M58A2

- Bomb, General Purpose, 500 lb., AN-M64
- Bomb, General Purpose, 500 lb., AN-M64A1
- Bomb, General Purpose, 600 lb., AN-M32

M114A1

- Bomb, General Purpose, 1,000 lb., AN-M44
- Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M55
- Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M59A1
- Bomb, General Purpose, 1,000 lb., AN-M65
- Bomb, General Purpose, 1,000 lb., AN-M65A1
- Bomb, General Purpose, 1,100 lb., M33
- Bomb, General Purpose, 2,000 lb., AN-M34
- Bomb, General Purpose, 2,000 lb., AN-M66
- Bomb, General Purpose, 2,000 lb., AN-M66A1

CHARACTERISTICS

	M112A1	M113A1	M114A1
Length overall.....	9.6 ins.	12.6 ins.	16.6 ins.
Weight.....	2.3 lb.	2.5 lb.	2.8 lb.
Diameter.....	1.5 ins.	1.5 ins.	1.5 ins.

BOMBS

M115

- Bomb, General Purpose, 100 lb., AN-M30
- Bomb, General Purpose, 100 lb., AN-M30A1
- Bomb, General Purpose, 250 lb., AN-M57
- Bomb, General Purpose, 250 lb., AN-M57A1
- Bomb, General Purpose, 300 lb., M31

M116

- Bomb, General Purpose, 500 lb., AN-M43
- Bomb, Semi-Armor-Piercing, 500 lb., AN-M58
- Bomb, Semi-Armor-Piercing, 500 lb., AN-M58A1
- Bomb, Semi-Armor-Piercing, 500 lb., AN-M58A2

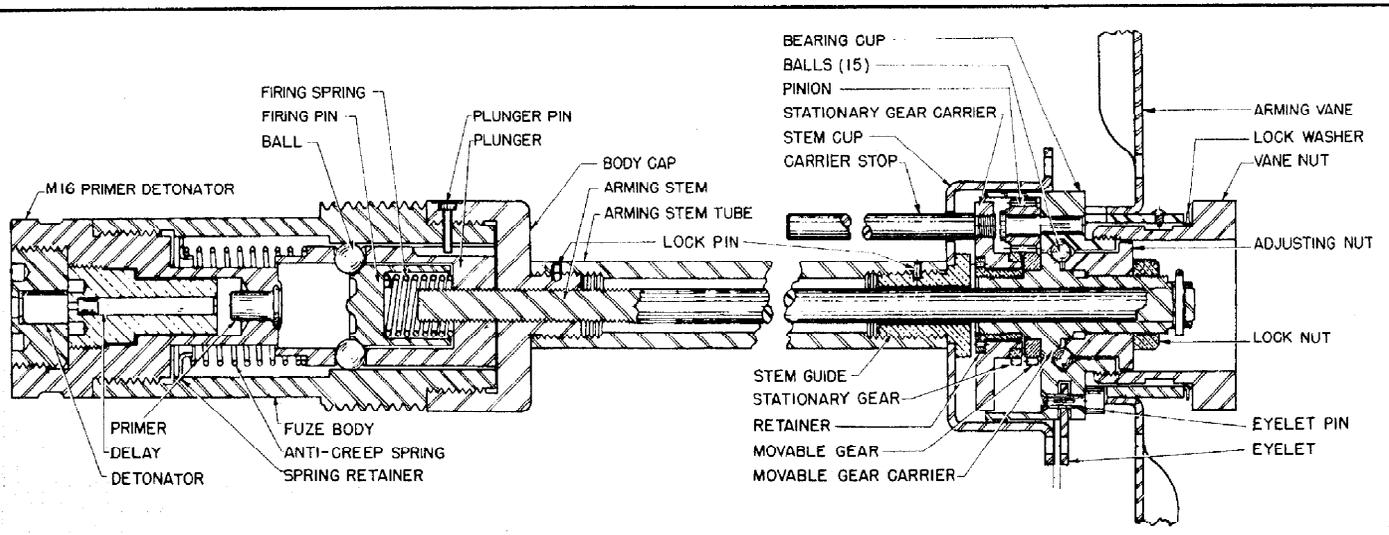
- Bomb, General Purpose, 500 lb., AN-M64
- Bomb, General Purpose, 500 lb., AN-M64A1
- Bomb, General Purpose, 600 lb., M32

M117

- Bomb, General Purpose, 1,000 lb., AN-M44
- Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M59
- Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M59A1
- Bomb, General Purpose, 1,000 lb., AN-M65
- Bomb, General Purpose, 1,000 lb., AN-M65A1
- Bomb, General Purpose, 1,100 lb., AN-M33
- Bomb, General Purpose, 2,000 lb., AN-M34
- Bomb, General Purpose, 2,000 lb., AN-M66
- Bomb, General Purpose, 2,000 lb., AN-M66A1

CHARACTERISTICS

	M115	M116	M117
Length overall.....	9.63 ins.	12.63 ins.	16.63 ins.
Weight.....	2.7 lb.	2.9 lb.	3.2 lb.
Diameter.....	1.5 ins.	1.5 ins.	1.5 ins.



