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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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75-mm PACK HOWITZER M1A1 AND CARRIAGE M8

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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

T M 9–319

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75-mm PACK HOWITZER M1A1 AND CARRIAGE M8



DEPARTMENT OF THE ARMY *NOVEMBER 1948*

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DEPARTMENT OF THE ARMY
Washington 25, D. C., 17 November 1948

TM 9–319, 75-mm Pack Howitzer M1A1 and Carriage M8, is published for the information and guidance of all concerned.

[AG 300.7 (24 May 45)]

BY ORDER OF THE SECRETARY OF THE ARMY:

OMAR N. BRADLEY
Chief of Staff, United States Army

OFFICIAL:

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PART ONE

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the information of the using arms and services. It contains technical information required for the identification, operation, use, and care of the howitzer, carriage, ammunition, and accessory equipment.

b. In all cases where the nature of repair, modification, or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed so that trained personnel with suitable tools and equipment may be provided or proper instructions issued.

2. Records

a. Artillery Gun Book. (1) The Artillery Gun Book, O. O. Form 5825 (this form is available from the Office, Chief of Ordnance), is used to keep an accurate record of the matériel. The gun book is stored in gun book cover M539. The book is divided as follows: Record of assignment; battery commander's daily gun record; and the inspector's record of examination.

Note. Record of assignment data must be removed and destroyed prior to entering combat.

These records are important for the following reasons:

(*a*) They inform unit commanders of the condition and serviceability of the weapons under their jurisdiction.

(*b*) They serve as the record of use and maintenance of the matériel and expedite effective maintenance.

(*c*) They serve as a source of technical data to the Ordnance Department for the improvement of weapons and furnish valuable design data for the development of new weapons.

(2) Complete instructions on how to make entries in the Artillery Gun Book are contained therein. *It is absolutely essential that the gun book be kept up to date, and that the gun book accompany the matériel at all times regardless of where it may be sent.* In order to facilitate proper maintenance of the howitzer and its related matériel (that is, carriage, recoil mechanism, and associate fire control equipment) and to avoid unnecessary duplication of repairs and maintenance, the following additional entries in the gun book are prescribed:

(*a*) A record of completed army modification work orders. The record will show the date completed and bear the initial of the officer or mechanic responsible for completion of the modification.

(*b*) A record of the seasonal changes of lubricant and recoil oil in sufficient detail to prevent duplication and afford proper identification by the inspector.

(*c*) The estimated accuracy life of the howitzer is listed in paragraph 6. The gun book contains information on method of calculating full service rounds. The reference to OFSB 4–1 in paragraph 6 of the gun book should be deleted.

(*d*) When a removable tube is replaced, an entry of the proof firing and bore diameter data shown on the star gage record which accompanies a new tube will be made in the gun book. Proof facilities will complete and forward star gage records with new tubes, attached in the same general manner as prescribed for gun books ((3) below). The tube serial number and all pertinent firing data for the removed tube which are contained in the gun book will be extracted onto a history of cannon report. History of cannon reports will be extracted in letter form and forwarded through technical channels to the Chief of Ordnance, Washington 25, D. C. ATTENTION: ORDFM—Weapons Section.

(3) The following procedure is prescribed to insure that the Artillery Gun Book will always accompany the matériel whenever it is shipped or transferred from one organization to another.

(*a*) During transfer or shipment, the gun book will be kept in a waterproof envelope securely fastened to the matériel with waterproof tape.

(*b*) Under one of the wrappings of tape, one end of a small tab will be inserted reading "Gun Book Here."

(4) Instructions for making gun book entries and the procedure for keeping the gun book with the cannon when it is shipped or transferred from one organization to another must be strictly followed. Ordnance maintenance units, base shops, and depots will insist that the gun book accompany each cannon when it enters their shop for repairs or maintenance.

(5) If a gun book is lost, it will be replaced at once and all

available data will be entered in the new gun book. Additional copies of Artillery Gun Book (O. O. 5825, Official Stock No. 28–F–67990) may be requisitioned through normal ordnance supply channels. A gun book which has become separated from the weapon to which it pertains and for which efforts to locate the weapon have failed, will be forwarded immediately to the Chief of Ordnance, Washington 25, D. C. ATTENTION: ORDFM—Weapons Section.

(6) When the cannon, including breech ring or receiver, is condemned, destroyed, turned in for salvage, or otherwise lost from service, the gun book will be forwarded with proper notation to the Chief of Ordnance, Washington 25, D. C. ATTENTION: ORDFM—Weapons Section. Information contained in the gun book to be returned which pertains to the carriage, recoil mechanism, or other weapon components being retained in service will be extracted and inserted in the gun book pertaining to the replacement cannon.

b. Field Report of Accidents. When an accident involving ammunition occurs, the incident will be reported as prescribed in AR 750–10 by the ordnance officer under whose supervision the ammunition is maintained or issued.

c. Unsatisfactory Equipment Report. Suggestions for improvement in design, maintenance, safety, and efficiency of operation prompted by chronic failure or malfunction of the weapon, spare parts, or equipment, should be reported on WD AGO Form 468, Unsatisfactory Equipment Report, with all pertinent information necessary to initiate corrective action. The report should be forwarded to the Chief of Ordnance, Washington 25, D. C. ATTENTION: ORDFM—Weapons Section, through technical channels in accordance with instruction No. 7 on the form. Such suggestions are encouraged in order that other organizations may benefit.

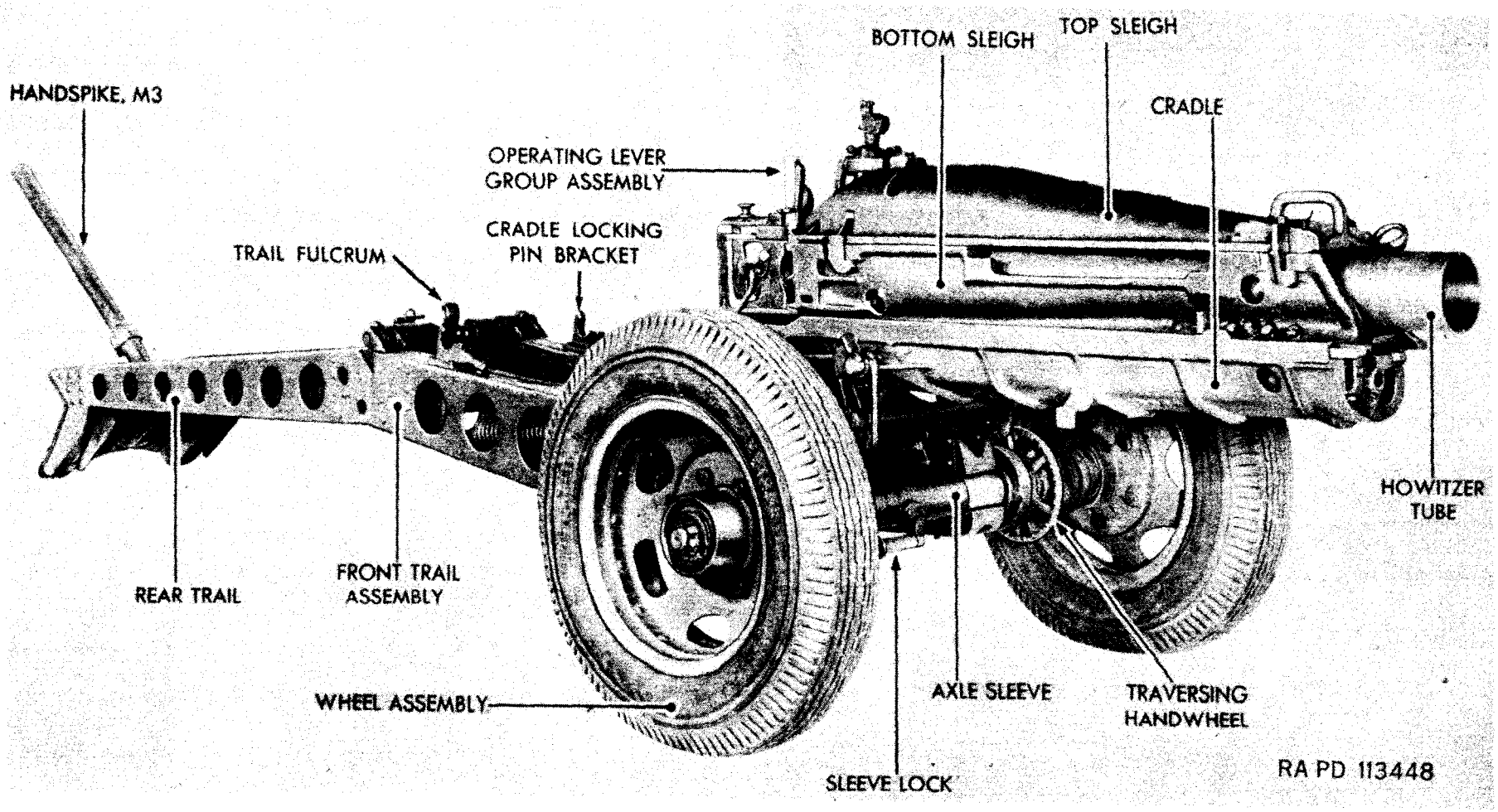


Figure 1. 75-mm pack howitzer M1A1 and carriage M8—right front view.

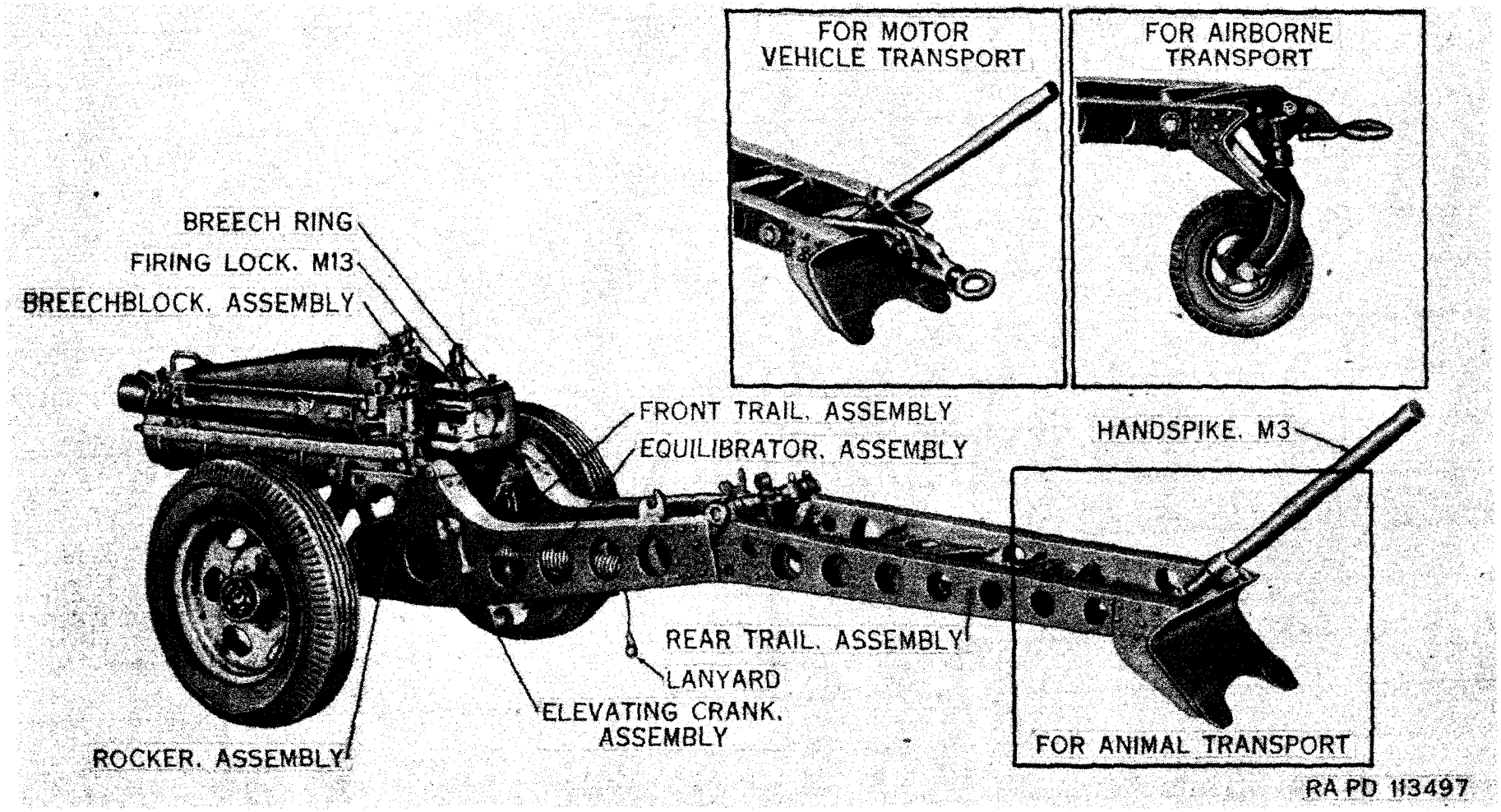


Figure 2. 75-mm pack howitzer M1A1 and carriage M8—left rear view.

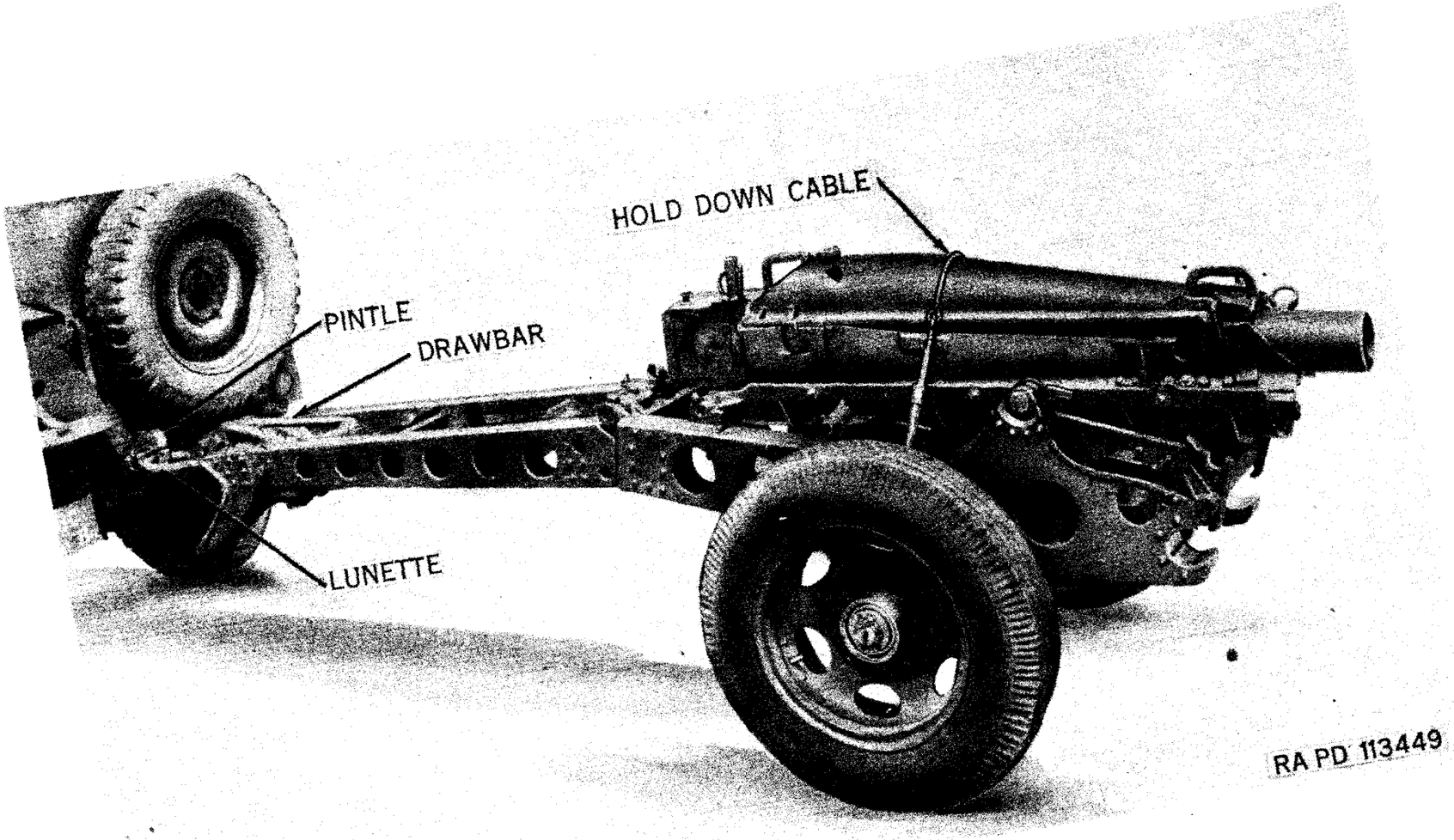


Figure 3. 75-mm pack howitzer M1A1 and carriage M8—in towing position.

Section II. DESCRIPTION AND DATA

3. General

a. The 75-mm pack howitzer matériel is a mobile, general purpose field artillery piece. It is manually operated, single loaded, and uses fixed and semifixed ammunition. The firing mechanism is a continuous pull (self-cocking) type, actuated by pulling a lanyard. The recoil mechanism is a hydropneumatic type, having a floating piston and a pneumatic respirator. It is used for either direct or indirect fire and can be elevated to high angles to deliver plunging fire on a target.

b. The matériel is composed of the 75-mm pack howitzer M1A1, with recoil mechanism M1A4 or M1A6, mounted on the 75-mm howitzer carriage M8 (figs. 1 and 2).

c. The 75-mm pack howitzer matériel can be disassembled into nine major components for paracrate packing in parachute delivery and into eight major components for mule pack in animal transport. It can be placed in traveling position for towing behind a prime mover (fig. 3). Snow skis are furnished for towing over soft mud or snow.

4. Serial Number Information

a. General. Four serial numbers are required for records concerning the components of this matériel. They are the howitzer serial number, the breech ring serial number, the carriage serial number, and the recoil mechanism serial number. Serial numbers of all major components will be entered in the gun book.

b. Howitzer Serial Number. This number is stamped on the tube (fig. 4, B) together with the model designation, name of manufacturer, year of manufacture, and weight of tube.

c. Breech Ring Serial Number. This number is stamped on the breech ring (fig. 4, A).

d. Carriage Serial Number. This number is stamped on the carriage name plate on the left side of the front trail assembly, together with the model designation, name of manufacturer, and year of manufacture (fig. 5, B).

e. Recoil Mechanism Serial Number. This number is stamped on the recoil mechanism name plate on the left side of the bottom sleigh, together with the model designation, name of manufacturer, and year of manufacture (fig. 5, A).

