

NAVORD OP 1001

SECOND REVISION

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PROJECTORS MARK 10 MOD 1 AND MARK 11 MOD 0

DESCRIPTION, OPERATION, AND MAINTENANCE



**PUBLISHED BY DIRECTION OF
COMMANDER, NAVAL ORDNANCE SYSTEMS COMMAND**

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NAVORD OP 1001

**SECOND REVISION
CHANGE 2**

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**19 OCTOBER 1953
CHANGED 30 NOVEMBER 1962**



DEPARTMENT OF THE NAVY
BUREAU OF ORDNANCE
WASHINGTON 25, D. C.

19 October 1953

ORDNANCE PAMPHLET 1001 (SECOND REVISION)

PROJECTORS MARK 10 MOD 1 AND MARK 11 MOD 0 - DESCRIPTION, OPERATION, AND MAINTENANCE

1. Ordnance Pamphlet 1001 (Second Revision) describes and provides operating and maintenance instructions for Projectors Mk 10 Mod 1 and Mk 11 Mod 0.
2. This publication is intended for use by all personnel concerned with the operation and maintenance of these projectors. Personnel should be thoroughly familiar with the contents of this publication to ensure safe operation and proper maintenance. Reports of errors, corrections, and other suggestions to increase the effectiveness of this publication are invited.
3. This publication supersedes Ordnance Pamphlet 1001 (1st Rev.), which should be destroyed.

A handwritten signature in cursive script, reading "M. F. Schoeffel", is positioned above the typed name.

M. F. SCHOEFFEL
Rear Admiral, U. S. Navy
Chief, Bureau of Ordnance

DEPARTMENT OF THE NAVY

BUREAU OF NAVAL WEAPONS

WASHINGTON 25, D.C.

OP 1001 (Second Revision) **CHANGE 3**

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PROJECTORS MARK 10 MOD 1 AND MARK 11
MOD 0, DESCRIPTION, OPERATION AND
MAINTENANCE

PAGE 1 OF 1 PAGE(S)

(with 5 enclosures)

**PUBLISHED BY DIRECTION OF
THE CHIEF OF THE BUREAU OF NAVAL WEAPONS**

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1. Remove pages 13 and 14 and substitute new pages 13, 14 and 14a.
2. Delete page 24 and substitute new page 24 and 24a.

DEPARTMENT OF THE NAVY
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PROJECTOR MARK 10 MOD 1 AND
MARK 11 MOD 0, DESCRIPTION,
OPERATION, AND MAINTENANCE

NAVORD OP 1001
SECOND REVISION CHANGE 2
30 November 1962
0609-100-1002

PAGE 1 OF 1 PAGE (S)

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1. Remove Title page and Letter of Promulgation page and insert new Title page and Letter of Promulgation page.
2. Remove pages iii and iv and insert new pages iii and iv.
3. Following page 22 insert new page 22A.

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WASHINGTON 25, D. C.**

To all holders of ORDNANCE PAMPHLET 1001 (SECOND REVISION)
insert change; write on cover 'Change 1 inserted'
Approved by The Chief of the Bureau of Ordnance

OP 1001 (2ND REV.) CHANGE 1

18 February 1954

W. H. [Signature]
Assistant Director, Research & Development Division 1 Page _____ Page 1

Ordnance Pamphlet 1001 (2nd Rev.)
is changed as follows:

PROJECTOR MARK 10 MOD 1 & MARK 11
MOD 0 — DESCRIPTION, OPERATION,
AND MAINTENANCE

1. Page 24,
Col. 1: In paragraph headed "Firing Panel Mk 33 Mod 0", change sub-paragraph (c) to read "Insert the off-mount and panel safety plugs in their receptacles."
2. Page 24,
Col. 2: Insert the following paragraph immediately preceding sub-paragraph (e) near the top of the column:

"Prior to testing each pair of spigots, remove only the panel safety plug after each time that the dial is stepped one number. Re-insert the panel safety plug in its receptacle to step the dial to the next number."
3. Insert this CHANGE sheet in the front of the book, between the front cover and title page.

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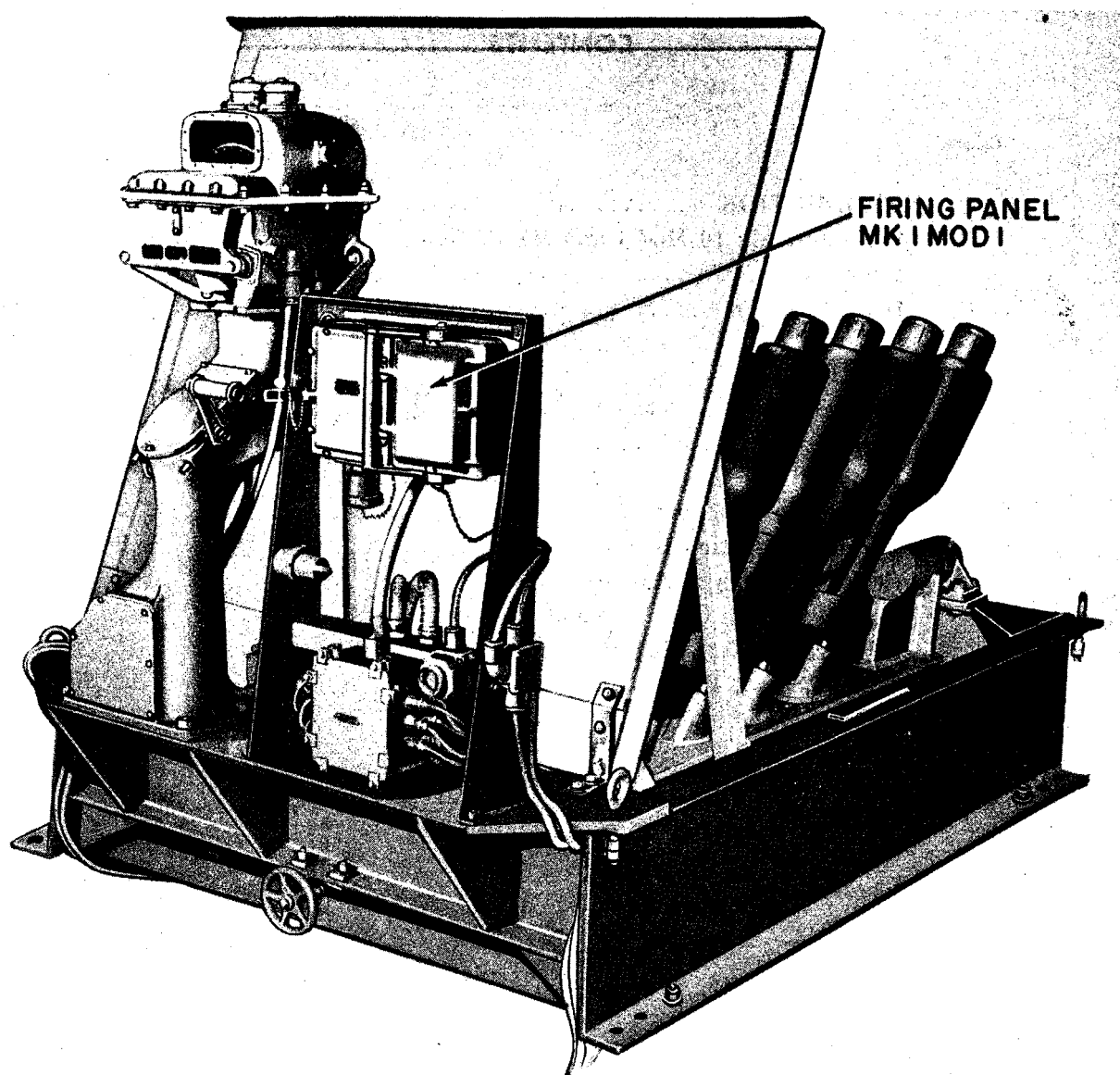


Figure 1. Projector Mk 10 Mod 1 or Mk 11 Mod 0 with Firing Panel Mk 1 Mod 1

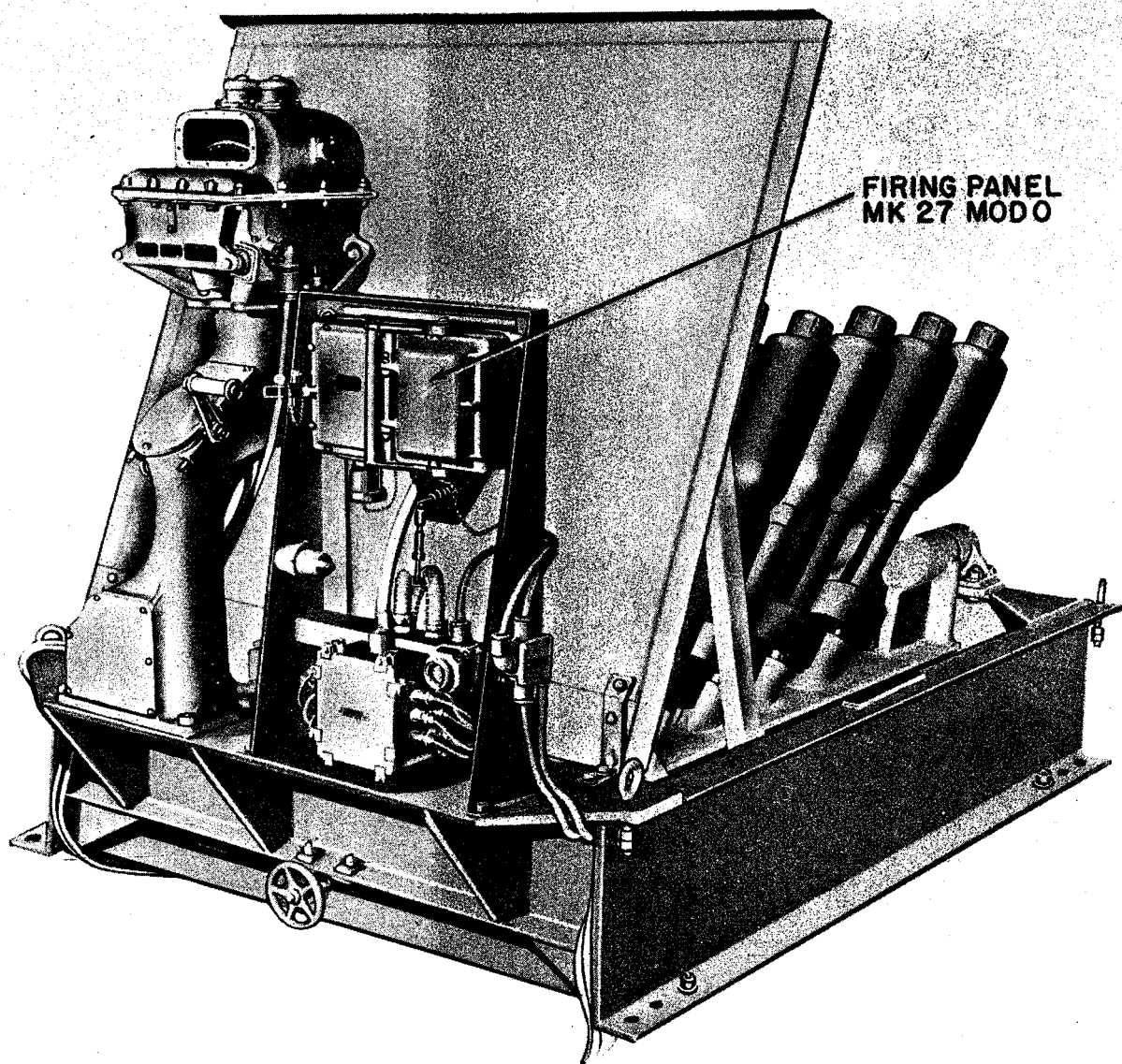


Figure 2. Projector Mk 10 Mod 1 or Mk 11 Mod 0 with Firing Panel Mk 27 Mod 0

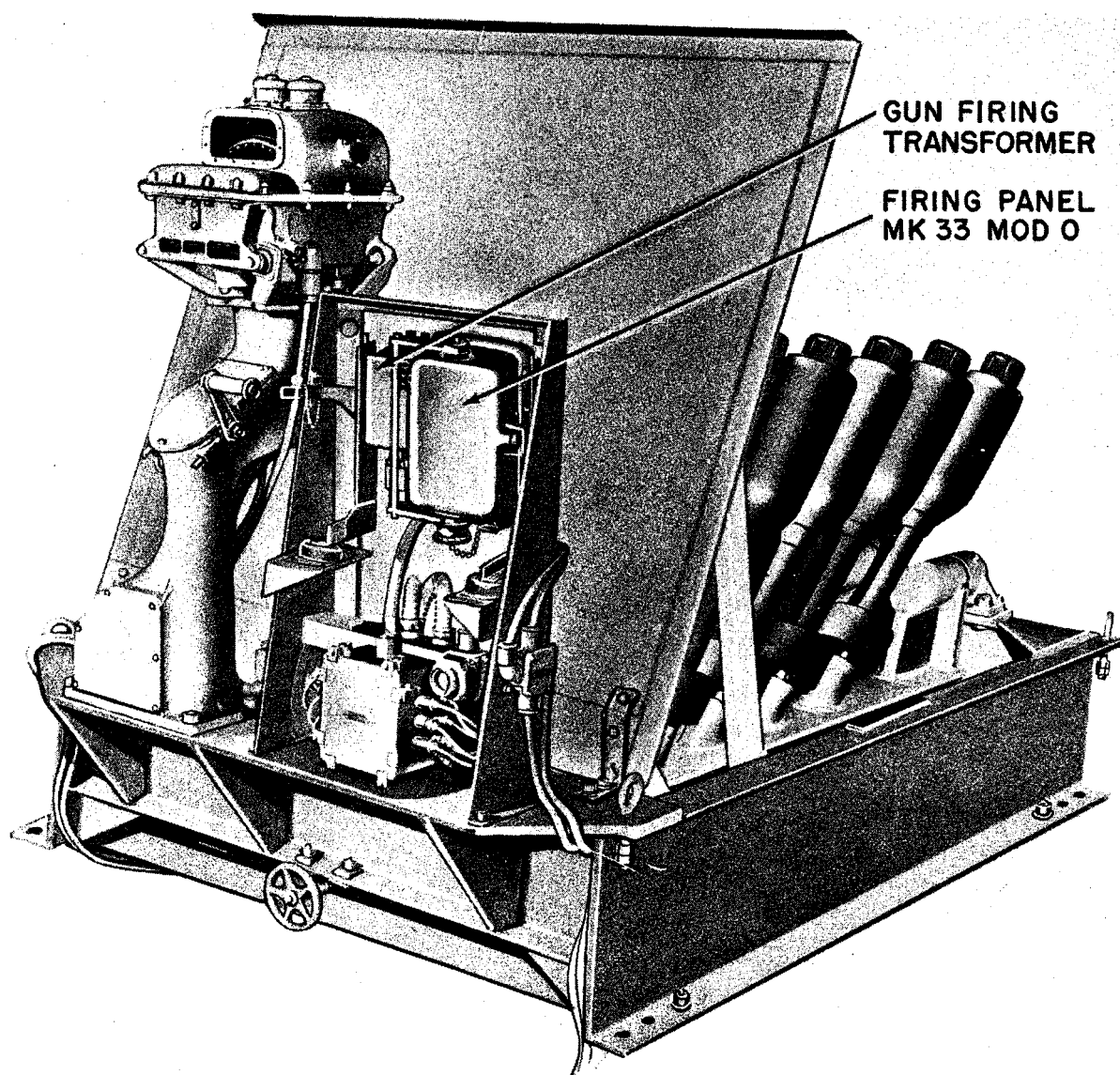


Figure 3. Projector Mk 10 Mod.1 or Mk 11 Mod 0 with Firing Panel Mk 33 Mod 0

Chapter 1

INTRODUCTION

Projectors Mk 10 Mod 1 and Mk 11 Mod 0

Projectors Mk 10 Mod 1 and Mk 11 Mod 0, figures 1, 2, and 3, are forward-throwing weapons designed to project a group of 24 explosive charges ahead of the vessel on which the projectors are mounted.