FUZES, BOMB, TAIL, M115, M116, M117

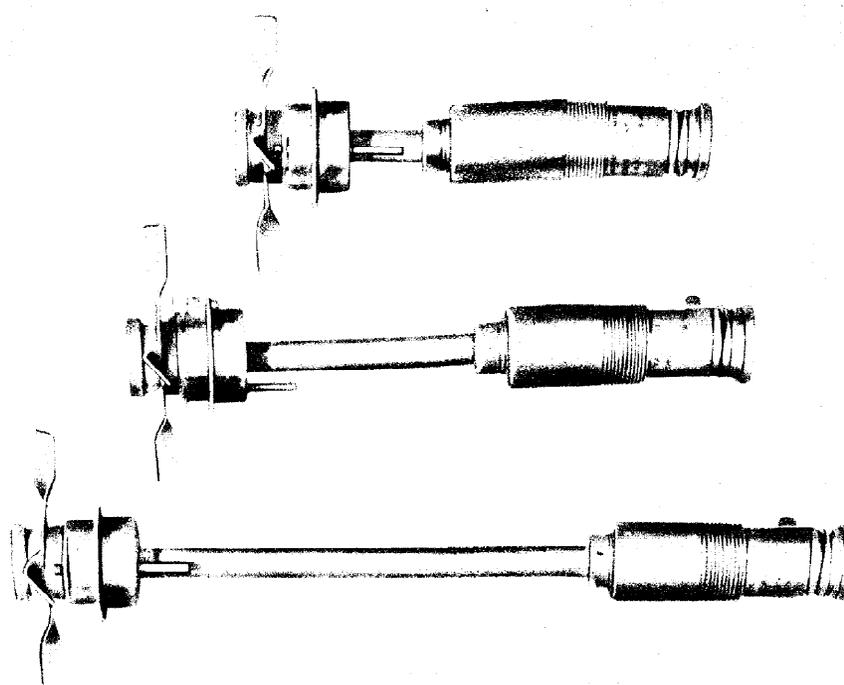
FUZES, BOMB, TAIL, M123, M124, M125—SUBSTITUTE STANDARD

These are special-purpose fuzes used with aircraft bombs when long delay periods are desired. They are made with fixed delays of 1, 2, 6, 12, 24, 36, 72, and 144 hours. The different delays are obtained by variation in strength of solvent contained in a glass ampoule and by variation in thickness of celluloid which has to be dissolved by solvent before functioning can occur. As supplied to the service each fuze is stamped with the delay period for which it has been manufactured.

The delays mentioned, however, are only approximate and vary greatly with the temperature, being much shorter at high temperatures and longer at low temperatures. The accompanying table shows the period at which detonation will occur at various temperatures.

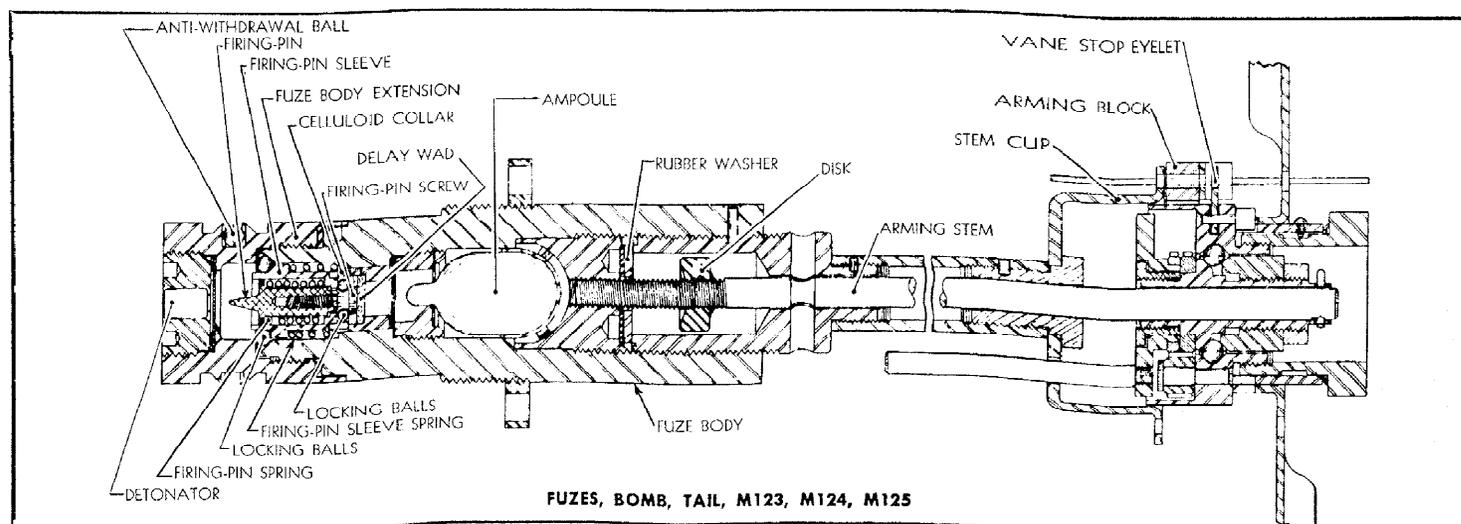
The three models are identical in functioning and mechanism, differing one from another only in the length of the tubes, arming stems, and in overall length. The different lengths are necessary in order to locate the arming vanes properly in the air stream when the fuzes are assembled in bombs of different sizes. The fuzes of this series are of the arming vane type with delay arming accomplished by a reduction gear assembly similar to that used in fuzes of the AN-M100A2 series. The rotation of the arming stem of the M123, M124, and M125 fuzes, however, screws the stem into the fuze; in the AN-M100A2 fuzes the stem is withdrawn for arming. The space required for the deeper entry of the stem into the fuze is obtained by placing an arming block, serving as a spacer, between the stem cup and the vane stop eyelet.

When the bomb is dropped the arming wire is pulled from the fuze, releasing the arming block and permitting the vanes to rotate. After approximately 400 feet of air travel the arming stem advances suffi-



FUZES, BOMB, TAIL, M123, M124, M125

Nominal delay period	TEMPERATURE				
	115° F	90° F	75° F	55° F	25° F
1	0 hr. 15 mins.	0 hr. 20 mins.	0 hr. 30 mins.	0 hr. 45 mins.	2 hrs. 10 mins.
2	0 hr. 20 mins.	0 hr. 50 mins.	1 hr. 0 mins.	1 hr. 30 mins.	3 hrs. 15 mins.
6	1 hr. 0 mins.	1 hr. 30 mins.	2 hrs. 0 mins.	3 hrs. 0 mins.	11 hrs. 0 mins.
12	1 hr. 15 mins.	2 hrs. 30 mins.	3 hrs. 50 mins.	9 hrs. 0 mins.	30 hrs. 0 mins.
24				8 hrs. 0 mins.	24 hrs. 0 mins.
36				15 hrs. 0 mins.	37 hrs. 30 mins.
72				38 hrs. 0 mins.	96 hrs. 0 mins.
144				70 hrs. 0 mins.	135 hrs. 0 mins.



FUZES, BOMB, TAIL, M123, M124, M125

BOMB FUZES (Continued)

ciently into the fuze to crush a glass ampoule containing a solvent. The released solvent filters through a delay wad and attacks a celluloid collar. After a total of approximately 1,000 feet of air travel the stem has advanced sufficiently to seat a disk against a rubber washer, thus sealing the vane end of the fuze against entrance of water and leakage of solvent.

The firing-pin and its spring are mounted within a sleeve and held in a cocked position

by eight balls seated in a groove beneath the shoulder of the firing-pin screw and there retained by the celluloid collar mentioned above. The sleeve, too, is surrounded by a spring and is held in position by a second set of locking balls which are released only if an attempt is made to withdraw the fuze from the bomb.

Action of the solvent on the celluloid collar weakens it until it can no longer hold the balls in the groove. The com-

pressed spring then exerts its force on the pin, pushes the balls aside, and drives the pin into the detonator, exploding the booster charge and the main explosive charge of the bomb.

ANTI-WITHDRAWAL DEVICE—All fuzes of this series incorporate an anti-withdrawal device which will detonate the bomb immediately upon any attempt to unscrew the fuze.

The fuze body is assembled to the body extension by a loose threaded joint, and the whole assembly is screwed into the fuze cavity of the adapter booster.

An eccentric groove, tapering from a maximum depth of approximately $\frac{1}{4}$ inch to a minimum of approximately $\frac{3}{32}$ inch is machined about the periphery of the fuze body extension. A steel ball $\frac{1}{4}$ inch in diameter is held in the deeper section of the groove. Should any attempt be made to unscrew the fuze, the ball wedges tightly in the shallower portion of the groove and locks the body extension to the adapter booster. This permits the body to unscrew from the body extension. After the fuze body has moved through approximately two turns the balls which support the firing-pin sleeve are pushed into recesses in the body and the sleeve is freed in much the same manner as the firing-pin in the normal operation of the fuze. The sleeve spring then drives the entire sleeve and firing-pin assembly into the detonator to explode the booster and the high-explosive charges.

BOMBS

M123

Bomb, Demolition, 100 lb., M30
Bomb, General Purpose, 100 lb., AN-M30
Bomb, General Purpose, 100 lb., AN-M30A1
Bomb, General Purpose, 250 lb., AN-M57
Bomb, General Purpose, 250 lb., AN-M57A1
Bomb, Demolition, 300 lb., M31

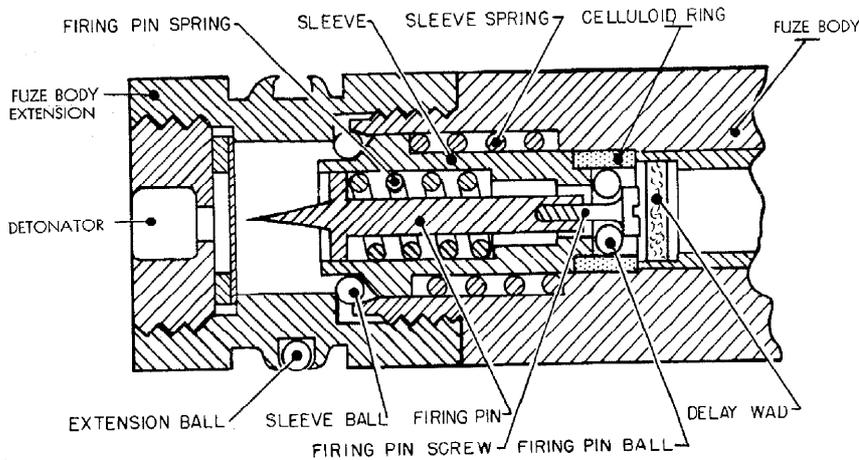
M124

Bomb, Demolition, 500 lb., M43
Bomb, General Purpose, 500 lb., AN-M43
Bomb, General Purpose, 500 lb., AN-M64
Bomb, General Purpose, 500 lb., AN-M64A1
Bomb, Semi-Armor-Piercing, 500 lb., AN-M58
Bomb, Semi-Armor-Piercing, 500 lb., AN-M58A1
Bomb, Demolition, 600 lb., M32

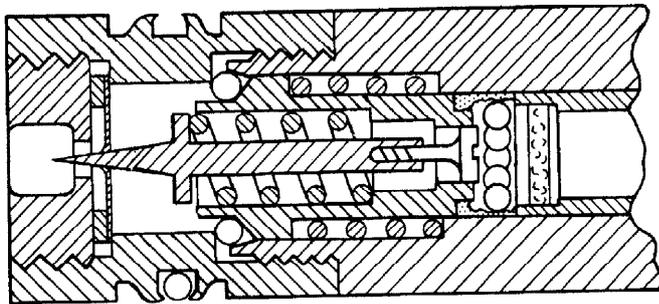
M125

Bomb, Demolition, 1,000 lb., M44
Bomb, General Purpose, 1,000 lb., AN-M44
Bomb, General Purpose, 1,000 lb., AN-M65
Bomb, General Purpose, 1,000 lb., AN-M65A1
Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M59
Bomb, Semi-Armor-Piercing, 1,000 lb., AN-M59A1
Bomb, Demolition, 1,000 lb., M33
Bomb, Demolition, 2,000 lb., M34
Bomb, General Purpose, 2,000 lb., AN-M34
Bomb, General Purpose, 2,000 lb., AN-M66
Bomb, General Purpose, 2,000 lb., AN-M66A1

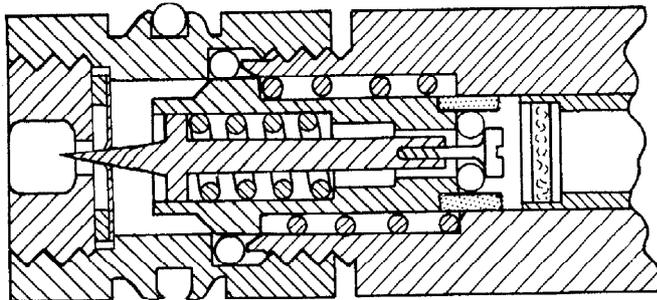
FIRING MECHANISM



FIRING PIN RELEASED BY DISSOLVING OF CELLULOID COLLAR



FIRING PIN RELEASED BY ANTI-WITHDRAWAL DEVICE



CHARACTERISTICS

	M123	M124	M125
Length overall	9.63 ins.	12.63 ins.	16.63 ins.
Weight	2.9 lb.	3.1 lb.	3.4 lb.
Diameter	1.45 ins.	1.45 ins.	1.45 ins.

BOMB FUZES (Continued)

**FUZE, BOMB, TAIL,
AN-Mk. 228—STANDARD**

This fuze is of the arming-vane type with mechanical delay arming. It is designed for delay action of 0.08 (± 0.01) second after impact.

Arming is accomplished by rotation of the arming vane and its shaft which turns an upper gear meshing with a pinion. This gearing reduces the ratio of rotation to 1 turn of the shaft for 23 turns of the vanes. Rotation of the cap turns the upper gear and unscrews the shaft until it is stopped by a shoulder on the vane-shaft extension. During this operation the lower gear carrier is raised and a lug is released from its seat in the inner sleeve. This frees the lower gear and carrier to rotate under the impulse of the lower pinion. The lower gear carrier and the striker turn through approximately 175° to bring into alignment the firing-pin extensions, delay elements, detonators, and the leads of each explosive train. These units are locked in the armed position by pins.

To insure functioning of the main high-

explosive charge in the bomb, this fuze is equipped with two independent firing mechanisms, each with its own explosive train. Each mechanism consists of a firing-pin extension and a firing-pin. One pin is slightly longer than the other and ignites its primer and explosive train a fractional part of a second ahead of the shorter pin.

On impact of the bombs the striker and lower gear carrier cut the shear pin which passes through the supporting collar and central shaft, and drive the firing-pin ex-

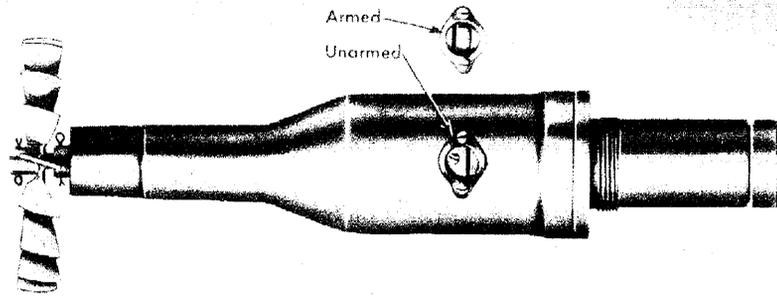
tensions against the pins. These strike the primers and the flash is passed on to the explosive trains which consist, in each case, of a delay element, detonator, auxiliary booster lead-in, booster lead-in, and booster charge.

BOMBS

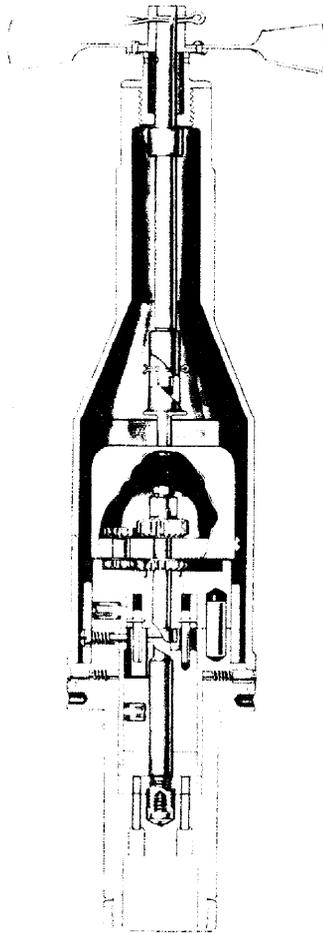
Bomb, Armor-Piercing, 1,000 lb., AN-Mk. 33
Bomb, Armor-Piercing, 1,600 lb., AN-Mk. 1

CHARACTERISTICS

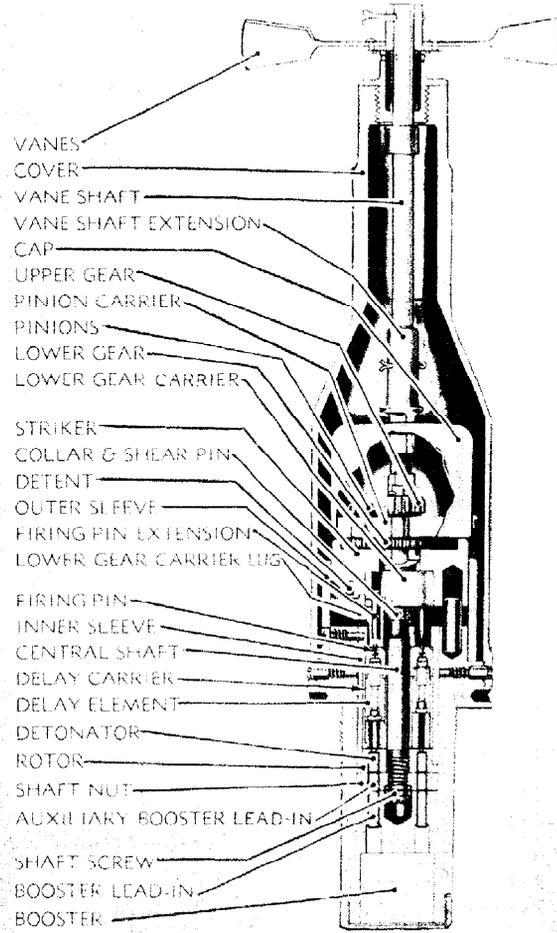
Length overall.....16.36 ins.
Weight.....10.5 lb.



FUZE, BOMB, TAIL, AN-Mk. 228

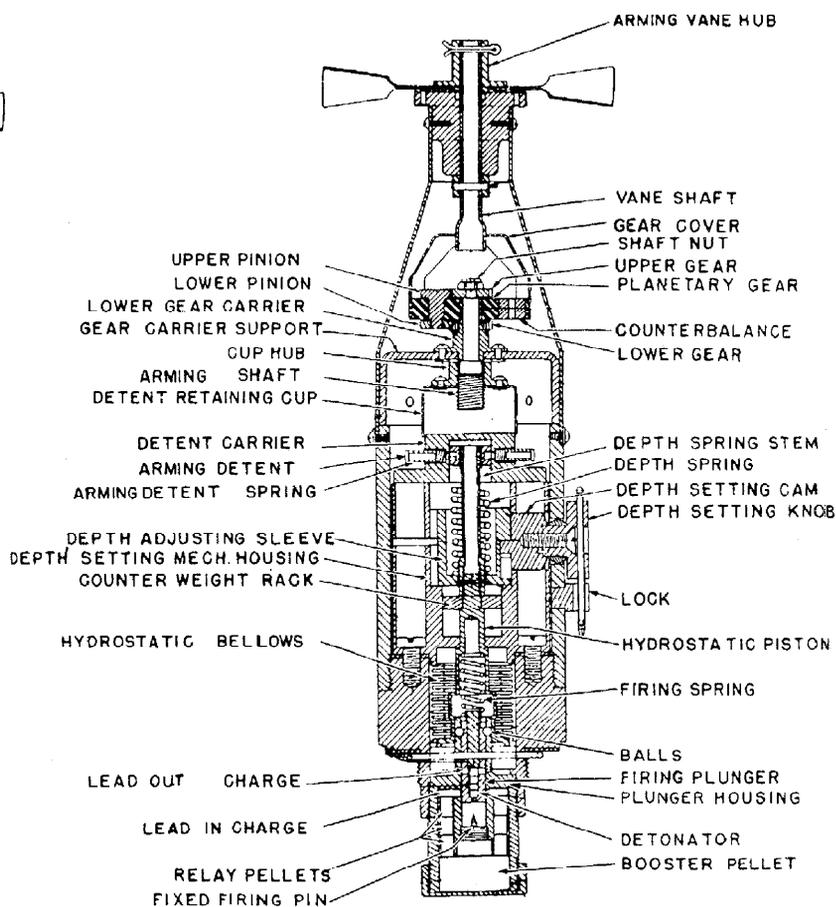
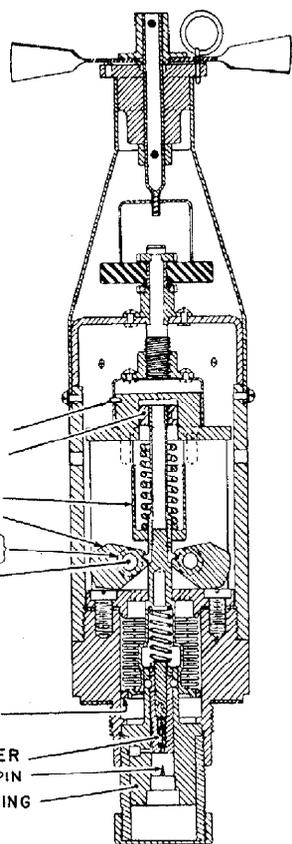


FUZE, BOMB, TAIL, AN-Mk. 228—UNARMED POSITION



FUZE, BOMB, TAIL, AN-Mk. 228—ARMED POSITION

BOMB FUZES (Continued)



FUZE, BOMB, HYDROSTATIC, AN-Mk. 230—UNARMED POSITION

FUZE, BOMB, HYDROSTATIC, AN-Mk. 230—ARMED POSITION

FUZE, BOMB, HYDROSTATIC, TAIL, AN-Mk. 230—STANDARD

This fuze is used with depth bombs dropped from airplanes against such submerged targets as submarines. It is of the arming-vane type with mechanical delay arming and may be set to function by hydrostatic pressure at depths of 25, 50, 75, 100 or 125 feet. Depth settings are made by an external knob.

Hydrostatic fuzes of this type must be regarded as consisting of two distinct units: the vane-actuated delay arming unit which completes its cycle of operation while the bomb is in the air; and the firing unit which depends upon hydrostatic pressure for its operation and which does not begin to function until the bomb has entered the water. The fuze cannot be set to detonate on impact nor can the arming operation be completed unless the bomb is released from sufficient height to permit of at least 110 revolutions of the arming vane before it strikes the water. As a corollary thereto, the hydrostatic mech-

anism is inoperative at normal atmospheric pressures.

Mechanical delay arming is accomplished during the free fall of the bomb by rotation of the arming vane and vane shaft, connected by a gear train which reduces the ratio of rotation to 1 turn of the shaft for 23 turns of the vane. Rotation of the shaft screws it into the detent retaining cup, raising the cup until it clears the arming detents which are then expelled from engagement with the nut at the head of the depth spring stem. Impact with the water spins two inertia counterbalances from engagement with lugs on the stem and the fuze is fully armed and the depth mechanism freed for action. The counterbalances prevent downward travel of the freed arming stem and detonation of the fuze on impact.

As the bomb submerges, water is admitted to the hydrostatic bellows through openings in the body sleeve and in the

housing of the depth mechanism. The bellows are free to expand in only one direction, downward, and as they expand under pressure of the admitted water they carry with them in that downward travel the hydrostatic piston, the piston ring, the counterweight rack, and the depth spring stem and nut—all moving as a unit. Both firing spring and depth spring are thereby compressed.

Functioning of the firing mechanism at various depths is governed by compression of the depth spring as positioned by the setting knob which extends through the fuze body. The knob may be set and locked in any of five positions, providing for explosion at depths of 25, 50, 75, 100, and 125 feet. The knob is a part of the depth-setting cam within the fuze body, and a lug or boss is machined off-center on the inner face of the cam to engage a slot in the depth-adjusting sleeve which surrounds the spring. When the fuze is

BOMB FUZES (Continued)

set for detonation at a depth of 25 feet, this lug is in its lowest position and the spring is at maximum expansion. With each setting for increasingly greater depth the lug is raised toward the vanes of the fuze and the spring is compressed within the sleeve for a corresponding distance.

The further the depth spring is compressed the greater the pressure which must be exercised upon the hydrostatic piston by the bellows to move spring and sleeve downward and compress the firing

spring. Although the pressure is greater, the distance the piston moves is the same for all depth settings.

The firing plunger is locked within its housing by steel balls which are forced into recesses in the piston after it has moved downward approximately $\frac{3}{8}$ inch. This frees the firing spring which drives plunger and primer against the fixed firing-pin. The flame passes from the primer-detonator to the lead-out and lead-in charges, which are brought into align-

ment by the descent of the plunger, and from them to the relay pellets and the booster charge which ignites the main explosive charge of the bomb.

BOMBS

Bomb, General Purpose, 500 lb., AN-M64

Bomb, General Purpose, 500 lb., AN-M64A1

Bomb, General Purpose, 1,000 lb., AN-M65

Bomb, General Purpose, 1,000 lb., AN-M65A1

Bomb, General Purpose, 2,000 lb., AN-M66

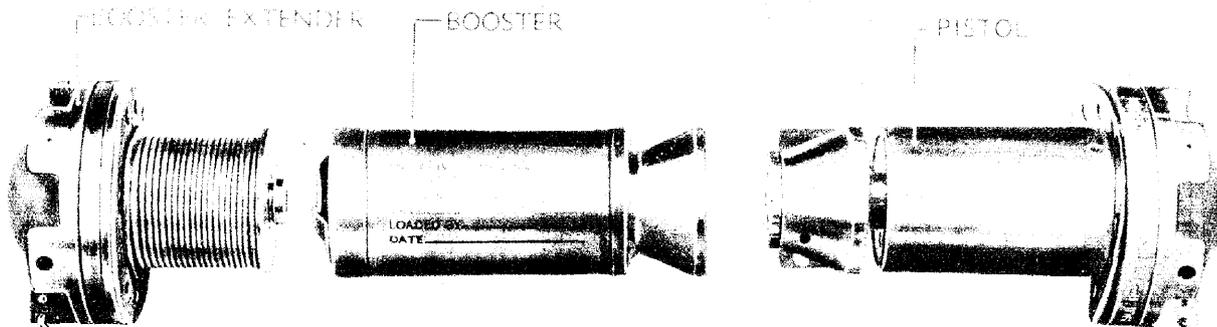
Bomb, General Purpose, 1,000 lb., AN-M66A1

FUZES, BOMB, HYDROSTATIC, TRANSVERSE, AN-Mk. 234, STANDARD—AN-Mk. 224, LIMITED STANDARD

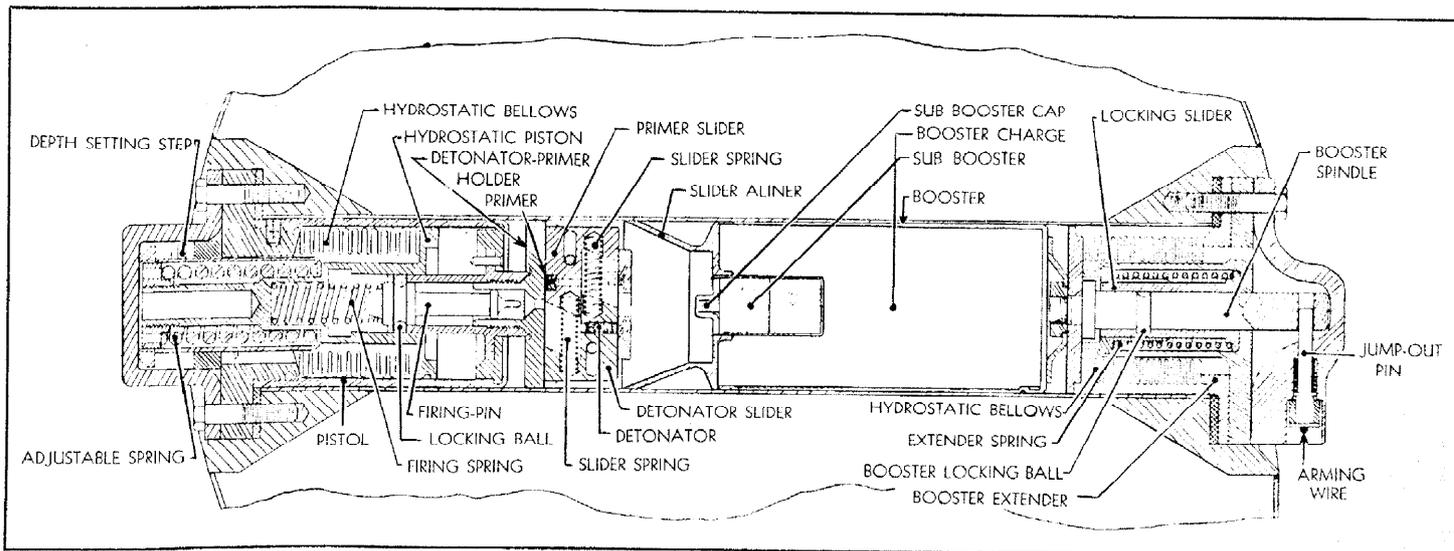
FUZE, BOMB, HYDROSTATIC, TRANSVERSE, AN-Mk. 234—The AN-Mk. 234 is an arming-pin type of fuze which is issued in three subassemblies: pistol, booster, and booster extender. It may be set to function at a predetermined depth of 25, 50, 75, 100, or 125 feet.

The assembled fuze fits into a transverse tube in the bomb. Arming-pins are located in either end of the fuze—one actuating the functioning of the pistol-firing mechanism, the other actuating the booster extender and booster to align the explosive train.

On the exterior of the pistol head are the depth-setting knob and the lock screw with safety clip. The depth-setting knob also serves as a water port. When the fuze is unarmed the port is closed by a plug and a neoprene tube connector which are attached to the arming wire. Upon release



FUZE, BOMB, HYDROSTATIC, TRANSVERSE, AN-Mk. 224



FUZE, BOMB, HYDROSTATIC, TRANSVERSE, AN-Mk. 234

UNCLASSIFIED

BOMB FUZES (Continued)

of the arming wire the plug and tube are pulled from the pistol, uncovering the water port. A second arming wire is attached to the bomb jump-out pin in the booster extender. On release this arming wire is withdrawn and the jump-out pin is ejected. This admits water to the bellows and also unlocks the booster spindle.

As the bomb submerges, the water entering the booster extender arms the fuze. Water pressure expands the hydrostatic bellows and pushes the booster toward the pistol. This movement is retarded by resistance of the extender spring until the balls which unite the booster spindle and

slide drop out of their position. The bellows now drive the booster forward with greater impetus and the slider aliner engages the detonator and primer sliders. These are moved inward against their springs until they are alined, at which time the subbooster cup enters the slot of the detonator-primer holder and comes into contact with the detonator charge. All the action in the booster extender is accomplished before the bomb reaches a depth of 20 feet.

During the process of arming in the booster extender and booster the hydrostatic bellows of the pistol are expanding.

As the bellows are extended they advance the hydrostatic piston and compress the firing spring and the adjustable spring. The adjustable spring controls the depth at which the firing mechanism will function by restraining the advance of the piston. The amount the adjustable spring must be compressed is predetermined by rotating the depth-setting step to the proper position under the lugs on the spring housing. The depth-setting step has four stepped surfaces, each expanding the adjustable spring so that an additional 25 feet of depth is required to provide the proper hydrostatic pressure for compressing the adjustable spring and actuating the firing mechanism.

The firing-pin is held in the safe position by locking balls. These drop into recesses when the piston has advanced sufficiently and free the firing-pin. The compressed firing spring then drives the pin into the primer, igniting the detonator, subbooster, and booster.

FUZE, BOMB, HYDROSTATIC, TRANSVERSE, AN-Mk. 224—The AN-Mk. 224 fuze is similar in mechanism and functioning to the Mk. 234 fuze. It consists of three subassemblies: pistol, booster, and booster extender.

The pistol of the Mk. 224 is set for depths of 25, 50, 75, 100, and 125 feet by disassembly and not externally as in the Mk. 234. Each depth-setting requires a different firing-pin spring or combination of firing-pin spring and auxiliary spring as follows:

Depth	Firing-pin Spring	Auxiliary Spring
25 ft.	Yellow	
50 ft.	Black	
75 ft.	Black	Green
100 ft.	Yellow	Red
125 ft.	Black	Red

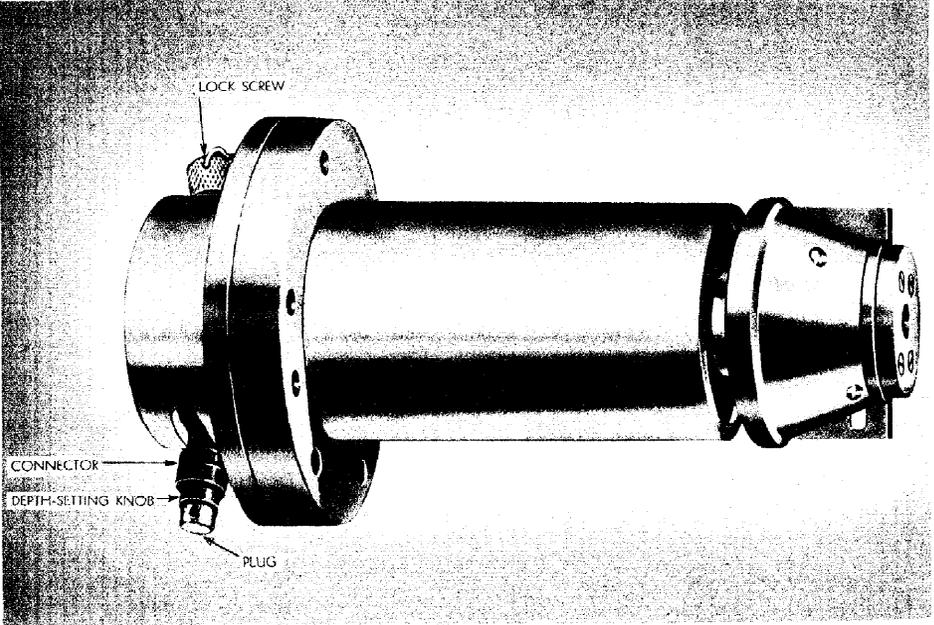
The different firing-pin springs and auxiliary springs are supplied separately and the desired spring or springs must be inserted before installing the pistol in the bomb.

The head of the Mk. 224 pistol contains a jump-out pin which closes the water port before withdrawal of the arming wire.

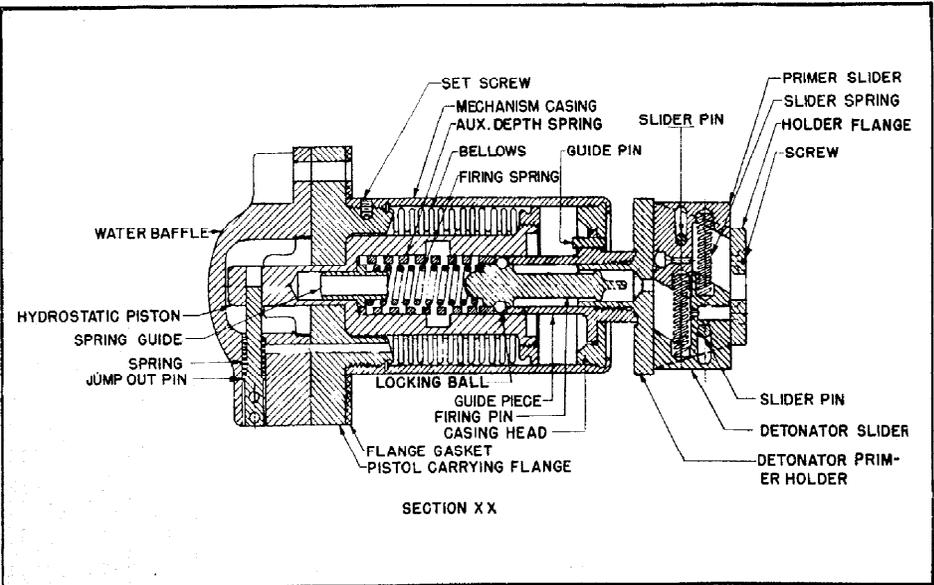
This fuze is armed and detonated in the same manner as the Mk. 234.

BOMBS

- AN-Mk. 234 and 224**
- Bomb, Depth, Aircraft, 325 lb., AN-Mk. 17 Mod. 1
- Bomb, Depth, Aircraft, 325 lb., AN-Mk. 17 Mod. 2
- Bomb, Depth, Aircraft, 325 lb., AN-Mk. 41
- Bomb, Depth, Aircraft, 350 lb., AN-Mk. 44
- Bomb, Depth, Aircraft, 350 lb., AN-Mk. 47
- Bomb, Depth, Aircraft, 650 lb., Mk. 29
- Bomb, Depth, Aircraft, 650 lb., Mk. 37
- Bomb, Depth, Aircraft, 650 lb., Mk. 38
- Bomb, Depth, Aircraft, 700 lb., Mk. 49



FUZE, BOMB, HYDROSTATIC, TRANSVERSE, AN-Mk. 234—PISTOL



FUZE, BOMB, HYDROSTATIC, TRANSVERSE, AN-Mk. 224—PISTOL