5. Differences Between Models

a. The recoil mechanism M1A6 differs from the recoil mechanism M1A4 in that a modified recoil piston rod collar assembly and

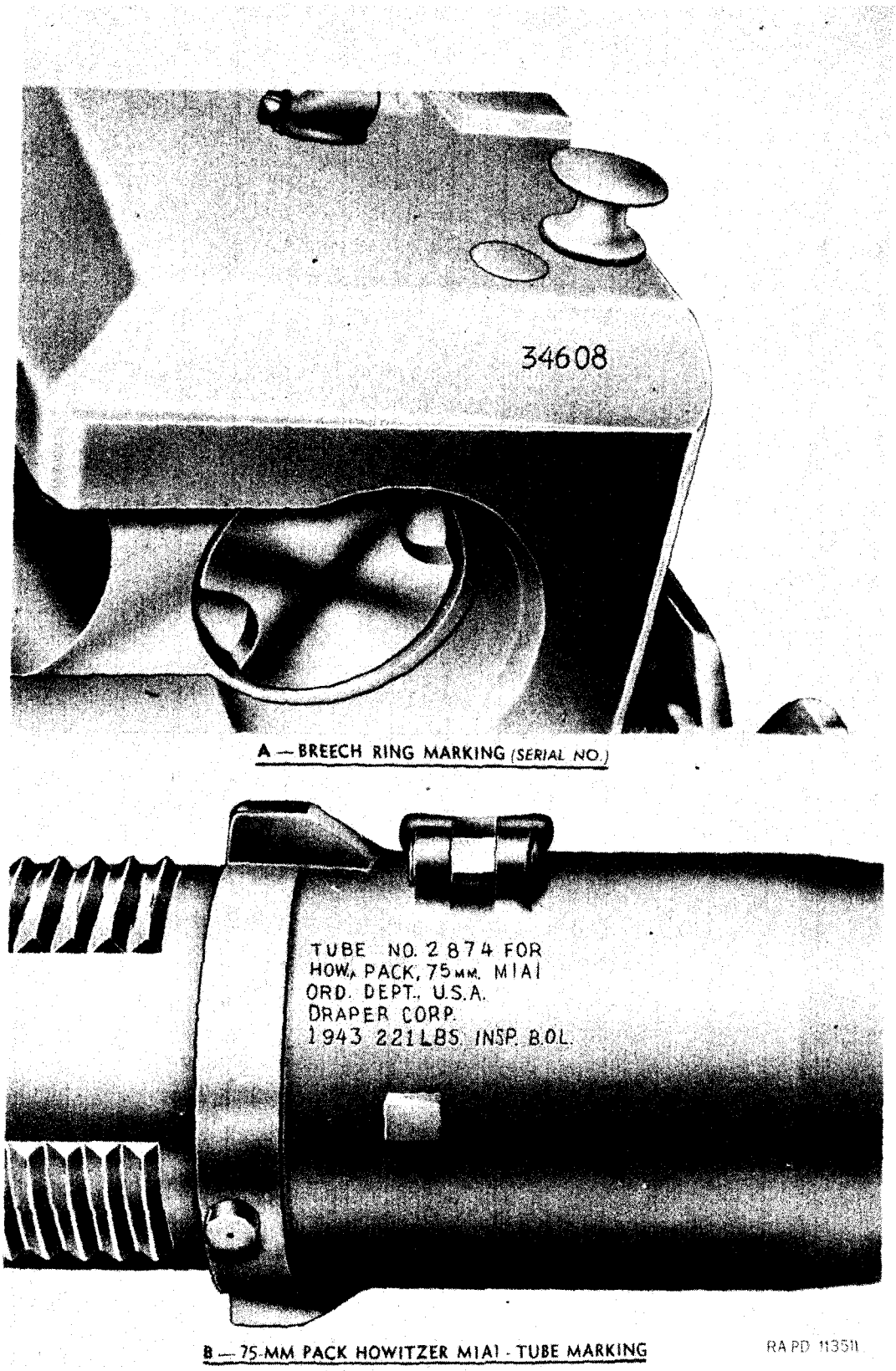
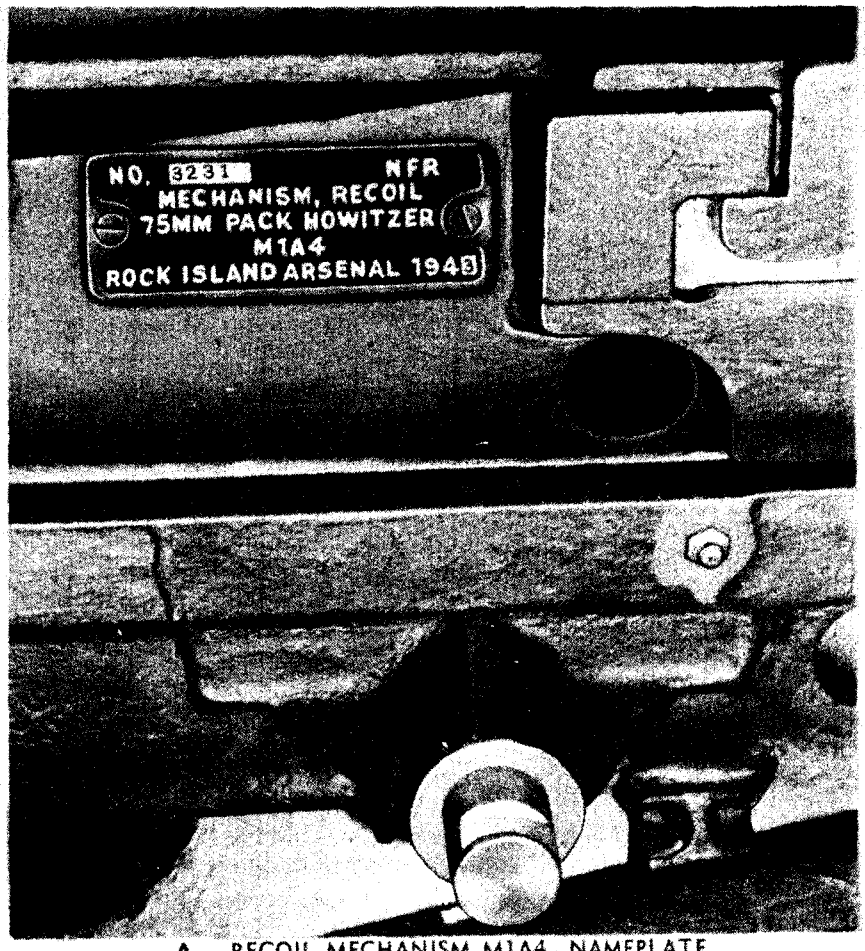
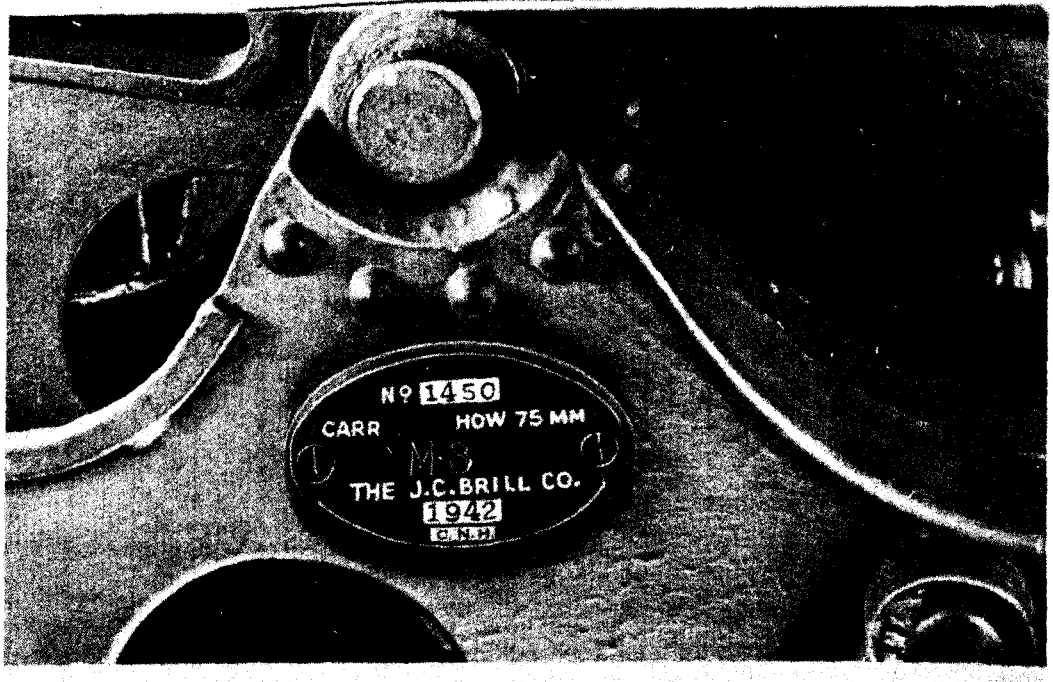


Figure 4. Location of tube and breech ring identification markings.



A — RECOIL MECHANISM M1A4 - NAMEPLATE



B — 75-MM PACK HOWITZER CARRIAGE M8 - NAMEPLATE RA PD 113512

Figure 5. Location of carriage and recoil mechanism name plates.

piston rod collar stop replaces those items on the M1A4 model and stronger bolts are used to fasten the cylinder support to the bottom sleigh. The bottom sleigh is also modified in order to employ a hold-down device instead of the hold-down cable.

b. Carriages issued to airborne units are equipped with a caster wheel mounted on the drawbar to facilitate manual transport of the weapon by the gun crew. Those carriages issued to units furnished a prime mover are equipped with a drawbar for towing. Those carriages issued to pack animal units are not equipped with the drawbar or the caster wheel.

c. The distribution of the matériel between the paracrate loads differs with the use of aluminum, wood, or metal paracrates.

d. The placement of the loads on the airplane differs with the use of aluminum, metal, or wood paracrates as follows:

Pararack No.	*Paracrate No. (aluminum)*	*Paracrate No. (metal)*	*Paracrate No. (wood)*
1	M15	M5A2	M4.
2	M16	M6A1	M5.
3	M14	M4A2	M1.
4	M13	M3A2	M3.
5	Paracaisson, M18	Paracaisson, M9A2	M2.
6	Parachest, M17	Parachest, M8A1	Paracaisson, M9.
Door load	M1, M2, and M7A1	M1, M2, and M7A1	M6, M7, and Parachest, M18.

6. Tabulated Data

a. Data Pertaining to 75-mm Pack Howitzer M1A1.

(1) *General.*

Weight of howitzer (with breech mechanism) ..... 341 lb.
Weight of tube ..... 221 lb.
Weight of tipping parts ..... 839 lb.
Length of howitzer (with breech ring) ..... 59 in.
Length of tube ..... (15.93 cal.) 47 in.
Rifling—
  Number of grooves 28
  Twist ..... Uniform, right-hand, one turn in 20 calibers.
Diameter of bore ..... (2.95 in.) 75-mm
Type of breechblock ..... Horizontal sliding wedge
Weight of breech mechanism ..... 121 lb.
Type of firing mechanism ..... Continuous pull

(2) *Performance (average for new howitzer).*

Muzzle velocity—
  Shell, H.E., M48, with charge 4 (max.) ..... 1,250 fps.
  Shell, H.E., M48, with charge 1 (min.) ..... 700 fps.
Range (max.) (Shell, H.E., M48 at 772.5 mils elevation) .. 9,620 yds.
Rate of fire (equivalent full charge rounds in cool tube):
  First ½ minute ..... 16 rounds per minute

First 4 minutes ..... 6 rounds per minute
First 10 minutes ..... 5 rounds per minute
Prolonged fire ..... 150 rounds per hour
Maximum number of rounds which should be fired consecutively before cooling ..... 60 rounds
Estimated accuracy life of tube (equivalent full charge rounds) ..... 20,000 rounds
Ammunition ..... For complete ammunition data, see section XXXI

b. Data Pertaining to 75-mm Howitzer Carriage M8.

(1) *General.*

Time to emplace (paracrate loads) ..... 7 min.
Time to emplace (pack loads) ..... 3 min.
Weights—
Howitzer and carriage (complete with accessories) .. 1,440 lb.
Wheel with tire (each) ..... 90 lb.
At lunette ..... 40 lb.
Dimensions in traveling position, over-all:
Length ..... 126 in.
Width ..... 50 in.
Height ..... 33 in.
Road clearance ..... 10 in.
Method of transportation:
Towed by prime mover (truck, ¼-ton, 4 x 4 or carrier, cargo, M29 or M29C).
Carried as a unit in airplanes C46, C47, or C82.
Carried as a unit in gliders CG–4A or CG–15A.
Packed in paracrate loads for parachute delivery from airplanes C46, C47, or C82.
In pack loads for animal transport.
Type of equilibrator ..... Spring
Type of trails ..... Modified box
Tires and tubes:
Type and size ..... 6.00 x 16
Air pressure ..... 20 lb. per sq. in.

(2) *Performance.*

Limits of elevation—
Maximum ..... (45 deg.) 800 mils
Depression ..... (—5 deg.) —89 mils
Elevation per turn of handwheel ..... 24 mils
Limits of traverse (right or left) ..... (3 deg.) 53 mils
Maximum total traverse ..... (6 deg.) 106 mils
Type of traverse ..... Axle
Traverse per turn of handwheel ..... 4.1 mils

c. Data Pertaining to Recoil Mechanism M1A4 or M1A6.

(1) *General.*

Nitrogen pressure at 70° F. ..... 1,250 lb. per sq. in.
Type of recoil mechanism ..... Hydropneumatic, constant, w/floating piston.
Type of counterrecoil mechanism .... Hydropneumatic, dependent, w/floating piston.
Weight (with bottom sleigh) ..... 217 lb.
Recoil oil—
Type ..... See lubrication order.
Reserve in recuperator (counterrecoil) ..... ½ a fill of oil filling gun

(2) *Performance.*

Normal recoil (varies with charge) ..... 25 to 31 in.
Maximum allowable recoil ..... 32 in.

d. Data Pertaining to Sighting Equipment.

SIGHT UNIT, M28A1 (with equipment)
(Consisting of—
TELESCOPE, panoramic, M1
MOUNT, telescope, M3A1 and equipment
LIGHT, instrument, M13
COVER, telescope and mount, M410)
SIGHT UNIT, M29A1 (with equipment)
(Consisting of—
TELESCOPE, elbow, M62
ADAPTER, telescope, M9
MOUNT, telescope, M3A1 and equipment
LIGHT, instrument, M46
COVER, telescope and mount, M410)
SIGHT, bore, muzzle (15–2A–11) (RF11AD)
SIGHT, bore, breech (15–2A–11) (RF11HA)
TARGET, testing (C57280) for sightunit, M28A1 or (C7159200) for sightunit, M29A1
*CHEST, spare sight, M6 (D7418) (without contents)
CHEST, lighting equipment, M21 (without contents)
LIGHT, aiming post, M14, green filter
LIGHT, aiming post, M14, red filter
QUADRANT, gunner's, M1 (with equipment)

e. Data Pertaining to Fire Control Equipment.

SETTER, fuze, M22 ..... Hand type
WRENCH, fuze, M16 (41–W–1496–115) ..... Hand type
WRENCH, fuze, M18 (41–W–1496–135) ..... Hand type
WRENCH, fuze, M7A1 (41–W–1596–50) ..... Hand type
TABLE, firing, 75–I–4 (FM 21–6)

f. Data Pertaining to Paracrate Loads. (Pack howitzer, carriage, spare parts, and accessories packed for parachute delivery.)

*One per battery of four howitzers.

(1) For data concerning wood paracrates, see paragraphs 31 to 45, inclusive.

(2) For data concerning metal paracrates, see paragraphs 46 to 47, inclusive.

(3) For data concerning aluminum paracrates, see paragraphs 48 to 49, inclusive.

g. Data Pertaining to Mule Pack Loads. (Pack howitzer, carriage, spare parts, and accessories packed for animal transport.) For data, see paragraph 62.

h. Data Pertaining to Subcaliber Equipment.

(1) *Data pertaining to 37-mm subcaliber gun M12.*

Model of gun M12
Weight of gun ..... 35 lb.
Length of gun ..... 30 in.
Length of bore ..... 29.11 in.
Type of breechblock, Type of firing mechanism ..... Uses 75-mm howitzer breechblock and firing mechanism
Ammunition ..... For complete ammunition data, see section XXXI

(2) *Data pertaining to 37-mm gun M1916 and recoil mechanism M1916.*

(*a*) *General.*

Model of gun M1916
Model of recoil mechanism M1916
Weight of gun ..... 56.25 lb.
Weight of recoil mechanism ..... 32 lb.
Length of gun ..... 31.6 in.
Length of bore ..... 21.1 in.
Type of breechblock ..... Eccentric-screw (Nordenfeld) type
Type of firing mechanism ..... Trigger
Recoil mechanism—
  Type of recoil ..... Hydrospring
  Type of buffer ..... Dash pot
  Length of recoil ..... 7 to 10 in.
Ammunition ..... For complete ammunition data, see section XXXI

(*b*) *Performance.*

Maximum rate of fire ..... 35 rounds per minute

(*c*) *Capacities.*

Recoil oil—
  Type ..... See lubrication order, figure 156
  Quantity ..... 2¾ pt.

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PART TWO

OPERATING INSTRUCTIONS

Section III. GENERAL

7. Scope

Part two contains information for the guidance of the personnel responsible for the operation of this matériel. It contains information on the preliminary cleaning and servicing of the matériel, description and location of the controls and instruments, operation under normal and unusual atmospheric conditions, and information on methods of demolition to prevent enemy use.

Section IV. SERVICE UPON RECEIPT OF MATÉRIEL

8. General

a. Upon receipt of new or used matériel, it is the responsibility of the officer in charge to ascertain whether it is complete and in sound operating condition. A record will be made of any missing parts and of any malfunctions, and any such conditions will be corrected as quickly as possible.

b. Attention will be given to small and minor parts as these are the more likely to become lost or damaged and may seriously affect the proper functioning of the matériel.

c. The matériel will be prepared for service in accordance with the instructions given in paragraph 9 or 10. Any deficiencies will be corrected.

9. New Matériel

a. Howitzers received from storage in the assembled condition normally have working parts and unpainted surfaces covered with a corrosion preventive and, in addition, have the muzzle, and the breech ring protected by a tape protective covering. Howitzers also may be received from storage crated in separate pack loads.

b. Remove all tape covering from the matériel and disassemble the breech mechanism (par. 114), the firing lock (par. 119), and the wheels (par. 155). Scrape off as much corrosion preventive as practical from all parts of the matériel and thoroughly clean as outlined in paragraphs 84 and 85. Apply a film of the oil prescribed in paragraph 157 to unpainted surfaces. Pack the wheel bearings (par. 157*c*) and assemble all parts (par. 115, 120, and 156).

c. If the matériel was received disassembled into pack loads,

reassemble the matériel as outlined in paragraph 28.

d. Grease and oil the matériel in accordance with lubrication order, LO 9–319.

e. Perform all detailed inspection and maintenance procedures outlined in paragraphs 91 and 92.

f. Check the gun book for proper entries (par. 2) and check both the gun book and the matériel to see that all prescribed modifications have been performed. See FM 21–6 for list of current modification work orders.

g. Check spare parts, tools, and equipment (sec. XV) for completeness and serviceability.

h. Check auxiliary equipment for completeness and serviceability.

10. Used Matériel

a. Perform all the operations listed in paragraph 9.

b. Check all parts of the matériel for signs of excessive wear, damage, missing parts, or corrosion, and correct any deficiencies.

c. Pay especial attention to all latches, locks, and catches to see that they are functioning properly.

d. Operate all controls and instruments (pars. 12 and 13) and check carefully for proper functioning.

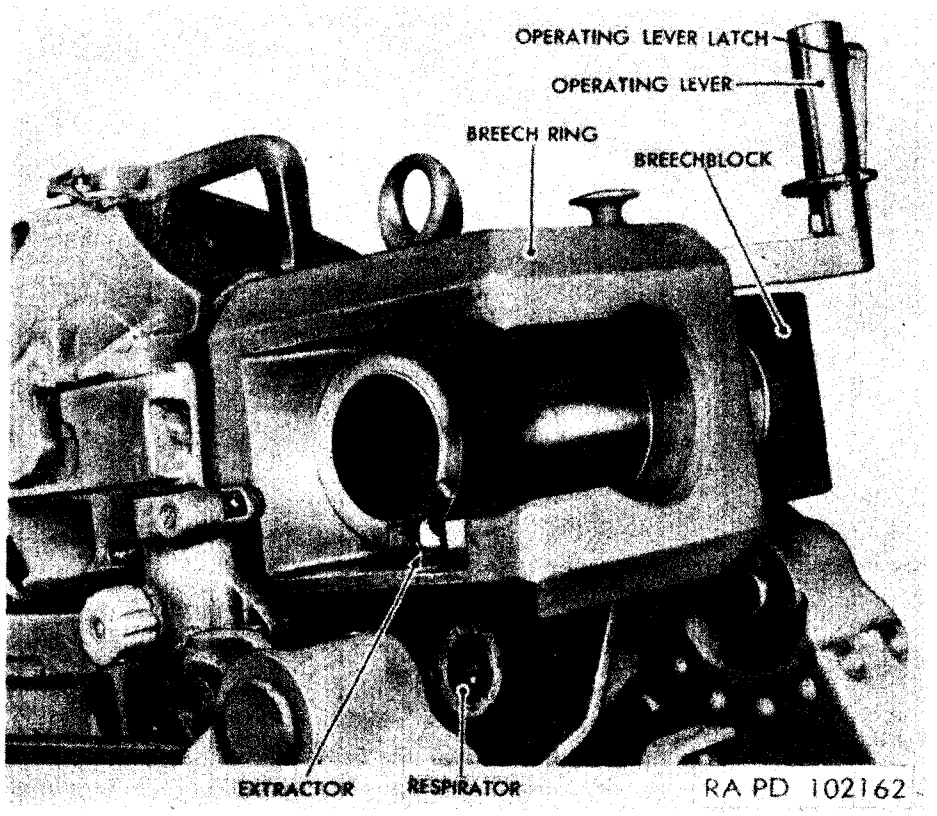


Figure 6. Breech in open position.

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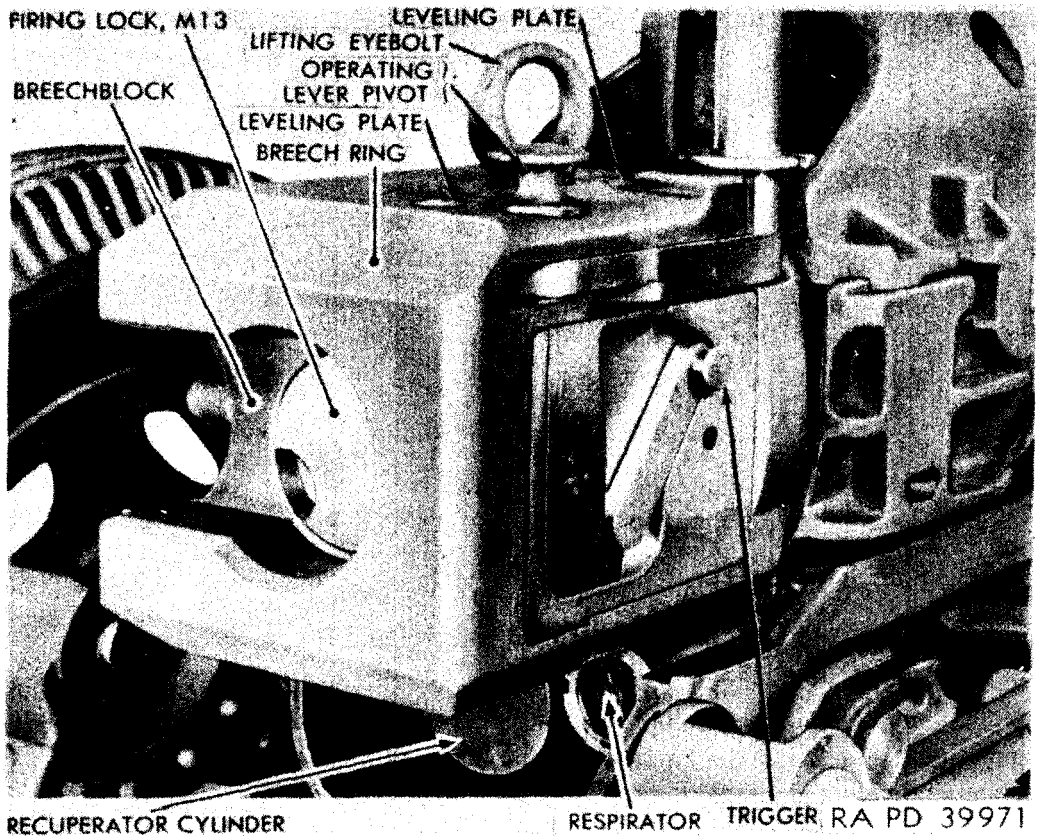


Figure 7. Breech in closed position.

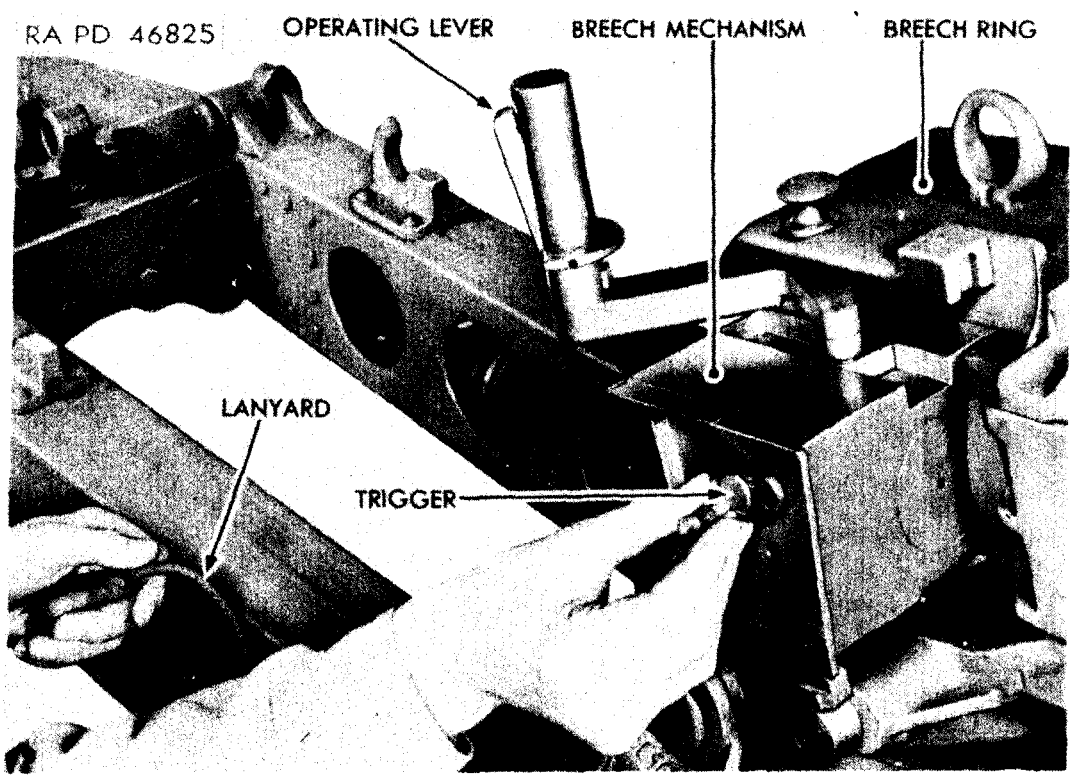


Figure 8. Attaching lanyard to trigger.

Section V. CONTROLS AND INSTRUMENTS

11. General

The controls and instruments used to operate the howitzer throughout the cycle of loading, firing, and reloading for continuous firing are located and described in this section. For location and description of sighting controls and instruments used in laying the howitzer, see section XXXII.

12. Controls

a. Breech Operating Lever. The L-shaped breech operating lever, except for its handle, is inclosed in the top right side of the breech ring when the breech is closed (fig. 7). Its purpose is to open and close the breech.

(1) To open the breech, grasp the operating handle and squeeze the latch to release it from the catch, and swing the operating lever to the rear (fig. 6).

(2) To close the breech, swing the operating lever to the front. When closed, it automatically engages the catch.

b. Lanyard. The lanyard assembly is composed of a cord, an engaging loop, and a pear-shaped wooden handle. It is attached to the trigger assembly (fig. 8). When pulled, it actuates the firing mechanism to fire the round of ammunition.

c. Elevating Mechanism (fig. 9). (1) Two elevating cranks, one at each side of the front trail assembly, when rotated, move the howitzer in elevation.

(2) The knob of each elevating crank is pivoted to permit swinging the knob into the trail opening in order to lock the elevating mechanism in traveling position (fig. 10). Dogs at the base of the knob keep it locked in either traveling or operating position. A spring in the knob keeps the dogs engaged.

d. Traversing mechanism. The traversing handwheel is on the axle (fig. 9) and, when turned, provides a small (106 mils) traversing adjustment of the howitzer.

e. Handspike. The handspike is inserted in the rear trail (fig. 11). When the piece approaches the limit of its traverse and greater traverse is desired, the trail is shifted manually by grasping the handspike and lifting the trail to the desired position.

f. Respirator. The respirator is an adjustable air valve located in the rear end of the recoil cylinder (fig. 6). Its purpose is to provide for adjustment of counterrecoil buffing action. This is accomplished by turning the valve to the proper setting as specified in paragraph 17*d*.

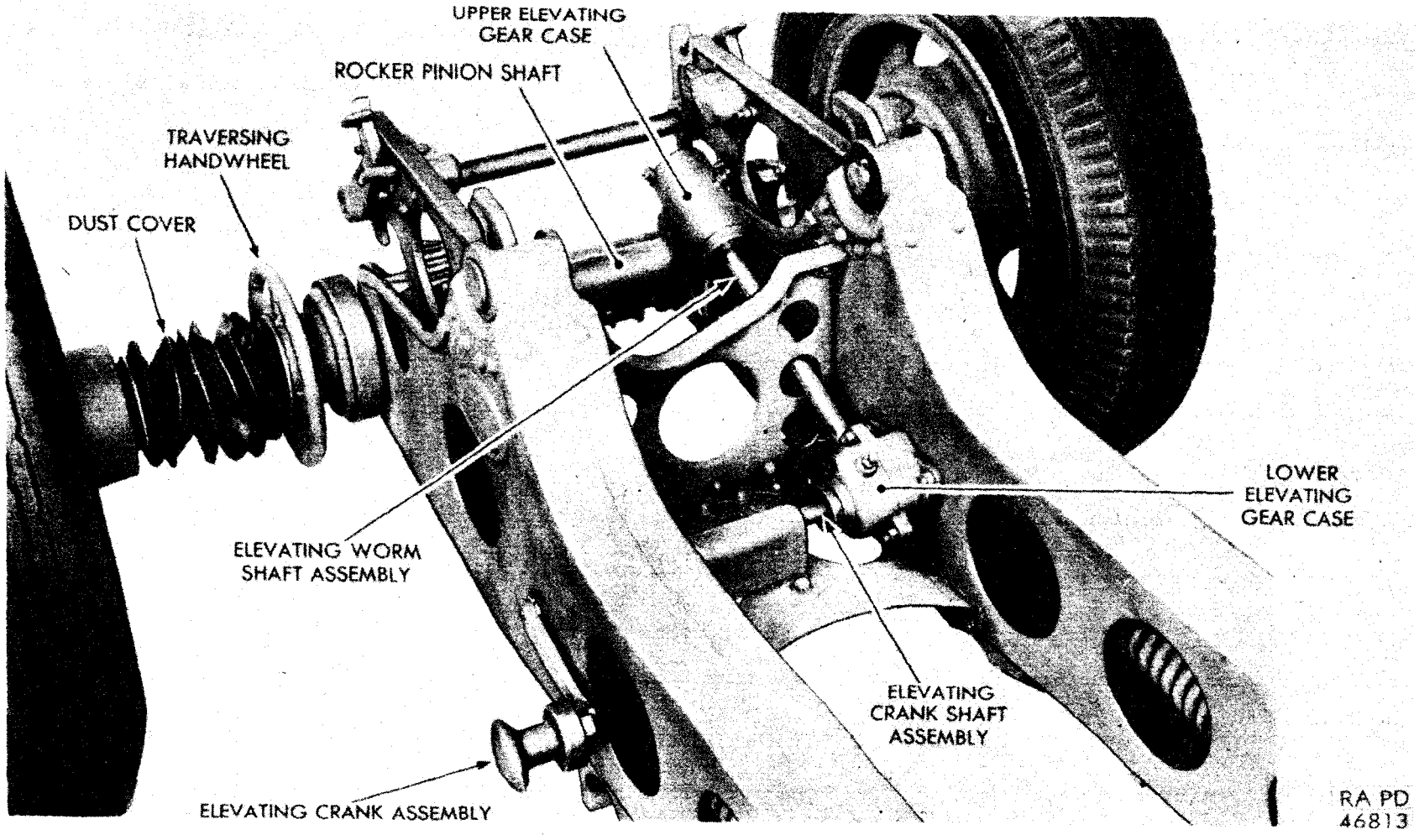


Figure 9. Elevating and traversing mechanisms.

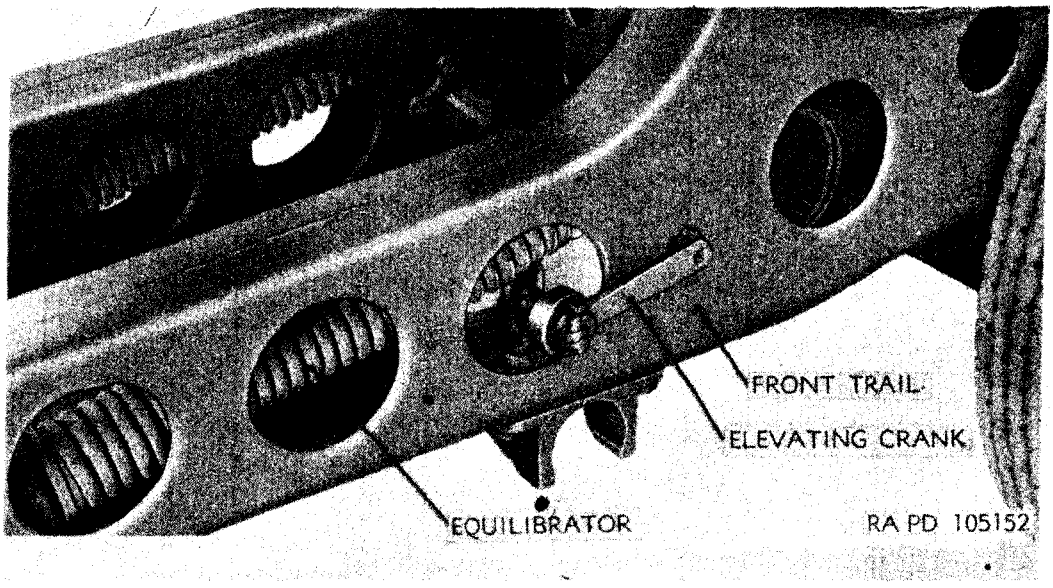


Figure 10. Knob of elevating crank locked in traveling position.

13. Instruments

a. Oil Index. The oil index (figs. 182 and 186) is located in the recuperator cylinder front head. Its function is to indicate a sufficiency or deficiency of oil reserve in the recuperator cylinder as outlined in paragraph 123*d*.

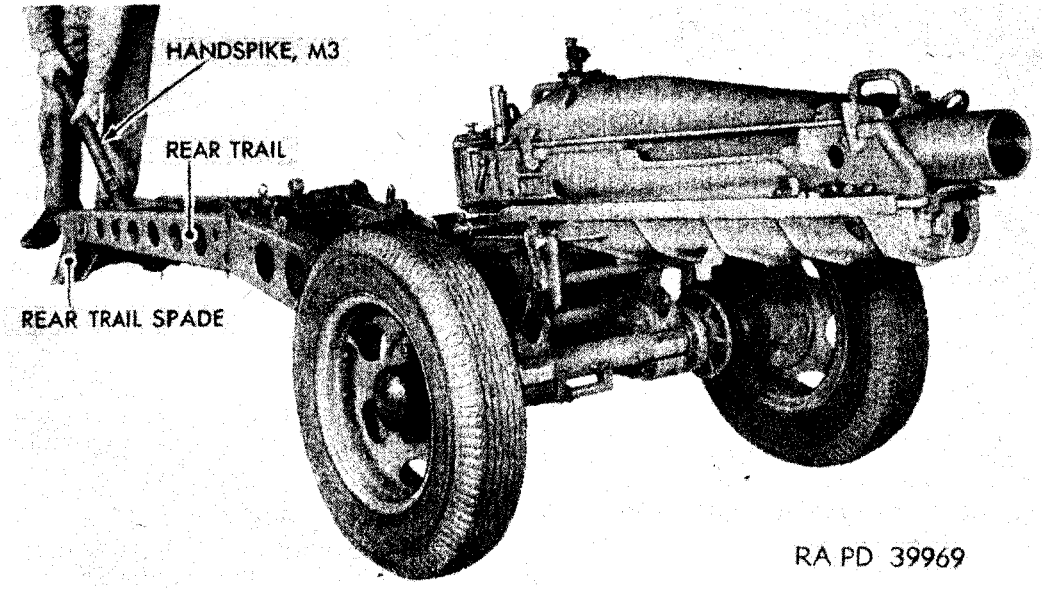


Figure 11. Maneuvering the trail with handspike M3.

b. Recoil Indicator. The recoil indicator (fig. 12) is bolted to the right side of the bottom sleigh. It contains a spring-loaded plunger which may be set to trace a path in grease smeared beside the recoil indicator scale cut in the top surface of the cradle; or when not in use, it may be raised and retained out of contact with

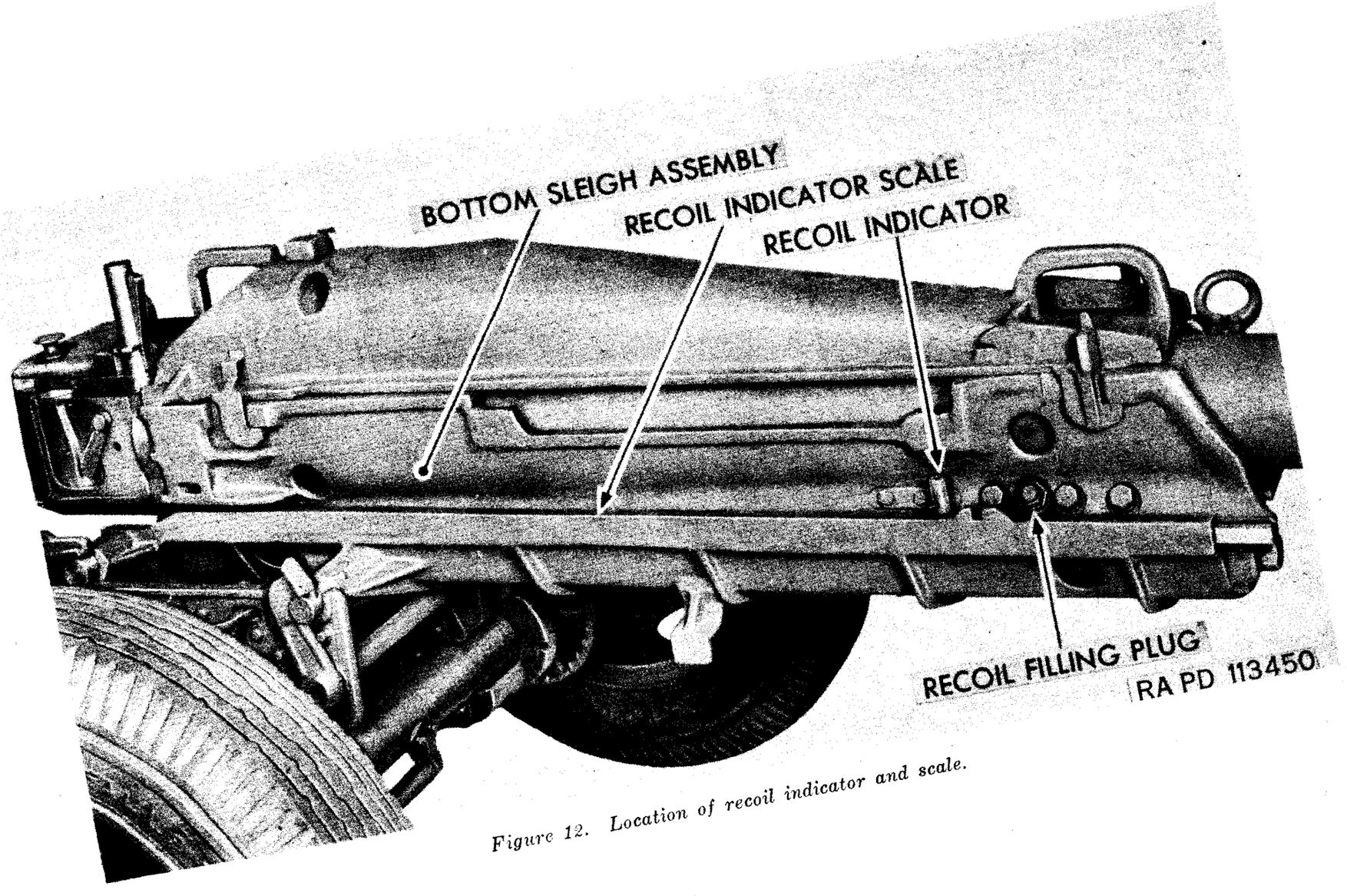


Figure 12. Location of recoil indicator and scale.

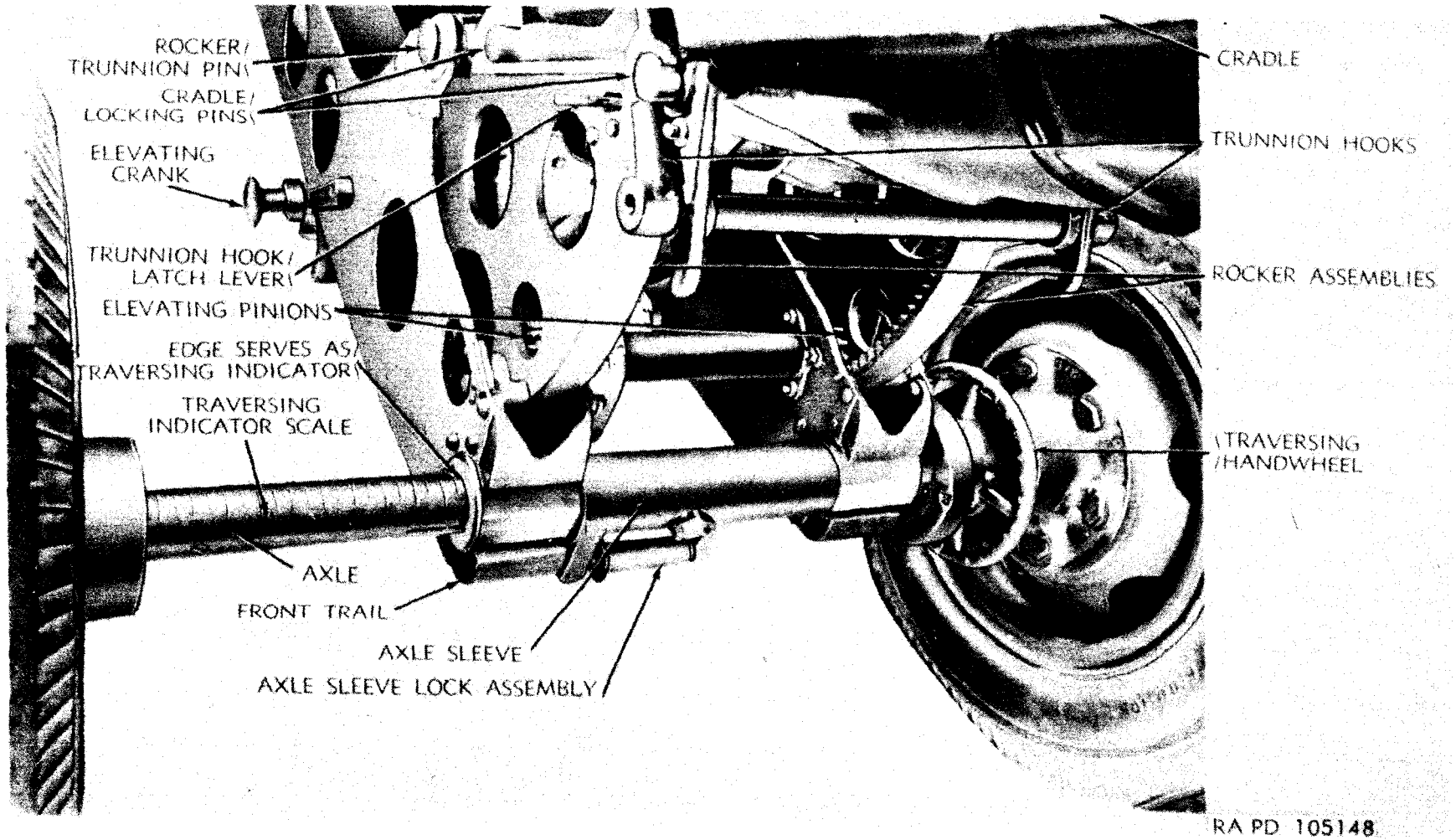


Figure 13. Howitzer at maximum left traverse—front view.

the cradle. The length of recoil is read on the scale as indicated by the path of the plunger left in the grease.

c. Traversing Indicator. The traversing indicator scale (fig. 13) is cut in the upper surface of the traversing axle. This scale is uncovered by the axle sleeve as the howitzer is traversed to the left and indicates the amount of traverse in mils right or left of the center of traverse.

d. Fire Control Instruments. Information on fire control instruments is contained in section XXXII.

Section VI. OPERATION UNDER NORMAL CONDITIONS

14. General

a. Information in this section is concerned with the mechanical steps necessary to prepare the howitzer for firing, to fire it, and to prepare it for transport in climates where moderate temperatures and humidity prevail. Preventive maintenance schedules listing all maintenance operations and including operational maintenance prior to and during firing are covered in paragraphs 91 and 92. Operation of subcaliber equipment is covered in section XXXIII.

b. The additional instructions for preparing the howitzer for

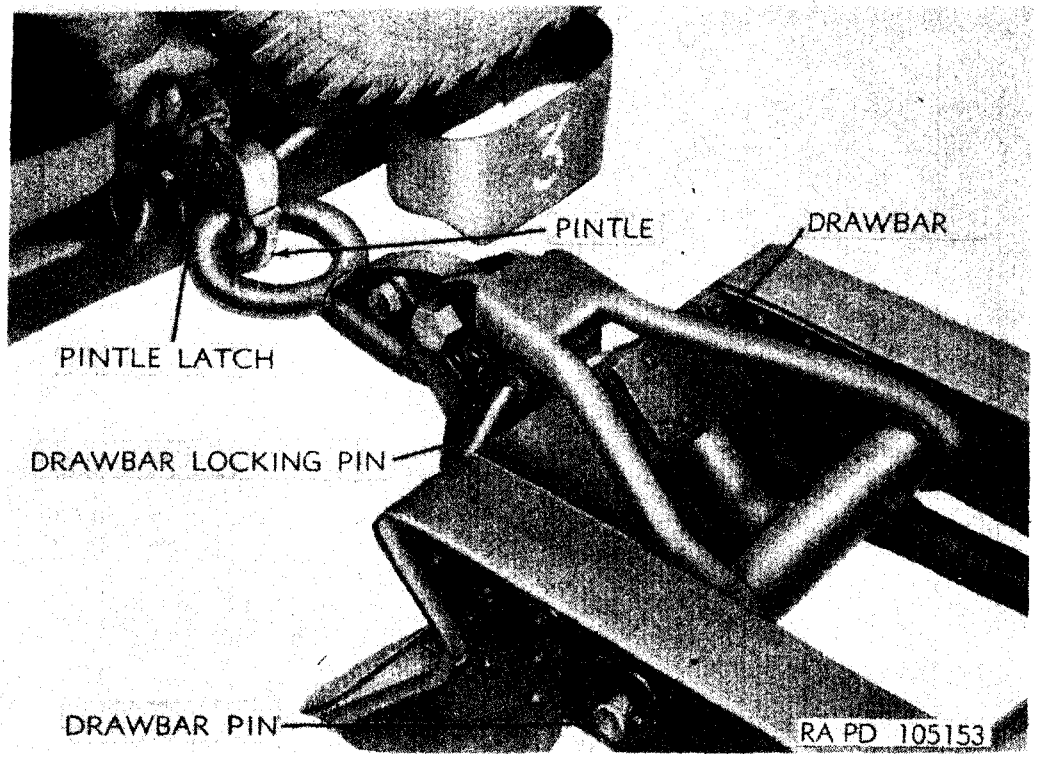


Figure 14. Unhooking matériel from prime mover.

operation when delivered in pack or paracrate loads are included in separate sections. After it has been assembled in accordance with the instructions in those sections, then the instructions in this section for an assembled howitzer are applicable.

c. The 75-mm pack howitzer matériel may arrive at the point of emplacement in five different ways—

(1) Towed by prime mover (fig. 3).

(2) Delivered by glider (fig. 146).

(3) Delivered by airplane (fig. 134).

(4) Delivered by parachute in paracrate loads (figs. 80, 81, and 114).

(5) Delivered by animal transport in mule pack loads.

d. To emplace the 75-mm pack howitzer when it has been towed to the point of emplacement by a prime mover, it first must be detached from the prime mover (fig. 14). It is then maneuvered into emplacement position by hand and the cradle is shifted from the traveling position forward into firing position as described in paragraph 15.

e. When the matériel is transported as a unit to the combat area by glider or airplane, it is unloaded and maneuvered or towed into emplacement position by hand, where it is then shifted into firing position. Loading and unloading from the glider or airplane is covered in sections IX and X.

f. When the matériel is dropped from an airplane by parachute in paracrate loads, the howitzer and carriage are normally assembled at the point where paracrate load M1 lands (par. 28). The howitzer matériel is then maneuvered into emplacement position by hand. Disassembly, loading, preparing for dropping, and assembling of the matériel for this method of transportation are covered in section IX.

g. When the matériel is transported by animals, it is normally assembled in the firing position in the emplacement position (sec. XI).

15. To Shift the Assembled Howitzer from Traveling Position to Firing Position

a. Lift up on the pintle latch of the prime mover and raise the upper part of pintle (fig. 14).

b. Remove the lunette from the pintle.

c. Remove the hold-down cable (fig. 3). Depress the howitzer to slightly below zero elevation.

d. Pull out the top sleigh clamping latch pin (fig. 20), place the socket of the handspike on the top sleigh clamping latch and turn it one-quarter turn in a counterclockwise direction (fig. 21).

e. Move the top sleigh to the rear, disengaging the top sleigh

front and rear hooks from the bottom sleigh. Remove the top sleigh (fig. 22).

f. Insert a lifting bar through the breech ring eyebolt and another under the muzzle end of the howitzer, and lift the tube and breech mechanisms, as one unit, up and out of the bottom sleigh.

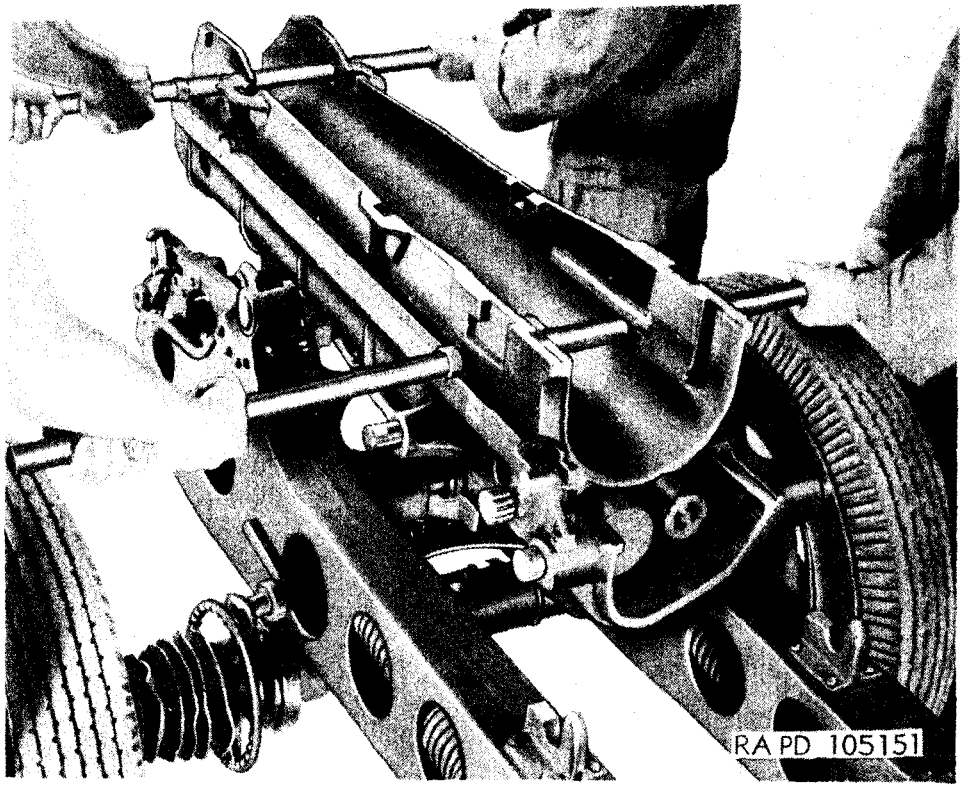


Figure 15. Removing bottom sleigh assembly and cradle assembly as one unit.

g. Insert lifting bars through the bottom sleigh assembly, and lift the bottom sleigh assembly and cradle assembly, as one unit, from the trail assembly (fig. 15) and place it carefully on the ground or dunnage if available.

h. While one man supports the front trail, disengage the axle sleeve lock (fig. 16) by pulling the handle out perpendicular with the axle sleeve. By means of the axle sleeve lock handle, rotate the axle sleeve one-quarter turn.

i. Pull axle and wheels from the traveling position axle bearings (fig. 3) by means of the lock handle and traversing handwheel, while the front trail is being supported.

j. Place the axle and wheels in the firing position axle bearings (figs. 13 and 16), rotate the axle sleeve through 90°, and engage the axle sleeve lock.

k. By means of lifting bars (fig. 15) raise the bottom sleigh assembly and cradle assembly, as a unit, and move it into the forward position on the rocker assemblies as shown in figure 21, making certain that the rear cradle locking pins are completely

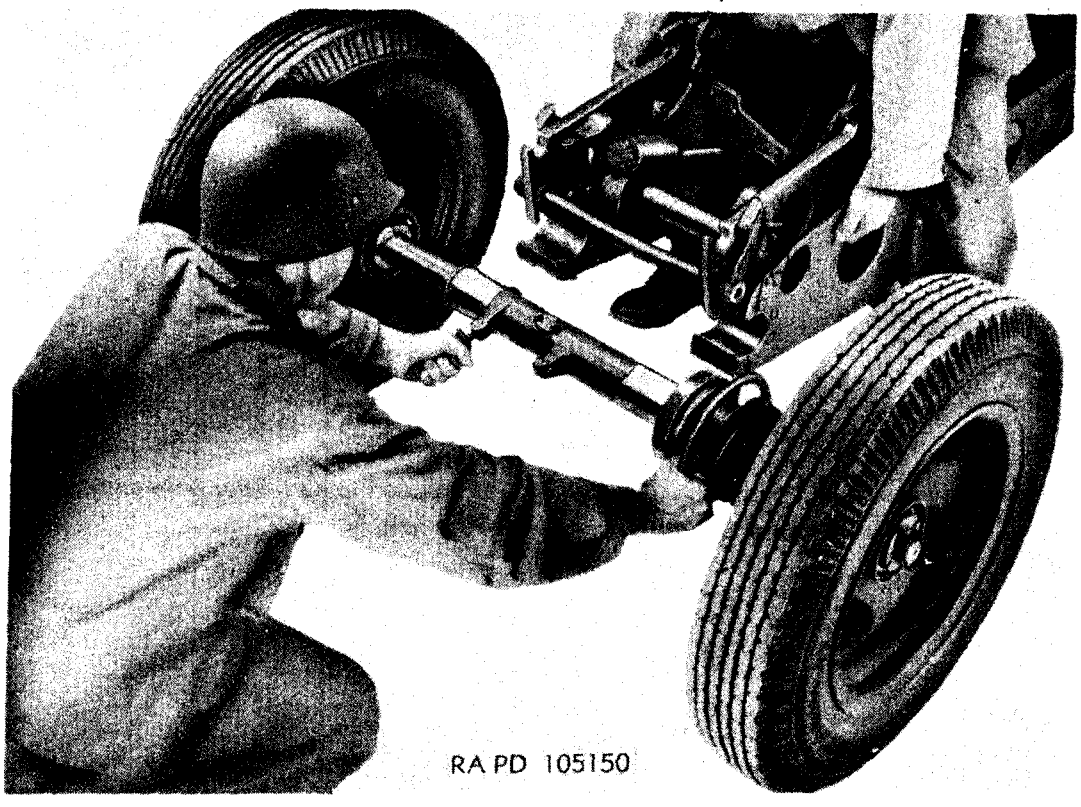


Figure 16. Engaging axle in firing position axle bearings of front trail.

into the notched bearings on the rocker assembly. The trunnion hooks should be in the open position as shown in figure 30.

l. Press the trunnion hooks forward and lock in that position by pushing the trunnion hook latches rearward. Figure 21 shows the howitzer properly locked in the firing position.

m. Raise the breech ring and tube assembly into place in the bottom sleigh assembly. Make certain that the tube is turned counterclockwise as far as it will go.

n. Place the top sleigh in position over the howitzer tube. Slide it forward so that the top sleigh hooks engage the notches in the bottom sleigh.

o. Using the handspike socket, turn the top sleigh clamping latch one-quarter turn in a clockwise direction and lock the top sleigh in position.

p. Insert the top sleigh clamping latch pin in the top sleigh clamping latch (fig. 20).

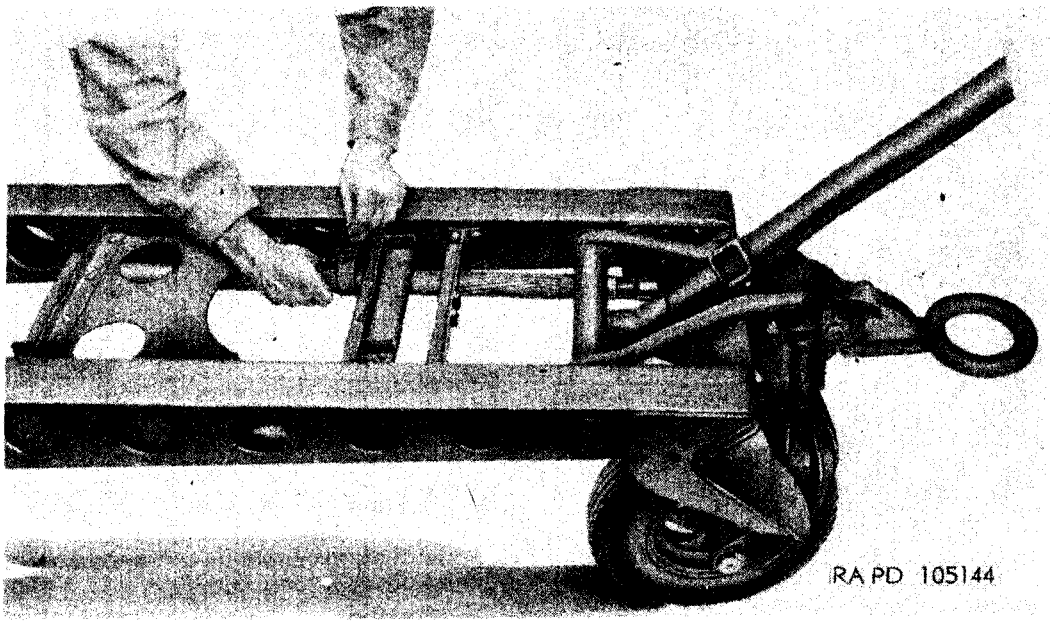


Figure 17. Removing cleaning staff-sections from trail.

16. To Emplace Howitzer After It Has Been Prepared for Firing

a. Insert the handspike M3 in place in rear trail handspike socket (fig. 11).

b. Maneuver the piece into emplacement position. Fold the drawbar (fig. 18) forward or remove drawbar.

c. Remove covers from the matériel. Remove cleaning staff-sections (fig. 17) from trail and assemble them. Obtain bore brush from equipment chest and assemble it to the cleaning staff.

d. In the case of matériel issued to airborne units, remove the caster wheel as shown in figure 31.

Note. Emergency (or hasty) firing position is made by withdrawing the drawbar locking pin assembly (fig. 18, B) and swinging the unlocked drawbar forward over the trail (fig. 18, A).

e. Dig a small pit for rear trail spade.

Note. If the bearing strength of the soil is too weak for steady emplacement of the piece, an embedding post or log should be used. This wooden support should be placed behind the spade and dug in so as to distribute the force of recoil over a larger ground area and prevent movement of the weapon during firing.

f. Secure the telescope mount support in position in the sight bracket (sec. XXXII); then mount the telescope mount M3A1 and panoramic telescope M1 (or elbow telescope M62) in position on the mount support.

g. Test and aline sighting equipment for laying the howitzer properly as outlined in section XXXII.

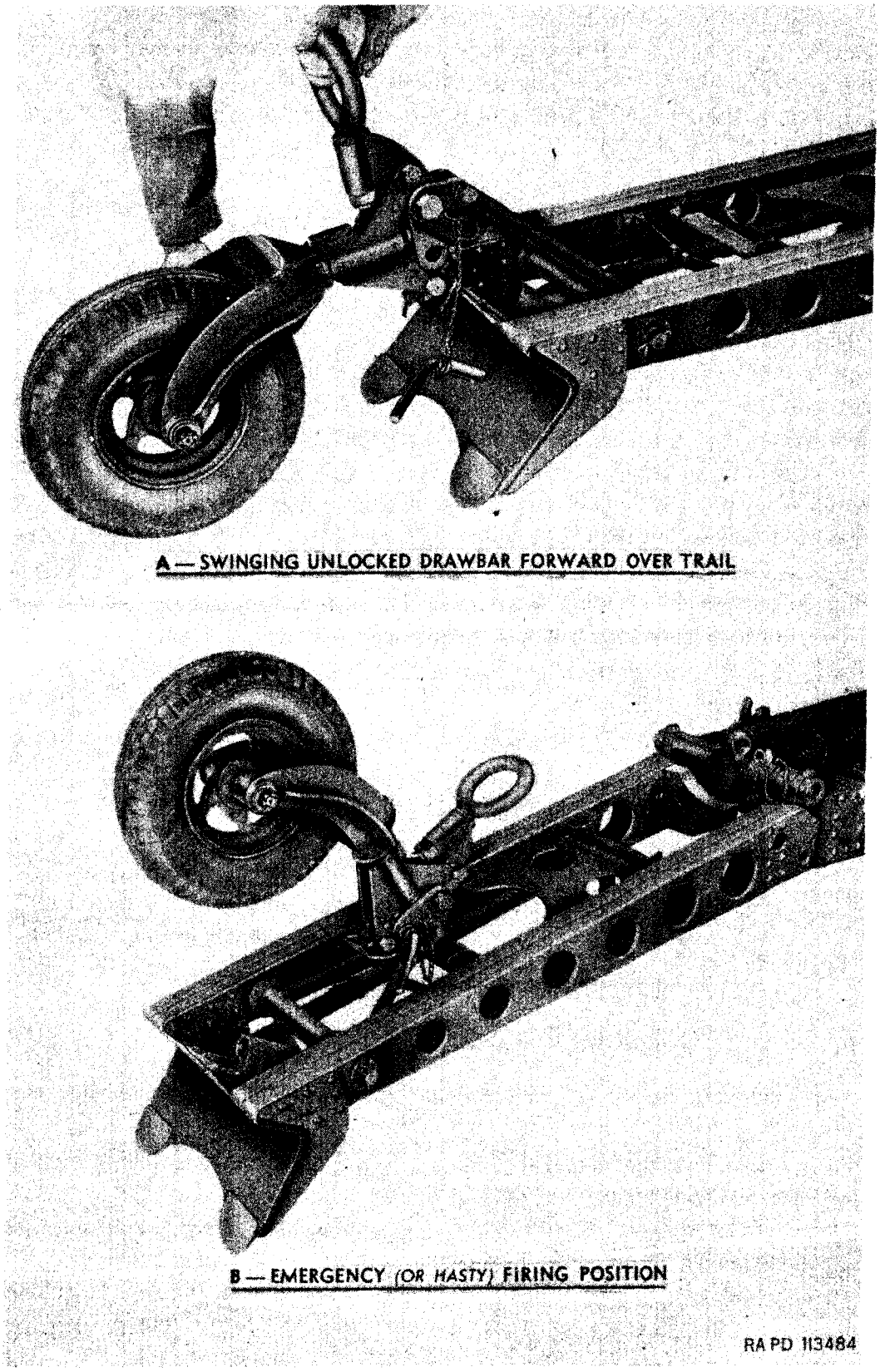


Figure 18. Moving drawbar and caster wheel into emergency firing position.

h. Set the recoil indicator handle to the down position, so that the recoil indicator comes in contact with the recoil slide (fig. 12). See paragraph 21*c* for measurement of length of recoil.

i. Open the breech (par. 12*a*) and attach the lanyard to trigger (fig. 8).

17. Inspections and Operations Prior to Firing

a. Wipe the bore and chamber thoroughly dry (par. 85*b*).

b. Examine the recoil stuffing box head (fig. 182), the filling plug hole (fig. 180), and the oil index recess (fig. 182) for oil leakage. If there is undue leakage, other than a few drops of dark oil, the howitzer must not be fired. The condition must be reported to ordnance maintenance personnel for correction.

c. Release a small amount of the recoil oil until the index recedes slightly into its recess and then reestablish the correct oil reserve, taking care that only enough oil is added to bring the oil index just even with the front face of the recess (par. 123*d*). The howitzer must not be fired with a deficient or excess oil reserve, as to do so may irreparably damage the recoil mechanism.

d. Adjust the respirator (fig. 183). The following settings are normally used:

(1) Maximum buffing action is obtained when the respirator is set at 0 position.

(2) Minimum buffing action is obtained when it is set at the 3 position.

(3) For depression or low angle firing, set at 0 or 1 position.

(4) For high angle firing, set at 2 or 3 position.

e. Check sighting and fire control instruments (pars. 178 and 179).

18. To Load Round into Howitzer

a. Prepare the ammunition for firing as outlined in paragraph 166.

b. Open the breech and hold it fully open with the operating handle.

c. Insert the round of ammunition into the chamber and close the breech. As the round is inserted into the breech with enough force to seat, it causes a jar when it strikes the extractor that can be felt at the breech operating lever handle. This is the instant to close the breech. Should the round of ammunition fail to seat properly or rebound and prevent closing of the breech, the breech should be fully opened, the round reinserted and seated properly, and the breech closed. Exercise caution with complete rounds to avoid striking the fuze in any manner.

19. To Fire Howitzer

a. Pull the lanyard once (par. 12*b*). The firing lock is self-cocking and spring-actuated, thereby always delivering the same blow to the primer, regardless of the pull on the lanyard.

b. The firing mechanism returns automatically to the ready position when the lanyard is slackened.

c. In case of failure to fire, see malfunctions and corrections in paragraph 94.

20. To Extract Fired Cartridge Case

a. Open the breech smartly. The fired cartridge case will be automatically extracted from the chamber and ejected to the rear of the howitzer.

b. To extract the fired cartridge case if the extractor fails to do so when the breech is opened, insert the cleaning staff into the muzzle end of the bore and tap the bottom of the inside of the case lightly until it is loosened and can be pushed out of the chamber. Exercise caution when handling the empty case as it may still be hot. See paragraph 95 for correction of failure to extract.

21. Inspections and Operations During Firing

a. Keep all exposed bearing surfaces clean and covered with a thin film of the lubricating oil prescribed on the lubrication order.

b. Check for excessive leakage of recoil oil (par. 98). Constantly verify the complete return of the piece to battery and complete closing of the breechblock. Observe the behavior of the recoil mechanism for length of recoil (*c* below), smoothness of action, and return without shock. See paragraph 99 if howitzer returns to battery with shock, or paragraph 100 if it fails to return to battery. Keep the respirator properly adjusted for counterrecoil buffing action (par. 123*c*).

c. The length of recoil should be between 25 and 31 inches. Recoil of 32 inches or more will permanently damage the recoil mechanism due to physical battering of parts. To measure the length of recoil, grease the right sleigh rail in line with the recoil indicator (fig. 12), release the spring-loaded indicator, fire the round, and then note the length of recoil on the indicating scale. See paragraph 102 if howitzer overrecoils or underrecoils.

22. To Unload Complete Round from Howitzer

a. A complete round, once loaded, should always be fired in

preference to being unloaded, unless military necessity dictates otherwise.

b. A complete round or a stuck projectile will be removed under the direct supervision of an officer, exercising appropriate precautions. Slowly open the breech and catch the complete round or the cartridge case. If the projectile remains in the tube, fill the chamber with waste, close the breech, and level the howitzer tube. Insert the rammer head of the spring-operated unloading rammer (fig. 152), or of the solid rammer (fig. 152), into the muzzle until it incloses the fuze of the projectile, taking care that it fits properly and has no obstructions; then push or, if necessary, tap the rammer staff lightly until the projectile is dislodged from its seat. Open the breech and carefully remove the waste and the projectile from the chamber. Remove the rammer and staff from the tube. Segregate the removed round for the inspection of the local ordnance officer to ascertain whether it can be reused.

23. To Place Matériel in Traveling Position (for Towing by Prime Mover)

a. Traverse the piece to the center of the axle. Depress the tube slightly below zero elevation and lock the elevating cranks by swinging the elevating crank knob into the trail opening (fig. 10).

b. Remove the telescope mount and telescope. Remove the mount support.

c. Close the breech and remove the lanyard.

d. Disassemble the cleaning staff. Secure the staff-sections in place inside the rear trail.

e. In the case of airborne matériel, move the drawbar and caster wheel into traveling position.

f. To shift the howitzer from firing position to traveling position, reverse the procedure described in paragraph 15. Secure the handspike in place.

g. Secure in place with hold-down cable, attaching hooks to second lightening holes on the front and tightening the turnbuckle (fig. 3).

h. Properly install all covers.

i. Install the blackout-light system around the muzzle. Plug the jumper cable into the socket on the prime mover and attach the extension spring to the prime mover.

j. Open the pintle on the prime mover, move the howitzer into position and raise the rear trail and engage the lunette of the drawbar into the pintle of the prime mover. Close the pintle and insert the safety pin.

k. Check to make sure that all on-carriage equipment, tool chests, and equipment are properly loaded.

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Section VII. DISASSEMBLY AND ASSEMBLY FOR PARACRATE PACKING AND ANIMAL TRANSPORT

24. General

a. The 75-mm pack howitzer M1A1 and carriage M8 can be quickly and easily disassembled into major components for transport purposes in small units.

b. Two methods of transportation, namely, delivery as parachute paracrate loads and delivery by animal transport as pack loads, require disassembly and assembly of the matériel for packing.

c. Paragraphs 25 through 28 cover the proper method of disassembly and assembly of the matériel for parachute paracrate delivery and for animal transport.

d. Packing of the various animal packs and paracrate loads, and loading, releasing, and unpacking procedures are covered in sections VIII, IX, X, and XI.

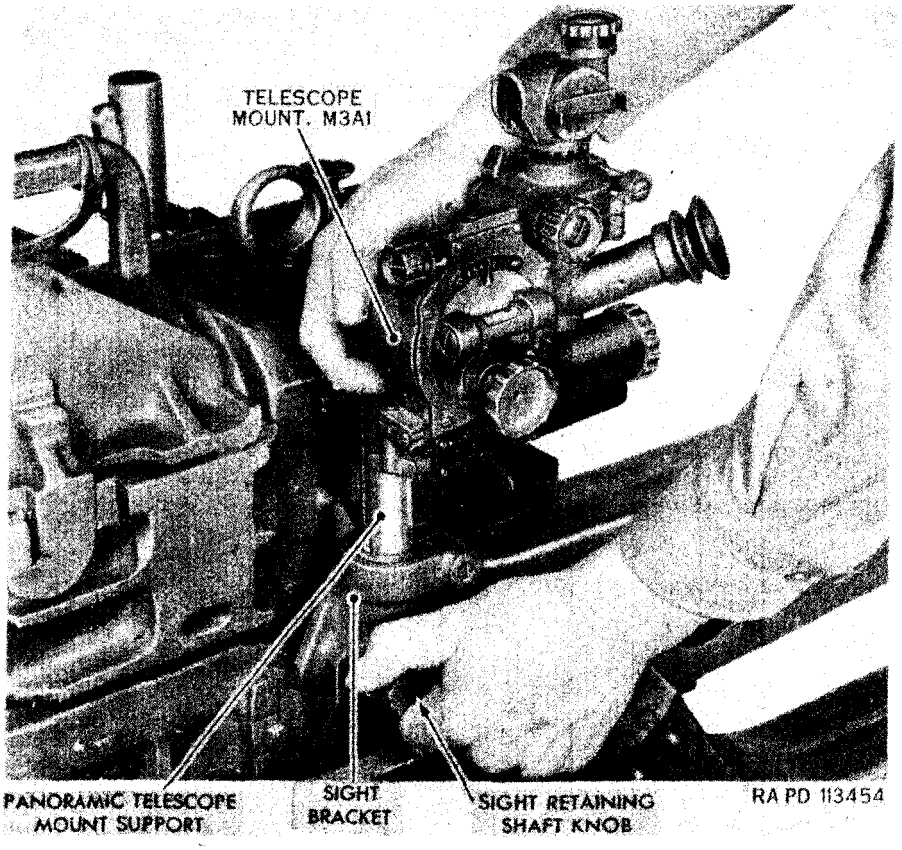


Figure 19. Dismounting panoramic telescope and mount from the sight bracket.

25. To Disassemble Howitzer for Pack Loads

a. Turn the sight retaining shaft knob on the sight bracket as far as it will go in a counterclockwise direction. Lift out the telescope mount, telescope, and telescope mount support as a unit (fig. 19).

b. Depress the howitzer to slightly below zero elevation. Turn the elevating crank knobs into the trail-lightening holes. This locks the elevating cranks for transport (fig. 10).

c. Pull out the top sleigh clamping latch pin (fig. 20), place the socket of the handspike on the top sleigh clamping latch, and turn it one-quarter turn in a counterclockwise direction (fig. 21).

d. Move the top sleigh to the rear, disengaging the top sleigh front and rear hooks from the bottom sleigh. Lift the top sleigh off (fig. 22).

e. Turn the tube until the eyebolt is vertical. See paragraph 106 for procedure if it proves difficult to disassemble the tube from the breech ring. Do not use a bar through the front eyebolt to turn the tube.

f. Pull the tube forward out of the breech ring. Insert a lifting bar through the rear eyebolt on the howitzer tube and lift the tube off (fig. 23). Put the breech and muzzle covers on the tube.



Figure 20. Removing top sleigh clamping latch pin.

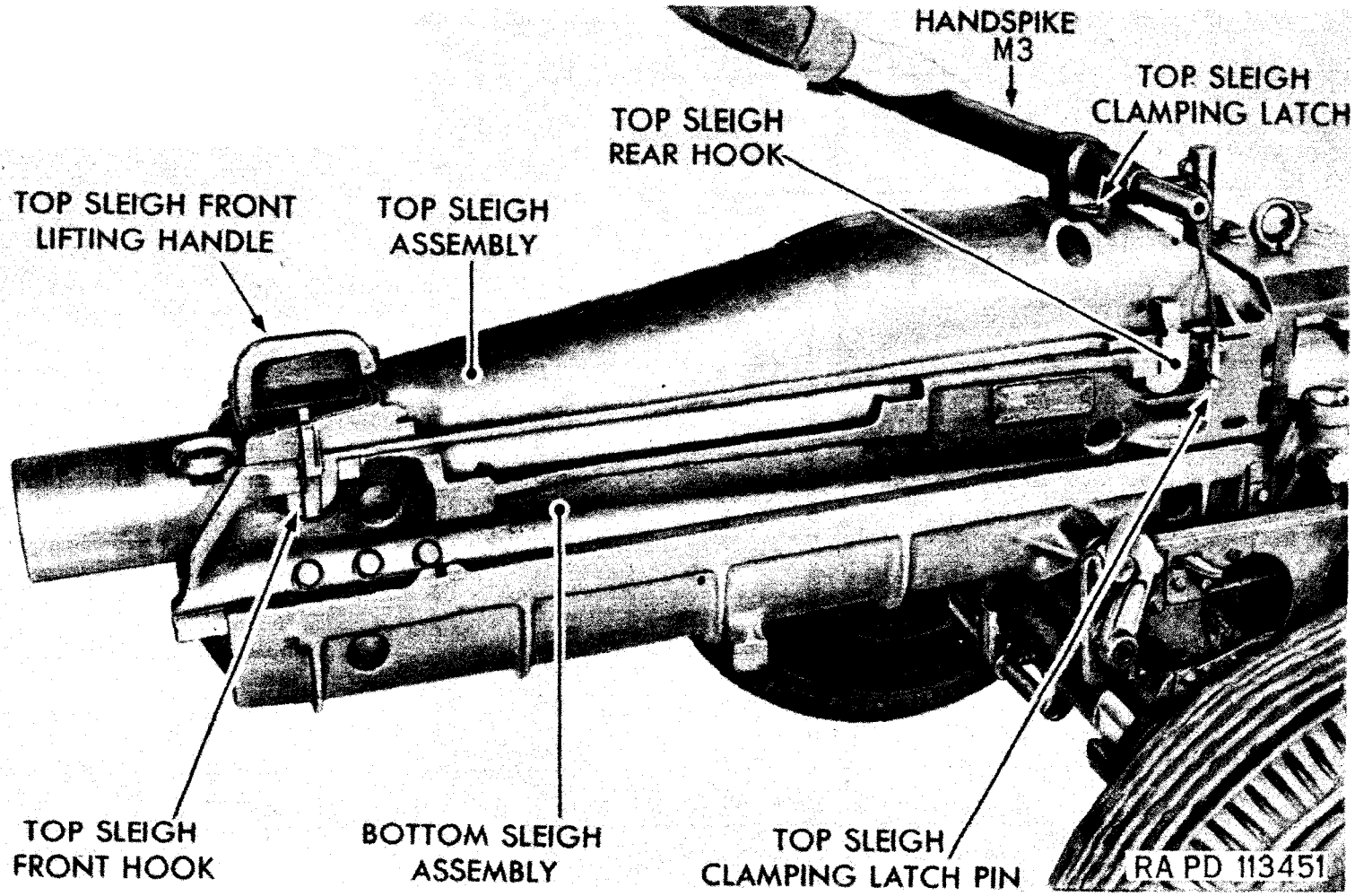


Figure 21. Unlocking top sleigh clamping latch for removal of top sleigh assembly.

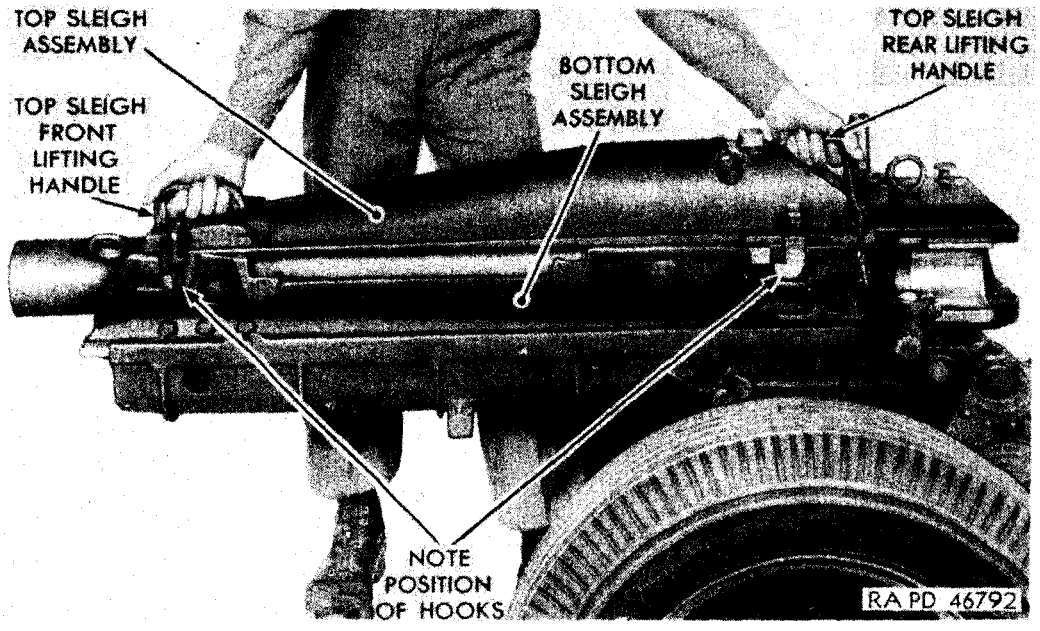


Figure 22. Removing top sleigh assembly.

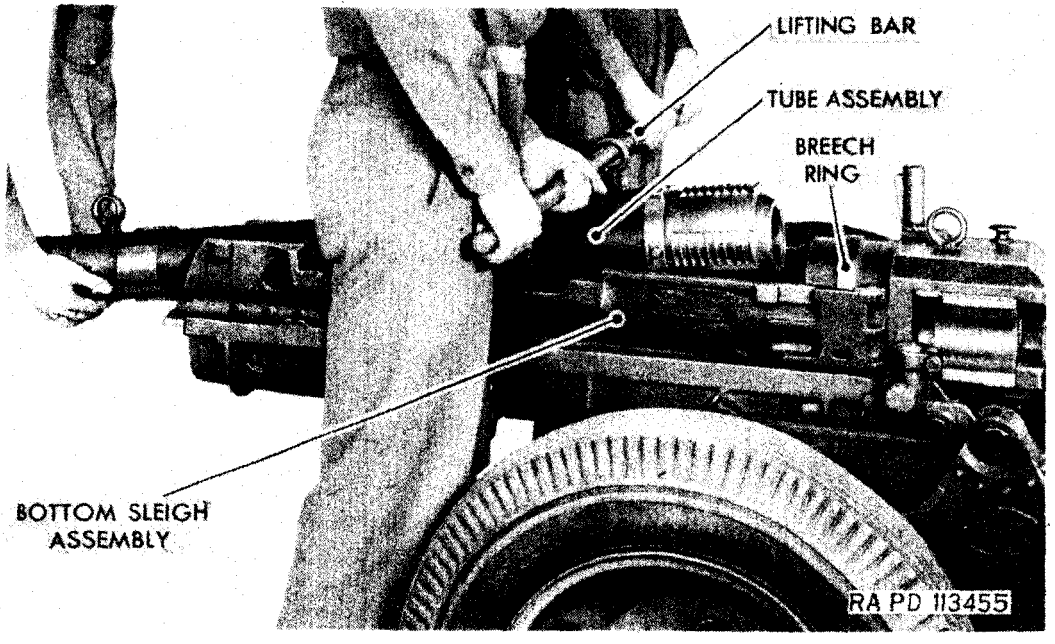


Figure 23. Removing tube assembly from bottom sleigh assembly.

g. Using a lifting bar inserted through the breech ring eyebolt, lift the breech ring straight up and out of the bottom sleigh (fig. 24).

26. To Disassemble Recoil Mechanism and Cradle for Pack Loads

a. Pull the piston rod latch lever to the left and lift the piston rod latch (figs. 25 and 26). This unlocks the recoil piston rod and permits removal of the bottom sleigh and recoil mechanism.

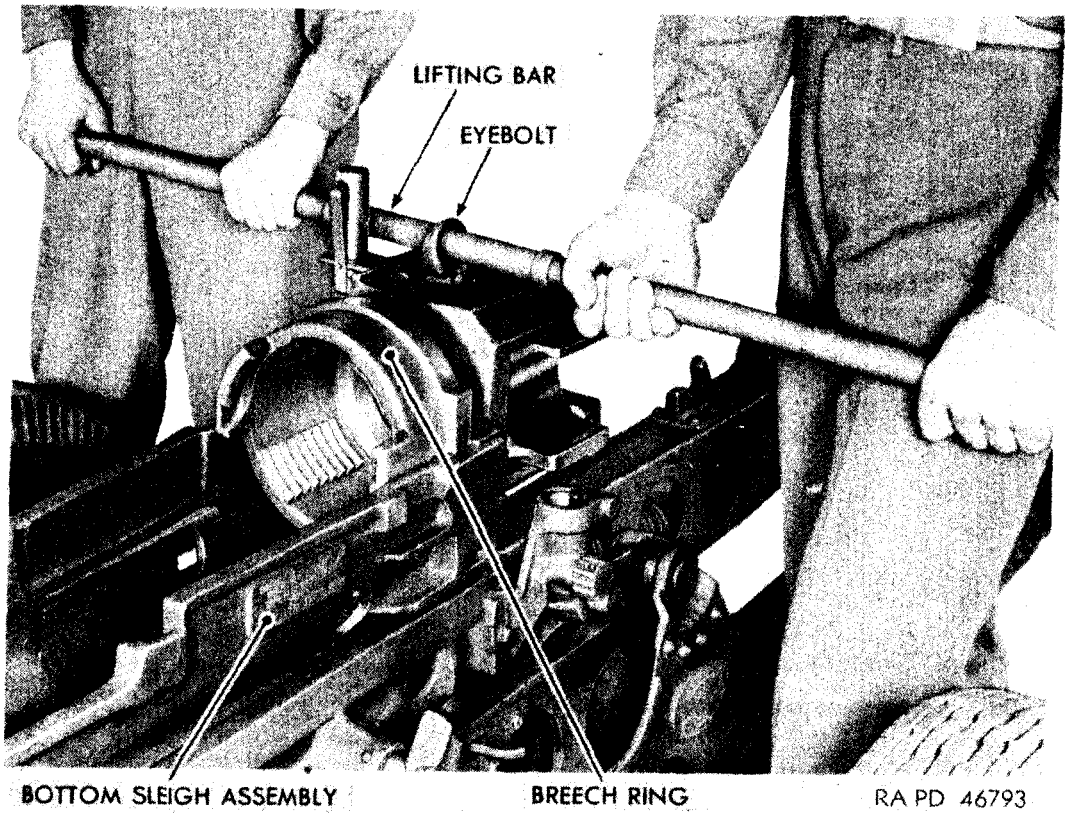


Figure 24. Removing breech ring from bottom sleigh assembly.

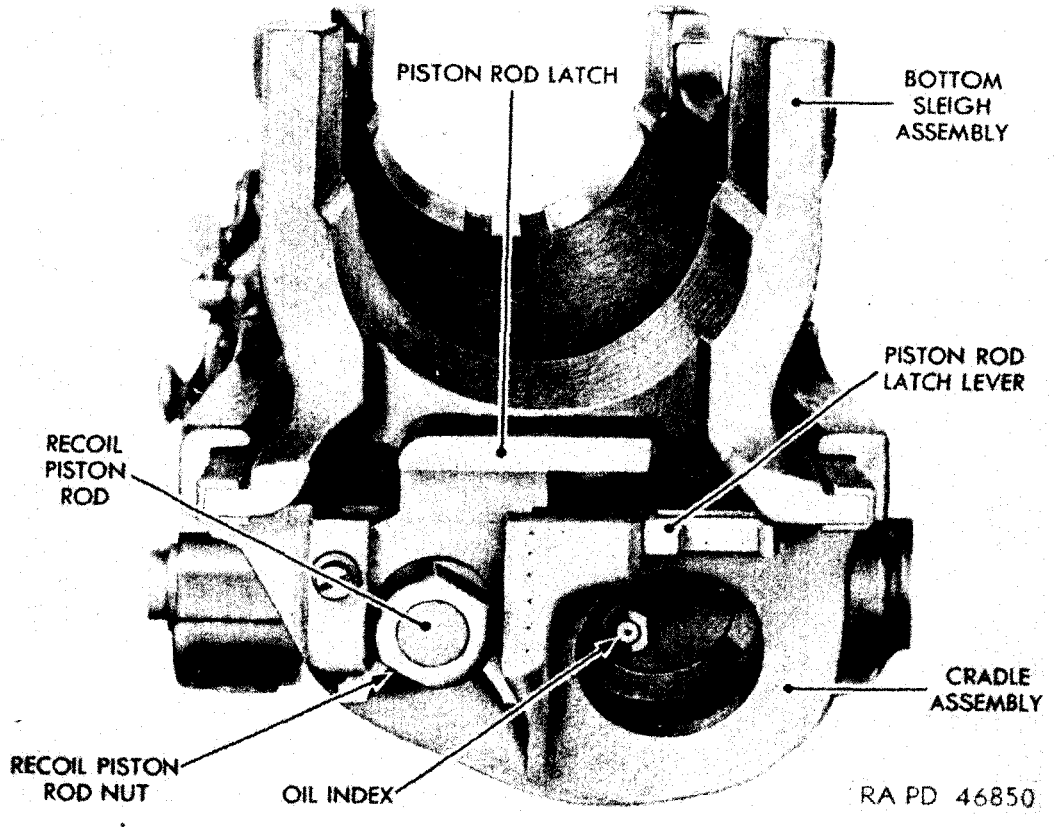


Figure 25. Recoil piston rod latch and lever in locked position.

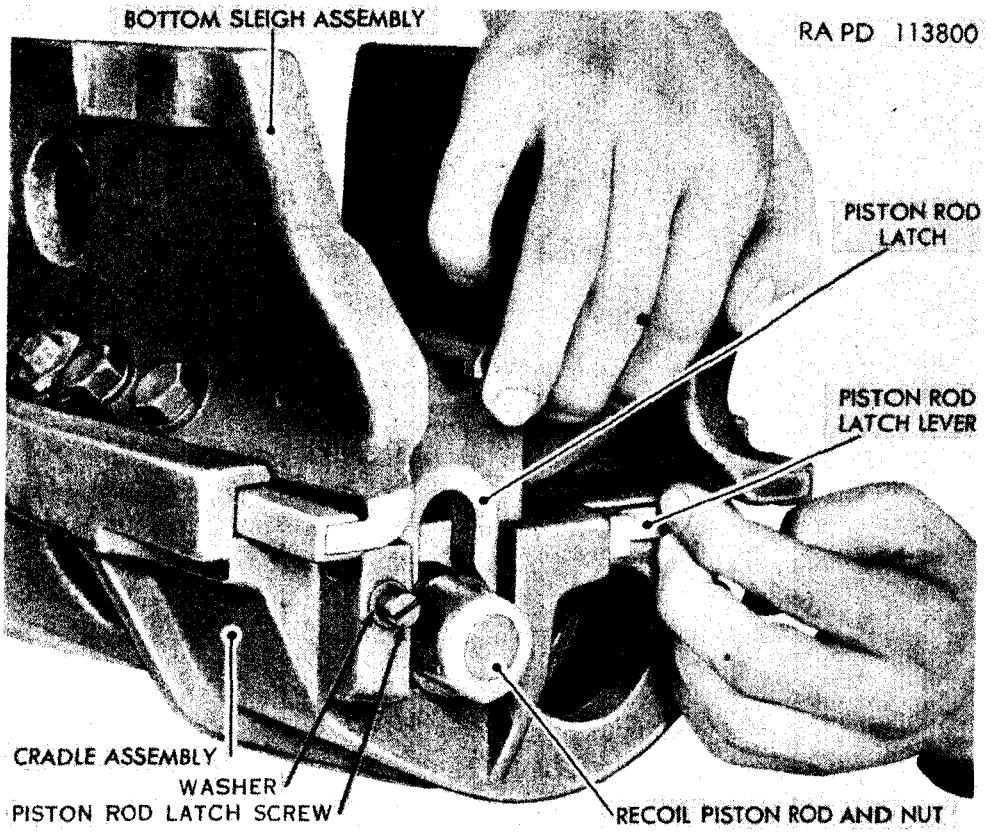


Figure 26. Unlocking recoil piston rod latch.

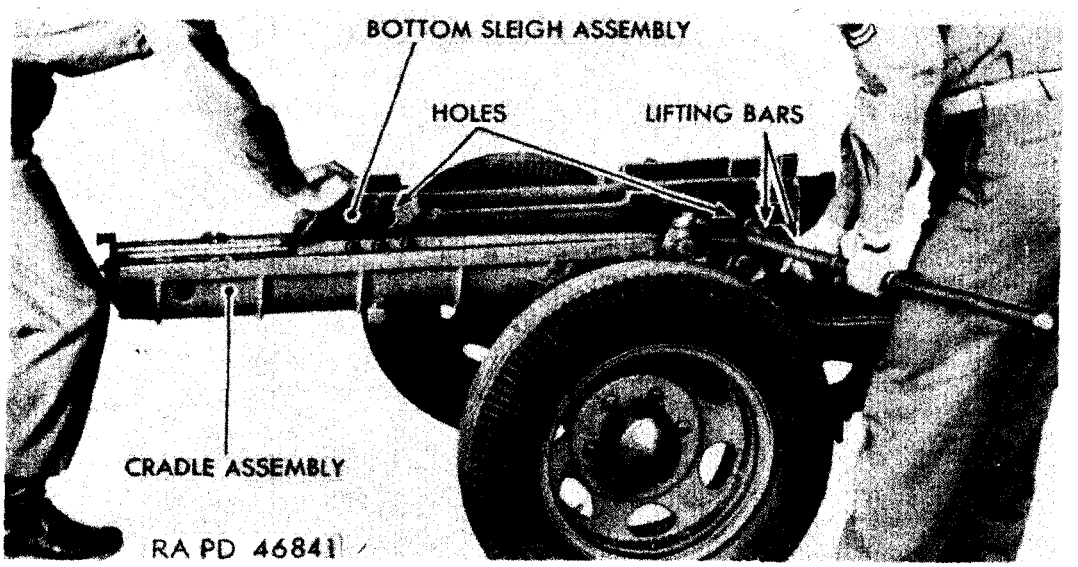


Figure 27. Pushing bottom sleigh and recoil mechanism to the rear.

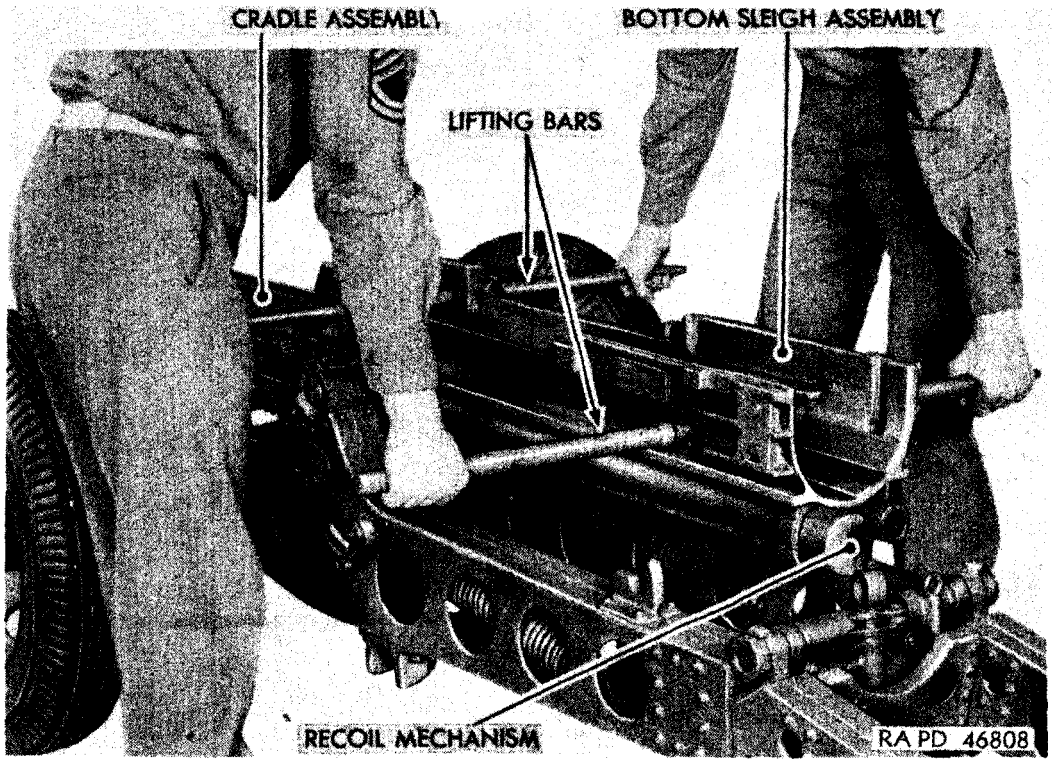


Figure 28. Removing bottom sleigh and recoil mechanism.

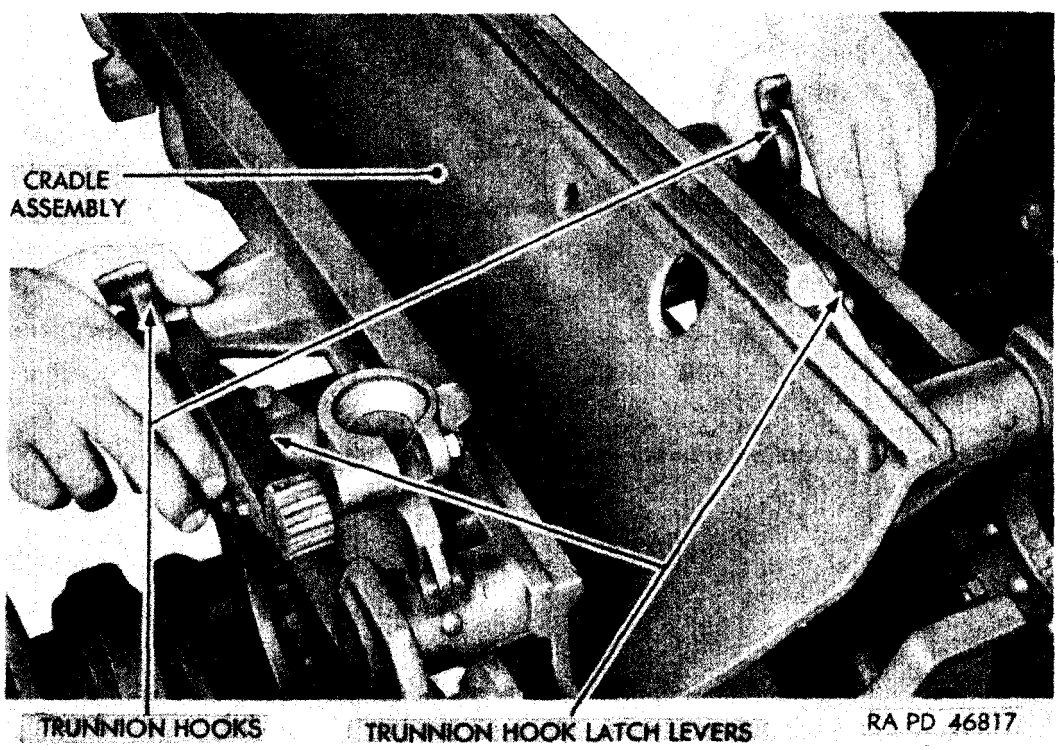


Figure 29. Unlocking trunnion hooks to remove cradle.

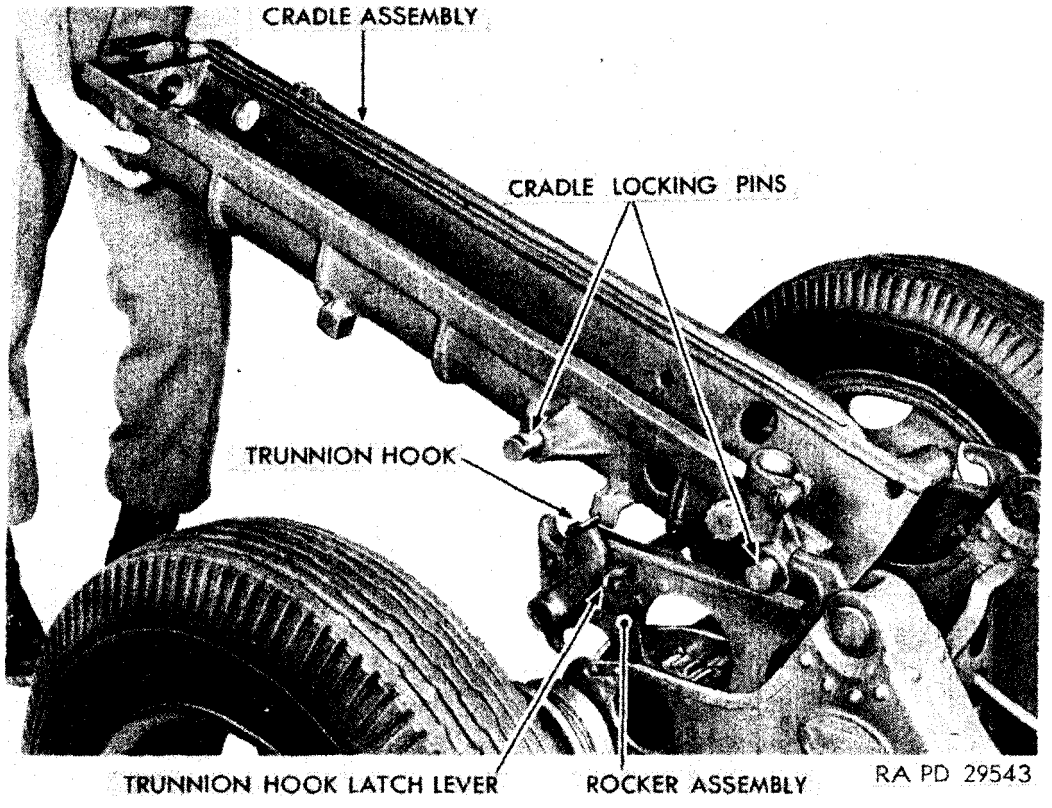


Figure 30. Removing cradle from rocker assembly.

b. Slide the bottom sleigh to the rear, passing a lifting bar through the rear bar holes when the holes are clear of the rear of cradle (fig. 27).

c. Continue to slide the bottom sleigh to the rear of the cradle until the front lifting bar holes are just back of the sight bracket; then insert a second lifting bar and remove the bottom sleigh by sliding it all the way out of engagement with the cradle ways (fig. 28).

Note. Care must be exercised to prevent damaging the recoil and recuperator cylinders.

d. Pull the trunnion hook latches forward and disengage the trunnion hooks by pressing rearward (fig. 29). Raise the front end of the cradle and slide it forward so that the rear cradle locking pins are out of engagement with the notched bearings on the rockers (fig. 30); then place a lifting bar through the rear lifting bar holes in the cradle and remove the cradle.

27. To Disassemble Trail Assembly and Axle for Pack Loads

a. Airborne carriages are equipped with a caster wheel for manual transport. Raise the trail and depress the caster wheel latch assembly (fig. 31). The caster wheel will fall free. Remove

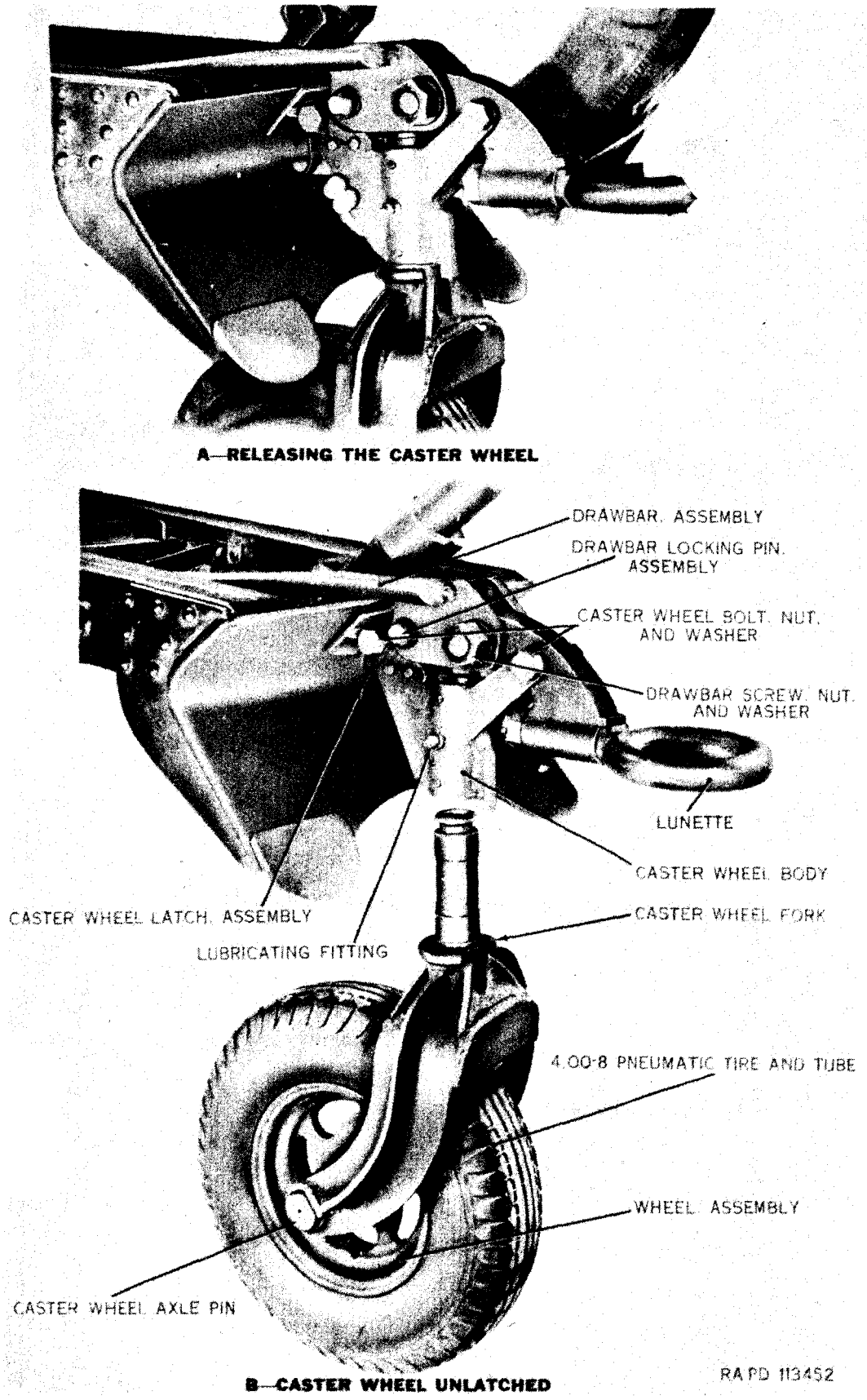


Figure 31. Removing caster wheel assembly from drawbar.

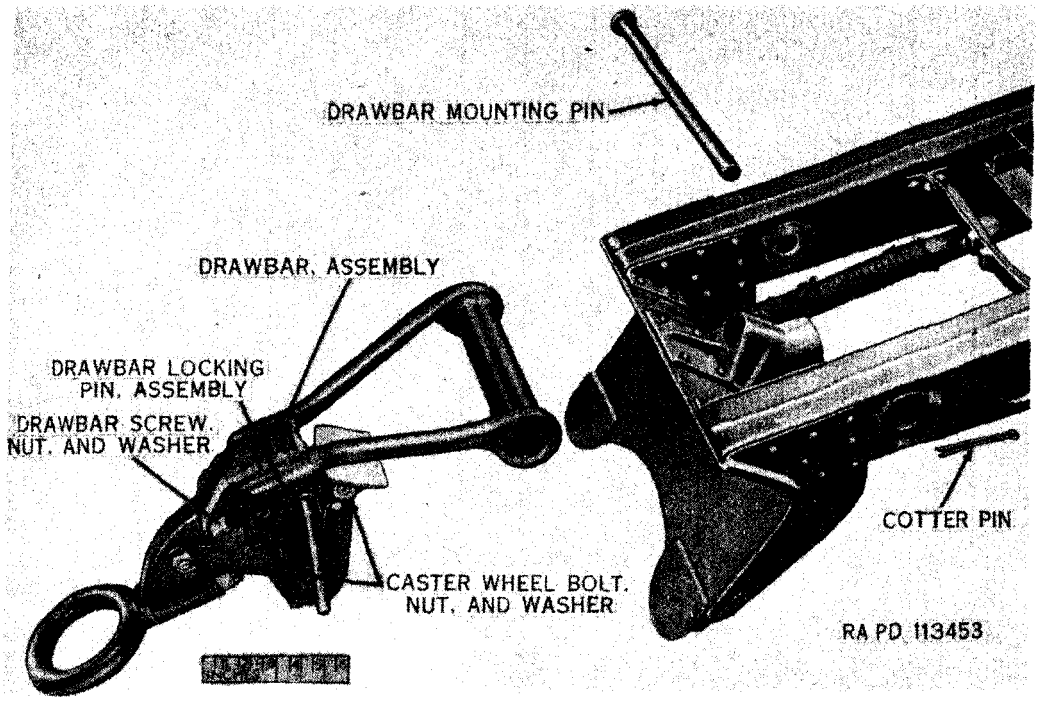


Figure 32. Drawbar assembly removed from rear trail assembly.

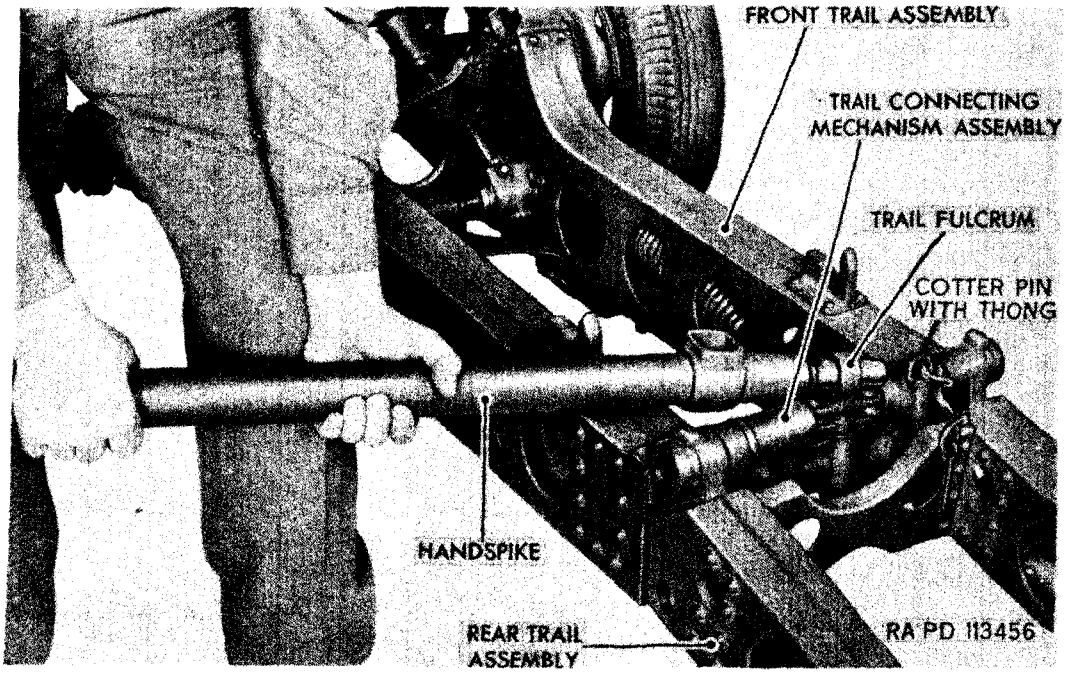


Figure 33. Unlocking trail connecting mechanism assembly.

the drawbar (fig. 32) by removing the cotter pin from the drawbar mounting pin and withdrawing the pin.

b. To disconnect the trail connecting mechanism, withdraw the cotter pin, which is secured to the housing by means of a thong, from its hole in trail connecting mechanism housing. Insert the

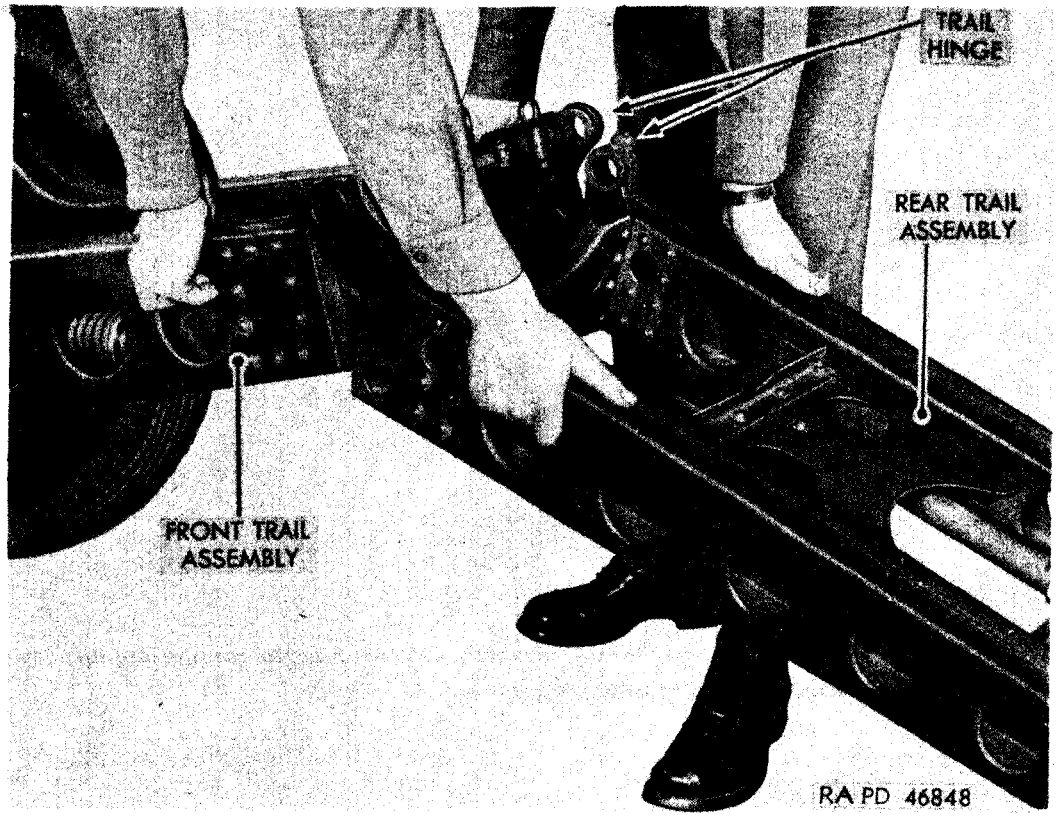


Figure 34. Separating front and rear trail assemblies.

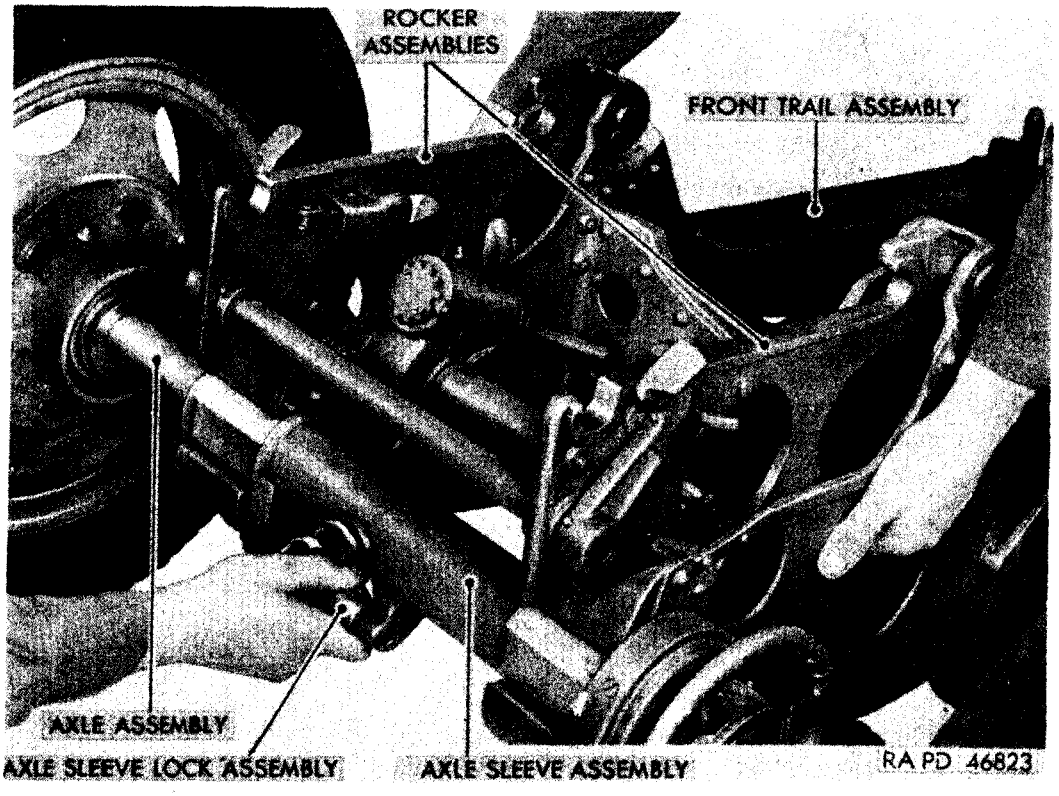


Figure 35. Disengaging axle sleeve lock preparatory to removing axle assembly.

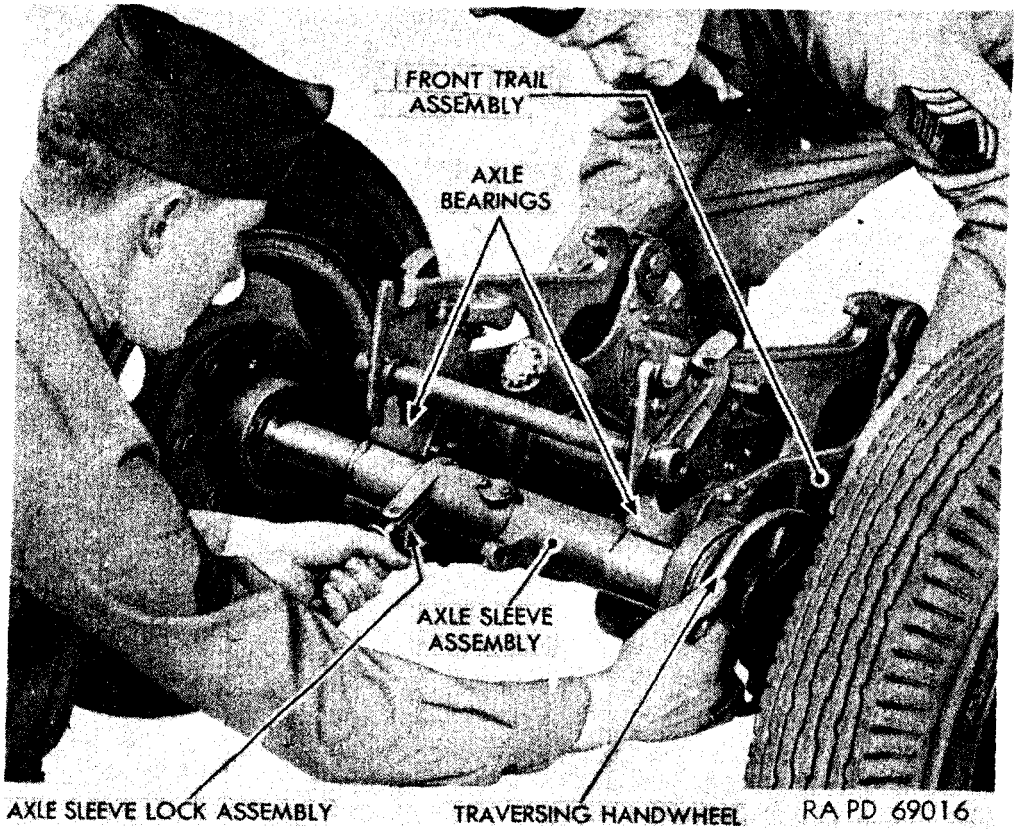


Figure 36. Removing axle and traversing mechanism.

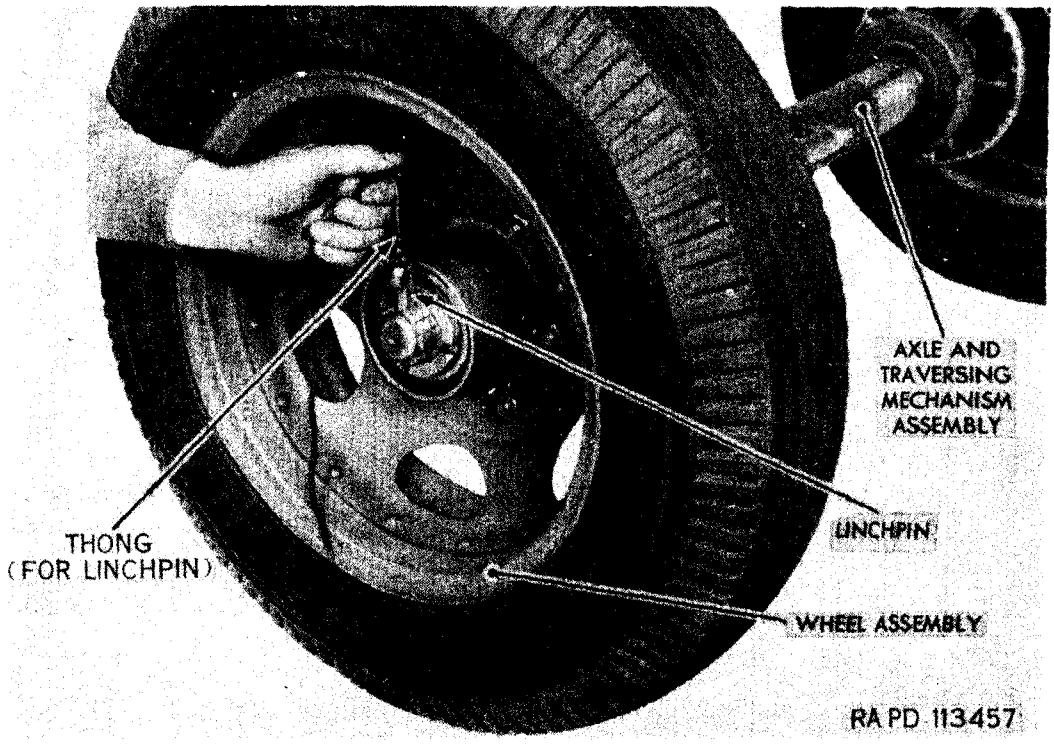


Figure 37. Removing axle linchpin.

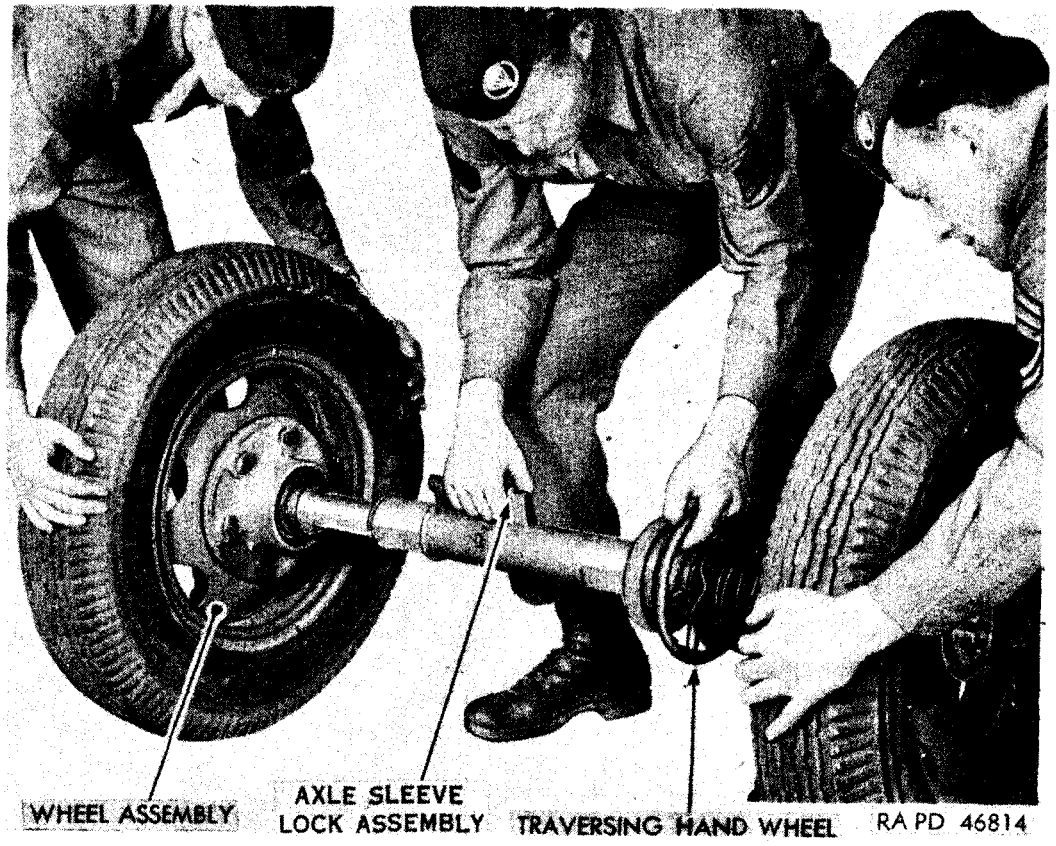


Figure 38. Removing wheels from axle assembly.

end of the handspike into the trail fulcrum and turn the fulcrum counterclockwise until it stops (fig. 33) ; then lift up the center of the trails until the joint is separated (fig. 34) and remove the rear trail.

Note. Do not attempt to disconnect the rear trail assembly until after the howitzer and cradle have been removed as outlined in paragraphs 25 and 26.

c. While one man supports the front trail, disengage the axle sleeve lock by pulling out on the handle (fig. 35).

d. By means of the axle sleeve lock handle, rotate the axle sleeve through 90°. Pull the axle and wheels from the front trail by means of the lock handle and traversing handwheel while the front trail is being supported (fig. 36).

e. Remove the linchpins from the axle arms (fig. 37).

f. Support the axle and pull off the wheels (fig. 38).

Note. The matériel is now completely disassembled for paracrate packing or for animal support.

28. To Assemble Pack Howitzer and Carriage from Pack Loads

Note. The point of assembly of the howitzer and carriage when delivered by parachute in a combat area will be the spot where the front trail (paracrate load M1) lands. All paracrate loads will be unpacked where they land and the howitzer and carriage components rushed to the point of assembly.

a. Place the wheels in position on the axle arms; secure in place with the linchpins.

b. