

TM 9-428

RESTRICTED

WAR DEPARTMENT

TECHNICAL MANUAL

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2;
BARBETTE CARRIAGE M1**

12 JUNE 1943

RESTRICTED**TECHNICAL MANUAL**
No. 9-428**WAR DEPARTMENT**
Washington, 12 June 1943**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2;
BARBETTE CARRIAGE M1**Prepared under the direction of the
Chief of Ordnance**CONTENTS**

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*This manual supersedes Ordnance Field Service Technical Bulletin No. 400-2, November 26, 1942, Artillery, Seacoast: Pressure Testing; Ordnance Document No. 1765, Description and Instructions for the Care of 5- and 6-inch Guns; and Ordnance Document No. 1026, 5- and 6-inch Guns.

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Section I

INTRODUCTION

	Paragraph
Scope	1
Characteristics	2
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1. SCOPE.

a. This manual is published for the information and guidance of the using arms and services.

b. It contains a description of the M1903A2 and M1905A2 Guns and Barbette Carriage M1, together with instructions and information necessary for the operation, inspection, and care of the materiel described.

c. Information necessary for the use and care of ammunition and accessories is included.

d. Disassembly, assembly, and repairs by battery personnel will be undertaken only under the supervision of an officer or the chief mechanic.

e. In cases where the nature of repair, modification, or adjustment is beyond the scope and/or facilities of the battery personnel, the local or otherwise designated ordnance service should be informed in order that trained personnel with suitable tools and equipment may be provided.

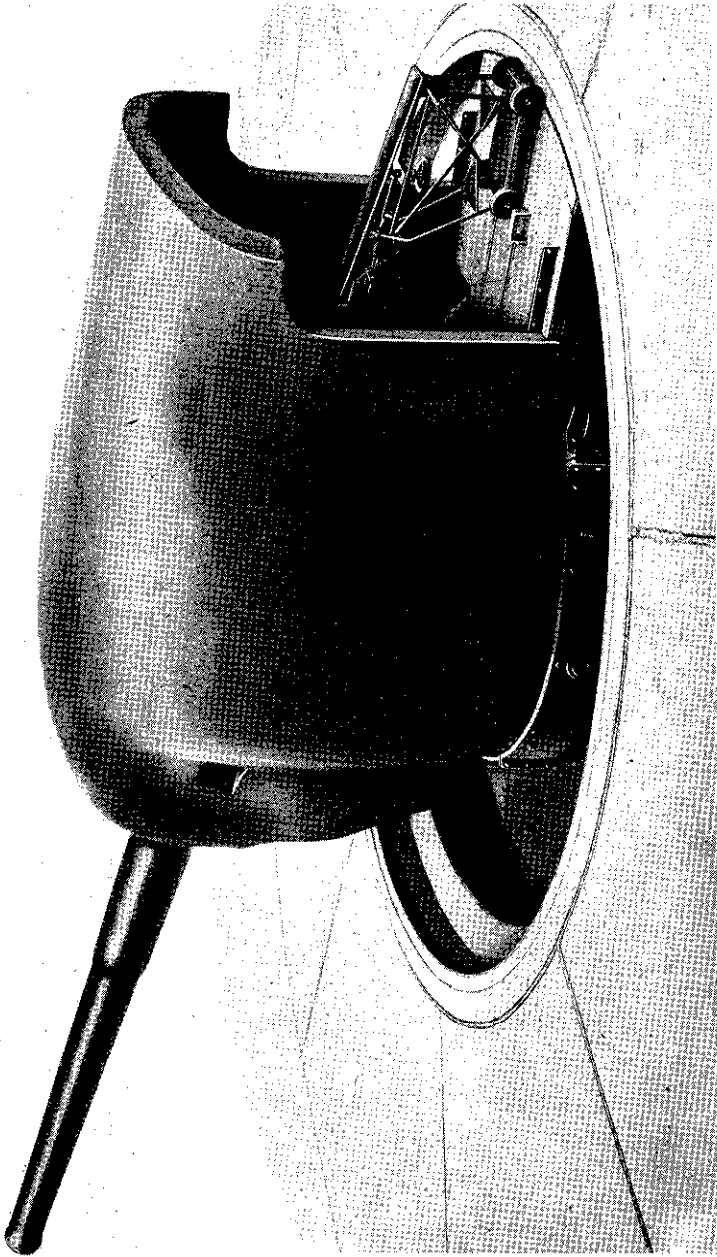
f. Instructions for the care and use of on-carriage sighting and fire-control equipment authorized for use with this weapon are included. Off-carriage sighting and fire-control equipment is not covered in this manual; for instructions on its care and use, refer to FM 4-15, Fire Control and Position Finding, and Technical Manuals on specific items of fire-control and sighting equipment.

g. Technical Manuals, Field Manuals, Firing Tables, Standard Nomenclature Lists, and other publications pertaining to materiel described herein are listed in section XV.

2. CHARACTERISTICS.

a. The 6-inch gun is a manually-loaded rapid-fire gun and has a maximum range of approximately 27,500 yards. It fires separately loaded ammunition and is directed by the data transmission system. An electric-hydraulic power unit, manually controlled, is used to elevate and depress the gun.

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Figure 1—6-Inch Gun and Barbette Carriage MI—Left Side

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b. The gun is mounted on a barbette carriage. A heavy metal shield over the front, top, and sides of the gun provides protection for the gun crew and gun against enemy fire and bomb fragments.

3. MODEL DIFFERENCES.

a. The main difference between the M1903A2 and M1905A2 Gun is in the construction of the breech mechanism (pars. 7 and 8). Both guns are of the same type and are operated in the same manner.

b. The only differences that will affect the using arms are in the method of loading and ejecting primers (the firing mechanisms are slightly different), and in the procedures and operations necessary to disassemble and assemble the breech mechanisms.

4. DATA.

a. M1903A2 and M1905A2 Guns.

Type of barrel	Built up
Type of breech	Lever-pull
Type of breechblock:	
M1903A2 (interrupted thread)	Shape, ogival
M1905A2 (interrupted thread)	Shape, tapered
Caliber	6 in.
Length of bore	50 calibers
Total length of gun (approx.)	310 in.
Length of barrel	302.90 in.
Length of rifling:	
M1903A2 Gun	256.66
M1905A2 Gun	250.286
Rifling, original tube:	
Rifling curve twist, right-hand, semicubical parabola	
Number of grooves and lands	54
Depth of grooves	0.05 in.
Width of grooves	0.2091 in.
Width of lands	0.14 in.
Rifling, liner:	
Rifling curve twist, uniform, right-hand	One turn in 25 calibers
Number of grooves and lands	76
Depth of grooves	0.05 in.
Width of grooves	0.131 in.
Width of lands	0.117 in.
Total weight of gun (approx.)	20,700 lb
Permissible mean maximum powder pressure	41,000 lb

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Range	27,500 yd
Muzzle velocity	2,800 ft per sec
Travel of projectile in barrel:	
M1903A2	256.845 in.
M1905A2	256.285 in.
Subcaliber gun bore	1.457 in.

b. Ammunition.

Weight of projectile:	
Armor-piercing	105 lb
High-explosive	90 lb
Chamber capacity:	
M1903A2	2,114 cu in.
M1905A2	2,122 cu in.
Maximum powder pressure	38,000 lb per sq in.
Weight of powder charge	32 or 37 lb

c. Barbette Carriage M1.

Total weight of carriage and gun without shield (approx.)	42 tons
Total weight of gun, carriage, and shield (approx.)	83 tons
Diameter of emplacement (approx.)	19 ft

d. Recoil Mechanism.

Type	Hydraulic and spring
Number of hydraulic cylinders	1
Orifices	Grooves
Buffer	Dashpot
Recoil oil	OIL, recoil, heavy
Normal length of recoil	19 in.
Maximum length of recoil	20 in.
Capacity of recoil cylinder	4½ gal
Number of spring cylinders	2
Spring pressure	40,000 lb

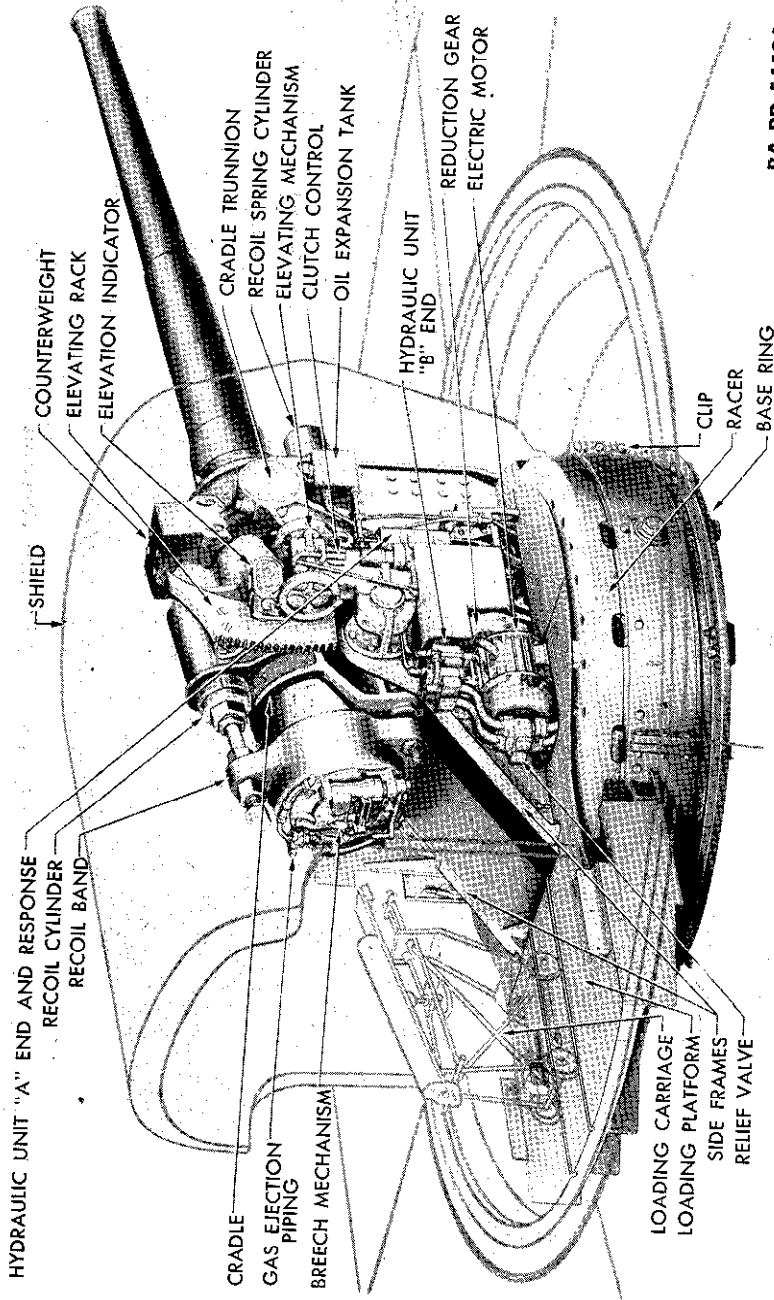
e. Traverse.

Traverse, continuous	360 deg
One handwheel turn	1.04 deg
Effort required to traverse	18 lb
Operation	Manual

f. Elevation.

Maximum elevation	844.5 mils
Maximum depression	-88.9 mils
Elevation for loading	177.8 mils plus or minus 17.8 mils

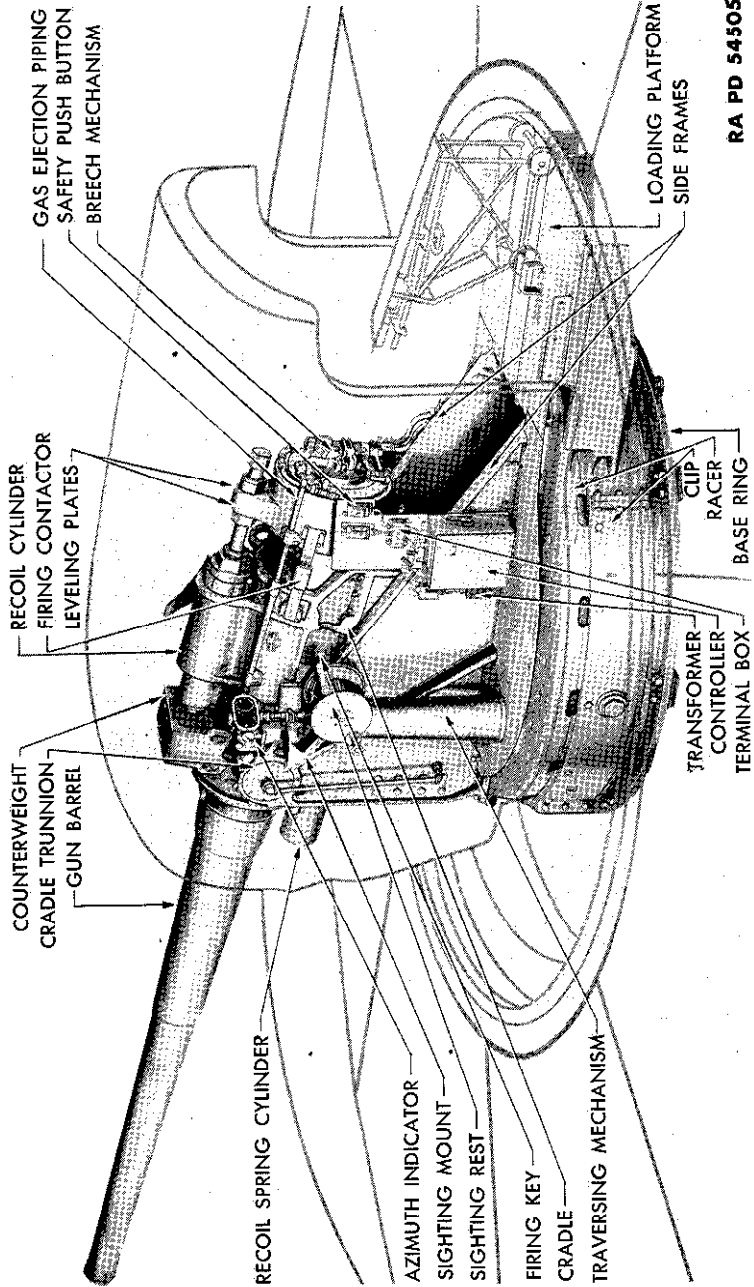
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Figure 2—6-Inch Gun M1903A2 and Barbette Carriage M1—Right Rear

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Figure 3—6-Inch Gun M1903A2 and Barbette Carriage M1—Left Rear

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Average effort required to elevate or depress	24 to 28 lb
One handwheel turn	23 mils
Operation	Hydraulic power or manual
Electric motor for hydraulic unit:	
Motor speed	1,745 rpm
Horsepower	10
Cycle	60
Volts	440
Reduction gear (ratio 2.8 to 1)	Speed 624 rpm
Hydraulic power unit (Waterbury Speed Gear No. 5, Model K):	
Maximum hydraulic pressure	725 lb per sq in.
Hydraulic oil	OIL, hydraulic, USA 2-79A
Oil capacity (approx.)	8 to 9 gal

g. Sighting Equipment.

- CLINOMETER, M1912
- BORE REST, clinometer
- SIGHT, bore
- QUADRANT, gunner's, M1 or M1918
- MOUNT, telescope, M35
- TELESCOPE, M31

h. Air Compressor (for Gas Ejection System).

Compressor unit (Worthington)	Size 6½ x 3½ x 4
Compressor type	VA2
Compressor model	A-23
Crankcase capacity	5 qt
Oil pressure	25 to 40 lb per sq in.
Compressor maximum speed	870 rpm
Pressure switch	140 to 150 lb per sq in.
Motor (Delco, type CT) model	A-7453R
Horsepower	10
Speed	1,755 rpm

Section II
DESCRIPTION OF GUN

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Gun, general	5
Gun barrel	6
Breech mechanism M1903A2	7
Breech mechanism M1905A2	8
Obturation	9
Firing mechanism	10

5. GUN, GENERAL.

a. The M1903A2 and M1905A2 Guns are mounted on the carriage and operated in the same manner. The principal differences are in the construction of the breech mechanisms. The following description applies in general to both models.

b. The 6-inch gun is 50 calibers in length, has a maximum range of approximately 27,500 yards and a muzzle velocity of 2,800 feet per second. The gun recoils in a cradle which has trunnions and bearings for tipping the gun in elevation. The recoil is absorbed by springs and a hydraulic recoil cylinder. The counterrecoil springs return the gun to battery.

c. The gun is normally fired electrically, but can be fired manually with a lanyard. Safety devices are provided to prevent firing the gun prematurely.

d. The gun fires separately-loaded ammunition, either armor-piercing or high-explosive. Firing is by means of a primer, *friction* type for lanyard firing, or *electric* type for electric firing.

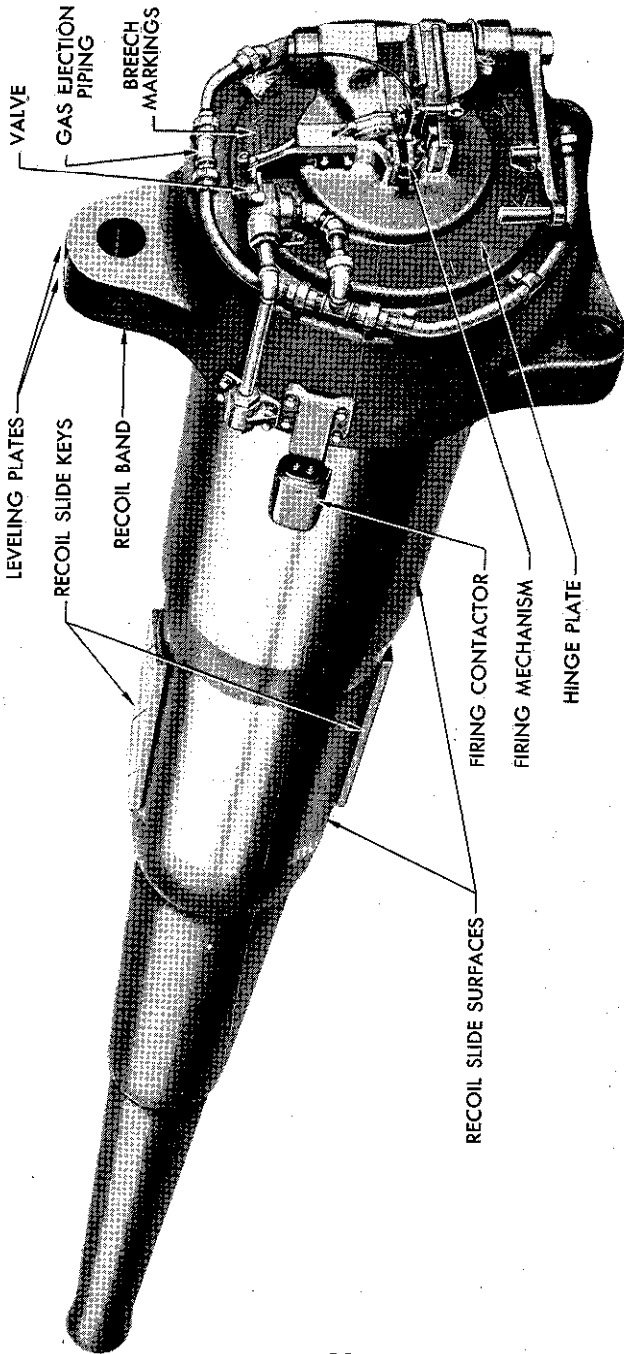
e. Elevation and azimuth indicators are provided on the carriage for directing the gun manually. Elevation of the gun is performed either manually or by electric-hydraulic power unit. The gun is traversed manually.

6. GUN BARREL.

a. The original gun barrels of the 1903A2 and 1905A2 models (fig. 4) are of the built-up type, being constructed of hoops, jacket, tube (or liner), recoil band, and hinge plate.

b. The breech recess, which is threaded to receive the breechblock, is machined in the jacket of the M1903A2 Gun, whereas the M1905A2 Gun breech recess is machined in a bushing which is screwed into the jacket.

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Figure 4—6-Inch Gun M1903A2—Left Side

DESCRIPTION OF GUN

c. The hinge plate is provided with lugs for the breechblock carrier hinge pin.

d. The recoil band, at the breech end of the barrel, has lugs with drilled holes to which the hydraulic cylinder piston and the spring rods are attached. Leveling plates, machined surfaces parallel with the bore of the gun, are provided for the use of a gunner's quadrant, which is sometimes used for laying the gun in elevation or for checking the accuracy of the elevation indicator.

e. The gun is supported and slides in the recoil mechanism cradle. Recoil slide keys (or splines) at the top and bottom of the barrel, which fit in corresponding slots in the cradle, allow the gun to recoil and counterrecoil, but prevent it from rotating in the cradle.

f. The tube is bored to form a chamber and bore. The chamber, at the rear, has a machined surface for the seating of the gas check pad. The powder chamber at the front narrows down to form the centering slope, which guides the projectile into the forcing cone. The forcing cone is tapered to guide the projectile rotating band into the rifling. The bore is rifled throughout.

g. The tubes for both the M1903A2 and M1905A2 models have an estimated accuracy life of 1,000 rounds. When the M1905A2 tube has eroded to the point where it is inaccurate, the gun must be removed and sent to an arsenal having suitable equipment and facilities for relining. On guns having the original tube (not relined), the rifling is not uniform (semiparabolic). On guns which have been relined, the rifling is usually uniform. When M1903A2 Guns are eroded to a point where they are inaccurate, they will be replaced by new guns of monoblock construction.

h. Some guns have special gas check seats. A marking plate (fig. 5) is fastened to the hinge plate which states the extent of enlargement in size and the advance of the gas check seat in the tube. These guns require special rings, gas check pad, and spindle disk, and some guns may be found to have an enlarged obturator spindle.

i. The breech hinge plate is stamped with the model of gun, name of manufacturer, and year of manufacture (fig. 5).

j. The muzzle face is marked with the model of gun, name of manufacturer, and year of manufacture. The weight of the complete gun is indicated and, if the gun has been relined, the year in which it is relined is marked. The muzzle face is scored with witness lines for the use of the muzzle bore sight, used in orientation of the gun.

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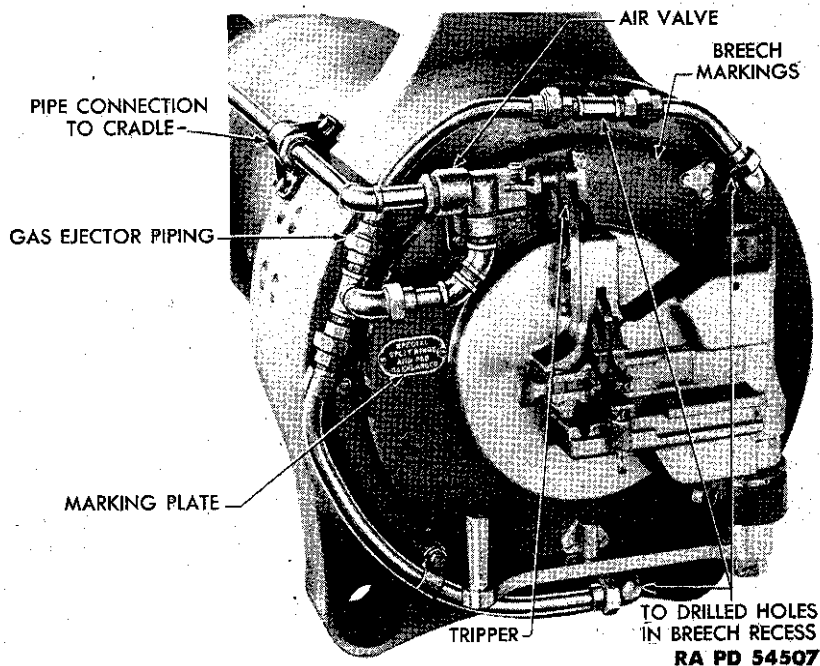


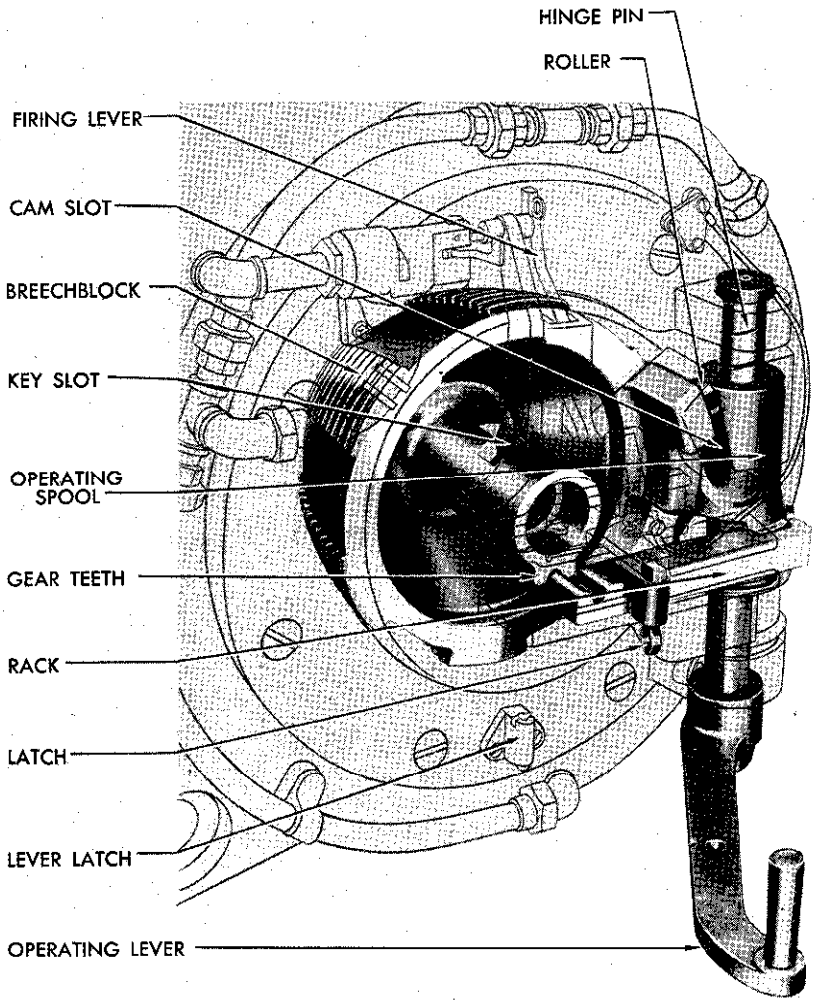
Figure 5—Gas Ejection System, M1903A2 Gun

k. A gas ejection system (figs. 5 and 7) is provided to eliminate gases, unburned pieces of powder bags, and powder fouling that may remain in the barrel after firing. The use of this system eliminates the need for swabbing out the powder chamber between rounds. Compressed air is piped from the carriage, through the cradle trunnion on the left side, to the cradle, then along the cradle to the breech. The connecting pipe to the breech telescopes in the cradle pipe, allowing the air connection to remain unbroken when the gun recoils and counterrecoils. Compressed air is automatically injected into the breech when it is opened. The air valve is opened by the tripper on the breechblock carrier. The air is then forced through piping around the breech to three drilled holes in the breech recess.

7. BREECH MECHANISM M1903A2.

- a. The breech mechanisms of the M1903A2 and M1905A2 Guns are similar in type and operation, but differ in construction.
- b. The breech mechanism is the lever-pull type with an interrupted thread breechblock, ogival in shape. When the breechblock is opened

DESCRIPTION OF GUN



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Figure 6—Breech Mechanism, M1903A2 Gun

with the operating lever (fig. 6), three operations are performed:

(1) The firing mechanism slide is moved away from the firing lever, thus preventing the gun from being fired when the breech is partly open, or when the operating lever has not been returned to its latched position.

(2) The breechblock is rotated to unlock it from the interrupted threads in the breech recess.

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(3) The breechblock is moved rearward out of the breech recess so that it will not strike when the breech is swung open.

c. When the operating lever is pulled back to open the breech, the hinge pin and the operating spool are rotated. The rack, engaged in a slot in the operating spool, is drawn to the right. This movement, through the rack and breechblock gear teeth, rotates and unlocks the breechblock. Further movement of the operating lever rotates a lug on the operating spool into a slot in the breechblock, which moves the breechblock to the rear, opening the gas ejection valve. The breechblock roller, operating in the cam slot of the operating spool, starts rotation of the breechblock so that the rack will engage in the operating spool lower slot, to open or close the breech. The roller also locks the breechblock in the closed position.

d. The obturator spindle key, which prevents the spindle from rotating with the breechblock, is retained in the block carrier and passes through a slot in the breechblock which permits rotation of breechblock. The key then enters a tapered slot in the obturator spindle to prevent its rotation.

e. At the same time that the breech is being opened, the firing mechanism slide, which is latched to the breechblock rotating rack, moves out of position to allow ejection of the spent primer. The primer is ejected manually after opening the breech. To permit changing the primer after the gun has been loaded and the breech closed, the firing mechanism slide may be unlatched from the rack and moved to the right. In closing the breech after loading, the gun cannot be fired prematurely manually because the firing leaf, on the slide, will not align with the firing lever, nor can it be fired electrically because the contact clip on the firing leaf will not contact the primer wire until the breech operating lever has been latched in the closed position.

f. A loading tray in the breech recess covers the two lower thread sectors when the breech is open. This is necessary to protect the threads from damage when the projectile is passed over them in loading. When the breechblock is closed and rotated, the tray is rotated to the right, up into the cut out sectors.

g. To observe the breechblock action, the block carrier latch (fig. 6) may be removed with the breech closed. This will allow the breech to be opened and the breechblock rotated without closing the breech. To remove the latch, depress the latch retainer spring, which is just under the lower hinge lug and pull downward to remove the latch retainer. The latch can then be withdrawn.

DESCRIPTION OF GUN

- A—RACK
- B—BLOCK CARRIER
- C—EJECTOR
- D—FIRING SLIDE
- E—TRIPPER
- F—AIR VALVE
- G—PIPE CONNECTION TO CRADLE
- H—TO DRILLED HOLES IN BREECH RECESS
- J—FIRING LEVER
- K—SPINDLE KEY
- L—FIRING LEAF
- M—CONTACT CLIP
- N—LEVER LINK
- P—FIRING CIRCUIT BREAKER
- Q—OPERATING LEVER
- R—BLOCK CARRIER LATCH

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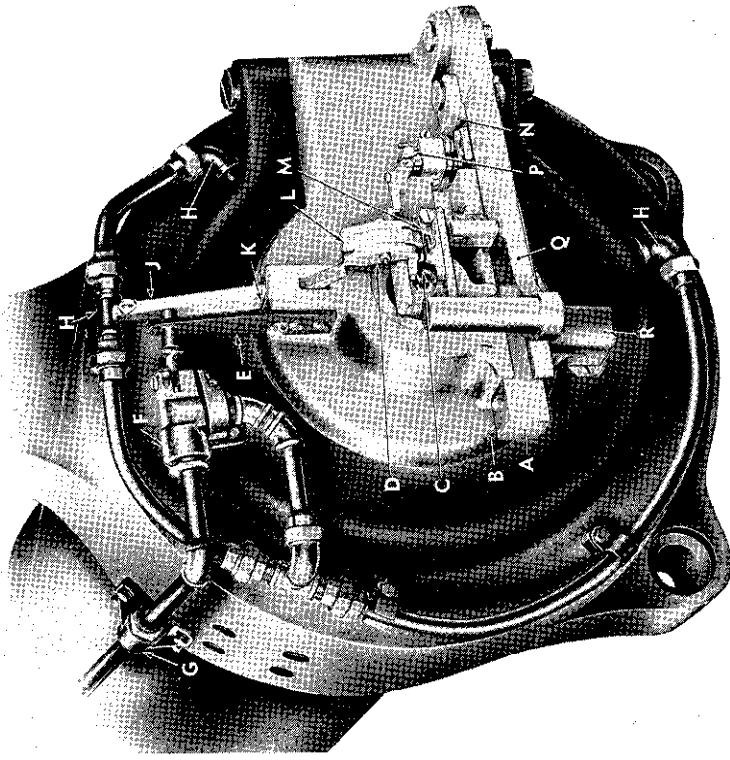


Figure 7—Breech Mechanism, and Gas Ejector System for the 6-Inch M1905A2 Gun

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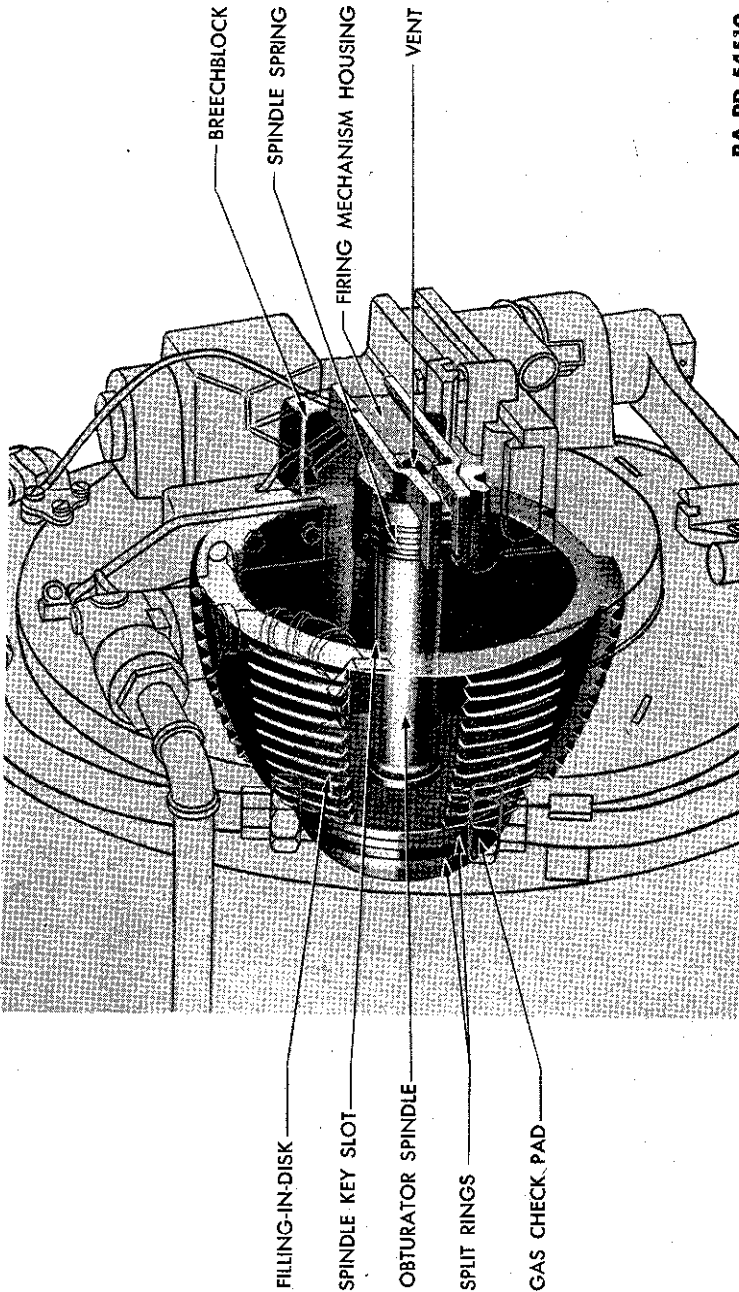


Figure 8—Obturator and Gas Check System, M1903A2 Gun

DESCRIPTION OF GUN

8. BREECH MECHANISM M1905A2.

a. The M1905A2 breech mechanism (fig. 7), like the M1903A2, is the lever-pull type. The breechblock has a six-sectored interrupted thread and is tapered in shape. When the breechblock is opened with the operating lever, the following operations are performed:

(1) The firing circuit is broken to prevent accidental firing until the breech is again closed.

(2) The breechblock is rotated, by the rack gear teeth which match teeth in the breechblock, to unscrew it from the interrupted threads in the breech recess.

(3) A plunger is moved upward when the breechblock is rotated to prevent movement of the firing lever. This prevents accidental firing when using a friction primer.

(4) The obturator spindle is prevented from rotating by the spindle key which is held by the block carrier.

(5) When the breechblock is rotated, the loading tray is moved to cover and protect the two lower thread sectors in the breech recess. A spring plunger retains the tray in this position until the breech is again closed and the plunger depressed to allow rotation of the tray.

(6) Further movement of the operating lever moves the rack to the angled sliding tooth, which engages a matching groove in the breechblock moving the block rearward. This is necessary to prevent the breechblock striking the breech recess when it is swung clear of the breech.

(7) When the breechblock has been rotated and pulled rearward, the block carrier latch is forced upward by spring pressure into a recess in the rack. This action unlatches the carrier from the catch and prevents further movement of the rack. Further movement of the operating lever swings the breech mechanism clear of the breech.

(8) It is necessary to move the firing mechanism to the right manually to uncover the primer for ejection.

9. OBTURATION.

a. The M1903A2 and M1905A2 Guns use the same system of obturation (fig. 8). Obturation is the sealing of the breech to prevent the escape of powder pressure to the rear.

b. When the breech is closed, the gas check pad and steel split rings enter the slightly tapered gas check seat in the barrel (fig. 9). When the gun is fired, the obturator spindle is forced back by the pressure of the expanding gases, thereby compressing the gas check pad

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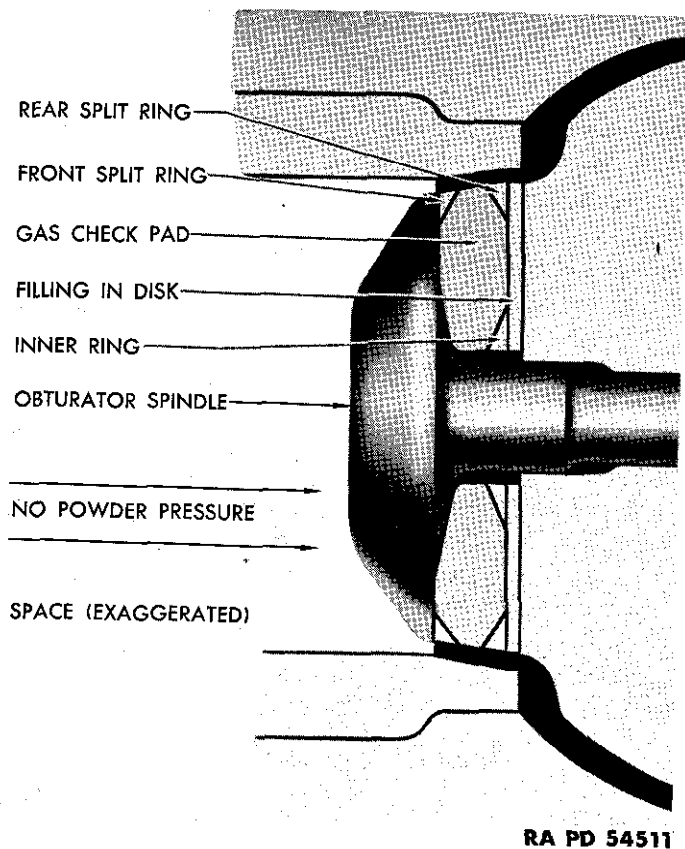
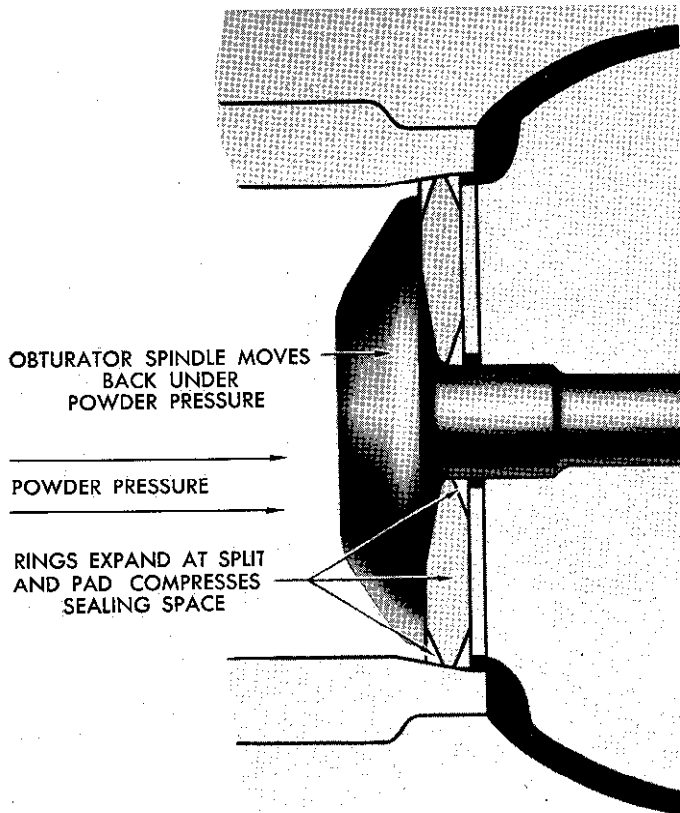


Figure 9—Obturator in Normal Position

and expanding the split rings (fig. 10). This action effectively seals the breech. After firing, the split rings and the gas check pad resume their original position and the breech may be opened. There is also a small split ring used to seal the obturator spindle hole in the gas check pad. The filling-in-disk serves as a bearing washer to eliminate friction between the gas check pad and the breechblock. This is necessary, as the breechblock rotates and the obturator spindle, which is keyed to the block carrier, does not.

c. The obturator spindle is bored to provide a chamber for the primer and vent for the primer flame. Threaded holes in the mushroom head of the spindle are used to attach plugs used in pressure

DESCRIPTION OF GUN



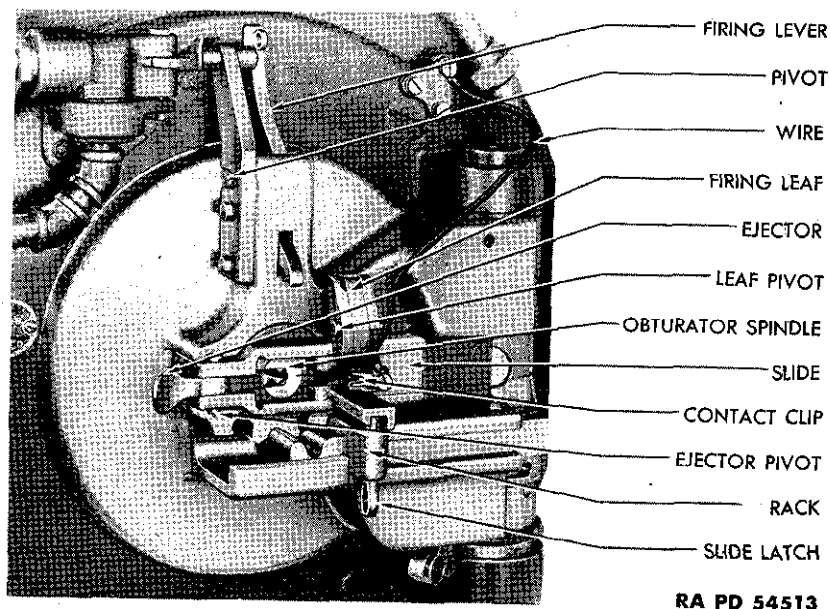
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Figure 10—Obturator in Firing Position

testing. These holes are plugged with screws to prevent burning the threads when the pressure plugs are not used. Holes are also provided in the head for a spanner wrench, which is sometimes necessary for removal of the obturator spindle.

d. The spindle (fig. 8) is grooved for the spindle key which prevents the spindle from rotating with the breechblock. A spring is interposed between the block carrier and the firing mechanism housing to allow the spindle to move rearward when the gun is fired (fig. 10) and to return it to the normal position (fig. 9) after firing. The firing mechanism housing is threaded onto the spindle so that it will

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Figure 11—Firing Mechanism, M1903A2 Gun

move with the spindle. Scribed lines on the housing and the rear face of the spindle indicate the position of the spindle when the spindle key is aligned.

10. FIRING MECHANISM.

a. **General.** The firing mechanism of the M1903A2 and M1905A2 Guns are similar in operation and in construction. They are designed to fire either electrically (by electric line power or by magneto), using the Electric Primer M30, or manually (by lanyard), using the Friction Primer M1914. Both guns are safe from accidental firing when the breech is not closed.

b. Firing Mechanism, M1903A2 Gun.

(1) The firing mechanism is latched to the breechblock operating rack (fig. 11). As the breech operating lever is moved to open the breech, the slide is moved to the right to uncover the primer for ejection and also as a safety feature. In case of a misfire, or for any other reason, the firing mechanism may be moved to the right when the breech is closed by pulling down the slide latch and pushing the slide

DESCRIPTION OF GUN

over by hand. However, the slide cannot be moved into firing position until the breech is closed.

(2) The gun cannot be fired if the breech operating lever is not in its latched position.

(a) It cannot be fired manually (with lanyard) because the firing leaf will not be aligned with the firing lever.

(b) It cannot normally be fired electrically because the electric contact clip will not be in contact with the wire electrode of the primer.

(3) The primer, which resembles a blank cartridge with a knob-ended wire protruding from the base, is inserted into the end of the obturator spindle. The spindle is cut out on one side to allow the primer to seat over the ejector. After opening the breech, the primer is ejected by pushing the ejector (fig. 11) forward. A spring returns the ejector to its original position.

(4) When the gun is fired by lanyard, the firing lever is pulled back, which depresses the firing leaf and pulls the wire of the primer rearward. This action ignites the friction primer. When fired electrically the contact clip on the firing leaf makes contact with the primer wire when the breech is closed.

c. Firing Mechanism, M1905A2 Gun.

(1) The firing mechanism (fig. 7) on the M1905A2 Gun can be moved in or out of position whether the breech is open or closed. When the firing mechanism slide is unlatched and moved to the right the primer is automatically ejected.

(2) The gun cannot normally be fired when the breech is open.

(a) It cannot be fired manually (with lanyard) because a spring plunger prevents movement of the firing lever until the breechblock is rotated to lock it in the breech recess.

(b) It cannot be fired electrically because the firing circuit is not completed until the breech is closed.

(3) The primer, which resembles a blank cartridge with a knob-ended wire protruding from the base, is inserted into the end of the obturator spindle. The spindle is cut out on one side to allow the primer to seat over the ejector. After opening the breech the firing mechanism slide is unlatched and moved to the right. This action uncovers the primer vent and automatically ejects the spent primer case.

(4) When the gun is fired by lanyard, the firing lever is pulled back, which depresses the firing leaf and pulls the wire of the primer rearward. This action fires the friction primer. When fired electrically

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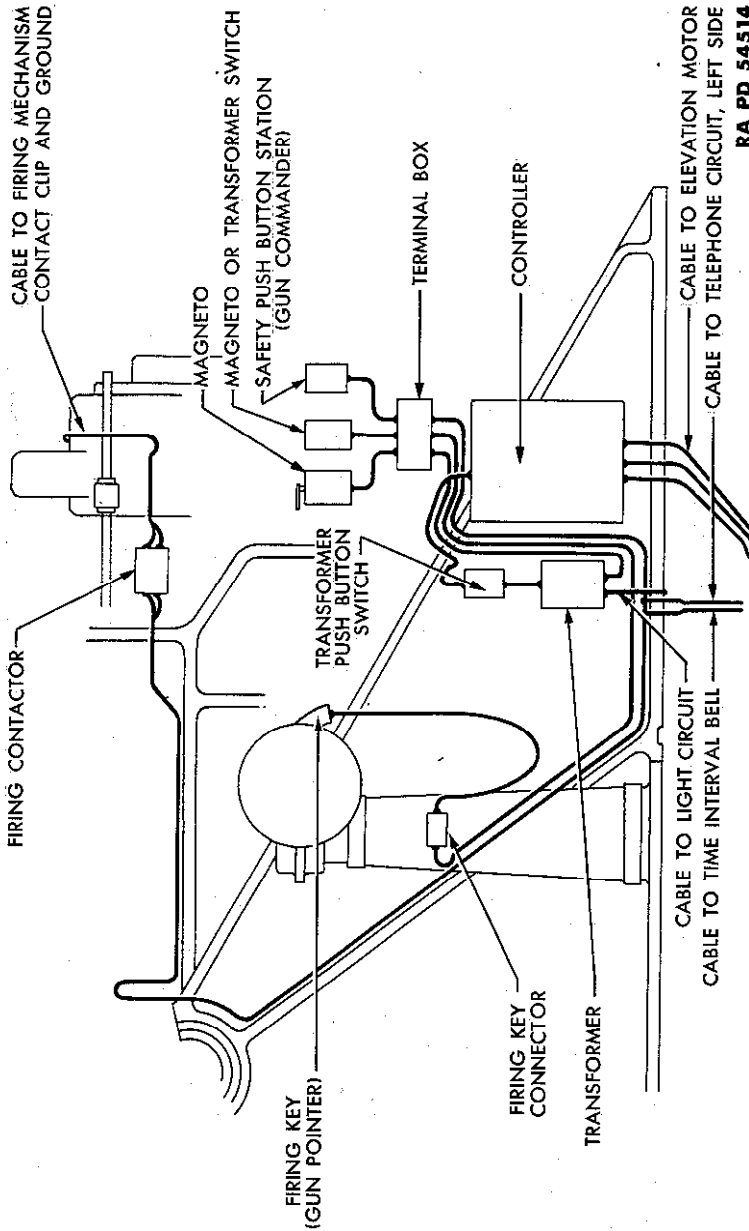
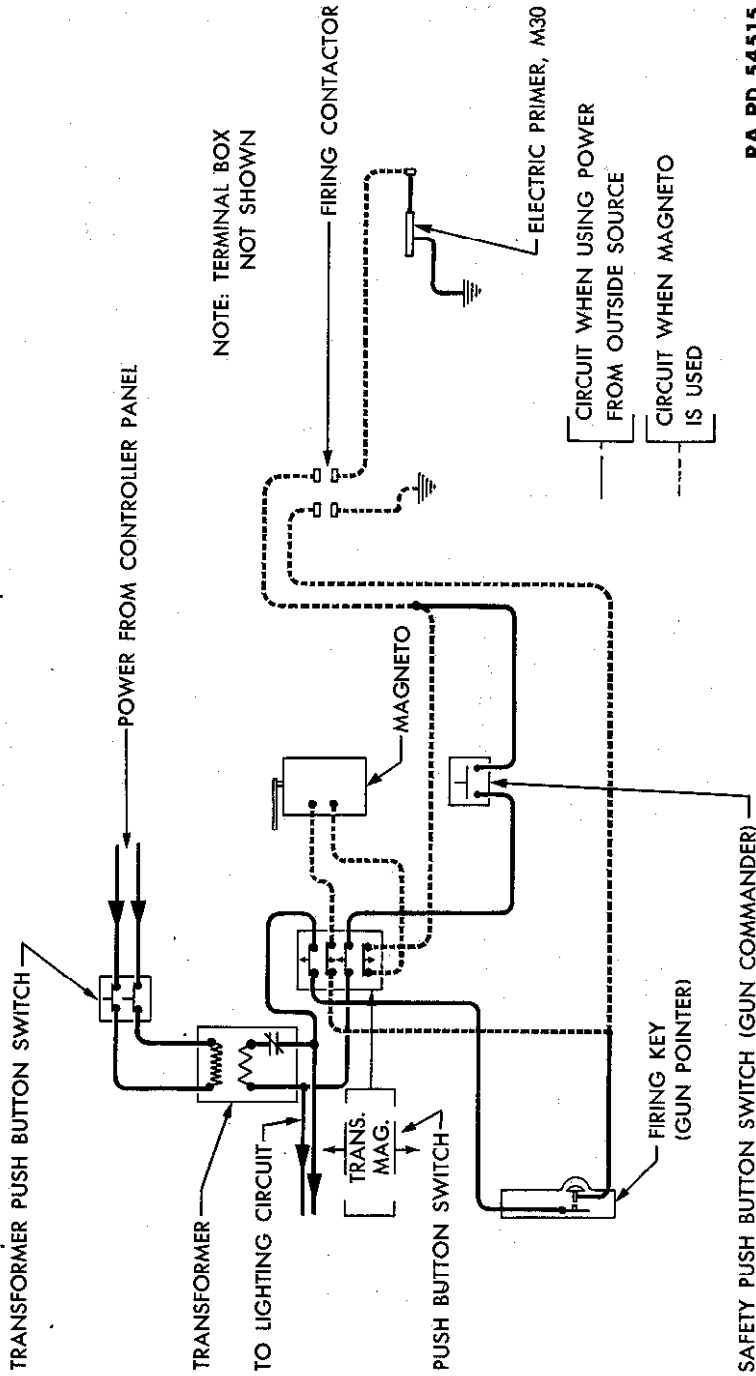


Figure 12—firing Circuit Cable Arrangement

DESCRIPTION OF GUN



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Figure 13—Firing Circuit Diagram

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the contact clip on the firing leaf makes contact with the primer wire when the firing mechanism slide is moved to the left. The firing circuit is completed, when the breech is closed, by the contacts on the breech operating lever link.

d. Firing Circuit.

- (1) The gun is fired electrically by an outside source of power or by the magneto which is mounted on the controller panel.
- (2) Figure 12 illustrates the cable arrangement of the firing circuit, and figure 13 shows in detail the arrangement of the series plug and receptacle. For a complete diagram of the power and firing circuits refer to figure 30.
- (3) When the gun is fired by means of the outside power source, the circuit is complete in the following manner:
 - (a) The transformer push button switch is turned on.
 - (b) The transformer reduces the line voltage.
 - (c) The power lines from the transformer are wired through the terminal box to the *magneto-transformer* push button switch.
 - (d) The push button switch is turned on to "TRANSFORMER." This directs current to the safety push button switch and to the firing key.
- (4) The firing cable leading to the firing key is equipped with a series plug and receptacle (fig. 29) which is located near the gun pointer's station.
 - (a) When Case II firing is to be employed, the gun pointer inserts the plug in the receptacle and locks it in place by turning the plug to the right, thus compressing the plunger springs in the receptacle and breaking the circuit to the gun commander's push button switch. This arrangement carries the current to the firing key which when pressed re-establishes the circuit to the gun commander's push button station. It is necessary that the gun commander's push button be pressed in to complete the circuit to the firing mechanism on the gun breech.
 - (b) For Case III firing, the plug must be removed from the receptacle. This is accomplished by turning the plug slightly to the left and withdrawing it from the receptacle box. This releases the compression on the plunger springs, thereby re-establishing direct connection between the gun commander's push button switch, and the firing mechanism on the gun breech.
 - (c) In Case III firing the gun pointer exercises no control over the firing circuit, and the gun commander, by pressing the gun commander's push button, fires the piece directly from his station.

DESCRIPTION OF GUN

(d) In Case II firing, with the plug assembled in the receptacle the gun commander presses the safety push button switch and commands *fire*. The gun pointer then completes the circuit by closing the firing key as soon as he is on the target.

(e) The firing circuit cannot be established unless the breech is completely closed.

(f) When the circuit is complete, the electric current heats a platinum wire in the primer which fires the primer.

(5) When the gun is fired by means of the magneto, the transformer-magneto push button switch is turned on to "MAGNETO." The firing circuit is then complete. Firing is accomplished by operating the magneto lever.

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

Section III

DESCRIPTION OF CARRIAGE

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II. GENERAL.

a. **Emplacement.** The Barbette Carriage M1 is installed in a prepared concrete emplacement, lowered, so that the gun platform is at ground level.

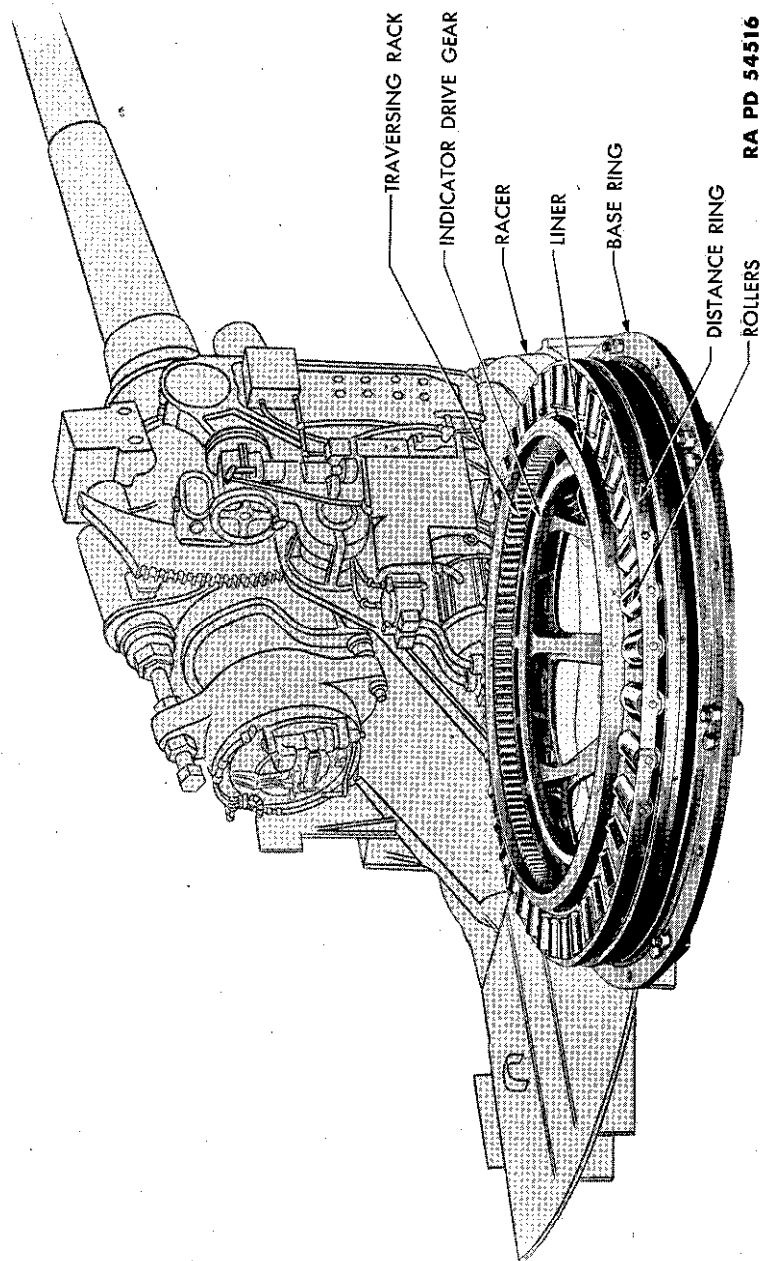
b. **Shield.** Protection from enemy fire for the gun, carriage, and gun crew, is provided by a heavy cast steel shield with all surfaces curved to aid in deflecting enemy fire.

c. **Base.** The base, which is the stationary foundation of the carriage, is bolted to the concrete emplacement. The large traversing rack and azimuth indicator drive rack are mounted in it.

d. **Top Carriage.** The top carriage consists of the racer, side frames, and loading platform. The side frames, bolted to the top surface of the racer, support the gun cradle in trunnions, elevating mechanism; and traversing indicator mechanism. The weight of the top carriage is supported and traverses on conical shaped rollers between the upper surface of the base ring and the lower surface of the racer.

e. **Recoil Mechanism and Cradle.** The recoil mechanism and cradle consists of the following assemblies: the cradle, a large casting in which the gun slides for recoil and counterrecoil; the cradle trunnions and bearings, for tipping the gun; the elevating rack, for elevating and depressing the gun; the recoil cylinder, for slowing the gun to a gradual stop in recoil and counterrecoil; the recuperator springs, for slowing the gun in recoil and returning the gun to battery in counter-recoil.

DESCRIPTION OF CARRIAGE



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Figure 14—Base Ring and Rollers

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

f. **Elevating Mechanism.** The gun may be elevated by hand power or by electric-hydraulic power. The gun can be elevated to a maximum of 844.5 mils or depressed to minus 88.9 mils. The elevating mechanism is mounted on the right side frame. The carriage is elevated through a worm, wormwheel, and pinion gear operating on the elevating rack, which is mounted on the cradle to elevate or depress the gun. The tipping parts are balanced to eliminate the need for a brake.

g. **Traversing Mechanism.** The carriage is traversed manually through a worm, wormwheel, and pinion gear drive to the traversing rack in the base ring. The carriage may be traversed continuously through 360 degrees. However, stops are usually employed on individual guns after emplacement to limit the field of fire.

h. **Electrical System.** The electrical system consists of the power circuit for the operation of the electric motor for elevation, lighting circuit, firing circuit, telephone circuit, and the circuit for the time interval bell. Two telephones, one for the elevation setter and one for the gun pointer, are installed inside the shield.

i. **Gas Ejection System.** The gas ejection system, for clearing the gun of gases, etc., after firing, is piped from the compressor (in casemate) through the center of the base ring to an expansion tank, then up through the left side cradle trunnion, along the cradle to the breech, and through three orifices in the breech to the chamber.

j. **Loading Carriage.** A four-wheeled loading carriage, operating on tracks on the loading platform, is used to carry projectiles to the gun breech. A foot-operated latch in the platform floor is used to hold the carriage away from the breech when the gun is to be fired.

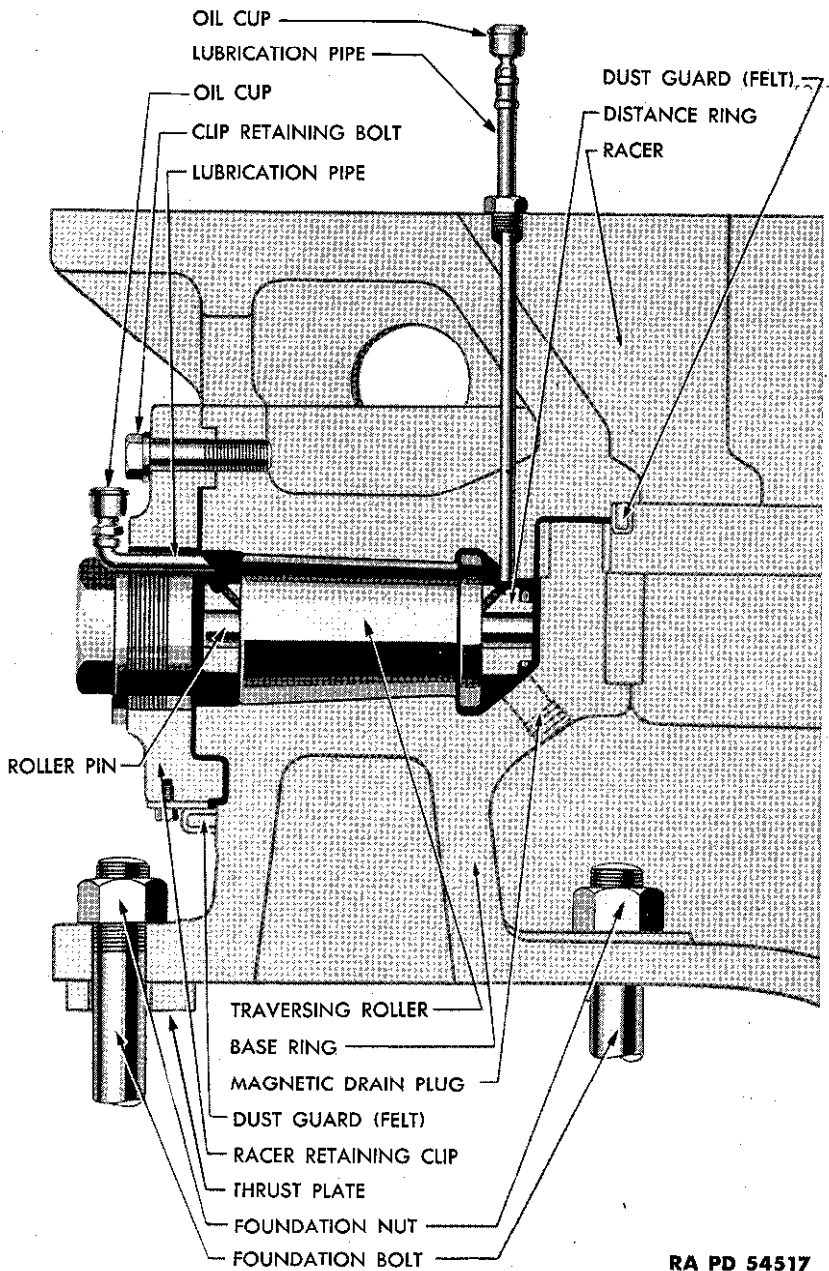
12. BASE.

a. The base ring (fig. 14), which is the stationary foundation of the carriage, is a large casting, machined and ground to a smooth hard surface for the large conical rollers. Mounted in it are the traversing rack, azimuth indicator ring gear, and the center terminal assembly with the exception of the terminal box and contact rings.

b. Foundation studs with nuts, deeply imbedded in the emplacement concrete, are provided to hold the base ring when leveled. The base ring has at each alternate outer foundation stud, a cap screw, which bottoms on the steel mounting plates, for leveling the base ring.

c. The racer, which is the turntable, or rotating gun platform, is traversed and supported on the conical rollers. The 40 conical rollers

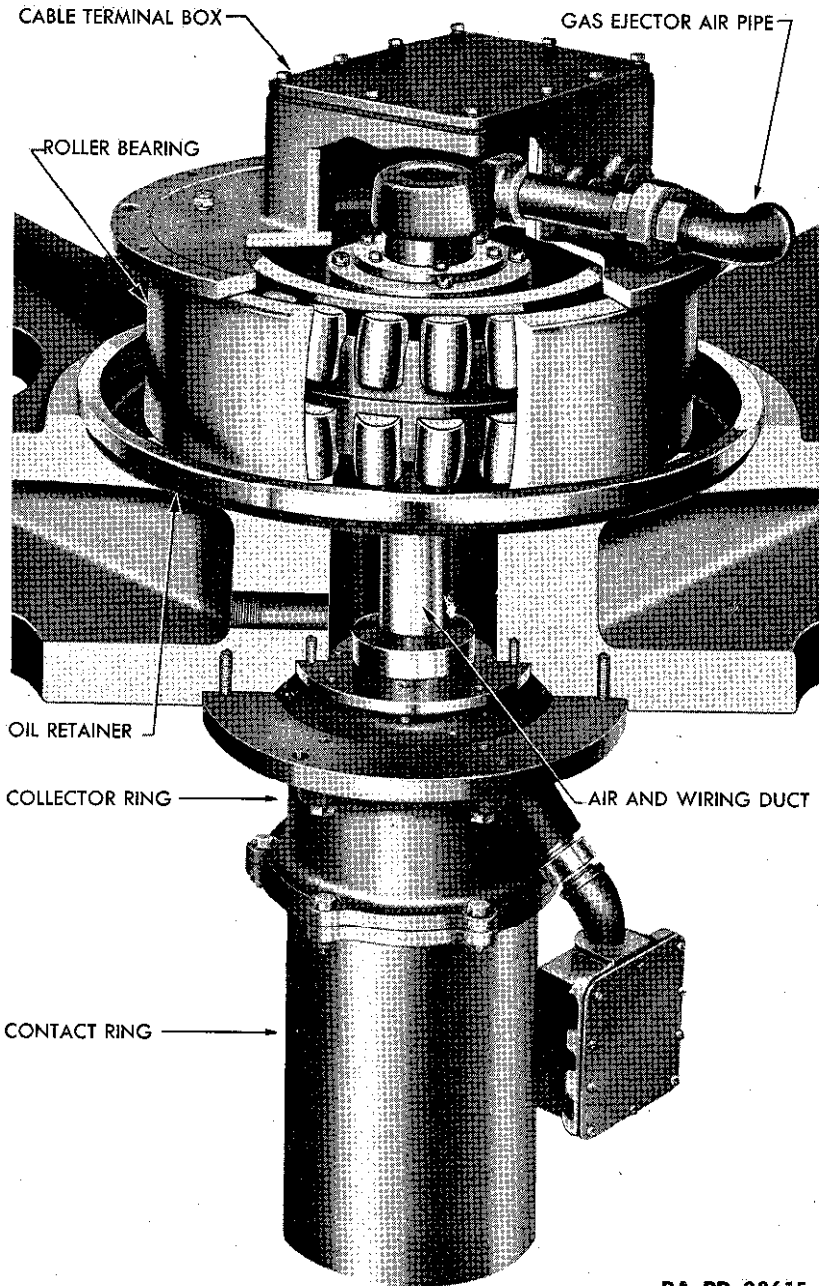
DESCRIPTION OF CARRIAGE



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Figure 15—Base Ring and Racer
29

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**



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Figure 16—Base Ring Center Bearing

DESCRIPTION OF CARRIAGE

are held in position by the large distance ring. A large roller bearing (fig. 16) at the center holds the base ring and racer concentric with each other. To hold the racer down to the base ring when firing, racer retaining clips are provided (fig. 15). These clips, bolted to the racer, form a band which is lipped inward at the bottom to traverse in the base ring groove. Plugs may be removed for the inspection of the rollers and machined surfaces of the base ring and racer.

d. The conical roller pins and bearings are lubricated through oil cups (fig. 15) at the retaining clips for the outer ends of the pins, and oil cups on top of the racer for the inner ends of the pins. The oil flows from the oilers, through the lubrication pipe, to grooves in the distance ring. The distance ring is drilled at each roller pin for the oil to enter. A felt dust guard at the outer diameter of the base ring and at the bottom of the retaining clip, prevents the entrance of dirt from the outside. Magnetic drain plugs pick up and hold metal particles and allow the draining of oil, also of water, which will condense on the side walls and drip into the base ring drain pockets. Another felt dust guard immediately under the inner surface of the racer and bolted at the top of the inner diameter of the base ring prevents the entrance of dirt from the inside.

e. To allow continuous 360-degree traverse of the carriage, all of the electrical connections for the azimuth and elevation indicators, and the power wires for the elevating mechanism motor, are brought up through the center of the base ring and racer (fig. 16). Connections are made in a power collector ring and contact ring, which maintain electrical contact in any position of the gun. The air pipe for the gas ejection system is also passed through the center terminal of the mount.

13. TOP CARRIAGE.

a. The side frames which support the gun are bolted to the racer. They are held parallel with each other at the front by a transom which is bolted to each side frame. An adjustable limit stop, to limit the elevation of the gun to 844.5 mils, and the gas ejection equalizer tank are mounted on the transom. Figure 29 illustrates the piping and equalizer tank arrangement of the gas ejection system from the base ring to the breech. The right side frame of the carriage supports the elevating mechanism, speed gears, hydraulic piping and oil expansion tank. The electric gearmotor drive for the elevating mechanism hydraulic unit is mounted on the bottom of the right side frame. The left side frame supports the azimuth indicator drive, the indi-

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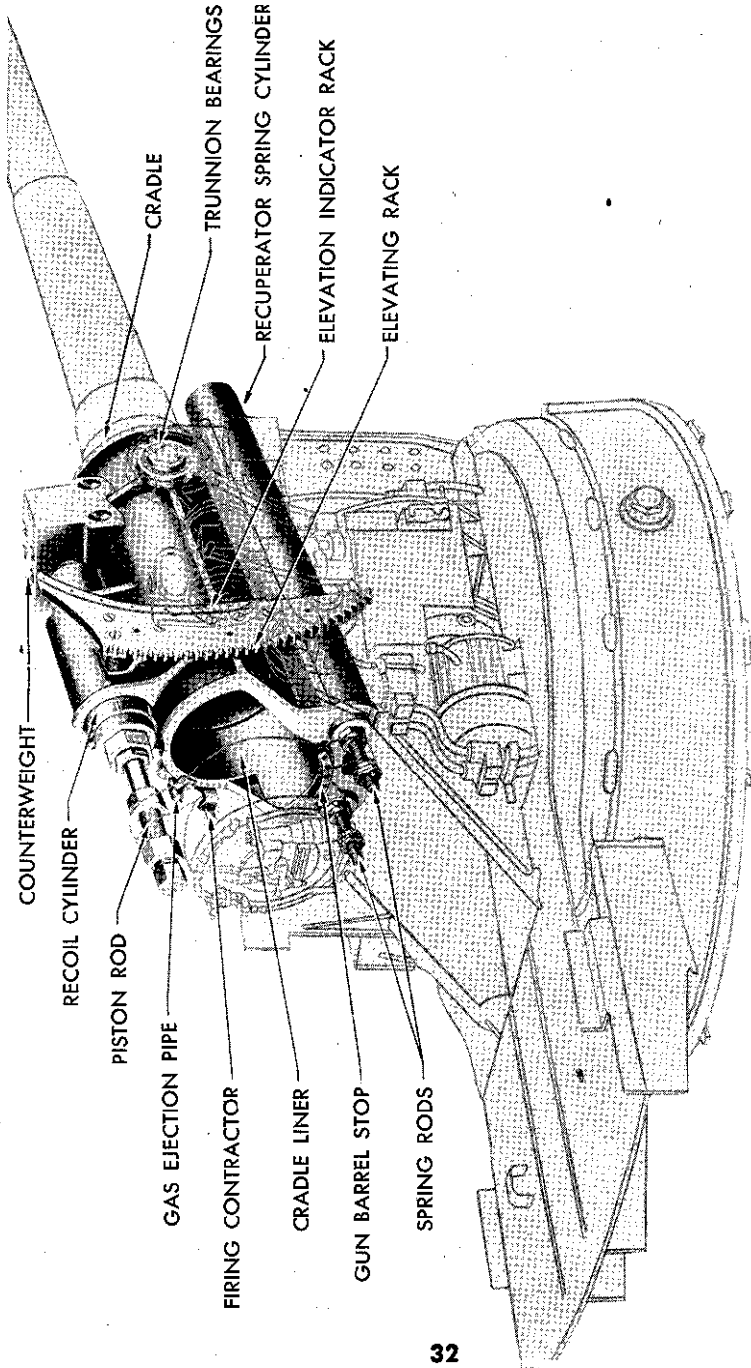


Figure 17 - Recoil Mechanism and Cradle

DESCRIPTION OF CARRIAGE

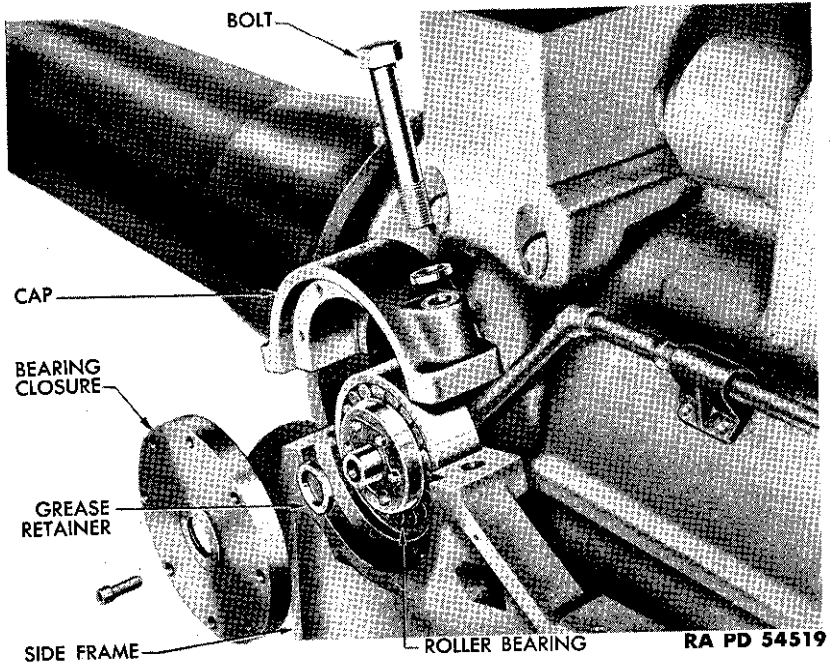


Figure 18—Cradle Trunnion, Bearing and Cap

cator mounting bracket, and the telescope. The controller panel for the power and firing circuits, switches, magnetos, etc., is also mounted on the left side frame. A wiring diagram of the power and firing circuits is shown in figure 30, and cable arrangement in figures 12, 13, and 31.

b. The loading platform frame, which is bolted to the racer retaining clip, is provided with tracks to guide the wheels of the loading carriage to and from the breech mechanism. A latch is provided in the platform floor to hold the loading carriage away from the breech when firing. The latch is depressed to release the loading carriage by means of the foot-operated pedal. A spring returns the latch to hold the loading carriage in either the loading or firing position. The loading platform and the area inside the shield around the racer are completely covered with nonskid metal floor plates. The plates are installed in sections to permit them to fit around the various assemblies mounted to the racer.

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1****14. RECOIL MECHANISM AND CRADLE.****a. Cradle.**

(1) **RECOIL SLIDE.** The cradle casting is bronze-lined to provide a bearing surface (fig. 17) for the gun in recoil and counterrecoil. Slots are cut in the forward cylinder section for the gun recoil slide keys which prevent the gun barrel from rotating. Button type lubrication fittings are provided on all sides, front, and rear, for lubricating the recoil slide bearing. The maximum permissible length of recoil is 20 inches.

(2) **COUNTERWEIGHT.** A counterweight mounted to the cradle casting is used to acquire the desired balance of tipping parts. The gun is perfectly balanced with a round of ammunition in the chamber.

(3) **ELEVATING RACK AND INDICATOR RACK.** The elevating rack is mounted to pads on the right side of the cradle. The elevating mechanism pinion operates on this rack to elevate or depress the gun. The indicator drive rack, which is mounted on the forward surface of the elevating rack, drives the elevation indicator gear.

(4) **FIRING CONTACTOR.** The firing contactor, on the left side of the cradle, causes the circuit to break when the gun recoils, and closes the firing circuit when the gun returns to battery. This eliminates long looping cables and provides some measure of safety, as the gun cannot be fired electrically when it is out of battery and the firing circuit broken.

(5) **GAS EJECTION SYSTEM PIPE.** The gas ejection system pipe is mounted on the left side and passes from the gun breech along the cradle, then through the drilled trunnion (fig. 18). The pipe on the gun telescopes into the pipe on the cradle so that when the gun recoils, the pipe on the gun slides in the cradle pipe, thus maintaining air pressure to the breech at all times.

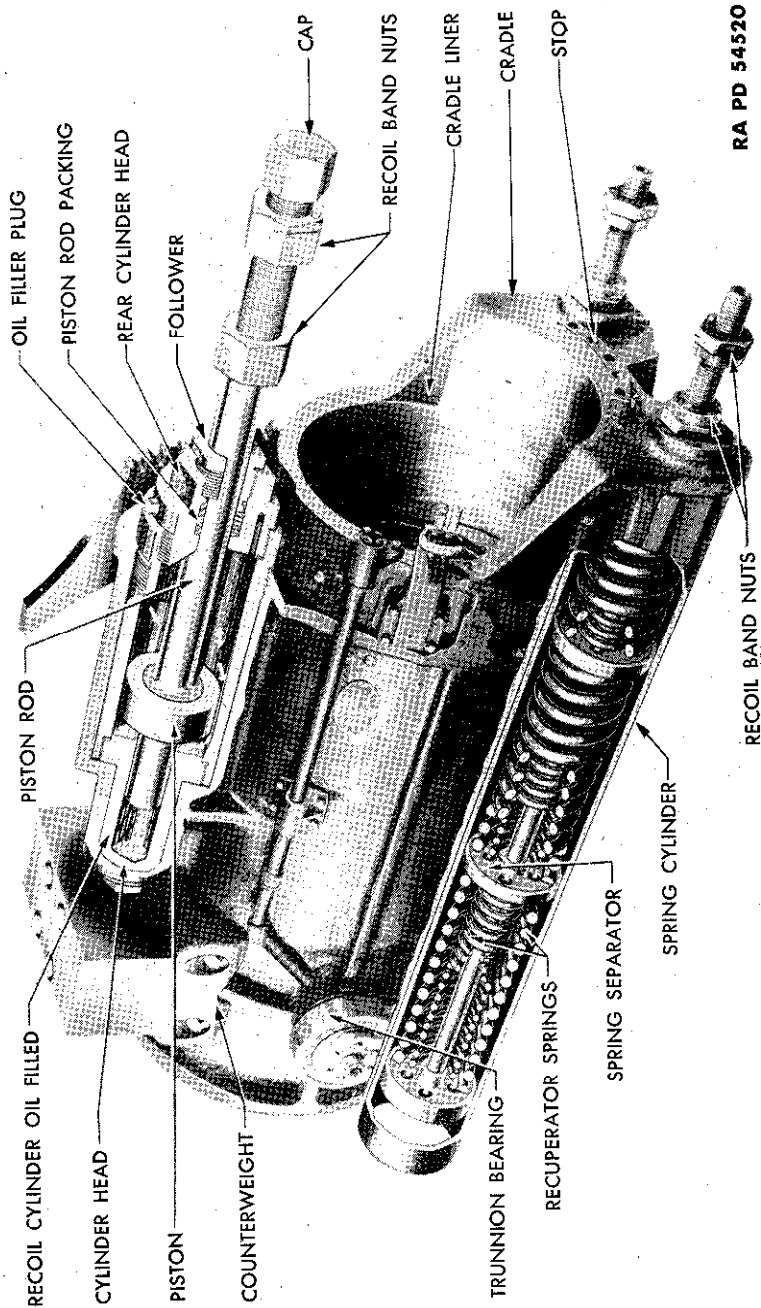
(6) **GUN BARREL STOP.** A bronze stop (fig. 17) is fastened to the lower rear surface of the cradle to provide a seating surface or stop for the gun when it is returned to battery after firing.

(7) **CRADLE TRUNNIONS.** The cradle trunnion bearings (fig. 18) are large roller bearings, shrunk onto the cradle trunnion and held in position in the side frames by retainers and bearing closures which also exclude dirt and moisture from the bearings. The bearings are clamped to the side frames by means of trunnion caps.

b. Recoil Mechanism.

(1) The recoil cylinder (fig. 19) is oil filled and serves as a brake to slow the gun to a gradual stop in recoil and counterrecoil. In recoil,

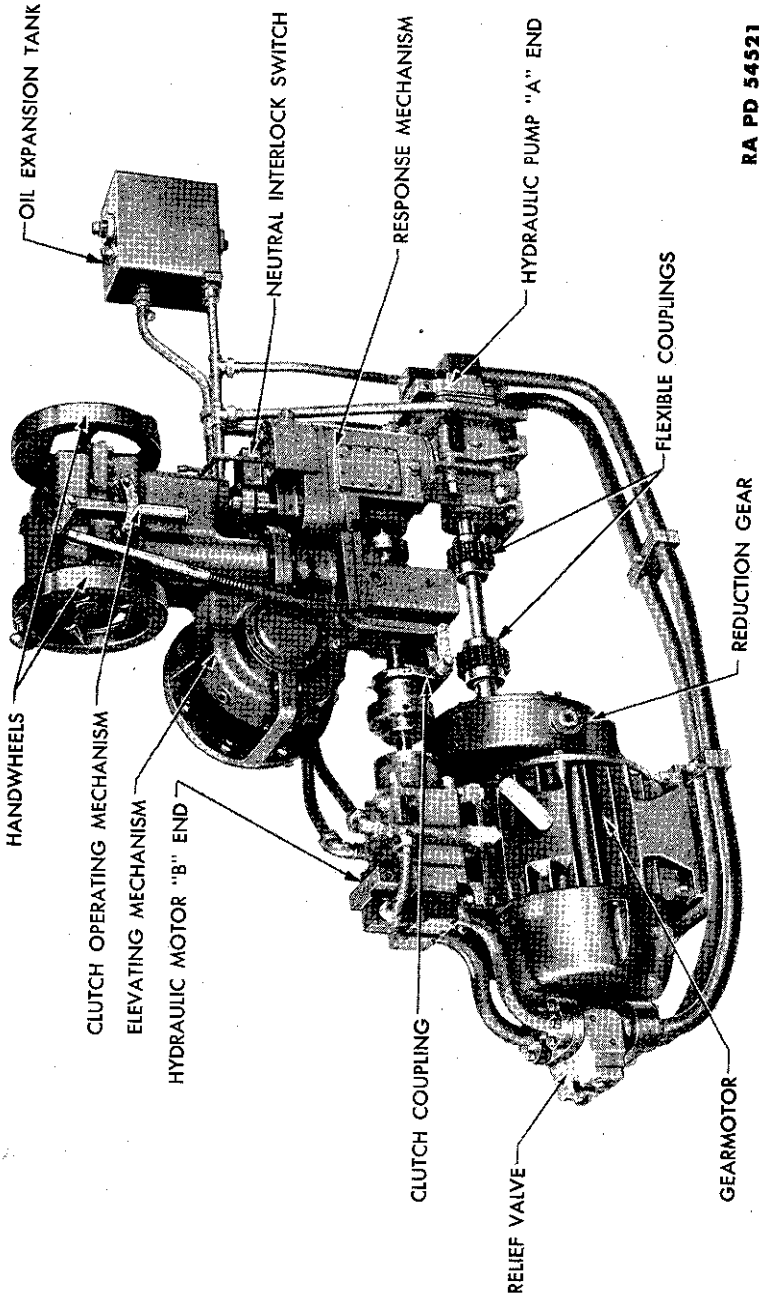
DESCRIPTION OF CARRIAGE



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Figure 19 -- Recoil Cylinder and Recuperator Springs

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GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1



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Figure 20—Elevating Mechanism and Hydraulic System

DESCRIPTION OF CARRIAGE

the piston forces oil through the throttling grooves to the front of the cylinder. These grooves are of varying depth to permit rather fast action at the start of recoil, and then gradual slowing of the piston to a stop at the end of recoil. In counterrecoil, the recuperator springs, which have been compressed in recoil, force the gun back into battery.

(2) The recoil cylinder provides resistance in counterrecoil until the male buffer of the piston rod enters the female buffer in the cylinder head. Then the oil in the cylinder head must be forced out around the male buffer until the counterrecoil action has stopped, thus permitting a smooth return to battery.

(3) The recoil cylinder piston rod is packed to withstand high oil pressures and to allow the piston to be moved easily. It is connected to the recoil band and adjusted, to prevent the piston rod end from hitting the cylinder head, by means of two nuts. The nuts are pinned into position after adjusting. A large cap nut protects the threaded end of the piston rod.

(4) The recuperator springs are housed in cylinders to retain grease and exclude dirt. Six springs, three large diameter and three small diameter, are used in each cylinder. Separators are used to keep the springs apart. The connecting rod is screwed into the spring cylinder piston at the front, and is connected to the recoil band at the rear, so that when the gun recoils, the springs are compressed to approximately 40,000 pounds. After recoil, the springs reassert themselves and return the gun to battery.

15. ELEVATING MECHANISM.

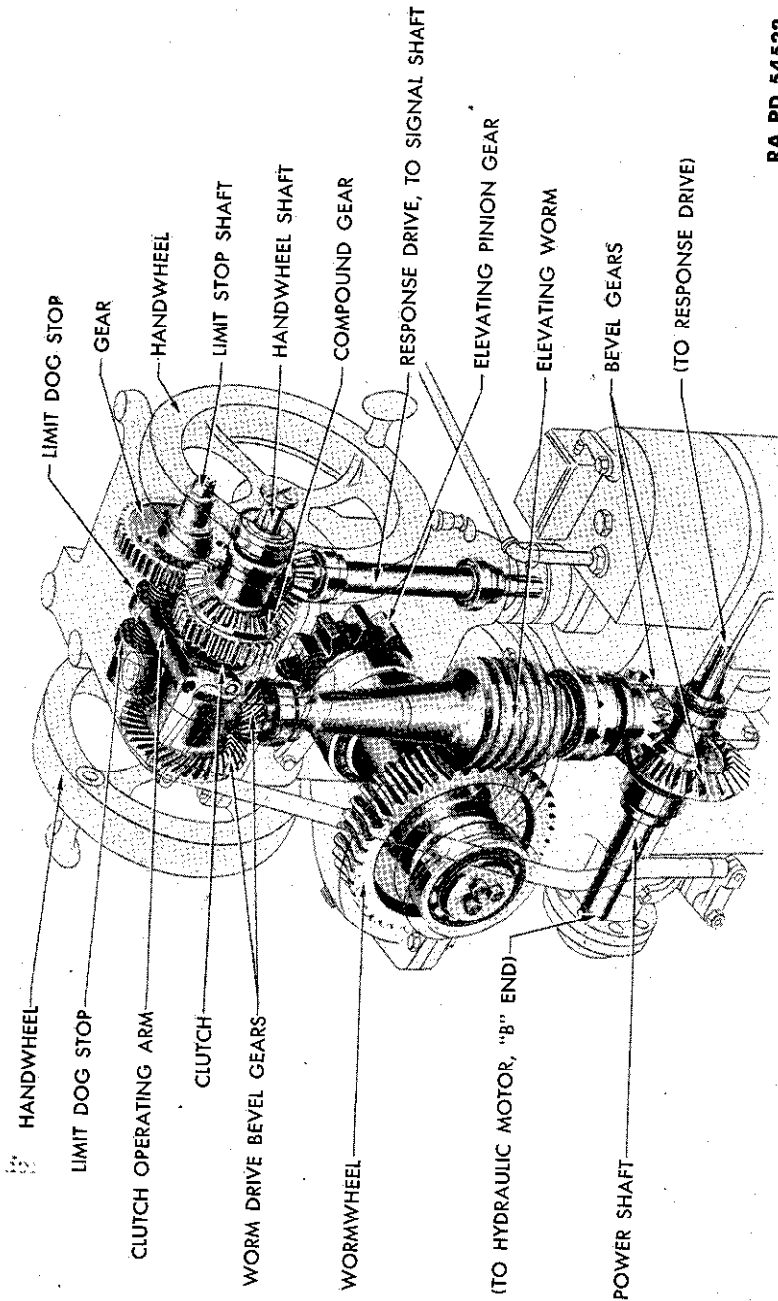
a. General.

(1) The elevating mechanism may be operated by hand power or by the electric-hydraulic power unit.

(2) The use of the hydraulic power system lessens the effort required for operation and increases the speed of elevating and depressing the gun. This is essential to a faster rate of fire because the gun must be depressed to the 177-8-mil elevation for loading and then elevated or depressed for firing.

b. **Hydraulic System.** The hydraulic system is powered by an electric motor which drives a constant speed variable delivery fluid pump ("A" end), operating a constant displacement fluid motor ("B" end) which is geared to the elevating mechanism. Turning the hand-wheels activates the hydraulic pump ("A" end) which delivers oil

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Figure 21—Elevating Mechanism

DESCRIPTION OF CARRIAGE

under pressure to the hydraulic motor ("B" end) to elevate or depress the gun. The response mechanism stops the hydraulic pump and the movement of the gun when the handwheels are stopped.

c. Clutch Operating Mechanism.

(1) **GENERAL.** The clutch operating lever (fig. 21) is placed in the "HAND" position for manual operation of the elevating mechanism, and in the "POWER" position for operation of the hydraulic system.

(2) HAND OPERATION.

(a) When the lever is placed in the "HAND" position, the clutch arm moves the handwheel shaft clutch to disengage the compound gear from the handwheel shaft and to engage the worm drive gear to the handwheel shaft.

(b) The compound gear drives the limit stop dog shaft gear and the response drive signal shaft.

(c) At the same time that the handwheel clutch is moved, the clutch between the elevating mechanism power shaft and the hydraulic motor ("B" end) is disengaged.

(3) POWER OPERATION.

(a) When the clutch lever is placed in the "POWER" position, the clutch arm moves the clutch to disengage the worm drive gear from the handwheel and to engage the compound gear (fig. 21).

(b) At the same time, the clutch is engaged to connect the hydraulic motor to the elevating mechanism.

d. Electric Gearmotor.

(1) The ten-horsepower electric motor (fig. 20) drives the hydraulic variable delivery pump ("A" end) through a reduction gear at a constant speed of 624 revolutions per minute.

(2) The motor is connected to the hydraulic pump unit with flexible, chain-type couplings.

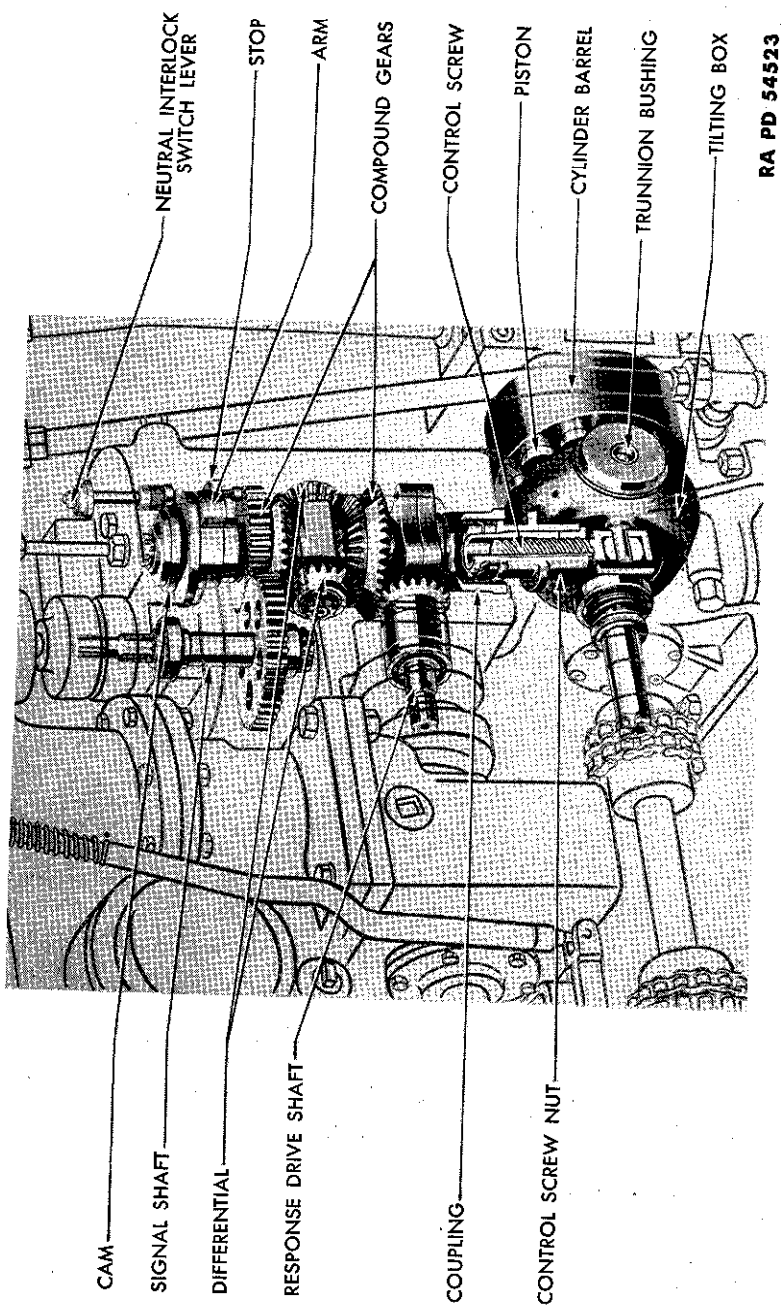
(3) Power wires for the operation of the motor are brought through the center of the base ring to the controller, then to the neutral interlock switch, push button switch, and the motor. For wiring diagram see figure 30.

e. Neutral Interlock Switch.

(1) To prevent starting the motor when the hydraulic pump is in a position to start pumping immediately, the neutral interlock switch is provided.

(2) This switch completes the power circuit only when the hydraulic pump is in the neutral position. This is necessary so that the motor can reach its maximum speed before applying the load and to prevent uncontrolled movements of the gun.

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Figure 22—Hydraulic Variable Delivery Pump ("A" End) and Response

DESCRIPTION OF CARRIAGE

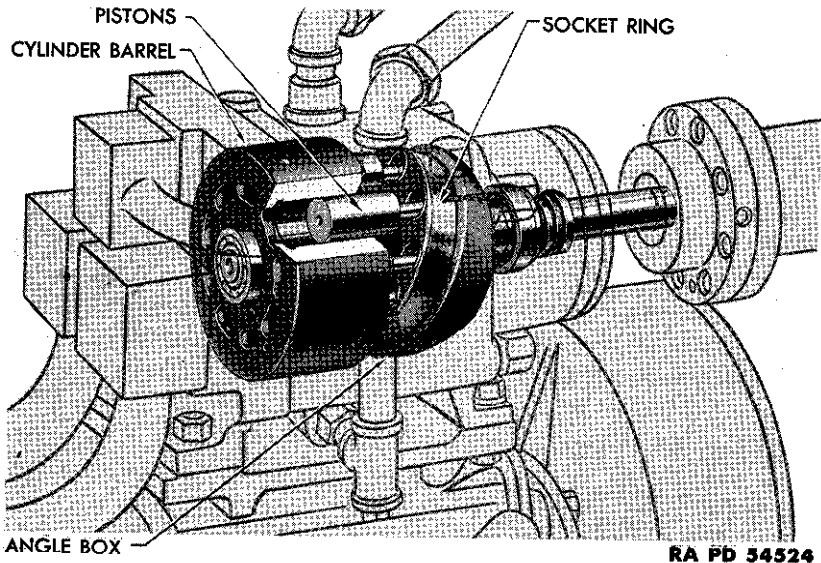


Figure 23—Hydraulic Motor ("B" End)

(3) The switch is operated by a cam in the response mechanism which is set at the neutral position of the hydraulic pump. The neutral position can be determined by rotating the handwheels when the clutch is in the power position and observing the movement of the switch operating lever. The lever will move out away from the switch stem when the pump is in the neutral position.

f. Hydraulic Pump ("A" End) and Response.

(1) The "A" end unit (fig. 22) is a nine-cylinder variable delivery pump. Connecting rods are attached to the socket ring by ball and socket joints, and the socket ring is retained in the tilting box. A universal joint permits tilting the socket ring and tilting box, which is supported in a trunnion at each side of the case. Closely fitted pistons, connected to the rods by ball and socket joints, operate in the cylinder barrel. A two-port valve plate contains oil replenishing ball check valves and oil passages to the hydraulic motor ("B" end).

(2) When the tilting box is parallel with the cylinder barrel, there is no pumping action of the pistons in the cylinder barrel although the pump is constantly rotated. This is the neutral position. When the tilting box is tilted the pistons oscillate in the barrel. Oil is drawn into

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the cylinder on one side of the valve plate and forced out on the other side. The oil flow direction is reversed by reversing the angle of the tilting box.

(3) The tilting box is tilted by the response mechanism. Rotation of the elevating mechanism handwheels, when the clutch is in the "POWER" position, rotates the signal shaft and the upper differential compound gear, which is not keyed to the differential shaft. Rotation of the compound gear rotates the differential which is keyed to the shaft. Rotation of the differential shaft rotates the control screw nut. When the nut is turned on the control screw, the tilting box is moved up or down to start the hydraulic pump.

(4) To return the hydraulic pump tilting box to the neutral position and stop movement of the gun when the handwheel rotation is stopped, the lower compound gear, driven by the elevating mechanism power shaft, rotates the differential and shaft until the neutral position is reached and the pump is stopped.

(5) An arm and stop, at the top of the differential shaft, limit the tilting box to 20 degrees in either direction.

(6) The cam operates the neutral interlock switch.

g. Hydraulic Motor ("B" End).

(1) The hydraulic motor (fig. 23) is the same as the hydraulic pump ("A" end) except that the angle box is fixed at 20 degrees.

(2) Oil under pressure from the hydraulic pump ("A" end) flows through one of the ports in the valve plate and into the exposed cylinders. This pressure forces in the pistons. Since the pistons are at an angle to the socket ring and angle box, rotation of the drive flange results. As the cylinder barrel rotates, the cylinders are successively connected to the inlet and outlet ports of the valve plate. The speed of rotation of the drive shaft is directly proportioned to the quantity of oil supplied to it by the hydraulic pump.

(3) When the flow of oil is reversed, determined by the position of the "A" end tilting box, the direction of rotation of the hydraulic motor is reversed.

h. Relief Valve. The relief valve (fig. 20) is adjusted to prevent oil pressures from exceeding 725 pounds.

i. Oil Expansion Tank.

(1) The oil expansion tank (fig. 20) carries an oil reserve and acts as a thermal cooling system for the oil. Hot oil rises from the top of the "A" and "B" end units to the top of the tank. Cooler oil goes to the bottom of the tank and then to the bottom connection of the "A"

DESCRIPTION OF CARRIAGE

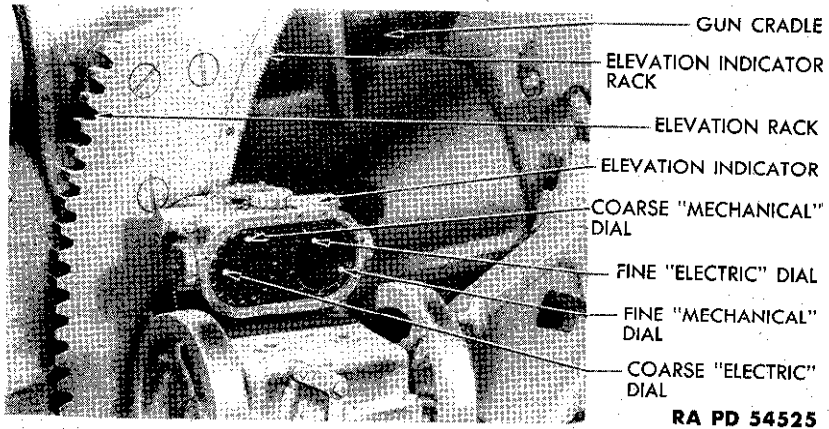


Figure 24—Elevating Indicator and Drive

and "B" end units. Oil is introduced directly into the "A" and "B" end cylinders by means of replenishing ball check valves.

(2) The tank is provided with a bayonet type oil level gage, filler and drain plugs, and a screen filter to prevent the entrance of foreign material.

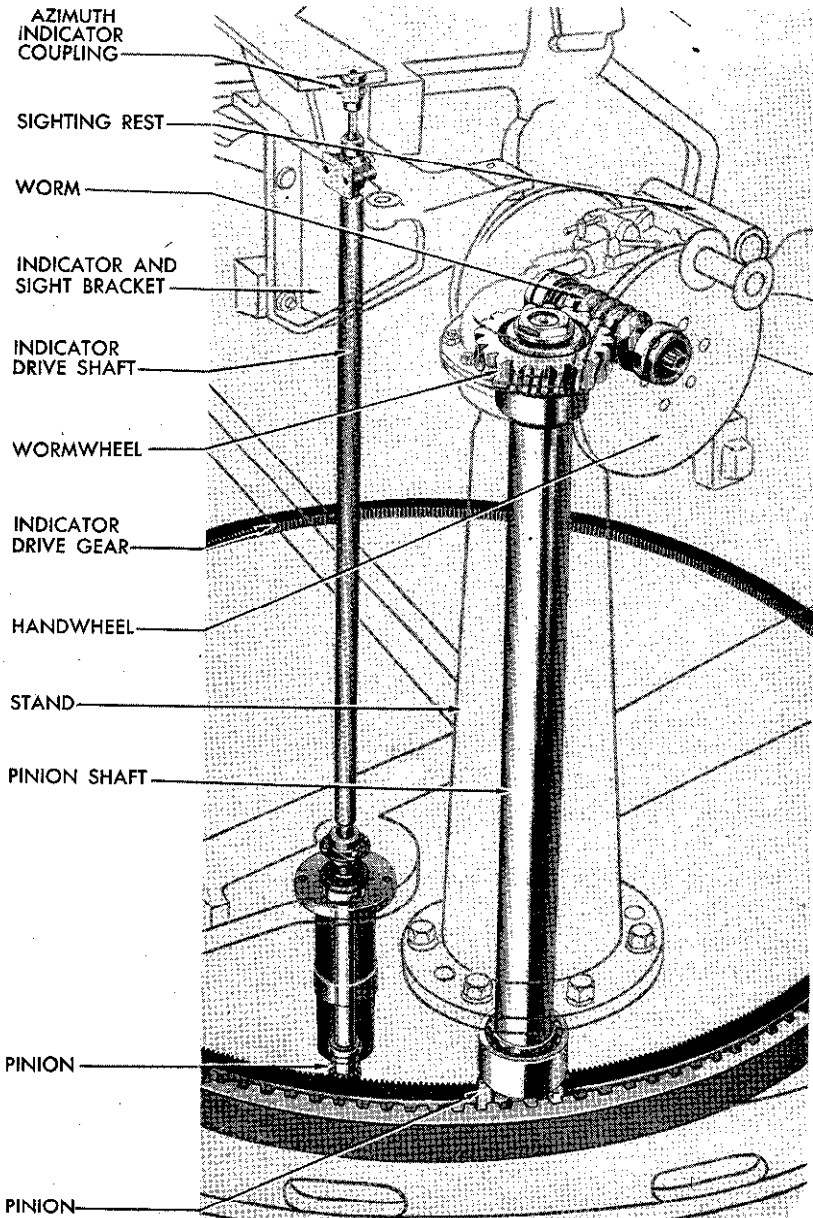
j. Limit Stop Dog Shaft. The shaft (fig. 21) is gear-driven when the elevating mechanism is operated by the hydraulic system. When the threaded shaft is rotated, the limit stop dog is stopped and further movement of the handwheels is prevented at the 817.8- to 826.7-mil elevation and the —71.1- to —80.0-mil depression. The limit stop dog is stopped by the gear on the right side and the limit dog stop dog on the left side.

k. Worm and Wormwheel. The worm and wormwheel are closely fitted to eliminate backlash. The worm is rotated manually by the worm drive bevel gears at the top. It is rotated when using the hydraulic unit by the power shaft and bevel gears at the bottom.

l. Pinion Shaft and Elevation Rack. The elevating pinion gear operates directly on the elevation rack which is bolted to the gun cradle. An indicator drive rack mounted on the elevating rack drives the elevation indicator.

m. Elevation Indicator. The indicator (fig. 24) is mounted to the elevating mechanism cover and is driven by the indicator rack, bolted to the elevation rack. The mechanical dials are set at zero with

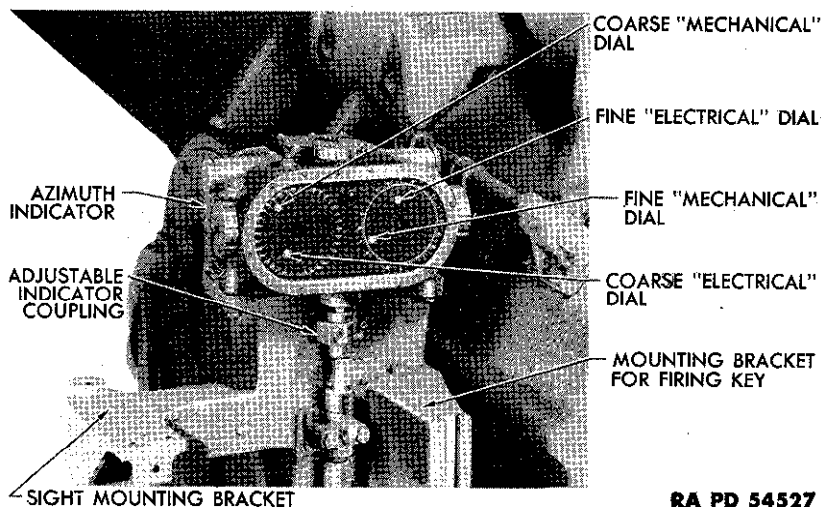
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RA PD 54526

Figure 25—Traversing Mechanism and Indicator Drive

DESCRIPTION OF CARRIAGE



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Figure 26—Azimuth Indicator

the gun leveled. Electric dials are controlled by the data transmission system. In operation, the elevating mechanism is operated to match the mechanical dials with the electric dials. For detailed information on the use and care of this instrument, refer to section X.

16. TRAVERSING MECHANISM.

a. The mount is traversed manually by the direct drive traversing mechanism (fig. 25) which is enclosed in the stand and mounted to the racer. Turning the handwheels rotates the worm and wormwheel, and the pinion which traverses the mount engages with the traversing rack in the base ring, moving the carriage to the right or left.

b. The azimuth indicator is driven by a smaller ring gear, similar to the traversing rack, also mounted in the base ring. The indicator coupling is rotated on the shaft to adjust the azimuth indicator in orientation.

c. The indicator (fig. 26) is mounted on the bracket bolted to the side frame. This bracket also provides a mount for the direct fire sight. The electric dials are controlled by the data transmission system. In operation, the traversing mechanism is operated to match the mechanical dials with the electric dials. For detailed information on the use and care of this instrument, refer to section X.

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17. SHIELD.

a. The shield, for the protection of the gun and gun crew, is bolted to the racer and traversed with the gun. An aperture at the front permits elevating the gun, and another smaller opening on the left side permits the use of direct fire sights by the gun pointer. The curved surfaces of the shield aid in deflecting enemy fire.

b. The shield is insulated with a layer of ground corkmastic composition to aid in deadening sound and to keep the inside of the shield dry.

c. An adjustable cradle stop, which prevents the gun from being depressed further than —88.9 mils, is installed at the top of the shield, just above the center of the recoil mechanism cradle.

d. Lights provided for night firing are mounted at the top of the shield, and jacks for the telephone system are at the sides. The time interval bell is also installed at the side.

18. LOADING CARRIAGE.

a. The loading carriage from which the projectiles are rammed into the breech, is a four-wheeled carriage. It is rolled, on rails built into the loading platform, up to the open breech of the gun and held in this position while the projectile and powder charge are rammed into the gun. After loading, the carriage is rolled back and latched in this position. A foot-operated pedal releases the carriage latch.

b. To bring the carriage to a gradual stop, when it is rolled against the breech for loading, a hydraulic and spring buffer is provided. The buffer is filled with OIL, recoil, heavy, and has a spring in the cylinder to return the buffer plunger after the carriage has been rolled away from the breech. The carriage for the M1905A2 Gun differs from the carriage of the M1903A2 Gun in that the M1903A2 Carriage has a different nose and buffer.

c. The height and angle of the carriage is designed to load the gun when it is elevated to 177.8 mils. However, the carriage loading tray may be adjusted by means of the handwheel, under the trap, to either 160.0 mils or 195.6 mils. A pointer and indicator plate indicate the angle at which the loading tray is set.

19. GAS EJECTION SYSTEM.

a. **General.** The gas ejection system (fig. 28), used to clear the gun barrel after firing, consists of an air compressor, piping to the gun center terminal, piping from the center terminal to the equalizer tank,

DESCRIPTION OF CARRIAGE

piping to the gun cradle, the telescoping pipe connection to the gun, an air valve and the piping around and through the breech to the powder chamber.

b. Air Compressor.

(1) The air compressor (fig. 27) is a V-type, two-cylinder, two-stage compressor. It is driven by a ten-horsepower electric motor at a maximum speed of 870 revolutions per minute.

(2) Air is drawn into the larger low pressure cylinder through the suction muffler, which is screened to prevent the entrance of dirt. The air is initially compressed in the low pressure cylinder and pumped into the smaller high pressure cylinder. The pressure is raised by the high pressure cylinder and the air is then forced through the intercooler and then through the discharge pipe to the gun.

(3) The compressor is driven by V-belts from the motor pulley to the compressor pulley, which is also the flywheel and cooling fan for the cylinders and intercooler.

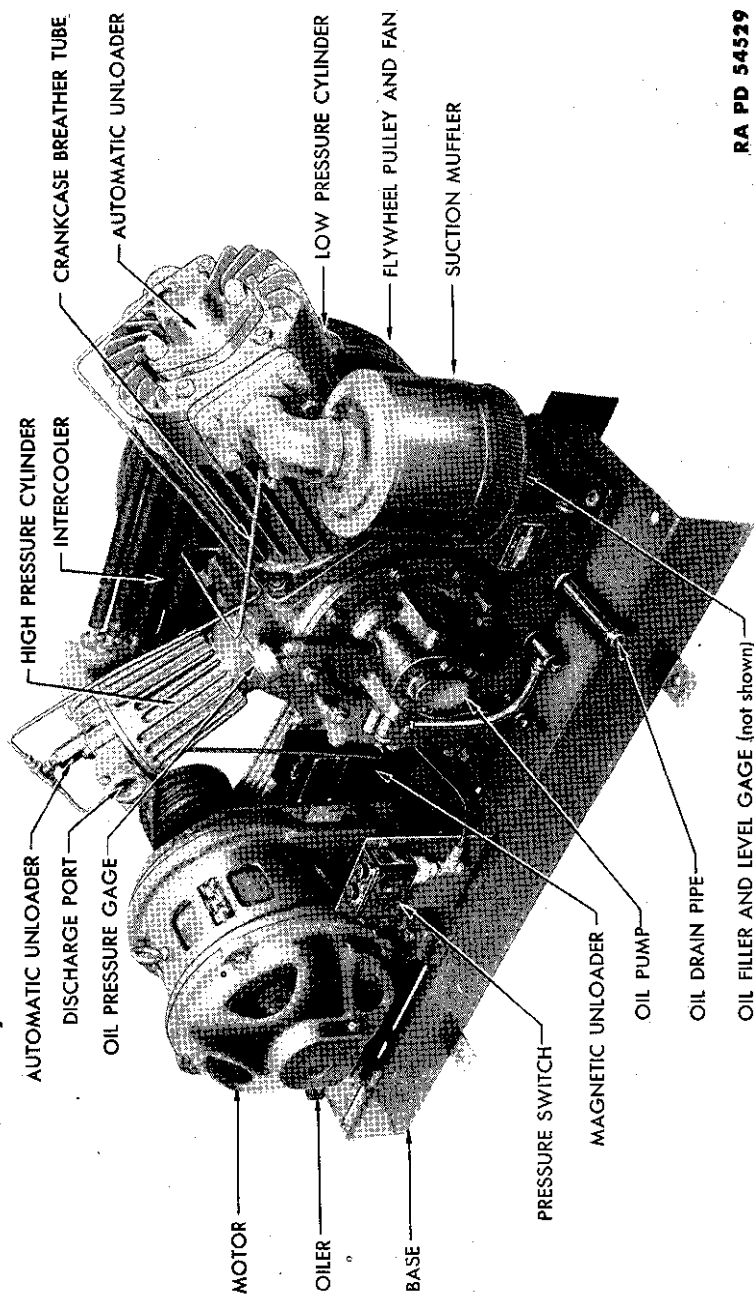
(4) The crankcase of the compressor is enclosed and provides a sump for the crankcase oil. The lubricating oil is pumped, by a gear type oil pump, from the sump to the connecting rod and piston pins. Cylinder walls, crankshaft bearings and pistons are splash-lubricated. A pressure gage is mounted on the oil pump. Normal oil pressure is between 25 and 40 pounds. A crankcase breather tube connected to the air inlet elbow ventilates the crankcase. A bayonet-type dip stick or level gage in the crankcase filling plug opening is used to indicate the level of oil in the crankcase. The capacity of the crankcase is approximately 5 quarts. A drain pipe is provided for draining all crankcase oil.

(5) The drop forged, counterbalanced crankshaft is supported in the crankcase in tapered roller bearings. The gear type oil pump is driven from one end of the shaft and the flywheel pulley is attached to the tapered crankshaft on the other end. Two bronze connecting rods are mounted in bronze backed babbitt bushings on the single crank pin. Full floating piston pins attach the pistons. The larger piston is aluminum for balance while the smaller piston is iron. Cylinders mounted on the crankcase at a 90-degree angle are finned for cooling. Feather valves are used for intake and exhaust of air.

(6) Automatic unloaders which regulate the air pressure when the motor is running are mounted on each cylinder head.

(7) The compressed air passes from the low pressure cylinder to the high pressure cylinder, then through the intercooler, where the

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RA PD 54529

Figure 27 - Air Compressor

DESCRIPTION OF CARRIAGE

air is cooled and moisture removed before entering the discharge piping. The intercooler is mounted in the air stream from the pulley fan.

(8) **AUTOMATIC STOP AND START CONTROL.** The stop and start control automatically starts and stops the compressor when the transfer switch is in the "AUTOMATIC" position according to the demand. It starts the motor when the pressure drops below 140 pounds and stops it when the pressure exceeds 150 pounds.

(9) **PRESSURE REGULATION.**

(a) When the transfer switch is in the "HAND" position, the pressure is regulated by the automatic unloaders while the motor continues to run.

(b) Pressure regulation is effected by the use of automatic unloaders to hold open the compressor suction valves. The automatic unloaders are operated to hold open the valves by the discharge air pressure which is brought from the discharge pipe to the pressure switch. When the pressure exceeds 150 pounds, the pressure switch three-way valve opens and admits discharge air pressure to the automatic unloaders. When the air pressure drops to 140 pounds, the pressure valve closes and releases the pressure from the automatic loaders, allowing the compressor to reload.

(c) When the transfer switch is in the "OFF" position, the motor is completely shut down.

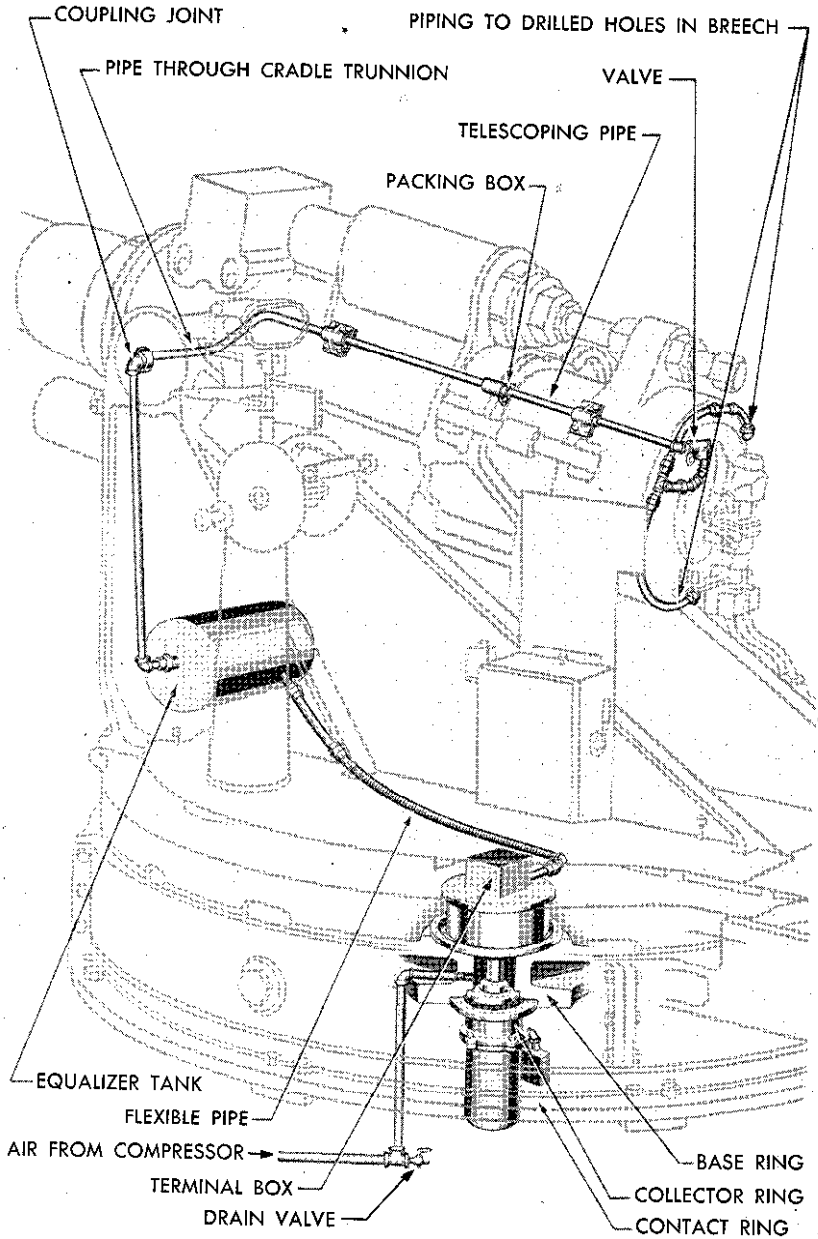
c. **Air Pipe to Gun Center Terminal.** The air is piped from the discharge port in the high pressure cylinder through the intercooler to a water trap in the emplacement, which is provided with a drain valve. A vertical pipe connects to the air duct in the center terminal (fig. 16).

d. **Air Pipe to Equalizer Tank.** A flexible air pipe connects from the center terminal air duct to the equalizer tank, mounted in straps on the side frame transom (fig. 28).

e. **Air Pipe to Cradle Trunnion.** The equalizer tank outlet pipe passes from the tank through the left side frame and up to the cradle trunnion. The trunnion is bored and fitted with a sleeve to allow the air to pass through to the side of the cradle. A special type fitting permits rotation of the cradle trunnion and holds air pressure.

f. **Air Pipe to Breech.** A hole is bored through the top of the cradle trunnion at a 45-degree angle to meet the sleeve in the center of the cradle trunnion. The pipe is fitted into this sleeve and passes

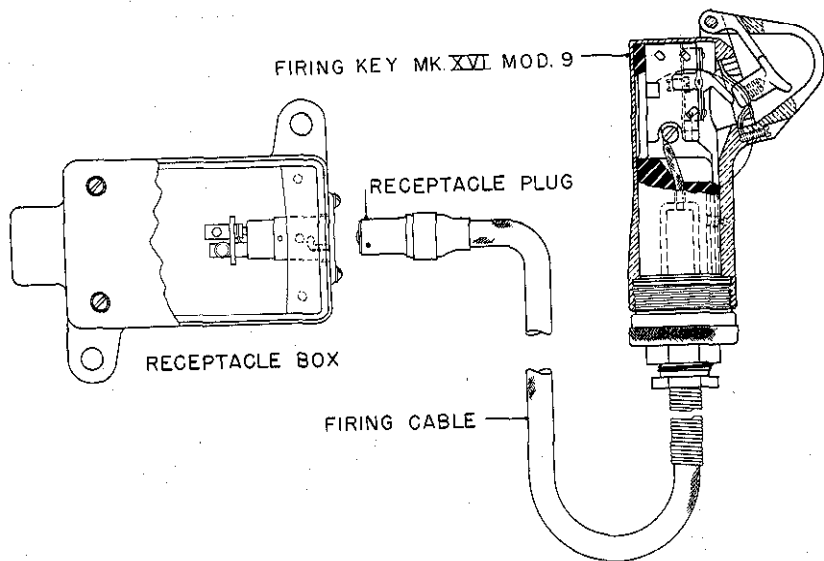
**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**



RA PD 54530

Figure 28—Gas Ejection System Piping

DESCRIPTION OF CARRIAGE



RAPD 70660

Figure 29—Firing Circuit Series Plug and Receptacle

to the end of the cradle. The pipe from the breech telescopes in the cradle pipe so that when the gun recoils, air does not escape. A packing gland is provided on the cradle pipe.

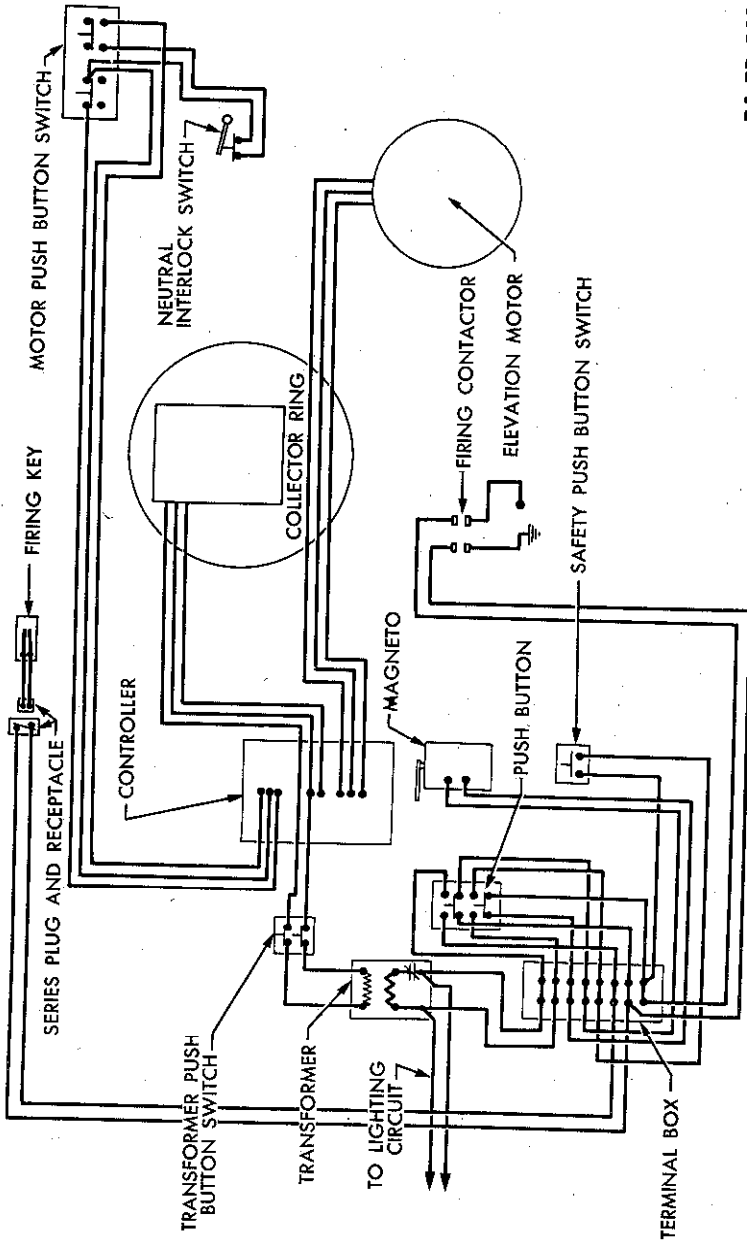
g. **Air Valve.** The telescoping pipe attaches to the air valve, mounted on the breech. The valve is opened automatically, by the tripper on the block carrier, when the breech is opened. Air is then piped around the breech to three air holes drilled in the breech recess.

20. ELECTRICAL SYSTEM.

a. Power for the operation of the elevation electric motor, firing circuit, and lighting circuit is supplied from an outside source or the generator units installed in the traverse. The cable is brought up to the collector ring, mounted on the under side of the base ring (fig. 16). The collector ring permits continuous traverse of the gun, while maintaining electrical contact, by means of insulated circular contacts which rotate with the gun and stationary breech contacts mounted in the collector ring housing.

b. The contact ring is mounted to the collector ring. It is employed for the transmission of electrical fire control data, time interval bell

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Figure 30—Power and Firing Circuit

DESCRIPTION OF CARRIAGE

and telephone circuits. It also allows continuous traverse of the gun while maintaining electrical contact. For description of on-carriage fire-control equipment, refer to section X.

c. Power and Firing Circuit (fig. 30).

(1) **CONTROLLER.** The controller (fig. 12), mounted on the left side frame, is provided with a master switch and an overload circuit breaker.

(2) **TRANSFORMER.** Power for the 12-volt transformer is wired to a push button switch (fig. 12) and then to the transformer. Power for the firing circuit is wired to the terminal box. Another cable from the transformer is for the lighting circuit.

(3) **TERMINAL BOX.** The terminal box is a distribution box for the firing circuit wiring to the magneto, firing key, transformer-magneto switch and safety push button switch.

(4) **SAFETY PUSH BUTTON SWITCH.** This switch is operated by the gun commander to complete the firing circuit in Case III firing when the plug is removed from the receptacle at the gun pointer's station.

(5) **MAGNETO.** The magneto is provided for firing when outside source of power has failed.

(6) **TRANSFORMER-MAGNETO SWITCH.** This switch is a two-unit, double pole, watertight unit with maintained contacts in either position. For firing with outside source of power, the switch is turned on to "TRANSFORMER"; for magneto firing, to "MAGNETO."

(7) **FIRING KEY.** The firing key, mounted on the right traversing handwheel, is operated to complete the firing circuit when using transformer power in Case II firing. It is operated by the gun pointer. The gun cannot be fired until gun commander completes circuit by depressing the safety push button switch.

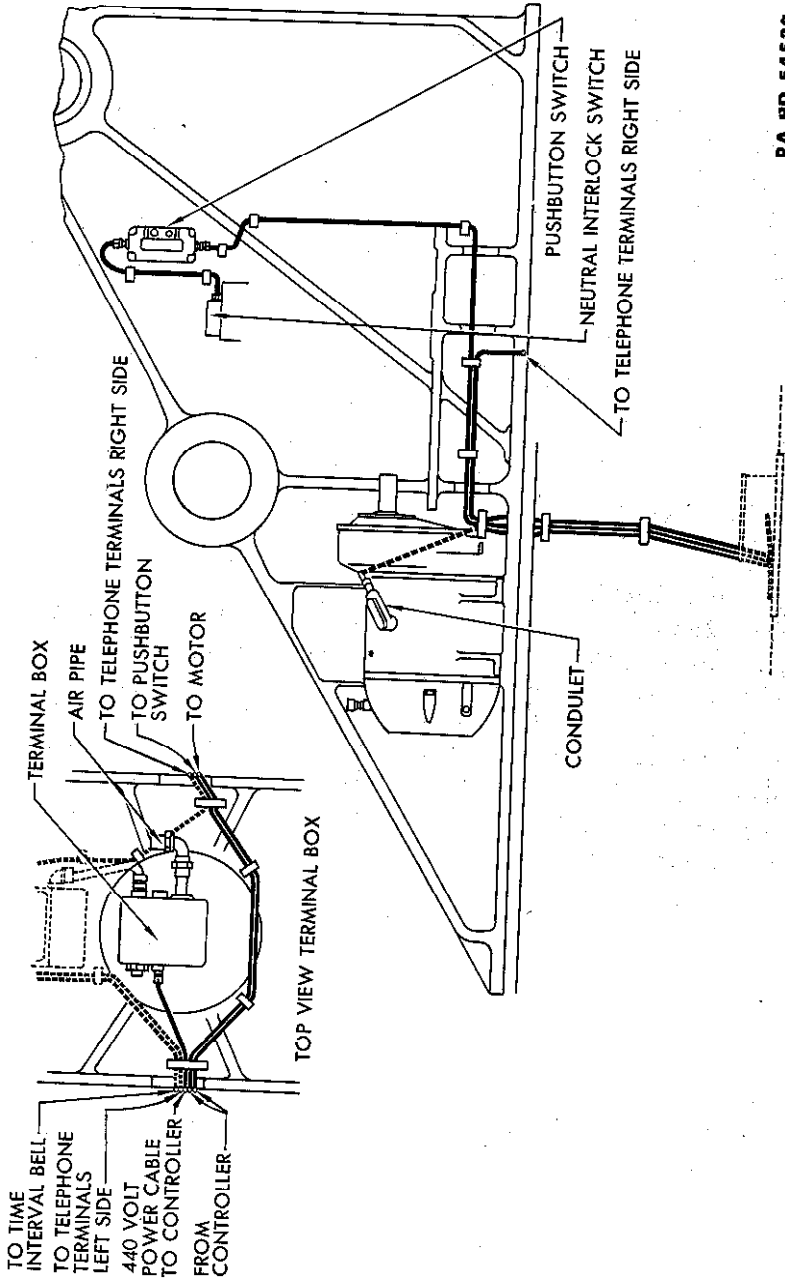
(8) **FIRING CONTACTOR.** The firing contactor breaks the firing circuit when the gun is fired and makes the circuit when the gun is returned to battery. Its use eliminates long looping cables.

(9) **ELEVATING MOTOR.** The ten-horse power motor for power in driving the hydraulic variable delivery pump, is wired to the controller. A push button switch and the neutral interlock safety switch complete the circuit for starting when the main controller switch is on.

(10) **MOTOR PUSH BUTTON SWITCH.** This switch (fig. 31) is used in starting the motor. However, the power circuit is not complete until the hydraulic variable delivery pump is in the neutral position.

(11) **NEUTRAL INTERLOCK SWITCH.** This switch (fig. 31) completes the power circuit when the push button switch is on and the variable delivery pump is in the neutral position. The switch is oper-

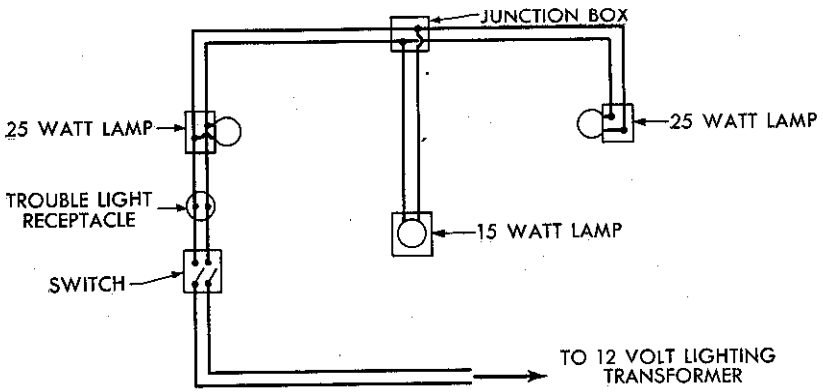
6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1



RA PD 54532

Figure 31 — Power Cable Arrangement — Right Side

DESCRIPTION OF CARRIAGE



RA PD 54533

Figure 32—Lighting Circuit

ated by a lever and cam arrangement in the hydraulic response assembly.

d. Lighting Circuit.

(1) Two 25-watt and one 15-watt, 12-volt lamps are provided for lighting the inside of the shield. The 15-watt lamp is located in a receptacle at the top center of the shield. The 25-watt lamps are located in receptacles at the right and left side center of the shield. Power is provided by the 12-volt transformer which is also used for the firing circuit. A wiring diagram is shown in figure 32.

(2) An extension trouble light is provided for making repairs, etc. The receptacle and light cord are at the left side of the shield.

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GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

Section IV

OPERATION

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To traverse	22
To elevate or depress gun	23
To load	24
To fire	25
To unload	26
After firing	27

21. PREPARATION FOR FIRING.

a. **Bore Cleaning and Inspection.** Remove the breech and muzzle covers and inspect the bore and chamber to be sure that no foreign material has accumulated. If dirty, clean with SOLVENT, dry-cleaning, and wipe dry. Normally, the bore and chamber should be wiped dry or cleaned to remove the coating of oil applied after the previous firing.

b. **Breech and Firing Mechanism Inspection.** Open and close the breech and note action. If sluggish or difficult to operate, determine cause and correct this condition (par. 49). With the breech closed, pull down the firing slide latch bolt and move the slide to be sure that it operates freely. The breechblock threads and the threads in the breech ring should be clean. Wipe the gas check pad, apply a coating of OIL, engine, SAE 10, and rub in well.

c. **Electrical Contact Check.** Before firing, all electrical contacts should be tested to be sure that the firing circuit is complete. The circuit may be tested with a test lamp or by firing a primer (par. 54).

d. Ammunition Preparation.

(1) Projectiles to be fired should be prepared beforehand (par. 66) and placed in the racks provided.

(2) Verify the type of projectile, weight, and lot number.

(3) Remove the rope grommet and inspect the rotating band. Remove any burs with file.

(4) Clean the projectile with SOLVENT, dry-cleaning, and waste, or with sponge and water. It is important that projectiles be perfectly clean and free of sand and dirt.

(5) Projectiles equipped with base-detonating fuzes will normally

OPERATION

be received properly fuzeed for firing. Projectiles equipped with point-detonating fuzes will normally be received unfuzed and will be fuzeed as required in the following manner:

(a) Remove the eyebolt lifting plug from the projectile. Do not remove plug until fuze is to be installed. The eyebolt plug is provided as a lifting device, and also as a plug to keep out foreign matter.

(b) Inspect fuze cavity and threads. They should be free of any foreign matter that would interfere with the proper assembly of the fuze.

(c) Insert the fuze, being careful to see that it is fitted with its felt or rubber washer, and screw it in by hand.

(d) Screw up the fuze with the fuze wrench but without using any great force.

(e) If there is any difficulty in screwing in the fuze, it should be removed and another inserted. If the same trouble is experienced with the second fuze, the shell should be rejected.

(f) Set the fuze to "DELAY" or "S. Q." (Superquick) as directed and described in paragraph 69.

(g) For further information and instructions on ammunition, refer to section IX.

(6) Powder charges will be kept in their containers, excepting the charge which is to be served to the piece for the next succeeding round. The powder charge for any round will not be brought from the traverse until the preceding round has been fired. Instructions for removal of powder charges from containers and preparations for firing are given in paragraph 66.

(7) Previous to firing, each of the primers to be used in firing is to be inserted in the obturator spindle in order to test the proper fit of each primer.

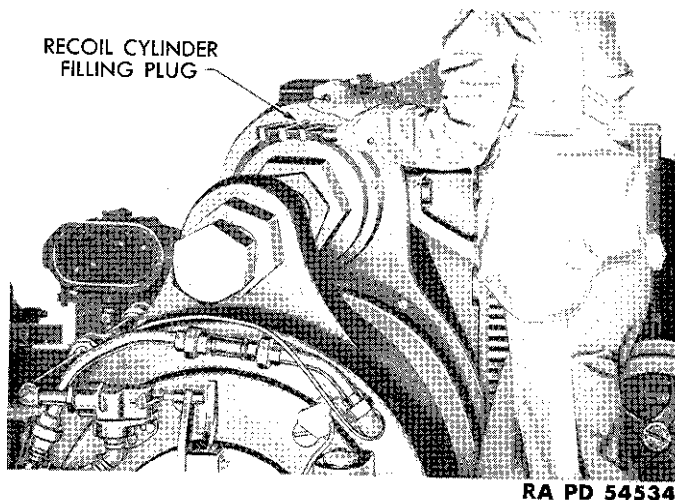
e. **Air Compressor Starting.** Check level of crankcase oil (par. 40 h), and then start the air compressor which supplies air pressure for the gas ejection system.

f. **Recoil Oil Checking.** Depress the gun to 0.0 mils, remove the recoil cylinder filling plug (fig. 33), and note that the cylinder is completely filled.

22. TO TRAVERSE.

a. The mount is traversed manually by turning the handwheels of the mechanism on the left side. In traversing, the trigger of the firing key or pistol should be depressed only when the gun is on the target and loaded for firing. When tracking, the gun pointer will match the

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Figure 33—Recoil Cylinder Filling Plug Removal

mechanical hand of the azimuth indicator with the plotting room controlled hand of the indicator at all times. For operation of sighting and fire-control equipment, refer to section X.

23. TO ELEVATE OR DEPRESS GUN.

a. The gun may be elevated by hand power or by means of the electric-hydraulic power unit. When using the power unit, the elevation is controlled by movement of the handwheels, in the same manner as when elevating the gun manually.

b. To elevate manually, place the clutch operating lever in the "HAND" position.

c. To elevate by electric power, place the clutch operating lever in the "POWER" position (fig. 34). Rotate the handwheels to the central position. This is indicated by observing the point at which the neutral interlock switch lever (fig. 34) moves in slightly. Hold the handwheels in the neutral position and turn on the motor switch. After starting the motor, the gun is elevated or depressed by turning the handwheels in the direction desired.

d. The elevation of the gun is directed from the plotting room to the elevation indicator (fig. 35). The controlled indicator hand and

OPERATION

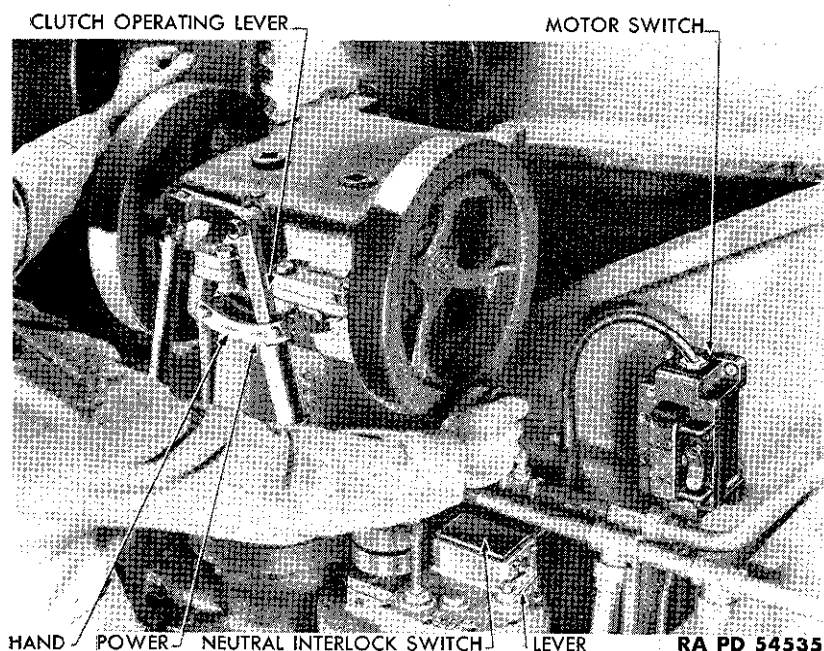


Figure 34—Elevating Mechanism Operation

the mechanical indicator hand are matched by the range setter after the gun has been loaded. After firing, the gun is returned to 177.8 mils elevation, the loading position.

24. TO LOAD.

a. Breech Opening.

(1) Grasp the breech operating lever (fig. 36) and pull it out of its latch. Pull the lever to unscrew the breechblock and continue the movement to swing the block clear of the gun. Hold the breech open to prevent its interfering with the loading carriage.

(2) When opening the breech, the gas ejector valve tripper on the block carrier opens the valve on the breech hinge plate which admits air under pressure to clear the gun of gases, powder fouling, and unburned pieces of powder bag. The valve should remain open until the projectile is being rammed.

b. Spent Primer Ejection. After a round has been fired, the spent primer is ejected after opening the breech. On the M1903A2

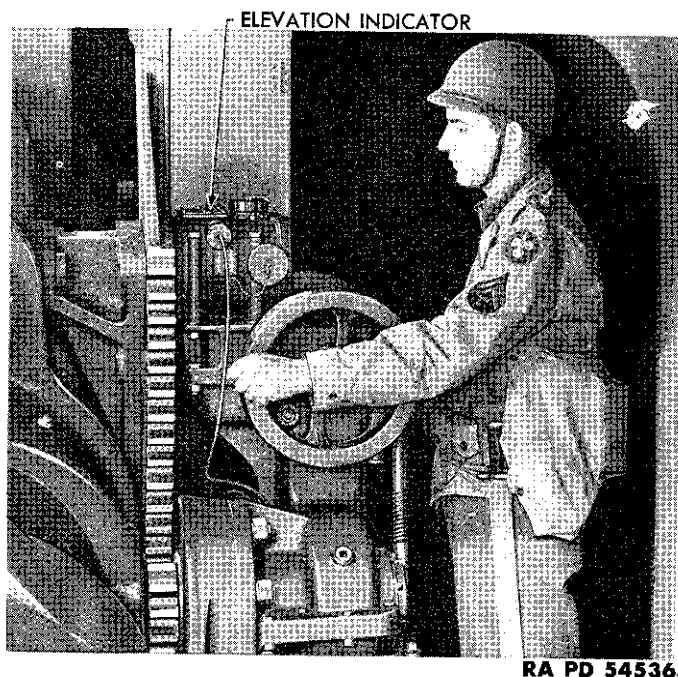
**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

Figure 35—Gun Elevating or Depressing

Gun, the firing mechanism slide uncovers the primer when the breech is opened, and the primer is ejected manually (fig. 37). On the M1905A2 Gun, the firing mechanism slide is unlatched and the slide moved to the right. This action uncovers the primer case and ejects it by the same action.

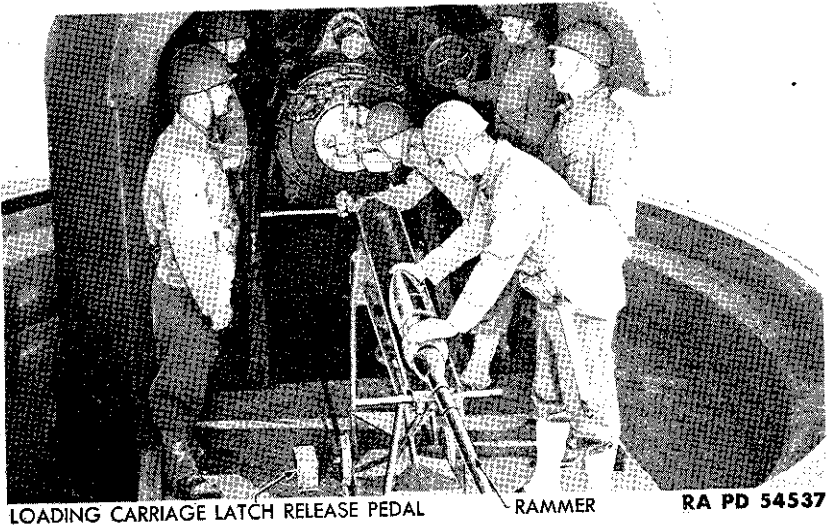
c. Primer Insertion.

(1) Wipe off the obturator spindle mushroom head and gas check pad, using waste or wiping cloths slightly dampened with OIL, engine, SAE 10, or SOLVENT, dry-cleaning. Clean the primer vent and seat with vent-cleaner and insert primer (fig. 38).

(2) The firing mechanism slide on the M1903A2 Gun will move into position to align the firing lever and firing leaf, and make the electrical contact only when the breech is closed, and therefore is safe from accidental firing when the breech is open.

(3) The firing mechanism on the M1905A2 Gun may be moved into position when the breech is open, but the firing lever is locked

OPERATION

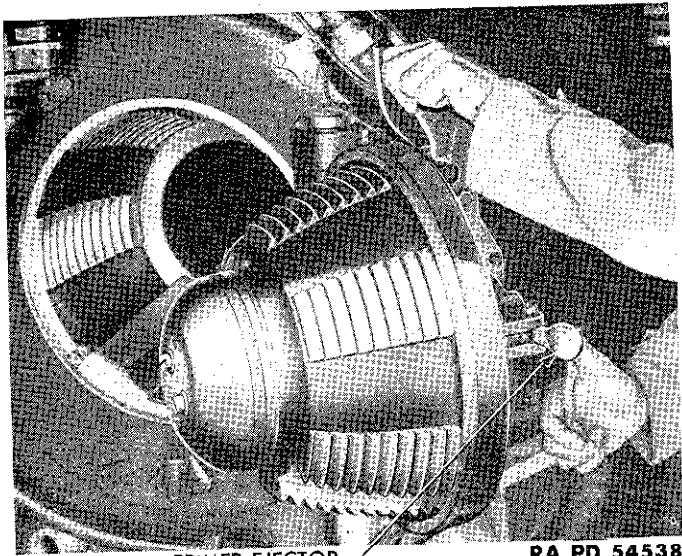


LOADING CARRIAGE LATCH RELEASE PEDAL

RAMMER

RA PD 54537

Figure 36—Breech Opening and Projectile Placing Operation



PRIMER EJECTOR

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Figure 37—Spent Primer Ejection

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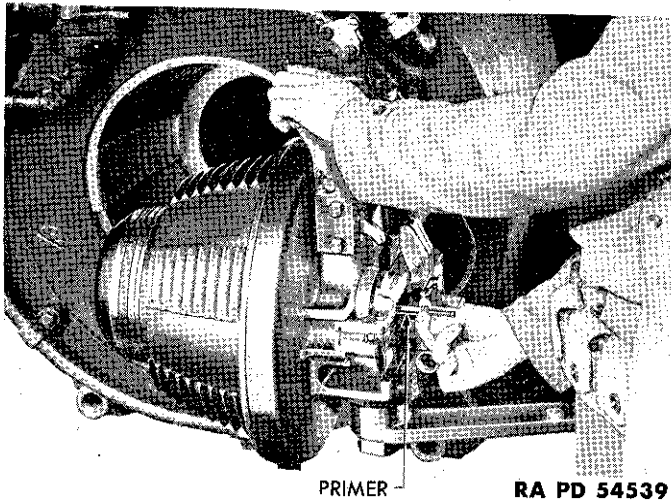


Figure 38—Primer Insertion

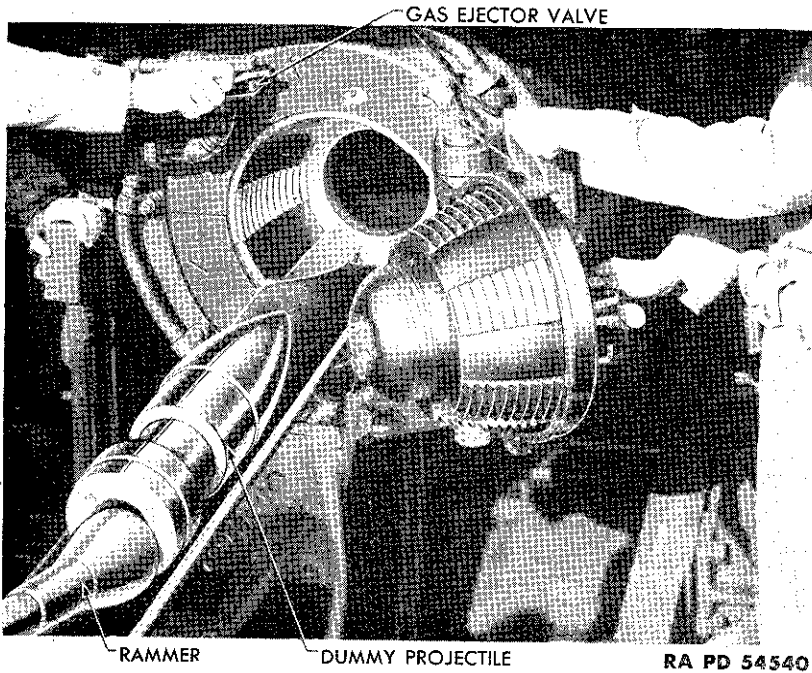
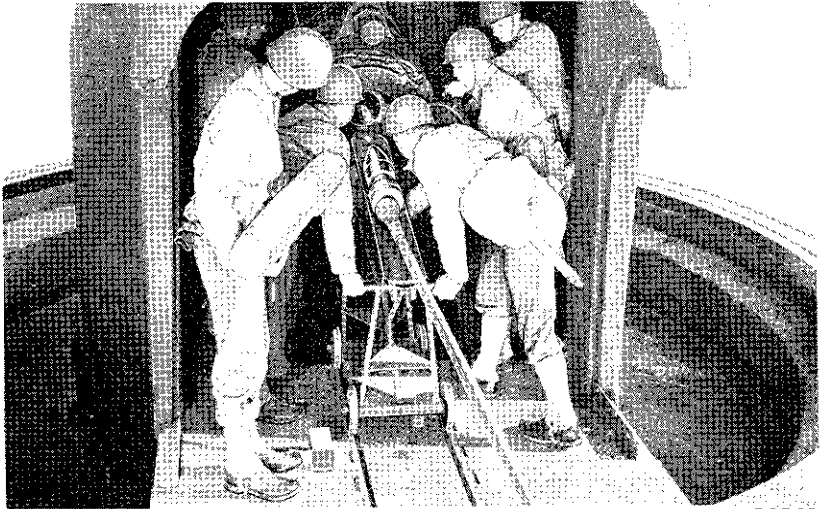


Figure 39—Projectile Ramming

OPERATION



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Figure 40—Projectile and Powder Charge Preparation

to prevent movement until the breech is closed. Electrical contact (contacts on breech operating lever) is not made until lever is latched position.

d. Projectile Ramming.

(1) The projectile is brought up to the gun and placed on the loading carriage (fig. 39) with the rammer head at the base of the projectile and lying on the carriage.

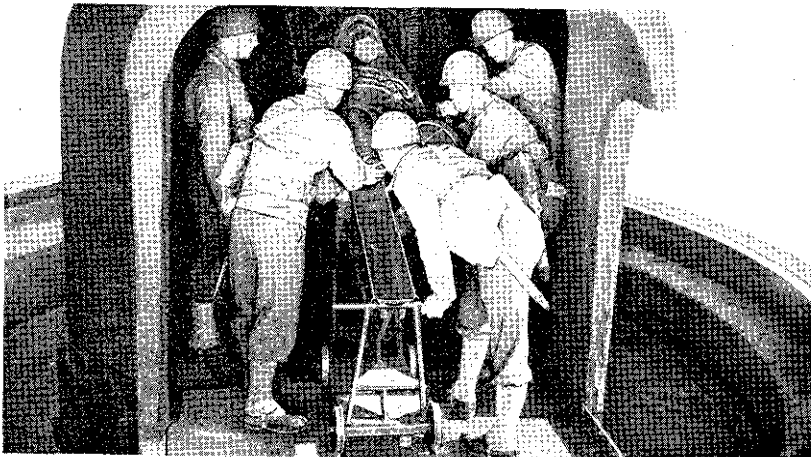
(2) The loading carriage latch release pedal is depressed and the carriage rolled and held up to the breech. At the same time the rammer pushes the projectile into the chamber, driving it forward smartly to seat the projectile securely in the forcing cone.

(3) As the projectile is being rammed, the gas ejector valve (fig. 39) is closed to stop the flow of air.

e. Powder Charge Insertion. As the projectile is being rammed (fig. 40), the prepared powder charge is brought up. Place it on the loading carriage, igniter pad (dyed red) to the rear, and push it into the chamber (fig. 41).

f. Breech Closing. Roll the loading carriage back to its latched position and close the breech. Make certain that the operating lever is in its latched position.

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Figure 41—Powder Charge Insertion

25. TO FIRE.

a. The gun will be fired electrically except in the case of power failure or a broken firing circuit.

b. Electrical Firing.

(1) Set the transformer-magneto push button switch in "TRANSFORMER" position. Then for Case III firing, with the gun laid in azimuth and elevation, and the path of recoil cleared of personnel and material, the gun pointer removes the series plug from the receptacle (fig. 29), if assembled, establishing direct connection to the gun commander's safety push button switch (par. 10 d (4)). The gun commander then presses the safety push button in the safety push button switch (fig. 12) mounted on the left side frame mounting plate, and fires the piece directly from his station.

(2) In Case II firing, with the gun laid in azimuth and elevation, and the series plug inserted in the receptacle, the gun commander presses the safety push button and commands "fire." The gun pointer then completes the firing circuit by closing the firing key as soon as he is on the target.

c. To fire manually, using friction primer, a lanyard is attached to the lanyard loop on the firing lever, and the lanyard pulled with a quick strong pull (not a jerk).

OPERATION



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Figure 42—Firing the Gun

d. **Misfires.** In the event of a misfire, follow the procedure prescribed in paragraph 28 a.

26. TO UNLOAD.

a. **Service Rounds.** No unloading device is provided with this materiel for use in unloading service rounds of ammunition. When it is desired to unload the piece, the projectile may be fired out of the gun, after it has been determined that the field of fire is clear.

b. **Dummy Ammunition.** The dummy projectile may be extracted by inserting the hand extractor through the hole in the base of the projectile and pulling it back quickly to release the band from the chamber forcing cone (fig. 43). Push the projectile forward and repeat if necessary. Pull the projectile onto the loading carriage using the extractor as a guide.

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RA PD 54544

Figure 43—Dummy Projectile Extracting

27. AFTER FIRING.

- a. Turn off the compressor switch. Check lever of crankcase oil (par. 40 h), and general condition of compressor, piping, etc.
- b. Shut off the electric motor of the elevating mechanism and the transformer for the firing circuit.
- c. Clean and oil the bore and breech mechanism as described in paragraph 36.
- d. Check the oil level in the recoil cylinders (par. 21 f), and hydraulic system (par. 39).
- e. Clean and lubricate all tools and accessories used in firing.
- f. Replace covers for direct fire sights, gun muzzle and gun breech.
- g. Relubricate the recoil sliding surfaces of the gun and cradle.
- h. Return unused powder charges to original wrappings and containers. Mark containers so that opened powder charges may be used first in the next firing of the gun.
- i. If gun is active, projectiles may remain fuzed. If inactive, fuzes should be removed and returned to original boxes, and the lifting eye plugs replaced in the fuze socket of the projectile.

Section V

MALFUNCTION AND CORRECTION

	Paragraph
Gun and breech mechanism.....	28
Recoil mechanism.....	29
Elevating mechanism.....	30
Traversing mechanism.....	31
Gas ejection system.....	32

28. GUN AND BREECH MECHANISM.

a. Misfire.

(1) PRECAUTIONS. When a misfire occurs, the gun will be kept pointed at the target or in a clear field of fire for ten minutes from the last attempt to fire (except when a special device is available, as described below), before removing primer or opening the breech. Personnel will be kept clear of the path of recoil until after the breech is opened. The breech must not be opened before removal of the primer.

(2) PRIMER FAILURE.

(a) If the primer is not heard to fire after three attempts, using transformer power, change push button switch to "MAGNETO" and operate the firing magneto.

(b) If the primer fires with the magneto, the transformer power circuit is broken. It may be that no power is passing to the transformer, or that the circuit is broken at the firing key, firing circuit series plug and receptacle or at the safety push button.

(c) If the primer fails to fire with the magneto, the primer is defective or the magneto firing circuit is broken.

(d) After three attempts to fire the primer, wait 10 minutes from the last attempt to fire, keeping the gun pointed in a safe field of fire. Remove the primer and place it as quickly as possible where it can do no damage if it goes off by hangfire.

NOTE: If a special device (pole and net) is available which permits removal of the primer by a person entirely clear of the path of recoil, the primer may be removed after 2 minutes have elapsed since the last attempt to fire. This device may only be used when the discharge of the primer is not heard. If, after removal, it is found that the primer actually failed to fire, no further wait is necessary before inserting a new primer or opening the breech. If, on the other hand, examination shows the primer has fired, the procedure prescribed in (3) below will be observed.

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GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

(e) If it is necessary to fire the round immediately and no time is allowed for correcting malfunction, continue firing with friction primers and lanyard.

(f) If time is allowed for correction of malfunction, insert new electric primer and repeat attempts to fire, using transformer, then magneto. If primer again is not heard to fire, observe all precautions and wait the prescribed time as before. Then remove the primer and check the firing circuits from the source to the gun for loose connections, broken wires, etc. For diagrams and details of firing circuit see figures 12, 13, and 30.

(g) If friction primer fails to fire after several attempts, keep the gun pointed to a safe field of fire and wait 10 minutes before removal of primer. If primer has not fired, note that the firing lever and firing leaf are functioning properly, insert new primer and continue to fire. Handle carefully primers that have failed to fire, and dispose of them quickly due to possibility of hangfire.

(3) PROPELLING CHARGE FAILURE.

(a) If the primer is heard to fire but the propelling charge has failed, no attempt will be made to remove the primer or to open the breech until 10 minutes have elapsed after the firing of the primer.

(b) After 10 minutes, remove the primer and clean out the primer vent with vent-cleaning bit. Insert new primer and attempt to fire.

(c) Failure of the propelling charge to fire indicates an abnormal condition, such as missing igniter; igniter end of the charge against the projectile; wet igniter; igniter charge folded over and not accessible to the primer flame; or failure to remove the igniter protector cap.

b. Gas Leakage.

Cause	Correction
(1) Bruises on gas check pad or torn covering.	(1) Replace
(2) Burred or broken split rings.	(2) Replace.
(3) Dented or scored gas check pad seat.	(3) Report to ordnance maintenance personnel.

c. Breechblock Difficult to Open After Firing.

(1) Gas check pad stuck in seat.	(1) Coat pad with OIL, engine, SAE 10, and rub in well.
(2) Broken loading tray, interfering with breechblock and breech recess threads.	(2) Remove and replace loading tray, or report to ordnance maintenance personnel for repair.

MALFUNCTION AND CORRECTION

d. Failure of Breech Mechanism to Operate Freely.

Cause	Correction
(1) Lack of lubrication, burred parts or dented and scored parts.	(1) Disassemble breech mechanism, clean and relubricate (par. 37). Report damaged breechblock threads or other damaged parts to ordnance maintenance personnel.

e. Leveling Plates on Recoil Band Not Alined with Bore of Gun.

(1) Plates burred or rusted.	(1) Report to ordnance maintenance personnel for filing.
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f. Rifling of Gun Bore Rusted or Corroded.

(1) Bore improperly cleaned and oiled; powder fouling on moisture corrosion.	(1) Clean and oil bore, as outlined in paragraph 36 b.
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29. RECOIL MECHANISM.

a. Gun Recoils with Shock.

(1) Broken recuperator springs.	(1) Report to ordnance maintenance personnel.
(2) Void in recoil cylinder.	(2) Refill cylinder with oil (par. 38).

b. Gun Returns to Battery with Shock.

(1) Void in recoil cylinder.	(1) Refill cylinder (par. 38).
(2) Recoil cylinder piston rod not properly adjusted.	(2) Report to ordnance maintenance personnel.
(3) Piston rod striking cylinder head instead of the gun resting on the stop.	(3) Report to ordnance maintenance personnel.

c. Recoil and Counterrecoil Slow.

(1) Recoil slides in cradle not properly lubricated.	(1) Relubricate through lubricating fittings on cradle.
(2) Recoil slide surface of gun barrel not properly lubricated.	(2) Clean and coat gun barrel with lubricant.
(3) Recoil oil cold and thickened.	(3) Recoil speed will be satisfactory after firing one or two rounds.

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Cause	Correction
(4) Presence of rust on recoil slide.	(4) Remove rust and corrosion from recoil slide with CLOTH, crocus.
(5) Sticky packings.	(5) Report to ordnance maintenance personnel.

30. ELEVATING MECHANISM.

a. Electric Motor Fails to Start.

(1) Hydraulic pump not in neutral position.	(1) Rotate handwheels until neutral interlock completes power circuit.
(2) Power wiring circuit broken.	(2) Check wiring, switches, neutral interlock switch, and power source. See wiring diagram, figure 30.

b. Electric Motor Noisy.

(1) Reduction gear case dry.	(1) Refill gear case to proper level (par. 39).
(2) Damaged gears.	(2) Report to ordnance maintenance personnel.

c. Hydraulic Units Fail to Operate.

(1) Hydraulic pump damaged.	(1) Report to ordnance maintenance personnel.
(2) Motor damaged.	(2) Report to ordnance maintenance personnel.
(3) Relief valve open.	(3) Report to ordnance maintenance personnel.

d. Effort to Elevate Gun Uneven.

(1) Elevating rack on gun cradle out of alignment.	(1) Report to ordnance maintenance personnel.
(2) Dirt between rack and elevating pinion gear.	(2) Clean rack and gear, and relubricate.
(3) Ice or foreign material in gear housings.	(3) Report to ordnance maintenance personnel for removal and relubrication of elevating mechanism.
(4) Cradle trunnion bearings not properly lubricated.	(4) Lubricate bearings (see par. 35).
(5) Trunnion bearings rusted or damaged.	(5) Report to ordnance maintenance personnel.

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e. Backlash in Handwheels.

Cause	Correction
(1) Wear of gears, worm, and worm wheel.	(1) Report to ordnance maintenance personnel.
(2) Elevating rack out of alignment.	(2) Report to ordnance maintenance personnel.
(3) Elevating rack and pinion not properly mated.	(3) Report to ordnance maintenance personnel.

f. Gun Cradle Hits Elevation Limit Stops.

(1) Limit stop dog shaft not properly adjusted.	(1) Report to ordnance maintenance personnel.
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31. TRAVERSING MECHANISM.

a. Backlash in Handwheels.

(1) Wear of worm and worm wheel.	(1) Report to ordnance maintenance personnel.
(2) Wear of traversing rack and pinion gear.	(2) Report to ordnance maintenance personnel.

b. Backlash in Azimuth Indicator Drive.

(1) Wear of gears.	(1) Report to ordnance maintenance personnel.
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c. Handwheel Effort Excessively High.

(1) Dirt, rust, or gummed oil on base ring roller path.	(1) Remove inspection plugs in retaining clip. Clean rollers and roller path, and relubricate.
(2) Dirt on traversing rack.	(2) Clean and relubricate.
(3) Lubricating oil in worm and worm wheel case thickened by low temperature.	(3) Change grade of lubricant (par. 35).
(4) Dust guard packing sticking.	(4) Report to ordnance maintenance personnel.

32. GAS EJECTION SYSTEM.

a. Air Compressor Vibration.

(1) Play in main bearings, crank pin bearings, wrist pin bearings.	(1) Report to ordnance maintenance personnel.
(2) Loosened belt pulley.	(2) Report to ordnance maintenance personnel.
(3) Broken or bent fan.	(3) Report to ordnance maintenance personnel.

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b. Oil Pressure Below 25 Pounds.

Cause	Correction
(1) Crankcase oil level too low (see par. 40 h (1) (b)).	(1) Refill crankcase to correct level.
(2) Oil too thin.	(2) Drain crankcase oil and refill with proper grade of oil.
(3) Damaged oil gage.	(3) Report to ordnance maintenance personnel.
(4) Oil pump cover loose.	(4) Tighten cover cap screws.
(5) Clogged connection to oil pump.	(5) Report to ordnance maintenance personnel.
(6) Pump needs priming.	(6) Remove suction line plug on outside of tee connection on suction side of pump. Fill oil pump and suction connection (about ½ pint of oil). Replace plug.

c. Compressor Fails to Build Up Pressure.

(1) Leaky head gaskets, discharge port gasket, discharge pipe, outlet valve, and leaking or broken feather valve strips.	(1) Report to ordnance maintenance personnel.
(2) Open drain valve.	(2) Close valve, located in pit under base ring.

d. Failure of Motor to Start.

(1) Dirty contacts in pressure switch.	(1) Report to ordnance maintenance for cleaning.
(2) Failure of power line.	(2) Report to ordnance maintenance personnel.
(3) Defective wiring connections.	(3) Report to ordnance maintenance personnel.

Section VI

CARE AND PRESERVATION

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33. GENERAL.

a. It is of vital importance that all parts of the materiel be kept in proper condition in order that the weapon be ready for immediate service. Lubricating, cleaning, and preserving materials provided with the gun and mount will enable the personnel to keep the parts in proper working condition. This section of this manual prescribes the uses of these materials.

b. Moving parts of the various mechanisms should be lubricated in the prescribed manner, and periodical examinations should be made to insure that the lubricant is reaching the parts for which it is intended.

c. Dirt and grit settle on bearing surfaces, and in combination with the lubricant itself, form a cutting compound. Powder fouling attracts moisture and hastens the formation of rust. It is essential that all parts be cleaned at frequent intervals, depending upon use and service. If rust should accumulate, its removal requires special care in order that clearances shall not be unduly increased. CLOTH, crocus, should be used for this purpose. The use of coarse abrasives is forbidden.

d. In disassembly, assembly or inspection, extreme care must be exercised to prevent dust, dirt, or other foreign matter from entering the mechanism of the gun.

e. When materiel is not in use, the proper covers must be used.

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f. When the weapon is to be unused for a considerable length of time, the materiel should be prepared as described in paragraph 41.

g. Should an enemy shell burst near the weapon, it must be determined that the weapon has not been damaged to a dangerous degree before the next round is fired. Damage of a serious nature should be reported to the ordnance personnel.

34. ORGANIZATIONAL EQUIPMENT AND ACCESSORIES.

a. All organizational equipment tools and accessories should be kept in an orderly manner so that they can be quickly located when required. They should be protected from loss or damage by being kept in the place provided for them. Items susceptible to rust and corrosion must be cleaned thoroughly at regular intervals, and coated with a film of oil. Parts supplied in protective containers should be kept in the containers until required.

b. The sets of organizational equipment and accessories for the gun and mount should be maintained as completely as possible at all times. The sets should be checked with the lists in the Standard Nomenclature Lists (see sec. XV, "References"), and all parts expended, missing or seriously damaged should be replaced immediately.

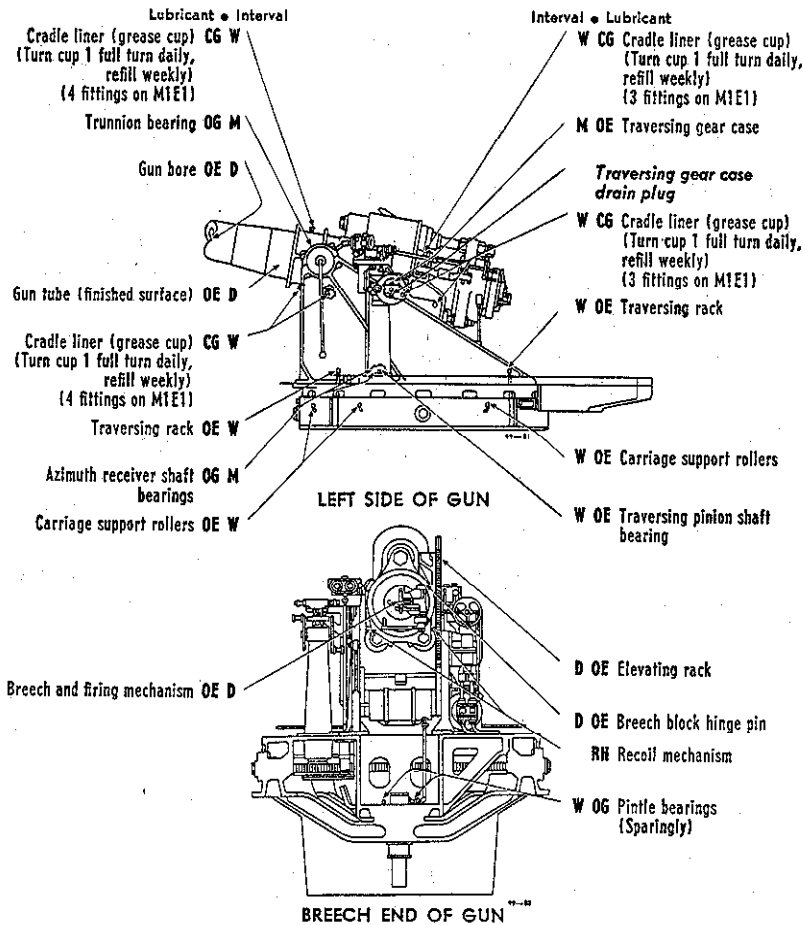
35. LUBRICATION INSTRUCTIONS.

a. **General.** The following lubrication instructions for Gun, 6-inch, M1903A2, M1905A2; Carriage, barbette, 6-inch, M1, are published for the information and guidance of all concerned, and supersede all previous instructions.

(1) **REFERENCES.** Materiel must be lubricated in accordance with the latest instructions contained in Technical Manuals and/or Ordnance Field Service Bulletins. Reference is made to OFSB 6-4, "Artillery Lubrication, General," for additional lubrication information, and to OFSB 6-2, "Product Guide," for latest approved lubricants.

b. **Lubrication Guide.** Lubrication instructions for all points to be serviced by the using arms are shown in War Department Lubrication Guide No. 99 (figs. 44 and 45), which specifies the types of lubricants required and the intervals at which they are to be applied. The following lubrication instructions contain the same information as the guide. Guides from which data are reproduced are 10- x 15-inch laminated charts which are part of the accessory equipment of each piece of materiel. Data contained in the lubrication guides are binding on using troops.

CARE AND PRESERVATION



KEY

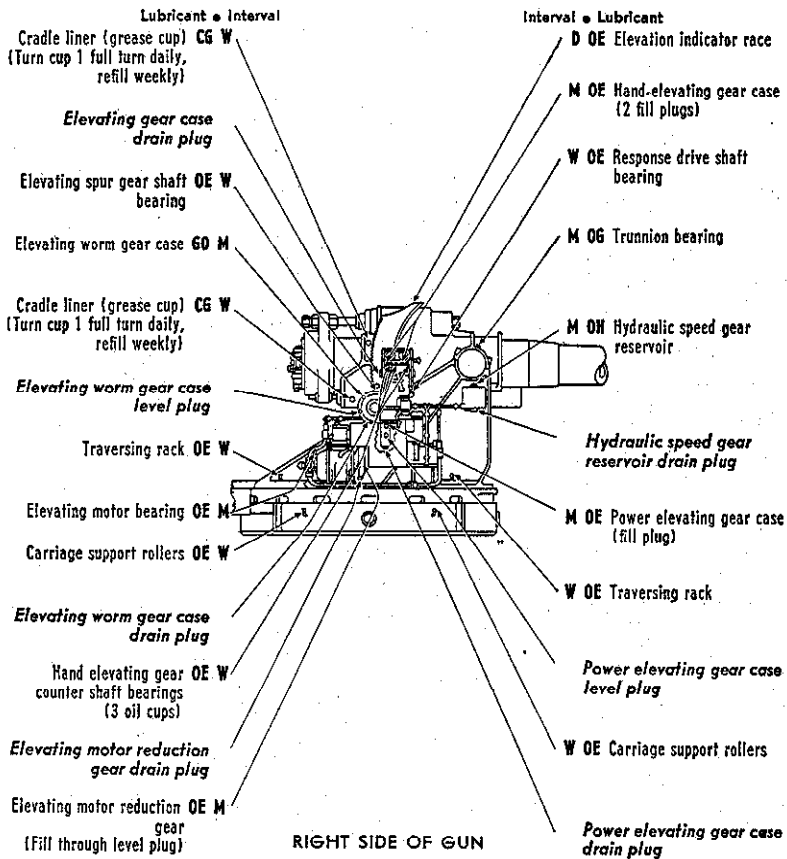
LUBRICANTS	
OE—OIL, engine SAE 30 (above +32° F.) SAE 10 (+32° F. to 0° F.)	OG—GREASE, O.D. No. 0 (above +32° F.) No. 00 (below +32° F.)
CG—GREASE, general purpose No. 1 (above +32° F.) No. 0 (+32° F. to 0° F.)	RH—OIL, recoil, heavy

INTERVALS
D—DAILY
W—WEEKLY
M—MONTHLY

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Figure 44—Lubrication Guide

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**



KEY

LUBRICANTS	
OE—OIL, engine SAE 30 (above +32° F.) SAE 10 (+32° F. to 0° F.)	OG—GREASE, O.D. No. 0 (above +32° F.) No. 00 (below +32° F.)
GO—LUBRICANT, gear, universal SAE 90 (above +32° F.) SAE 80 (below +32° F.)	CG—GREASE, general purpose No. 1 (above +32° F.) No. 0 (+32° F. to 0° F.)
OH—OIL, hydraulic	

INTERVALS
D—DAILY
W—WEEKLY
M—MONTHLY

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Figure 45—Lubrication Guide

CARE AND PRESERVATION

c. Points to be Serviced and/or Lubricated by Ordnance Maintenance Personnel.

(1) **TRUNNION BEARINGS.** Moisture and grit accumulate in the trunnion bearings; therefore, they will be cleaned once a year. They will also be cleaned before changing grades of lubricant. Use the following procedure:

(a) Remove trunnion covers and clean all grease from bearings, housings and covers with SOLVENT, dry-cleaning.

(b) Thoroughly dry bearings and housings and pack bearings with GREASE, O.D. (seasonal grade).

(c) Replace trunnion covers and fill housing with the proper lubricant.

(2) **HYDRAULIC SPEED GEAR RESERVOIR.** The oil used for a hydraulic medium becomes contaminated with water, dirt, and oxidized oil that combine to form sludge. Although the system is drained and fresh oil supplied at the specified intervals, a portion of this sludge remains in the mechanism. To prevent sludge from accumulating, the machine will be disassembled, cleaned and refilled once each year, with OIL, hydraulic.

d. Reports and Records.

(1) **REPORTS.** If lubrication instructions are closely followed, proper lubricants used, and satisfactory results are not obtained, a report will be made to the ordnance officer responsible for the maintenance of the materiel.

(2) **RECORDS.** A complete record of lubrication servicing will be kept in the Artillery Gun Book for the materiel.

Additional lubrication and service instructions on individual units and parts. COLD WEATHER: For lubrication and service below 0 F, refer to OFSB 6-5.

1. **FITTINGS AND OILERS.** Clean before applying lubricant. Where bearings can be seen, lubricate fittings until new lubricant is forced from the bearing. **CAUTION:** Lubricate following heavy rains. Do not use high pressure washing system for cleaning artillery materiel.
2. **INTERVALS** indicated are for normal service. For extreme conditions of heat, water, sand, dust, etc., lubricate more frequently.
3. **RECOIL FLUID.** Recoil mechanism capacity, 4½ gallons.
4. **GEAR CASES.** Monthly, check level; if necessary add lubricant to correct level. Every 6 months, drain, flush and refill.

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a. Gear cases will be flushed when changing grades of oil to clean them of sediment and moisture. In localities where atmospheric temperatures permit the use of the same grade the year round, they will be drained and flushed every 6 months. Follow procedure below:

(1) Drain used oil and replace drain plug.

(2) Fill case approximately half full with OIL, engine, SAE 10, and manipulate the gears rapidly for 5 minutes.

(3) Drain OIL, engine, SAE 10, used for flushing, replace plug and fill case to correct level with lubricant specified on lubrication guide.

5. **TRAVERSING RACK AND PINION AND CARRIAGE SUPPORT ROLLERS.** Weekly, lubricate with OIL, engine (seasonal grade). Traverse several times while lubricating to allow oil to reach all surfaces of rollers. Every 3 months, clean with SOLVENT, dry-cleaning, and reoil.

NOTE: Because dirt and grit accumulate on the traversing rack, carriage support rollers and racer, it is necessary to clean them every 3 months. The following procedure is recommended: While slowly traversing the gun, scrub rollers, rack and racer with a brush dipped in SOLVENT, dry-cleaning. Continue traversing and scrubbing until all dirt and sediment is removed from these surfaces and the oil distributing grooves. When thoroughly dry, lubricate parts with OIL, engine (seasonal grade).

6. **HYDRAULIC SPEED GEAR RESERVOIR.** Monthly, check level; if necessary, add OIL, hydraulic, to correct level. Every 6 months, drain and refill with fresh OIL, hydraulic.

NOTE: The expansion and contraction of the hydraulic oil in these units produces a breathing action in the expansion chamber. This chamber is vented to the atmosphere so moisture and dust are drawn into the system, making it essential that the system be drained every 6 months and refilled with fresh oil.

7. **GUN BORE.** Daily, and after firing, clean and coat with OIL, engine (seasonal grade).
8. **GUN TUBE.** Daily, and before firing, clean and oil exposed finished metal surface. Keep surface covered with thin film of OIL, engine (seasonal grade).
9. **BREECH AND FIRING MECHANISM.** Daily, and before and after firing, clean and oil all moving parts and exposed metal surfaces with OIL, engine (seasonal grade). **CAUTION:** To insure easy breech operation and to avoid misfiring in cold weather,

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clean with SOLVENT, dry-cleaning; dry and lubricate with OIL, lubricating, preservative, light. To clean firing mechanism, remove and operate pin in SOLVENT, dry-cleaning.

10. **ELEVATING RACK AND PINION.** Daily, clean and apply OIL, engine (seasonal grade). If considerable dust is present when gun is operated, the oil should be removed from the teeth and they should remain dry until action is over. If surfaces are dry, there is less wear than when coated with a lubricant contaminated with grit.
11. **OILCAN POINTS.** Weekly, lubricate loading carriage elevating screw, loading carriage wheel bearings, and handwheel handles with OIL, engine (seasonal grade). Daily, lubricate elevation indicator race with OIL, engine (seasonal grade).
12. **POINTS TO BE SERVICED AND/OR LUBRICATED BY ORDNANCE MAINTENANCE PERSONNEL AT TIME OF ORDNANCE INSPECTION.** Trunnion bearings, hydraulic speed gear reservoir (par. 35 c).

36. GUN BARREL.

a. **General.** The wear on cannon does not depend entirely upon the number of rounds fired, but very largely upon the care given the bore in cleaning, oiling and cooling between rounds, as well as upon a thorough cleaning and oiling schedule followed through in a consistent manner. It is essential that every projectile be cleaned thoroughly before it is inserted in the gun.

b. Cleaning Procedure.

(1) Cleaning procedure is to be followed at intervals specified by the officer in charge. Whether the interval will be daily or otherwise will depend upon atmospheric or other conditions.

(2) **BORE CLEANING.** Assemble the staff sections (fig. 46) and attach the wire cleaning brush. Wrap the brush with pieces of burlap soaked in SOLVENT, dry-cleaning. With eight or ten men on the staff, work the brush through the bore, using a pushing and pulling action. A man, posted at the muzzle of the gun, can indicate by his hands the progress of the brush in the bore and prevent its slipping out of the muzzle of the gun.

(3) **CHAMBER CLEANING.** Use the wire cleaning brush on a single section of the staff to clean the chamber. Wrap with burlap soaked in SOLVENT, dry-cleaning.

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Figure 46—Bore Oiling

(4) **BORE AND CHAMBER DRYING.** Follow the procedure given for cleaning, using the same accessories and methods, but substituting dry burlap soaked in SOLVENT, dry-cleaning.

(5) **BORE OILING.** Assemble the slush brush on the staff. Apply OIL, engine, SAE 30 (for temperatures above 32 F); SAE 10 (for temperatures below 32 F).

c. Cleaning After Firing.

(1) This procedure is to be followed immediately after firing while the gun is still warm, and is to be repeated at the end of 24 hours and again at the end of 48 hours. The purpose of the second and third washing, drying and oiling operations is to remove the effects of sweating.

(2) Swab the bore and chamber with a solution of one-half pound of SODA ASH, in one gallon of warm water. Use the bore sponge and staff. If SODA ASH is not available, use a hot solution of water and SOAP, castile. Yellow soaps should not be used as they leave a gummy deposit.

(3) When all powder fouling has been removed, swab the bore with clear warm water. Then dry the bore and chamber, using the sponge covered with burlap or cleaning cloths. Oil the bore, using the slush brush and prescribed grade of engine oil, as shown in figure 46.

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d. **Leveling Plates.** The leveling plates on the recoil band should be protected from rusting by a coat of grease or oil. In case of rusting or damage, repair by filing must be made by ordnance maintenance personnel.

e. **Recoil Slide.** The recoil slide surfaces of the gun barrel should be kept clean and well lubricated with specified grease.

37. BREECH MECHANISM.

a. General.

(1) Keep the breech mechanism clean and well lubricated. When the gun is not in use, the breech cover should be in place to keep it clean and dry. When the gun is active, and light lubricants are used, the exposed surfaces of the breech should be wiped dry and lubricated daily.

(2) After firing, the breech mechanism should be disassembled, cleaned thoroughly, and lubricated. Since the clearances between parts of the firing mechanism are small, care must be exercised to keep the mechanism well oiled and free from dust and dirt. The mechanism should always be disassembled, cleaned, and oiled immediately after firing.

(3) Occasionally, during firing, residue works its way back through the venthole in the spindle to the primer seat, causing the primer to seat improperly. After firing, this residue should be removed by reaming out the primer seat with the primer seat cleaning reamer. At this time the venthole in the spindle should also be cleaned.

(4) At intervals, when the gun is not being fired, the breech mechanism should be disassembled, cleaned, and lubricated. These intervals will be specified by the officer in charge and their frequency will depend upon atmospheric and other conditions.

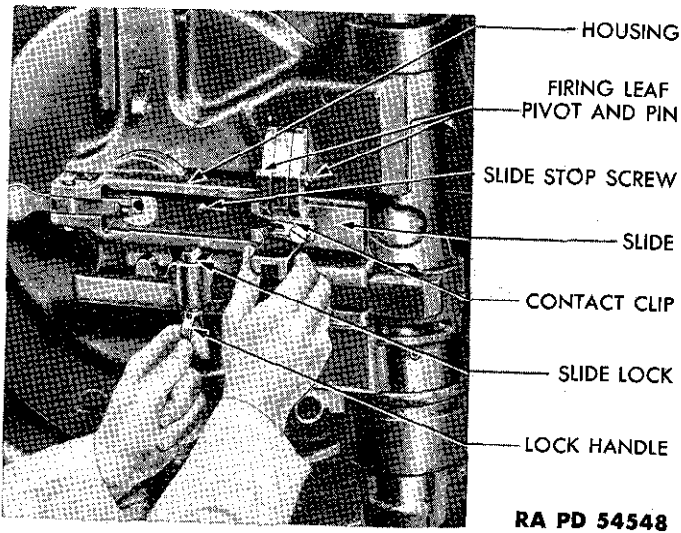
(5) If the breechblock does not operate smoothly, or if it is difficult to operate, the breech mechanism should be disassembled and all parts inspected to determine the cause.

(6) Any cutting or abrasive action in the threads of the breech recess and breechblock should be reported to ordnance maintenance personnel for correction.

(7) Extreme care must be taken to prevent injury to the gas check seat. Dents or deep scoring of the metal should be reported to ordnance maintenance personnel.

(8) The gas check pad should be protected against injury. A dented or torn outer surface will cause gas leakage. A coating of OIL,

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Figure 47—Firing Mechanism Slide Removal

engine, SAE 10, rubbed in well, will prevent rusting of the gas check seat, and will aid in preventing the pad from sticking after the first few fired rounds.

b. Breech Mechanism, M1903A2 Gun: Disassembly.

(1) **FIRING MECHANISM SLIDE REMOVAL.** Disconnect the firing cable from the contact clip (fig. 47) and remove the slide stop screw with small screwdriver. Operate the breech operating lever to open the breech until the obturator spindle is moved rearward. Pull down on the slide lock handle and move the slide to the right, out of the housing.

(2) **FIRING LEAF AND CONTACT CLIP REMOVAL.** The firing leaf can be removed by pinching together the split ends of the pivot pin. Remove the pin and pivot (fig. 47). It is not necessary to remove the contact clip and insulation as a regular procedure. Frequent disassembly will cause wear and possible damage to the insulation. For disassembly, refer to paragraph 57.

(3) **PRIMER EXTRACTOR REMOVAL.** Pinch together the split ends of the pivot pin and push out the pin and pivot (fig. 48). Withdraw the extractor and leaf spring.

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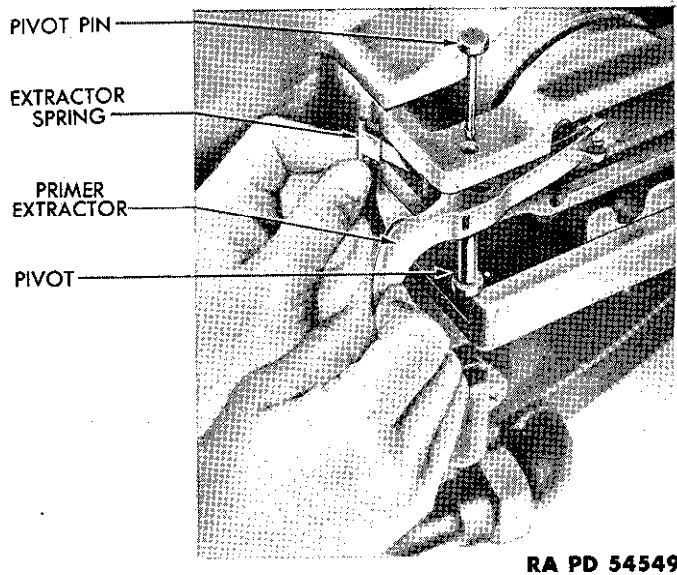


Figure 48—Primer Extractor Removal

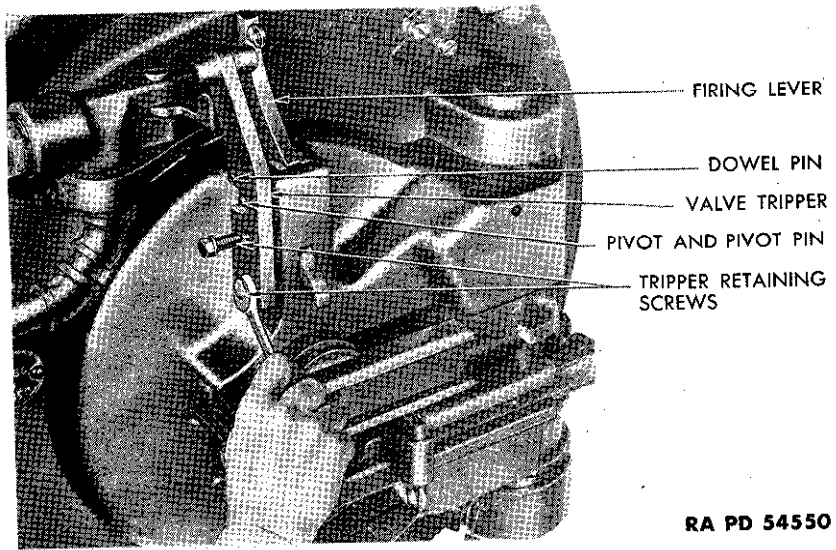


Figure 49—Gas Ejection Valve Tripper Removal

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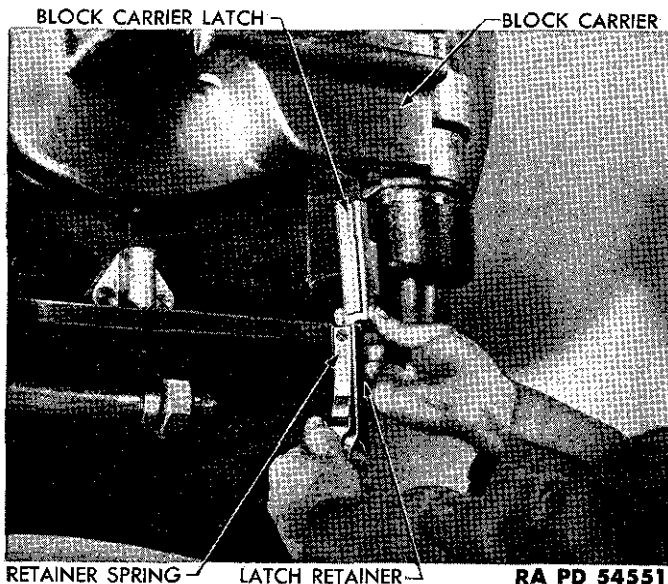


Figure 50—Block Carrier Latch Removal

(4) **VALVE TRIPPER AND FIRING LEVER REMOVAL.** Remove the tripper retaining screws and washers, and pull the tripper (fig. 49), to the left, off the dowel pin. Pinch together the split ends of the pivot pin and push out the pin and pivot. Lift the firing lever out of the block carrier.

(5) **BLOCK CARRIER LATCH REMOVAL.** Close the breech, depress the latch retainer spring (fig. 50), and pull the latch retainer down off the latch dovetail slide. Withdraw the latch.

(6) **OBTURATOR SPINDLE KEY REMOVAL.** Open the breech operating lever and withdraw the spindle key (fig. 51). It may be necessary to move the lever back and forth slightly while lifting upward on the key in order to remove it, as the parts fit very closely.

(7) **OBTURATOR SPINDLE REMOVAL.** Unscrew the obturator spindle (right-hand thread) from the firing mechanism slide housing (fig. 52), using the obturator tit wrench provided. The wrench fits in the two holes in the obturator spindle head. Remove the housing and obturator spindle spring, then withdraw the spindle from the breech-block. Remove the gas check pad and split rings. Handle the split rings and gas check pad carefully to prevent damage to these parts.

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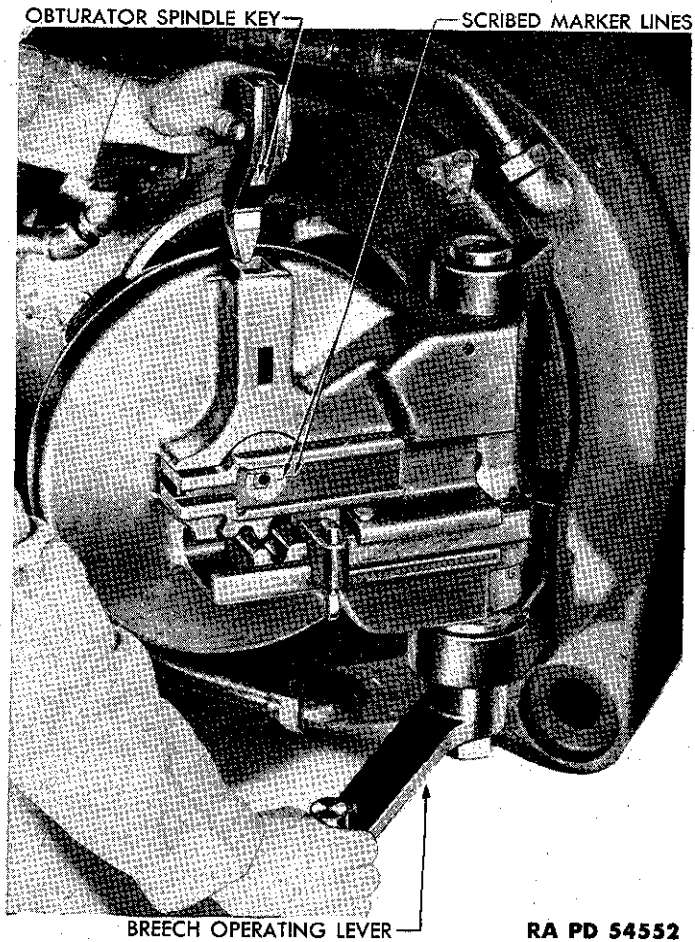


Figure 51—Obturator Spindle Key Removal

(8) **FIRING MECHANISM SLIDE LOCK REMOVAL.** When the lock is to be removed, it should be done before removing the breechblock operating rack. Remove the lock handle (fig. 53), using a screwdriver or other convenient tool, passed through the handle eye if necessary. Withdraw the lock and lock spring.

(9) **BREECHBLOCK OPERATING RACK REMOVAL.** Move the breech operating lever forward as far as it will go and withdraw the breechblock operating rack (fig. 53).

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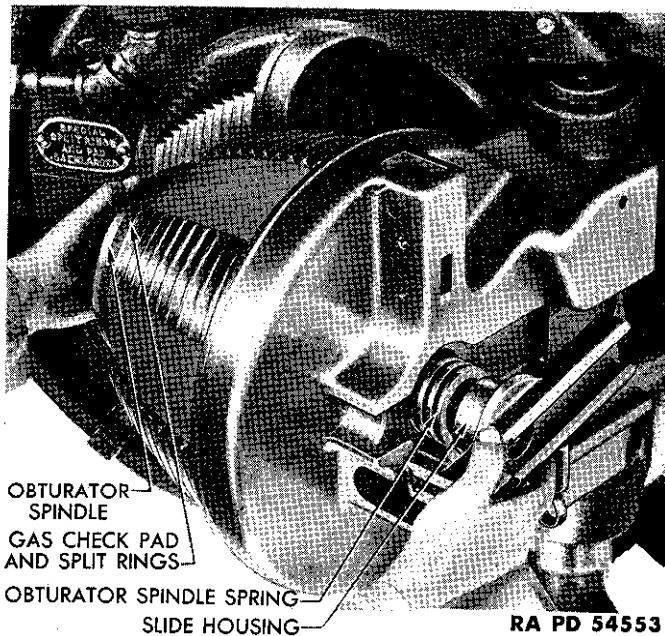


Figure 52—Obturator Spindle Removal

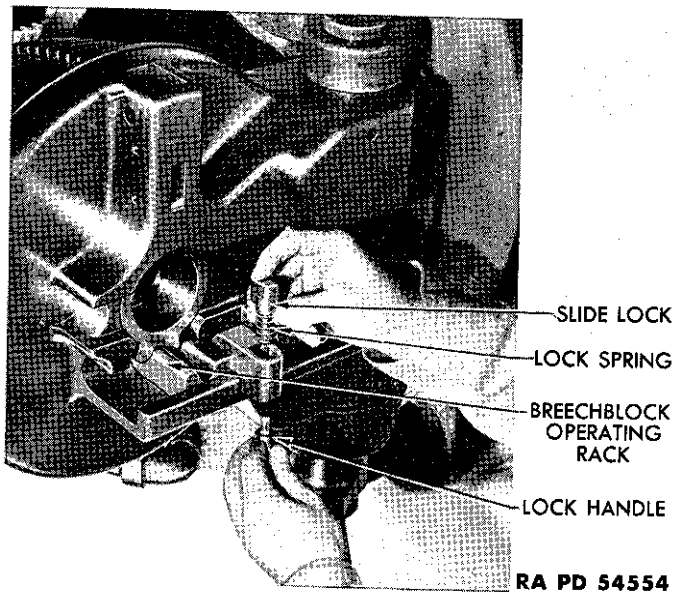


Figure 53—Firing Mechanism Slide Lock Removal

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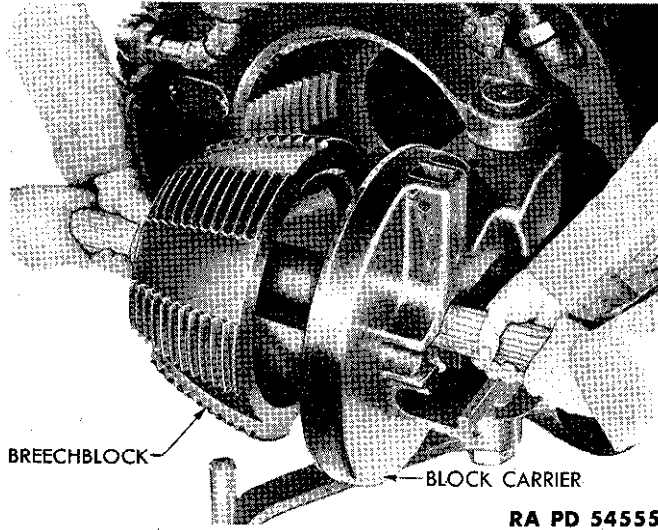


Figure 54—Breechblock Removal

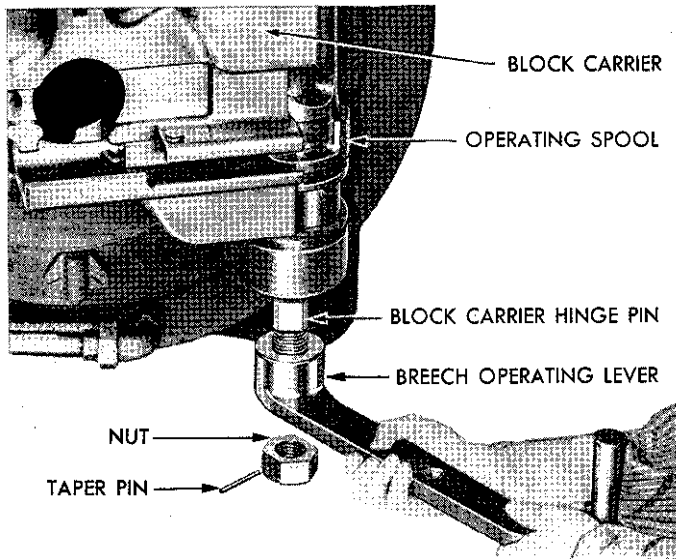


Figure 55—Block Carrier and Operating Spool Removal

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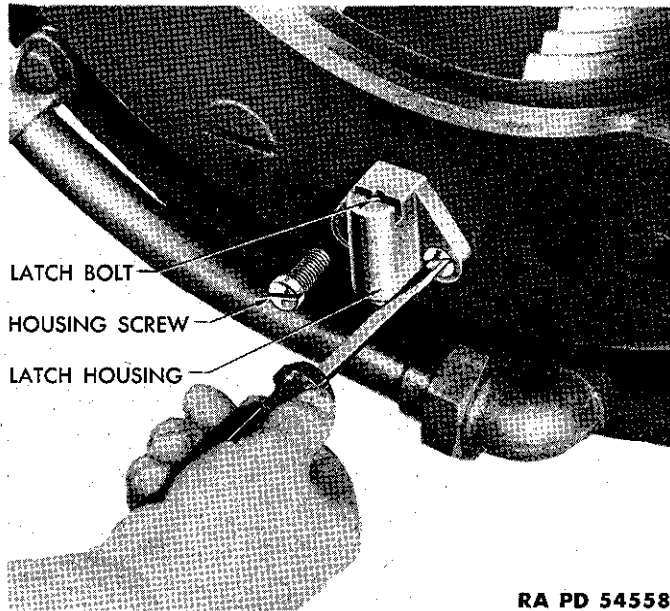
Figure 56—Loading Tray Removal

(10) **BREECHBLOCK REMOVAL.** Insert a stout wooden rod, or metal rod wrapped with cloth, through the breechblock and slide it forward, out of the block carrier (fig. 54). **NOTE:** The breechblock weighs 167½ pounds.

(11) **BLOCK CARRIER AND OPERATING SPOOL REMOVAL.** Drive out the taper pin which locks the hinge pin nut with punch and hammer. Remove the nut, with wrench if necessary, and remove the breech operating lever. Loosen the gas ejection pipe union, directly over the hinge pin, hold the block carrier and operating spool from falling out, and remove the hinge pin. Lift out the block carrier and operating spool (fig. 55). **NOTE:** The block carrier weighs 97½ pounds. Remove the upper carrier bronze bushing from the carrier and the lower carrier bushing from the hinge plate lug.

(12) **LOADING TRAY AND LATCH BOLT REMOVAL.** Lift out the loading tray (fig. 56). Depress the latch bolt and remove the bolt nut using the 1.6-inch face spanner wrench. Withdraw the bolt and spring.

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Figure 57—Breech Operating Lever Latch Removal

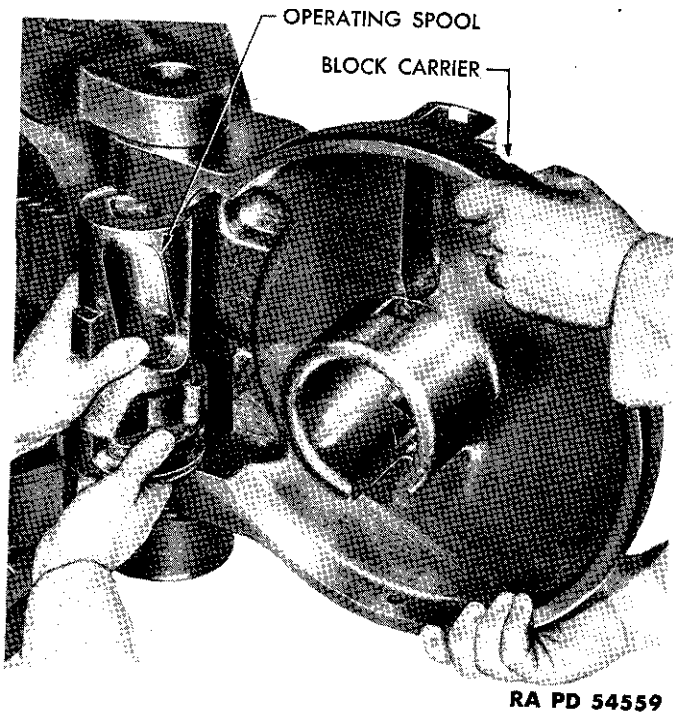
(13) **OPERATING LEVER LATCH REMOVAL.** Remove the housing retaining screws (fig. 57). Depress the latch bolt and rotate it to align the key and slot, using pliers. Withdraw the bolt and spring from the housing.

c. Breech Mechanism, M1903A2 Gun: Assembly.

(1) **CLEANING AND LUBRICATING.** Clean all parts thoroughly in **SOLVENT**, dry-cleaning. Rust or discoloration may be removed with **CLOTH**, crocus, and **SOLVENT**, dry-cleaning. Lay all parts on clean cloth and inspect them for burrs, scoring, or damage. When assembling, coat all parts with the specified grade of oil. The surfaces of the breech-block and block carrier which are inaccessible when the breech mechanism is assembled may be coated with **GREASE**, graphited, light. The gas check pad should be lubricated with **OIL**, engine, SAE 10, rubbed in well.

(2) **OPERATING LEVER LATCH ASSEMBLY AND INSTALLATION.** Place the bolt spring on the bolt and the bolt in the housing (fig. 57). Depress the bolt, against spring pressure, and rotate it in the housing

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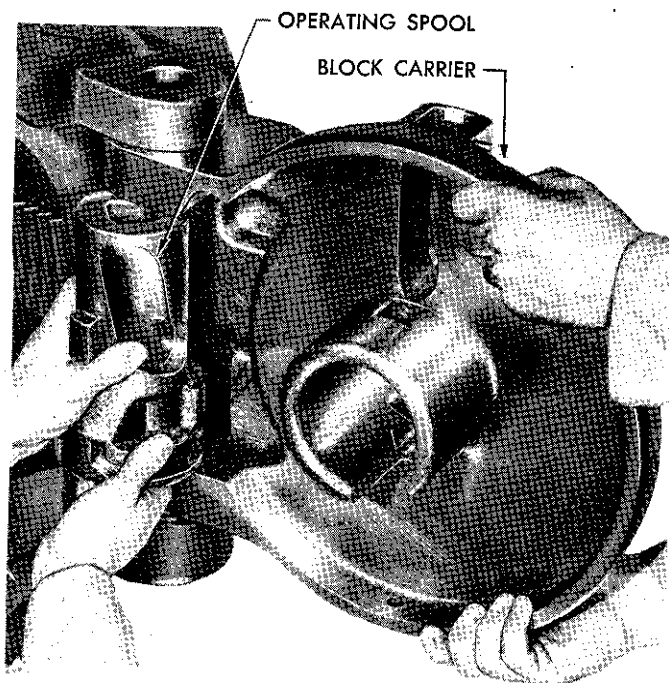
Figure 58—Operating Spool and Block Carrier Installation

to lock. Install the housing and retaining screws in the breech hinge plate.

(3) **OPERATING SPOOL AND BLOCK CARRIER INSTALLATION.** Place the shorter bronze bushing in the block carrier and the longer bushing in the breech hinge plate lug. Install the block carrier and the operating spool (fig. 58). Insert the hinge pin (fig. 55). Install the breech operating lever, retaining nut, and taper pin.

(4) **OPERATING RACK AND BREECHBLOCK INSTALLATION.** Install the operating rack in its slide in the block carrier. Coat the inner surfaces of the breechblock with **GREASE**, graphited, light, insert the lifting rod and attach the breechblock to the block carrier (fig. 59). Manipulate the breech operating lever and breechblock to align the operating spool cam slot and breechblock roller. Push in the breechblock while pushing the operating rack to the left to engage with the slot in the spool and to mesh the gear teeth of the operating rack and the breechblock.

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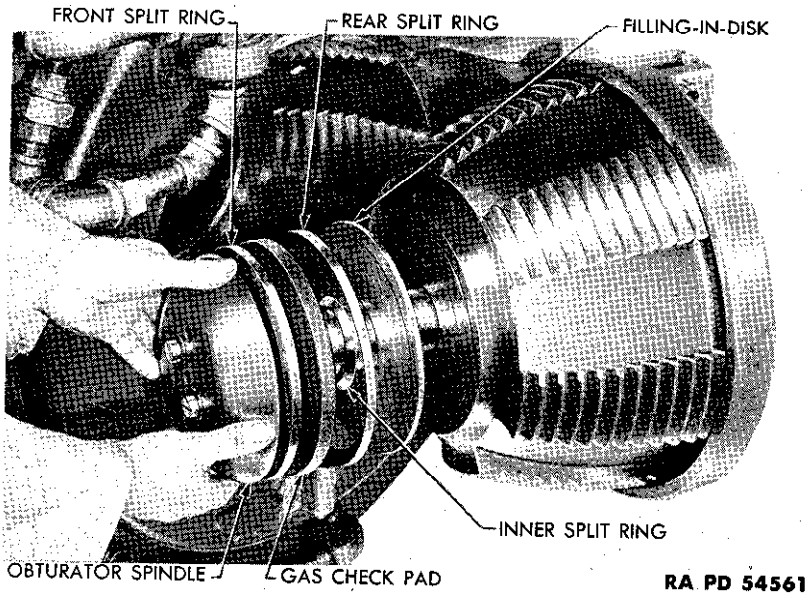
Figure 58—Operating Spool and Block Carrier Installation

to lock. Install the housing and retaining screws in the breech hinge plate.

(3) **OPERATING SPOOL AND BLOCK CARRIER INSTALLATION.** Place the shorter bronze bushing in the block carrier and the longer bushing in the breech hinge plate lug. Install the block carrier and the operating spool (fig. 58). Insert the hinge pin (fig. 55). Install the breech operating lever, retaining nut, and taper pin.

(4) **OPERATING RACK AND BREECHBLOCK INSTALLATION.** Install the operating rack in its slide in the block carrier. Coat the inner surfaces of the breechblock with **GREASE**, graphited, light, insert the lifting rod and attach the breechblock to the block carrier (fig. 59). Manipulate the breech operating lever and breechblock to align the operating spool cam slot and breechblock roller. Push in the breechblock while pushing the operating rack to the left to engage with the slot in the spool and to mesh the gear teeth of the operating rack and the breechblock.

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Figure 60—Obturator Spindle Installation

(9) **VALVE TRIPPER INSTALLATION.** Place the tripper (fig. 49) on the dowel pin on the block carrier. Assemble retaining screws and lock washers.

(10) **FIRING MECHANISM SLIDE LOCK INSTALLATION.** Install the lock and spring (fig. 53) in the breechblock operating rack. Depress the slide lock and screw in the lock handle.

(11) **PRIMER EJECTOR INSTALLATION.** Install the extractor spring (fig. 48) behind the pin in the housing and in the spring end slots. Assemble the extractor, pivot, and pivot pin.

(12) **FIRING MECHANISM SLIDE ASSEMBLY AND INSTALLATION.** Install the firing leaf, pivot, and pivot pin in the slide. Open the breech far enough to move the obturator spindle to the rear. Install the slide (fig. 47) in the housing, screw in the slide stop screw, and connect the firing cable to the contact clip.

(13) **LOADING TRAY INSTALLATION.** Insert the loading tray latch spring and bolt in the breech recess hole, and attach the nut. Install the loading tray (fig. 56).

d. Breech Mechanism, M1905A2 Gun: Disassembly.

(1) **FIRING MECHANISM SLIDE REMOVAL.** Disconnect the firing

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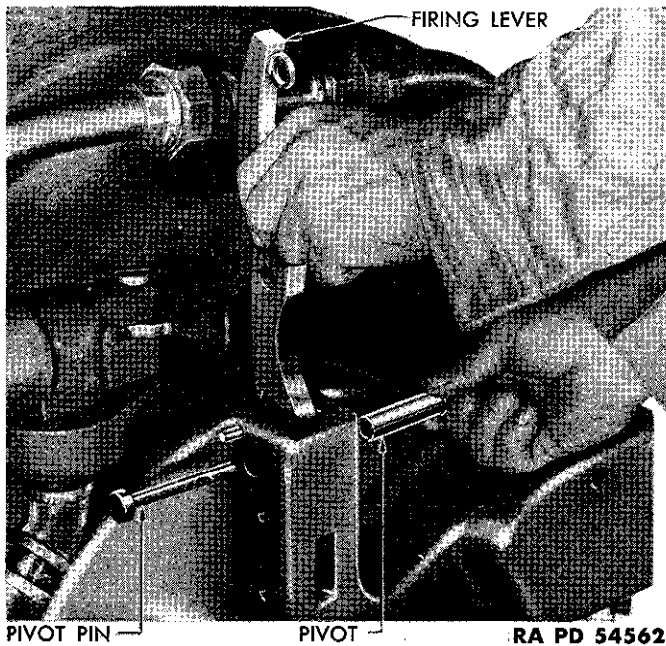


Figure 61—Firing Lever Installation

cable from the contact clip (fig. 62). Remove the slide stop. Unlatch the catch and move the slide to the right, out of the housing. Lift out the primer ejector.

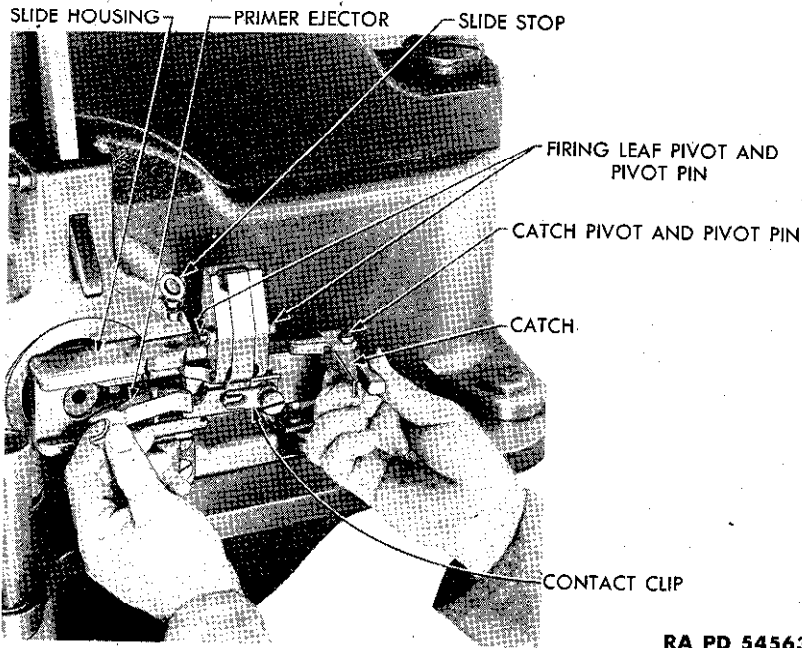
(2) **FIRING LEAF AND CONTACT CLIP REMOVAL.** The firing leaf and slide catch can be removed by pinching together the split ends of the pivot pins. Push out the pin and pivot pin. It is not necessary to remove the contact clip and insulation as a regular procedure. Frequent disassembly will cause wear and possible damage to the insulation. For disassembly, refer to paragraph 57.

(3) **VALVE TRIPPER AND FIRING LEVER REMOVAL.** Remove the tripper retaining screws and washers, and pull the tripper to the left (fig. 49), off the dowel pin. Pinch together the split ends of the pivot pin and push out the pin and pivot. Lift the firing lever out of the block carrier.

(4) **BLOCK CARRIER LATCH REMOVAL.** Push the latch spring detent (fig. 63) forward, remove the latch spring and latch.

(5) **OBTURATOR SPINDLE KEY REMOVAL.** Lift out the spindle key

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Figure 62—Firing Mechanism Slide Removal

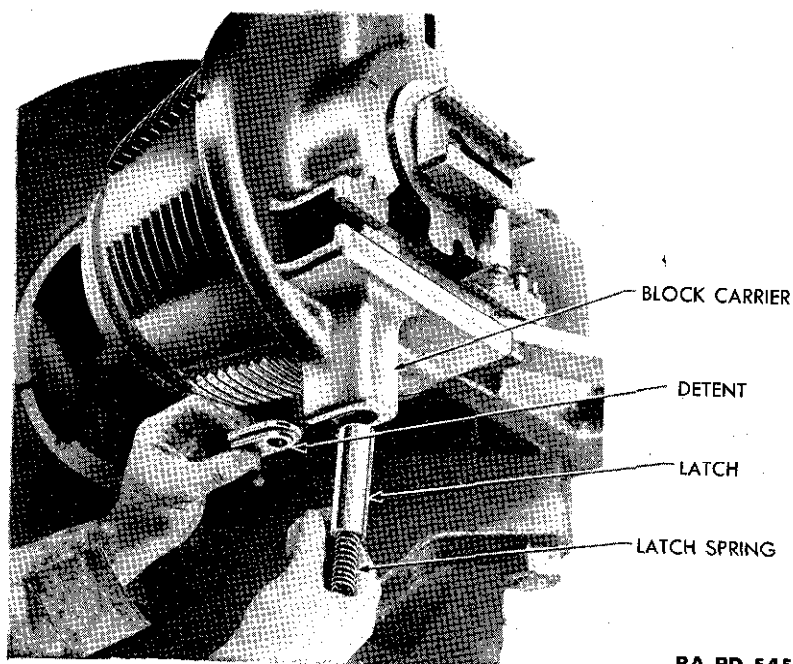
(fig. 64). It may be necessary to move the breech operating lever back and forth slightly while lifting upward on the key in order to remove it, as the parts are a close fit.

(6) **FIRING LEVER SAFETY PLUNGER REMOVAL.** The plunger (fig. 64) is removed by pressing it against spring pressure and rotating it to align the key and slot. Withdraw the plunger and spring from the spindle key.

(7) **OBTURATOR SPINDLE REMOVAL.** Unscrew the obturator spindle (right-hand thread) from the firing mechanism slide housing (fig. 65), using the obturator tit wrench provided. The wrench fits in the two holes in the obturator spindle head. Remove the housing and obturator spindle spring, then withdraw the spindle and remove the split rings and gas check pad.

(8) **BREECH OPERATING LEVER, LINK AND RACK REMOVAL.** Remove the lever and link pin locking keys by pinching the split ends and pushing them out. Lift out the pins. Swing the lever link (fig. 66)

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Figure 63—Block Carrier Latch Removal

to a right angle to the rack, rotate the breechblock and remove the rack from the block carrier.

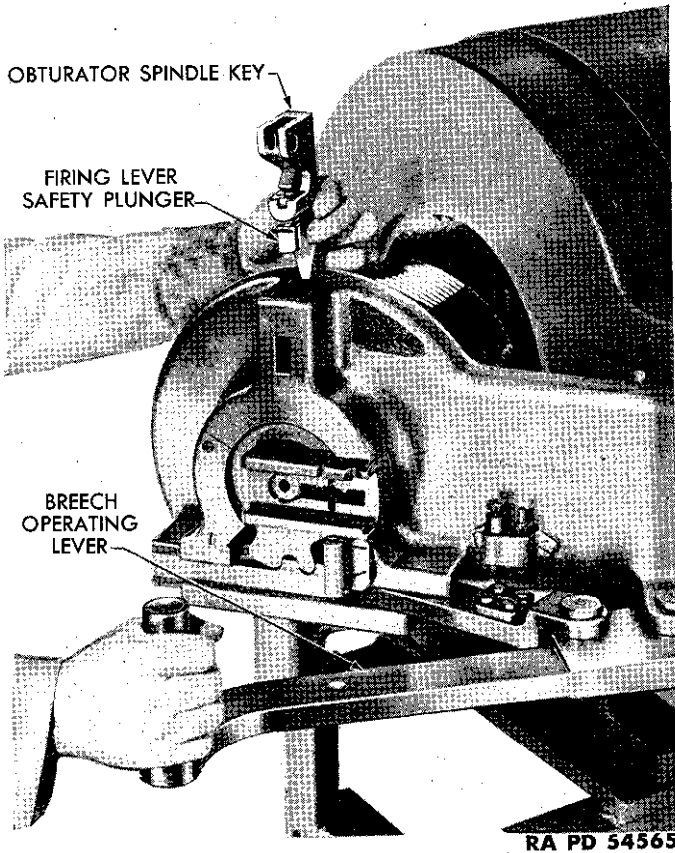
(9) **BREECHBLOCK REMOVAL.** Insert a stout wooden rod or a metal rod wrapped with cloth through the breechblock and slide it forward, out of the block carrier. Use the method shown in figure 54.

(10) **OPERATING LEVER LATCH REMOVAL.** Remove the housing retaining screws (fig. 66). Depress the latch bolt and rotate it to align the key and slot, using pliers. Withdraw the bolt and spring from the housing.

(11) **BLOCK CARRIER REMOVAL.** Drive out the taper pin which locks the hinge pin nut, with punch and hammer. Remove the nut, with wrench if necessary. Lift out the hinge pin (fig. 67) and remove the block carrier.

(12) **LOADING TRAY AND LATCH REMOVAL.** Lift out the loading tray (fig. 68). Remove the latch retaining screw and withdraw the latch and spring.

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Figure 64—Obturator Spindle Key Removal

e. Breech Mechanism, M1905A2 Gun: Assembly.

- (1) **CLEANING AND LUBRICATING.** Follow the instructions given for the M1903A2 gun breech mechanism (par. 37 c (1)).
- (2) **BLOCK CARRIER INSTALLATION.** Install the block carrier (fig. 67), assemble hinge pin, nut, and taper pin.
- (3) **BREECHBLOCK INSTALLATION.** Coat the inner surfaces of the block carrier and breechblock with **GREASE**, graphited, light, insert the lifting rod, and assemble the breechblock to the block carrier.
- (4) **LEVER LINK AND OPERATING RACK INSTALLATION.** Connect the lever link and operating rack with pin, rotate the breechblock to

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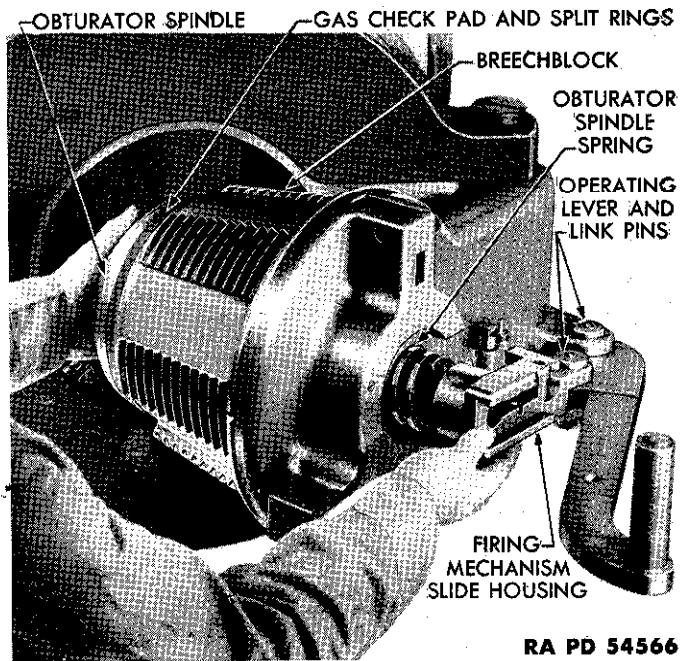


Figure 65—Obturator Spindle Removal

the right, and insert the operating rack in the block carrier, to mesh with the gear teeth of the breechblock.

(5) **BREECH OPERATING LEVER INSTALLATION.** Connect the breech operating lever to the block carrier with pin and key. Connect lever link to operating lever with pin and key.

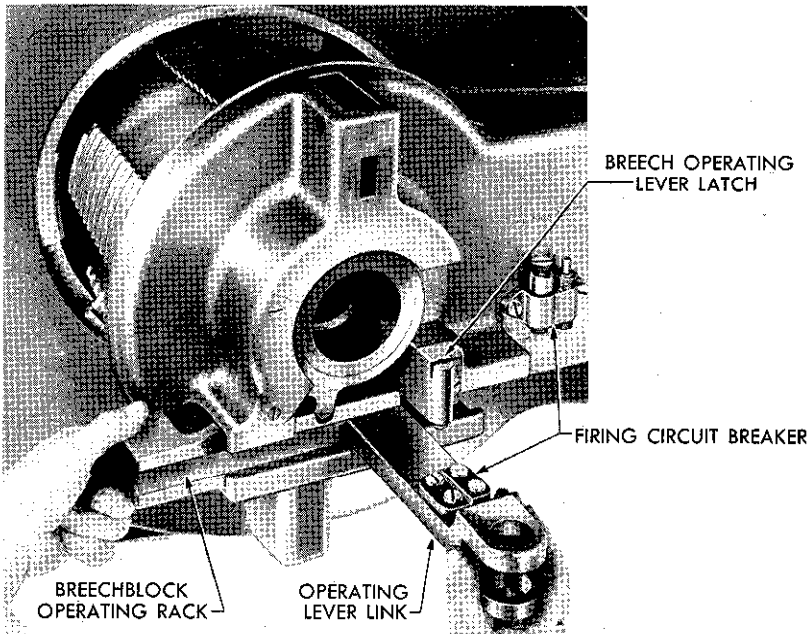
(6) **OBTURATOR SPINDLE, SPLIT RINGS, AND GAS CHECK PAD INSTALLATION.** Install as described in paragraph 37 c (5).

(7) **SPINDLE KEY ASSEMBLY AND INSTALLATION.** Assemble the firing lever safety plunger and spring to the spindle key and insert the key in the block carrier (fig. 64).

(8) **BLOCK CARRIER LATCH INSTALLATION.** Insert the latch (fig. 63) and spring in the block carrier, compress the spring, and install the spring detent.

(9) **FIRING LEVER AND VALVE TRIPPER INSTALLATION.** Insert the firing lever in the obturator spindle key and block carrier. Alie the lever and push in the pivot and pivot pin.

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Figure 66—Operating Link and Rack Removal

(10) **FIRING MECHANISM SLIDE ASSEMBLY AND INSTALLATION.** Attach the catch and firing leaf to the slide with pivots and pivot pins (fig. 70). Install the primer ejector (fig. 62) in the housing slots. Insert the slide in the housing and screw in the slide stop. Connect the firing cable to the contact clip.

38. RECOIL MECHANISM.

a. Recoil Cylinder.

(1) The recoil cylinder must be kept filled at all times with OIL, recoil, heavy, in temperatures above 0 F. The gun is to be at 0.0 mils elevation when filling or checking oil levels.

(2) The drain plug at the bottom of the rear cylinder head should be removed frequently and a small amount of recoil oil drained into a clean container. Inspect the oil for water and rust sediment. If oil is contaminated, drain and refill with OIL, recoil, heavy. The cylinder may be flushed, using the plumber's force pump. Be sure to wash off all oil from the pump and hoses after flushing.

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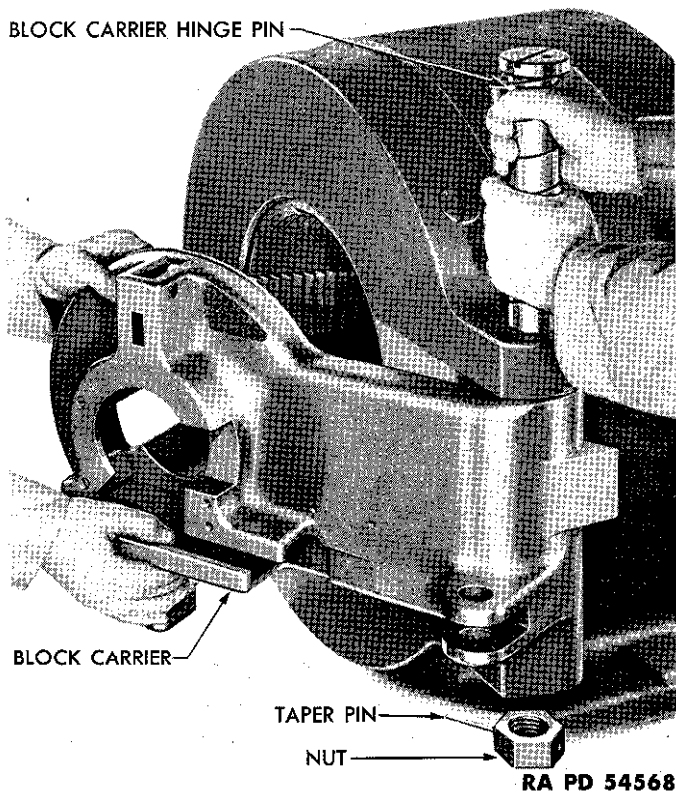


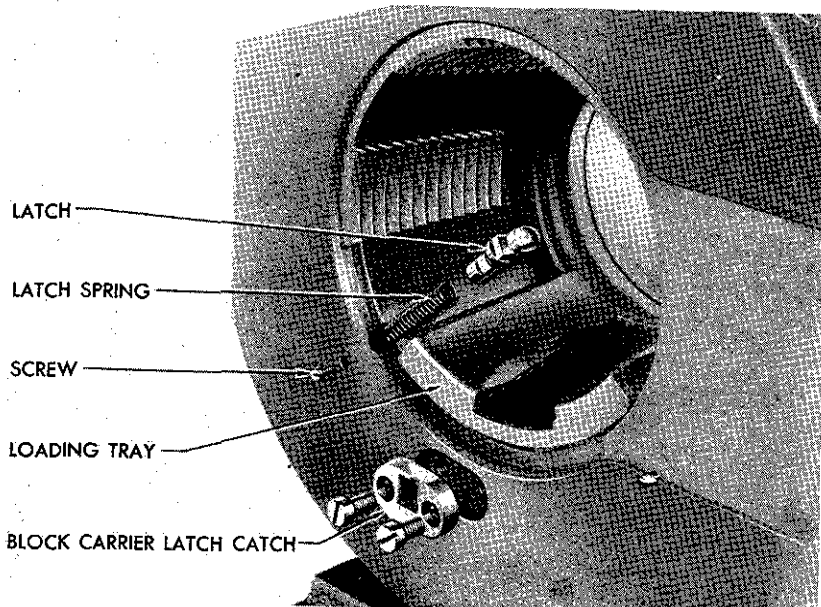
Figure 67—Block Carrier Removal

(3) If oil leaks from the piston rod packing, tighten the rod follower to further compress the gland and packing material around the piston rod. When oil spurts out when the gun is fired and the packing is tight, report to ordnance maintenance personnel for re-packing.

(4) Once each 6 months the gun should be pulled out of battery and the sliding surfaces of the gun cleaned, with SOLVENT, dry-cleaning and CLOTH, crocus, and relubricated with seasonal grade lubricant. If the operation of pulling the gun out of battery is beyond the scope of the battery personnel, report to ordnance maintenance personnel.

(5) Every 2 years, the recoil cylinder and recuperator springs should be disassembled by ordnance maintenance personnel for in-

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Figure 68—Loading Tray and Latch Disassembled

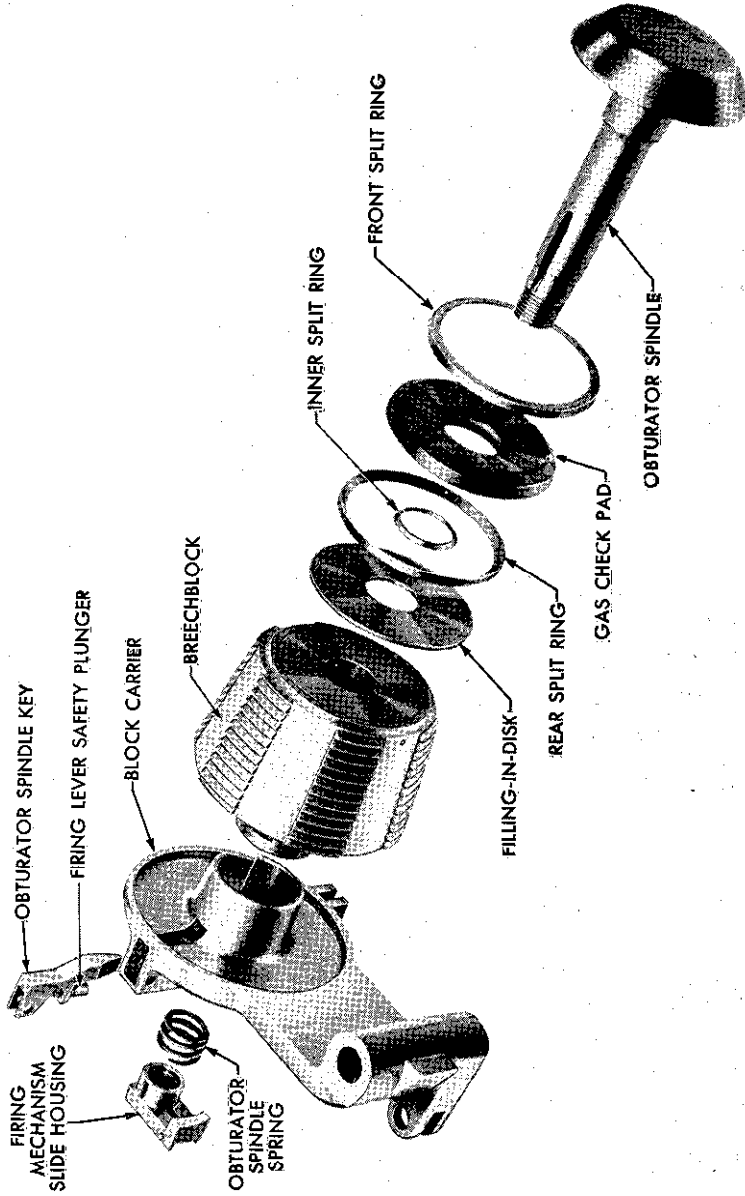
spection, cleaning, lubricating recuperator springs and cylinders, and to replace recoil piston rod packing if necessary.

39. ELEVATION HYDRAULIC POWER UNIT.

a. **Caution.** It is essential that the hydraulic system be completely filled with oil and that all air pockets are eliminated. If the unit is operated with air pockets in the system, the hydraulic pump and motor will be damaged. Oil must be absolutely clean.

b. **To Fill System With Oil.** Remove the vent plugs (fig. 71) from the valve plate of the hydraulic motor and pump. Remove the filling plug in the expansion tank and pour in oil until it flows from opened vent plugs. Insert the vent plugs and add oil until the tank is completely filled. The capacity of the system is approximately 9 gallons. Start the electric motor, with the clutch control lever in the "POWER" position, and operate the handwheels very slowly to elevate and depress the gun about 177.8 mils. Stop the motor and loosen the vent plugs in the hydraulic pump and motor again until some oil flows out, then tighten plugs. Refill the expansion tank.

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Figure 69—Obturator Disassembled

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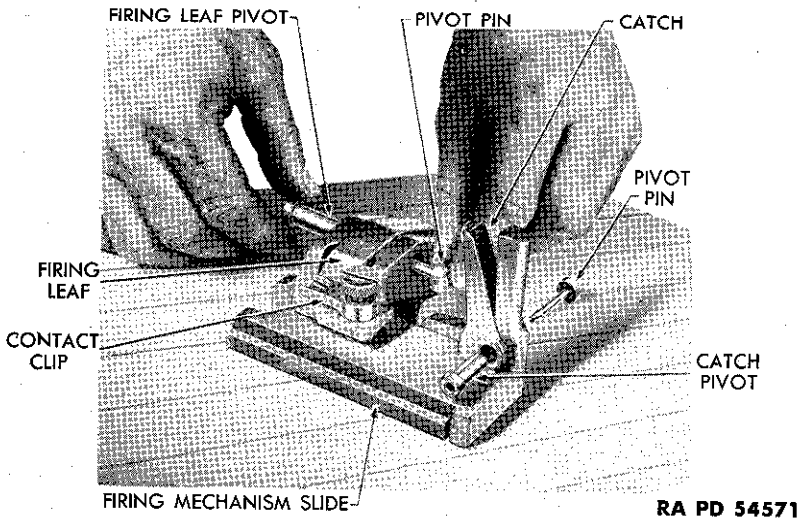


Figure 70—Firing Mechanism Slide Assembly

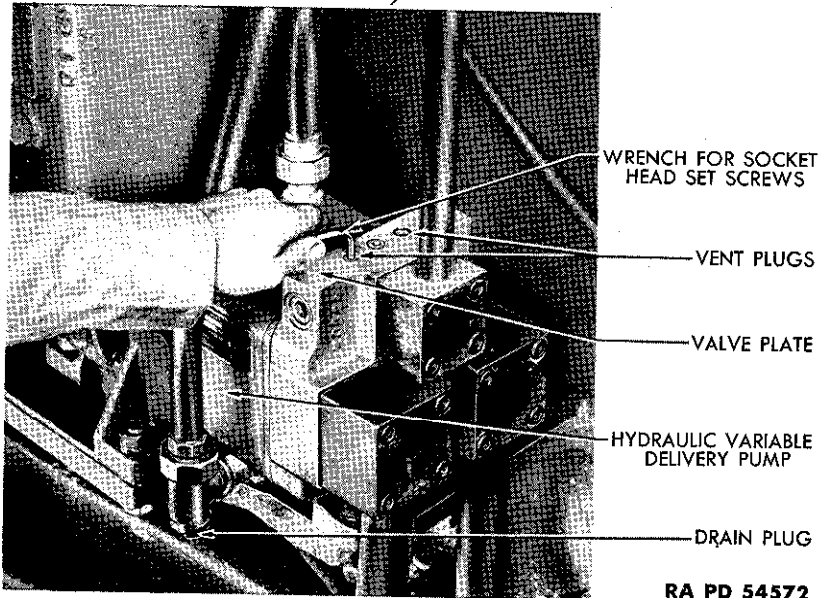


Figure 71—Hydraulic Pump Vent Plugs Removal

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c. The level of the oil, as indicated by the dip stick in the expansion tank, should never be lower than the lowest mark on the stick. Check the level of oil before and after using the hydraulic system.

d. If the hydraulic pump or motor should become noisy, stop immediately and check level of oil. Remove vent plugs to be sure that no air is trapped in the system. If noise continues, report to ordnance maintenance personnel. Leaks in the system also should be reported.

e. Once each 6 months, the system should be drained, cleaned, and refilled by ordnance maintenance personnel.

f. The electric gearmotor reduction gear case should be frequently checked and kept filled to the level plug with oil. Lubricate the motor shaft and bearing as specified in lubrication guide.

g. The clutch on the hydraulic motor shaft should be lubricated as specified. It is necessary that the cover guard be removed to make the lubrication fitting accessible.

40. CARRIAGE.

a. **Top Carriage.** Once each 6 months, the trunnion bearing closures should be removed by ordnance maintenance personnel and the bearing thoroughly cleaned with clean SOLVENT, dry-cleaning, and relubricated (par. 35). The floor plates inside the shield should be removed occasionally to clean out dirt which may have collected.

b. **Elevating Mechanism.** The elevating mechanism is to be lubricated as specified on lubrication guide and the condition of lubricant checked frequently by removing drain plugs and allowing a small amount of oil to drain out. Water and dirt will settle to the bottom of the gear housings. In cold weather the water present in contaminated oil will freeze and may cause irreparable damage to the gears. If lubricant is contaminated, drain, flush, and refill. The elevating pinion gear and rack are to be cleaned thoroughly and coated with oil, before and after using. The successful operation of the elevation hydraulic unit depends on a smooth operating, clean, and properly lubricated elevating mechanism.

c. **Traversing Mechanism.** The traversing mechanism worm and wormwheel are to be lubricated as specified on lubrication guide. Excessive backlash in the handwheels should be reported to ordnance maintenance personnel for correction.

d. **Traversing Rack.** The exposed rack, when lubricated, will collect dust and dirt. For this reason it should frequently be cleaned with SOLVENT, dry-cleaning, and coated with a film of oil.

**6-INCH SEACOAST MATERIEL:
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(1) Sixteen magnetic drain plugs (fig. 15) are provided for draining water which has condensed in the pockets of the base ring, also for draining excess lubricating oil. Remove these plugs frequently and allow water to drain. Wash plugs in SOLVENT, dry-cleaning.

(2) Periodically the large inspection plugs (fig. 15) in the racer retaining clips should be removed and the condition of the traversing rollers noted. If rusty or dirty, report to ordnance maintenance personnel for removal of the racer retaining clips. The clips should also be removed at the intervals specified on lubrication guide. The rollers and machined surfaces of the racer and base ring are to be thoroughly cleaned with SOLVENT, dry-cleaning, and relubricated with OIL, engine (seasonal grade).

(3) The base rollers are to be lubricated as specified by the lubrication guide, through the oilers on the racer and on the racer retaining clips, while traversing the top carriage.

f. Traversing the Carriage. Due to the weight supported by the traversing rollers, it is advisable to traverse the mount and leave the gun pointing in a different position each day. The carriage should be traversed about 30 degrees away from the previous position. This will lessen the possibility of deformation of the rollers and roller paths which might result from leaving the carriage in one position all of the time. The carriage should be traversed through its full range every day when the gun is active.

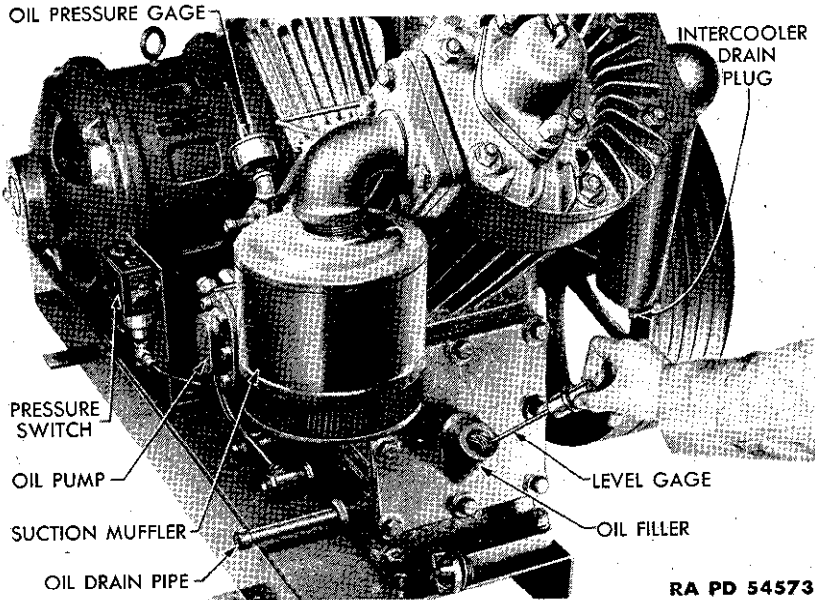
g. Loading Carriage. The loading carriage buffer is to be kept filled with oil, and packing nuts kept tight to prevent leakage of oil. The loading tray is to be kept clean and polished. Corrosion and roughness can be removed with SOLVENT, dry-cleaning, and CLOTH, crocus. The practice of rolling the carriage in and out of the casement is to be avoided as much as possible as this will cause rapid wear of the wheels and may result in the carriage jumping the rails in the loading platform at a critical time.

h. Gas Ejection System.**(1) AIR COMPRESSOR.**

(a) *Motor Bearings.* Check and refill, if necessary, the electric motor bearing cups with same grade of oil as used in compressor crankcase. Drain, flush, and refill every 6 months.

(b) *Crankcase.* The crankcase is to be filled to the top groove on the oil gage stick with OIL, engine SAE 30 (for temperatures above 32 F); SAE 10 (for temperatures below 32 F). CAUTION: Never let the oil level fall below the lower groove on level gage stick. Drain,

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Figure 72—Air Compressor

flush, and refill the crankcase with the proper grade of oil every 6 months. The capacity of the crankcase is approximately 5 quarts. **CAUTION:** For flushing the crankcase, use OIL, engine, SAE 10. Never use gasoline or kerosene as its use may cause an explosion or other damage to the compressor.

(c) *Tighten Bolts and Nuts.* Tighten all bolts and nuts, particularly foundation stud nuts, after several hours operation; after 2 months use; twice yearly.

(d) *Suction Muffler and Intercooler.* Keep the suction muffler screen and the finned tubes of the intercooler clean. Use air pressure if possible. The intercooler drain plug should be removed daily after using the compressor to remove water.

(e) *Motor Drive V-belts.* Keep belts tight and straight. Squealing indicates slippage and loose belts. To tighten, loosen motor slide bolts and move the motor away from compressor. Belts and motor sheave should be parallel to straightedge (or stretched string) placed against both outer edges of compressor pulley. Avoid excessive tension on belt as this condition reduces belt life and causes bearings to overheat. Never use belt dressing on V-belts.

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(2) GAS EJECTION PIPING. The drain valve in the compressed air pipe in the gun emplacement pit should be opened to drain water from piping, daily, when compressor is used. All pipe fittings should be kept tight to prevent leakage.

41. PREPARATION FOR INACTIVE AND ACTIVE SEASON.

a. **General.** During the inactive season, or when the gun is not to be used for a considerable length of time, materiel will be prepared and maintained as described below and in such manner as to permit its being prepared for service in not more than 72 hours.

b. Gun.

(1) **CLEAN GUN BORE.** Clean the bore and chamber, using water and SODA ASH, to remove all traces of powder fouling and oil, then slush the bore with COMPOUND, rust-preventive, heavy. This work should not be undertaken in extremely cold weather.

(2) **METHOD OF SLUSHING BORE.**

(a) Attach a dragline to the fixed eye on the shaft of the bore greasing device (fig. 94) and pass the other end of the line through the bore of the gun. After removing the removable collar from the opposite end of the shaft, the friction disks are then slipped on. These are now ready for inserting in the bore (1, fig. 73). As the first disk enters, the studs in the rim of the disk will strike against the muzzle face of the gun. Compress these studs with wooden sticks held against their ends. The same is done for the second disk (2, fig. 73). When this has been completed push both the disks in, holding the shaft, until the disks are located at the extreme end of the shaft, and the other end of the shaft extends out beyond the muzzle face of the gun a distance equal to the thickness of the smoothing brush (3, fig. 73). This will allow the smoothing brush to be fitted on after the slushing compound has been applied.

(b) Pack the slushing compound into the muzzle end of the gun, taking care to pack solid with no air pockets (4, fig. 73). Care should also be taken to prevent the bore greasing device from being pushed breechward during this operation. In some instances, it may be necessary to hold the shaft in order to prevent this breechward movement.

(c) Install the smoothing brush and spreading disk assembly with the spreading disk next to the slushing compound (5, fig. 73). At this point, coat the brush bristles with slushing compound, to insure the slushing of the first few inches of the bore at the beginning of the pulling operation.

(d) By means of the dragline (6, fig. 73), pull the bore greasing

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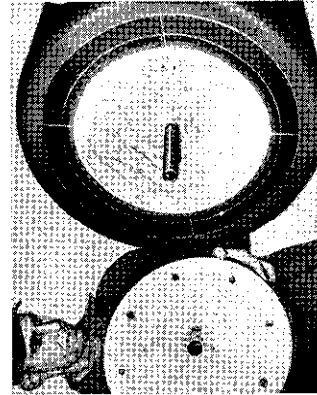
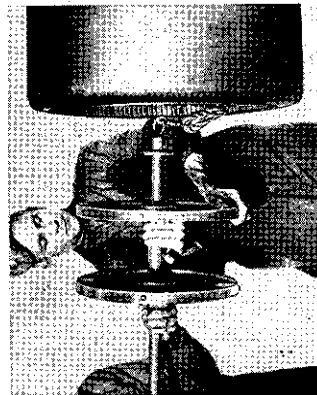
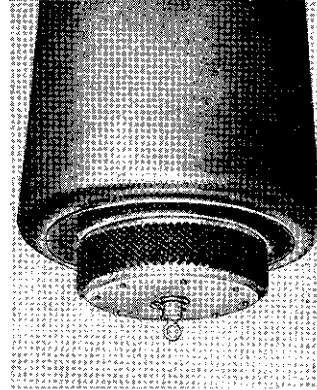
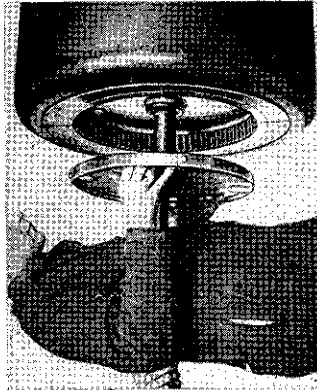
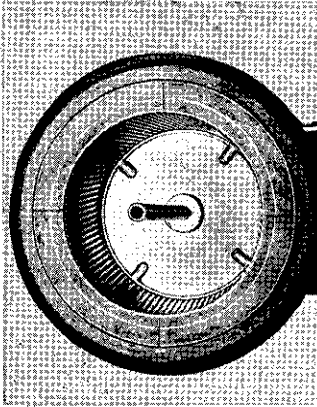


Figure 73—Slushing Bore

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device and slushing compound through the bore of the gun. The force of the pull is exerted on the brush and spreading disk assembly which pushes the slushing compound and friction disks through the bore. Pressure is built up against the compound by the resistance of the friction disks, causing the compound to ooze out around the spreading disk and fill the grooves or rifling of the gun. After the bore greasing device has been drawn through the bore to the point where the friction disks enter the chamber, pressure against the compound is lost. To compensate for this loss of resistance and to slush the last several inches of rifling, it is necessary to hold a pole or staff against the friction disk.

(e) The pull on the dragline may be supplied by hand or where space will permit, by a tractor. Care should always be taken to keep the direction of the pull along the axis of the bore. Once the pulling operation is started, it is desirable to continue the pull until the bore is completely slushed; each stop and start leaves a heavy ring of slushing compound in the bore.

(f) An alternate method of placing the bore greasing device in the bore is to draw it in from the breech end. This can be accomplished by passing a light line through the bore from the muzzle end, and attaching the line to the eye on the brush end of the device. As the device is being pulled through by the light line, the dragline to be used in the slushing operation is attached to the opposite end of the device and drawn through at the same time.

(3) **CLOSE ENDS OF GUN BORE.** After slushing, saturate cleaning waste or wiping cloths with **COMPOUND**, rust-preventive, heavy, and stuff a plug of this material in the muzzle end of the bore. Then tie a piece of canvas around the muzzle, and stuff saturated waste in breech end of chamber.

(4) **RECOIL SLIDES.** Clean and coat the recoil slide surfaces with **COMPOUND**, rust-preventive, heavy.

c. Breech Mechanism.

(1) Remove the obturator spindle, split rings, gas check pad, and firing mechanism slide. Clean the gas check pad with wet sponge and wooden scraper, dry and coat with **OIL**, engine, SAE 10, rubbing it in well. Then place in original container in armament chest. Clean other parts with **SOLVENT**, dry-cleaning, dry and coat with **COMPOUND**, rust-preventive, heavy, and store in protected place.

(2) Remove the breechblock and block carrier. Clean and coat all parts with rust-preventive compound, and reassemble. Coat breechblock threads with rust-preventive compound and close breech. Install breech cover.

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(3) All parts removed from gun should be carefully marked with tags, bearing the name of the battery, gun model, and serial number. Temporary record of place of storage will be made and filed in the battery emplacement book.

d. Recoil Mechanism. Be sure that the recoil cylinder is filled with OIL, recoil, heavy, and that the cradle is lubricated, and all exposed metal surfaces coated with COMPOUND, rust-preventive.

e. Elevation Hydraulic Power Unit. Fill the hydraulic system with oil. Remove guards, and coat shafts and flexible couplings with COMPOUND, rust-preventive.

f. Elevating and Traversing Mechanism. Lubricate as prescribed on lubrication guide.

g. Base Ring and Rollers. Ordnance maintenance personnel should be called for removal of racer retainer clips. Clean rollers and roller paths with SOLVENT, dry-cleaning, and coat thoroughly with COMPOUND, rust-preventive.

h. Air Compressor. Drain and refill the compressor crankcase. Remove suction muffler flange and discharge pipe flange and pour in engine oil while turning the compressor by hand. This will insure oiling of the cylinders, pistons and valves.

i. Loading Carriage. Fill the carriage buffer with oil and coat all metal surfaces with COMPOUND, rust-preventive. Store carriage in casemate.

j. Shield. Cover the gun slot and gun pointer's aperture in the front of shield and the rear of the shield with materials available.

k. Gun Emplacement. Be sure that drains in the concrete emplacement are open and that no debris is in the pit to clog the drains.

l. Properly covered and lubricated, the materiel will require little care while inactive.

m. At regular intervals of 30 days or less, the amount of oil in the recoil cylinder and in the hydraulic system should be checked and the proper grade of oil added, if necessary. The carriage should be traversed and elevated through its full range of travel in azimuth and elevation. Leave the carriage traversed about 30 degrees from its former position.

n. It is especially required that all parts of the carriage be kept clean at all times. Rust should not be allowed to accumulate on metal surfaces. If rust is found upon inspection, remove with SOLVENT, dry-cleaning, and CLOTH, crocus, and recoat with COMPOUND,

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rust-preventive, heavy. Cracked or flaking painted surfaces should be retouched as soon as possible.

o. Turn the air compressor over by hand, a few times, to distribute oil.

p. At the beginning of the active season, all exposed finished surfaces will be thoroughly cleaned and lubricated. Careful inspection of the condition of finished and unfinished surfaces will be made and rust and marred paint removed. Cleaning and preparation of surfaces for repainting or touching up is covered in paragraph 45.

q. Remove plugs and covers from the gun bore and scrape out the rust-preventive compound, clean with SOLVENT, dry-cleaning, and coat bore with proper grade of oil.

r. Remove breech mechanism parts from storage place. Disassemble breech mechanism, clean, lubricate, and assemble.

s. Ordnance maintenance company should be called for the removal of the racer retaining clips. Thoroughly clean the traversing rollers and roller paths of COMPOUND, rust-preventive, and lubricate with the proper grade of engine oil. Replace racer retaining clips.

t. Lubricate the gun and carriage as prescribed on lubrication guides. Check the lubricant in gear cases to be sure that it is the proper grade.

u. Inspect the gun, carriage, all equipment and accessories. Inspection and adjustments to be made are listed in section VII.

42. CLEANING AND PRESERVING MATERIALS.

a. The following cleansers, abrasives and preservatives are required for use with this materiel. See TM 9-850 for detailed information.

(1) LUBRICATING AND PRESERVING MATERIALS.

COMPOUND, rust-preventive, light

GREASE, graphited, light

GREASE, O.D., No. 00

GREASE, O.D., No. 0

GREASE, lubricating, special

NAPHTHALENE, flake

OIL, lubricating, chain and wire rope, grade 2

OIL, engine, SAE 10

OIL, engine, SAE 30

OIL, lubricating, for aircraft instruments and machine guns

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(2) GREASE, O. D. No. 00 AND 0. Used in pressure lubrication fittings and gear cases. The proper grade for use in various regions is indicated in the lubrication guide.

(3) OIL, ENGINE, SAE 10. Used on sliding surfaces of breech and firing mechanism and all sliding surfaces of the gun and carriage when the average daily temperature is below 32 F.

(4) OIL, ENGINE, SAE 30. Used on sliding surfaces of breech and firing mechanism, and all sliding surfaces of the gun and carriage when the average temperature is above 32 degrees F.

(5) OIL, HYDRAULIC. A special light oil for hydraulic variable speed gears and other hydraulic controls.

(6) OIL, LUBRICATING, FOR AIRCRAFT INSTRUMENTS AND MACHINE GUNS. This oil is used to lubricate firing pin and delicate bearings of fire control and sighting instruments, unless otherwise prescribed. To be applied by dropping from end of the dropper attached to the stopper of the bottle, or from the end of a piece of clean wire. Also used as indicated in lubrication guide for gun and mount in arctic regions. In the oiling of fire control instruments, only a few drops are needed. If more than necessary is used it may run into the optical elements of the instruments and so affect the serviceability of the instrument as to require complete disassembly to remove the oil.

(7) GREASE, LUBRICATING, SPECIAL. Used on fire control instruments wherever a grease is indicated.

b. Cleaners and Abrasives.

ALCOHOL, ethyl, grade 1

AMMONIA, 28%

BURLAP, jute (8 oz. 40 in. wide, yd.)

CLOTH, abrasive, aluminum-oxide

CLOTH, crocus

CLOTH, wiping, cotton, mixed (sterilized)

GLYCERINE, grade A, U.S.P.

PAPER, flint, class B, No. 1/2

PAPER, flint, class B, No. 1

PAPER, flint, class B, No. 2

PAPER, lens, tissue

POLISH, metal, paste (type III)

REMOVER, paint and varnish

SOAP, castile

SODA ASH, type I

SODA, caustic (lye)

SOLVENT, dry-cleaning

SPONGE, cellulose, type A

SPONGE, natural, class A

WASTE, cotton, colored

WASTE, cotton, white

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43. PAINTS AND RELATED MATERIALS.

a. The following paints and related materials are required for use with this materiel. See TM 9-850 for detailed information.

- | | |
|---|-------------------------------------|
| ENAMEL, synthetic, blue drab, lusterless | PAINTE, stencil, black, ready mixed |
| ENAMEL, synthetic, gloss-red | PAINTE, stencil, white |
| ENAMEL, synthetic, olive-drab, lusterless | PRIMER, synthetic, refinishing |
| ENAMEL, white | PRIMER, synthetic, rust inhibiting |
| LACQUER | THINNER, for synthetic enamels |
| LEAD, red, dry, grade B | TURPENTINE, gum spirits |
| MIXTURE, liquid, for red lead paint | VARNISH, shellac, orange, type II |
| OIL, linseed, raw, type A | VARNISH, spar, water resisting |

(1) To avoid the possibility of paint plugging the fitting or being carried into the oilholes, etc., with the lubricant, the orifices of the fittings will not be painted.

(2) ENAMEL, SYNTHETIC, GLOSS-RED. Used around oilholes and fittings for lubricants to attract attention and furnish ready identification.

(3) LEAD, RED, DRY. A separate requisition is required for the necessary liquid mixture for making red lead paint.

(4) PAINT, STENCIL, BLACK. Used for stenciling equipment and materiel, except on black or dark background.

(5) PAINT, STENCIL, WHITE. Used for stenciling equipment and materiel, except on white or light background.

(6) Camouflage is a major consideration in painting ordnance artillery materiel, with rust-prevention secondary. The camouflage plan at present employed utilizes three factors: Color, gloss, and stenciling. See Engineer's Field Manual FM 5-20 and FM 5-21 for full information.

44. WASHING.

a. Serious damage to ordnance materiel, in many cases requiring repair and replacement of component parts of sighting equipment, fire control instruments, guns and carriages, has frequently resulted from the use of water, steam, or air from a high pressure hose for cleaning purposes. For this reason, operating personnel is cautioned

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to prevent water, dirt or grit from being forced into trunnion bearing, bearing surfaces and gear cases when using water, steam, or air under pressure for cleaning.

b. Under no circumstances will a hose, either normal pressure or high pressure, be used in cleaning any sighting equipment or any fire-control instruments. Before washing, take off removable sighting equipment, from the materiel to be cleaned. In cases where it is not removable, take care to cover the parts properly.

(1) Natural sponges should in general be used for washing and cleaning materiel. Cellulose sponges may be substituted for natural sponges. Cellulose sponges must not be wrung. Squeezing only is the proper method of removing water.

(2) WASTE, COTTON. Colored cotton waste may be used for general cleaning purposes on the exteriors of ordnance materiel. It is also used as caulking for cracks from which it is desired to exclude dust and dirt. While waste is used for general cleaning purposes on finished surfaces of ordnance materiel, instead of white cotton waste an equivalent amount of clean wiping rags may be used.

45. PAINTING MISCELLANEOUS MATERIALS AND TOOLS.

a. For the purpose for which these are used, see TM 9-850.

BRUSHES:

Artist, camel's-hair, round,
No. 1

Flowing, skunk hair, No. 3
(2-inch)

Sash tool, oval, No. 1 ($2\frac{7}{32}$
x $1\frac{3}{4}$ -inch)

Sash tool, oval, No. 3
($1\frac{3}{32}$ x $2\frac{1}{8}$ -inch)

Scratch, painter's, handled
(14 x $\frac{7}{8}$ -inch)

Varnish, oval, ($1\frac{7}{8}$ -inch)

BURLAP, jute, 8-ounce (40
inches wide)

KNIFE, putty

NEEDLE, sacking

PALM, sailmaker's

TWINE, jute

b. The bristles of brushes are subject to attack by moths. Brushes in storage should be protected by naphthalene flakes.

c. Camel's-hair brushes, after being thoroughly cleaned with turpentine, should be laid flat on a horizontal surface (not in water). Other paint brushes should be cleaned after use and kept with bristles submerged in fresh water.

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Section VII

INSPECTION AND ADJUSTMENT

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46. GENERAL.

a. Inspection has as its purpose the detection of conditions which might cause improper performance. Such conditions may be caused by:

(1) Mechanical deficiencies resulting from ordinary wear, breakage or exposure to the elements or enemy fire.

(2) Faulty or careless operation.

(3) Improper care, such as inadequate lubrication, inadequate protection or insufficient preservative measures.

b. Inspection should always be accompanied by corrective measures to remedy any deficiencies found. When properly carried out, inspection and necessary corrective maintenance will insure the maximum reliability and performance of the materiel. The inspection outlined in this section of this manual should be made at regular intervals of not to exceed 30 days, during both active and inactive seasons.

c. Before inspecting particular points, the gun and carriage should be inspected in general for evidences of faulty operation, care or maintenance. Any unusual conditions which might result in improper operation or damage to the materiel will be immediately remedied. Untidy appearance and evidences of rust or deterioration will be corrected. Missing or broken apparatus will be replaced.

47. GUN.

Inspection

a. **Bore.** Note condition of the bore. Look for rust on the lands and carbon deposits in grooves.

Adjustment

a. Remove rust or carbon deposits. Clean and slush. Wipe dry and lubricate.

INSPECTION AND ADJUSTMENT

Inspection

b. **Gas Check Pad Seat.** Examine the gas check pad seat for burs or roughness.

c. **Recoil Slide Surfaces.** Note condition of slide surfaces on the barrel. Look for rust and scoring.

48. FIRING MECHANISM.

a. Note action of the firing mechanism slide in the slide housing.

b. Check the tension of the firing leaf spring.

c. Make sure that accumulations of dirt do not hold the leaf away from the slide.

d. Test firing mechanism by firing a friction primer, using the primer flame baffle (par. 83 d).

49. BREECH MECHANISM.

a. **Operation.** Note smoothness of operation of the breech mechanism in opening and closing.

b. **Breechblock and Breech Recess Threads.** Examine the breechblock and breech recess for burs or indentations on the threads, and for rust, pitting and other evidences of erosion.

Adjustment

b. Remove burs or roughness with **CLOTH**, crocus. If the surface cannot be smoothed in this manner, notify ordnance maintenance personnel. Do not use any other abrasive.

c. Remove rust and burs with **SOLVENT**, dry-cleaning, and **CLOTH**, crocus.

a. If slide sticks or does not move freely, remove slide and inspect for burs or rusting. Remove burs and rust with **CLOTH**, crocus.

b. Replace weak and broken spring.

c. Disassemble and clean dirty mechanism.

d. If the slide will not close over primer head or if it distorts the primer head, ream out the primer seat.

a. If the mechanism binds or does not operate smoothly, disassemble, clean and examine all parts for wear or breakage. Replace unserviceable parts. Lubricate the mechanism and reassemble. If it is still difficult to operate, notify ordnance maintenance personnel.

b. If not possible to smooth up or clean with **CLOTH**, crocus, notify ordnance maintenance personnel. Do not use any other abrasive.

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Inspection

c. **Split Rings.** Examine the split rings for burrs or cracks.

d. **Gas Check Pad.** Examine gas check pad for bruises or torn covering.

e. **Obturator.** Examine the obturator spindle for burrs and check for longitudinal play in spindle.

f. **Loading Tray.** Examine the loading tray for cracks.

50. RECOIL MECHANISM.

a. **Recoil Cylinder.** Check recoil cylinder for the proper amount of oil. At 0.0 mils elevation the oil should be at the level of the filling plug hole.

b. **Check Condition of Recoil Oil.** Remove a small quantity of recoil oil through the drain plug hole. Examine oil for water and rust sediment.

c. **Check Packing.** Look for leakage of recoil oil around piston rod.

51. BASE RING AND ROLLERS.

a. **Check Level.** To check the level of base ring, install the clinometer to bore rest inserted in muzzle of the gun. Level the gun and observe the bubble as the gun is traversed.

b. **Inspect Rollers and Roller Path.** Remove the inspection plugs in the racer retaining clips and note condition of rollers and roller path.

Adjustment

c. Replace defective rings.

d. Replace damaged or defective gas check pad.

e. If possible remove burrs from spindle, using CLOTH, crocus. If spindle shows excessive play, notify ordnance maintenance personnel.

f. Report to ordnance maintenance company for welding, brazing or replacement.

a. Refill if necessary.

b. If oil is contaminated, drain, flush and refill with clean recoil oil.

c. Tighten recoil piston rod follower. If leak persists, notify ordnance maintenance personnel for repacking.

a. If the maximum error is more than ten minutes, notify ordnance maintenance personnel for releveling.

b. If any signs of rusting or dirt are present, clean the rollers and roller path and lubricate.

INSPECTION AND ADJUSTMENT

52. ELEVATING MECHANISM.

Inspection

a. **Check Level of Oil in Hydraulic System.** Remove the level gage in the expansion tank and note that level of oil is at least as high as the second mark.

b. **Check Condition of Hydraulic Oil.** Drain out a small amount of oil from the lowest point in the system and inspect for water and sediment.

c. **Check Level and Condition of Oil in Elevating Mechanism.** Remove level plugs and inspect level and condition of oil.

d. **Check Effort to Elevate.** The effort to elevate or depress should be approximately 24-28 pounds, as measured at the handwheels.

e. **Check Backlash.** Operate handwheels to elevate and depress.

f. **Check Operation of Elevating Mechanism Under Power.** Operate the mechanism under power and note that the gun is stopped when the handwheels are stopped, and that the pump and motor are quiet in operation. Operation should be smooth.

g. **Check Rack.** Inspect the elevating rack on the gun cradle and note that it is tight.

Adjustment

a. If oil is below level, refill with proper grade of oil.

b. If water or dirt is present, drain, flush, and refill.

c. Refill if necessary. Drain, flush and refill if oil is dirty.

d. If effort is excessive, report to ordnance maintenance personnel.

e. If handwheels can be moved more than an eighth turn without elevating or depressing the gun, report to ordnance maintenance personnel.

f. Report any irregularity to ordnance maintenance personnel.

g. If loosened, tighten screws.

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53. TRAVERSING MECHANISM.

Inspection

a. Check Effort to Traverse.

The effort to traverse should be approximately 18 pounds as measured at the handwheels.

b. Check Oil Level and Condition of Oil. Remove level plug and inspect level and condition of oil.

Adjustment

a. If effort is excessive inspect for dirt between the pinion and traversing rack in the base ring. Check grade of oil in worm and wormwheel. If source of trouble cannot be located, report to ordnance maintenance personnel.

b. Refill if necessary. Drain, flush and refill if necessary.

54. ELECTRICAL EQUIPMENT.

a. Firing Circuit.

(1) Note condition of cables.

(1) Repair frayed insulation with friction tape; replace damaged cables. Replace damaged connections and missing screws in straps and brackets.

(2) Test firing key or pistol and gun commander's push button to make sure proper contact is made when these parts are operated. Use test lamp or fire electric primer.

(2) If firing circuit is not complete, see that controller switch and transformer switch are on, and that the selective firing switch is in "TRANSFORMER" position. Check all wiring and connectors. Notify ordnance maintenance personnel if break in circuit is not found.

b. Power Circuit. Check power circuit by operating elevation motor.

b. Report any irregularities to ordnance maintenance personnel.

c. Lighting Circuit. Test all lights in shield and trouble light.

c. Replace defective bulbs or receptacles.

55. AIR COMPRESSOR.

a. Crankcase. Check level of oil and condition in crankcase.

a. Refill if necessary. Drain, flush and refill if oil is dirty.

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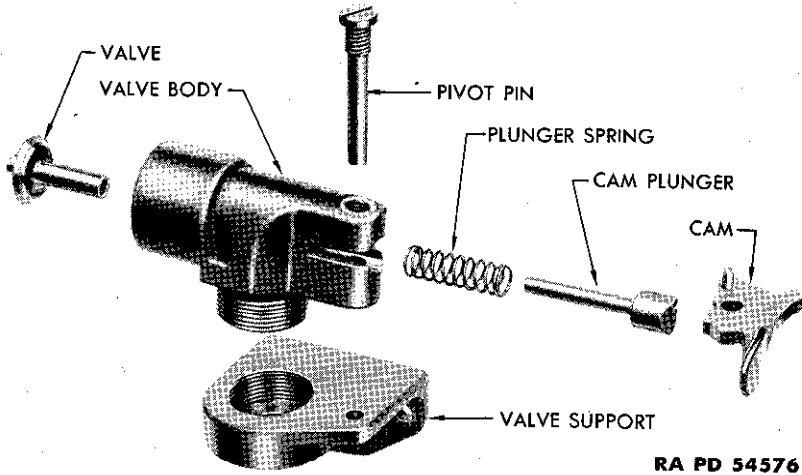


Figure 76—Valve, Gas Ejection

b. **Piping.** If leaks in piping connections cannot be corrected by tightening, report to ordnance maintenance personnel.

c. **Air Compressor.** Report any irregularities in the operation of the compressor to ordnance maintenance personnel.

Section IX

AMMUNITION

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59. GENERAL.

a. Ammunition for the 6-inch Guns M1903A2 and M1905A2 is of the separate loading type. The loading of each complete round into the cannon requires three separate operations: one, the fuzed projectile; two, the propelling charge; and three, the primer. These components are shipped separately. Armor-piercing projectiles for this gun are shipped fuzed; high-explosive and practice projectiles are shipped unfuzed.

60. NOMENCLATURE.

a. Standard nomenclature is used in this section in all references to specific items of issue. Its use for all purposes of record is mandatory.

61. FIRING TABLES.

a. For applicable firing tables, see section XV, References.

62. CLASSIFICATION.

a. The projectiles authorized for use in these guns are classified as armor-piercing (shell and shot), high-explosive, practice, and dummy. Armor-piercing shell and shot have thick walls (shot having thicker walls than shell) and a relatively small quantity of explosive filler, whereas high-explosive projectiles have relatively thin walls and a

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correspondingly larger quantity of high-explosive filler. Target practice projectiles are inert (contain no explosive) cast-iron shot similar in size, shape, and weight to the service shell and shot. Dummy (drill) projectiles, which are also inert, consist of a steel and bronze assembly of somewhat similar size, shape, and weight to service projectiles; they are designed for training in handling projectiles and loading cannon.

63. IDENTIFICATION.

a. **General.** Ammunition and components are completely identified by means of the painting and marking (including ammunition lot number). Other essential information is marked on the components, for example: on the projectile, the weight zone or weight and kind of filler; on the propelling charge, the weight of igniter, designation of each section, etc. See figures 77-88 and the following paragraphs. The muzzle velocity may be obtained from the firing tables.

b. **Mark or Model.** To identify a particular design, a model designation is assigned at the time the model is classified as an adopted type. This model designation becomes an essential part of the standard nomenclature and is included in the marking on the item. Prior to the First World War, the year in which the design was adopted preceded by an M was used as the model designation, for example: M1906. From the First World War until July 1, 1925, it was the practice to assign mark numbers. The word "Mark," abbreviated "Mk.", was followed by a Roman numeral, for example, SHELL, H. E., Mk. III. The first modification of a model was indicated by the addition of MI to the mark number, the second by MII, etc. The present system of model designation consists of the letter M followed by an arabic numeral. Modifications are indicated by adding the letter A and appropriate arabic numerals. Thus, M2A1 indicates the first modification of an item for which the original model designation was M2.

c. **Ammunition Lot Number.** When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. In the case of separate-loading ammunition, a lot number is assigned to, and marked on, each of the components—projectile, fuze, propelling charge and primer—as well as on all packing containers. It is required for all purposes of record, including reports on condition, functioning and accidents in which ammunition is involved. To provide for the most uniform functioning, all of the components in any one lot of separate-loading ammunition are manufactured under as nearly identical conditions as practicable. For example, in the case of projectiles, any

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one lot consists of projectiles made by one manufacturer, loaded by one manufacturer, and of one weight. Therefore, to obtain the greatest accuracy when firing separate-loading ammunition, successive rounds, should consist of:

- Projectiles of one lot number (one type and one weight).
- Propelling charges of one lot number.
- Fuzes of one lot number.
- Primers of one lot number.

d. Painting and Marking.

(1) **PAINTING.** Projectiles are painted to prevent rust and to provide, by the color, a ready means of identification as to type. For the projectiles described herein, the color scheme is as follows:

High explosive or armor-piercing	Yellow; marking in black
Practice	Black; marking in white*
Dummy or drill (inert)	Black; marking in white, except red band at center of gravity

(2) **MARKING.** For purposes of identification, the following are marked on the components of separate loading ammunition:

(a) On the projectile:

- Caliber and type of cannon in which fired.
- Kind of filler, for example, "TNT," "EXP.D," etc.
- Mark or model of projectile.
- Weight or weight zone.
- Lot number.

(b) On the propelling charge or section thereof (stenciled):**1. On the body:**

- Kind of charge, for example, "1 CHG."
- Powder lot (includes type of powder, the word "Lot," initials of manufacturer, serial number of lot and year of manufacture).
- Caliber, type, and model of cannon in which fired.

2. On the igniter:

- Weight, grade, and kind of igniter powder.
- Caliber and models of cannon in which fired.
- Month and year of loading.

3. On dummy propelling charges:

- "DUMMY CHARGE" or "DUMMY PROPELLING CHARGE", together with the caliber and model of gun in which it is used.

*It should be noted that the above color scheme is not wholly in agreement with the basic color scheme described in TM 9-1900, practice projectiles being generally painted blue.

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(c) On the fuze (stamped on the body):

- Type and model of fuze.
- Loader's initials.
- Month and year loaded.
- Loader's lot number.

(d) On the primer (stamped on the head):

- Mark or model.
- Loader's lot number.
- Year of loading.

e. **Weight Zone Markings.** Because it is not practicable to manufacture high-explosive projectiles within the narrow weight limits required for the desired accuracy of fire, projectiles are grouped into weight zones in order that the appropriate ballistic corrections indicated by firing tables may be applied. The weight zone of the projectile is indicated thereon by means of squares, of the same colors as the markings, with a prick punch in the center of each square—none, two, three, or more being used, dependent upon the weight of the projectile. For the high explosive shells for 6-inch guns, two squares indicate normal or standard weight. In the case of armor-piercing and practice projectiles, the actual weight to the nearest pound is stenciled thereon, rather than squares to indicate the weight zones.

4. CARE, HANDLING, AND PRESERVATION.

a. Ammunition components are packed to withstand conditions ordinarily encountered in the field. Armor-piercing shell and shot M1911, and dummy projectiles are packed individually in crates—the armor-piercing shot, Mk. XXXIII, being packed individually in boxes. The rotating bands of these projectiles are protected by grommets. High explosive shell are shipped uncrated with grommets and eyebolt lifting plugs. Practice projectiles are shipped uncrated with grommets. Fuzes, propelling charges, and primers are packed in moisture-resistant containers. Since explosives are adversely affected by moisture and high temperature, the following precautions should be observed:

(1) Moisture-resistant seals should not be broken until ammunition is to be used.

(2) Ammunition, particularly fuzes, primers and propelling charges, should be protected from sources of high temperature, includ-

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ing the direct rays of the sun. More uniform firing is obtained if the rounds are at the same temperature.

- b. Do not attempt to disassemble any fuze.
- c. Do not remove the eyebolt lifting plug from the unfuzed round until ready to assemble the fuze thereto. The eyebolt lifting plug is provided for convenience in handling and to keep the fuze opening free of foreign matter.
- d. Primers must always be stored in a dry place. Prolonged exposure to moisture or dampness may cause malfunctioning.
- e. Explosive ammunition must be handled with appropriate care at all times. The explosive elements in primers and fuzes are particularly sensitive to undue shock and high temperature.
- f. Each of the separate loading components should be free of foreign matter—sand, mud, grease, etc.,—before loading into the gun.
- g. Do not remove protective or safety devices from fuzes until just before use.
- h. Components of rounds prepared for firing but not fired, will be returned to their original condition and packings, and appropriately marked. Such components will be used first in subsequent firing, in order that stocks of opened packings may be kept at a minimum. Fuzes and primers will be inspected prior to repacking.

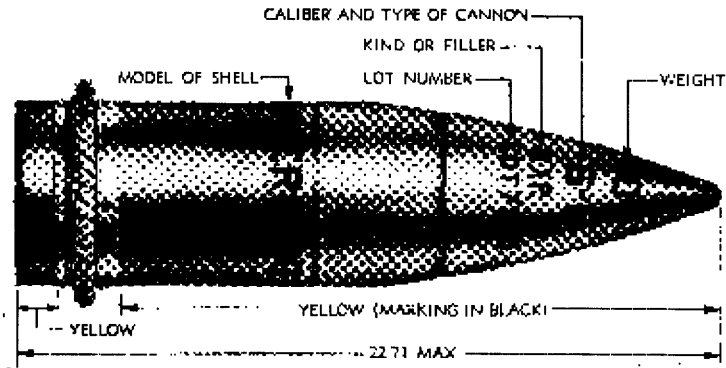
65. AUTHORIZED ROUNDS.

a. The ammunition (figs. 77-88) authorized for use in the 6-inch Guns M1903A2 and M1905A2 is listed in Tables I and II. It will be noted that the nomenclature (standard nomenclature) completely identifies the ammunition.

66. PREPARATION FOR FIRING.

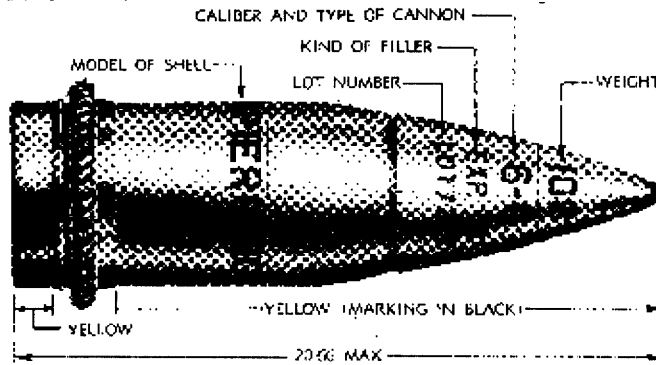
a. Aside from removal of the packing material (including the grommet which protects the rotating band), the armor-piercing projectiles are ready for firing. In the case of high-explosive shells, in addition to removing the grommet, the eyebolt lifting plug must be removed and the appropriate fuze assembled to the shell. Cast-iron practice shells are shipped uncrated and require only the removal of the grommet.

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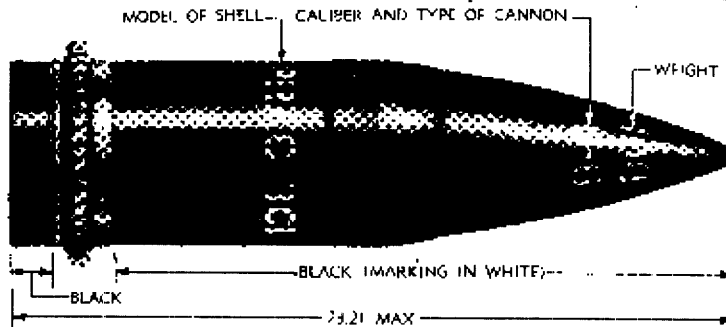
RA PD 5308

Figure 77—SHELL, A.P., 108-lb, M1911, 6-inch Guns, M1897MI-08-08MI-08MI and M1900-03-03A1-03A2-05-05A1-05A2



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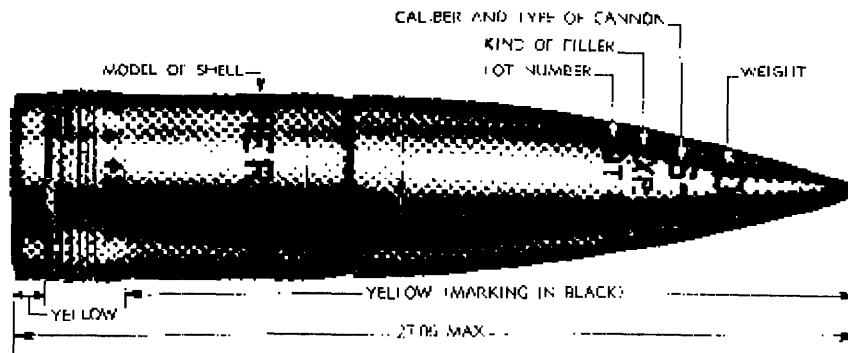
Figure 78—SHOT, A.P., 108-lb, M1911, 6-inch Guns, M1897MI-08-08MI-08MI and M1900-03-03A1-03A2-05-05A1-05A2



RA PD 5310

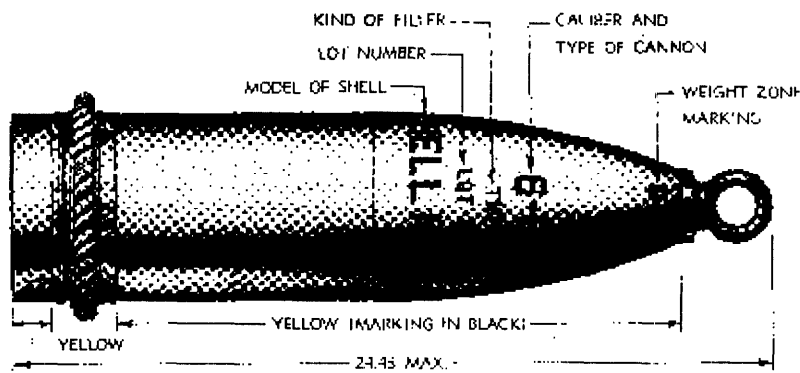
Figure 79—SHELL, C.I., 108-lb, M1911, 6-inch Guns, M1897MI-08-08MI-08MI and M1900-03-03A1-03A2-05-05A1-05A2

AMMUNITION



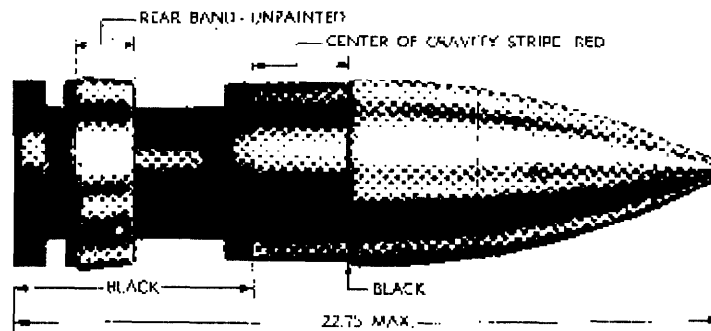
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Figure 80—SHOT, A.P., 105-lb, MK. XXXIII, w/FUZE, B.D., M60, 6-inch Guns, M1900-03-03A1-03A2-05-05A1-05A2



RA PD 5307

Figure 81—SHELL, H.E., 90-lb, MK. II A1, Unfuzed, 6-inch Guns, M1897MI-08-08MI-08MI1 and M1900-03-03A1-03A2-05-05A1-05A2 (Adapted for Fuze, P.D. M51, w/Booster, M21, or M51A1, w/Booster, M21A1)



RA PD 5313

Figure 82—PROJECTILE, dummy, 108-lb, MK. II A1, 6-inch Gun

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

TABLE I

AMMUNITION FOR 6-INCH GUNS M1903A2 AND M1905A2

Nomenclature of Projectile	Propelling Charge (Type)	Primer (Model)
SERVICE AMMUNITION		
SHELL, H.E., 90-lb, Mk. II, unfuzed, 6-inch guns, M1897-MI-08-08MI-08-MII and M1900-03-03A-03A2-05-05A1-05A2 (adapted for PDF Mk. IV-Star or M47)	Single section 32-lb ^o	M30**
SHELL, H.E., 90-lb, Mk. IIA1, unfuzed, 6-inch guns, M1897MI-08-08MI-08MII and M1900-03-03A1-03A2-05-05A1-05A2 (adapted for FUZE, P.D., M51, w/BOOSTER, M21, or M51A1, w/BOOSTER, M21A1)	Single section 32-lb*	M30**
SHELL, A.P., 108-lb, M1911, 6-inch guns, M1897MI-08-08MI-08MII and M1900-03-03A1-03A2-05†-05A1-05A2	Single section 32-lb*	M30**
SHOT, A.P., 108-lb, M1911, 6-inch guns, M1897MI-08-08MI-08MII and M1900-03-03A1-03A2-05‡-05A1-05A2	Single section 32-lb*	M30**
SHOT, A.P., 105-lb, Mk. XXXIII, w/FUZE, B.D., M60, 6-inch guns, M1900-03-03A1-03A2-05-05A1-05A2	Single section 37-lb*	M30**
PRACTICE AMMUNITION		
SHELL, C.I., 108-lb, M1911, 6-inch guns, M1897MI-08-08MI-08MII and M1900-03-03A1-03A2-05†-05A1-05A2	Single section 32-lb*	M30**
DRILL AMMUNITION		
PROJECTILE, dummy, 90-lb Mk. I, 6-inch gun	Single section 32-lb†	M30** Inert
PROJECTILE, dummy, 108-lb Mk. II, 6-inch gun	Single section 32-lb†	M30** Inert
PROJECTILE, dummy, 108-lb Mk. IIA1, 6-inch gun	Single section 32-lb†	M30** Inert

SUBCALIBER AMMUNITION

see paragraph 72.

B.D.—Base-detonating
C.I.—Cast iron
H.E.—High explosive
P.D.—Point-detonating
PDF—Point-detonating fuze

For designation of propelling charges, see paragraph 58. The actual weight of the charge may vary from the nominal weight shown, dependent upon the particular powder lot.

* Service primer is designated PRIMER, electric, M30. If electric power fails, PRIMER, friction, M1914, will be used.

** A fired service primer is used for drill purposes.

† If not available, SHELL, H.E., 90-lb, Mk. II or Mk. IIA1, may be issued.

‡ Dummy charge, see paragraph 58.

Includes projectiles originally designated SHELL, A.P., 108-lb, M1898, SHELL, A.P., 108-lb, M1903, and SHELL, A.P., 108-lb, M1904, which are stored, issued and reviewed as SHELL, A.P., 108-lb, M1911.

Includes projectiles originally designated SHOT, A.P., 108-lb, M1898, SHOT, A.P., 108-lb, M1903, and SHOT, A.P., 108-lb, M1904, which are stored, issued and reviewed as SHOT, A.P., 108-lb, M1911.

AMMUNITION

After removal from the cartridge storage case, the propelling charge is prepared for firing by removing the igniter protector caps and liner data tag. See also paragraphs 68 and 69, devoted to the particular charges and fuzes.

67. PROJECTILES.

a. **General.** The projectiles authorized for use in these guns are listed in paragraph 65. Detailed data pertaining to these projectiles (figs. 77-82) appear in Table II, below. Although of the same general shape—cylindrical body, square base, and ogival head—projectiles for the 6-inch Guns M1903A2 and M1905A2 differ in characteristic details as follows:

- (1) Location of fuze: point or base.
- (2) Radius of ogive: short for low-velocity, long for high-velocity projectiles.
- (3) Armor-piercing cap: used only with armor-piercing projectiles.
- (4) Windshield or false ogive: used with armor-piercing projectiles to improve their ballistic efficiency.
- (5) Base cover: used with armor-piercing and high-explosive projectiles to prevent hot gases from the propelling charge from coming in contact with the bursting charge in the projectile through possible flaws in the base.

b. **Ammunition Data.** See Table II.

68. PROPELLING CHARGES.

a. **General.** The propelling charges authorized for use with this weapon are of two types. One, a single section charge—the other, a base and increment charge. The single section charge consists of a laced cloth bag (see fig. 83) containing NH (nonhygroscopic) smokeless powder. An igniter of black powder is assembled to each end of the single section charge. The base and increment charge consist of a base section and one increment section. The cloth bodies of this charge are reinforced with a cloth wrapping wound spirally along the length of each section. An igniter charge of black powder is sewed to one end of the base section. The base section is equipped with four tying straps which are tied over the increment thus securing both sections together. The full charge is used for maximum range firing and the base section alone is used by itself for firing in the low

**6-INCH SEACOAST MATERIEL;
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

TABLE II

Type and kind	Model	Nominal weight (pounds)	Fuze	Action	Length (inches)	Rotating band inches from base	Width in inches	Weight (pounds)	Filler Type	Shipped
SHELL, H.E.	Mk. II	90	*	Delay	24.50	1.25	2.00	13.69	TNT	Unfuzed, uncrated
SHELL, H.E.	Mk. IIA1	90	**	S.Q. or Del.	24.43	1.25	2.00	13.69	TNT	Unfuzed, uncrated
SHELL, A.P.	M1911	108	B.D., Mk. V	Nondelay	22.71	1.25	2.00	4.53	EXP.D	Fuzed, one per crate
SHOT, A.P.	M1911	108	B.D., Mk. V	Nondelay	20.66	1.25	2.00	1.54	EXP.D	Fuzed, one per crate
SHOT, A.P.	Mk. XXXIII	105	B.D., M60	Delay	27.06	1.00	2.50	2.17	EXP.D	Fuzed, one per crate
SHELL, C.I.	M1911	108			23.21	1.25	2.00			Uncrated
PROJ., dummy	Mk. I	90			23.00	Sliding ring	1.19			One per crate
PROJ., dummy	Mk. II	108			22.75	Sliding ring	1.19			One per crate
PROJ., dummy	Mk. IIA1	108			22.75	Sliding ring	1.86			One per crate

S.Q.—Superquick.

* Either FUZE, P.D., M47 or Mk. IV—Star may be used.

** Either FUZE, P.D., M51, w/BOOSTER, M21, or M51A1, w/BOOSTER, M21A1 may be used.

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ranges. Propelling charges are packed in airtight cartridge storage cases and, to prevent accidental ignition of the charge, an igniter protector cap is placed over each igniter pad.

b. Preparation for Firing. Once the charge is removed from its container it is only necessary to remove the igniter protector caps and the attached linen data tag and the charge is ready for firing.

CAUTION: When loading the base and increment charge, the igniter—indicated by the words "IGNITING POWDER"—should be to the rear (breach end). If the igniter end is loaded first, the charge will not burn properly. This might result in a serious accident.

c. CHARGE, Propelling, Single Section, NH Powder, 6-inch Guns, M1900-03-03A1-03A2-05-05A1-05A2, 90-lb and 108-lb Projectile. The weight of this charge (fig. 83) is approximately 32 pounds. The bag is $6\frac{3}{8}$ inches in diameter and $42\frac{3}{8}$ inches in length (maximum). The total igniter charge consists of 10 ounces of black powder; 3 ounces are contained in each of the igniter pads, which are sewed—one to each end of the charge, and the other 4 ounces are in a core igniter. The cloth of the igniter pad is dyed red to indicate that it contains black powder. The following marking is stenciled on the charge:

Each Side	Side
3-OZ IGNITER	WT. 1 CHG. XX LB (Dif-
WITH 4-OZ CORE	fers with the powder lot and
A-1 BLK. PDR. LOT XXX	projectile weight).
6 IN. G. M1900, M1903 & M1905	1 CHG. 6 IN. G. M1900,
XX-XX (MONTH & YEAR OF	M1903 & M1905
LOADING)	XX-XX LOT XX XXX XX
	(Type of powder, initials of
	manufacturer, serial number
	of lot and year of manufac-
	ture).

d. CHARGE, Propelling, Single Section, NH Powder, 6-inch Guns, M1900-03-03A1-03A2-05-05A1-05A2, 105-lb Projectile. For description of this charge see the foregoing subparagraph. The weight is approximately 37 pounds. This charge is authorized for use with SHOT, A.P., 105-lb, Mk. XXXIII, w/FUZE, B.D., M60.

e. CHARGE, Propelling, Base and Increment, 6-inch Guns, M1903-03-031A-03A2-05-05A1-05A2, 90-lb Projectile. This charge

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GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

authorized for use with SHELL, HE., 90-lb, Mk. II or Mk. IIA1. The weight of complete charge is 30 pounds; 18 pounds are contained in the base section, and the other 12 pounds in the increment section. The igniter charge which is sewed to one end of the base section, consists of 7 ounces of black powder. The full charge is 5.75 inches in diameter and 40 inches in length—the base section is 24 inches long, and the increment section is 16 inches long. The following marking is stenciled on the charge:

On the base section	On the increment section
rear End: IGNITING POWDER
front End: 6 IN. GUN BASE	6 IN. GUN INCREMENT

f. **CHARGE, Propelling, Dummy, Single Section, 32-lb, 1917, 6-inch Guns, M1900-03-03A1-03A2-05-05A1-05A2.** This dummy charge is used for drill purposes with all dummy projectiles listed in paragraph 67. The charge consists of a quantity of small hardwood and lead cylinders (simulated smokeless powder grains) in a lead-weighted hardwood cylinder contained in a laced bag of white cotton duck. A handle of the same material is attached to the side of the charge to facilitate its removal from the chamber of the gun by means of an extractor as described in paragraph 83. The dummy charge for these guns weighs 32 pounds. It is 5¾ inches in diameter and 41 inches in length. It is similar in size and weight to the propelling charge illustrated in figure 83.

D. FUZES.

a. **Classification.** A fuze is a mechanical device used with a projectile to explode it at the time or under the circumstances desired. Fuzes are classified in general according to location in the shell as *point-detonating* or *base-detonating*. Fuzes authorized for use with projectiles for the 6-inch Guns M1903A2 and M1905A2 are classified further—as to type of action after impact—as *superquick*, *nondelay*, and *delay*.

b. **Arming.** Artillery impact fuzes are so designed that they are in an "unarmed" condition before firing; they become armed by forces incident to firing.

c. **Boresafe.** Dependent upon the method of arming, some fuzes are considered "*boresafe*." A boresafe fuze is one in which the explo-

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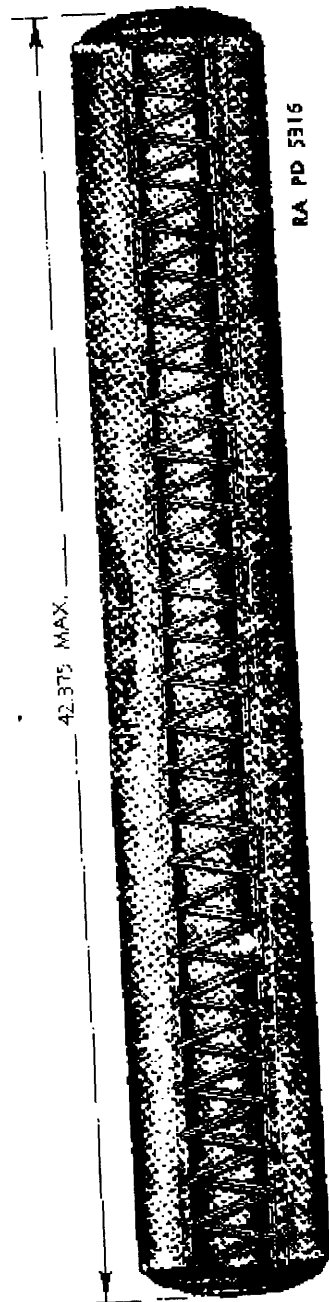
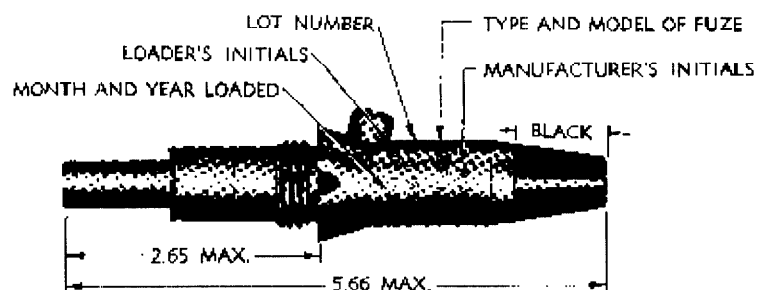


Figure 83 — CHARGE, Propelling, Single Section, NH Powder, 6-inch Guns,
M1900-03-03A1-03A2-05-05A1-05A2, 90-lb and 108-lb Projectile

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**



RA PD 1278A

Figure 84—FUZE, P.D., M47

sive train is so interrupted that, prior to firing and while the projectile is still in the bore of the gun, premature action of the bursting charge is prevented should any of the more sensitive elements malfunction.

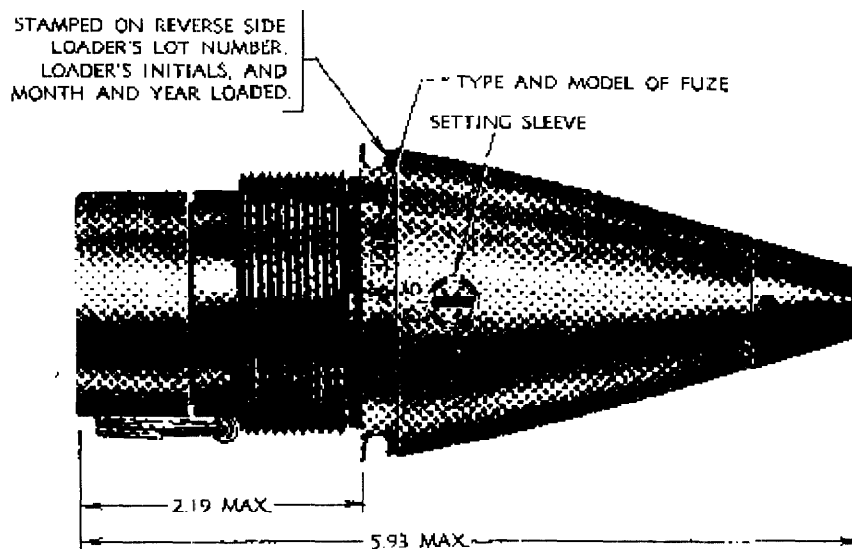
d. **FUZE, B.D., Mk. V.** This base-detonating fuze is used with high-explosive projectiles in which nondelay action is required. It is classified as boresafe. As issued, it is assembled to the projectile and covered by the base cover, hence it is not visible.

e. **FUZE, B.D., M60.** This fuze is of the base-detonating delay type. Due to arrangement of the explosive elements, it is classified as a boresafe fuze. This fuze is authorized for SHOT, A.P., 105-lb., Mk. XXXIII, w/FUZE, B. D., M60. This projectile is shipped with fuze and base cover assembled, hence the fuze is not visible.

f. **FUZE, P.D., M47.** This point-detonating fuze (fig. 84), is of the delay type. It is used with high explosive projectiles. It is not classified as boresafe but may be fired under the same conditions as boresafe fuzes. It may be identified by the stamping on the body and the black paint on the head.

g. **FUZE, P.D., M51A1, w/BOOSTER, M21A1.** This fuze is shown in figure 85. The booster, instead of being a component of the loaded projectile, is permanently attached to the fuze at the time of manufacture. The fuze contains two actions, superquick and delay, and is classified as boresafe. Both actions are initiated on impact, the functioning of the shell depending upon the setting of the fuze. When the fuze is set "DELAY," the superquick action is so interrupted that the fuze functions with delay action. It should be noted, however,

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Figure 85—FUZE, P.D., M51A1, w/Booster, M21A1

that, if the superquick action malfunctions when the fuze is set "S.Q.," the projectile will function with delay action. On the side of the fuze near the base is a slotted "setting sleeve" and two registration lines; the one parallel to the axis is marked "S.Q.," the other "DELAY." As shipped, the fuze is set "S.Q." To set the fuze for delay action it is only necessary to turn the setting sleeve so that its slot is aligned with "DELAY." (A delay pellet—0.05 second—incorporated in the delay action train provides for the delay action). The setting may be made or changed with a screwdriver or similar instrument at any time before loading, even in the dark. If superquick action is desired the slot should be parallel to the fuze axis; if delay action is desired the slot should be at right angles to the fuze axis. A cotter pin with pull ring is assembled to the booster to prevent accidental movement of the detonator during shipment. This cotter pin is to be withdrawn just prior to assembling the fuze with booster to the projectile.

h. **FUZE, P.D., M51, w/BOOSTER, M21.** With the exception of an internal modification, this fuze is the same in all respects to **FUZE, P.D., M51A1, w/BOOSTER, M21A1.**

6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1

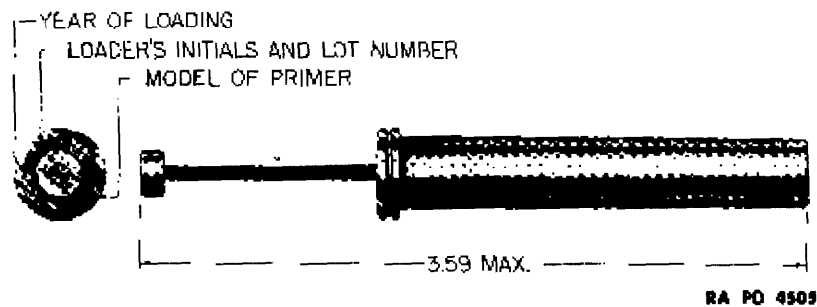


Figure 86--PRIMER, Electric, M30

70. PRIMERS.

a. **General.** The primer is the component used to fire the propelling charge. It consists, essentially, of a small quantity of sensitive explosive and a large quantity of black powder within a brass container. The primer is designed for insertion into the breechblock and, dependent upon the type, is fired by an electric current or by friction. The symbol of the loader and the lot number of the primer are stamped on the head.

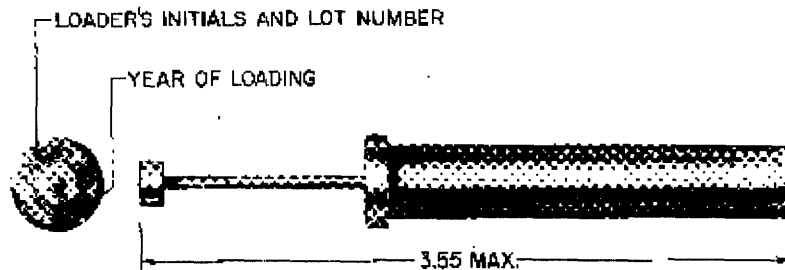
b. **PRIMER, Electric, M30.** This primer (fig. 86) is used with all guns in emplacements fitted with electrical equipment. It is fired by the heat generated by an electric current passing through a resistance wire embedded in the sensitive explosive. The black powder charge intensifies and transmits the flame to the igniter, which is sewed to propelling charge. This primer may be distinguished from the friction primer, described below, by the presence of black insulation on the wire and the presence of a groove around the head of the case. A live primer is supplied for dummy rounds; it is to be fired by the service and retained for use with the dummy (drill) ammunition.

c. **PRIMER, Friction, M1914.** This primer (fig. 87) is similar in appearance to the electric primer, described in subparagraph b, above, with the exceptions stated. It is used for all 6-inch guns where electric power is not available either from lack of facilities or from temporary power failure. It is ignited by the heat generated when a serrated plug is pulled through a friction mixture.

71. PACKING.

a. Complete packing data covering dimensions, volume and weight of the various components of the ammunition described herein are published in SNL P-1, P-2, P-7, P-8, and R-3. Although weights of individual projectiles and crates vary somewhat, dependent upon the

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Figure 87--PRIMER, Friction, M1914

type and model, and propelling charges vary likewise, dependent upon the particular powder charge, the following data are considered representative for estimating weight and volume requirements:

	Weight (pounds)	Volume (cubic feet)
6-inch gun projectile as shipped:		
High-explosive, uncrated*	90	0.77
Over-all dimensions (inches): 24.43 x 7.37 (diam.)		
Armor-piercing Shot, Mk. XXXIII, packed 1 per box	124	1.52
Over-all dimensions (inches): 31 1/8 x 9 3/16 x 9 3/16		
Armor-piercing Shell, M1911, packed 1 per crate	115	1.77
Over-all dimensions (inches): 28 7/8 x 10 3/8 x 10 3/8		
Practice, uncrated ^c	108	0.73
Over-all dimensions (inches): 23.21 x 7.37 (diam.)		
Propelling charge:		
Packed 1 charge per cartridge storage case, 2 cases per crate	108	4.87
Over-all dimensions of crate (inches): 43 3/8 x 17 3/4 x 9 3/4		
Dummy propelling charges are packed and shipped in wooden boxes as required.		

*NOTE: The outside diameter given in over-all dimensions of uncrated projectiles includes the grommet.

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

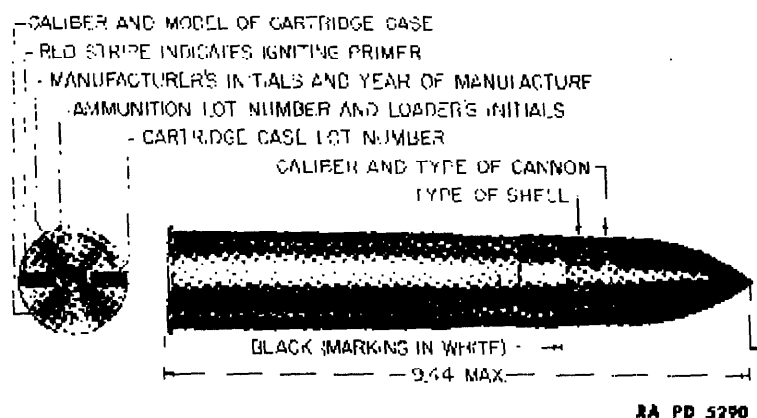


Figure 88—SHELL, Fixed, Subcaliber, 1.457 inch

	Weight (pounds)	Volume (cubic feet)
Fuzes:		
FUZE, P.D. M47, packed in metal-lined box, 50 fuzes per box.	50.7	0.86
Over-all dimensions (inches): $18\frac{3}{16} \times 9\frac{3}{16} \times 8\frac{29}{32}$		
FUZE, P.D. M51A1, w/BOOSTER, M21A1, packed in individual fiber containers, 25 containers (25 fuzes) per wooden box	77.0	1.46
Over-all dimensions (inches): $17\frac{7}{16} \times 15\frac{3}{8} \times 9\frac{1}{32}$		
Primers:		
Packed 20 per metal container, 25 containers (500 primers) per box.	47.8	1.06
Over-all dimensions (inches): $17\frac{9}{16} \times 16 \times 6\frac{1}{32}$		

72. SUBCALIBER AMMUNITION.

a. **General.** SHELL, fixed, subcaliber, 1.457 inch (fig. 88), is authorized for use in the GUN, subcaliber, 1.457 (1-pdr.), when this gun is used for subcaliber practice in 6-inch seacoast guns. This ammunition is issued in the form of fixed complete rounds. "Fixed" ammunition refers to complete rounds in which the propelling charge is fixed, that is, not adjustable, and which are loaded into the gun as a unit. The projectile, which is made of steel, is inert and weighs 1.06

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pounds as fired. The cartridge case is of the extracting rim type and contains an igniting primer. To distinguish this round from those containing percussion primers, a diametrical red stripe is painted across the base. When firing, a regular service primer (PRIMER, electric, M30, or PRIMER, friction, M1914) is required to fire the igniting primer of the subcaliber round. The complete round may be identified by the markings thereon.

b. **Packing.** Data for packing are as follows:

	Weight (pounds)	Volume (cubic feet)
Complete round without packing material	1.66	—
Packed 50 rounds per metal-lined box	112.0	2.21
Over-all dimensions of box (inches):		
23 $\frac{7}{8}$ x 12 $\frac{3}{16}$ x 13 $\frac{1}{8}$		

73. FIELD REPORT OF ACCIDENTS.

a. When an accident involving the use of ammunition occurs during training practice, the procedure prescribed in section VII, AR-750-10 will be observed by ordnance officer under whose supervision the ammunition is maintained or issued. Where practicable, reports covering malfunctions of ammunition in combat will be made to Chief of Ordnance, giving type of malfunction, type of ammunition, the lot number of the complete rounds or separate loading components, and condition under which fired.

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pounds as fired. The cartridge case is of the extracting rim type and contains an igniting primer. To distinguish this round from those containing percussion primers, a diametrical red stripe is painted across the base. When firing, a regular service primer (PRIMER, electric, M30, or PRIMER, friction, M1914) is required to fire the igniting primer of the subcaliber round. The complete round may be identified by the markings thereon.

b. **Packing.** Data for packing are as follows:

	Weight (pounds)	Volume (cubic feet)
Complete round without packing material	1.66	—
Packed 50 rounds per metal-lined box	112.0	2.21
Over-all dimensions of box (inches):		
$23\frac{7}{8} \times 12\frac{13}{16} \times 13\frac{1}{8}$		

73. FIELD REPORT OF ACCIDENTS.

a. When an accident involving the use of ammunition occurs during training practice, the procedure prescribed in section VII, AR-750-10 will be observed by ordnance officer under whose supervision the ammunition is maintained or issued. Where practicable, reports covering malfunctions of ammunition in combat will be made to Chief of Ordnance, giving type of malfunction, type of ammunition, the lot number of the complete rounds or separate loading components, and condition under which fired.

6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1

Section X

ON-CARRIAGE FIRE CONTROL AND SIGHTING EQUIPMENT

	Paragraph
On-carriage fire-control equipment	74
On-carriage sighting equipment	75
General	76
Care in handling	77
Lubrication	78
Optical parts	79
Azimuth indicator M9 and elevation indicator M8	80
Mount, telescope, M35, with telescope, M31	81

74. ON-CARRIAGE FIRE-CONTROL EQUIPMENT.

a. The on-carriage elements of the fire-control system used with the 6-inch Barbette Carriage M1 consist of an Azimuth Indicator M9 and an Elevation Indicator M8. The indicators are mounted on the carriage near the traversing and elevating handwheels, respectively. The indicators have "match-the-pointer" dials. The handwheel operators keep the dial pointers matched and thereby apply transmitted data to the gun. A ready signal lamp in each indicator shows when the indicator is receiving correct data. The indicators receive their data either from a gun data computer, or from an azimuth transmitter and an elevation transmitter.

b. For instructions on the care and use of the off-carriage fire-control and sighting equipment used with this carriage, refer to FM 4-15, Seacoast artillery: Fire Control and Position Finding, and Technical Manuals on specific items of fire control and sighting equipment.

75. ON-CARRIAGE SIGHTING EQUIPMENT.

a. The combination of Telescope Mount M35 and Telescope M31 forms the sighting element for aiming the gun in azimuth. The combination is intended for Case II fire, in which the gun is *aimed* in azimuth and *laid* in elevation. Either the gunner's quadrant or the elevation indicator can be used for laying the gun in elevation for this type of fire.

76. GENERAL.

a. The instructions given hereunder supplement instructions pertaining to individual instruments included in the following sections.

ON-CARRIAGE FIRE-CONTROL AND SIGHTING EQUIPMENT

b. The policy in regard to disassembly, repair, maintenance and adjustment for all sighting and fire-control instruments is as described below.

(1) Except as authorized in (step 2) below, disassembly and assembly of instruments by the using personnel are, in general, not permitted beyond the extent authorized in the paragraphs dealing with the individual instruments.

(2) In general, battery operating personnel are limited to adjustments, repairs and maintenance which can be performed with the facilities available to them and which do not require access to the interior of the instrument through the removal of the cover plates. Adjustments, repairs and maintenance which can be performed with the facilities available and which require access to the interior of the instrument through the removal of the cover plates may be performed by local personnel, either of the using arm or of the Ordnance Department, who have been qualified for the work either through the successful completion of a recognized course of instruction in maintenance, or through adequate experience in the type of operation to be undertaken. A recognized course of instruction is one that has the approval of the Chiefs of Ordnance and Coast Artillery. Determination of adequate experience in each case will be made by the responsible ordnance officer. The responsible ordnance officer will take the necessary action where maintenance requires facilities beyond those available locally.

c. The maintenance duties described are those for which tools and parts have been provided the using personnel. Other replacements and repairs are the responsibility of maintenance personnel, but may be performed by the using arm personnel, when circumstances permit, within the discretion of the responsible ordnance officer.

77. CARE IN HANDLING.

a. Fire-control and sighting instruments are, in general, rugged and suited for the purpose for which they have been designed. They will not, however, stand rough handling or abuse. Inaccuracy or malfunctioning will result from such treatment.

b. Unnecessary turning of screws or other parts not incident to the use of the instrument is forbidden.

c. When placing instruments in or removing them from their carrying cases, avoid the use of force.

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GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

d. When the instruments are not in use, keep them in the carrying cases provided or in the condition indicated for traveling.

e. Keep the instrument as dry as possible. If the instrument becomes wet, dry it before placing it in its carrying case.

f. Instruments which indicate incorrectly or fail to function properly after the authorized tests and adjustments have been made are to be turned in for repair by ordnance personnel.

g. No painting of fire control or sighting equipment by the using personnel is permitted.

h. Fire-control mechanisms move freely and smoothly throughout the range of the instruments. The mechanisms must not be forced against the stops provided at the extremes of the range.

78. LUBRICATION.

a. Where lubrication with oil is indicated, use **OIL**, lubricating, for aircraft instruments and machine guns; where lubrication with grease is indicated, use **GREASE**, lubricating, special.

b. Lubricants for fire control instruments also function as rust-preventives. Lubricants must be applied carefully and diligently. Excessive lubrication must be avoided.

c. The exterior of instruments must be kept free of dirt, dust and seeping oil. Remove excess oil from metal or painted surfaces with a cloth slightly moistened with **SOLVENT**, dry-cleaning, and wipe the surface with a clean cloth.

79. OPTICAL PARTS.

a. To obtain satisfactory vision, exposed surface of lenses and other optical parts must be kept clean and dry. Corrosion and etching of the surface of the glass can be prevented or greatly retarded by keeping the glass clean and dry.

b. For wiping optical parts use only **PAPER**, lens, tissue. The use of cleaning cloths for wiping optical parts is not permitted. Do not wipe lenses or windows with the fingers. To remove dust, brush the glass lightly with a clean **BRUSH**, artist, camel's-hair, rd. Rap the brush against a hard body to knock out the small particles of dust that cling to the hairs. Repeat this process until all dust is removed from the glass surface. An additional brush with coarse bristles is provided with some instruments for cleaning mechanical parts. Each brush should be used only for the purpose for which it is intended.

c. Exercise particular care to keep optical parts free from grease and oil. To remove grease or oil from optical surfaces, apply **SOAP**,

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liquid, lens cleaning with a tuft of PAPER, lens, tissue. Wipe the surface gently with clean lens paper. If lens cleaning liquid soap is not available, breathe heavily on the surface and wipe it off with clean lens paper. Repeat this process until the surface is clean.

d. Moisture may condense on the optical parts of the instruments when the temperature of the parts is lower than that of the surrounding air. The moisture, if not excessive, can be removed by placing the instrument in a warm place. Heat from strongly concentrated sources should not be applied directly as it may cause unequal expansion of parts, thereby resulting in breakage of optical parts or inaccuracies in observation.

80. AZIMUTH INDICATOR M9 AND ELEVATION INDICATOR M8.**a. Description.**

(1) The Azimuth Indicator M9 and Elevation Indicator M8 receive four elements of data, namely: coarse azimuth, fine azimuth, coarse elevation, and fine elevation. The indicator dial for each of these four elements consists of an inner dial bearing a pointer index, an outer concentric ring bearing a similar pointer index, and a graduated scale. The inner dial is electrically driven by the corresponding transmitter element in the plotting room, and its pointer index shows the same scale reading as the plotting room transmitter. The outer concentric ring is geared to the traversing or elevating drive of the gun carriage, and its pointer index shows the actual azimuth or elevation of the gun. Hence, when the inner and outer pointer indexes are matched, the gun is at the same azimuth or elevation as that which is set on the transmitter dials in the plotting room.

(2) For each element of data transmitted, an alternating-current synchronous transmitter, one or more alternating-current synchronous repeaters, and connecting means are provided. The repeaters and transmitters resemble small electric motors in external appearance. The repeater follows the motion of the distant transmitter and synchronizes (lines up) with the transmitter when power is applied, regardless of relative position prior to application of power. The repeater cannot carry mechanical load, and is therefore used in connection with a "follow-the-pointer" drive. Each repeater carries only an index (electrical) with which another index (mechanical), connected to the element to be positioned, is brought into alignment by means of a handwheel or other drive.

(3) The Azimuth Indicator M9 (fig. 89) is mounted on the left side of the gun carriage. The coarse dial indicates 360 degrees per revolu-

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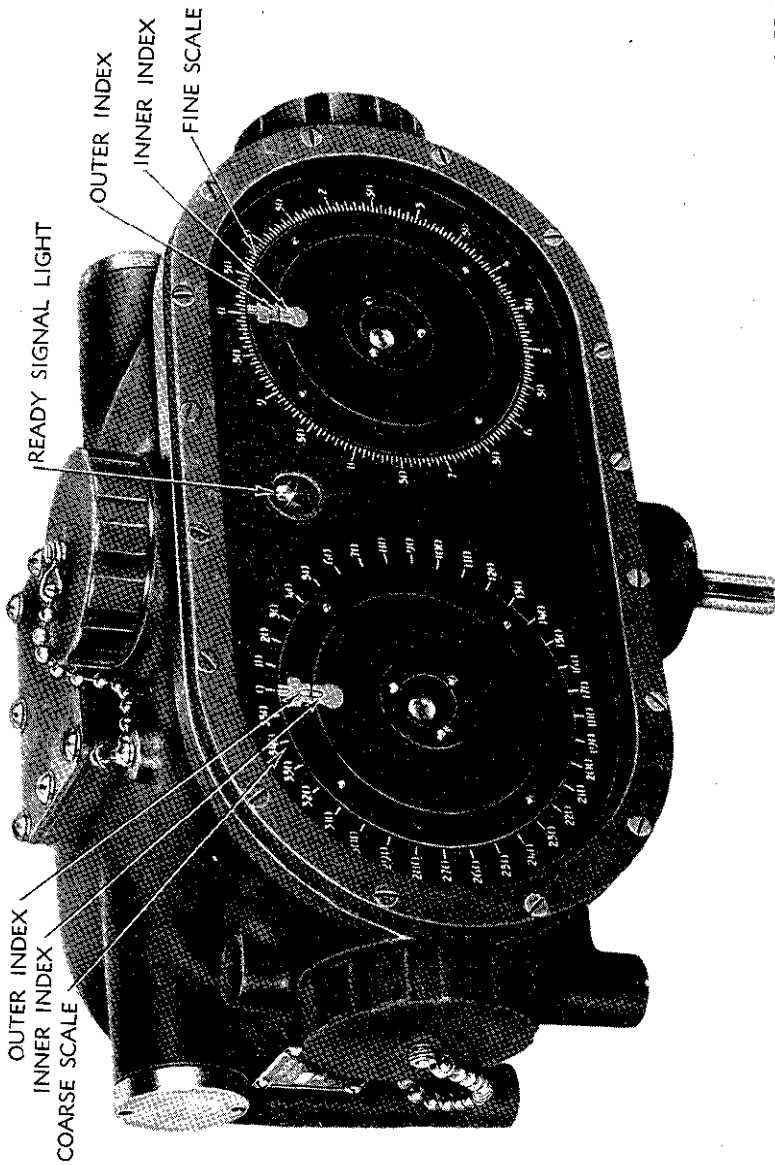


Figure 89 — Azimuth Indicator

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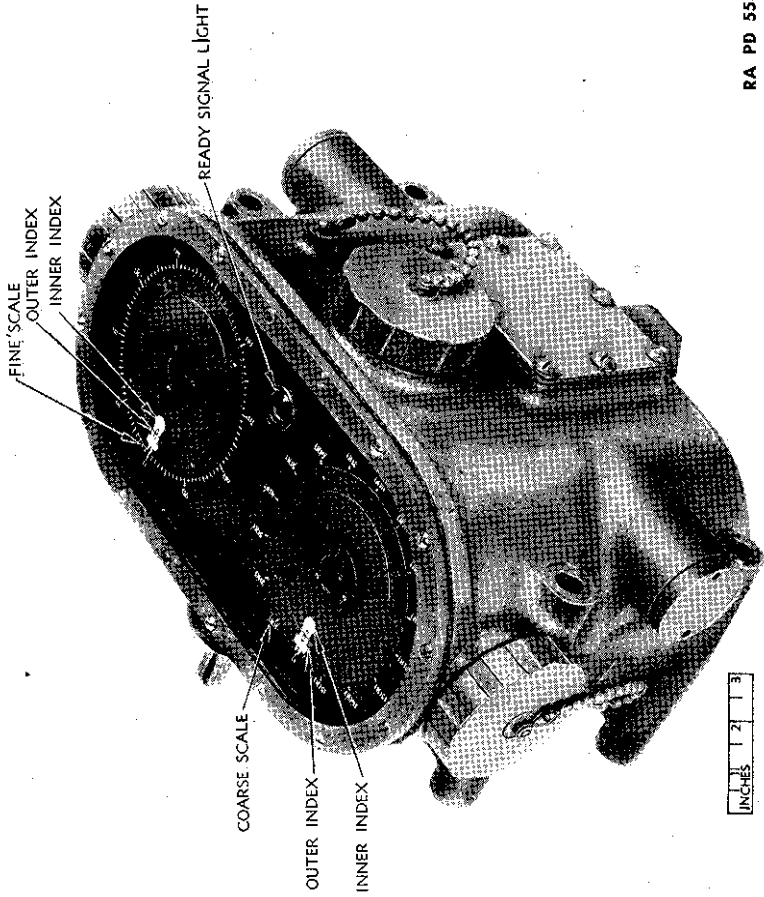


Figure 90—Elevation Indicator M8

**6-INCH SEACOAST MATERIEL:
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tion, and the fine dial indicates 10 degrees per revolution. A ready signal lamp is mounted behind a red bull's-eye between the dials. The entire mechanism is inclosed in a weatherproof case provided with a shatterproof glass window.

(4) The Elevation Indicator M8 (fig. 90) is mounted on the right side of the carriage, on top of the elevating gear case. It is similar in construction to the azimuth indicator except that the unit of graduation of the dials is the mil instead of the degree. The coarse dial is graduated from 0 to 1,600 mils in 100-mil divisions and numbered every 100 mils. The fine dial is graduated from 0 to 100 mils in 1-mil divisions and numbered every 10 mils.

(5) A switch box near the elevation indicator contains a trouble lamp receptacle and a toggle switch. The switch operates the electric lamps in the indicators for illuminating the indicator dials.

(6) On-carriage wiring is carried in metal conduits to the gun terminal box, which is mounted in the lower rotating part of the gun carriage, on top of the center terminal. Cables lead from the terminal box to the collector rings and contact rings which are mounted in a stationary position in the center on the under side of the base ring. The center terminal assembly permits free traverse of the carriage throughout the 360 degrees field of fire.

b. Operation.

(1) If possible, verify the adjustments before commencing operations. These adjustments are described in subparagraph d, below.

(2) At the guns, the traversing and elevating handwheel operators first match the pointer indexes on the coarse indicator dials and then match the pointer indexes on the fine indicator dials. The operators keep the pointer indexes matched when the data received from the elevation and azimuth transmitters changes. The ready signal lamps show when correct data signals are being transmitted.

(3) Operation of the system with the gun data computer is the same as described above, except that the azimuth and elevation transmitters are not used, the gun data computer being connected instead.

c. Instructions for Reading Coarse and Fine Dials on Indicators.

The scale reading is the sum of the readings on the coarse and fine scales. When the coarse index indicates between two graduations on the coarse scale, the lower-numbered graduation is the one which is read. Thus, a coarse indication between 40 degrees and 50 degrees, together with a fine indication of 5.15 degrees is read as 45.15 degrees.

ON-CARRIAGE FIRE-CONTROL AND SIGHTING EQUIPMENT**d. Verification of Adjustments.**

The following adjustments should be checked when possible before commencing operation.

(1) ORIENTATION.

The outer dials on the azimuth and elevation indicators should indicate correctly the actual gun azimuth and elevation. Instructions for adjustment are in subparagraph e, below.

(2) SYNCHRONIZATION.

The inner dials on the azimuth and elevation indicators should read the same as the corresponding transmitter dials when the system is energized. They should also read the same as the corresponding dials on the gun data computer. Instructions for adjustment are in subparagraph f, below.

(3) READY SIGNAL LAMPS AND INDICATOR ILLUMINATING LAMPS.

Two lamps are connected in parallel at each lamp position, so that if one lamp burns out the other lamp will remain operative. If the lamps at any position show reduced illumination, indicating that one of the lamps is burned out, the defective lamp should be replaced. Instructions for lamp replacement are in subparagraph g, below.

e. Orientation.

(1) Orientation refers to the mechanical adjustment of the azimuth and elevation indicators so that when the gun is pointed in a given direction, the outer indexes for azimuth and elevation will indicate correctly the direction in which the gun is pointed.

(2) Each gun is oriented independently of the other. The instructions which follow are for one gun. Readjustment will seldom be required after the initial adjustment. Readjustment will, however, be required after any disassembly operations involving the indicator drives on the gun mount.

(3) ORIENTATION OF AZIMUTH INDICATOR M9.

(a) Using the bore sights, traverse the gun until it is accurately directed on a datum point of known azimuth.

(b) Note that the zero adjusting device is located on the split gear at the bottom of the azimuth indicator drive shaft tube. The zero adjusting device has an adjusting worm and a clamping screw. The head of the adjusting worm is slotted for screwdriver operation.

(c) Loosen the clamping screw and then turn the adjusting worm as required until the indicator scale reading (the combined reading of the coarse and fine scales) is the same as the known azimuth of the datum point. Tighten the clamping screw to retain the adjustment.

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(a) Using the clinometer or gunner's quadrant, set the gun to a convenient reference elevation. Any elevation can be chosen, but the gun must be set accurately to the chosen elevation.

(b) Note that the zero adjusting device is located on the shaft behind the elevation indicator. The zero adjusting device has an adjusting worm and a clamping screw. The adjusting worm and the clamping screw have knurled socket heads which can be operated either by hand or by use of a $\frac{7}{32}$ -inch socket head set screw wrench.

(c) Loosen the clamping screw and then turn the adjusting worm as required until the indicator scale reading (the combined reading of the coarse and fine scales) is the same as the gun elevation. Tighten the clamping screw to retain the adjustment.

f. Synchronization.

(1) Synchronization is the adjustment of the indicator inner indexes to the same reading as the corresponding transmitter dials.

(2) Synchronization is performed with the system energized. It will seldom be necessary to alter the synchronization adjustments, but the adjustments should be verified periodically.

(3) Slotted adjusting shafts for the coarse and fine indicator inner indexes are located under the indicator signal lamp cover (fig. 91). The motion of these shafts is limited to a few turns, sufficient to provide adjustment under all normal conditions. No attempt should be made to force a shaft if a stop is encountered.

(4) To synchronize the azimuth or elevation indicator, energize the system and note the readings of the coarse and fine transmitter output dials. By means of the slotted adjusting shafts, set the inner coarse and fine indexes to read the same as the corresponding transmitter output dials.

(5) Do not attempt to synchronize if the direction of rotation of any of the indicator inner indexes is reversed, or if there is a large departure from synchronism (often a multiple of 60 degrees). Such condition indicates a wiring fault which must first be determined and corrected.

(6) Synchronizing adjustments performed with the azimuth and elevation transmitters will normally hold also for the gun data computer. If the synchronizing adjustment changes when the gun data computer is connected in place of the azimuth and elevation transmitters, it will be necessary to adjust the transmitter elements in the transmitter to bring them into agreement with the corresponding transmitter elements in the gun data computer.

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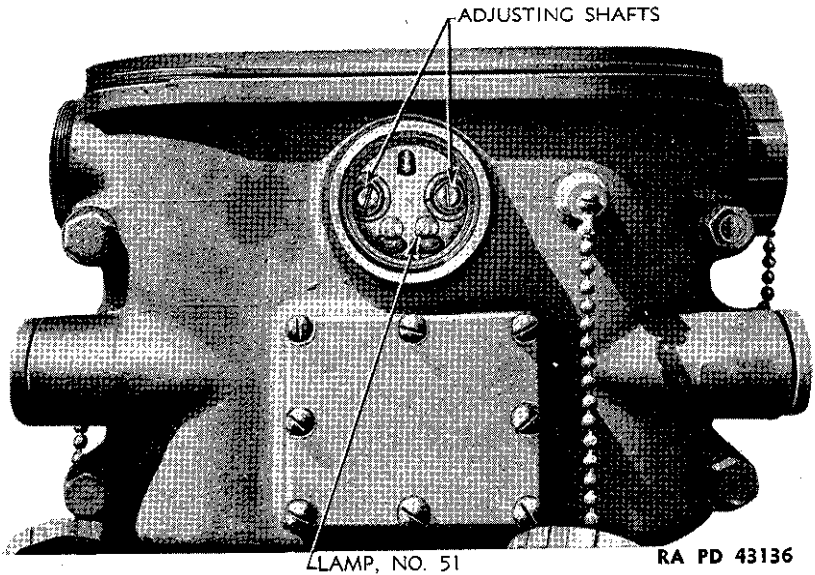


Figure 91—Elevation Indicator M8—Ready Signal Lamps and Synchronizing Adjusting Shafts

g. Lamp Replacement.

(1) Lamps used in the azimuth and elevation indicators are Mazda No. 51 type (1 cp, 6-8 volts, 0.2 ampere, G3- $\frac{1}{2}$ bulb). The lamps are accessible for lamp replacement after removal of the lamp well covers. See figures 91 and 92.

h. Care and Preservation.

(1) Power should be switched off before cables are connected or disconnected. See that cables are securely held in the receptacles before turning the power on.

(2) Do not kink or twist the cables. Avoid bending the cables on a short radius, or allowing them to chafe against moving parts. Keep the cables clean of oil or grease. To remove oil or grease, wipe the area as clean as possible and then wash with soapy water.

(3) When the cables are not connected, keep plugs and receptacles closed with the covers provided to exclude dirt and moisture.

(4) When the cables are connected, keep the plugs and receptacles tightened firmly together by means of the round nuts. Screw the plug and receptacle covers together to keep them from dangling and to protect the threads.

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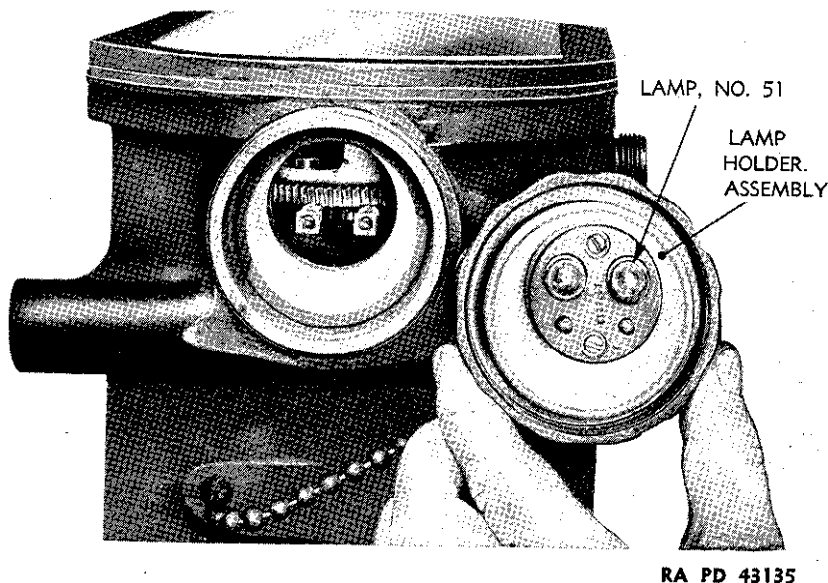


Figure 92—Elevation Indicator M8—Lamp Holder, Assembly

(5) When disconnecting a cable, pull on the body of the plug. Do not pull on the cable or spring.

(6) The indicators do not require lubrication when in service. Such lubrication as is required is performed in connection with major disassembly or overhaul.

(7) Should any repeater start to "run away" (run as a motor at a high rate of speed), cut off the power immediately and then reapply power after the repeater comes to rest. Repeaters are most likely to run away at the instant when power is applied.

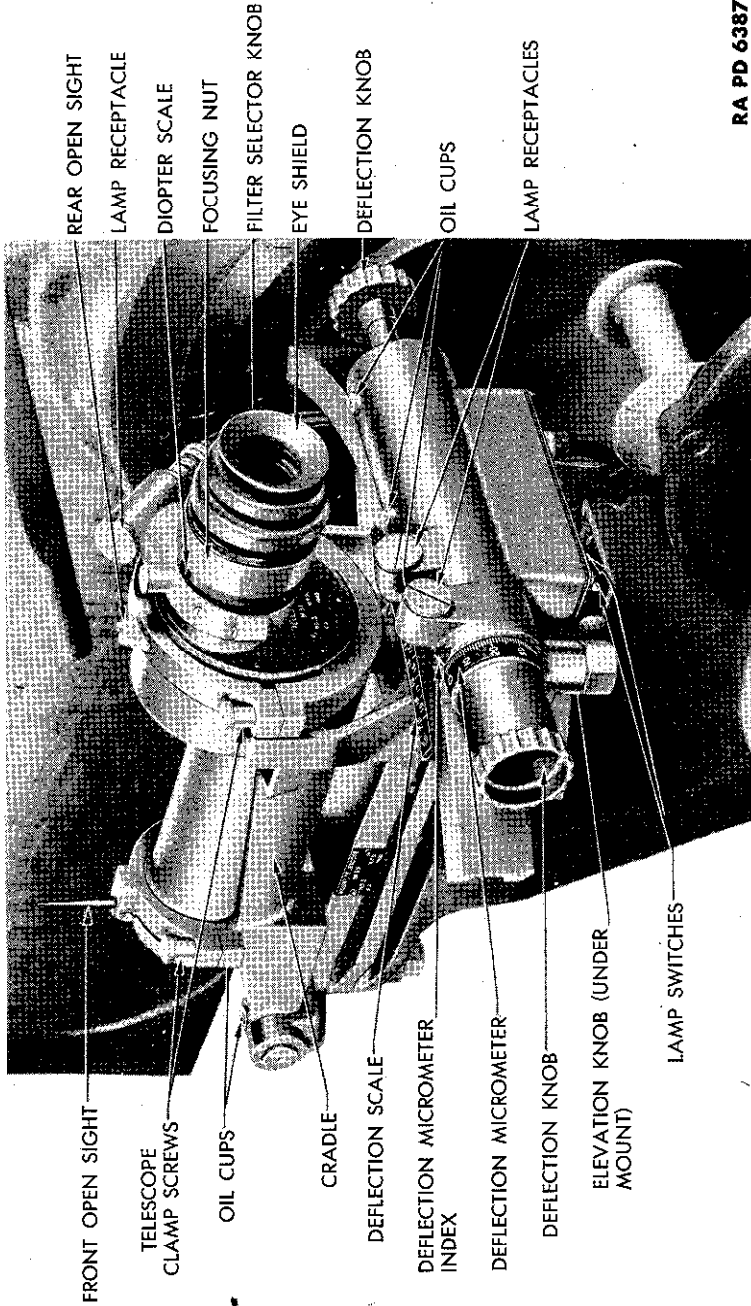
(8) Should a repeater on either gun bind or stick during operation, turn off the power to that gun by means of the switch in the main junction box. A binding or sticking repeater will cause inaccurate transmission of data to the corresponding repeater on the other gun, and will be subject to overheating and possible burn-out.

81. MOUNT, TELESCOPE, M35, WITH TELESCOPE, M31.

a. **General.** The Telescope Mount M35 is mounted on the left side of the carriage (fig. 93). The Telescope M31 fits into the telescope mount. The combination of telescope mount and telescope forms the sighting element for aiming the gun in azimuth (case II pointing).

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REAR OPEN SIGHT
LAMP RECEPTACLE

DIOPTR SCALE
FOCUSING NUT

FILTER SELECTOR KNOB
EYE SHIELD

DEFLECTION KNOB

OIL CUPS

LAMP RECEPTACLES

FRONT OPEN SIGHT
TELESCOPE
CLAMP SCREWS

OIL CUPS

CRADLE

DEFLECTION SCALE

DEFLECTION MICROMETER
INDEX

DEFLECTION MICROMETER

DEFLECTION KNOB

ELEVATION KNOB (UNDER
MOUNT)

LAMP SWITCHES

Figure 93—Telescope Mount M35, with Telescope M31

**6-INCH SEACOAST MATERIEL:
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b. Description of Telescope Mount M35.

(1) The cradle of the telescope mount has clamps and locating surfaces for securing the telescope. The open sights at the top of the cradle provide a line of sight parallel to the telescope line of sight, and are used for rapid approximate aiming. The front sight can be folded down when not in use.

(2) The elevating knob of the telescope mount elevates or depresses the cradle and telescope.

(3) The deflection knob deflects the cradle and telescope in azimuth. Deflection motion is read in degrees and hundredths of degrees on the scale and micrometer. The deflection scale is calibrated from 0 degrees to 20 degrees in 1-degree intervals. The deflection micrometer is calibrated directly in hundredths of degrees. "NORMAL" deflection setting (line of sight parallel to axis of gun bore) is 10.00 degrees.

(4) Built-in electric lamps illuminate the deflection scale and micrometer of the telescope mount, and the reticle cross wires of the telescope. The lamp circuits are controlled by switches on the rear face of the telescope mount. A short interconnecting cable, which is furnished as an accessory, ties the telescope to the telescope mount.

c. Description of Telescope M31.

(1) The telescope (fig. 93) has an 8-power magnification and a field of view of 8 degrees, 45 minutes.

(2) The eyepiece can be focused to meet eyesight variations of individual observers. The diopter scale on the eyepiece enables the observer to prefocus the telescope, if he knows his own eye correction.

(3) Amber, neutral or clear filters can be introduced by use of the filter selector knob.

(4) The objective cap covers and protects the objective when the telescope is not in use.

d. Preparing for Operation.

(1) Clamp the telescope in the cradle of the telescope mount. If illumination will be required, connect the cable between the telescope and telescope mount.

(2) Focus the telescope by turning the focusing nut until objects at target range appear sharp and clear. The observer should record the diopter scale setting for his future use. If the diopter scale setting is known, the telescope can be focused by simply bringing the scale to the known setting.

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(3) Select the proper telescope filter according to the light conditions. Use the clear filter for dim light or for normal light with no glare. Use the amber or neutral filter to reduce glare. The neutral filter is most useful when observing into the direction of the sun.

e. Operation, Gun Pointing.

(1) Set the deflection scale and micrometer to the announced deflection by turning the deflection knob. If no deflection is required, set to 10.00 degrees.

(2) Traverse the gun to bring the telescope to bear on the target. The open sights may be used initially to speed pointing. Use the elevating knob to bring the target onto the horizontal cross wire of the telescope reticle, then refine the gun traverse to place the target exactly at the intersection of the horizontal and vertical cross wires. This final operation points the gun in azimuth.

f. Test and Adjustment. At regular intervals depending on service conditions, the gun should be bore sighted to verify the alinement of the telescope and telescope mount. Procedure for bore sighting is as follows:

(1) Place the breech bore sight in the gun and stretch the black linen cord tightly across the muzzle, vertically and horizontally in the score marks on the muzzle.

(2) Use the bore sights to point the gun at a distant datum point, at or beyond midrange of the gun. Set the deflection scale and micrometer of the telescope mount to read 10.00 degrees and observe the datum point through the telescope. Use the elevating knob, if necessary, to bring the datum point onto the horizontal cross wire of the telescope. If the adjustment is correct, the datum point will appear exactly on the vertical cross wire.

(3) If the adjustment is not correct, turn the deflection knob to bring the datum point onto the vertical cross wire. Adjust the deflection scale and micrometer to read 10.00 degrees with the telescope in this position. To adjust the micrometer, loosen the three screws in the cupped end of the deflection knob to unclamp the micrometer, then turn the micrometer to zero reading and reclamp. To adjust the scale, loosen the screw at each end of the scale and shift the scale to bring the "10" graduation in register with the index, then reclamp.

g. Lamp Replacement. The electric lamps are mounted in individual lamp receptacles which are removable to permit lamp replacement. To remove the lamp receptacle, loosen the small headless

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clamping screw (using the jeweler's screwdriver provided) in the edge of the receptacle and then unscrew the receptacle.

h. Care and Preservation.

(1) Refer to paragraphs 76-79 for general care and preservation instructions.

(2) Keep the objective cap in place whenever the telescope is not in use. During idle periods, store the telescope in the carrying case provided.

(3) Lubricate the telescope mount occasionally by applying a drop of OIL, lubricating, for aircraft instruments and machine guns, in each of the six oil cups. Lubricate sparingly. Wipe off any excess lubricant to prevent accumulation of dust and grit.

Section XI

ORGANIZATIONAL SPARE PARTS AND ACCESSORIES

	Paragraph
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Accessories	83

82. SPARE PARTS.

a. Organizational spare parts are not provided for fixed coast artillery.

83. ACCESSORIES.

a. A complete list of accessories for the gun and gun carriage is contained in the Standard Nomenclature List, E-54.

b. Accessories include tools and equipment required for such disassembling and assembling as the using arm is authorized to perform, and for the cleaning and preserving of the gun, carriage, ammunition, etc. They also include chests, covers, tool rolls, and other items necessary to protect the materiel when it is not in use. Additional accessories and supplies of a general nature are provided for battery use. Accessories should not be used for purposes other than as prescribed, and when not in use should be properly stored.

c. There are a number of accessories whose names or general characteristics indicate their use. Others, embodying special features or having special uses, are described below.

d. **BAFFLE**, primer flame, is a small plate which fits over the venthole in back of the mushroom head of the obturator spindle. It is used when firing primers for test purposes to avoid fouling the bore of the gun. It is stored in the same chest with the subcaliber equipment. To install the baffle, proceed as follows: Remove dummy pressure plugs, attach baffle, and replace plugs to retain the baffle on the obturator head. Fire the primers. Remove baffle plate and replace plugs. Clean the ventholes and primer seat.

e. **BOOK**, artillery gun (O.O. Form 5825), is used to keep an accurate record of the materiel. It includes records of assignments, the battery commander's daily record, and the inspector's record of ammunition, as well as forms to be filled out in case of premature explosions. This book should be in the possession of the organization at all times. The completeness of the records and the whereabouts of the book are responsibilities of the battery commander. It must

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also contain the date of issuance of the materiel, to and by whom issued, and the place where issued. If a new cannon is installed on the carriage, all data in the old book with reference to sights, carriage, etc., must be copied into the new gun book before the old gun book is relinquished.

f. **BRUSH**, slush, 6-inch, is a cylindrical, short bristled brush used to coat the bore of the gun with oil to prevent rust.

g. **BRUSH**, wire cleaning, 6-inch, is a cylindrical brush with long wire bristles, for cleaning the gun bore of powder fouling, carbon deposits, and corrosion.

h. Covers.

(1) The muzzle cover is made of a wooden and spring steel frame covered with olive-drab cotton duck designed to fit over the muzzle of the gun. Straps retain it in position.

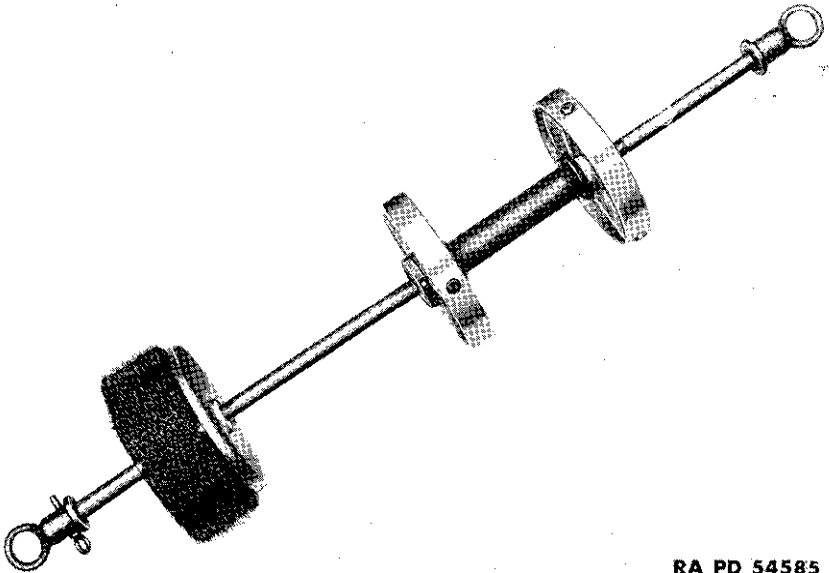
(2) The breech cover is made of olive-drab cotton duck and straps around the breech to protect it when not in use.

i. **DEVICE**, bore greasing, 6-inch, M1 (fig. 94), consists of three parts: two friction disks assembled to a spacer, a smoothing brush and spreading disk assembly, and a shaft fitted with an eye on each end. The friction disks serve as guides. They keep the shaft centered and parallel to the bore of the gun. This, in turn, centers the slushing compound spreading disk, which is assembled to the brush assembly, and insures an even pressure of brush bristles against the bore of the gun. The friction device and brush assembly are free to slide on the shaft.

j. **EXTRACTOR**, hand (for dummy projectile), is a long wooden pole with a hook on one end and a handle near the other end. To remove the drill projectile, the hook end is inserted in a cavity in the base of the projectile. The pole is then pulled smartly rearward, causing the mass of the drill projectile to strike the rear ring and band. This momentum usually is sufficient to loosen the rear band and the projectile may be drawn from the gun.

k. **EXTRACTOR**, power (for dummy projectile), is used to dislodge dummy projectiles which cannot be removed with the hand extractor. One of its parts consists of a steel bar, threaded at one end and formed into a hook at the other. Immediately in front of the threaded end of this bar is a squared section which fits into a square hole in a cast steel yoke. The bar can slide in the yoke but it cannot

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RA PD 54585

Figure 94—Bore Greasing Device, 6-inch, M1

turn. The yoke fits on the breech face of the gun with the hooked end of the bar inserted in the base of the dummy projectile. A washer and nut are placed on the threaded end of the bar. The projectile is pulled from the gun by turning the nut clockwise.

l. FUNNEL, filling, is a funnel with a flexible spout used when pouring oil into recoil cylinders and gear cases.

m. HEAD, rammer, is aluminum, cone-shaped and constructed to be assembled on the rammer staff. When so assembled it is used to ram the projectile firmly into its seat in the bore of the gun. A hole in the front end of the head permits a projectile to be removed, if jammed, from the gun without touching the nose of the projectile. The rammer in this case is inserted from the nozzle.

n. POUCH, gunner's, is a leather pouch with a shoulder strap used to carry primers and primer seat cleaning brush.

o. PROP, sponge, is used as a stand for the sponge and staff. The head end of the sponge and staff rests upon the support to facilitate the changing of head parts, and to insure that head parts are kept clean by being kept off the ground.

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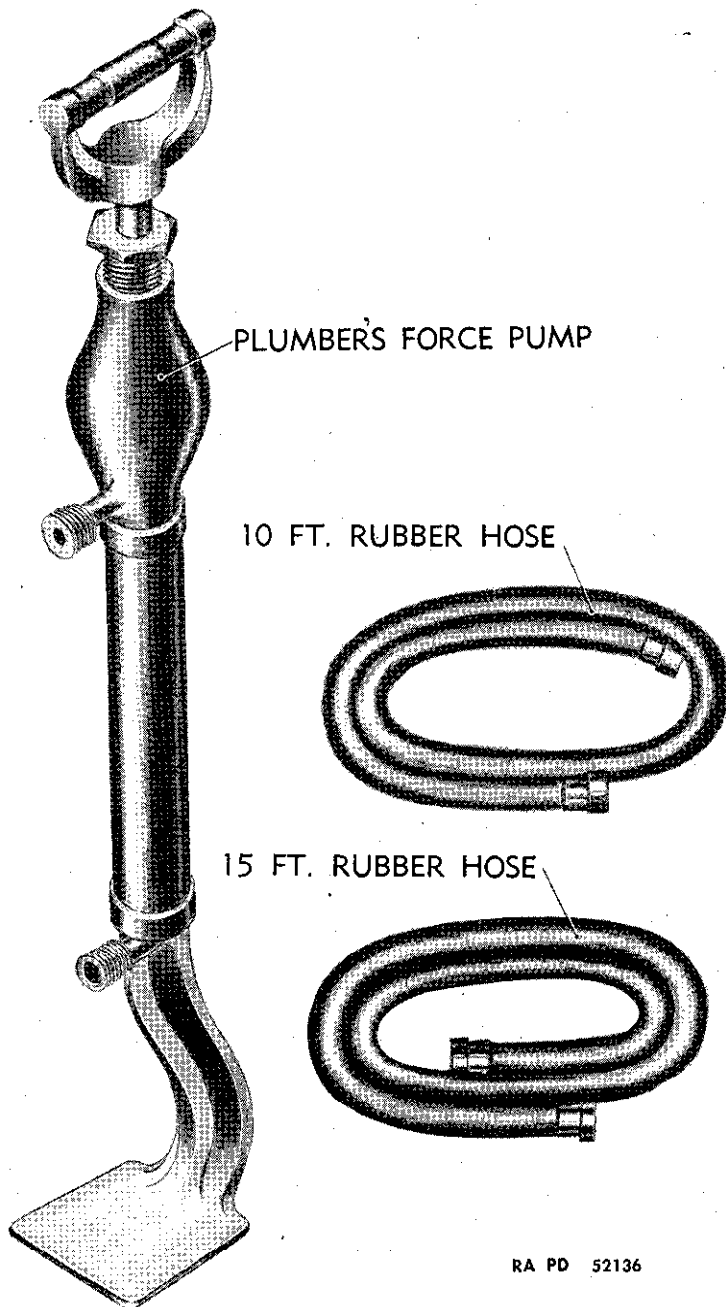


Figure 95—Pump, Force (Plumber's)

ORGANIZATIONAL SPARE PARTS AND ACCESSORIES

p. **PUMP**, force (plumber's) (fig. 95), connected with the hose provided, is used to clean recoil cylinders and gear cases by flushing them with light oil or **SOLVENT**, dry-cleaning, under pressure.

q. **REAMER**, primer seat cleaning, is used to ream out the primer seat and to keep it free of powder residue. Care must be exercised not to exert pressure enough to damage either the reamer or obturator spindle.

r. **SCRAPER**, bore, steel, 6-inch, is a steel disk with a portion of its circumference cut away and with a threaded bushing in its center. It may be attached to the brush staff and used to scrape loose the rust-preventive compound and other substances which have hardened to the surfaces of the bore and require more than a brush to dislodge.

s. **SPONGE**, bore, is a cylindrical, padded form which, when wrapped with burlap and screwed to the end of the staff, is used to clean and dry the bore of the gun.

t. Staffs.

(1) **STAFF**, sponge, is composed of one section "B" (76 in. long) and two sections "E" (each 125 in. long). The sections "E" are fitted with male and female couplings at each end to permit connection with other sections or with the sponge. The section "B" is plain on one end and has a male coupling on the other to connect the sections "E" forming the end of the assembled staff. These three sections together form a handle for use with the bore scraper, bore sponge or brushes.

(2) **STAFF**, rammer, is composed of one section. One end of the staff is plain, and the other is fitted with a male coupling so that it may be assembled with the rammer head. On the staff is fitted a graduated scale for gaging the proper distance a projectile must be rammed into the gun.

u. **WRENCH**, spanner, face, 1.6 inch, is for removal of the loading tray latch bolt nut on the M1903A2 Gun.

v. **WRENCH**, tit, obturator, is a spanner wrench which fits in the two bored holes in the mushroom head of the obturator spindle, for removal of the obturator.

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Section XII

SUBCALIBER EQUIPMENT

	Paragraph
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Subcaliber tube removal	88
Care and maintenance	89

84. PURPOSE.

a. Subcaliber equipment is used for training purposes only, to provide practice in laying and firing the 6-inch gun. The use of smaller bore ammunition prevents wear on the regular piece during practice and is less costly. Although the handling and loading, as well as the range obtained, differ from those of the regular piece, the elevating, traversing, sighting, etc., are adequate for instructional purposes.

85. DESCRIPTION OF SUBCALIBER EQUIPMENT.

a. All operations for the use and care of subcaliber equipment for use in M1903A2 and M1905A2, 6-inch Guns are the same for each gun. The subcaliber tube adapters, however, are slightly different as the powder chambers are different in size and shape.

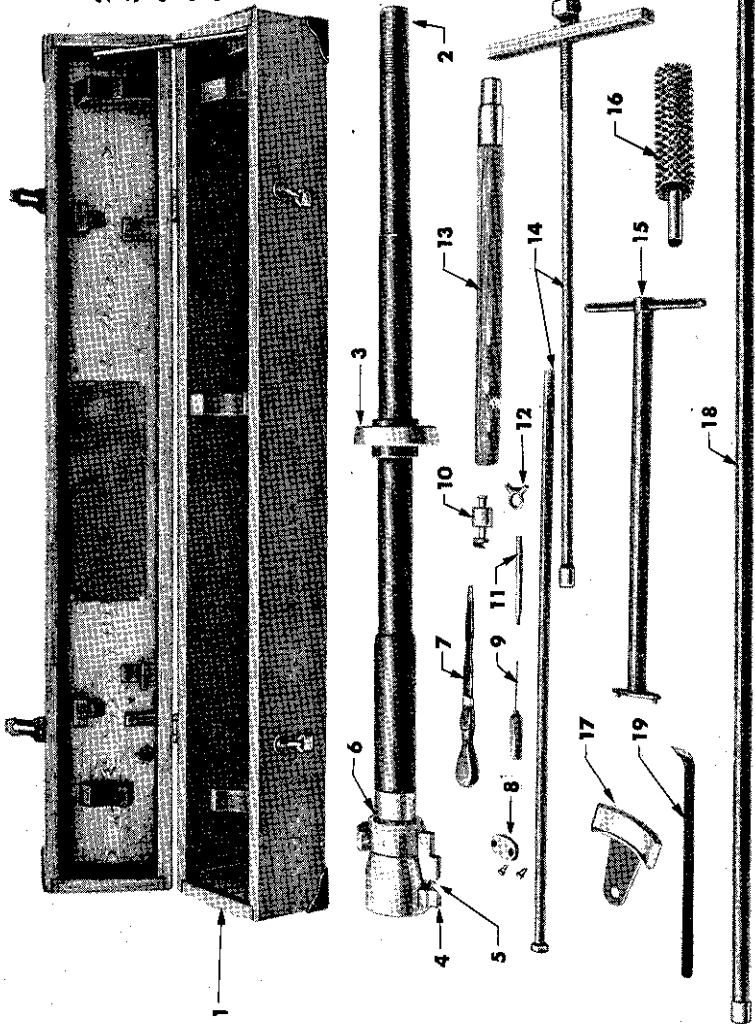
b. Description of Subcaliber Equipment.

(1) The subcaliber tube (fig. 96) is inserted in the bore of the 6-inch gun. It is centrally supported at the front by a tapered adapter which seats in the powder chamber just to the rear of the forcing cone. The tube is supported at rear by the rear adapter, adapter shoe, and adapter wedge (fig. 96). Tightening the wedge screw forces the tube forward and retains it in this position so that the subcaliber gun recoil is absorbed by the larger gun barrel and not the breechblock.

(2) The fixed ammunition used contains an igniting primer which is set off by the flame of the normal primer. After installing the subcaliber tube, as described in paragraph 86, a round is loaded, the breech of the gun is closed, and the round fired in the same manner as the 6-inch gun is fired with regular ammunition.

SUBCALIBER EQUIPMENT

- 1—STORAGE CHEST
- 2—TUBE
- 3—FRONT ADAPTER
- 4—REAR ADAPTER WEDGE
- 5—WEDGE SCREW
- 6—REAR ADAPTER
- 7—CLAMPING SCREWDRIVER
- 8—OBTURATOR SPINDLE PLATE
- 9—VENT CLEANER
- 10—LOCATING GAGE
- 11—DISMOUNTING PIN
- 12—CLIP EXTRACTOR
- 13—HANDSPIKE
- 14—GUN EXTRACTOR
- 15—ADJUSTING WRENCH
- 16—BRISTLE SPONGE
- 17—REAR ADAPTER SHOE
- 18—BRISTLE SPONGE STAFF
- 19—HAND EXTRACTOR



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Figure 96—Subcaliber Equipment for 6-inch Guns

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

c. Description of Materiel, Accessories, and Tools.

(1) The subcaliber equipment is stored in a chest which contains the following:

ADAPTER, front	HANDSPIKE
ADAPTER, rear	PIN, dismounting
CHEST, storage	PLATE, obturator spindle
CLEANER, vent	SCREW, wedge (one spare)
EXTRACTOR, clip	SCREWDRIVER, clamping
EXTRACTOR, gun	SHOE, rear adapter
EXTRACTOR, hand	SPONGE, bristle
GAGE, locating	STAFF, bristle sponge
GUN, subcaliber, 1.457 in.	WEDGE, rear adapter
(37-mm, 1 pounder)	WRENCH, adjusting

(2) **FRONT ADAPTER.** The front adapter (fig. 96) is the front support of the subcaliber gun in the bore of the 6-inch gun. It is tapered to match the taper of the 6-inch gun chamber and threaded for adjusting the subcaliber gun, forward or to the rear of the breechblock.

(3) **REAR ADAPTER.** The rear adapter (fig. 96) with the rear adapter shoe provides support at the rear of the subcaliber gun. A wedge and wedge screw attach to the adapter for tightening the subcaliber gun in the chamber of the 6-inch gun.

(4) **STORAGE CHEST.** The storage chest (fig. 96) is used for storing and carrying the subcaliber equipment. A list of parts, accessories, and part numbers are fixed in the cover of the chest. Clips and blocks hold the gun, parts and accessories in position.

(5) **VENT CLEANER.** The vent cleaner (fig. 96) is used to clean the vent in the obturator spindle plate after firing.

(6) **CLIP EXTRACTOR.** The clip extractor (fig. 96) is used to remove sticking cartridge cases after starting the case with the hand extractor. It may also be used when cartridge cases are too hot to handle by hand. The extractor has three claws which fit over the rim of the cartridge case. A rope may be passed through the extractor eye and wrapped around a lever placed against the face of the breech if necessary.

(7) **GUN EXTRACTOR.** The gun extractor (fig. 96) is used as a puller for removal of the subcaliber gun. Its use is necessary only when the front adapter sticks in the chamber of the 6-inch gun to the extent that it cannot be removed with handspike (fig. 96).

(8) **HAND EXTRACTOR.** The hand extractor (fig. 96) is for removal of the spent cartridge case. It is used as a pry to pull out the case far enough to use the clip extractor.

SUBCALIBER EQUIPMENT

(9) **LOCATING GAGE.** The locating gage (fig. 96) is used in adjusting the subcaliber gun in the bore of the 6-inch gun. The locating gage is inserted in the chamber of the subcaliber gun with its flange "A" pulled to the rear. The breech is closed, then opened. The flange of the locating gage is to be flush with the face of the subcaliber gun. The gun is rotated in the threaded front adapter to move it forward or to the rear to acquire the correct clearance for the cartridge case between the subcaliber gun and the obturator spindle of 6-inch gun.

(10) **SUBCALIBER 1.457-INCH GUN.** The gun (fig. 96) has a bore of 1.457 inches (37-mm). It is centrally supported in the bore of the 6-inch gun. The breechblock obturator spindle of the 6-inch gun backs up the cartridge and subcaliber gun.

(11) **HANDSPIKE.** The handspike (fig. 96) is inserted in the chamber of the subcaliber gun for installing and removing it from the bore of 6-inch gun.

(12) **DISMOUNTING PIN.** The dismounting pin (fig. 96) fits into a drilled hole in the front adapter to provide leverage for turning it in assembly and disassembly.

(13) **OBTURATOR SPINDLE PLATE.** The plate (fig. 96) is screwed to the mushroom head of the obturator spindle of the 6-inch gun. A vent through the plate for the primer flame to reach the igniter primer in the base of the subcaliber cartridge case (fig. 97) is provided. This vent is cleaned after firing with the wire vent cleaner.

(14) **WEDGE SCREW.** The wedge screw (fig. 96) is screwed into the rear adapter and the rear adapter wedge and is used to clamp the subcaliber gun in the chamber of the 6-inch gun. A spare screw is carried in the storage chest.

(15) **CLAMPING SCREWDRIVER.** The screwdriver (fig. 96) is used for the rear adapter wedge screw and for installing the obturator spindle plate.

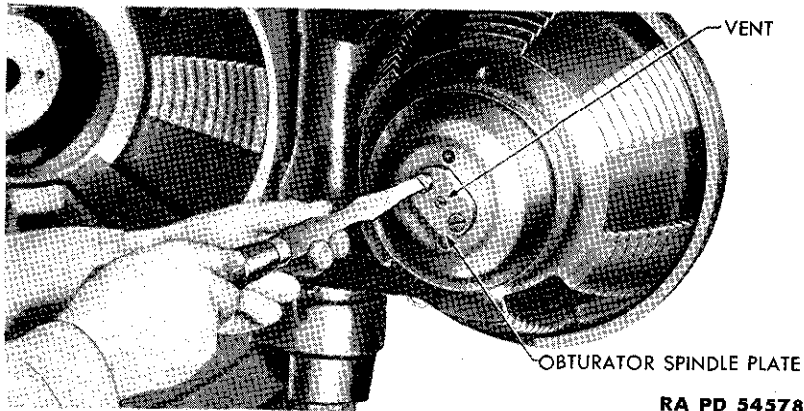
(16) **REAR ADAPTER SHOE.** The shoe (fig. 96) is inserted after installing the subcaliber gun to support the gun. It is positioned under the rear adapter.

(17) **BRISTLE SPONGE.** The bristle sponge is used for cleaning the subcaliber gun after firing.

(18) **BRISTLE SPONGE STAFF.** The staff (fig. 96) is screwed to the bristle sponge for cleaning the subcaliber gun.

(19) **REAR ADAPTER WEDGE.** The wedge (fig. 96) is moved rearward, by turning the wedge screw, to clamp the subcaliber gun in the chamber of the 6-inch gun.

6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1



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Figure 97—Obturator Spindle Plate Installation

(20) **ADJUSTING WRENCH.** The adjusting wrench (fig. 96) is used to turn the subcaliber gun in the front adapter to adjust the gun to the breech of the 6-inch gun. The wrench has two pins which engage with holes provided in the subcaliber gun.

86. SUBCALIBER TUBE INSTALLATION.

a. Assemble Gun and Adapters.

(1) The front and rear adapters will not be removed except for painting, thorough cleaning, etc.

(2) Screw on the rear adapter (fig. 96) with the projecting lug to the rear.

(3) Assemble the wedge screw and rear adapter wedge.

(4) Screw on the front adapter, with smaller diameter of adapter towards the muzzle end of subcaliber gun. Use the dismantling pin to turn the adapter if necessary.

b. Obturator Spindle Plate Installation.

(1) Remove the dummy pressure plugs.

(2) Install the plate and retaining screws (fig. 97) to the mushroom head of the obturator spindle, using the clamping screwdriver.

c. Gun Installation.

(1) Be sure that the chamber of the 6-inch gun and all parts of the subcaliber gun are perfectly clean. Inspect the front and rear adapters for burrs which might prevent the gun seating properly in the chamber.

SUBCALIBER EQUIPMENT

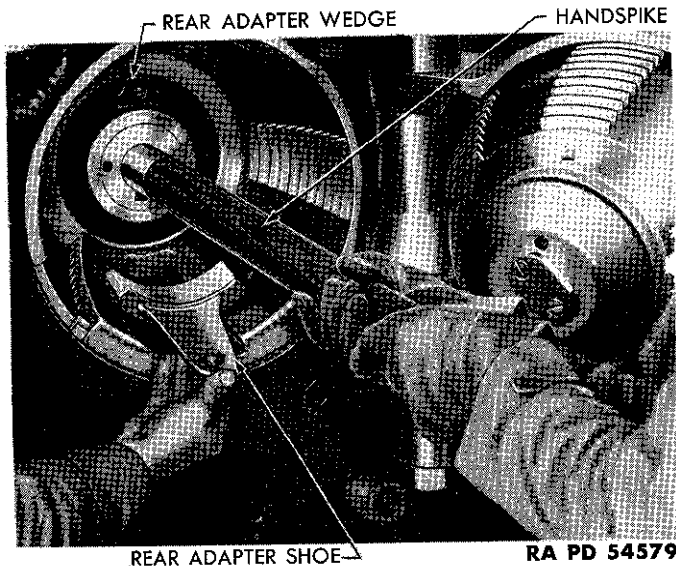


Figure 98—Gun and Rear Adapter Shoe Installation

(2) Turn the rear adapter wedge screw counterclockwise to move the wedge all the way forward.

(3) Place the handspike (fig. 98) in the chamber of the subcaliber gun. Insert the gun into the chamber of the 6-inch gun with the rear adapter wedge uppermost.

(4) Push the gun forward with the handspike to cause the front adapter to seat firmly in the chamber of 6-inch gun.

(5) Raise the gun with handspike (fig. 98) and install rear adapter shoe under rear adapter. Remove the handspike.

(6) Using the clamping screwdriver, turn the wedge screw clockwise to move the rear adapter wedge rearward (fig. 99). The wedge moving back against the taper of the powder chamber will hold the subcaliber gun in position and prevent its turning.

d. Subcaliber Gun Adjustment.

(1) Insert the locating gage (fig. 100) in the chamber of subcaliber gun with its flange "A" pulled to the rear.

(2) Completely close breech of large gun, then open it and note whether flange of locating gage is flush with rear face of subcaliber gun.

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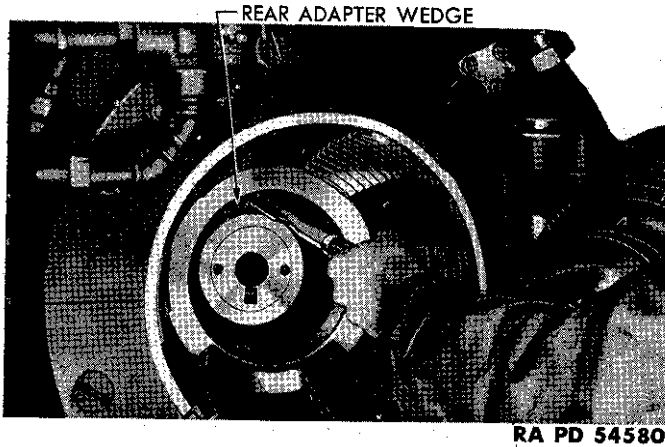


Figure 99—Subcaliber Gun Clamping

(3) If it protrudes, turn the wedge screw counterclockwise to loosen gun, and screw the gun counterclockwise (to the left) with adjusting wrench to move the gun to the rear. If the flange is below the face of gun, turn the gun clockwise (to the right) to move the gun forward. One full turn of the gun is equal to one-tenth of an inch.

(4) After rechecking adjustment with locating gage and having made sure that gage is exactly flush with subcaliber gun, tighten the

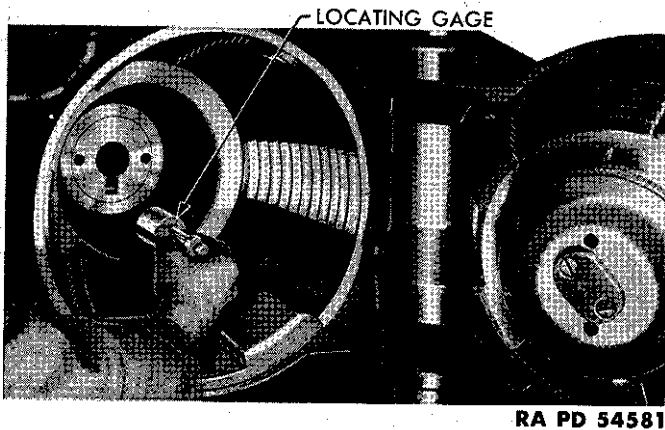


Figure 100—Locating Gage Insertion, Subcaliber

SUBCALIBER EQUIPMENT

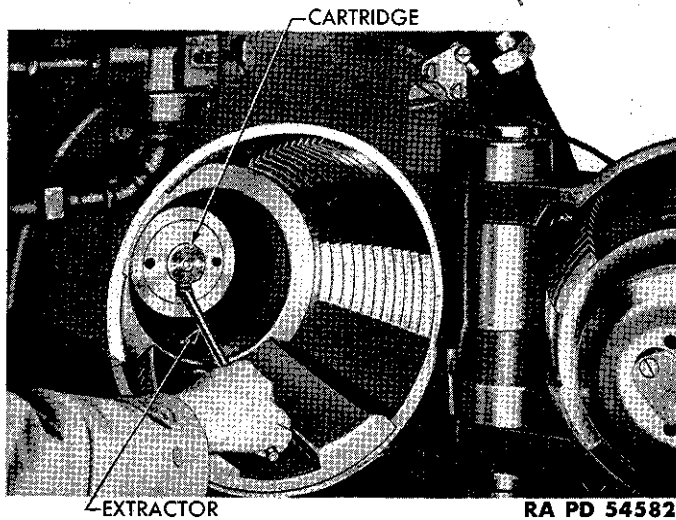


Figure 101—Cartridge Case Removal, Using Hand Extractor

rear adapter wedge screw with clamping screwdriver. The gun is then ready for firing.

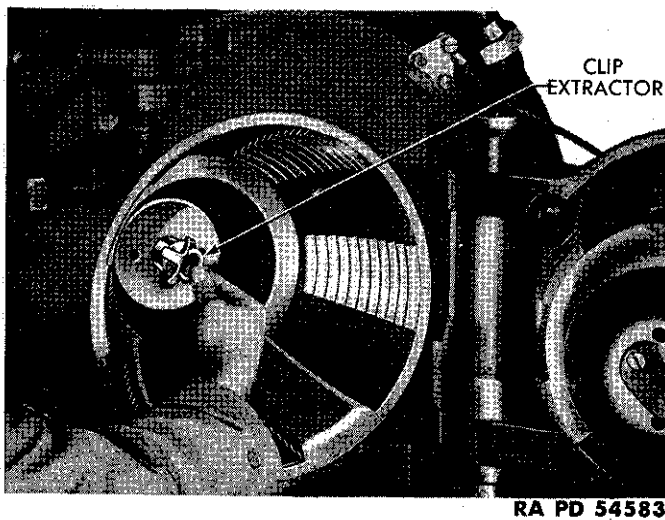


Figure 102—Cartridge Case Removal, Using Clip Extractor

**6-INCH SEACOAST MATERIEL:
GUNS M1903A2 AND M1905A2; BARBETTE CARRIAGE M1**

87. OPERATION.

a. Insert cartridge, being careful in loading to prevent driving the point of projectile against the edge of chamber of the subcaliber gun. Close the breech and fire as with regular ammunition (par. 25).

b. After firing round, open the breech and extract cartridge case with hand extractor (fig. 101). If case sticks or is too hot to handle, remove cartridge case with clip extractor (fig. 102). If case cannot be removed by hand, pass a light rope through the eye of extractor, tie it to a lever, place the lever against breech ring, and pull out case.

c. Remove powder fouling from rear face of subcaliber gun and from obturator spindle with oiled waste or cloth. Clean powder fouling from obturator spindle plate with vent cleaner.

d. Recheck the location of subcaliber gun with locating gage after firing one or two rounds, to be sure that gun has not moved forward.

88. SUBCALIBER TUBE REMOVAL.

a. Screw the rear adapter wedge screw counterclockwise to move the wedge all the way forward.

b. Insert the handspike in chamber of subcaliber gun, raise gun, and remove rear adapter shoe.

c. Lift out the tube and place it in the storage chest. Do not lay the gun on hard surface as the front and rear adapters may be burred or damaged.

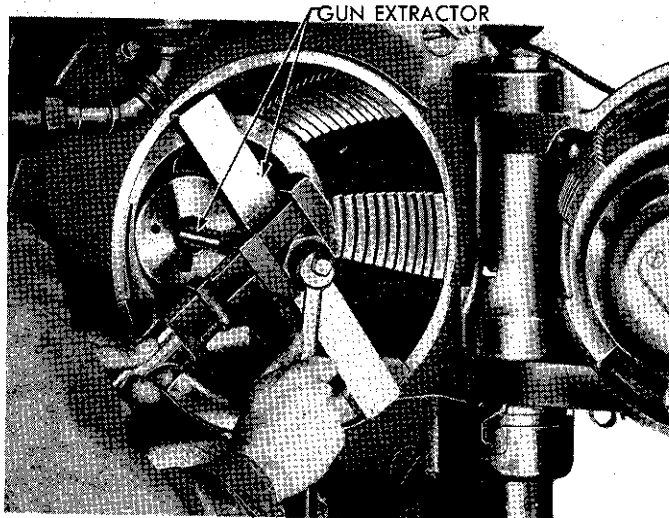
d. If subcaliber tube sticks in 6-inch gun, it may be removed with the gun extractor (fig. 103). Screw the two extractor rods together. Install the cross bar, washer, and nut to rod. Insert the extractor into gun, hold the extractor rod with $\frac{5}{8}$ -inch wrench, and tighten the large nut (fig. 103) until gun is loosened.

89. CARE AND MAINTENANCE.

a. **Subcaliber Gun Cleaning After Firing.** Before removing the subcaliber gun after firing, clean the bore, using the bristle sponge, with a solution of $\frac{1}{2}$ to 1 pound of SODA ASH, or 1 to $1\frac{1}{2}$ pounds of sal soda in each gallon of water, or with warm soapsuds. Dry the bore thoroughly with waste or cloths pushed through the bore with the sponge staff, then coat the bore with OIL, engine (seasonal grade).

b. **6-inch Gun Cleaning After Firing.** Remove the subcaliber gun after cleaning, and clean and oil the 6-inch gun, using the same pro-

SUBCALIBER EQUIPMENT



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Figure 103—Subcaliber Gun Removal, Using Gun Extractor

cedure (par. 36) as used for cleaning and oiling the gun after firing regular ammunition.

c. Subcaliber Equipment Care.

- (1) Clean all parts and accessories after using and coat screw threads and steel finished parts with OIL, engine (seasonal grade).
- (2) The bristle sponge should be cleaned and dried before placing in storage chest.
- (3) When the equipment is to be stored for long periods, wash with SOLVENT, dry-cleaning, and coat all parts and bore of gun with COMPOUND, rust-preventive, heavy.

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Section XIII

OPERATION UNDER UNUSUAL CONDITIONS

	Paragraph
General	90
Tropical climates	91
Arctic climates	92
Excessively moist or salty atmosphere	93
Excessively sandy or dusty conditions	94

90. GENERAL.

a. Because of the different climates in which this materiel may be expected to operate, special instructions are given in this section for three regions, namely: Arctic, temperate and tropical.

b. By "arctic" is meant a climate usually experienced in Alaska, Newfoundland, Labrador, or Iceland. By "temperate" is meant a climate usually experienced in continental United States or Hawaii. By "tropical" is meant a climate usually experienced in Panama, the Philippines, or Cuba.

c. In certain cases, the prescribed instructions may not apply; for example, a tropical climate may be experienced in a temperate region. In cases of this nature, the instructions as to the classification of climate in which the materiel is operating are left to the judgment of the ordnance officer. He is cautioned, however, that only extended, and not temporary, periods of climatic conditions govern the classification.

d. Manufacturing arsenals and plants should lubricate the materiel on assembly as prescribed in the lubrication guides (figs. 44 and 45). If the materiel is to be used in a climate other than temperate, the precautions in paragraphs 91 or 92 should be taken.

e. Materiel, previously lubricated for a colder climate than the one in which the materiel is to be used, should be relubricated with lubricants prescribed for use in that climate.

f. Materiel, previously lubricated for a warmer climate than the one in which the materiel is to be used, should be completely cleaned of all lubricants and relubricated with the lubricants prescribed for use in that climate.

91. TROPICAL CLIMATES.

a. The usual precautions will be taken to see that in temperatures above 90 F, summer grade grease (Grease, O.D., No. 0), and OIL,

OPERATION UNDER UNUSUAL CONDITIONS

engine, SAE 30, are used as lubricants where specified. The oil levels in the gear cases, elevation hydraulic system, and recoil cylinder should be checked.

92. ARCTIC CLIMATES.

a. **General.** Preparing a weapon for arctic climates consists of inspecting and placing the weapon in good mechanical condition, cleaning and lubricating with cold weather lubricants, and frequent exercising. The recoil oil should be modified by ordnance maintenance personnel.

b. **Inspection.** The materiel should be inspected to see that all moving parts operate freely and without binding. The elevating and traversing handwheels should be operated throughout their ranges. The oil levels in the gear cases, recoil cylinder, and elevation hydraulic units should be checked.

c. **Lubrication of the Materiel.** The materiel should be properly lubricated in accordance with instructions in paragraph 35. Before applying the cold weather lubricants, the materiel should be thoroughly cleaned and all old lubricants removed.

d. **Sighting and Fire-control Instruments.** Sighting and fire-control instruments are normally lubricated for operation over a wide range of temperatures (including arctic). They should be exercised frequently during periods of low temperature, to insure their proper functioning. If the instruments do not function properly, the ordnance maintenance personnel should be notified.

93. EXCESSIVELY MOIST OR SALTY ATMOSPHERE.

a. When the materiel is not in active use, the unpainted parts should be covered with a film of oil or rust-preventive compound. The bore of the tube and the breech mechanism should be kept heavily oiled, and should be inspected daily for traces of the formation of rust. The materiel should be lubricated more frequently than is prescribed for normal service. The breech and muzzle covers must be kept on the gun when firing conditions permit.

b. Special attention should be given to the lubrication of the traversing roller system and the roller paths. The gun must be traversed throughout its range at least once daily, and the gun pointed at a different azimuth each day. The trunnion caps must be kept fully packed with grease to exclude moisture from the bearings.

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c. In excessively salty atmosphere, the oil or rust-preventive compound used to protect the materiel should be replaced often as the salt has a tendency to emulsify the oil and destroy its rust-preventive qualities.

94. EXCESSIVELY SANDY OR DUSTY CONDITIONS.

a. If considerable dust is present when the gun is operated, the lubricant should be removed from the elevating and traversing racks and pinions, and the teeth of these parts should remain dry until the action is over. If the surfaces are dry, there is less wear than when they are coated with lubricant contaminated with grit.

b. The breech and muzzle covers must be kept on the gun when firing conditions permit.

Section XIV

SEACOAST ARTILLERY: PRESSURE TESTING

	Paragraph
Definitions	95
Use of pressure gages for seacoast artillery	96
Excessive pressures	97
Limitations on use of propelling charges	98
Maximum permissible pressures	99

95. DEFINITIONS.

a. *The elastic strength pressure* is the computed internal gas pressure in a gun which, at the section under consideration, will stress the metal in some layer of the wall tangentially up to the minimum elastic limit which is prescribed for the metal from which the member is made.

b. *The maximum pressure* is the maximum value of the pressure exerted by the powder gases on the walls of a gun during the firing of a round.

c. *The rated maximum pressure* for any type of gun is that value of the maximum pressure which is specified in the powder specifications as the upper limit of average pressure which may be developed by an acceptable powder in the form of propelling charges which will impart the specified muzzle velocity to the specified projectile.

d. *The permissible mean maximum pressure* for any type of gun is that value which should not be exceeded by the average of the maximum pressure developed in a series of rounds fired under any service conditions.

e. *The permissible individual maximum pressure* for any type of gun is that value which should not be exceeded by the maximum pressure developed by an individual round under any service condition.

96. USE OF PRESSURE GAGES FOR SEACOAST ARTILLERY.

a. **Major Caliber Pressure Gages.** For seacoast cannon equipped for major caliber pressure gages, pressure measurements will be made in all practices with service or target practice ammunition. Copper cylinders should be changed after each shot of trial fire and must be changed after completion of trial fire. Copper cylinders need not be changed between shots of record fire.

**6-INCH SEACOAST MATERIEL:
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b. **Medium or Minor Caliber Gages.** For seacoast cannon using medium or minor caliber gages, pressure measurements will be limited to shots of trial fire. Extreme care will be taken after each round to insure that no gage remains in the bore.

NOTE: Should there be evidence that excessive pressures are being developed, the firing will be stopped and an investigation made to determine the cause.

97. EXCESSIVE PRESSURES.

a. Excessive pressures are considered as follows:

(1) When the average of the maximum pressures developed in the individual rounds exceeds the *permissible mean maximum pressure*, or:

(2) When the maximum pressure developed in any individual round exceeds the *permissible individual maximum pressure*.

98. LIMITATIONS ON USE OF PROPELLING CHARGES.

a. The propelling charges should not be used in a practice if in the trial shots the mean of the maximum pressure readings exceeds the permissible mean for the particular gun, or the recorded pressure on any round exceeds the permissible individual maximum pressure, or if the difference between the maximum pressures obtained on any two rounds exceeds a value equal to 15 percent of the mean of the group. In the latter case, the powder is liable to develop dangerous pressures if firing is continued, or if not actually unsafe, may give excessive velocity variation which will be reflected into the range dispersion.

b. The propelling charges will not be used in subsequent practices if in the record shots the recorded pressure exceeds by more than 5 percent the *permissible individual maximum pressure*. The 5 percent increase is based upon the assumption that the coppers in the gages have not been changed between individual rounds. Under such conditions gage readings are usually somewhat higher than the pressure on any individual round.

99. MAXIMUM PERMISSIBLE PRESSURES.

a. Maximum permissible pressures for the M1903A2 and M1905A2 Guns are listed in columns 4, 5, and 6 of the table below. Column 3 lists the rated maximum pressure for each gun. This pressure is listed in firing tables under the captions "Maximum pressure for which the gun is designed" or "Maximum pressure."

SEACOAST ARTILLERY: PRESSURE TESTING

TABLE OF PRESSURES

	1	2	3	4	5	6
GUNS	Computed Elastic Strength-Pressure (lb per sq in.)	Rated Maximum Pressure (lb per sq in.)	Permissible Mean Maximum Pressure (lb per sq in.)	Permissible Individual Maximum Pressure (lb per sq in.)	Permissible * Maximum Pressure Record Shots (lb per sq in.)	
6-in. Gun						
M1903A2 . . .	58,462	38,000	41,000	43,700	45,600	
6-in. Gun						
M1905A2 . . .	55,401	38,000	41,000	43,700	45,600	

* Pressure recorded by a series of rounds without changing coppers.

**6-INCH SEACOAST MATERIEL:
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Section XV

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100. STANDARD NOMENCLATURE LISTS.

- a. Gun, 6-in., M1903A2 and M1905A2, and carriage, gun, barbette, 6-in., M1 SNL E-54
- b. **Ammunition.**
 - Ammunition instruction material for antiaircraft, harbor defense, heavy field, and railway artillery, including complete round data SNL P-8
 - Charges, propelling, separate loading, 6-in. to 240-mm, inclusive, for harbor defense, heavy field, and railway artillery SNL P-2
 - Firing tables and trajectory charts SNL F-69
 - Fuzes, primers, blank ammunition, and miscellaneous items for antiaircraft, harbor defense, heavy field, and railway artillery SNL P-7
 - Projectiles, separate loading, 6-in. to 240-mm, inclusive, for harbor defense, heavy field, and railway artillery, including complete round data SNL P-1
- c. **Sighting Equipment.**
 - Mount, telescope, M35, and telescope, M31 .. SNL F-234
- d. Cleaning, preserving and lubricating materials; recoil fluids, special oils, and miscellaneous related items SNL K-1

Current Standard Nomenclature Lists are as tabulated here.

An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index." OPSI

REFERENCES

101. EXPLANATORY PUBLICATIONS.

a. Ammunition.

Ammunition, general	TM 9-1900
Coast artillery ammunition	TM 4-205
Range regulations for firing ammunition for training and target practice	AR 750-10

b. Sighting and Fire Control Equipment.

Auxiliary fire-control instruments (field glasses, eye-glasses, telescopes, and watches)	TM 9-575
Seacoast artillery: fire control and position finding	FM 4-15
Sighting and fire-control instruments—Lubrication—general	OFSB 6-9

c. Care and Preservation.

Cleaning, preserving, lubricating, and welding materials and similar items issued by the Ordnance Department	TM 9-850
Preservation and care of seacoast defense materiel	TM 4-245
Seacoast artillery: formations, inspections, service, and care of materiel	FM 4-20
Defense against chemical attack	FM 21-40
Chemical decontamination materials and equipment	TM 3-220

d. General.

Star-gaging equipment, impression outfits and pressure gages	TM 9-1860
Coast artillery gunner's instruction, fixed seacoast artillery, expert gunners	TM 4-310
Coast artillery weapons and materiel	TM 4-210
Ordnance materiel—general	TM 9-2005
Coast defense	FM 31-10
Firing	FM 6-40
Seacoast artillery: service of the piece—6-inch gun on barbette carriage	FM 4-75
Seacoast artillery: gunnery	FM 4-10

6-INCH SEACOAST MATERIEL:
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102. FIRING TABLES.

a. Gun, 6-in., M1903A2 and M1905A2.

SHELL, A.P., 108-lb, M1911, w/fuze, BD,
Mk. V

SHELL, C.I., 108-lb, M1911

SHOT, A.P., 108-lb, M1911, w/fuze, BD,
Mk. V

} FT 6-C-2

SHELL, H.E., 90-lb, Mk. II, w/fuze, PD,
M47, or Mk. IV (star).....

FT 6-D-2, C-3

SHELL, H.E., 90-lb, Mk IIA1

SHOT, A.P., 105 lb, Mk. XXXIII, w/fuze, BD,
M60

FT 6-E-1

b. Gun, Subcaliber, 1.457-in. (1-Pdr).

SHELL, 1.1-lb

FT 37-C-2

Current firing tables are as tabulated here. An
up-to-date list of firing tables is maintained in
SNL F-69.

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