The explosive charges are mounted on 24 cylindrical bars called spigots, which are attached to cradles capable of being tilted about a horizontal axis by means of gearing from a gun train indicator pedestal. Port and starboard rotation about this axis compensates for the ship's roll and permits some training of the line of fire.

Projector Mk 11 Mod 0 differs from Projector Mk 10 Mod 1 in the range, size, and shape of the patterns of fall achieved by the fire charges. Figure 13 shows the water impact patterns.

The purpose of the projector is to fire the 24 explosive charges so that they strike the water in an elliptical pattern from Projector Mk 10 or in a circular pattern from Projector Mk 11.

The projectors are installed primarily aboard vessels engaged in antisubmarine activities and are generally used in conjunction with sound ranging equipment.

Dimensions

The major dimensions and weights of Projectors Mk 10 Mod 1 and Mk 11 Mod 0 are approximately:

Length	91.25 in.
Width	67.0 in.
Height	75.5 in.
Weight Including Gun Train	
Indicator, without charges	5000 lb.
Weight with charges	6600 lb.

Deck Reaction

The measured deck reactions resulting from firing the projector (not including dead weight of the projector) are:

Horizontal (rearward)	44,200 lb.
Horizontal (lateral)	28,000 lb.
Vertical (at aft end of frame)	61,000 lb.
Vertical (at forward end of frame)	36,800 lb.

Chapter 2

DESCRIPTION

General

The main components of the projector are:

- a. Base frame.
- b. Blast shield.
- c. Cradle and spigot assembly.
- d. Roll correction gear assembly.
- e. Control box support.
- f. Terminal junction box and wiring.
- g. Off mount safety plug and receptacle.

The following components are used in conjunction with the projector:

a. Firing Panel Mk 1 Mod 1, figure 1, Firing Panel Mk 27 Mod 0, figure 2, or Firing Panel Mk 33 Mod 0, figure 3.

b. Gun Train Indicator Mk 52 and Mods or Mk 61 and Mods.

c. Target Designation Transmitter Mk 8 and Mods.

For complete descriptions of these components, refer to the following publications:

OP 1994 Firing Panels Mk 1 Mod 1
 and Mk 27 Mod 0.

OP 1995 Firing Panel Mk 33 Mod 0.

OP 972 Gun Train Indicator Mk 52
 and Mods, and Target
 Designation Transmitter
 Mk 8 and Mods.

L.D. S.K. Train Indicator Mk 61 and
No. 105775 Mods.
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Base Frame

The base frame, figures 4 and 5, provides a mounting for the cradle and spigot assemblies from which the projector charges are fired. It consists of two 18-inch channels, extending fore and aft. The channels are approximately 83 inches long. A 12-inch I-beam is welded to the fore and to the aft end of the channels as cross members. Each I-beam has four trunnion bearing assemblies bolted to its top surface.

Gear Mounting Plate. A gear mounting plate, figure 4, is bolted to the aft end of the base frame. This plate provides a mounting for the roll correction gear assembly and the control box support.

Cradle Locking Device. The cradle locking device is bolted to the aft I-beam, under the gear mounting plate. This device consists of a locking

screw and a handwheel. Rotating the handwheel projects the locking screw into a hole in the cradle connecting bar, thus locking the cradles in their central position.

CAUTION: The cradle locking device should be engaged at all times except when the projector is in operation or being lubricated.

Blast Shield

The blast shield, figure 5, is mounted on the aft end of the base frame. It provides protection for nearby personnel, from hot gases and cartridge case components. It consists of two parts, upper and lower.

Lower Blast Shield. The lower blast shield is a steel plate attached to the gear mounting plate by brackets. The upper portion of the lower blast shield is bent forward at an angle of 25 degrees and is attached to the upper blast shield.

Upper Blast Shield. The upper blast shield is a steel plate supported by the lower blast shield and by brackets attached to the side channels of the base frame.

Control Box Support

The control box support, figure 6, provides a shockproof mounting for the firing panel and a mounting for the terminal junction box. The support is mounted on the gear mounting plate, to the right of the roll correction gear assembly.

A plug holding cup is attached to the support. This female threaded cup is used to store the firing panel safety plug. The firing key receptacle on the support holds the firing key when it is not in use.

An indicator lamp, called the "Mount Ready" light, gives a visible indication that firing power is available on the projector. This lamp is mounted on the support, to the right of the junction box. A terminal box, mounted on the outside surface of the support, connects the indicator lamp into the 20-volt AC circuit, between the power source and the off mount safety plug.

When Firing Panel Mk 33 Mod 0 is used, the control box support must be modified, as shown in figure 7. A mounting bracket is installed and the shockproof mountings, the plug holding cup, and the firing key receptacle are relocated.

Terminal Junction Box and Wiring

The terminal junction box, figure 8, is a distribution point at which power from the firing panel is distributed to the spigots. The box is attached to the control box support.

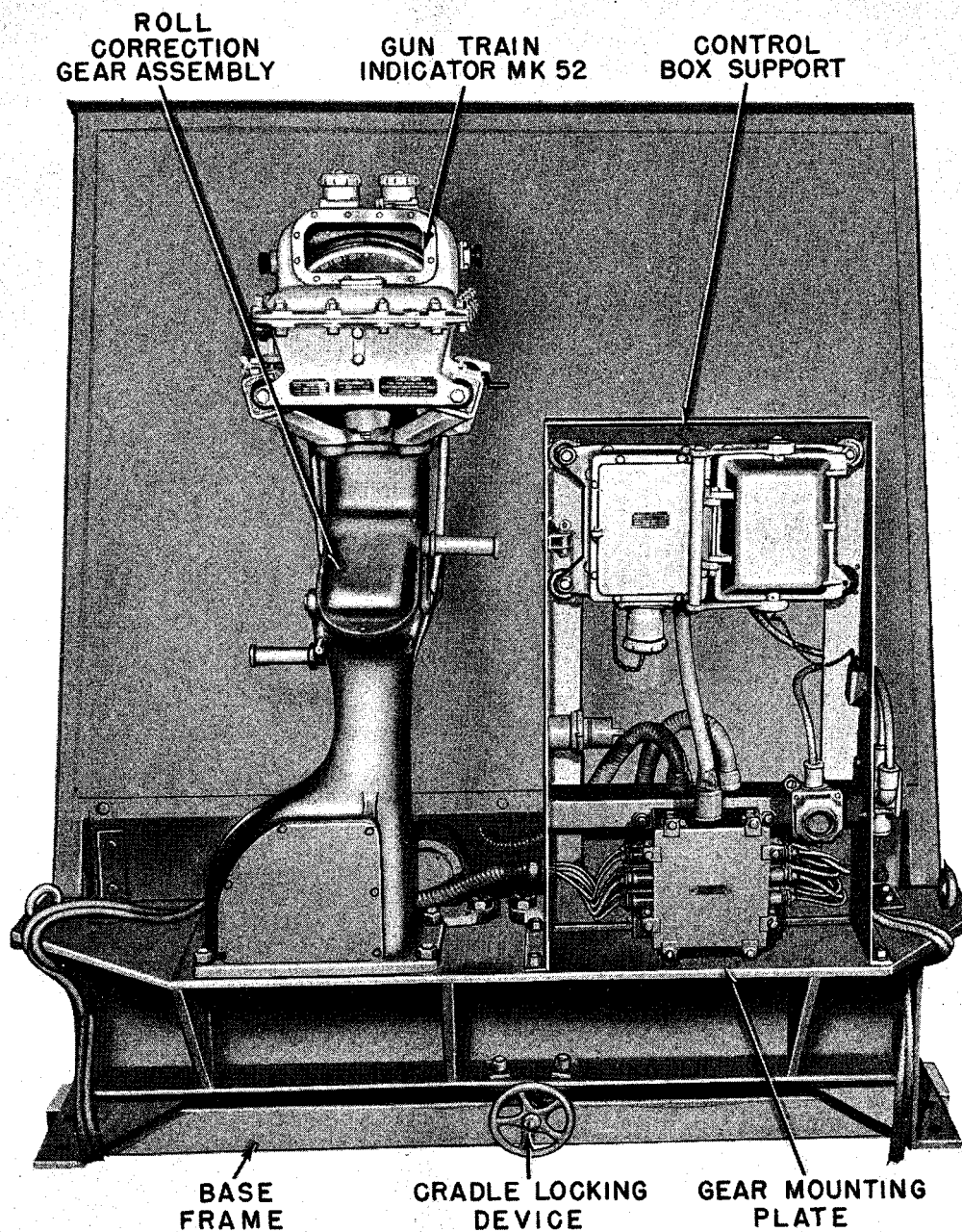


Figure 4. Projector Mk 10 Mod 1 or Mk 11 Mod 0, Rear View

Enclosed in the junction box are two terminal strips, each having seven terminals. The 24 spigots are wired, in pairs, to 12 of these 14 terminals. Through an opening on the top of the box a 14-conductor, lead-covered cable is connected to the terminals. This cable is the lead from the firing panel to the junction box.

Wiring from the firing pin in each spigot is attached by clips to the underside of the top surface of each cradle beam. At the aft end

of each cradle, the six wires from its six spigots are encased in flexible metal tubing. This tubing is passed through a hole in the lower blast shield to the junction box. Six holes on each side of the junction box and 12 holes on the rear provide entry for the 24 spigot wires which are connected to the terminals.

Figure 9 shows the wiring of the projector.

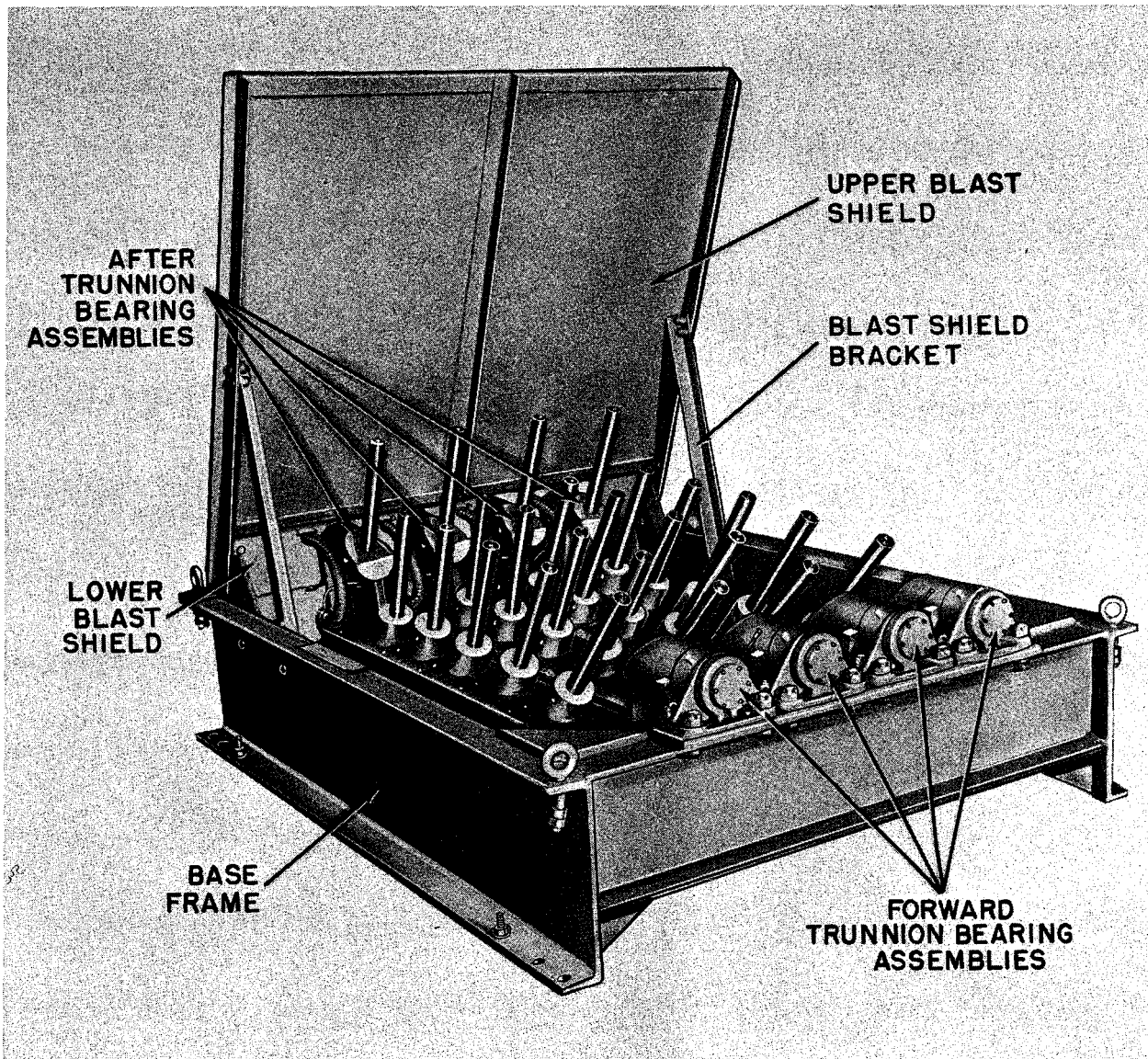


Figure 5. Projector Mk 10 Mod 1 or Mk 11 Mod 0, Front View

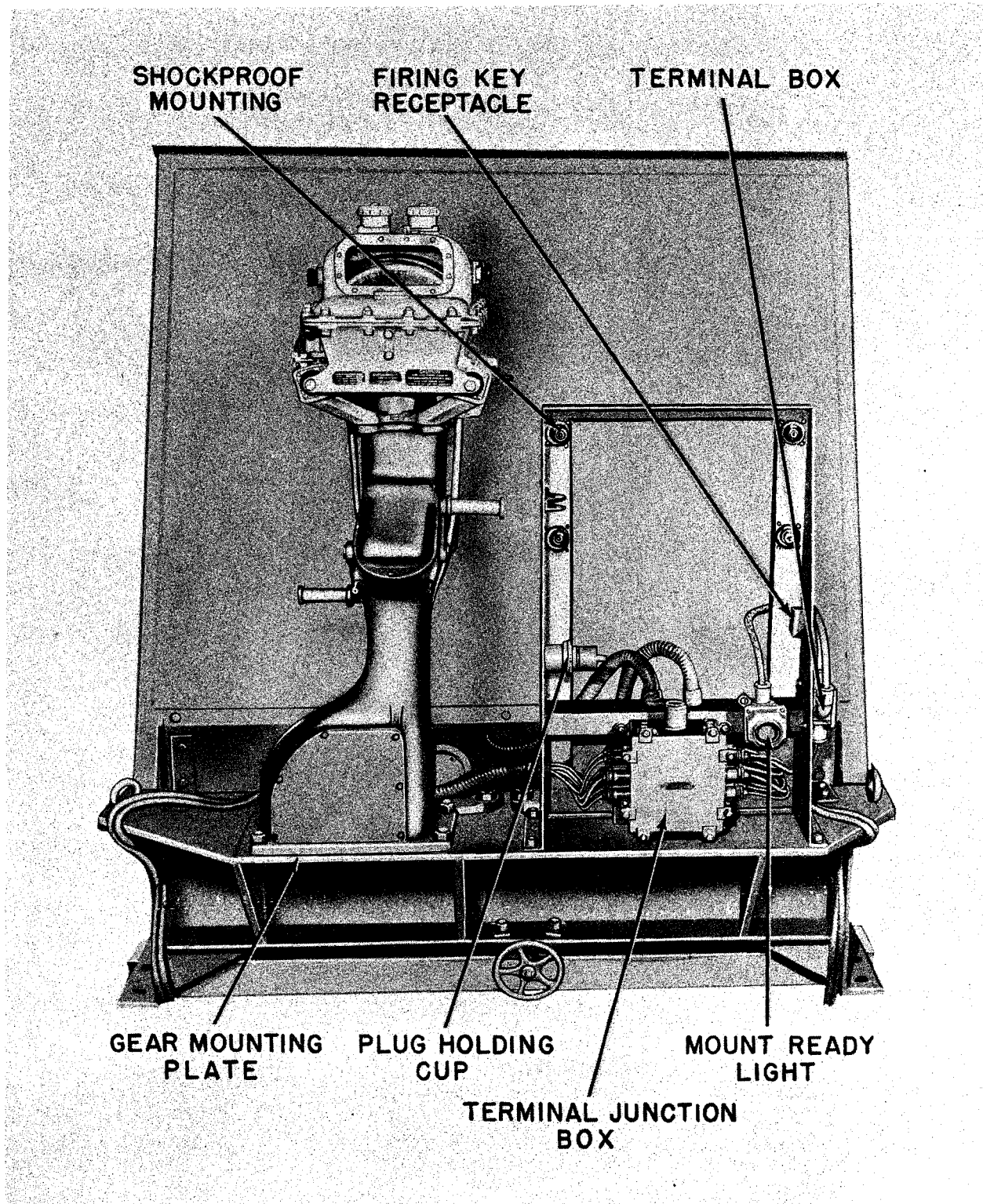


Figure 6. Control Box Support

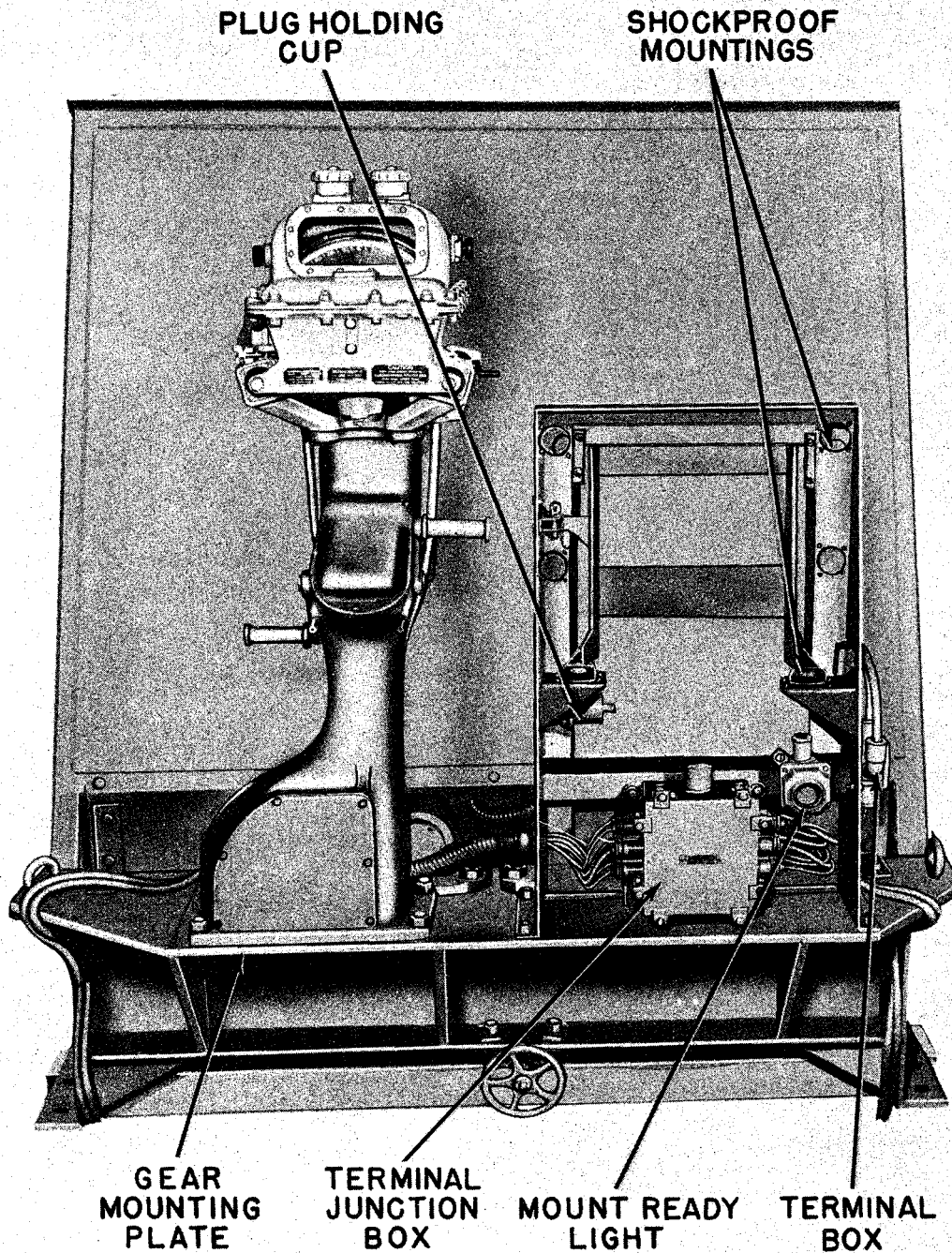


Figure 7. Control Box Support Modified for Firing Panel Mk 33 Mod 0

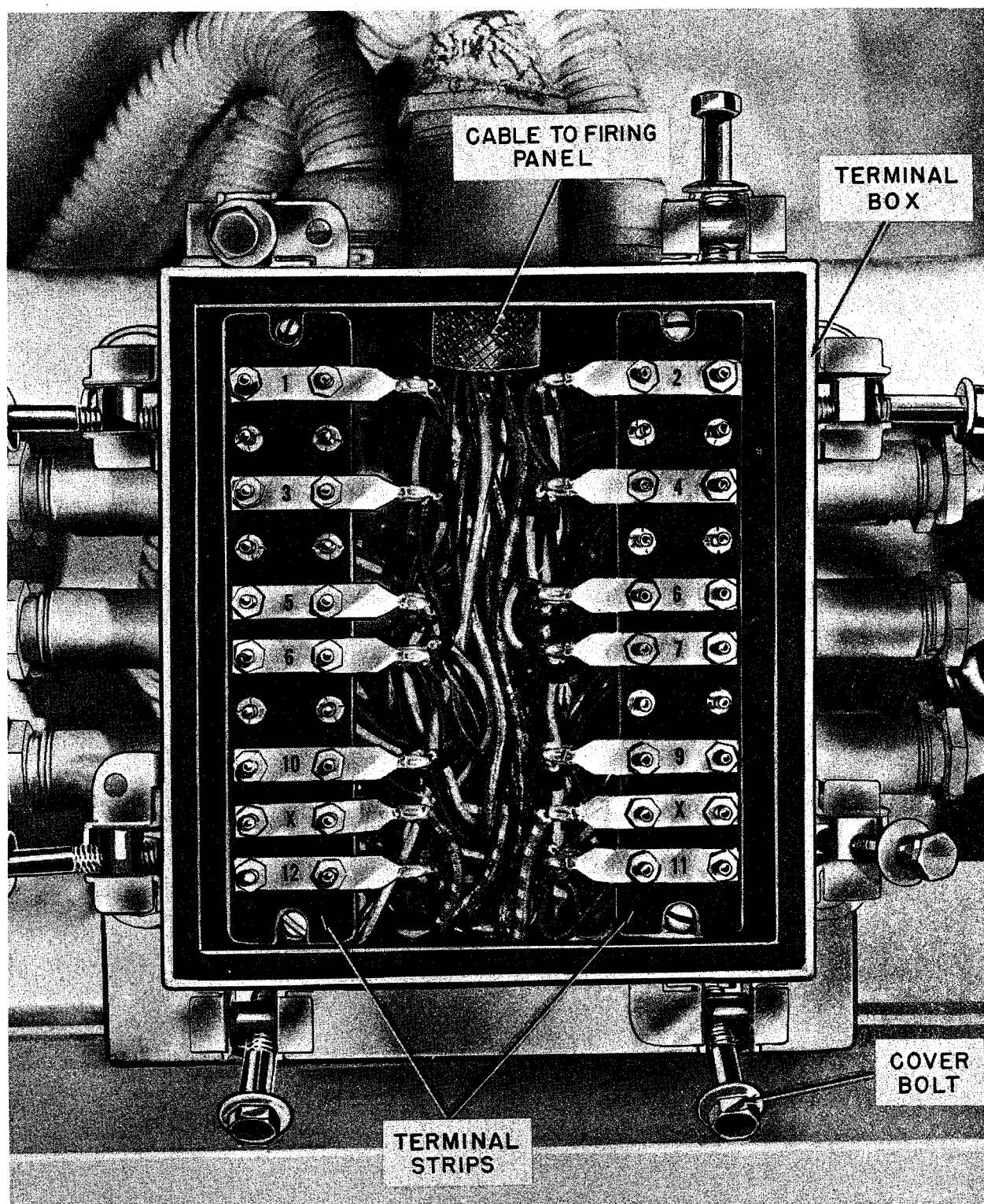


Figure 8. Terminal Junction Box, Cover Removed

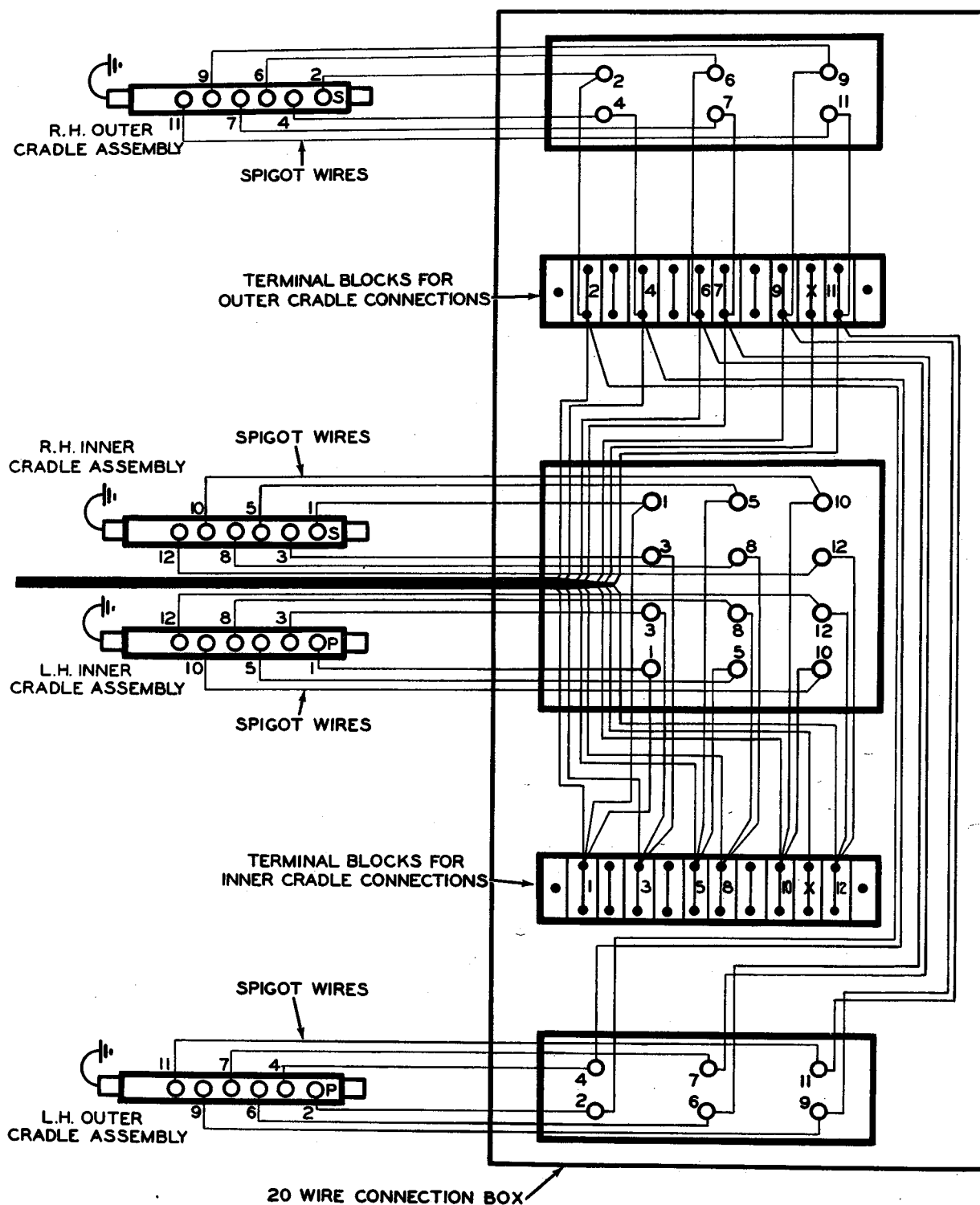


Figure 9. Elementary Wiring Diagram, Projector Mk 10 Mod 1 or Mk 11 Mod 0

Cradle and Spigot Assembly

There are four cradle and spigot assemblies in each projector. The spigots, which hold the projector charges and contain the electric contacts for firing, are mounted on these cradles.

Cradles. The cradles, figure 10, are 10-inch I-beams. A trunnion assembly is welded on both ends of each cradle. These trunnions fit into the trunnion bearings mounted on the fore and aft ends of the base frame. By means of these trunnions, the cradles can be tilted about an axis parallel to the longitudinal axis of the projector. The port outer cradle has a longer rear trunnion spindle which projects through the trunnion bearing, and to which the worm gear quadrant of the roll correction gear assembly is attached.

Cradle Connecting Bar. The four cradle beams are joined at their aft ends by the cradle connecting bar, figure 12. When the roll correction gear assembly is operated, the port cradle is rotated about its axis. Since the four cradles are joined by the cradle connecting bar, all cradles tilt simultaneously.

Spigot Sockets. Six spigot sockets, figure 11, are welded on each cradle beam, five on top of the beam and one on top of the rear trunnion assembly. Each individual socket is oriented in azimuth and elevation with respect to the cradle beam. This individual orientation produces the desired water impact pattern.

The spigots are inserted in the spigot sockets and are secured in place by setscrews located in the sides of the sockets. A hole drilled through each spigot socket provides a passage for the spigot wiring.

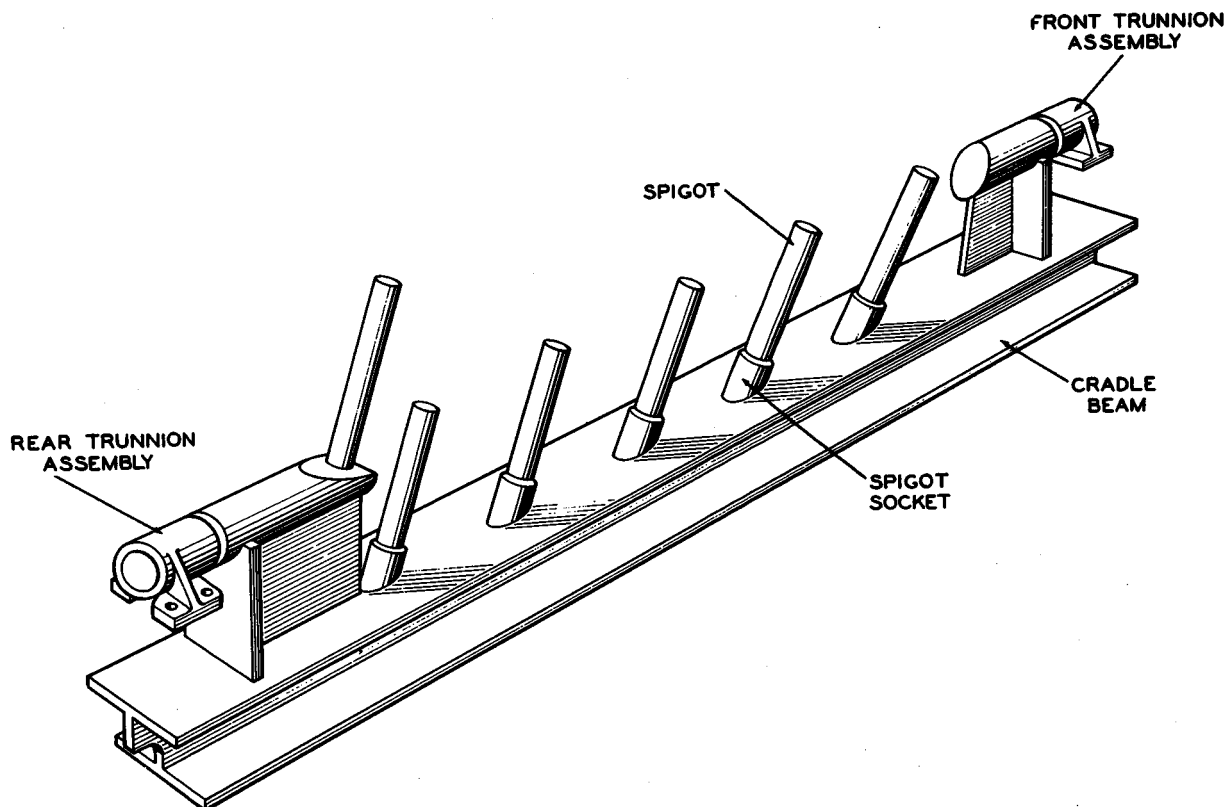


Figure 10. Cradle and Spigot Assembly

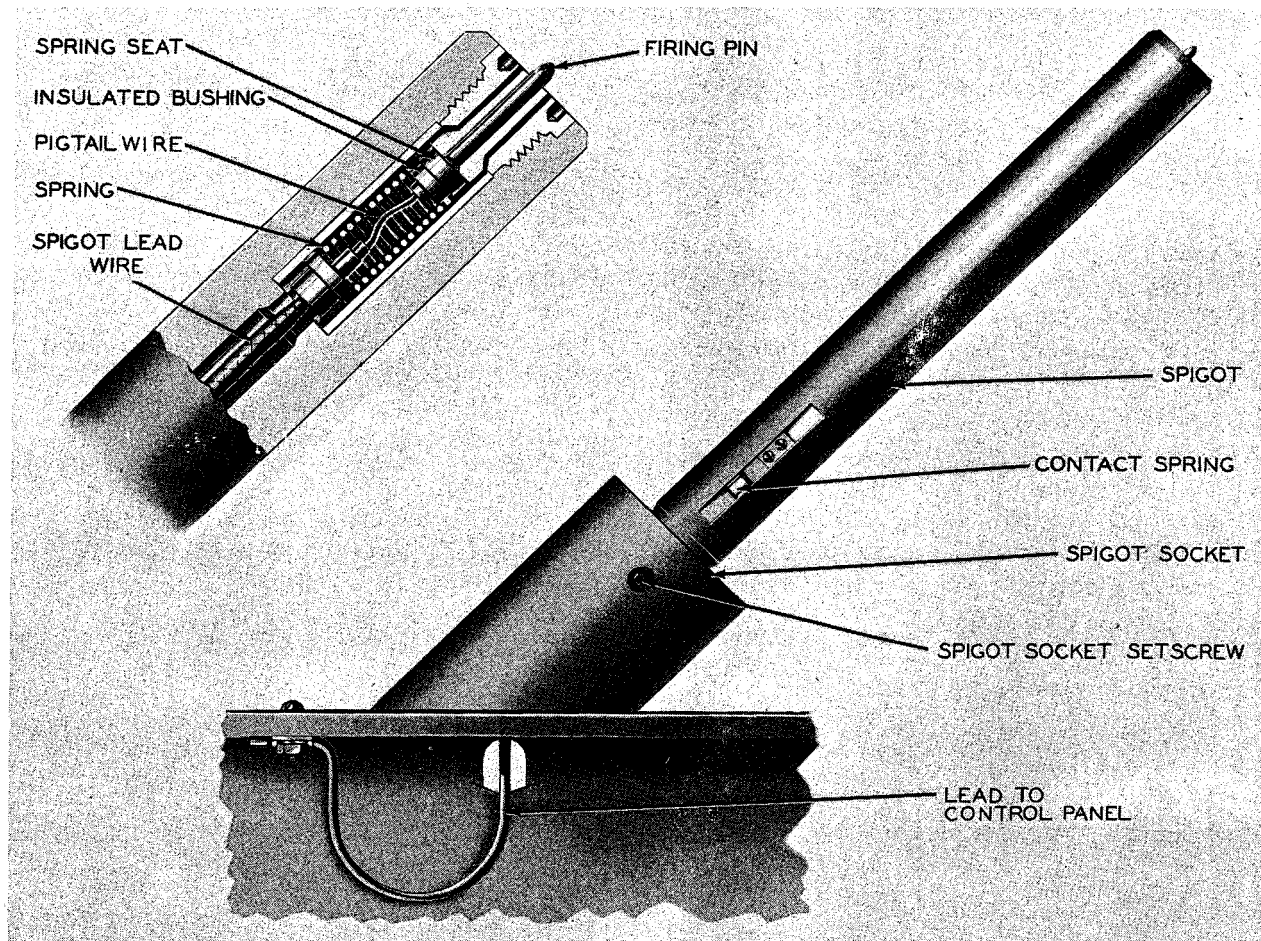


Figure 11. Spigot Assembly

Spigots. Each spigot, figure 11, is a steel rod, drilled through its center to permit the passage of the firing pin wiring, and recessed at its top for insertion of the firing pin assembly.

The firing pin wiring assembly passes through the holes in the spigot socket and the spigot to within approximately $3\frac{1}{8}$ inches of the top of the spigot. A pigtail wire, passing through the firing pin spring, connects the wiring to the firing pin. The firing pin spring and the pigtail wire are enclosed in an insulating bushing. The firing pin is secured in the spigot by a threaded bushing. The firing pin spring causes the firing pin to project about $\frac{1}{4}$ inch above the top of the spigot.

A contact spring is attached to the side of the spigot near the socket. The grounded return of the firing circuit is made through this spring, which contacts the inside of the projector charge tail tube.

Roll Correction Gear Assembly

The roll correction gear assembly, figure 12, provides a means of compensating for the ship's roll and permits some training of the line of fire. It is bolted to the gear mounting plate, behind the blast shield. The assembly consists of the roll correction gear housing, worm gear shaft, worm gear quadrant, and handcranks.

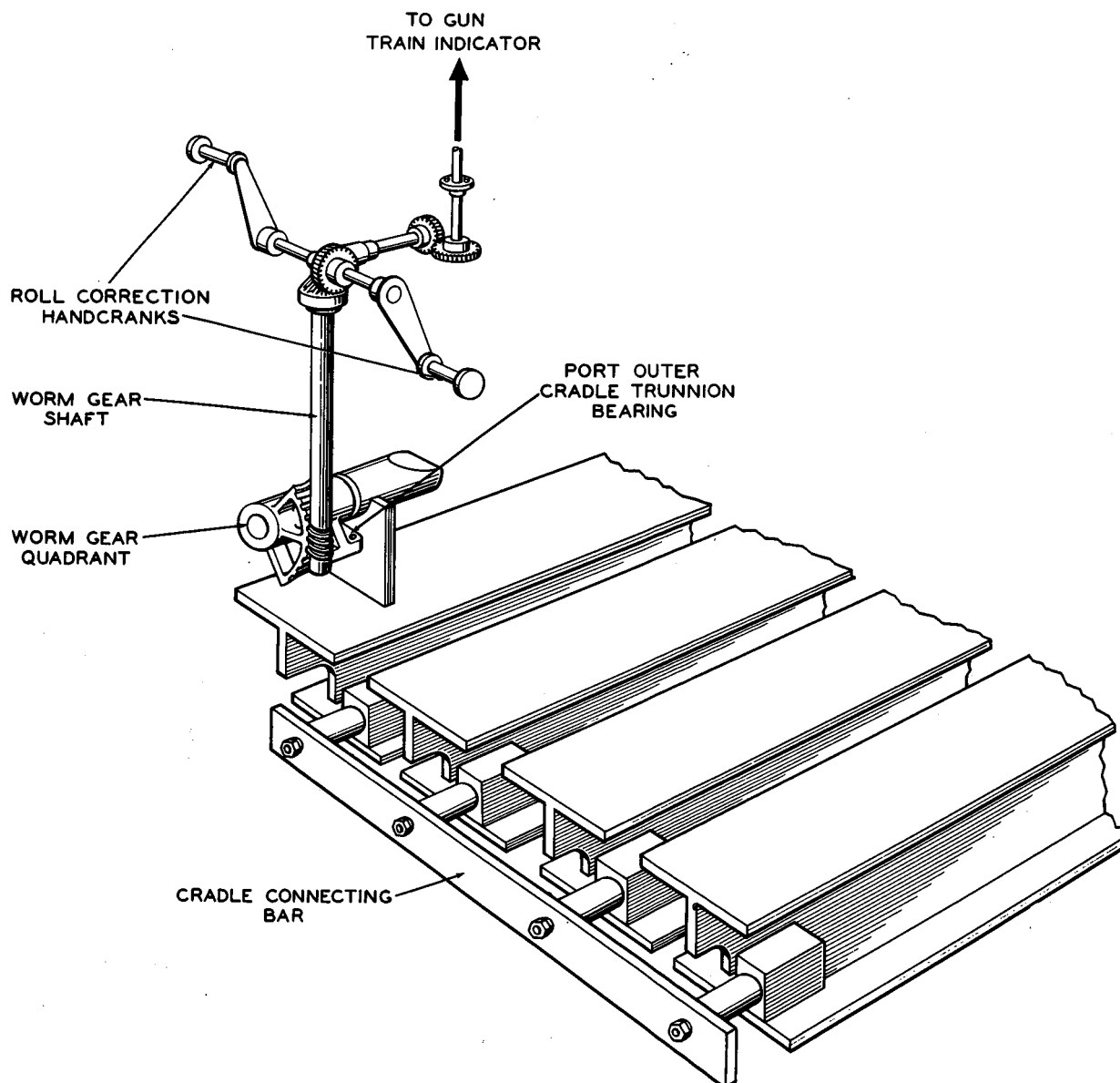


Figure 12. Roll Correction Gear Assembly

The handcranks are connected through gearing to the worm gear shaft. This shaft engages the worm gear quadrant which is keyed to the port outer cradle trunnion spindle. When the handcranks are turned, the cradles tilt, since all four cradles are connected by the cradle connecting bar.

A Gun Train Indicator Mk 52 or Mk 61 is mounted on top of the roll correction gear housing and is connected to the handcranks through gearing and shafting. As the handcranks are turned to tilt the cradles, the amount of tilt is indicated on the dial of the gun train indicator.

CAUTION: The cradle beams should be locked in their central position at all times, except when the projector is in operation or is being lubricated. The cradles are designed so that the center of gravity of the loaded cradles coincides with the axis of the trunnions. Tilting an empty cradle imposes an eccentric load on the tilting mechanism and results in excessive strain. Therefore, do not tilt cradles unless at least half of the spigots on each cradle are loaded.

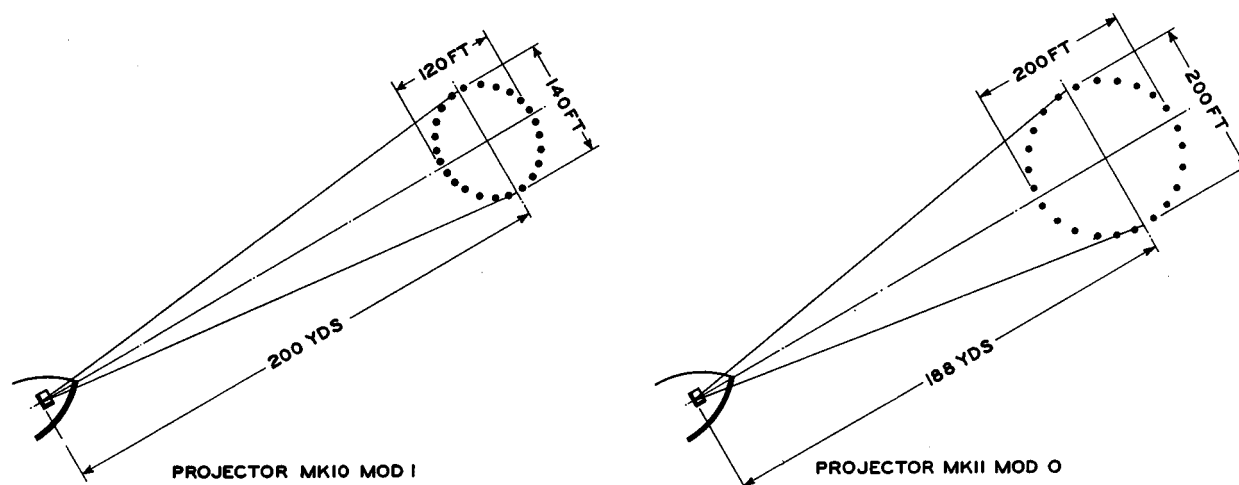


Figure 13. Water Impact Patterns, Complete Round of Fire

Off Mount Safety Plug and Receptacle

The off mount safety plug and receptacle provide a means of preventing accidental or premature firing. The receptacle is secured in a convenient location near the projector, and the plug must be inserted before the projector can be fired.

The receptacle is connected to the terminal box on the bottom of the right upright of the control box support. Its location in the firing circuit is between the indicator lamp and the firing panel.

The receptacle has four female contacts. A mounting bracket provides a means of securing it to a bulkhead. A threaded cap, attached by a chain, protects the four contacts when the plug is removed.

The plug has four male contacts. It is normally stored in a plug holding cup, attached in the vicinity of the receptacle. The plug is inserted in the receptacle only when all safety

precautions have been obeyed and all is in readiness for firing or testing.

CAUTION: Keep the off mount safety plug dry at all times.

Water Impact Pattern

The principal difference between Projector Mk 10 Mod 1 and Mk 11 Mod 0 is in the azimuth and elevation orientation of the spigots.

The orientation on Projector Mk 10 Mod 1 results in an elliptical water impact pattern as shown in figure 13. This pattern has a major diameter of approximately 140 feet and a minor diameter of about 120 feet.

The water impact pattern from Projector Mk 11 Mod 0, figure 13, is circular and has a diameter of approximately 200 feet.

Range Data

For range data for Projectors Mk 10 Mod 1 and Mk 11 Mod 0, refer to OP 1904.

Chapter 3

OPERATION

Gun Crew

The projector requires the following crew at the mount: a mount captain, a mount trainer, two first loaders, two second loaders, and a safety observer.

The mount captain's duties are primarily the same as in any other form of gunnery. Since it is the mount captain's responsibility to see that all safety precautions are observed and that all procedures relating to handling, loading, and firing, are correctly performed, he must be thoroughly familiar with all operations and procedures involved in the projector.

The mount trainer operates the roll correction gear and the cradle locking device.

The two first loaders, one on the port side and one on the starboard side of the projector, place the projector charges on the spigots. The two second loaders (ammunition passers) pass the charges from the ready lockers to the first loaders.

WARNING

Allow no one forward of the line of the blast shield when the projector is loaded and the off mount safety plug and panel safety plug are connected. Remove the off mount safety plug, the panel safety plug, and the firing key from their receptacles and lock the cradles securely at 0 degree tilt before or during any operation involving loading of the projector or removal of the fuze caps or safety wires. The removed safety plugs must be physically kept upon the person responsible for safety.

Circuit Testing

As a maintenance procedure, the spigot circuits are tested for continuity between the firing panel and the firing pin on each spigot, with the projector completely UNLOADED.

WARNING

Before testing the projector or firing panel, check that the off mount safety and the panel safety plugs are removed from their receptacles and kept upon the person responsible for safety. Check that no charges are on the spigots.

Firing Panels Mk 1 Mod 1 and Mk 27 Mod 0. The procedure for testing unloaded projectors equipped with Firing Panel Mk 1 Mod 1 or Mk 27 Mod 0 is as follows:

- Set the transfer switch lever to "R".
- Set the ripple dial to "C".
- Insert the panel safety plug into its receptacle.
- Insert the off mount safety plug into its receptacle.
- Insert the firing key on the "AC" side. On Firing Panel Mk 27 Mod 0, disconnect the pivot link at the firing key.

f. Rotate the ripple dial clockwise stopping successively at positions 12 to 1. Place the green (20 volt) projector test fixture on either of the number 12 spigots. Place the red (2 volt) projector test fixture on either of the number 11 spigots. Depress the firing key, as when firing. The bulb in the green tester should burn brightly. Failure to do so indicates a break or a dead short. A lamp which burns dimly indicates the presence of a

high-resistance connection or low-resistance short in the particular circuit. The 2-volt bulb of the red test fixture should not burn. If it does, this indicates a short between firing lines which could be dangerous. In either case, trace and eliminate the trouble before proceeding in the test to the next number on the ripple fire rotary switch. Under no circumstances shall a voltmeter be used in lieu of the test fixtures. Continue on in the same manner, moving the red test fixture to either of the number 10 spigots and the green test fixture to either of the number 11 spigots. Continue until all of the 12 "pairs" of spigots have been tested taking care not to place the red test fixture on the spigot to be energized as the 2-volt bulb will burn out.

Firing Panel Mk 33 Mod 0. The procedure for testing unloaded projectors equipped with Firing Panel Mk 33 Mod 0 is as follows:

WARNING

Before testing the projector or firing panel, check that the off mount safety plug and the panel safety plug are removed from their receptacles and kept upon the person responsible for safety. Check that no charges are on the spigots.

- a. Check that the dial indicates "OFF".
- b. Turn selector switch to "SINGLE STEP"
- c. Insert the panel safety plug in its receptacle.
- d. Insert the off mount safety plug in its receptacle.
- e. Press the "SINGLE STEP" pushbutton firmly and release.
- f. Place the green (20 volt) projector test fixture on either of the number 1 spigots. Place the red (2 volt) projector test fixture on either of the number 2 spigots. Press the "SINGLE STEP FIRE OR TEST" pushbutton and hold in the closed position. The number "1" will appear in the window indicating that the circuits to both number "1" spigots are

energized. The bulb in the green test fixture should burn brightly. Failure to do so indicates a break or dead short. A lamp which burns dimly indicates the presence of a relatively high-resistance connection or a low-resistance short in the particular circuit. The 2-volt bulb of the red test fixture should not burn. If it does, this indicates a short between firing lines which could be dangerous. In either case, trace and eliminate the trouble before proceeding in the test to the next number on the ripple fire rotary switch. Under no circumstances shall a voltmeter be used in lieu of the test fixtures. Continue on in the same manner moving the red test fixture to either of the number "3" spigots and the green test fixture to either of the number "2" spigots. Continue this procedure until all 12 pairs of spigots have been tested and "off" appears in the window of the firing panel. Care should be taken not to place the red (2 volt) test fixture on the spigot to be energized as the 2-volt bulb will burn out.

After the No. 1 pair of spigots has been checked, continue operating the "SINGLE STEP" pushbutton until all 12 pairs of spigots have been checked and "OFF" appears in the window.

WARNING

Do not test the projector when spigots are loaded.

Loading

The following is a list of the duties of the gun crew during loading operations.

Second Loaders. These crew members inspect the tail tube of the charge, when they pick it up from the ready lockers, to determine that there is not an excessive amount of grease in the tail tube. Any excessive grease must be wiped out before the charge is passed to the first loaders.

The tail shrouds should be inspected to see that they are not bent or damaged. Any damaged charges will be set aside for repair or disposition as ordered by the officer in charge.

The second loaders carry the charges, with the upper portion cradled in one arm while grasping the tail tube with the other hand. The tail tube should be toward the bow of the ship as the charge is passed to the first loader. The charge should be carried at approximately the same angle as the spigot so that the first loader can place it on the spigot with as little change in position as possible.

First Loaders. The first loaders receive the charges from the second loaders, figure 14,

cradling the upper portion in one hand and, with the other hand, grasping the after edge of the tail shroud between the fins. The projector charges are lowered on the spigots gently until they are approximately six inches from the seated position. The hand around the body of the charge is then removed clear of the charge; the charge is lowered to its seated position, figure 15, and given at least one full turn.

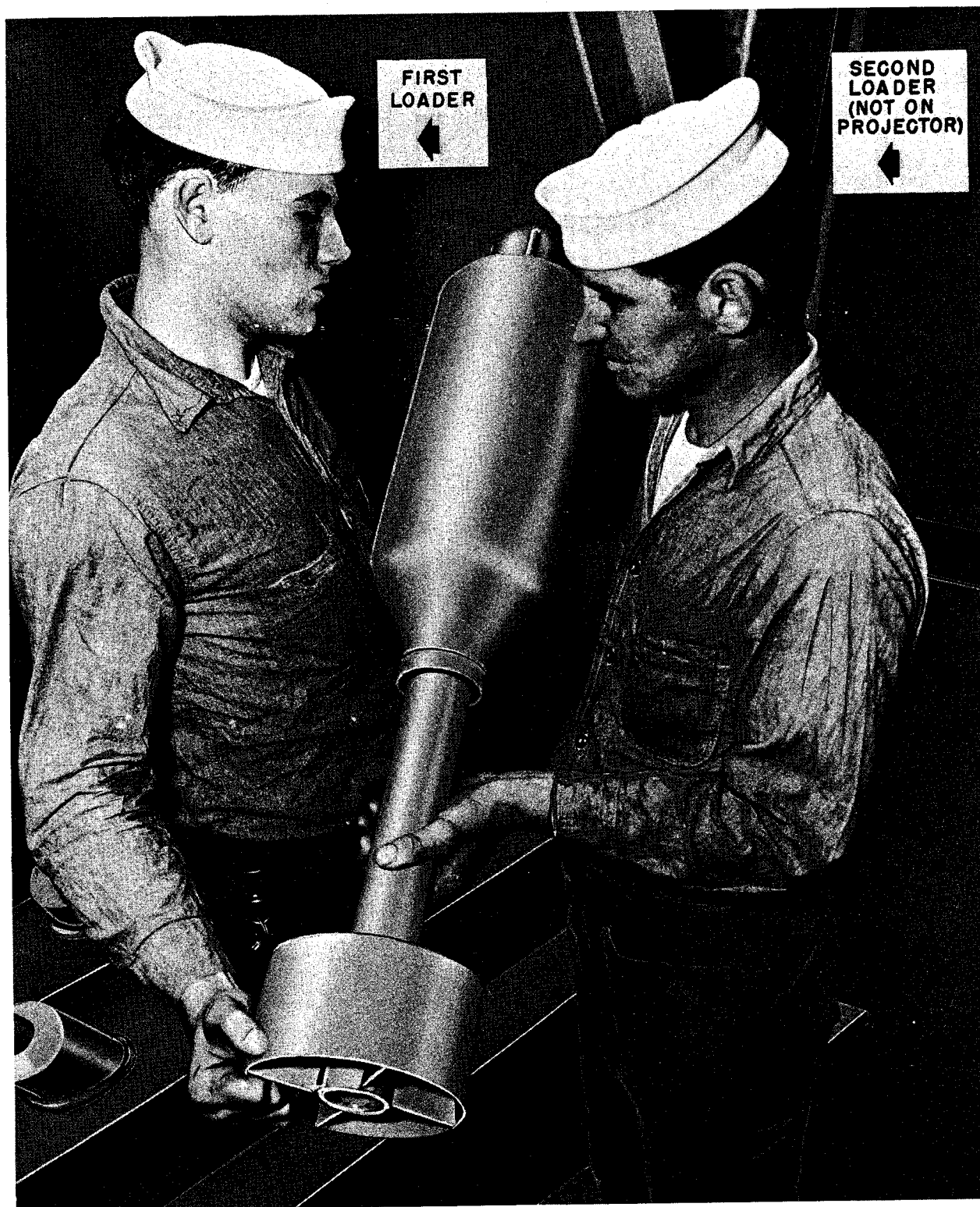


Figure 14. Second Loader Passing Charge to First Loader

Revolving the charge on the spigot assures a good contact between the firing pin and the cartridge primer.

The first loaders load the inboard cradles first, starting from the rear and working forward, figure 15. They stand inside the base frame during this phase of loading. In loading the last inboard spigot, they straddle the forward end of the frame to improve their balance, figure 16.

Next they load the outboard cradles, figure 17, again starting from the rear and working forward. The first loaders straddle the side of the base frame during this stage of loading. To load the last outboard spigot, they stand completely outside the frame.

If less than 24 charges are being used, the

empty spigots must be loaded with dummy charges in order to keep the cradles balanced.

WARNING

These dummy rounds **MUST** be readily identifiable by black painting and by notches in the tail shroud. All fleet activities have been requested to paint dummy drill rounds with black paint, both head and tail, **AFTER** confirming that tails are inert. In addition, for night identification, cut four V-shaped notches each on forward and aft edges of the tail shroud; each notch to be approximately 1-inch deep with ninety-degree included angle, and edges and corners rounded and smoothed. **ONLY** rounds marked as above are authorized for use in dummy drill.

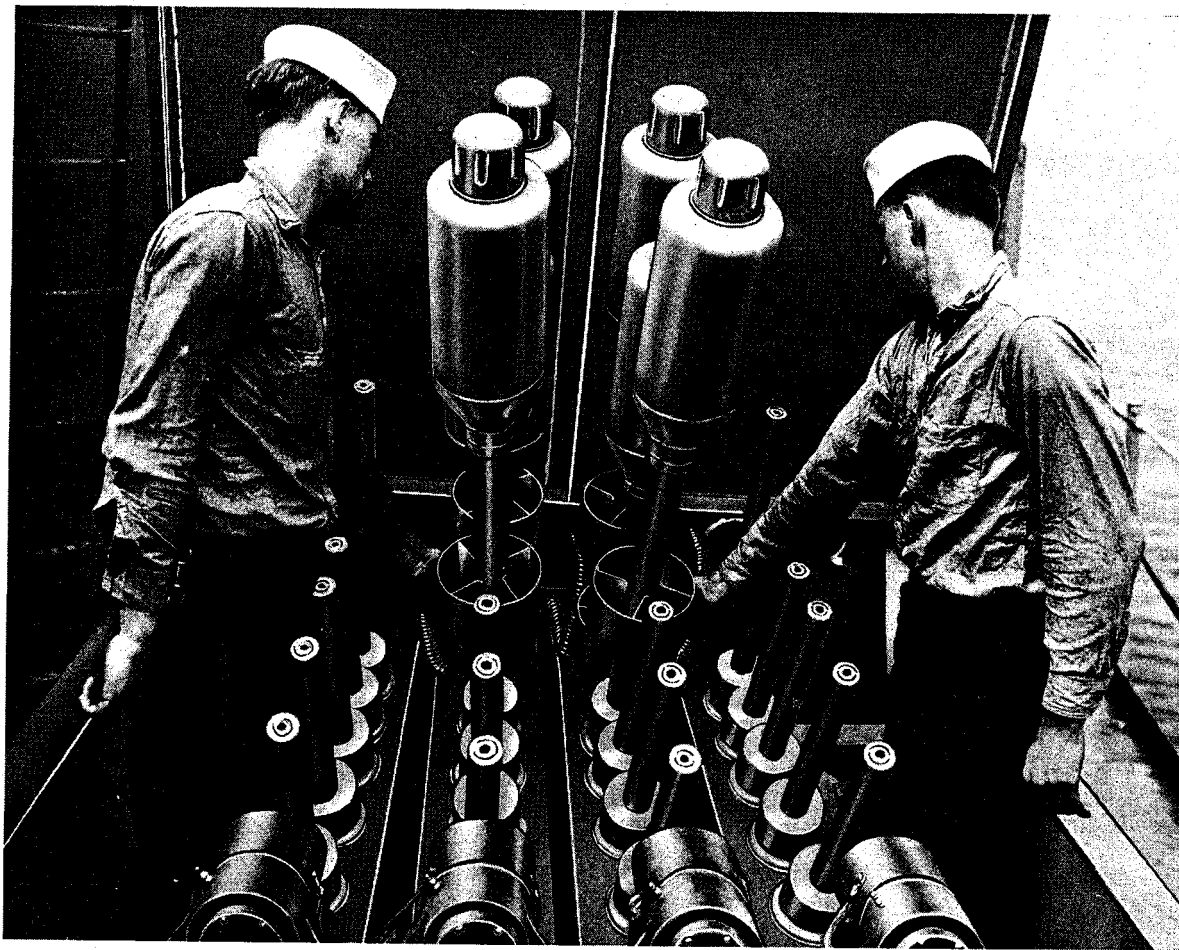


Figure 15. Loading Rear Inboard Spigots

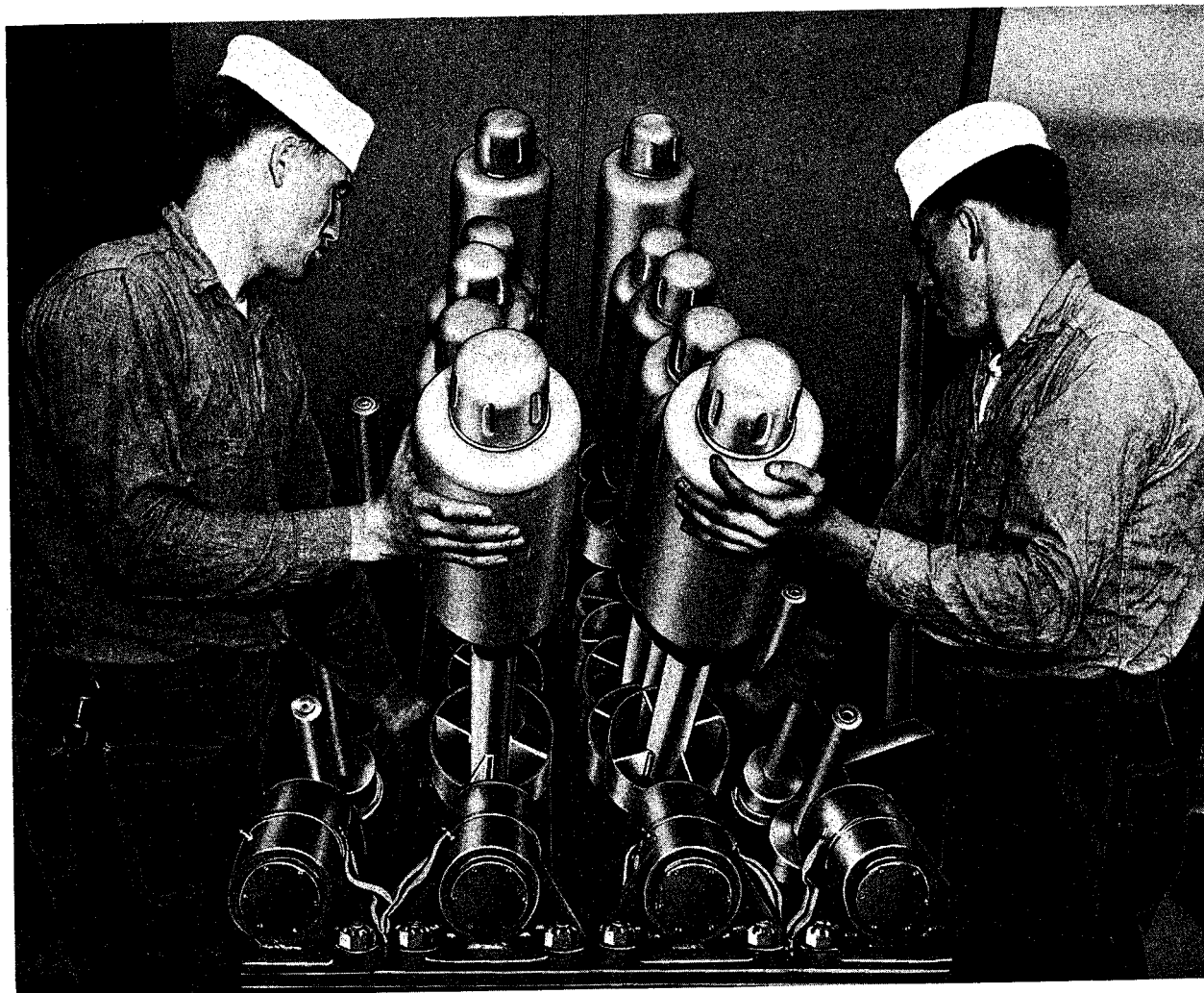


Figure 16. Loading Forward Inboard Spigots

After the spigots are loaded, the first and second loaders move aft of the projector.

WARNING

Allow no one to pass in front of the projector during and after loading.

Once the cradles have been test tilted, figures 19 and 20, as described under mount trainer's duties in the following paragraph, and again locked in position, the first loaders remove the fuze caps, figure 21, and safety pins, figure 22. The caps and pins are set aside, for replacement on the charges if the projector is not fired.

Mount Trainer. After the cradles are loaded, the mount trainer disengages the cradle locking device, at the mount captain's order. He then test tilts the cradles, if time permits, to see that the charges do not interfere with one another. This test consists of tilting the cradles all the way to port, figure 19, and to starboard, figure 20, checking the alignment of the charges at each tilt.

After the projector has been test tilted, the mount trainer again locks the cradles and the first loaders remove the fuze caps and safety pins.

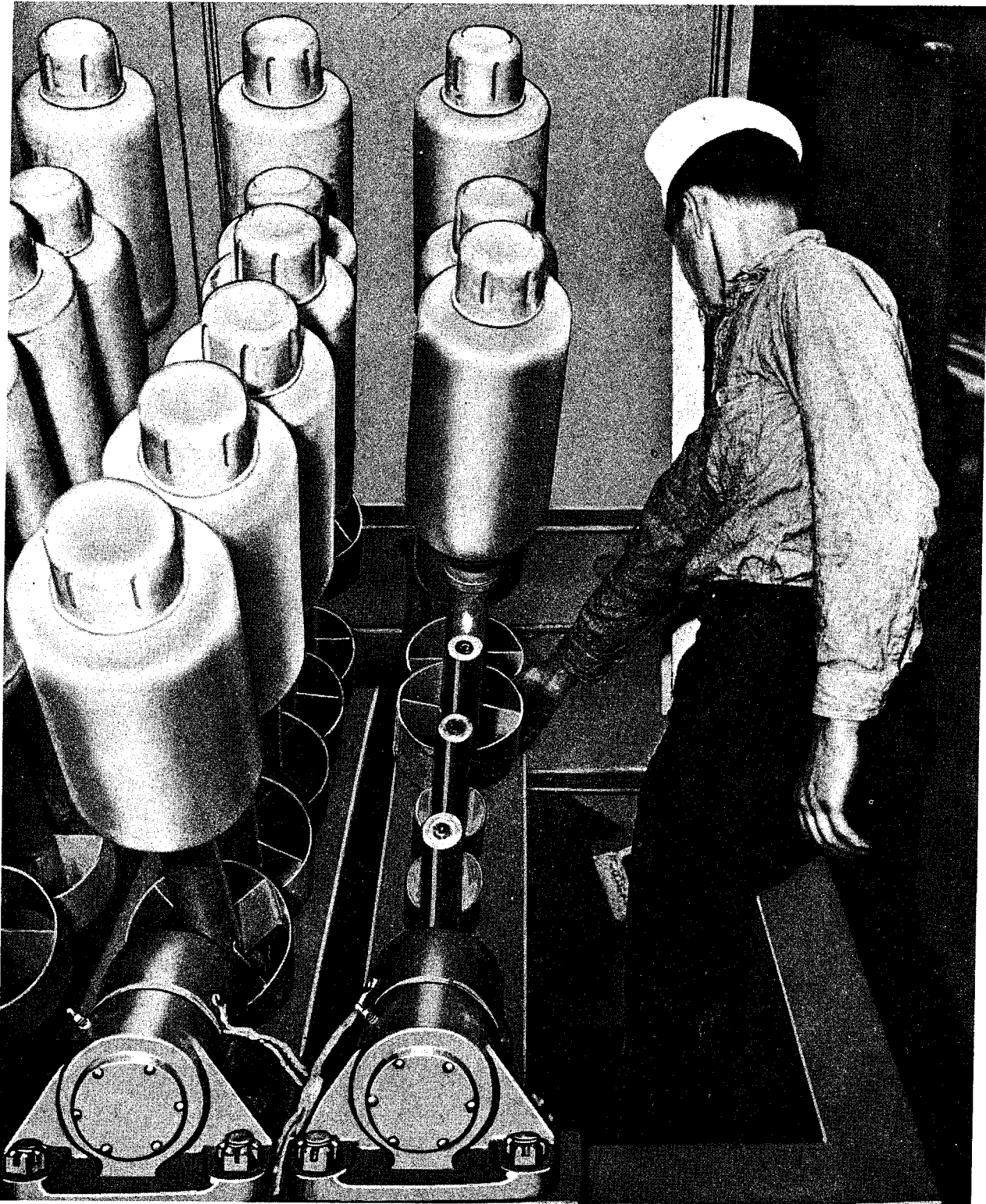


Figure 17. Loading Rear Outboard Spigots

Mount Captain. The mount captain directs the handling and loading of the projector charges.

When the loaded projector is test tilted, he checks that all charges are securely mounted on their spigots. After the cradle is locked, he orders the removal of the fuze caps and safety pins, inserts the off mount and the panel safety plugs, and reports the projector ready for firing.

Safety Observer. The safety observer's sole responsibility is to check that all safety pre-

cautions are complied with. He makes certain that the off mount and the panel safety plugs are out of their receptacles before the loading operation begins. He carefully observes the loaders during their operations to see that the charges are handled correctly and safely. He allows no one in front of the projector once loading has been started.

Firing

When the projector is loaded and ready for firing, the mount trainer disengages the cradle locking device and operates the roll correction gear.

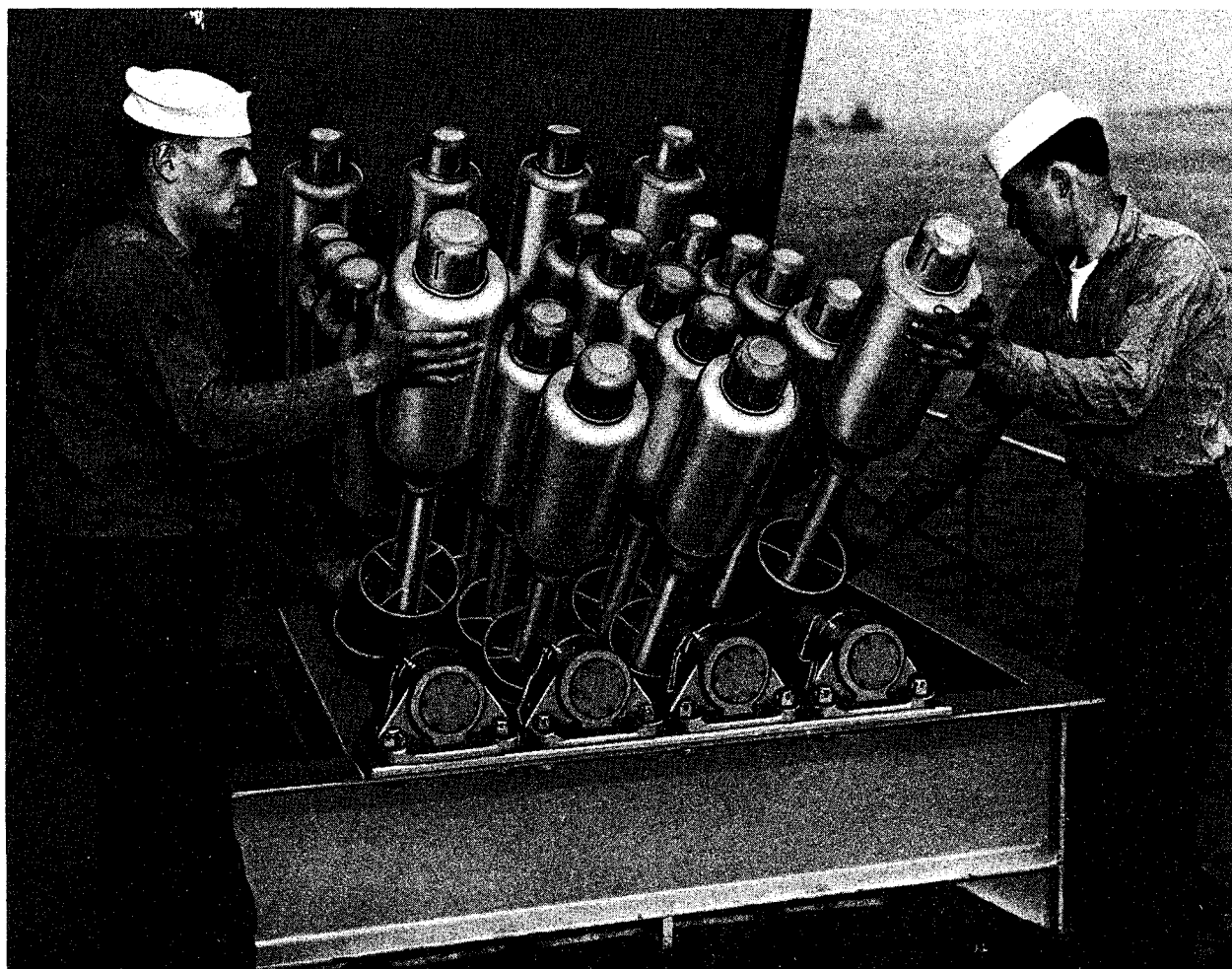


Figure 18. Loading Forward Outboard Spigots

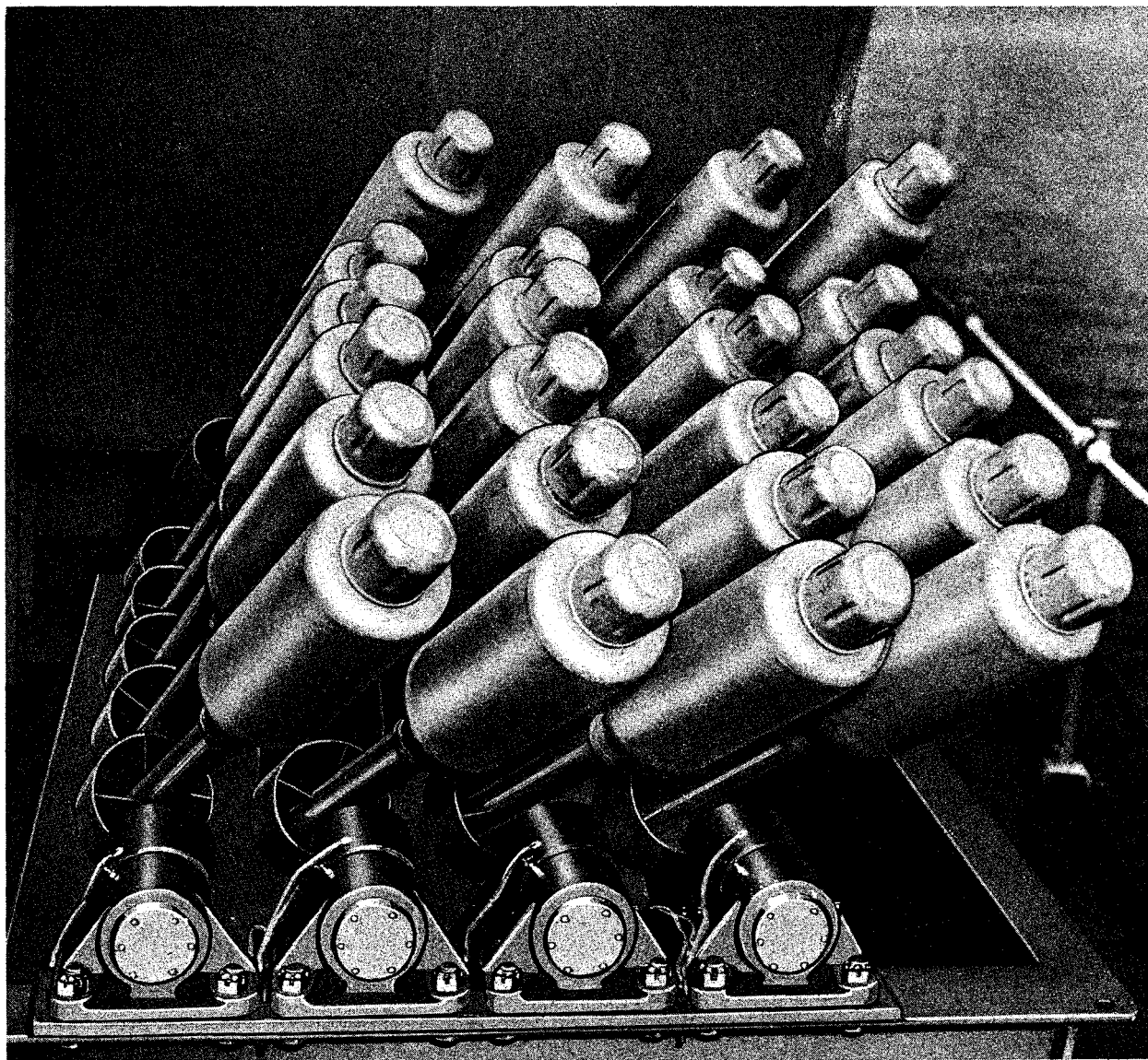


Figure 19. Test-Tilting to Port

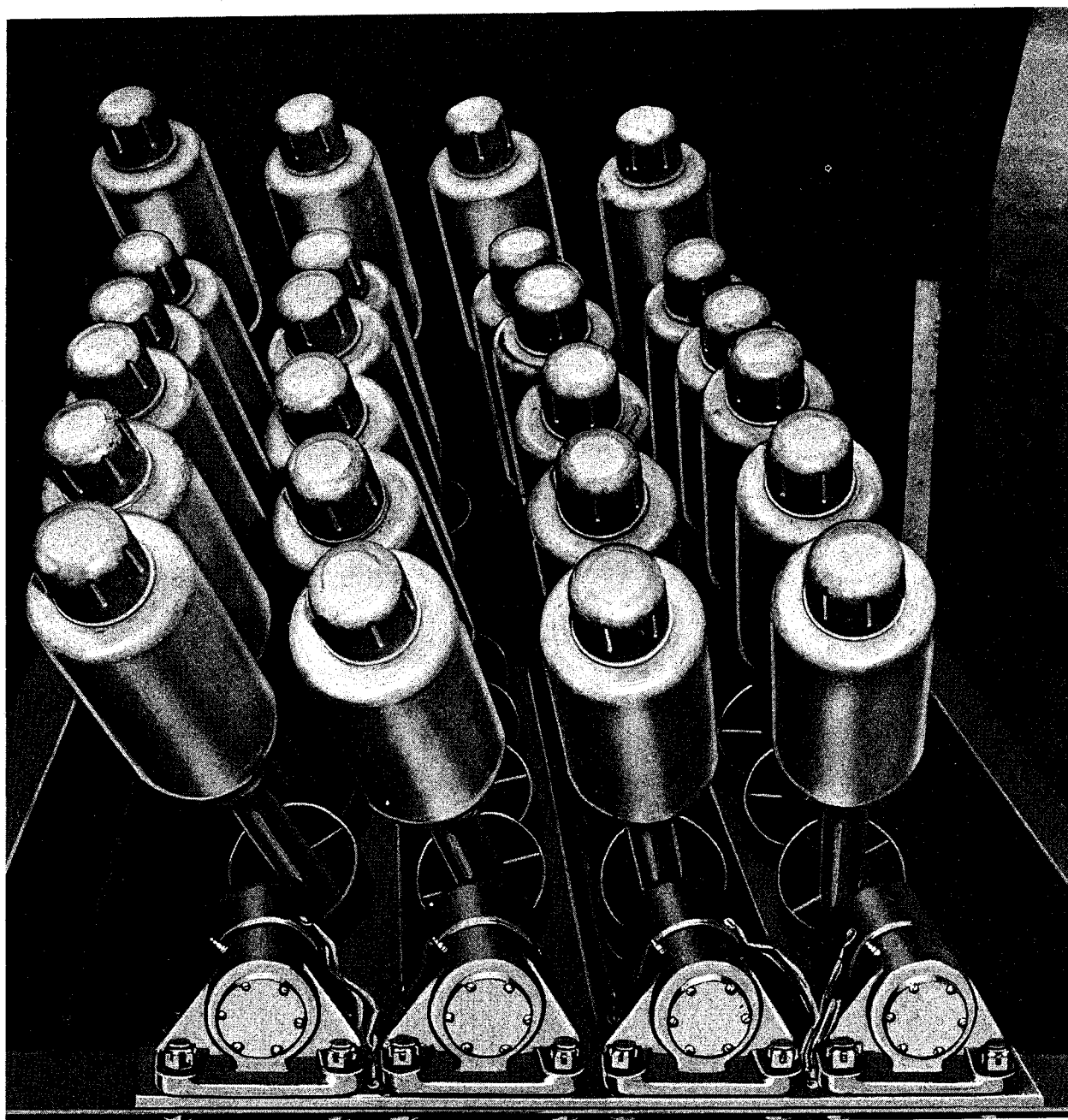


Figure 20. Test-Tilting to Starboard

The gun train indicator, mounted above the roll correction gear assembly, indicates a tilting correction received from the target designation transmitter. This correction compensates for the roll of the ship. By operating the roll correction handcranks and matching pointers on the gun train indicator, the mount trainer keeps the cradles tilted at the correct angle.

When firing the projector locally, the mount captain operates the firing mechanism on command from the plotting room. If the projector is being fired remotely, the mount captain reports all in readiness to fire, and firing power is applied from a remote control station.

After the projector is fired, the mount captain checks that all charges have been discharged. If less than 24 charges are used, he makes certain that those charges remaining on the spigots are dummy rounds.

WARNING

In case of misfires or hang-fires, keep all personnel behind the line of the blast shield for the prescribed safe time after the last attempt to fire, regardless of whether or not the off mount and the panel safety plugs and the firing key have been removed from their receptacles.



Figure 21. Removing Fuze Caps

Practice Charge

When loading a Practice Depth Charge Mk 12, a loader's hand could be severely injured by the charge shroud ring if the spigot firing pin were electrically "hot" for any reason. The charge would fire as soon as it touched the pin before he could take his hand away. The firing pin should not be "hot" if the projector is maintained correctly and all safety precautions are followed. The loading fixture, figure 21A, is provided to prevent a casualty.

WARNING

Always use the fixture when firing practice charges.

Fixture for Practice Charges. Fixtures are provided for each projector installation and conveniently stored near the projectors.

A fixture, figure 21B, is installed on each projector spigot from which it is planned to fire a practice charge. Install a fixture by sliding it over the spigot and tightening the setscrew at its lower end against the spigot boss.

Firing the Practice Charge. Place a practice charge on the spigot and insert it into the fixture until it is stopped by the interior latch just short of the firing pin.

Press the lever against the body of the fixture. This releases the latch from the aft end of the practice charge shroud and cams the charge down against the firing pin. Fire the charge in the normal manner from UB plot.

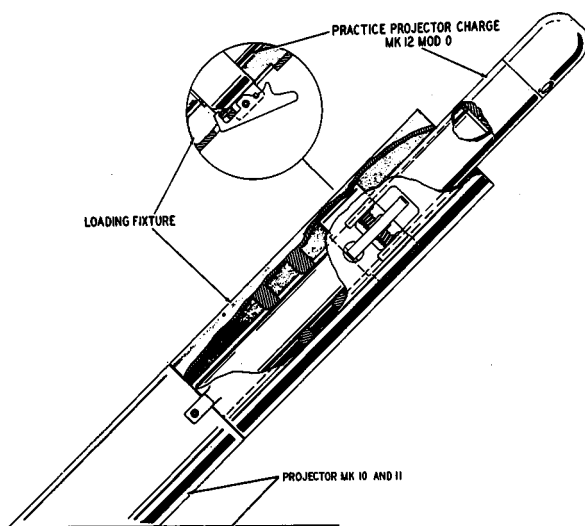


Figure 21A. Loading Fixture for Practice Charge Mk 12 Mod 0

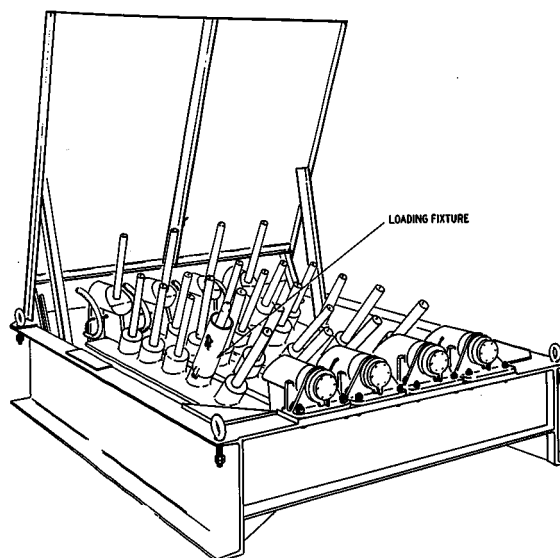


Figure 21B. Projector Mk 10 Mod 1 and Mk 11 Mod 0. Loading Fixture Installed

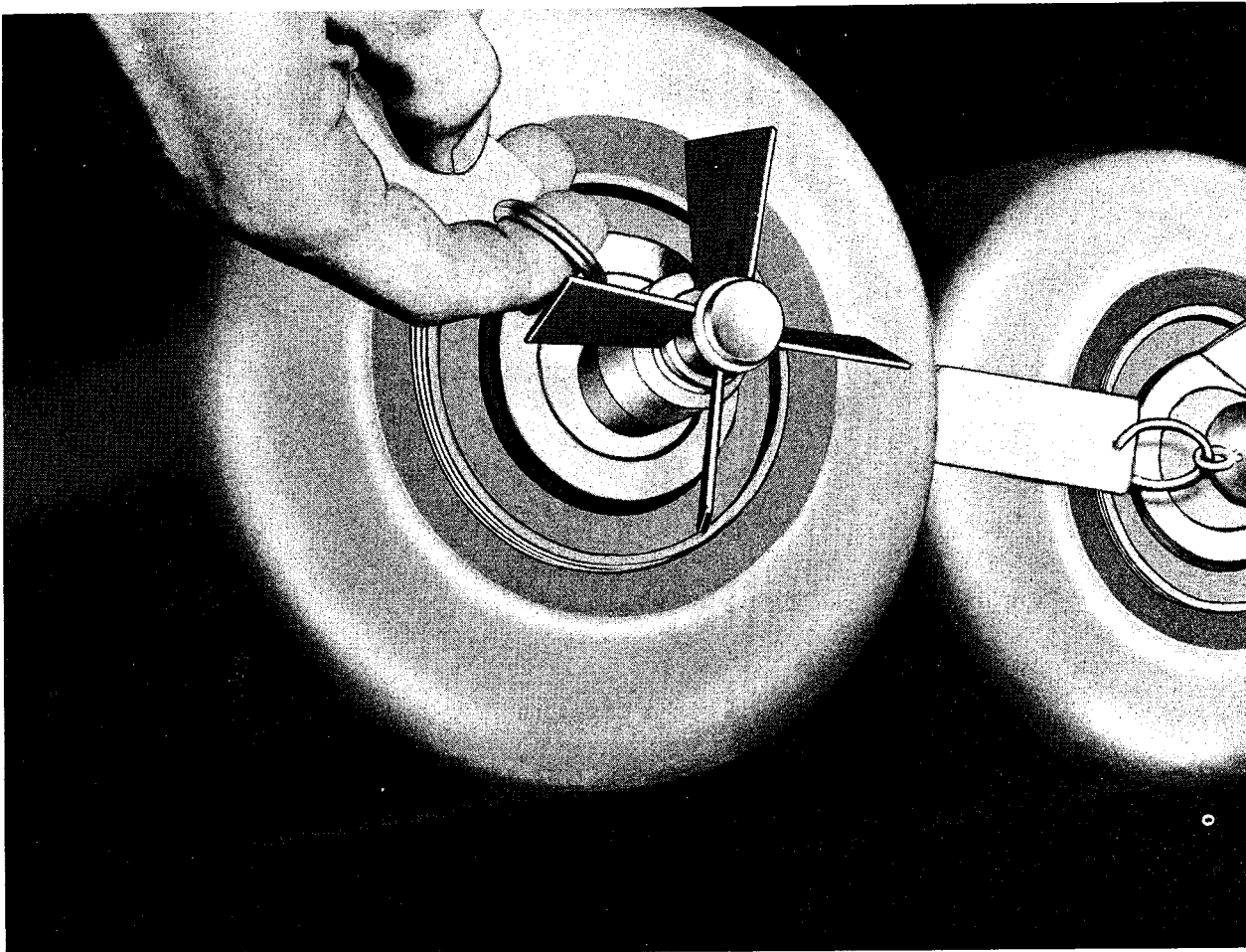


Figure 22. Removing Safety Pins

Chapter 4 MAINTENANCE

General

Maintenance of the projector and its accessories is generally divided into two groups, mechanical and electrical.

Mechanical Maintenance. Mechanical maintenance consists mainly of keeping all working surfaces well lubricated and free from corrosion, and in keeping all other parts painted so as to prevent rust or corrosion. As a fur-

ther protection against rust, keep the canvas spigot cover over the spigots when the projector is not loaded.

Electrical Maintenance. Electrical maintenance consists of keeping all portions of the electrical installation, including spigot leads and firing pins, free from mechanical damage such as abrasion, breaks, frayed insulation, etc., and from electrical shorts or corrosion of terminals.

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In all maintenance work, the special tools which are provided with the projector should be used. These include a 1.5-volt lamp, a 20-volt lamp, a special pin-type spanner wrench, and a spigot-pulling device.

Defective Wiring Test

The defective wiring test shall be performed in addition to routine checking whenever the projector or firing panel wiring is serviced or replaced.

CAUTION: Before testing the projector or firing panel, check that the off mount safety plug and the panel safety plug are removed from their receptacles. Check that no charges are on the spigots.

Firing Panels Mk 1 Mod 1 and Mk 27 Mod 0.

The procedure for making this test on projectors equipped with Firing Panel Mk 1 Mod 1 or Mk 27 Mod 0 is as follows:

- a. Energize the power circuit to the firing panel.
- b. Rotate the ripple dial successively from 12 to 1.

Check every spigot firing contact to ground for each position of the dial, using a 1.5-volt (or smaller) lamp. The lamp should not light.

The lamp must be checked for burn outs immediately before and after, and at regular intervals during this test. If the lamp visibly lights on any spigot, it shall be assumed that the projector or firing panel wiring is faulty. No loading must be attempted until the trouble is located and positively corrected.

Firing Panel Mk 33 Mod 0. The procedure for making the defective wiring test on projectors equipped with Firing Panel Mk 33 Mod 0 is as follows (note the preceding CAUTION).

- a. Check that the dial indicates "OFF."
- b. Turn selector switch to "SINGLE STEP."
- c. Insert the ^{off-mount} panel safety plug in its receptacles.
- d. Press the "SINGLE STEP" pushbutton firmly and release. The number "1" will

Prior to testing each pair of spigots, remove only the panel safety plug after each time the dial has stepped to the number. Re-insert the panel safety plug in its receptacle to step the dial to the next number.

appear in the window, indicating that the circuits are closed to spigot 1 on the starboard side and spigot 1 on the port side.

e. Press the "SINGLE STEP FIRE OR TEST" pushbutton firmly and perform the following check for each spigot.

f. Check each spigot firing contact to ground using a 1.5-volt (or smaller) lamp. The test lamp should not light. The same analysis and use of the test lamp, as stated above for Firing Panels Mk 1 Mod 1 and Mk 27 Mod 0, is applicable here. Make certain that the "SINGLE STEP FIRE OR TEST" pushbutton is closed while performing this test.

g. After the No. 1 pair of spigots has been checked, continue operating the "SINGLE STEP" pushbutton until all 12 pairs of spigots have been checked and "OFF" appears in the window.

WARNING

Do not test the projector when spigots are loaded.

Adjustments

Generally, no mechanical adjustments will be required on the projector and its accessories once the installation has been completed and inspected at the outfitting yard, provided no mechanical or other serious damage has occurred.

Spigots and firing pins may have to be replaced from time to time. The instructions for these procedures are included in the following paragraphs.

Examination and readjustment of the electrical or indicating features of the target designation transmitter and gun train indicator may be required if these instruments should get out of synchronization. Any adjustments of these instruments should be undertaken only by competent personnel who are thoroughly familiar with OP 972.

Removal of Firing Pin

To remove the firing pin, figure 23, use only the special pin-type wrench provided for this purpose.

In all maintenance work, the special tools which are provided with the projector should be used. These include a red (2 volt) test fixture, a green (20 volt) test fixture, a special pin type spanner wrench, and a spigot-pulling device.

Defective Wiring Test

The defective wiring test shall be performed in addition to routine checking whenever the projector or firing panel wiring is serviced or replaced.

CAUTION: Before testing the projector or firing panel, check that the off mount safety plug and the panel safety plug are removed from their receptacles. Check that no charges are on the spigots.

Firing Panels Mk 1 Mod 1 and Mk 27 Mod 0. The procedure for making this test on projectors equipped with Firing Panel Mk 1 Mod 1 or Mk 27 Mod 0 is as follows:

a. Energize the power circuit to the firing panel.

b. Rotate the ripple dial successively from 12 to 1. Check every spigot by placing the red test fixture over the spigot indicated by the dial position. The lamp in the test fixture should not light.

The lamp must be checked for burn-outs immediately before and after, and at regular intervals during this test. If the lamp visibly lights on any spigot it shall be assumed that the projector or firing panel wiring is faulty. No loading must be attempted until the trouble is located and positively corrected.

Firing Panel Mk 33 Mod 0. The procedure for making the defective wiring test on projectors equipped with Firing Panel Mk 33 Mod 0 is as follows (note the preceding CAUTION).

a. Check that the dial indicates "OFF."

b. Turn selector switch to "SINGLE STEP."

c. Insert the off-mount and panel safety plugs in their receptacles.

d. Press the "SINGLE STEP" pushbutton firmly and release. The number "1" will appear in the window, indicating that the circuits are closed to spigot 1 on the starboard side and spigot 1 on the port side.

Prior to testing each pair of spigots, remove only the panel safety plug after each time that the dial is stepped one number. Reinsert the panel safety plug in its receptacle to step the dial to the next number.

e. Press the "SINGLE STEP FIRE OR TEST" pushbutton firmly and perform the following check for each spigot.

f. Check each spigot by placing the red test fixture over the spigot indicated in the window of the firing panel. The lamp in the test fixture should not light. The same analysis and use of the test fixture as stated previously for Firing Panels Mk 1 Mod 1 and Mk 27 Mod 0 is applicable here. Make certain that the "SINGLE STEP FIRE OR TEST" pushbutton is closed while performing this test.

g. After the No. 1 pair of spigots has been checked, continue operating the "SINGLE STEP" pushbutton until all 12 pairs of spigots have been checked and "OFF" appears in the window.

WARNING

Do not test the projector when spigots are loaded.

Adjustments

Generally, no mechanical adjustments will be required on the projector and its accessories once the installation has been completed

and inspected at the outfitting yard, provided no mechanical or other serious damage has occurred.

Spigots and firing pins may have to be replaced from time to time. The instructions for these procedures are included in the following paragraphs.

Examination and readjustment of the electrical or indicating features of the target design-

nation transmitter and gun train indicator may be required if these instruments should get out of synchronization. Any adjustments of these instruments should be undertaken only by competent personnel who are thoroughly familiar with OP 972.

Removal of Firing Pin

To remove the firing pin, figure 23, use only the special pin-type wrench provided for this purpose.

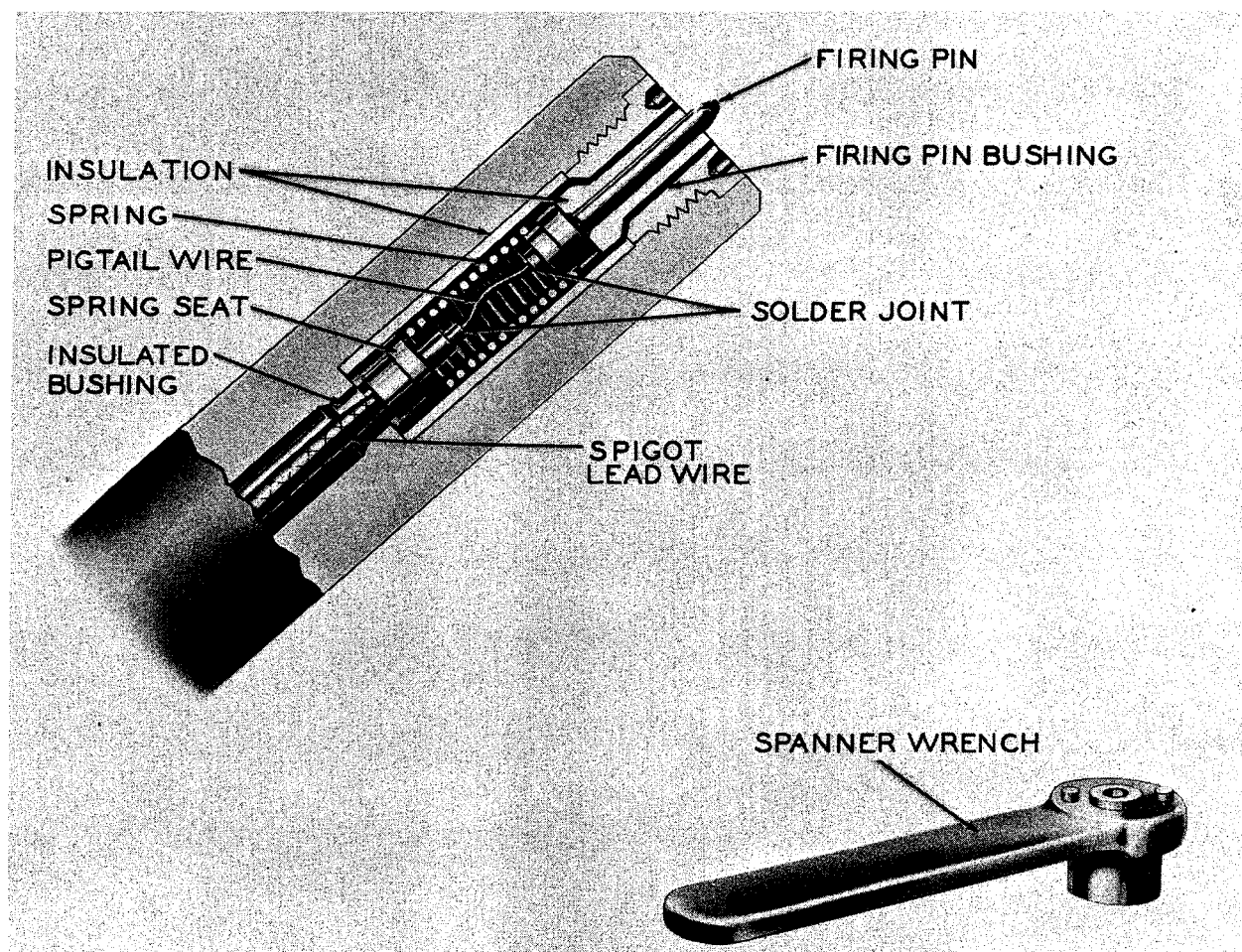


Figure 23. Firing Pin Removal

This wrench is constructed so as to hold the firing pin and insulation sleeve away from the firing pin bushing as it is unscrewed. If the firing pin is allowed to turn with the bushing, the pigtail wire may be broken.

After removing the bushing, pull the firing pin assembly out of the housing, being careful to feed enough wire up through the spigot so that the complete assembly can be removed.

The firing pin and spring should be removed and cleaned at least once a week. Use light oil on the firing pin and spring before replacing.

If a pigtail wire is broken, replace it from the spare parts.

Spigot Removal

To remove a damaged spigot, figure 24, from the spigot socket, use the spigot pulling device provided.

The spigot puller is a steel tube that fits over the spigot and bears against the spigot socket.

After the firing pin assembly has been removed, unscrew the spigot socket setscrew. Screw the threaded end of the bolt at the top of the puller into the spigot as far as it will go. Then tighten the threaded nut at the upper end of the puller. As this nut is tightened, the bolt is withdrawn, pulling the spigot out of the socket.

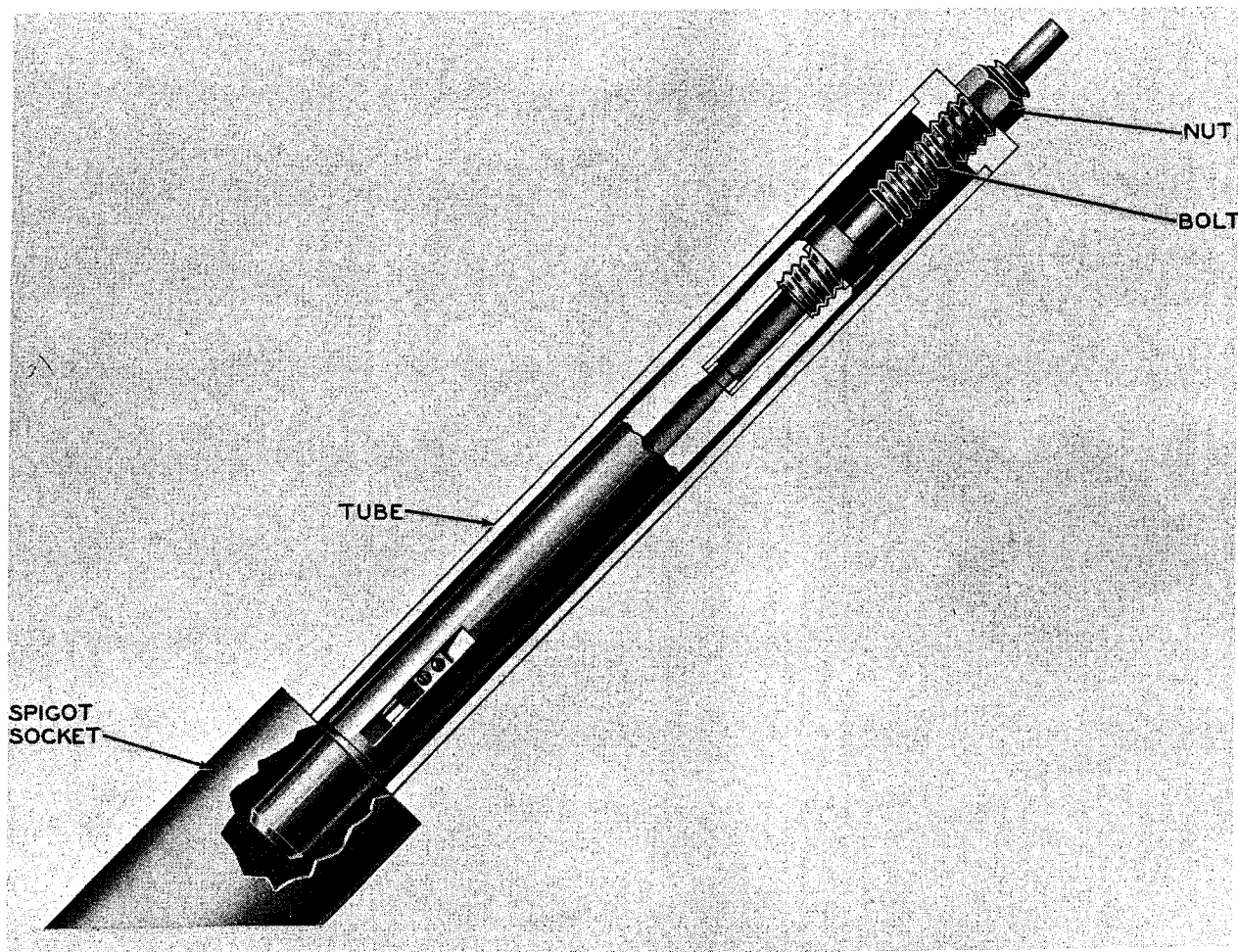


Figure 24. Spigot Removal

If the spigot tends to turn in its socket, it may be necessary to use a second wrench to secure the flattened end of the bolt while the nut is being tightened. Do not use a pipe wrench on the spigots.

Replacing the Spigot

Place the spigot in the socket so that the setscrew flat is in line with the socket setscrew hole.

If it is necessary to use force in replacing the spigot, place a block of wood over the spigot and use a hammer to drive in the spigot. Inspect the end of the spigot to see whether or not it has been damaged during removal or replacement. Remove any burrs, using a file if necessary.

Lubrication

Lubrication instructions for the projectors are given on BuOrd Dwg. 516706. This drawing indicates access locations, designates the required lubricants, and specifies the frequency of application.

Lubrication instructions for the Gun Train Indicator are given on BuOrd Dwg. 516482.

References

For further details of Projectors Mk 10 Mod 1 and Mk 11 Mod 0, refer to the following BuOrd Drawings and Lists of Drawings.

	<i>Projector Mk 10 Mod 1</i>	<i>Projector Mk 11 Mod 0</i>
List of Drawings	Sk. No. 109302	Sk. No. 262347
General Arrangement— Right Side Elevation	Dwg. No. 423601	Dwg. No. 367425
General Arrangement— Plan View and Sections	Dwg. No. 423603	Dwg. No. 367426
General Arrangement— Rear Elevation	Dwg. No. 423602	Dwg. No. 367427
Lubrication Chart	Dwg. No. 516706	Dwg. No. 516706
Wiring Diagram	Dwg. No. 367494	Dwg. No. 367494

Chapter 5

SAFETY PRECAUTIONS

General

The safety precautions listed below must be observed at all times.

a. Keep the cradle locking device in the locked position at all times except when actually using or greasing the projector.

b. Keep the off mount safety plug dry at all times.

c. Allow no one forward of the line of the blast shield when the projector is loaded and the off mount safety plug and the panel safety plug are connected.

d. Remove the off mount safety plug, the panel safety plug, and the firing key from their receptacles and lock the cradles securely at 0 degree tilt before and during any operation involving loading of the projector or removal of the fuze caps or safety wires. The removed safety plugs must be physically kept upon the person responsible for safety.

e. Never tilt cradles while personnel are inside the base frame.

f. Lower projector charges on the spigots gently, making sure each is seated properly; give each charge at least one full turn after it is in place.

g. In case of misfires or hang-fires, keep personnel behind the line of the blast shield for the prescribed safe time after the last attempt to fire, regardless of whether or not the off mount safety plug, the panel safety plug, and the firing key have been disconnected.

h. Never test any electrical components of the projector when charges are on the spigots.

i. During projector firing, keep personnel in exposed areas to a minimum. Due to the expelling of the exploded propelling charge cartridge from the tailpiece of the charge, all personnel required to be in exposed areas should wear battle helmets.

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**PROJECTORS MARK 10 MOD 1 AND MARK 11 MOD 0
DESCRIPTION, OPERATION, AND MAINTENANCE**