

U.S. ARMY MILITARY HISTORY INSTITUTE

**CATALOGUE OF
STANDARD
ORDNANCE
ITEMS**

REGRADED UNCLASSIFIED BY
AUTHORITY OF EOD DIR. 5200.9
BY RAKERS ON 1/14

SECOND EDITION 1944

VOLUME II



**Office of the
Chief of Ordnance
Technical Division**

WASHINGTON, D. C.

UNCLASSIFIED

~~DECLASSIFIED - EOD Directive No. 5200.9,~~

~~27 September 1958~~

PROPERTY OF US

UNCLASSIFIED

~~CONFIDENTIAL~~

UNCLASSIFIED

Contents

**ARTILLERY—SUBMARINE MINES—SIGHTING
AND FIRE CONTROL INSTRUMENTS**

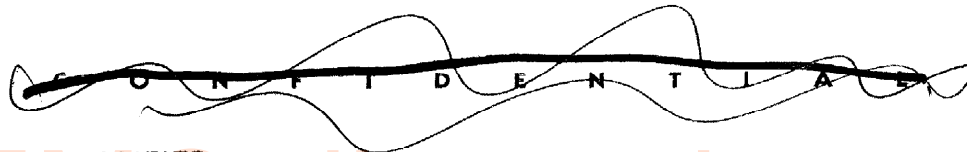
	PAGES
MOBILE ARTILLERY	151-186
Mortars—Multiple Gun Mounts—Light Antitank Guns—Pack, Airborne (Paracrates), and Field Howitzers—Light Field Guns—Medium Guns and Howitzers—Heavy Guns and Howitzers	
RAILWAY AND SEACOAST ARTILLERY	187-194
8 Inch Gun on Railway Mount—Panama Mount—6 Inch, 8 Inch, 12 Inch, and 16 Inch Guns on Barbette Carriages	
TANK ARMAMENT	195-202
37 mm, 75 mm, 76 mm, 3 Inch, and 90 mm Tank Guns—105 mm Howitzer—2 Inch Mortar	
ANTIAIRCRAFT ARTILLERY	203-218
37 mm, 40 mm, 3 Inch, 90 mm, 120 mm Guns and Carriages	
SUBCALIBER GUNS	219-228
Cal. .22, Cal. .22-.30, Cal. .50, 37 mm, 1-Pounder, 2.95 Inch, 3 Inch, 75 mm	
ARMY CONTROLLED SUBMARINE MINES	251-255
Harbor Defense by Controlled Mines—Submarine Mine Flotilla—Audio Reception System—Submarine Mine Systems—Miscellaneous Equipment	
FIRE CONTROL—MOBILE ARTILLERY	
On Carriage Equipment	257-287
Panoramic Telescopes and Mounts—Range Quadrants—Elbow Telescopes and Mounts—Quadrant Mount—Quadrant Sight—Sight—Straight Telescope and Mount—Instrument Lights	

~~DECLASSIFIED~~

27 September 1953

~~EO 12958 Directive No 5200.9,~~

UNCLASSIFIED



UNCLASSIFIED

CONTENTS (Continued)

PAGES

Off Carriage Equipment 288-298

Range Finders—Compass—Aiming Circle—Observation Tower—Observation Telescopes—Battery Commander's Telescopes—Battery Commander's Periscope—Rocket Board—Aiming Posts—Gunner's Quadrant—Machine-Gun Clinometer—Angle-of-Site Instrument—Powder Temperature Thermometer—Fuze Setters—Graphical Firing Tables—Plotting Boards—Sound Ranging Plotting Board—Sound Ranging Wind Corrector

FIRE CONTROL—RAILWAY AND SEACOAST ARTILLERY

On Carriage Equipment 299-302

Straight Telescopes and Mounts—Elevation Quadrant—Quadrant Adapters—Panoramic Telescope and Mounts

Off Carriage Equipment 303-322

Plotting Boards—Plotting and Relocating Boards—Set Forward Rule—Prediction Scale—Scale Arms—Wind Component Indicator—Deflection Boards—Range Correction Board—Percentage Corrector—Spotting Boards—Fire Adjustment Board—Gun Data Computers—Azimuth Instruments—Depression Position Finders—Aiming Rule—Data Transmission Systems—Remote Control System, Cable System—Generating Unit—Observation Telescope—Clinometer

FIRE CONTROL—TANK ARMAMENT 323-327

Periscopes and Telescopes—Direct Sighting Telescopes—Panoramic Telescope and Mount—Sight—Azimuth Indicators—Elevation Quadrant

FIRE CONTROL—ANTIAIRCRAFT ARTILLERY

On Carriage Equipment 329-333

Elbow Telescopes and Mounts—Sighting Systems—Computing Sights—Range Indicator

Off Carriage Equipment 334-355

Height Finders—Helium Filling Kits—Stereoscopic Tester—Stereoscopic Trainer—Mechanical Antiaircraft Directors—Director Trainer—Electrical Antiaircraft Directors—Data Transmission Systems—Remote Control Systems—Torque Amplifier—Slide Rule—Cable Repair Kits—Antiaircraft Battery Commander's Observation Instrument—Generating Units—Fuze Setters—Powder Temperature Indicators—Scoring Register—Antiaircraft Machine Gun Trainer

UNCLASSIFIED

DECLASSIFIED - EOB Effective No. 5200.9,

27 September 1958

~~C O N F I D E N T I A L~~

UNCLASSIFIED

CONTENTS (Continued)

PAGES

FIRE CONTROL—SUBMARINE MINES **357-358**

Plotting Boards—Mine Predictor

FIRE CONTROL—MISCELLANEOUS **359-361**

Binooculars—Eyeglasses—Watches—Message Center Clock—Bore Sights—
Instrument Repair Kit

AIRCRAFT ARMAMENT

AIRCRAFT ARMAMENT **375-381**

Browning Machine Guns, Aircraft, Cal. .30 and Cal. .50, M2—20 mm Gun,
AN-M2—37 mm Guns, M4, M9—75 mm Gun, M4, Mount, M6

UNCLASSIFIED

~~C O N F I D E N T I A L~~
21 September 1980

60 MM MORTAR M2—MOUNT M2—STANDARD

The 60 mm Mortar, M2, is of French origin, developed by the Edgar Brandt Company, but manufactured in the United States under rights purchased from the Brandt organization. Its design has been altered and improved to conform to our standards. In addition to its normal function, it is now utilized as a projector for the illuminating shell, M83, employed to disclose aerial targets at night.

MORTAR, M2—The mortar consists of the barrel, base cap and firing pin. The base cap, ending in a spherical projection which fits into a socket in the base plate, is screwed to the breech end of the smooth-bored barrel. The firing pin fits in the base cap, which is bored and threaded axially to receive it.

MOUNT, M2—The bipod mount comprises the leg, elevating mechanism and traversing mechanism assemblies. The leg assembly consists of two tubular steel legs connected by a clevis joint attached to the elevating screw guide tube. Spread of the legs is limited by the clevis joint, which is provided with a spring latch to lock the legs in the open position. The legs terminate in spiked feet. The left leg has a cross-leveling mechanism consisting of a sliding bracket connected by a link to the elevating screw guide tube.

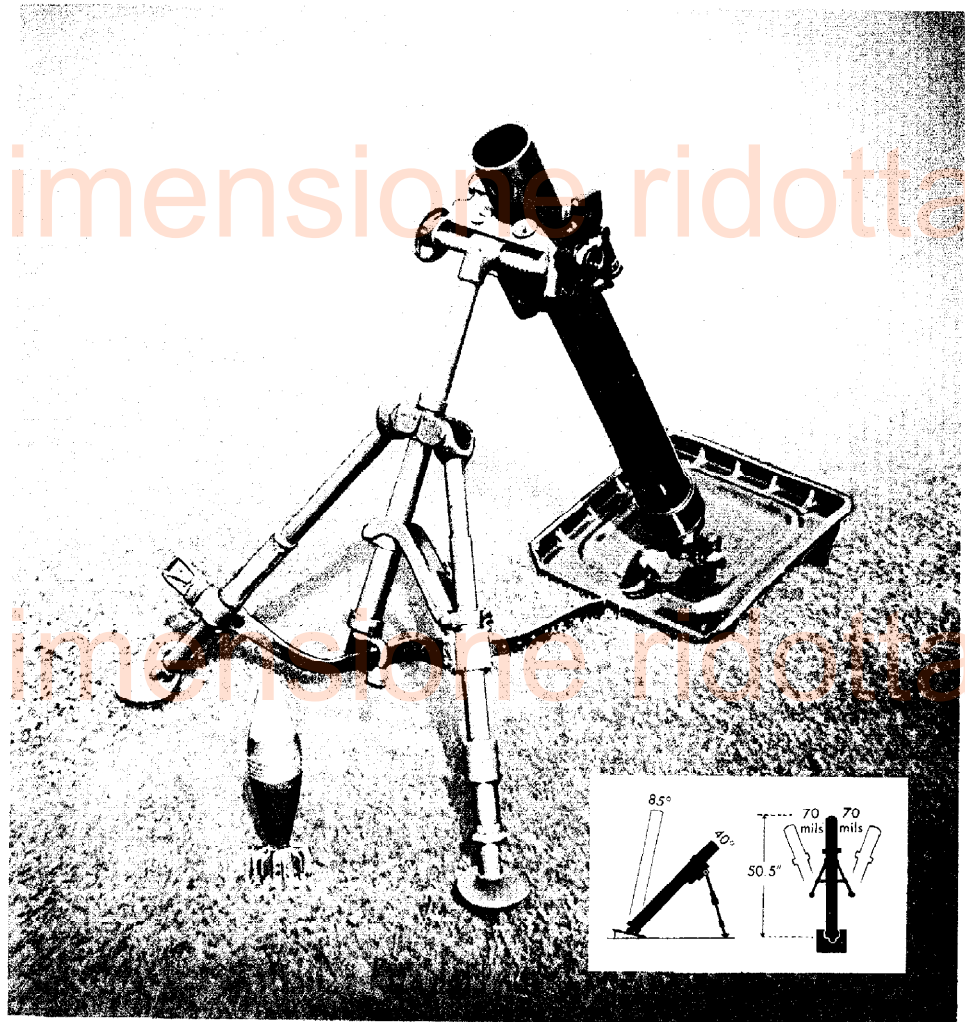
The elevating mechanism assembly consists mainly of an elevating screw nut which moves vertically on a screw within a guide tube, the elevating screw being actuated by a crank attached to its lower end.

The traversing mechanism consists of a horizontal screw operating in a yoke and actuated by a traversing handwheel.

The sight bracket fits in a dovetail slot provided in the yoke.

The barrel is clamped to the bipod by means of a clamping collar and saddle, shock absorbers being used to stabilize the mortar and mount during firing.

The base plate consists of a pressed steel body to which are welded a series



60 mm MORTAR, M2, IN FIRING POSITION, WITH SHELL, M49A2

of ribs and braces, a front flange and a socket. A locking lever fastens the spherical projection of the base cap in the socket.

Sighting and Fire Control Equipment

Sight (Collimator), M4

Ammunition

Projectile and propelling charge are in one unit constituting a complete round. The shell is furnished with stabilizing fins and a nose fuze. Propelling charges are divided into parts to provide for zone firing.

REFERENCES—TM 9-2005, v.3; FM 23-85.

PRINCIPAL CHARACTERISTICS

MORTAR, M2

Weight of Mortar, M2, and Mount, M2 . . . 42.0 lb.
 Weight of mortar 12.8 lb.
 Overall length of mortar 28.6 ins.
 Diameter of bore 2.36 ins.
 Rate of fire, maximum 30 to 35 rds./min.
 Rate of fire, normal 18 rds./min.

MOUNT, M2

Weight of mount 29.2 lb.
 Weight of bipod 16.4 lb.
 Weight of base plate 12.8 lb.
 Elevations, approximate 40° to 85°
 Mortar clamp position A 40° to 65°
 Mortar clamp position B 45° to 70°
 Mortar clamp position C 50° to 85°
 Maximum traverse, right 70 mils
 Maximum traverse, left 70 mils

AMMUNITION

Shell	Range, Approximate
H.E., M49A2	100 to 1,985 yds.
Illuminating, M83	
Training, M69	

81 MM MORTAR M1—MOUNT M1—STANDARD

During the first World War, the standard mortar adopted by the U. S. Army for infantry use as an indirect fire weapon was the British 3" Stokes trench mortar, Mk. I. Designs for a new mortar were started in 1920, but were abandoned in favor of attempts to improve bomb vanes in an effort to attain greater accuracy. While these tests were under way, the French firm of Edgar Brandt succeeded in developing a refined version of the Stokes mortar, together with suitable ammunition, which satisfied the requirements of the U. S. War Department. After tests of the Stokes-Brandt mortar and mount were completed successfully by the Ordnance Department, and the using arms, manufacturing rights were purchased from the Brandt Company.

The 81 mm Mortar, M1, has a heavier barrel than the Stokes, Mk. I, and a heavier base plate of new design. It also has a greater range and a higher rate of fire.

MORTAR, M1—The complete weapon consists of a barrel, bipod and base plate. The barrel is demountable from the bipod to form one load, while the bipod and base plate comprise two loads. Each load is light enough to be carried by one man. The smooth-bore muzzle-loading barrel is a seamless drawn-steel tube fitted at the breech end with a base cap within which is secured a firing pin protruding into the barrel.

MOUNT, M1—The mount consists of a base plate and a tubular steel bipod formed by two legs attached to a center trunnion by means of a compass joint. The left leg carries a cross-leveling mechanism which consists of a sliding bracket connected with the guide tube by a connecting rod. The mortar clamp, in two sections, clamps the barrel to the bipod and can be adjusted to three positions on the barrel.

The base plate is a rectangular pressed-steel body to which are welded a series of ribs and braces, a front flange, three loops, two handle plates and a socket for the spherical end of the tube base cap.

Sighting and Fire Control Equipment

Each mortar is equipped with a sight which includes a collimator, elevating and lateral deflection mechanisms, and longitudinal and cross-levels. The sight



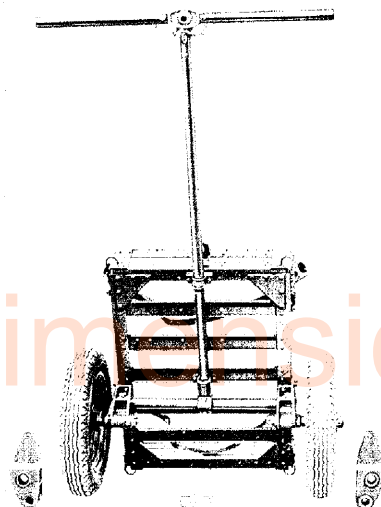
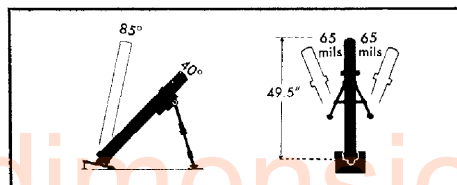
81 mm MORTAR, M1, IN FIRING POSITION, WITH SHELLS, M43 AND M56

mechanism, supported by a bracket fitted into the mortar yoke, provides accurate laying for elevation and deflection.

Sight, M4, and Aiming Posts, M7, M8 and M9, are used with the 81 mm mortar.

Transportation

The 81 mm mortar can be carried by two men or can be transported on Hand Cart, M6A1. It is also part of the armament of the Half Track 81 mm Mortar Carrier, M4.



HAND CART, M6A1

Ammunition

Stabilization in flight is obtained by fins on the shell which cause the projectile to strike nose first. A point-detonating impact type of fuze is fitted to the nose of the shell. The propelling charge attached to the base end of the projectile consists of an ignition cartridge and propellant increment. The increments of the charge are removable to provide for zone firing.

REFERENCES—TM 9-2005, v.3; TM 9-1260.

PRINCIPAL CHARACTERISTICS

MORTAR, M1

Weight of Mortar, M1, and Mount, M1. 136.0 lb.
 Weight of mortar. 44.5 lb.
 Overall length of mortar. 49.5 ins.
 Diameter of bore. 3.2 ins.
 Rate of fire, maximum. 30 to 35 rds./min.
 Rate of fire, normal. 18 rds./min.

MOUNT, M1

Weight of mount. 91.5 lb.
 Weight of bipod. 46.5 lb.
 Weight of base plate. 45.0 lb.
 Elevations, approximate. 40° to 85°
 Mortar clamp position A. 40° to 70°
 Mortar clamp position B. 50° to 80°
 Mortar clamp position C. 55° to 85°
 Maximum traverse, right. 65 mils
 Maximum traverse, left. 65 mils

AMMUNITION

Weight Ranges, Approximate
 H.E. shell, M43A1, 6.87 lb. 100 to 3,290 yds.
 M36, 10.62 lb. 300 to 2,558 yds.
 Chemical shell, M57, 10.75 lb. 300 to 2,470 yds.

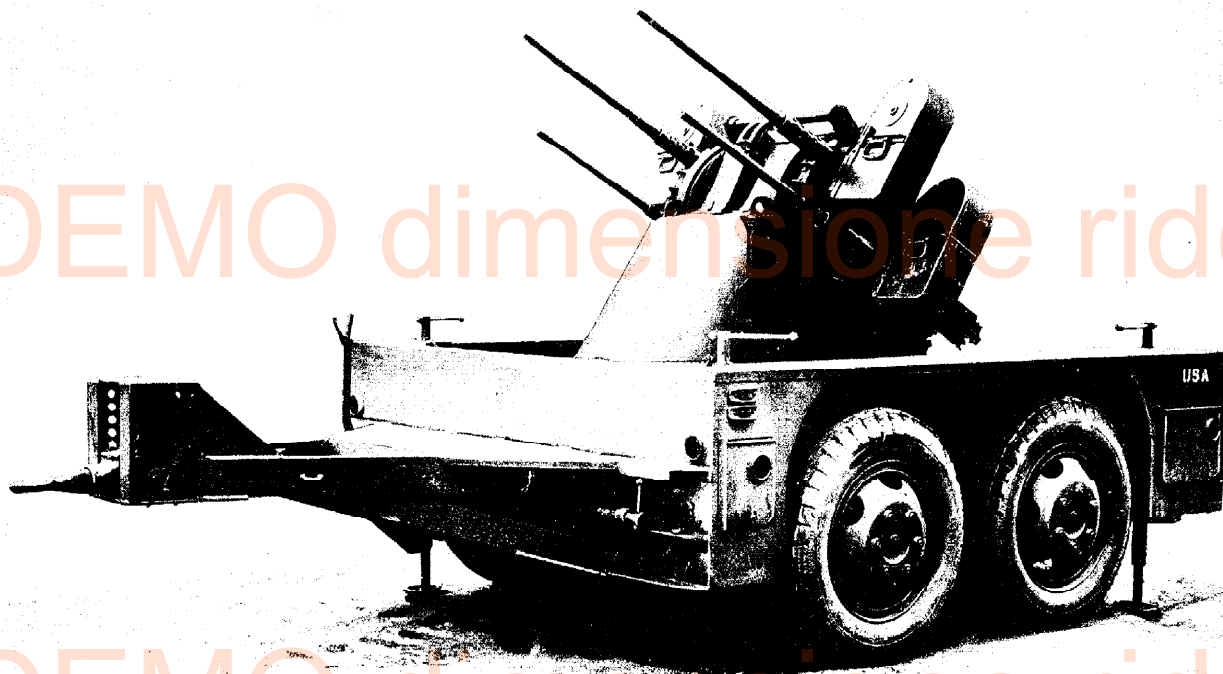
HAND CART, M6A1 STANDARD

The Hand Cart, M6A1, is a utility vehicle which differs from the basic Hand Cart, M3A4, only in the addition of suitable brackets and straps to adapt it for transport of the 81 mm mortar. It can also be used as an ammunition cart for the 37 mm Gun, M3A1, the 60 mm mortar, or the 81 mm mortar.

CHARACTERISTICS

Overall length (including pole). 69.5 ins.
 Dimensions of body. 24 ins. x 32 ins. x 5 ins.
 Overall width. 39.1 ins.
 Weight. 70.8 lb.
 Tire Size. 4 ins. x 12 ins.

MULTIPLE CAL. .50 MACHINE-GUN CARRIAGE M51—STANDARD



MULTIPLE CAL. .50 MACHINE-GUN CARRIAGE, M51 (MULTIPLE CAL. .50 MACHINE-GUN MOUNT, M45, ON TRAILER MOUNT, M17)

Mobile and semi-mobile automatic weapons battalions armed with the Caliber .50 Machine Gun, M2, on the Mount, M3, lacked firepower for effective action against enemy attack aviation. In order to provide an antiaircraft weapon of concentrated firepower which could be used for convoy defense, the Multiple Caliber .50 Machine-Gun Carriage, M51, was designed and standardized.

The Multiple Machine-Gun Carriage, M51, is composed of the Multiple Caliber .50 Machine-Gun Mount, M45, with four Caliber .50 Browning Machine Guns, HB, M2, on the Mount, Trailer, M17. The carriage is drawn by a prime mover.

The Mount, M45, is a power-driven, armored gun mount with a self-contained power unit. It can be traversed through 360°, and elevated from -10° to +90°. Firing of the guns and movement of the mount are controlled from a pair of hand grips in front of the gunner's seat within the mount.

All the rotatable elements of the mount are located in a turret which rests on a welded steel base plate anchored to the floor of the trailer. A centrally located gunner's seat is situated between two trunnion sectors which carry the guns and ammunition chests. A sight base—in the center of which is the Navy Reflector Sight, Mk. IX, the control handle, and the firing switch—extends over the gunner's head from one trunnion to the other and moves with the trunnions.

Two Caliber .50 Browning Machine Guns, HB, M2, are mounted outboard on each trunnion. An ammunition Chest, M2, with a capacity of 200 rounds, is mounted outboard of each gun. The guns are normally fired electrically by solenoids, but may be fired by a hand-firing mechanism on each gun in the event of power failure.

A variable speed drive unit beneath the mount turntable drives the mount in elevation and azimuth at speeds from 0° to 60° per second. The variable speed drive obtains its power from two heavy-duty 6-volt storage batteries in the rear of the mount. These batteries are charged by a 300-watt, 12-volt, gasoline motor-driven charger located beside the batteries.

PRINCIPAL CHARACTERISTICS OF MOUNT, M45

Weight, without armor, guns, ammunition chests, fuel, and operator.....	1,468 lb.
Weight, fully equipped, including gunner (approx.).....	2,396 lb.
Weight of armor.....	132 lb.
Overall width.....	79½ ins.
Overall height (guns level).....	4 ft., 7 ins.
Power drive.....	Maxson Var. Speed Drive, Model 120A with 1-hp., 12-volt, 90-amp. electric motor
Weight of power drive.....	139 lb.
Power charger.....	Briggs & Stratton, Model 304, type 25592, driven by a 1-cylinder, 4-cycle gasoline motor
Charger output.....	300 watts, 15 volts
Weight of power charger.....	75 lb.
Batteries, storage, lead, acid, 3-cell, 17 plates per cell (6 volts each).....	2
Armament, Cal. .50, HB, M2, Fixed Browning Machine Guns, mounted outboard on right and left trunnions.....	4
Ammunition.....	Cal. .50, 800 rounds (200 rounds each in Cal. .50 Ammunition Chests, M2, mounted outboard on guns)
Azimuth speed.....	0° to 60° per sec.
Elevation speed.....	0° to 60° per sec.

A removable shield of armor plate, with hinged doors on the top, fits between the trunnion to provide protection for the gunner and the driving mechanisms.

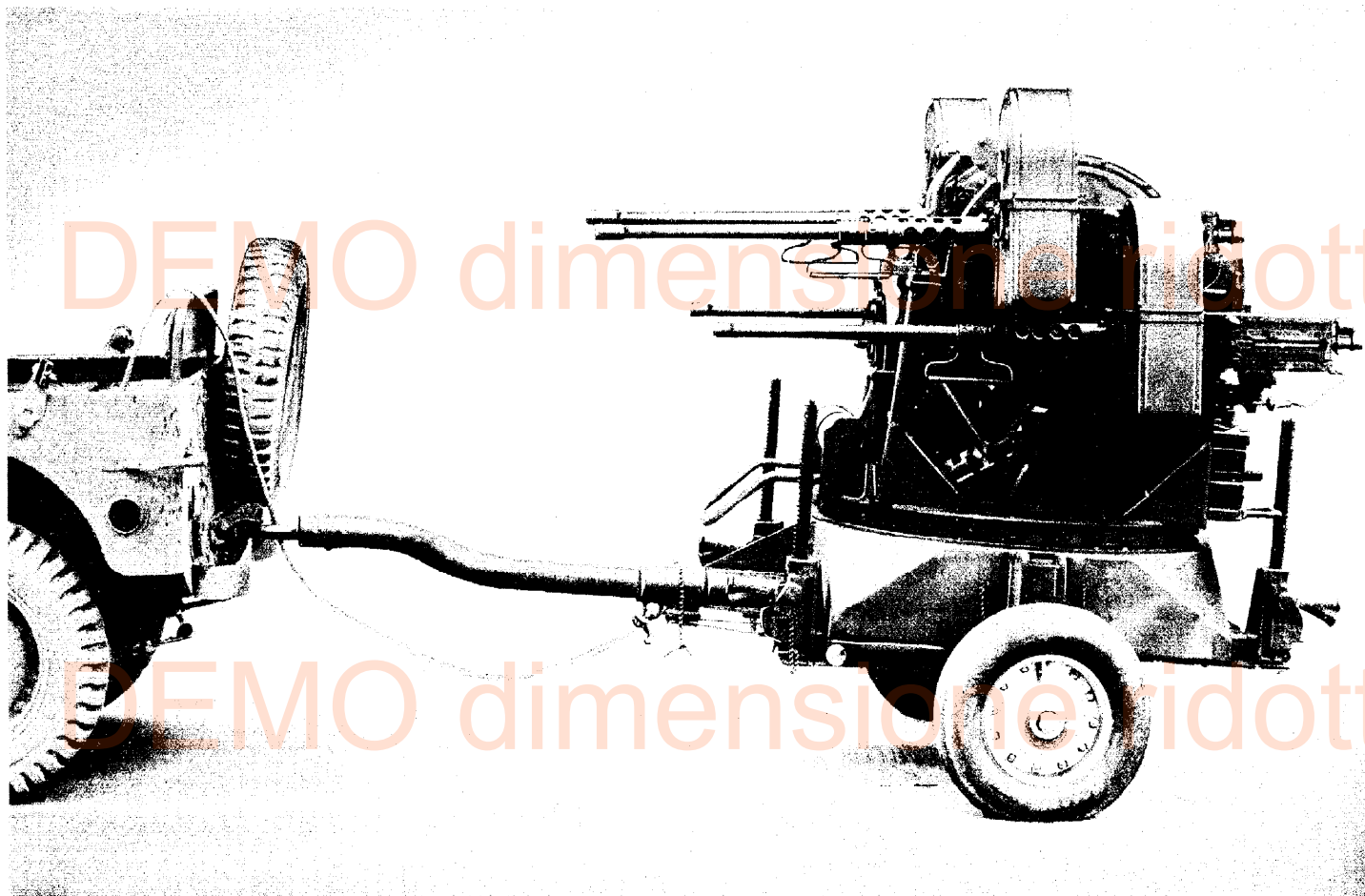
The Trailer Mount, M17, is a short coupled, 4-wheel type vehicle. It is a modification of the General Trailer, M7, used to transport Generating Unit, M7, in Antiaircraft Gun Battalions. Jacks at each corner of the trailer allow it to be emplaced firmly for firing.

REFERENCES—OCM 17969; OCM 18020; OCM 18845; OCM 18964; OCM 19140; TM 9-222.

UNCLASSIFIED



MULTIPLE CAL. .50 MACHINE-GUN TRAILER MOUNT M55—STANDARD



MULTIPLE CALIBER .50 MACHINE-GUN TRAILER MOUNT, M55, IN TRAVELING POSITION ATTACHED TO 1/4-TON 4 X 4 TRUCK

The Multiple Caliber .50 Machine-Gun Trailer Mount, M55, was designed as an antiaircraft ground mount to be transported by airplane. It consists of the Multiple Caliber .50 Machine-Gun Mount, M45C, mounted on the Trailer Mount, M20.

The Multiple Caliber .50 Machine-Gun Mount, M45C, is identical with the Multiple Caliber .50 Machine-Gun Mount, M45, used with the Multiple Caliber .50 Machine-Gun Carriage, M51, except for a special armor shield protecting the mechanism and the gunner.

Armament consists of 4 Browning Caliber .50 Machine Guns, HB, M2, with a rate of fire of 450 to 575 rounds per minute for each gun. Two guns with their ammunition chests are mounted outboard of each trunnion. The gunner sits between the trunnions, from which position he

controls the movement of the mount and the firing of the guns through the medium of a handlebar control.

Elevation is from -9° to $+90^{\circ}$. A continuous traverse of 360° is possible for the power-operated turret. Power for the elevating and traversing mechanisms is supplied by two truck type 6-volt storage batteries connected in series to furnish 12 volts to the constant speed drive motor. Two differentials, each driven by two Reeves split pulley variable speed drives, permit variation in speed of the elevation and traverse gears. Deflection of the handlebar control governs the speed of the pulleys. Movement of the output shaft of the differential is in proportion to the amount of speed change of the pulleys. Rates of tracking in both elevation and traverse are from a minimum

of $1/4^{\circ}$ per second to a maximum of 60° per second.

The Trailer Mount, M20, is a portable two-wheeled mount that may be moved for short distances by hand or by a prime mover. It is capable of stowage in a CG-4A Glider or a C47 Transport Airplane. The removable pneumatic-tired wheels are equipped with hydraulic brakes. Mechanical jacks allow the mount to be emplaced and leveled in firing position when the wheels are removed. A steel pole extends from the front of the mount and ends in a lunette for attachment to the pintle of a prime mover. Tow ropes are supplied for aid in manual manipulation of the mount.

REFERENCES—OCM 22521; OCM 22117; OCM 21716; OCM 20241; OCM 20025.

UNCLASSIFIED



20 MM AUTOMATIC GUN MK. IV—STANDARD



20 mm AUTOMATIC GUN, MK. IV (Oerlikon)

The 20 mm Automatic Gun, Mk. IV, for close-range, high-angle fire, is the Swiss Oerlikon Gun as manufactured in England and adapted to American manufacturing limits.

The Mk. IV Oerlikon will operate automatically so long as the trigger is held back in the firing position or there is a cartridge in the magazine. Ejection is automatic, and the gun is furnished with a safe-fire gear. The cyclic rate is approximately 450 rounds per minute.

The gun is composed of recoiling and nonrecoiling parts. The recoiling parts comprise the breech bars and springs, and the barrel spring with its casing. The nonrecoiling parts consist of the barrel, mounted on the breech casing; the breech casing; various stops; a locking gear, and the trigger group.

The barrel is of forged steel, with fins outside the outer section to support the barrel spring and permit air circulation for cooling. The first two inches of the muzzle flare outward as a flash shield. The barrel can be readily removed and replaced by a new barrel.

A detachable drum-type magazine with a capacity of 60 rounds is carried on top of the breech casing.

The Oerlikon employs the force of the explosion to check and reverse the movement of a relatively heavy breechblock that is never locked. This breechblock recoils and counterrecoils with a purely

reciprocating motion. The barrel spring alone tends to keep the breechblock closed.

Before opening fire, the breechblock is pulled back until the sear is held by the trigger hook, compressing the barrel spring and causing a pull on the recoiling parts. Pressure on the trigger releases the breechblock, which is then moved forward by the barrel spring. The forward-moving breechblock picks up a round from the magazine and seats it in the chamber. Just before the block reaches its fully forward position the hammer-operated striker pin fires the round.

When the round is fired the gas pressure first absorbs the forward momentum of the barrel and then blows it backward

until the compressed barrel spring checks its movement. At full recoil the barrel is to the rear of the position at which it is caught by the trigger hook. As each round is fired the empty cartridge case is blown from the chamber, upon which the case is tipped out of the breech face by striking against an ejector in the breech casing.

When all rearward momentum has been absorbed the barrel is again brought forward by the counterrecoil action of the barrel spring. On its way forward the breechblock picks up the next round from the magazine.

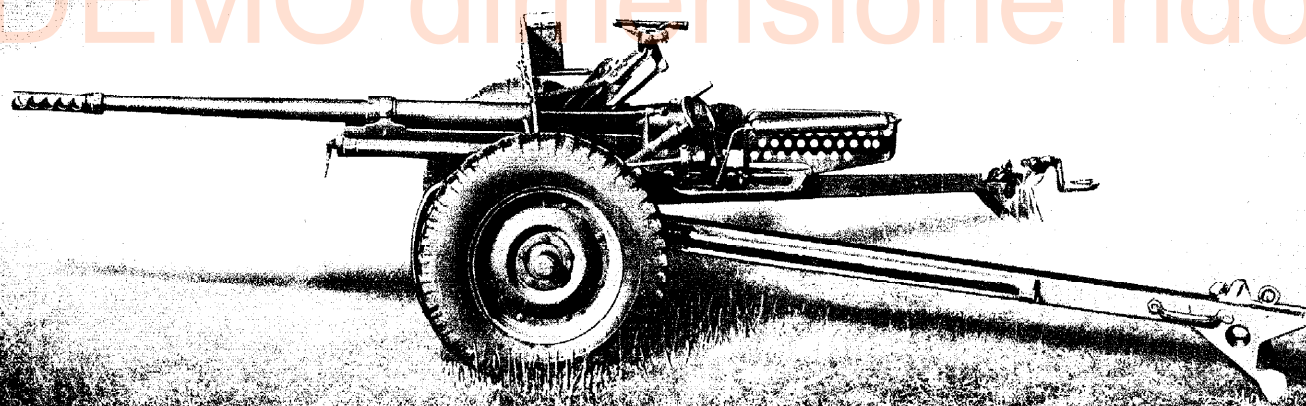
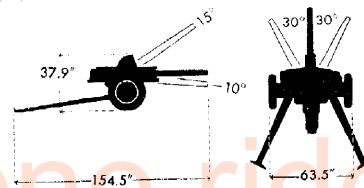
AMMUNITION—Ammunition is in the form of complete fixed rounds. It consists of Shell, H.E., Mk. IV, with tracer, and H.E., Mk. III, without tracer.

PRINCIPAL CHARACTERISTICS

Weight of gun.....	147 lb.
Weight of tube.....	37 lb.
Rate of fire, rds./min.....	390-500; aver. 450 (approx.)
Muzzle velocity.....	2,725 f./s.
Pressure.....	48,160 lb./sq. in.
Length, overall.....	{ 87 ins. w/o shoulder rest 97 ins. with " "
Number of lands and grooves.....	9
Rifling.....	1 in 36 uniform
Length of rifling.....	48.728 ins.
Cooling system.....	Air
Principle of operation.....	Blowback
Magazine.....	60 round
Weight of round.....	{ H.E., Mk. IV, with tracer—.514 lb. H.E., Mk. III—.526 lb.
Weight of projectile.....	{ H.E., Mk. IV, with tracer—.2621 lb. H.E., Mk. III—.2714 lb.
Weight of charge.....	{ H.E., Mk. IV, with tracer—.060 lb. H.E., Mk. III—.0626 lb.

UNCLASSIFIED

37 MM ANTITANK GUN M3A1—CARRIAGE M4A1—STANDARD



LEFT SIDE VIEW OF THE 37 mm GUN, M3A1, ON THE M4A1 CARRIAGE, SHOWING GAS DEFLECTOR NO LONGER USED ON THIS GUN

PRINCIPAL CHARACTERISTICS

GUN, M3A1

Weight.....	191 lb.
Length (overall) of gun.....	6 ft., 10½ ins.
Length of bore.....	53.5 calibers
Muzzle velocity.....	2,900 f./s.
Volume of chamber.....	19.92 cu. ins.
Travel of projectile in bore.....	69.95 ins.
Maximum powder pressure.....	50,000 lb./sq. in.
Type of mechanism.....	Drop block
Rate of fire (approximate).....	25 rds./min.
Range.....	12,850 yds.

RECOIL MECHANISM

Type.....	Hydrospring
Weight.....	77½ lb.
Normal recoil (— 1 in. + ½ in.).....	20 ins.

Maximum recoil.....	20½ ins.
Spring pressure (average).....	217 lb.
Maximum piston-rod pull.....	6,000 lb.

CARRIAGE, M4A1

Total weight without gun.....	721 lb.
Height of lunette (limbered position).....	29½ ins.
Length of carriage from muzzle to lunette.....	154½ ins.
Width over hub caps.....	63½ ins.
Height (traveling position).....	37¾ ins.
Trail spread (maximum) (included angle).....	60°
Elevation (maximum), carriage on wheels.....	15°
Depression (maximum), carriage on wheels.....	— 10°
Traverse (maximum, right).....	30°
Traverse (maximum, left).....	30°

AMMUNITION

	M63, H.E.	M74, A.P.	M51B2, A.P.C.
Weight of complete round.....	3.13 lb.	3.14 lb.	3.43 lb.
Weight of projectile (as fired).....	1.61 lb.	1.92 lb.	1.92 lb.
Weight of bursting charge.....	.085 lb.	.0 lb.	.0 lb.
Weight of powder charge.....	.49 lb.	.32 lb.	.53 lb.
Type of ammunition.....	Fixed	Fixed	Fixed
Muzzle velocity.....	2,600 f./s.	2,900 f./s.	2,900 f./s.
Armor penetration homogeneous plate			
20° from normal— 500 yds.....		1.4 ins.	2.4 ins.
1,000 yds.....		1.0 in.	2.1 ins.

The 37 mm guns are the lightest weapons of the field-gun type used in the U.S. Army. The original 37 mm gun supplied to the U.S. Army in 1917-18 was the M1916, of French design. It was a comparatively low-velocity weapon not suited for antitank employment.

The 37 mm Gun, M1916, is classified as Limited Standard for manufacture, but as Standard for issue, with its cradle, as subcaliber equipment. The Carriages, M1916, M1916A1 and M1916A2 are also Limited Standard.

The desirability of a light, highly mobile antitank gun, using armor-piercing and high-explosive shells, resulted in the production of the 37 mm antitank matériel whose design features closely resemble the German Rheinmetall weapon.

The 37 mm Antitank Gun, M3, represents the most powerful piece that has been manufactured to weigh less than 1,000 pounds. Recent developments in ammunition have increased the muzzle velocity from 2,600 feet per second to 2,900 feet per second, with consequently greater armor penetration.

UNCLASSIFIED



GUN, M3—The rifled barrel is a one-piece forging threaded to screw into a breech ring recessed for a vertically sliding block which is operated manually. The recoil system is of the hydrospring type, including a buffer mechanism which prevents possible damage to the weapon due to sudden stopping of the recoiling parts. The estimated life of the gun at normal pressure is approximately 2,500 rounds.

GUN, M3A1—Addition of gas deflectors to the M3 gun changed its designation to M3A1. These gas deflectors were subsequently removed, but all 37 mm, M3, guns with muzzles threaded for gas deflectors are now designated M3A1.

CARRIAGE, M4—This carriage has a split trail and pneumatic tires. It can be towed by a prime mover on roads or across country, and by its crew. Elevating and traversing mechanisms are attached to the mount. Adjustments in traverse are normally made by the use of the traversing handwheel, although a traversing release handle allows rapid changes in traverse through free movement of the gun. The handle must be held in position during free traverse, for on release of the handle the gun is automatically locked to the traversing mechanism.

In order to increase stability of the gun during firing, wheel segments which swing on the axle raise the tires off the ground. The segments are locked in both travel and firing positions by a handle-actuated plunger.

The Telescope, M6, is held in position by the Telescope Mount, M19, which is attached to the gun carriage by means of a bracket, assuring movement of the sight with the gun during traverse.

While a 37 mm gun squad consists of six men, the Carriage, M4, is designed for one-man control of aiming, elevating, traversing and firing.

Carriage, M4, is classified as Limited Standard.

CARRIAGE, M4A1—This carriage is identical with the Carriage, M4, except that for quick adjustment of the gun in traverse a release mechanism permits traverse to be effected by pressure of the right shoulder and arm against the shoulder traversing bar so long as the traversing release handle is locked to the rear. With the traversing release handle in its forward position, the gun may be traversed by use of a traversing knob.

The classification of this carriage is Standard.

Sighting and Fire Control Equipment

On Carriage Equipment

Telescope, M6

Telescope Mount, M19

Off Carriage Equipment

Lensatic compass

Bore sight

Ammunition

Ammunition for the 37 mm gun is in the form of fixed rounds. It consists of A.P.C. Shot, M51B1, with tracer; H.E. Shell, M63, with B.D. fuze, M58; canister, M2; A.P. Shot, M74, with tracer; T.P. Shot, M51, with tracer, and Drill Cartridge, M13.

Trainers

Subcaliber equipment for 37 mm guns comprises the rifle, subcaliber, cal. .22, M2A1, and the rifle, subcaliber, cal. .30, M1903A2, both minus the stock and front and rear sights, together with mount, subcaliber, cal. .22-30, M6. Rifles and mount are classified as Standard.

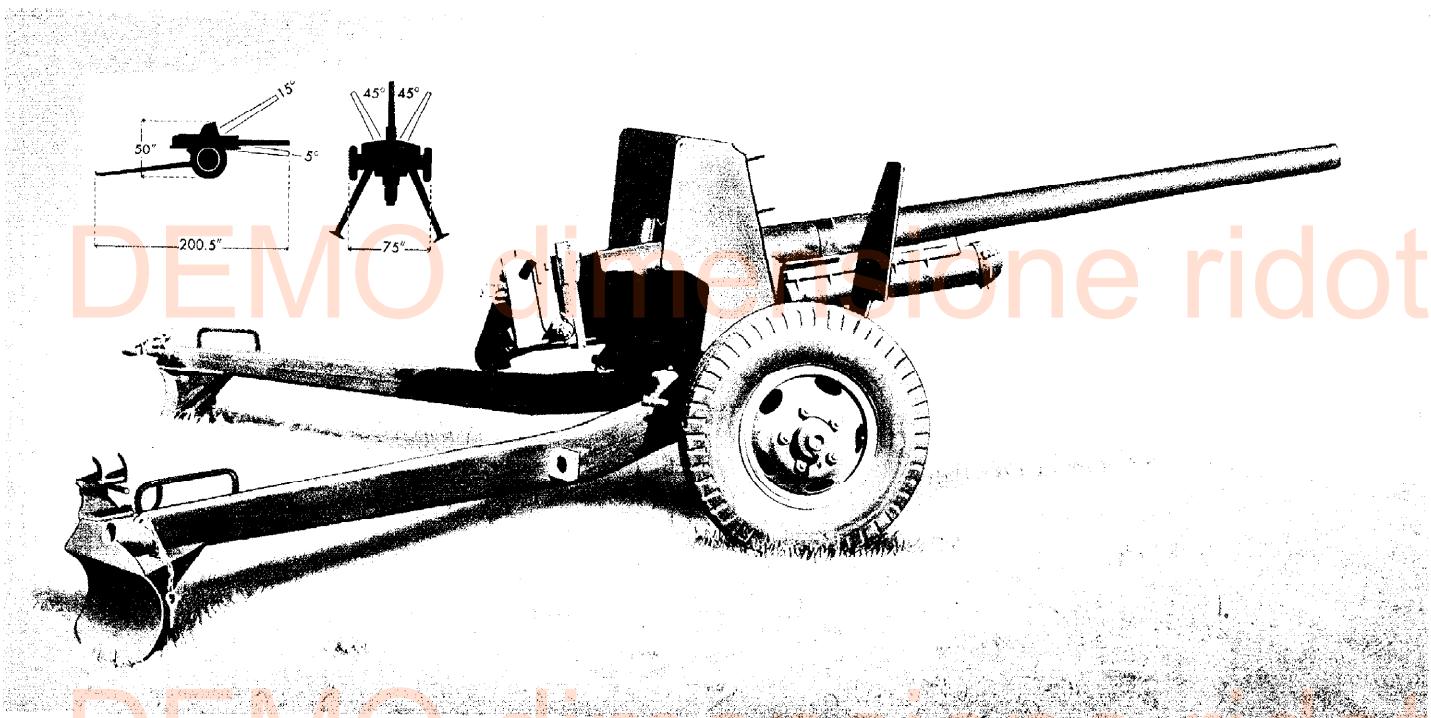
REFERENCES—FM 23-70; TM 9-2005, v.3.



BREECH VIEW OF 37 mm GUN, M3A1, Showing (1) Elevating Wheel; (2) Traversing Wheel; (3) Traversing Lock and Lever; (4) Trigger-actuating Handle; (5) Shoulder and Arm Traversing Bar

UNCLASSIFIED

57 MM ANTITANK GUN M1—CARRIAGE M1A3—(BRITISH) SUBSTITUTE STANDARD



57 mm ANTITANK GUN, M1, ON CARRIAGE, M1, IN FIRING POSITION; CARRIAGE, M1A3, IS CARRIAGE, M1, WITH MINOR MODIFICATIONS

PRINCIPAL CHARACTERISTICS

GUN, M1

Weight of gun.....	755 lb.
Overall length.....	117 ins.
Length of bore.....	50 cal.
Muzzle velocity.....	2,700 f./s.
Volume of chamber.....	100 cu. ins.
Travel of projectile in bore.....	96 ins.
Maximum powder pressure.....	46,000 lb./sq. in.
Breech mechanism.....	Vertical sliding wedge
Rate of fire (approximate).....	30 rds./min.
Rifling.....	Right-hand, 1 turn in 30 cal.
Range.....	10,260 yds.

RECOIL MECHANISM, M1

Type.....	Hydrospring
Weight, with slipper.....	373 lb.
Normal recoil (—1 in. + 1/2 in.).....	29 3/4 ins.
Maximum recoil.....	31 1/2 ins.

CARRIAGE, M1A3

Total weight without gun.....	1,945 lb.
Height of lunette (limbered position).....	22 ins.
Length of carriage (muzzle to lunette).....	200 1/2 ins.
Width over hub caps.....	75 ins.
Height (traveling position).....	50 ins.
Trail spread (maximum) (included angle).....	90°
Elevation (maximum), carriage in firing position.....	15°
Depression (maximum), carriage in firing position.....	—5°

Traverse (maximum, right).....	45°
Traverse (maximum, left).....	45°
Width of tread (c/l—c/l of wheels).....	57.7 ins.

AMMUNITION

Weight of complete round A.P., M70.....	12.56 lb.
Weight of projectile (target practice or armor piercing).....	6.28 lb.
Weight of powder charge (approximate).....	2.25 lb.
Type of ammunition.....	Fixed
Armor penetration—homogeneous plate	
20° from normal— 500 yds.....	3.4 ins.
1,000 yds.....	2.7 ins.
2,000 yds.....	1.9 ins.

Sighting and Fire Control Equipment

On Carriage Equipment

Telescope, M18
Telescope Mount, M24A1

Off Carriage Equipment

Gunner's Quadrant, M1

REFERENCES—TM 9-2005, v. 5; TM 9-303.

British battle experience indicated the need for a light gun more powerful than the 2-pounder (37 mm) which could be employed as an antitank weapon or be mounted in a tank or gun motor carriage. This requirement was met by the 6-pounder gun, standardized in America for Lend-Lease manufacture as the 57 mm Gun, M1.

O.C.M. 16489, dated 20 February 1941, authorized the preparation of drawings of the British 6-pounder gun, carriage and on-carriage fire control equipment converted to American gears, threads and tolerances. On 15 May 1941, O.C.M. 16722 recommended standardization of the British-American 57 mm matériel as Gun, M1, Carriage, M1, Telescope, M18, and Telescope Mount, M24.

Modifications were made to the M1 Carriage which culminated in the present Carriage, M1A3. These changes included substitution of free traverse for gear traverse, and new lunette, drawbar, and trail lock assemblies.

Ammunition

Ammunition for the 57 mm, M1, Gun is in the form of fixed rounds. It consists of A.P. Projectile, M70.

UNCLASSIFIED

PANORAMIC TELESCOPES FOR USE WITH MOBILE ARTILLERY

A panoramic telescope provides a means for sighting a gun or howitzer and for laying it in azimuth. Reticle markings in some of these instruments allow the use of the telescope for laying the weapon in elevation in direct fire. The telescope is attached to the left side of the carriage by means of a mount, some models of which contain certain indicating elements.

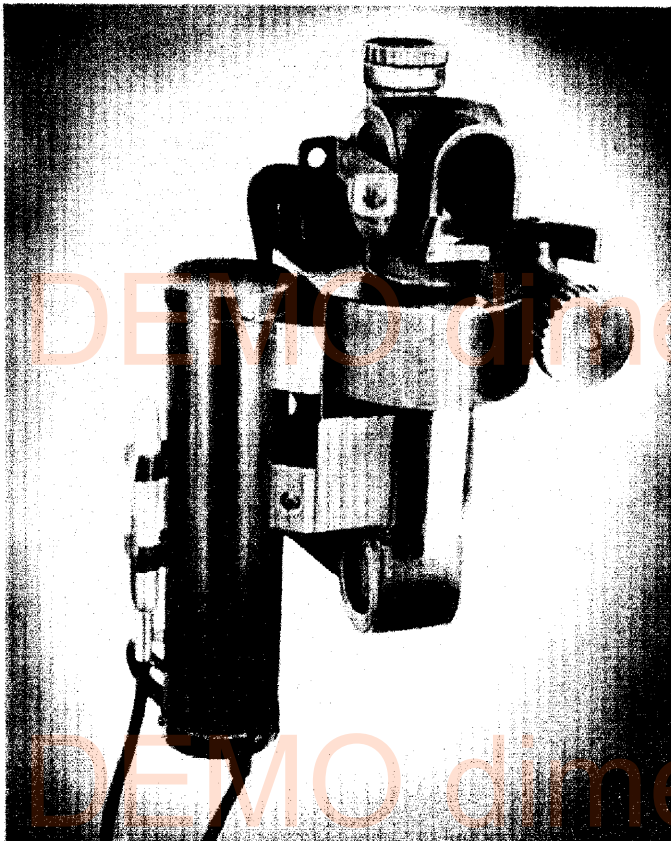
The panoramic telescope is a fixed-focus, erect-image, vertical telescope of the periscope type, with an optical system composed of various prisms and lenses, and a reticle to facilitate aiming. The objective prism can be elevated and depressed to bring the target into view. It can also be rotated through a complete circle, thereby enabling the target to be kept constantly in view while the observer remains in the same position. Rotating prisms in the rotating head and housing insure accurate and erect images at all azimuths. The rotation of the elevating prism and the dove prism is accomplished by a worm mechanism with a throwout device for rapid changes in azimuth.

At present, there are several standard panoramic telescopes. All contain basically the same parts and have the same general appearance. They differ chiefly in optical characteristics, in the markings of the reticle, in the relation of the head to the eyepiece, and in minor matters affecting only the appearance of the instrument.

At the top of the panoramic telescope is an elevation knob by which the instrument is elevated or depressed to give the proper



PANORAMIC TELESCOPE, M1



PANORAMIC TELESCOPE, M6, WITH INSTRUMENT LIGHT

UNCLASSIFIED



PANORAMIC TELESCOPE, M12

PANORAMIC TELESCOPES FOR USE WITH MOBILE ARTILLERY (Continued)

line of sight. Zero graduations and accompanying indexes on the elevation knob and on the rotating head below are matched to set the instrument for a horizontal line of sight.

The azimuth scale is graduated in 100-mil intervals from 0 to 32 and from 32

back to 0. An azimuth micrometer covers 100 mils at 1-mil intervals. Open sights are provided on each telescope.

Reticles and scales of panoramic telescopes are illuminated by self-contained instrument lights.

Optical Characteristics of Panoramic Telescope, M1

Magnification	3 power
Field of view	12° 12'
Diameter of exit pupil	0.15"
Effective focal length of objective	2.362"
Effective focal length of eyepiece	0.784"

A distinguishing point of this telescope is that the eyepiece slants upward at an angle of 25°; in other standard panoramic telescopes, the eyepiece is horizontal.

Where Panoramic Telescope, M1, is not available, Elbow Telescope, M62, and Telescope Adapter, M9, with a 1-inch filler, can be used as a substitute for the panoramic telescope.

TELESCOPE MOUNT, M3—This mount supports the Panoramic Telescope, M1, on the cradle of the 75 mm pack howitzer. It is mounted on a socket which is supported on a central pivot. The latter is aligned to the bore of the weapon. It automatically applies to the azimuth and the angle of elevation any necessary correction for trunnion cant.

This mount completes the sighting equipment for the 75 mm pack howitzer, containing within itself leveling, cross-leveling, angle-of-site, and elevation mechanisms.

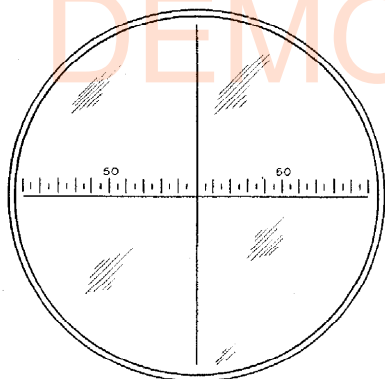
An elevating knob operates an elevation scale which is graduated in 100-mil intervals and an elevation micrometer which is graduated in 1-mil intervals. The elevating knob is attached to a range drum which is scaled in yards.

The angle-of-site mechanism consists of an angle-of-site level vial and a 600-mil scale and associated micrometer scale, operated by the angle-of-site micrometer knob.

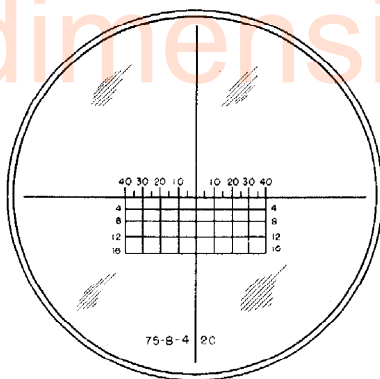
Telescope Mount, M3 has been reclassified as Limited Standard. All mounts are to be modified to M3A1C status.

TELESCOPE MOUNT, M3A1C—This telescope mount, now standard in place of the M3, consists of Telescope Mount, M3, modified to permit its use at elevations up to 65°. Telescope Mount, M3, can indicate a maximum elevation of only 45°.

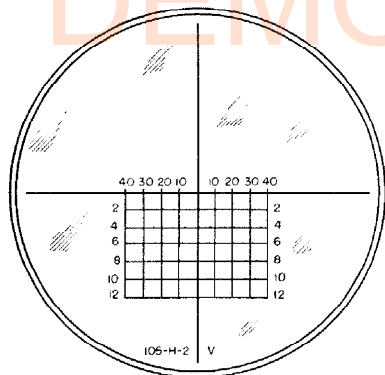
TELESCOPE MOUNT, M16—This mount supports the Panoramic Telescope, M1, on the 75 mm field howitzer carriage. It contains leveling and cross-leveling mechanisms. The gun is laid in elevation by means of the range quadrant which is mounted on the right side of the carriage.



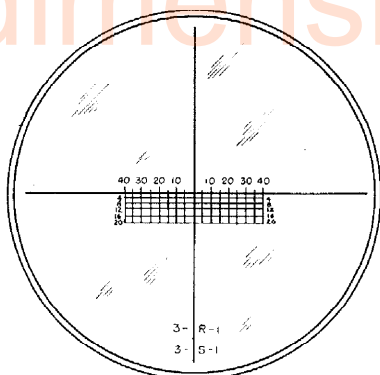
M12



M12A1



M12A2



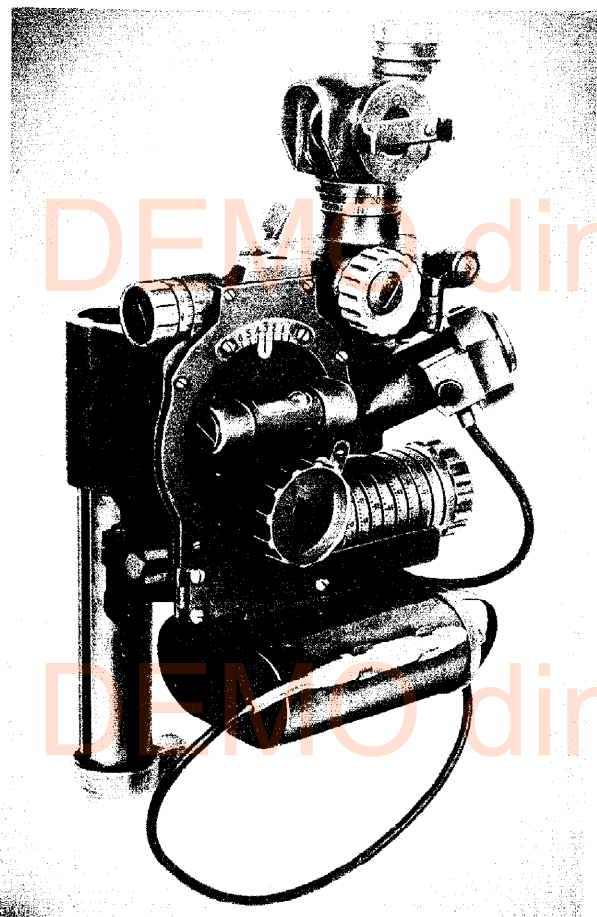
M12A3

RETICLE PATTERNS FOR THE M12 SERIES OF PANORAMIC TELESCOPES

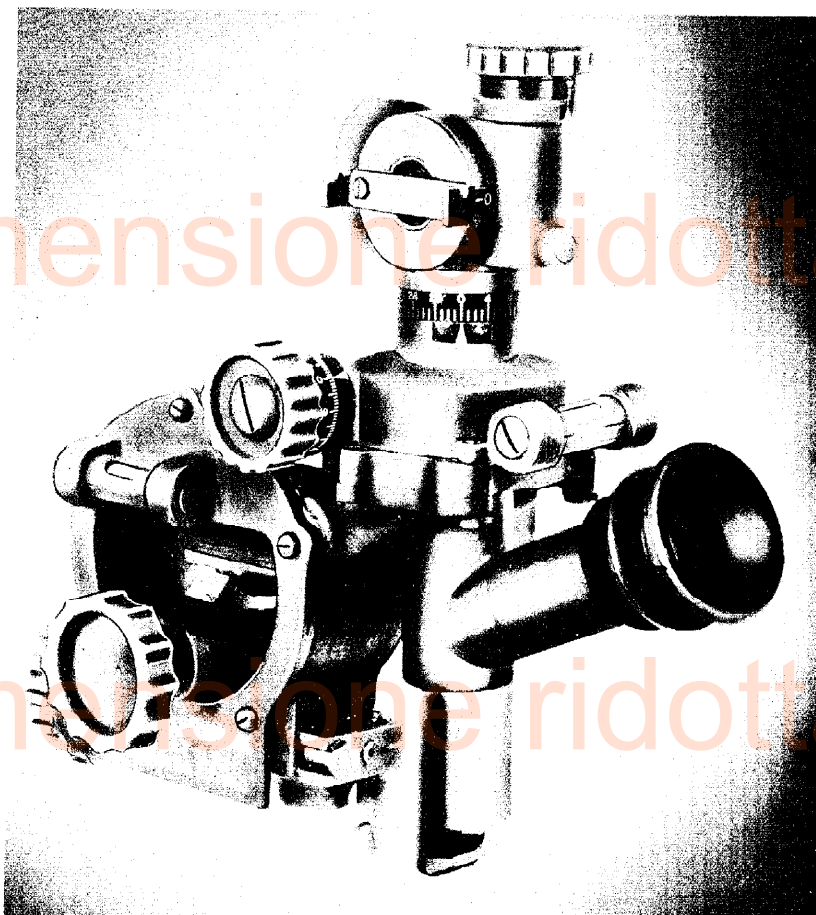
PANORAMIC TELESCOPE, M1

Panoramic Telescope	Telescope Mount	Instrument Light	Gun Carriage	Status of Carriage	Additional on-carriage equipment for this matériel
M1	M3A1C	M13	75 mm Pack Howitzer Carriages, M1, M8	Standard	None
M1	M16A1	M20	75 mm Howitzer Carriages, M3A2, M3A3	Standard	Range Quadrant, M3 Instrument Light, M18 Elbow Telescope, M5
M1	M16A1	M20	75 mm Howitzer Carriages, M2A1, M3, M3A1	Limited Standard	Range Quadrant, M3 Instrument Light, M18 Elbow Telescope, M5
M1	M16A1	M20	105 mm Howitzer Carriage, M3A1	Standard	Range Quadrant, M8 Elbow Telescope, M61
M1	M16	M20	105 mm Howitzer Carriage, M3A1	Standard	Range Quadrant, M8 Elbow Telescope, M61

UNCLASSIFIED



TELESCOPE MOUNT, M3, WITH INSTRUMENT LIGHT, M13



TELESCOPE MOUNT, M16, WITH PANORAMIC TELESCOPE, M1

TELESCOPE MOUNT, M16 has been reclassified as Limited Standard. All mounts are to be modified to M16A1 status.

TELESCOPE MOUNT, M16A1—This telescope mount is standard for use on 75 mm howitzer carriages in place of the M16. It is an M16 telescope mount modified to permit its use at elevations up to 65°.

Optical Characteristics of Panoramic Telescope, M6

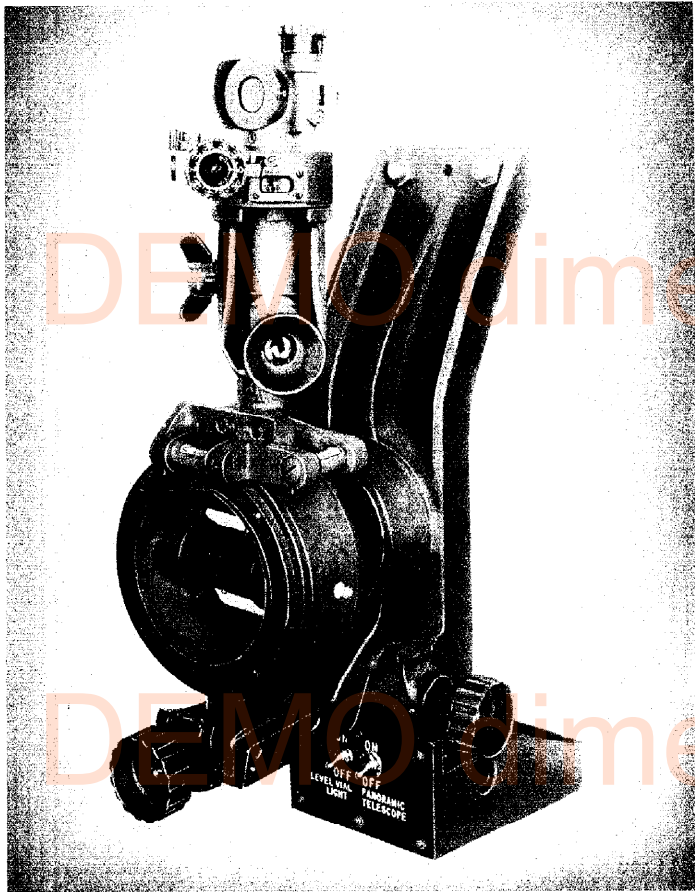
Power.....	4
Field of view.....	10°
Diameter of exit pupil.....	1.66"
Effective focal length of objective.....	3.135"
Effective focal length of eyepiece.....	0.788"

This instrument, itself standard, is used only on certain limited standard and substitute standard matériel. It has a reticle with a vertical and a horizontal crossline. The latter is graduated in mils to indicate deviations from the central position. An open sight on the side of the rotating head permits rapid approximate aiming.

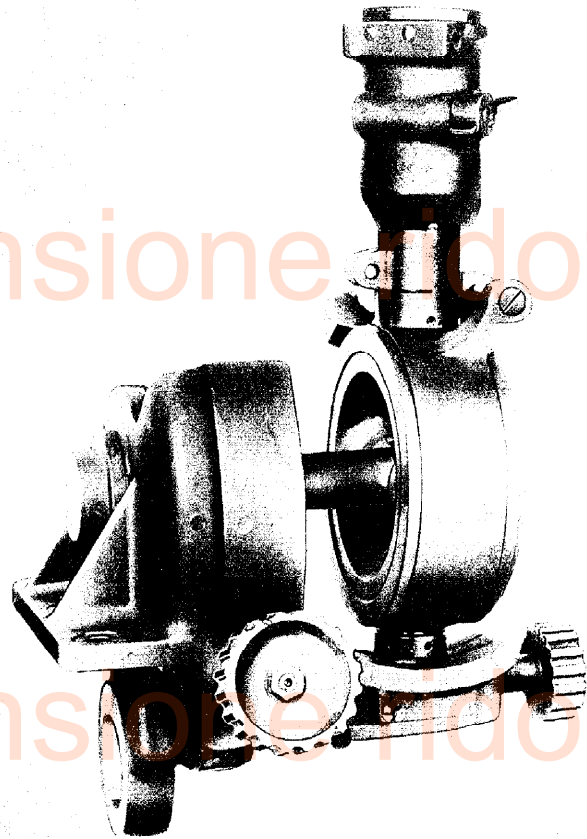
PANORAMIC TELESCOPE, M6

Panoramic Telescope	Instrument Light	Gun Carriage	Status of Carriage	Additional on-carriage equipment for this matériel
M6	M9	75 mm Gun Carriages, M1916, M1916A1, M1916M1, M1916M1A1	Limited Standard	Sight, M1916 (L.S.)
M6	M9	75 mm Gun Carriages M1917, M1917A1	Limited Standard	Rocking Bar Sight (L.S.)
M6	M9	2.95" V.M. Gun Carriage	Limited Standard	Sight, M1912 (L.S.)
M6	M9	155 mm Gun Carriage, M3	Substitute Standard	Quadrant Sight, M1918A1
M6	M9	155 mm Gun Carriages, M1917, M1917A1, M1918, M1918A1, M2	Limited Standard	Quadrant Sight, M1918A1 & M1918 (L.S.)
M6	M9	155 mm Howitzer Carriages, M1918A1	Substitute Standard	Quadrant Sight, M1918A1
M6	M9	155 mm Howitzer Carriages M1917, M1918, M1917A3	Limited Standard	Quadrant Sight, M1918 (L.S.)
M6	M9	8" Howitzer Carriage, M1917, U.S.	Limited Standard	Rocking Bar Sight, Type A (L.S.)
M6	M9	8" Howitzer Carriage, M1918, U.S.	Limited Standard	Rocking Bar Sight, Type B (L.S.)
M6	M9	240 mm Howitzer Carriage, M1918A2	Substitute Standard	Quadrant Sight, M1918A1
M6	M9	155 mm Gun Motor Carriage, M12	Standard	Quadrant Sight, M1918 (L.S.) Telescope, M53A1 Telescope Mount, M40

UNCLASSIFIED



TELESCOPE MOUNT, M18A1
(WITH SUBSTITUTE STANDARD PANORAMIC TELESCOPE, M5A5)



TELESCOPE MOUNT, M21A1

PANORAMIC TELESCOPES, M12 SERIES

Panoramic Telescope	Telescope Mount	Instrument Light	Gun Carriage	Status of Carriage	Other sighting equipment used with this material
M12	M18A1	M19	155 mm Gun Carriage, M1	Standard	Quadrant Mount, M1 Instrument Light, M12
M12	M18A1	M19	8" Howitzer Carriage, M1	Standard	Quadrant Mount, M1 Instrument Light, M12
M12	M30	M22 M35	240 mm Howitzer Carriage, M1, and 8" Gun Carriage, M2	Standard	Elevation Quadrant, M1 Quadrant Adapter, M10
M12	M25	M34	4.5" Gun Carriage, M1	Standard	-----
M12	M25	M34	155 mm Howitzer Carriage, M1	Standard	-----
M12A1	M22	M19	75 mm Gun Carriage, M2A3	Standard	Elbow Telescope, M14A1* Range Quadrant, M5 Telescope Mount, M23
M12A2	M21A1	M19	105 mm Howitzer Carriage, M2 series	Standard	Range Quadrant, M4 Telescope Mount, M23 Elbow Telescope, M16A1D*
M12A2	M21A1	M19	105 mm Howitzer Motor Carriage, M7, M7B1	Standard	Range Quadrant, M4 Telescope Mount, M42 Elbow Telescope, M16A1C*
M12A3	M21A1(S.) or M41A2 (L.S.)	M19	3" A.T. Gun Carriage, M6 3" A.T. Gun Carriage, M1A1	Standard Substitute Standard	Range Quadrant, M10C Telescope Mount, M23 Elbow Telescope, M29A1* Telescope Mount, M61A1 Telescope, M79C Instrument Light, M33 *Uses Instrument Light, M36.

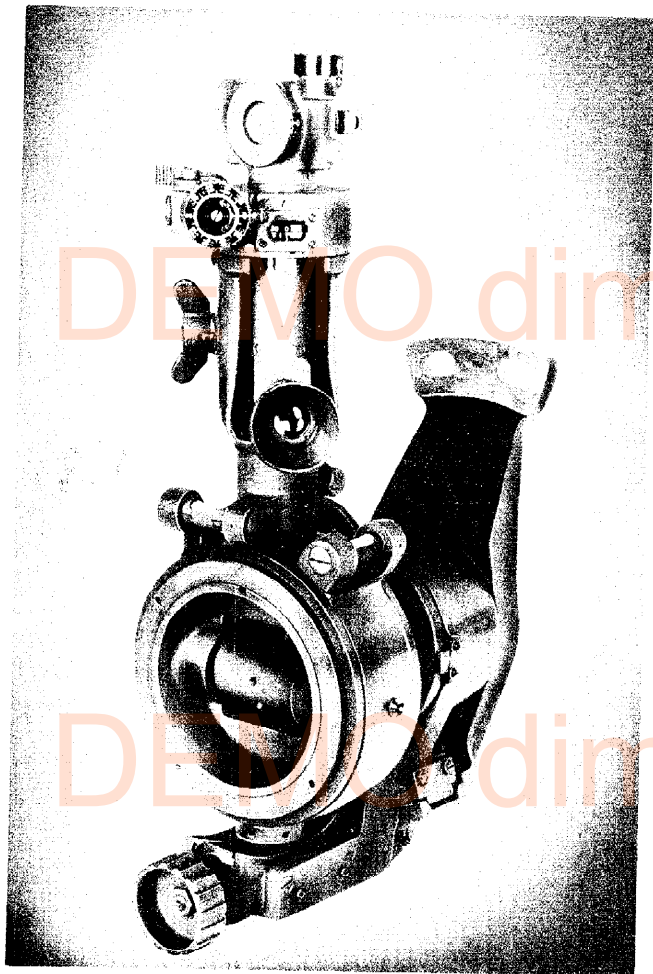
The main distinguishing point of this instrument is in its method of mounting, no separate mount being required. Instead, there is a T-lug on the telescope shank which fits into a corresponding T-shank which is in most cases located on the second item of sighting equipment.

Optical Characteristics of Panoramic Telescope, M12

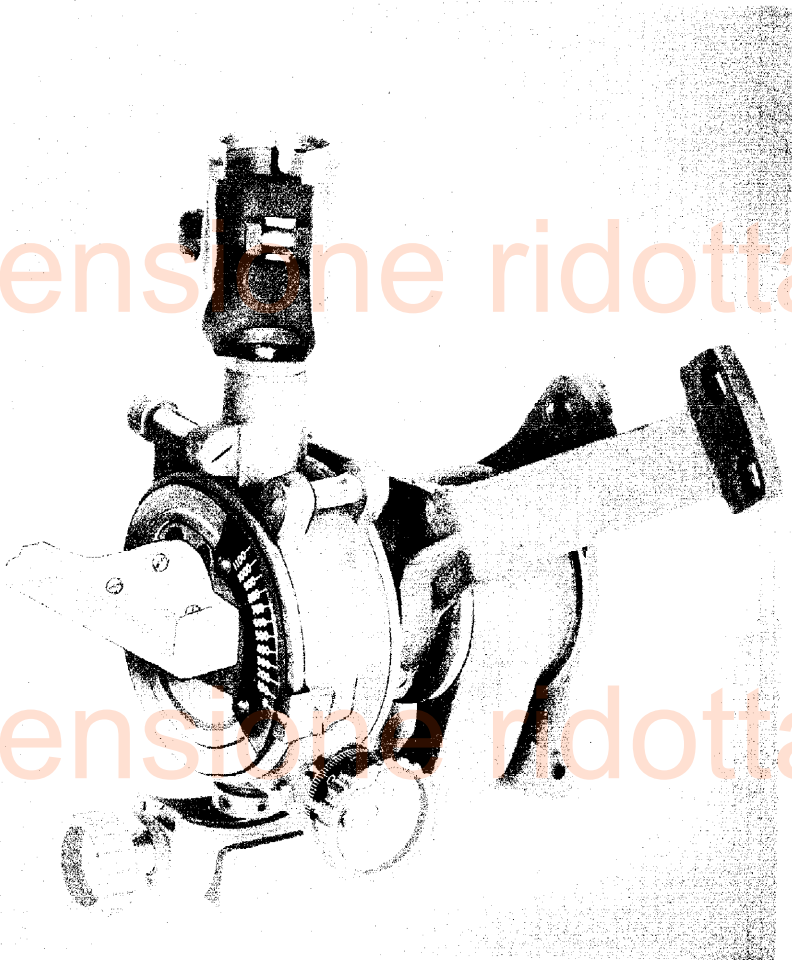
Power	4
Field of view	10°
Diameter of exit pupil	0.165"
Effective focal length of objective	4.004"
Effective focal length of eyepiece	1"

The four standard panoramic telescopes of the M12 series are identical except for the patterns of the reticles. In appearance and optical characteristics, they are similar to the M6.

UNCLASSIFIED



TELESCOPE MOUNT, M22
(WITH SUBSTITUTE STANDARD PANORAMIC TELESCOPE, M5A4)



TELESCOPE MOUNT, M25—LEFT REAR VIEW

PANORAMIC TELESCOPE, M12—The reticle has a horizontal and a vertical line intersecting at right angles. The horizontal line is graduated at 5-mil intervals, indicating 100 mils to the right and to the left of the center.

PANORAMIC TELESCOPES, M12A1, M12A2, M12A3—In addition to the central vertical and horizontal crosslines, the reticles of these telescopes have parallel horizontal and vertical lines below the central horizontal crossline to indicate the elevations for various ranges. The lines are spaced differently in each of the four models in order to apply to a specific weapon and ammunition. The number of the firing table from which the range-elevation data for graduating the reticle was taken is engraved at the bottom of each reticle.

Direct laying of these guns in both azimuth and elevation is therefore possi-

ble with the use of the panoramic telescope and mount only. Whenever possible, however, the panoramic telescope is used only for indirect laying of the gun in direction.

MOUNTS FOR PANORAMIC TELESCOPES, M12 SERIES—These mounts differ in the way in which they are affixed to the gun carriage. All of them have leveling, cross-leveling, and azimuth-compensating mechanisms, and a socket into which the panoramic telescope is inserted and firmly held in place.

TELESCOPE MOUNT, M18A1—This mount has a housing which is firmly bolted to the left side of the carriage. The mount does not elevate with the gun.

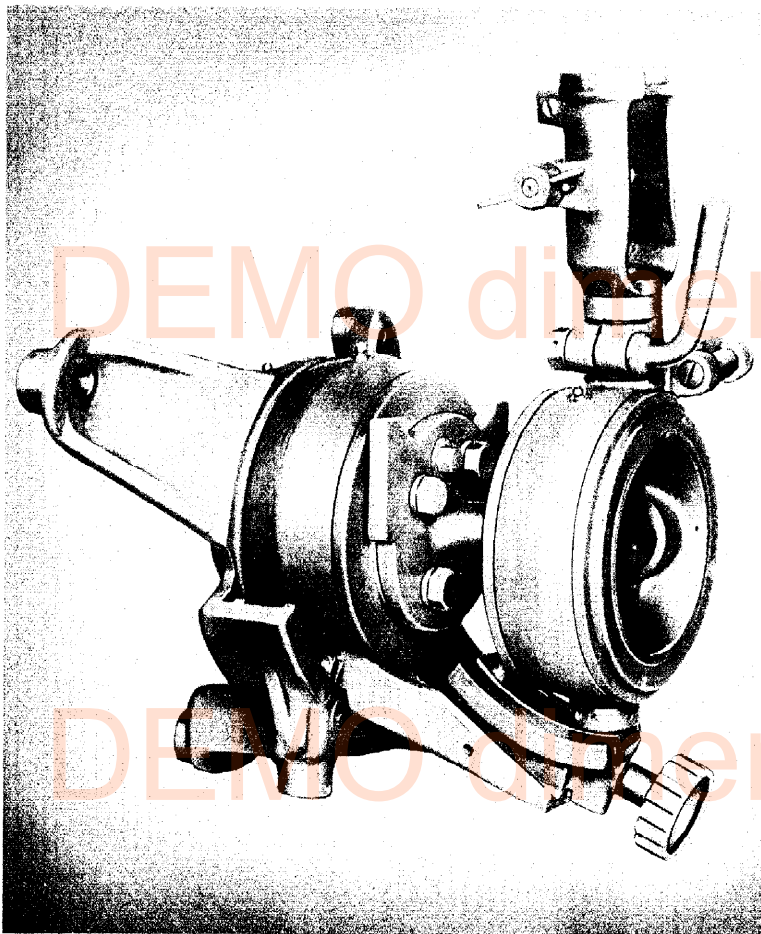
TELESCOPE MOUNT, M21—This mount has a bracket which fits over the left cradle trunnion, being attached to the cradle. The mount elevates with the gun.

TELESCOPE MOUNT, M21A1—This consists of Telescope Mount, M21, with a locking device added to the fore and aft leveling worms. It is standard for use on 3 inch matériel and on the 105 mm Howitzer Carriage, M2, and the 105 mm Howitzer Motor Carriage, M7.

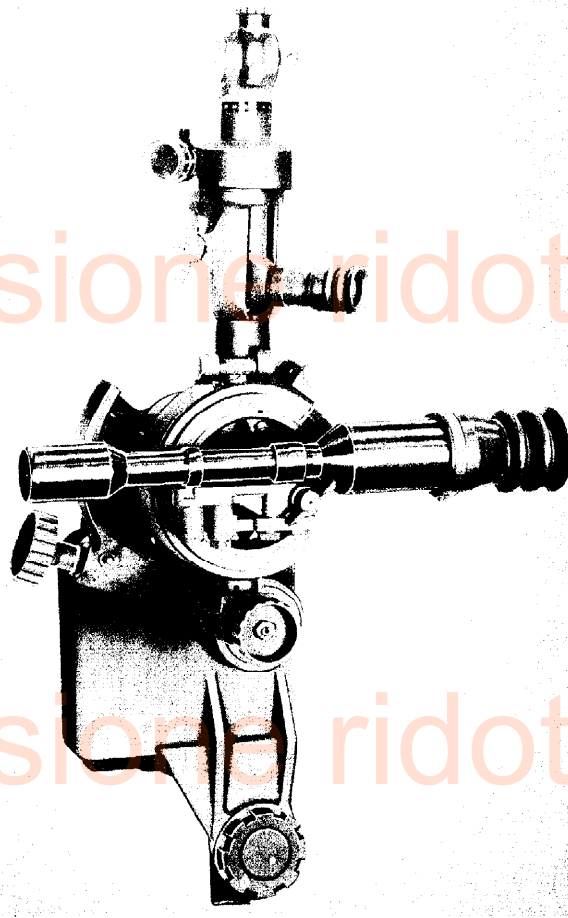
TELESCOPE MOUNT, M22—This mount is bracketed to the upper cross-arm on the gun cradle and is centered on a prolongation of the left trunnion extending into the actuating arm of the mount. It therefore rotates in elevation with the gun.

TELESCOPE MOUNT, M25—This mount, with the Panoramic Telescope, M12, constitutes the complete sighting equipment for the 4.5" Gun Carriage, M1, and the 155 mm Howitzer Carriage, M1. In addition to forming the support for the panoramic telescope, the mount has

UNCLASSIFIED



TELESCOPE MOUNT, M30



TELESCOPE MOUNT, M41A1, WITH PANORAMIC TELESCOPE, M12A3, AND DIRECT SIGHTING TELESCOPE

incorporated into it mechanisms for laying the weapon in elevation.

Attached to the mount are an actuating arm bracket and another bracket which is attached to the gun carriage. Both brackets are bolted to a third bracket which is, in turn, bolted to the end of the left trunnion.

The actuating arm bracket supports the pivot for the cross-leveling mechanism. The actuating arm itself acts as a pivot for elevating the longitudinal leveling mechanism.

The elevating mechanism is actuated by the elevating worm which causes the body assembly and the rocker to rotate about the actuating arm. The elevation scale is graduated at 100-mil intervals, from 0 to 1,100 mils with the 0 graduation indicating normal. An elevation micrometer covers 100 mils at 1-mil intervals.

TELESCOPE MOUNT, M30 — This mount follows the general pattern of mounts for the M12 series panoramic telescopes, and since it is never used for laying the gun in elevation, it is mounted so that it does not elevate with the gun.

TELESCOPE MOUNTS, M41A1 and M41A2 — LIMITED STANDARD — Telescope Mount, M41A1, was formerly standard for use on 3-inch antitank guns. It was designed to mount both a M12A3 panoramic telescope and a straight Telescope, M41. The latter was used for direct laying in a one-man, one-sight system. This mount was originally developed by modifying Telescope Mount, M21, by the addition of an 8 inch filler piece and a new actuating arm which had an extension and bracket on the outer end to support the straight telescope.

With the standardization of Telescope, M79C, and Telescope Mount, M61A1, in place of Telescope, M41, there was no longer any requirement for a panoramic telescope mount with additional facilities for the mounting of a straight telescope. Telescope Mount, M41A1, has therefore been reduced to limited standard, and the M21A1 is standard. All M41A1 mounts are to be made similar to the standard mount, M21A1, by modification to M41A2 status. This requires the removal of the 8 inch filler piece and the straight telescope holder and the addition of a locking device to the fore and aft leveling worms.

REFERENCES—OS 9-16; TM 9-305; TM 9-1545; TM 9-1548; TM 9-1551; TM 9-1552; TM 9-1553; TM 9-1583; TM 9-1584; TM 9-2005, v.5; TM 9-2674.

UNCLASSIFIED

STANDARD RANGE QUADRANTS

Range Quadrant	Gun Carriage
M3	75 mm Howitzer Carriages, M2A1, M3A1C
M3A1C	M3, M3A1, M3A2, M3A3
M4	105 mm Howitzer Carriages, M2, M2A1, M2A2
M5	75 mm Gun Carriage, M2A3
M8	105 mm Howitzer Carriage, M3A1
M10C	3 inch Gun Carriages, M1A1 and M6

A range quadrant is used for laying a gun or howitzer in elevation, for indirect fire. It is mounted on the right-hand side of the carriage so that any movement of the gun in elevation is imparted to the instrument.

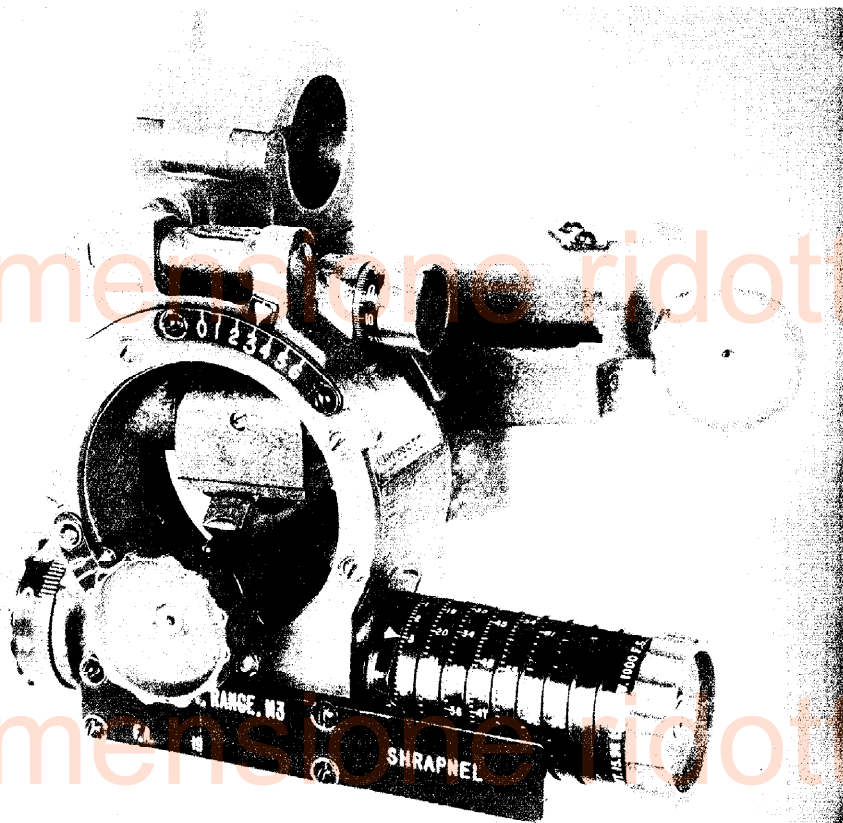
The five standard models of range quadrants are essentially the same, having the same general appearance, and performing the same functions. Each instrument has a cross-leveling mechanism, and a range-elevation mechanism which contains range and elevation scales. In addition, it has an angle-of-site level vial.

An elevation mechanism, which is contained in the elevating-worm housing, consists of an elevating-worm knob and accompanying mechanism, an elevation scale graduated into 100-mil intervals, an elevation micrometer covering 100 mils at 1-mil intervals, and a range drum.

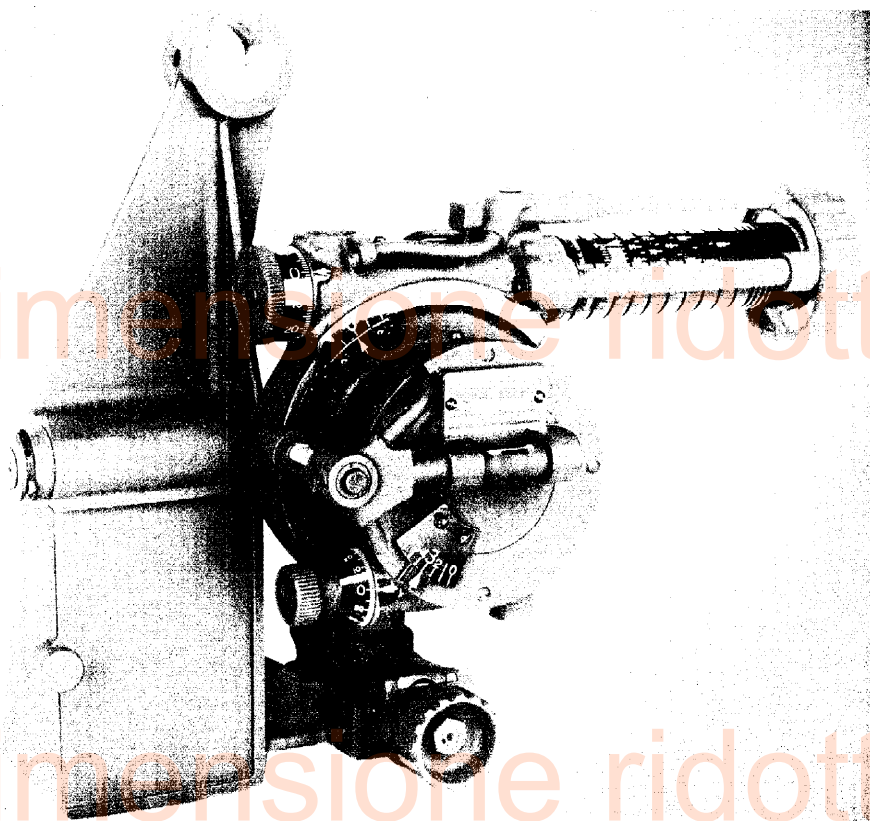
The angle-of-site scale, graduated in increments of 100 mils, represents a total of 600 mils. The normal angle of site is represented by the graduation "3." The angle-of-site micrometer is graduated into 100 equal spaces, each representing 1 mil. The centering of the longitudinal level vial indicates that the gun has been elevated to an angle equal to the angles shown on the scales. The angle-of-site mechanism is geared to the elevation mechanism, so that the angle of site and the angle of elevation are mechanically added together.

Each range drum is scaled for a specific weapon and a particular type of ammunition and powder charge. The drum is revolved until the index, which moves in a helical groove, is positioned at the desired range. At this time the correct elevation will be indicated by the elevation scale and micrometer.

RANGE QUADRANT, M3—This instrument is inserted in a socket in the sight bracket on the right side of the cradle. The Elbow Telescope, M5, is clamped into a socket in the upper part of the range quadrant. The range quadrant has a lateral deflection mechanism for use with this telescope in direct fire only.

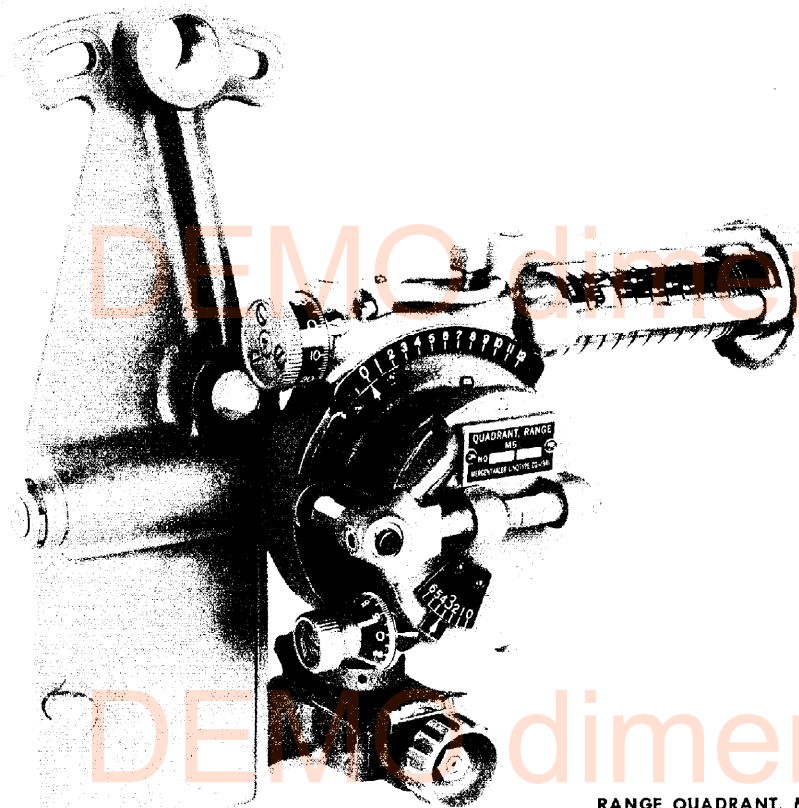


RANGE QUADRANT, M3 (M8 is similar except for change of range scales)

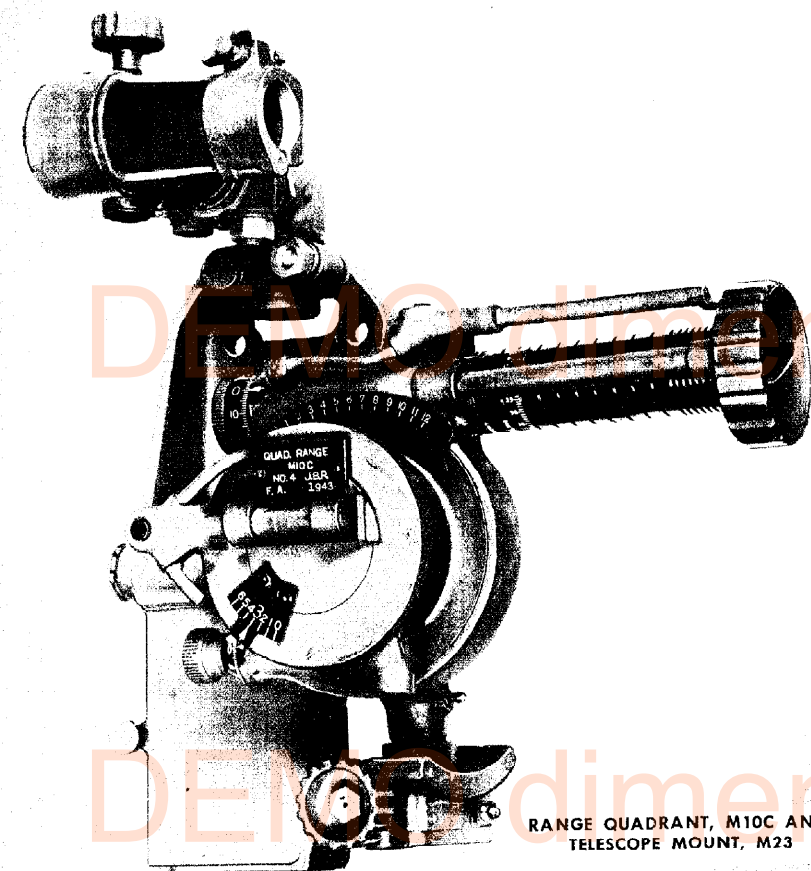


RANGE QUADRANT, M4

UNCLASSIFIED



RANGE QUADRANT, M5



RANGE QUADRANT, M10C AND TELESCOPE MOUNT, M23

UNCLASSIFIED

Illumination for the scales, levels and range drum is provided by means of Instrument Light, M18.

Range Quadrant, M3, has been reduced in classification to Limited Standard. All instruments will be modified to M3A1C status.

RANGE QUADRANT, M3A1C—Range Quadrant, M3A1C, consists of Range Quadrant, M3, modified to permit its use with the howitzer elevated up to 65°.

RANGE QUADRANT, M4—This range quadrant is mounted on a pad on the right side of the howitzer cradle. On a bracket in the upper part of this instrument are mounted the Telescope Mount, M23, and the Elbow Telescope, M16A1. Three range drums are provided, bearing range graduations for high-explosive shell for zones of fire III, V and VII.

A built-in lighting system with power supplied by four flashlight cells provides illumination for the elevation and angle-of-site scales and micrometers, the range drum, and the levels. The cells are contained in a battery box on the mounting bracket.

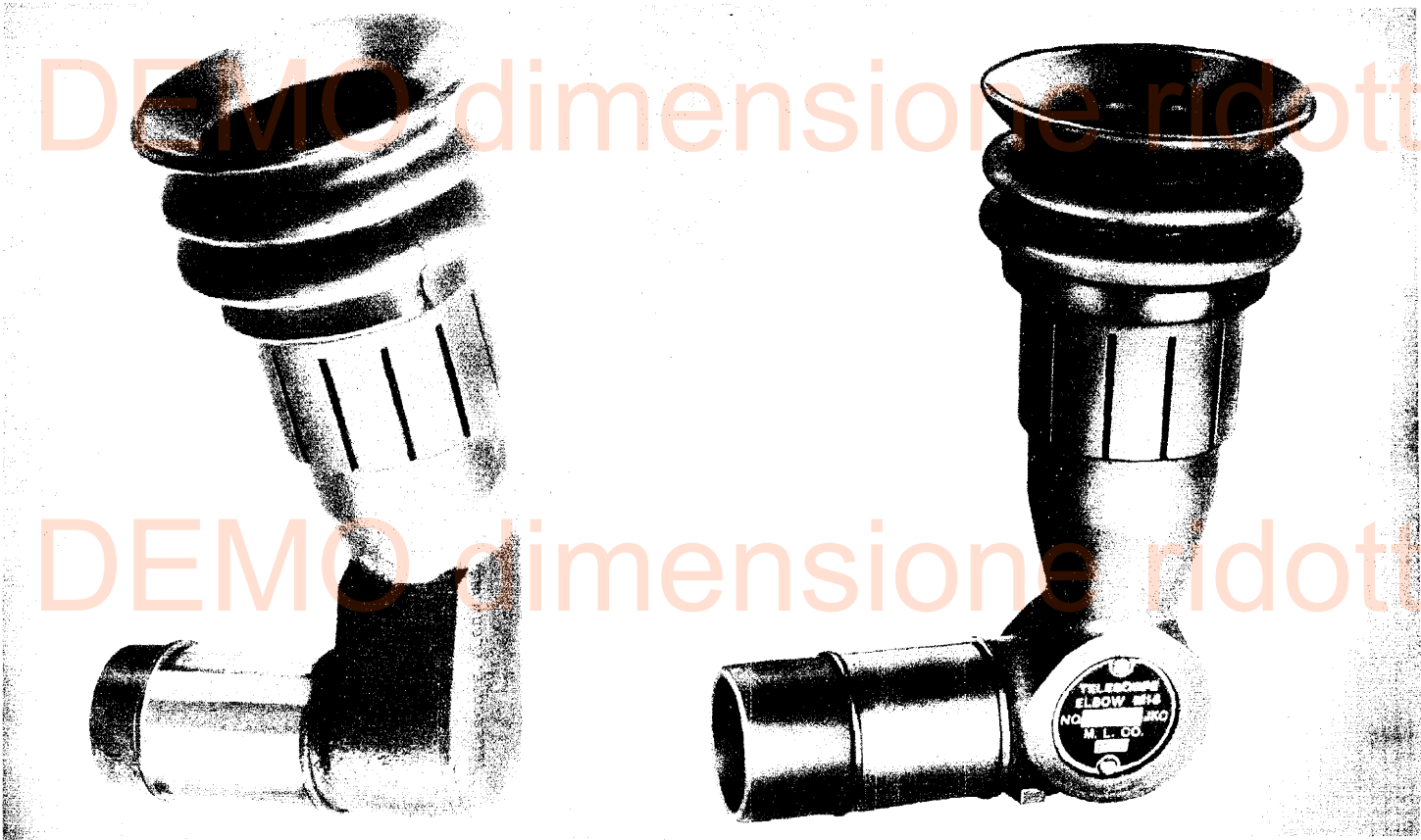
RANGE QUADRANT, M5—The mounting bracket of this instrument is supported on an extension of the right trunnion of the gun and on the guard of the gun cradle. The Telescope Mount, M23, which supports the Elbow Telescope, M14A1, is fastened to an extension on the upper part of this range quadrant. Four range drums are provided for use with four different kinds of ammunition. This instrument has a built-in lighting system similar to that used in the M4.

RANGE QUADRANT, M8—This range quadrant is mounted on a support on the right side of the howitzer cradle. The Elbow Telescope, M61, fits into a clamp in the upper part of the range quadrant. Only one range drum is provided. It is graduated in terms of the semifixed H.E. Shell, M1, with P.D. Fuze, M48, for zone IV. This range quadrant makes use of Instrument Light, M18.

RANGE QUADRANT, M10C—This range quadrant is similar to the M4 and M5 range quadrants, except that it has a range drum for the 3 inch H.E. Shell, M42, with Fuze, P.D., M48, muzzle velocity 2,800 feet per second, and mounts by four bolts without a trunnion pin support.

REFERENCES—TM 9-236; TM 9-1547; TM 9-1551; TM 9-1552; TM 9-2005, v. 5.

ELBOW TELESCOPES M5, M14A1, M16A1C, M16A1D, M29A1, M61 STANDARD—M14, M16, M29 LIMITED STANDARD TELESCOPE MOUNTS M23, M42, M50 STANDARD



ELBOW TELESCOPE, M5

ELBOW TELESCOPE, M14, M16, OR M29. THESE MODELS ARE IDENTICAL EXCEPT FOR DIFFERENCES IN THE RETICLES

These elbow telescopes are mounted on the right side of a gun or howitzer carriage and are used for laying the gun in elevation in direct fire. They are 3-power, fixed-focus, prism-erecting instruments, with line of sight always parallel to the axis of the bore of the gun. There is a 90° elbow, thus permitting the observer to face the side of the carriage while observing. Each telescope has a reticle etched with range lines applicable to the

ammunition used. Telescopes, M14A1, M16A1C, M16A1D, and M29A1, are each to be provided with a window for illumination of the reticle by means of Instrument Light, M36.

ELBOW TELESCOPE, M5—On either side of the vertical axis, the reticle is etched with a series of long and short horizontal lines, numbered to represent ranges from 400 to 3,000 yards. A letter "N" represents the normal line of sight.

This telescope has no separate mount, but is clamped into the upper part of the Range Quadrant, M3. The Range Quadrant has an azimuth worm knob, and when large lateral deflections are being applied, it may be used in order to bring the target within the field of view.

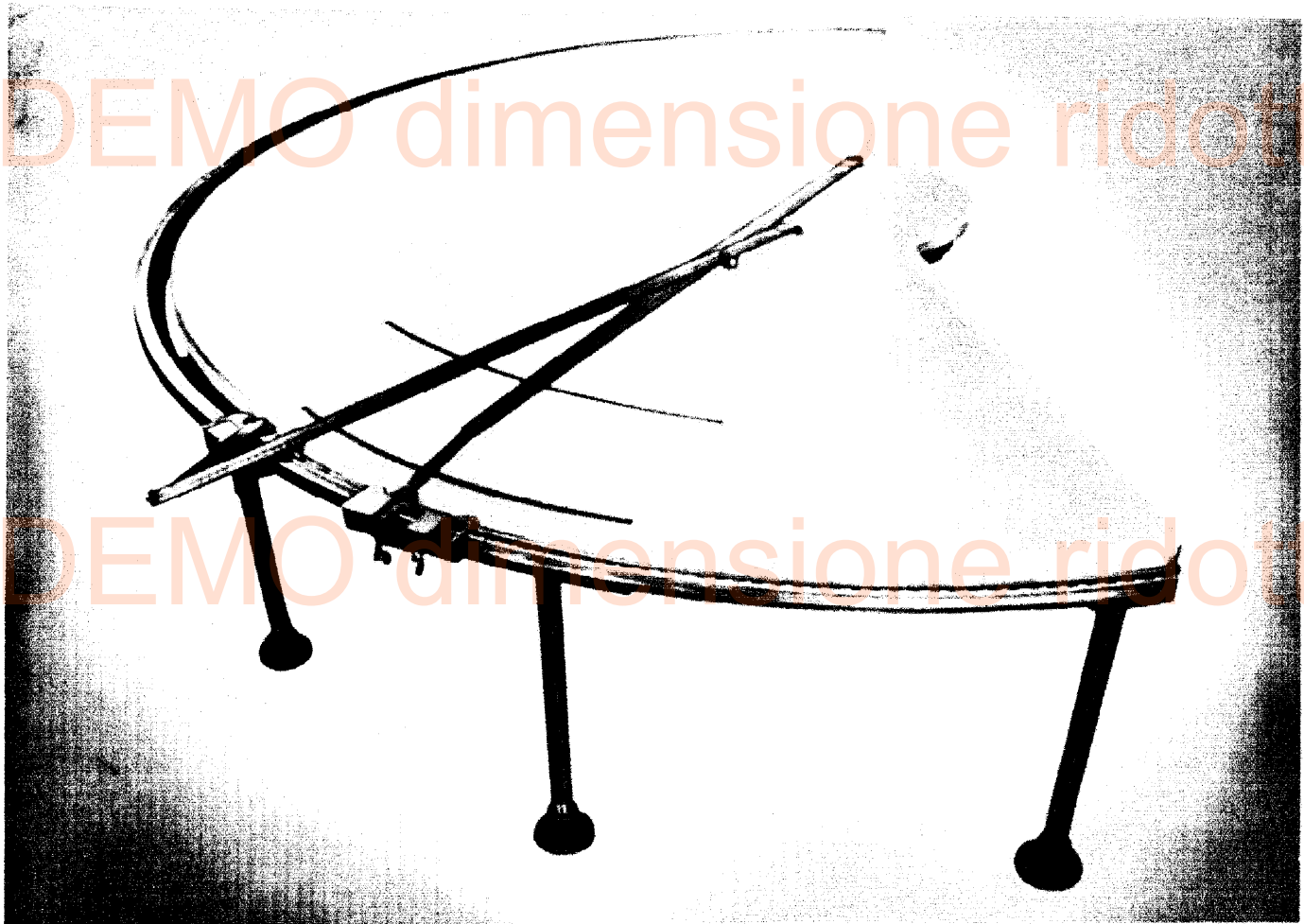
ELBOW TELESCOPE, M61—This instrument fits into a clamp in the Range Quadrant, M8. The reticle pattern has a normal point near the top and a series of

Elbow Telescope	Telescope Mount	Gun Carriage
M5	None	75 mm Howitzer Carriage, M3A1
M5	None	75 mm Howitzer Carriages, M2A1, M3
M14, M14A1	M23	75 mm Gun Carriage, M2A3
M14, M14A1	M23	75 mm Gun Carriages, M2, M2A1, M2A2
M16, M16A1D	M23	105 mm Howitzer Carriages, M2, M2A1, M2A2
M16, M16A1C	M42	105 mm Howitzer Motor Carriage, M7
M29	M23	3" Anti-tank Gun Carriage, M6, M1A1
M61	None	105 mm Howitzer Carriage, M3

UNCLASSIFIED

SUBMARINE MINE PLOTTING BOARDS

M9C, M9D, M9F STANDARD—M1906, M1918A1 LIMITED STANDARD

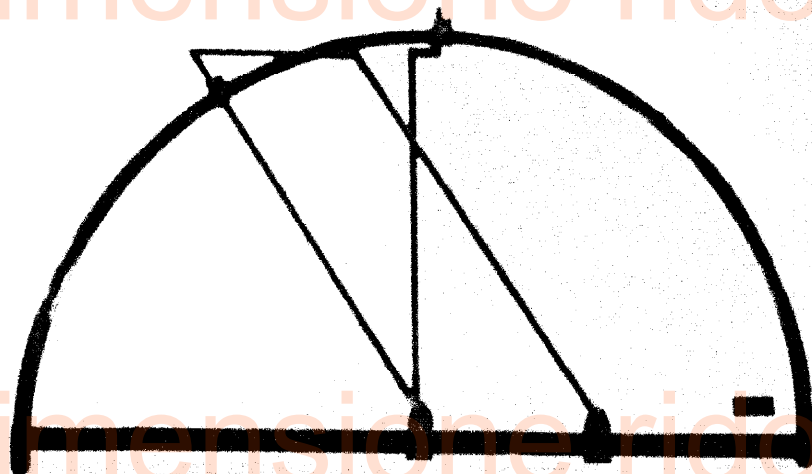


PLOTTING BOARD M9C

The submarine plotting board is a small scale representation of a mine field and is used for plotting the location of mine fields and the course of a moving target in relation to them.

SUBMARINE MINE PLOTTING BOARD, M1906 This is a semi-circular plotting board with a 13-inch plotting radius. Attached to the circular edge is an arc with circle in which index boxes ride. A baseline arm, scaled in ten divisions per inch, which will accommodate itself to the scale of the station arms being used, is placed on the diameter.

The primary arm, representing the primary station, is graduated according to the same scale. It is pivoted from the center of the board, and has an index box



SUBMARINE MINE PLOTTING BOARD, M1906

UNCLASSIFIED

LEAF 15, 2000



U.S. GOVERNMENT PRINTING OFFICE: 1944

SUBMARINE MINE PLOTTING BOARDS M9C, M9D, M9F, M1906, M1918A1 (Continued)

on its outer end for indicating the azimuth at which the arm is set.

The secondary arm is pivoted from a sliding block which is set at the point on the base line corresponding to the distance of the secondary station from the primary station. The secondary station index box is attached to the arm by a coupler representing the distance between the two stations. An auxiliary arm is pivoted from the center of the board and is attached to

the index box of the secondary arm. It provides a means of keeping the secondary arm parallel to a radius from the center of the board.

SUBMARINE PLOTTING BOARD, M1918A1—This is a larger plotting board with a plotting radius of 75 inches. The board is not a full semicircle, for the azimuth circle covers only about 160°. The base line is not a diameter of a circle, perpendicular to the normal azimuth of the

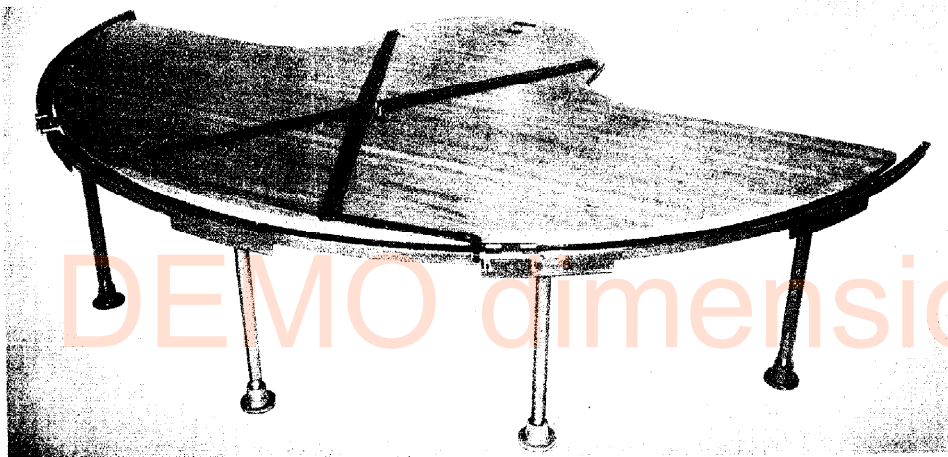
board. The stations are attached permanently to a fixed plate on sleeves correctly positioned in distance and direction from the center of the circle. No auxiliary arm is needed, and the primary and secondary arms are coupled directly to the index boxes. Each coupler is equal in length to the scaled distance between the station represented and the center of the azimuth circle. The index boxes have subscales for reading the azimuths of the station arms to .05°.

PLOTTING BOARD, M9C—The standard submarine plotting board is an adaptation of Plotting Board, M4, with a plotting radius of 67½ inches and a scale of 150 yards to an inch. It has been standardized in place of the M1906 and the M1918A1 to facilitate production.

PLOTTING BOARD, M9D—This is the M9-type board, scaled at 300 yards per inch.

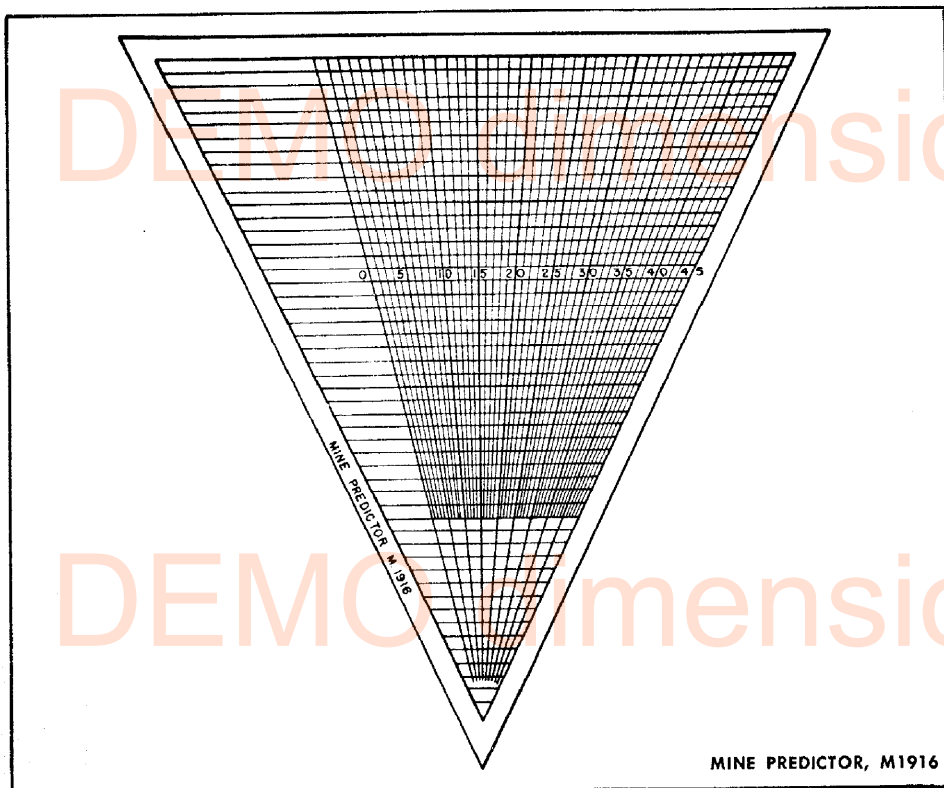
PLOTTING BOARD, M9F—This is the M9-type board, scaled at 100 yards per inch.

REFERENCES—TM 9-1570; TM 9-2571.



SUBMARINE PLOTTING BOARD, M1918A1

MINE PREDICTOR M1916—STANDARD



The mine predictor is used in conjunction with the submarine mine plotting board for determining when a moving target will arrive at the location of a mine. The instrument is a triangular piece of xylonite marked into a series of similar triangles. The radial lines represent time at 5-second intervals ranging from 0 on the left to 45 seconds on the right-hand edge. Between the left side of the predictor and the 0-second line is a wider triangle with radial lines representing the travel of the target in 15 seconds.

The course of the target is plotted on the plotting board at 15-second intervals, therefore the distance traveled in 15 seconds can be quickly ascertained. The predictor can be placed on the last plotted position of the target so that the distance between the left-hand edge and the zero graduation is equal to the distance traveled in 15 seconds. The time required for the target to reach the nearest mine can be read on the predictor.

REFERENCE—FM 4-6.

BINOCULARS M2, M13, M15A1, M17—STANDARD

BINOCULARS M3, M7, M8, M9, Mk 21A1—SUBSTITUTE STANDARD

BINOCULARS M6, M15—LIMITED STANDARD

BINOCULAR M2—This instrument is standard to meet all requirements for an 8-power, 56-mm objective binocular. It is designed with a large objective for use as a night glass. At present, it is supplied only to the Engineer Corps for use at searchlight control stations. Binoculars M7 and M15A1 are substitute standard for this requirement.

BINOCULAR M15—This is a 7-power, 50-mm objective binocular, which has been waterproofed to enable it to withstand a 5-minute submersion test. It is limited standard for use by the Engineers and the Air Forces, as well as for other services requiring a large objective binocular.

BINOCULAR M15A1—Binocular M15, modified to permit the use of Filter M1, is standard for issue to the Army Air Forces. It consists of the M15 with the soft rubber eyeshields and the polarized filter and associated mechanism removed. New plain phenolic eyeguards to accommodate Filter M1 are added.

BINOCULAR M13—This is the standard instrument to meet all requirements for a 6-power, 30-mm binocular. It has a field of view of 8° 30'. This instrument was recently adopted as Standard for procurement in lieu of Binoculars M3, M8, and M9, which are now Substitute Standard. The M13 is made to the same specifications as the M3, M8, and M9, except that whereas the latter are subjected to a rain test, the M13 is required to meet a 5-minute submersion test. Another binocular of this group is the limited standard M6 which is similar to the M3, M8, and M9. It was originally procured for the British only and had reticle graduations to meet their needs. Since it has been issued to the U. S. Army Air Forces, it has been given a standard designation.

BINOCULAR M16—This is an unwaterproofed 7 x 50 binocular, with a reticle similar to that of the M13 type of instrument. This binocular is used in limited quantities by cavalry, infan-

try, and armored units with special requirements for a binocular with a reticle for laying the gun and for spotting. It has better light gathering qualities and higher magnification than the M13 type binocular but is substitute standard for the M17 because it is less waterproof than the latter. This binocular without the reticle is designated M7.

BINOCULAR M17—This consists of Binocular M15, modified by the addition of a reticle. It is standard for issue to those units requiring such an instrument.

BINOCULAR MK. 21A1—This is a 7 x 50 waterproofed Navy binocular. It has been adopted as substitute standard for issue to the Air Forces with case and neck straps but without spare parts.

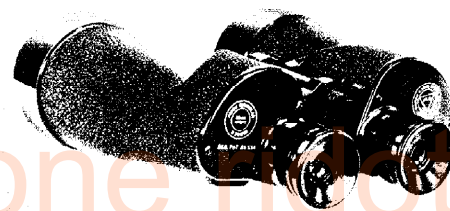
All these instruments have porro-prism erecting systems.

FILTER M1—This variable density filter is to be issued as a standard accessory for every Binocular M3, M6, M7, M8, M9, M13, M15A1, M17, and Mk 21A1. These filters prevent glare and permit observation in conditions of strong light without damage to the eyes. The filter consists of two pairs of polarizing disks, mounted in a frame which can be attached to the eyeguards. Each disk is a sheet of polarizing film between glass. Each pair of disks consists of a fixed disk which serves to neutralize reflection from horizontal surfaces, and a movable disk. The movable disks may be rotated concurrently by means of either of two levers. When in the same axial position as the fixed disk, maximum light transmission is permitted. When rotated 90° from the original position, only a small fraction of the incident light is transmitted. The advantage of this filter is that the light transmission may be varied to suit almost all conditions of visibility.

REFERENCES—TM 9-2005, vol. 5; TM 9-575.

CHARACTERISTICS

	M2	M15A1, M17, Mk 21A1	M3, M6, M8, M9, M13	M7, M16
Magnification	8X	7X	6X	7X
Diameter of entrance pupil	56 mm	50 mm	30 mm	50 mm
Diameter of exit pupil	7 mm	7 mm	7 mm	7 mm
Field of view	100 mils	127 mils	150 mils	127 mils
Weight less strap	50½ oz.	52 oz.	22.25 oz.	41 oz.



BINOCULAR M2



BINOCULAR M8



BINOCULAR M15



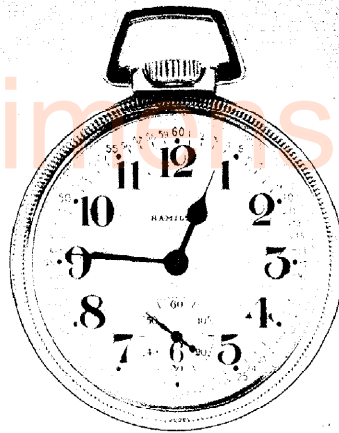
BINOCULAR WITH FILTER M1

UNCLASSIFIED

WATCHES—STANDARD



POCKET WATCH, 15 OR MORE JEWELS



POCKET WATCH, RAILROAD GRADE



STOP WATCH, TYPE B, CLASS 15

POCKET WATCH, 15 OR MORE JEWELS

—This watch has luminous-coated hour and minute hands and a black second hand. It has black minute and second graduations, and small red numerals to indicate 1-minute intervals.

POCKET WATCH, RAILROAD GRADE

—This 21-jewel watch is authorized for railway use. It has black numerals and blued-steel hands. The case has a nickel-finish surface.

WRIST WATCH, 7 OR MORE JEWELS—

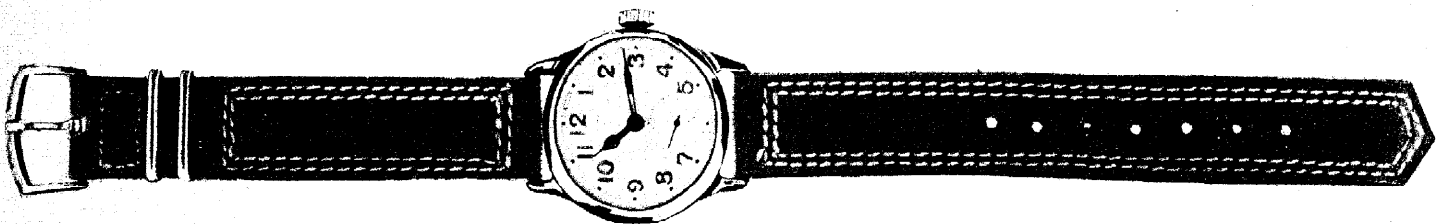
This watch is authorized for issue to all services. The hour and minute hands and hour numerals are luminous-coated for night use. The instrument is somewhat resistant to water and shock. The wrist strap is of water-proof canvas instead of the leather or webbing which was formerly used.

STOP WATCH TYPE B, CLASS 15—

This 15-jewel watch has a second dial registering up to 60 seconds in $\frac{1}{5}$ second

intervals, and a minute dial registering up to 30 minutes in 1-minute intervals. It is controlled by pushing the crown or the pushpiece which extends through the crown.

O.C.M. 19034, 15 Oct. 1942, requires that all watches procured in the future be equipped with a 24-hour face by superimposing figures 13 to 24 in red within the standard 12-hour figures. All watches must successfully pass a test for water resistance.



WRIST WATCH, 7 OR MORE JEWELS

MESSAGE CENTER CLOCKS M2—STANDARD, M1—LIMITED STANDARD

These clocks are timepieces of proven accuracy which are used in message centers. The M1 clock has two adjustable hour hands, one of which is used to indicate the hour in the operation zone and the other to indicate the hour at the point of origin of the message. The timepiece has a black dial and white, radium-inset hands and hour numerals. As in all Ordnance timepieces, there is an inner set of figures from 13 to 00 so that the hours can be read easily according to the 24-hour system. The minute hand is set by an outside stem and the clock has a high-grade, 8-day movement. Accuracy to within 30 seconds in 24 hrs. at temperatures from 0° to 105°F. is one of the specifications of the message center clock.

A carrying case is provided for this clock. It can be opened out to serve as a table support when necessary.

MESSAGE CENTER CLOCK, M2—This clock has a dial 6 inches in diameter. The instrument is moisture resistant, but not completely waterproof and dustproof.

MESSAGE CENTER CLOCK, M1—This timepiece has a dial 4½ inches in diameter and is less moistureproof than the M2.



MESSAGE CENTER CLOCK, M1

BORE SIGHTS—STANDARD

A bore sight is used to determine whether the axis of the bore is properly oriented for direction. Each bore sight consists of a breech element and a muzzle element, designed for one particular model of gun only. In most cases this model number is engraved on the breech element. Several types of bore sights are standard.

For most weapons, the breech element is a disk which fits into the breech end of the gun. There is a small hole in the center for sighting and four large holes used in grasping the disk. The muzzle element for small arms and light Field Artillery consists of black linen cord which is stretched across the muzzle of the gun through notches on the muzzle. A web belt is fastened around the muzzle and holds the cord in place.

For larger weapons the muzzle element is a second metal disk with center clearly indicated by intersecting chords.

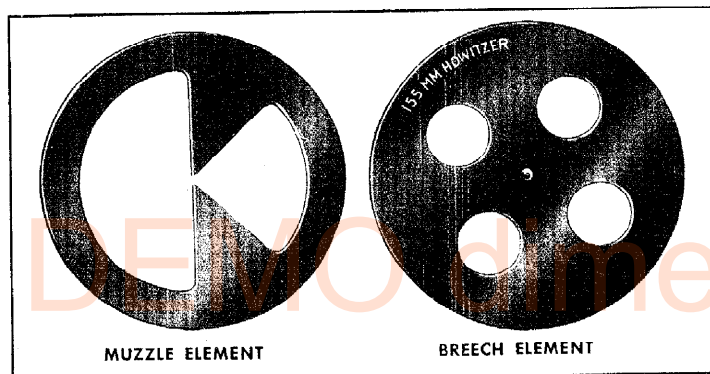
BORE SIGHTS, M10 AND M12—These bore sights are standard for use with 37 mm antiaircraft guns. The M10 is used in the breech and the M12 in the muzzle. The breech bore sight consists of a metal tube which is inserted in the bore and a mirror held at a 45° angle behind the tube. The mirror permits bore sighting by looking down from above the tube extension. It is thus unnecessary to remove the back plate, the driving rod assembly, and the lock frame as must be done when the ordinary type of breech bore sight is used.

The muzzle bore sight consists of a tube which is inserted in the muzzle of the gun. There are two cross wires for use in the actual bore sighting. On the projecting end are three arms which are visible from the rear of the gun. These serve as a warning to the gun crew of the presence of the bore sight.

Procurement of these is being held pending results of tests of Bore Sight Kit, T5.

BORE SIGHT, M17—This breech bore sight, standard for the 40 mm Antiaircraft Gun, M1, is used in conjunction with the conventional type of muzzle bore sight. It consists of a disk which fits into the breech of the gun, with a mirror positioned at a 45° angle to permit bore sighting from above without any disassembly of the weapon. The bore sight is correctly positioned by means of a small lug on the forward end which fits into a notch in the barrel. Not only does the lug serve to hold the bore sight in proper vertical alignment, but its upper part interferes with the barrel lock and prevents the closing of the top cover when the bore sight is in the breech.

REFERENCES—FM 4-15; TM 9-2005 vol. V.



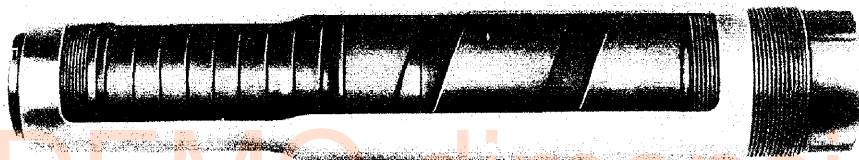
BORE SIGHTS FOR 155 MM HOWITZER

UNCLASSIFIED



BORE SIGHT, M17

20 MM AUTOMATIC GUN AN-M2 (Continued)



CUTAWAY VIEW OF 20 mm AN-M1 ADAPTER



20 mm ADAPTER, M6



20 mm ADAPTER, M7, WITH MUZZLE BRAKE, M1

ter are used together, the muzzle brake must be replaced by a thread protector.

SEAR-ACTUATING MECHANISMS—

Electric Trigger, AN-M1, is designed to fire the 20 mm guns in airplanes that are equipped with 24-volt electrical systems. It consists essentially of a mounting plate assembly and solenoid body and is attached to the receiver plate of the gun. The solenoid plunger and attached sear shaft are moved magnetically against spring tension by a force of approximately 75 pounds to depress the sear and fire the gun.

Sear Mechanism, M1, uses a bowden cable to move a sear spring plunger against the sear. A groove in the bowden connection shaft accommodates a safety trigger pin operated by a safety lever which is held in two positions, "Safe" and "Fire."

CHARGERS—Hydraulic Charger, M1, is used with Naval installations of the 20 mm AN-M2 gun where it is required that the gun be charged or "safetied" by remote control.

Manual Charger, M2, was previously designated as the B6 charger by the U.S.A.A.F. It consists essentially of a flanged charger slide for engaging and retracting the bolt assembly.

FEED MECHANISMS—The 20 mm Feed Mechanism, AN-M1A1, utilizes the recoil energy of the gun to draw a belt up to the gun, separate the rounds from the disintegrating links, and feed the rounds, one at a time, into the breech of the gun. This feed mechanism is made for both right-hand and left-hand feeding.

In the cylindrical metal case of the AN-M1A1 feed mechanism four sprockets, with hubs keyed on a rotatable central shaft, form an assembly which rotates as a whole. A link-ejector bracket is mounted on the hub of the front sprocket, a front feed lever carrying a last round retainer is mounted on the hub of the center sprocket, and a rear feed lever is mounted on the hub of the rear sprocket. The fourth sprocket was added in the AN-M1A1 mechanism at the forward position of the shaft to aid in supporting the projectile. Riveted to the front sprocket is a driving spring case within which is a spiral driving spring.

The mechanism is operated by the tension of the initially wound driving spring, this tension being maintained by the recoil of the gun which actuates a charging cam assembly. A recoil of approximately $\frac{1}{16}$ inch is required to operate the feed properly. As each round leaves the mouth, the driving spring acts in the driving spring case to rotate the shaft and the feed sprockets, thus feeding another round into the mouth.

Changes distinguishing the AN-M1A1 feed mechanism from the AN-M1 included an increase in the torsional pull of the spring from 180 pounds to 210 pounds, welding of the clutch into one piece, and hardening of the lips of the feed mouth to reduce wear.

The cartridges and disintegrating links can be assembled into a belt by hand or by means of the 20 mm Ammunition Linking Machine, M4.

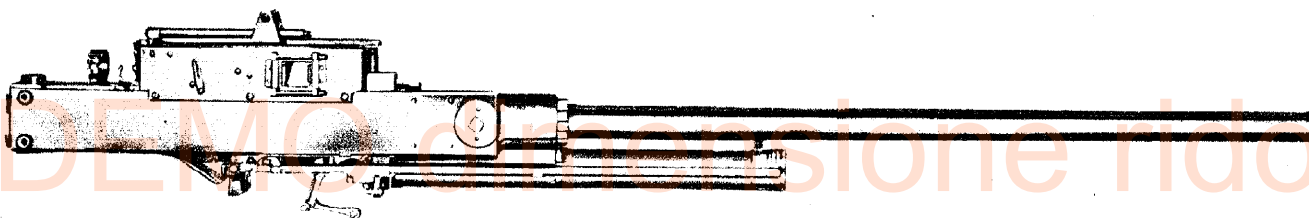
The 20 mm 60-round Magazine, M1A1, is operated by spring tension alone. Initial tension is applied during assembly and further tension is applied progressively in loading. The tensioned spring acts through the tensioning tube, feed arm axis tube, and feed arm to maintain the platform or follower in contact with the last round. Thus a round is always in position in the magazine mouth. The M1A1 magazine differs from its predecessor, the M1, in that the spring was changed to that used with the Oerlikon magazine, the spring case cover was changed from a forging to a stamping, and an improved method of fastening the spring to the case was adopted. A muzzle brake must be used with this magazine as it does not perform the function of the Feed Mechanism, AN-M1A1, in absorbing a portion of energy from the recoil.

FIRING CYCLE—When the sear is depressed, releasing the bolt assembly, the driving spring forces this bolt assembly forward, picking up the round from the mouth of the feed mechanism and forcing it into the chamber. When the round is chambered and the bolt assembly is in the forward position, the bolt lock drops into position and releases the breechblock slide assembly which allows the driving spring and breechblock slides to carry the firing pin forward to strike the primer. As the projectile passes the gas port a pressure is exerted against the gas piston which actuates the bolt-unlocking mechanism. The bolt is then forced backward by the then-existing pressures in the chamber and the force of the piston rods, compressing the driving and buffer springs. Extraction is accomplished by an extractor on the face of the bolt and ejection of the round is done by an ejector attached to the magazine slide upon which the feed mechanism is mounted. For automatic firing the sear is held in a depressed position, allowing the gun to fire continuously until the sear is released to engage the bolt assembly at the rear of the receiver.

AMMUNITION—This is issued in the form of fuzed complete rounds of fixed ammunition, classified as high-explosive-incendiary, armor-piercing, or ball. The M1, AN-M2, and British Hispano-Suiza guns fire the same ammunition. Service ammunition includes cartridge, H.E.I., Mk. I, with fuze, percussion, D.A., no. 253, Mk. III/A/; cartridge, A.P.-T., M75; and cartridge, projectile, ball.

REFERENCES—*Guns, M1 and M2*: O.C.M. 16429, 16530; *Gun, AN-M2*: O.C.M. 18019, 19654; *Adapter, AN-M1*: O.C.M. 17820, 18109; *Adapter, M6*: O.C.M. 20968; *Adapter, M7*: O.C.M. 20853; *Manual Charger, M2*: O.C.M. 21192; *Feed Mechanism, AN-M1A1*: O.C.M. 20746, TM 9-227.

37 MM AUTOMATIC GUN M4—STANDARD



37 MM AUTOMATIC GUN, M4

The 37 mm Automatic Gun, M4, is a plane-to-plane and plane-to-ground weapon with a muzzle velocity of 2,000 feet per second and a cyclic rate of 150 rounds per minute. The armor-piercing projectile, M80, fired from this gun will penetrate 1 inch of homogeneous armor plate at 500 yards. The gun is constructed to fire in any position, all of its parts functioning independently of gravity. It is magazine fed and may be fired manually or by remote control through a solenoid mounted at the rear of the gun. The 37 mm Gun, M4, was standardized from Limited Procurement type, T9, in December, 1939.

Recoil and counter-recoil are controlled hydraulically by means of a piston and spring combination connected to the recoiling parts and operating in an oil-filled recuperator cylinder mounted on the stationary trunnion block assembly. The recoiling parts of the gun include the tube and tube extension, the recuperator piston and piston rod, the lock frame assembly, the driving spring assemblies, and the breechblock assembly. The nonrecoiling parts include the trunnion block group, the feed box and feeding mechanism, the recuperator cylinder and bushing, the back plate group, and the manual charger assembly.

MOUNTS—The gun may be mounted in either a flexible or fixed mount, as provided by the Air Force.

FEEDING MECHANISM—As the gun was originally designed, ammunition could be fed by a 5-round clip, a 15-round link belt, or a nondisintegrating 30-round endless belt (horsecollar) magazine. The 30-

round endless belt Magazine, M6, is now used exclusively with this gun. The M4 gun feeds only from left to right. Mounted on the trunnion block assembly is the feed box containing the feed mechanism which draws the belted ammunition from the magazine and feeds it into the gun automatically. The 30-round endless belt Magazine, M6, is an oval-shaped framework providing a track for the endless belt. The articulated link belt contains 33 clips, although only 30 rounds are ordinarily loaded into the magazine. Modified M6 magazines are provided with a loading index, the purpose of which is to provide a lock for the belt when the feed slide is half-way across the full travel and thus reduce double feeding, particularly when the magazine is half empty.

FIRING CYCLE—Initial loading and cocking of the gun are accomplished manually. A safety feature incorporated in the design of the trigger mechanism prevents firing the round until the breechblock assembly is in the battery position.

The breech is locked and unlocked by recoil action which brings the operating lever guide pins against cams to raise and lower the breechblock. The function of the breechblock is to assist in the final chambering of the round, close the breech, and actuate the trigger trip. It also provides a mounting for the firing pin.

The lock frame, during automatic firing, is retracted by recoil action and is forced forward by the driving springs. The major function of the lock frame assembly is to force the cartridge into the chamber, actuate the breechblock, fire the round by means of the hammer striking the fir-

CHARACTERISTICS

Weight of gun.....	213 lb.
Weight of 30-round Magazine, M6 (empty).....	35.5 lb.
Length of gun overall.....	89.5 ins.
Weight of projectiles	
H.E., M54.....	1.34 lb.
Practice, M55A1.....	1.34 lb.
A.P., M80.....	1.66 lb.
Muzzle velocity	
H.E., M54.....	2,000 ft./sec.
Practice, M55A1.....	2,000 ft./sec.
A.P., M80.....	1,825 ft./sec.
Maximum powder pressure.....	23,200 lb./sq. in.
Length of recoil.....	9 ⁵ / ₈ ins.
Rate of fire.....	150 rds./min.

ing pin, extract the cartridge case from the chamber, and operate the ejector.

The back plate assembly, by absorbing the energy of the lock frame, reduces the shock against the carrier pin as the lock frame is latched to the rear.

The driving spring assemblies hold the lock frame against the carrier dog until the carrier is released by the carrier catch which is pivoted by the incoming round. The springs then drive the lock frame assembly forward, to operate the ejector, chamber the round, and raise the breechblock.

Initial extraction occurs during recoil. Extraction, ejection, feeding, and loading are accomplished during counter-recoil. If the trigger is held in the firing position, the gun will continue to fire automatically until the magazine is empty.

AMMUNITION—Ammunition is issued in the form of fixed rounds, consisting of H.E. shell, M54, with P.D. fuze, M56; practice shell, M55A1, with dummy fuze, M50; and A.P. shot, M80.

REFERENCES—O.C.M. 15542, 15619; TM 9-240.

UNCLASSIFIED

37 MM AUTOMATIC GUN M9—STANDARD



37 mm AUTOMATIC GUN, M9—RIGHT-HAND FEED GUN—LEFT SIDE VIEW

The 37 mm Gun, M9, is a fully automatic aircraft weapon firing high-explosive and armor-piercing projectiles at a rate of 140 rounds per minute. The muzzle velocity of this gun firing the 1.66-pound A.P. round, M80, is 3,050 feet per second and this shot will penetrate 3.1 inches of homogeneous armor plate at 500 yards. It is therefore an effective plane-to-plane and plane-to-ground weapon. Basically a modification of the 37 mm Antiaircraft Gun, M1A2, the M9 gun was standardized in January, 1943.

The 37 mm Gun, M9, may be mounted in the propeller shaft or in the wings, for which right- and left-hand disintegrating link belt feed mechanisms are provided. It is fired electrically by remote control but it is not designed for synchronized firing between the propeller blades.

The major components of the gun are the trunnion block group, the tube and tube extension, the recuperator group, the lock frame assembly, the breechblock assembly, the back plate group, the driving spring assemblies, and the feeding mechanism. The trunnion block group may be considered as housing the gun, as it provides for mounting the weapon and supports all the operating mechanism. The breech end of the one-piece tube screws into the tube extension, the tube extension in turn being connected to the hydraulic recuperator mechanism by means of the piston rod and nuts. The breechblock is of the vertical drop type, automatically operated.

The gun consists of two distinct groups,

recoiling and nonrecoiling. The nonrecoiling unit contains the trunnion block group, the feed box and feed mechanism, the recuperator, the recuperator bushing, the expansion chamber, and the back plate group. The recoiling portion of the gun consists of the tube and tube extension, the recuperator piston and piston rod, the lock frame assembly, the driving spring assemblies, and the breechblock assembly.

MOUNTS—The gun may be mounted on either a fixed or flexible mount as provided by the Air Force.

OPERATION—Initial loading and cocking of the gun are accomplished manually. After the first round has been fired the gun will continue to function automatically while the trigger is held in firing position. Explosion of the propellant forces the recoiling parts of the gun rearward, the breechblock being lowered in the process. Recuperator springs return the tube and tube extension to battery while the lock frame assembly, which moves independently of the tube extension, is carried forward by action of the driving springs and the compressed buffer springs.

When the lock frame assembly separates from the tube extension during recoil an extractor lip engages the rim of the empty cartridge case and partially withdraws it from the chamber. Extraction is completed during the forward movement of the tube extension in counter-recoil, the case being deflected downward out of the gun.

CHARACTERISTICS

Weight of gun.....	398 lb.
Length of gun overall.....	104 ins.
Weight of projectiles	
H.E., M54.....	1.34 lb.
A.P.C., M59.....	1.91 lb.
A.P., M80.....	1.66 lb.
Practice, M55A1.....	1.34 lb.
Muzzle velocity	
H.E., M54.....	2,600 ft./sec.
A.P.C., M59.....	2,800 ft./sec.
A.P., M80.....	3,050 ft./sec.
Practice, M55A1.....	2,600 ft./sec.
Maximum powder pressure.....	46,000 lb./sq. in.
Length of recoil.....	10 $\frac{3}{4}$ ins.
Rate of fire.....	140 rds./min.

Forward movement of the lock frame causes the charger to drive the round into the cartridge chamber, while coincident rotation of the operating lever lifts the breechblock into the closed position, the taper on the upper front side of the block completing the chambering of the round as the breechblock slides past the base of the cartridge. As it moves upward the breechblock raises the front end of the trigger trip, releasing the hammer if the trigger is held in firing position.

AMMUNITION—Ammunition is issued in the form of fuzed complete rounds of fixed ammunition. It consists of shell, H.E., M54, with fuze, P.D., M56; shot, A.P.C., M59; shot, A.P., M80; and shell, practice, M55A1, with fuze, dummy, M50.

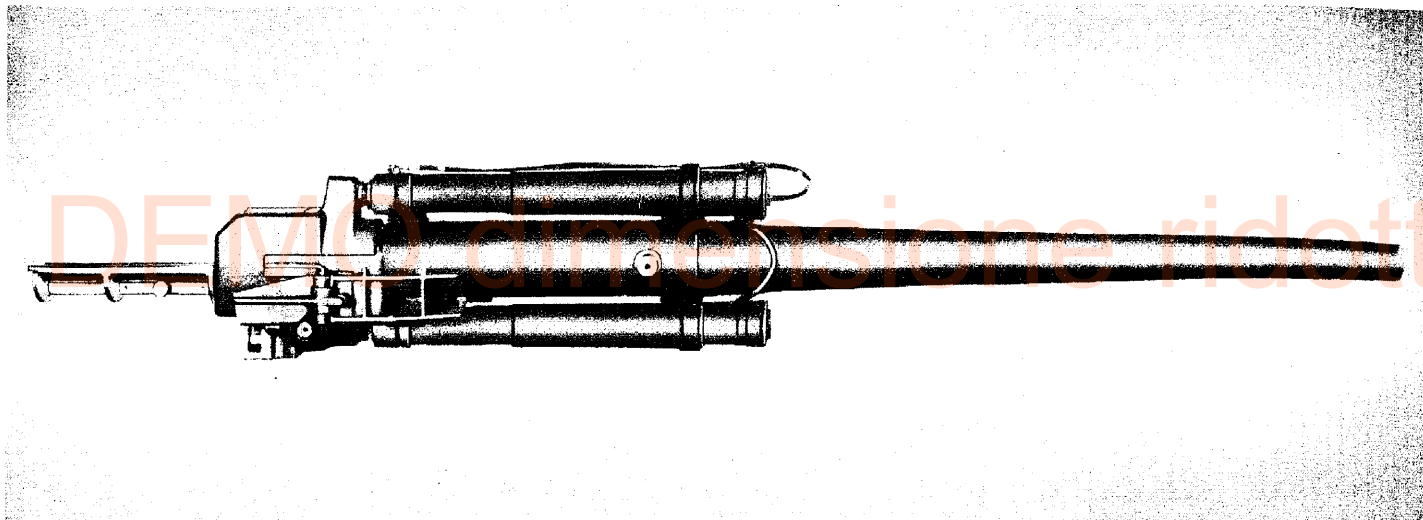
REFERENCES — O. C. M. 19378; TM 9-241.



RIGHT SIDE VIEW

UNCLASSIFIED

75 MM AIRCRAFT GUN M4—MOUNT M6—STANDARD



75 mm AIRCRAFT GUN, M4—MOUNT, M6

The 75 mm Aircraft Gun, M4, is a modification of the 75 mm Tank Gun, M3, designed for aircraft installation for tactical plane-to-ground use against sea and land targets. The M4 gun is mounted in the airplane on Mount, M6, a development of the Mount, T3E1. Military characteristics for this gun were approved in January, 1937, and Mount, M6, was approved for development in April, 1942. The 75 mm Aircraft Gun, M4, and the Mount, M6, were standardized in October, 1942.

The 75 mm Aircraft Gun, M4, is a single-shot, hand-loaded weapon with a vertical sliding, automatically operated breechlock. A removable, manually operated crank is provided to open the breech in the event of a misfire and for initial loading. A loading tray used with a loading ram is situated in back of the breech.

MOUNT, M6—The cradle of Mount, M6, consists of three tubular sections, mounted one above the other. The center section contains the barrel assembly and provides a mounting for the trunnions; the upper and lower sections carry the two cylinders of the hydrospring recoil mechanism. An electrical firing circuit is mounted on the left rear side of the center section. A cam ejector mechanism is mounted on the right rear side of the center section.

RECOIL MECHANISM—When the gun is fired the breeching, tube, recoil cylinder piston rods, and pistons move rearward as a unit. As each piston moves rearward, the recoil oil behind the piston is forced past the piston through the throttling grooves in the sleeve. Throttling the oil through the orifices thus formed absorbs a part of the recoil energy (part of the recoil energy is stored in the counter-

recoil springs). The grooves in the recoil sleeve are tapered toward the rear so that the gun is gradually slowed down and finally stopped when the piston reaches the end of the grooves (21 inches of recoil). When the recoil action ceases, the counterrecoil inner and outer springs force the recoil cylinder pistons, piston rods, breech ring, and tube forward. When the gun is six inches out of battery, a tapered buffer enters a cylindrical buffer chamber in the center of the recoil piston and piston rod. The oil trapped inside this chamber is forced out through an orifice in the center of the buffer, through a spring loaded valve, as well as between the chamber wall and the buffer. When the pressure inside the chamber becomes large enough, it moves the valve which further restricts the oil through the valve and increases the buffing action until the gun comes to rest. By adjusting the compression of the buffer valve spring, the amount of buffing is adjusted.

FIRING MECHANISM—The breech is opened manually. A round is placed in the loading tray and shoved into the breech. The flange on the rear of the case will engage the extractors and pull them forward, thereby releasing the breechblock which is moved upward by the tension of the closing spring to close the breech. The gun is fired electrically by means of a firing solenoid which becomes energized when the firing switch is closed, causing the solenoid plunger to move rearward. The solenoid plunger actuates the firing mechanism which presses the firing plunger, thereby releasing the sear and firing the gun.

EJECTOR MECHANISM—The ejector mechanism functions in conjunction with the semi-automatic operation of the breechblock. During recoil the spring-

CHARACTERISTICS

Weight of gun.....	893 lb.
Weight of gun and mount.....	1,200 lb.
Length of tube overall.....	110.575 ins.
Weight of projectiles	
H.E., M48.....	14.6 lb.
A.P.C., M61.....	14.96 lb.
Muzzle velocity	
H.E., M48.....	1,974 ft./sec.
A.P.C., M61.....	2,024 ft./sec.
Maximum powder pressure.....	38,000 lb./sq. in.

actuated ejector cam is operated by a boss on the crank, the spring then returning the cam to its original position. As the gun slides forward in counter-recoil the boss strikes the end of the cam, rotating the operating shaft of the breech mechanism, dropping the breechblock and ejecting the empty cartridge case. The boss on the crank then passes under the ejector cam. Insertion of the shell causes the breechblock to return to the closed position.

MUZZLE COVER—An automatically functioning aluminum muzzle cover was formerly provided which opened when the breech was closed and closed when the breech was opened. It consisted of a rear tube surrounding the barrel and secured to the cradle, a collar secured to the gun tube, a retractor in the rear, and a retriever with moveable petals on the front end.

AMMUNITION—This is issued in the form of fuze complete rounds of fixed ammunition. The rounds include the shell, H.E., M48, with fuze, P.D., M57, and the projectile, A.P.C., M61A1, with fuze, B.D., M66A1. A steel cartridge case is not used for the shell, H.E., M48, in the M4 aircraft gun because of the possibility of poor extraction which would jam the gun.

REFERENCES—O. C. M. 18699; TM 9-311.

UNCLASSIFIED

OFFICE CHIEF



OF ORDNANCE

15 JANUARY 1944

381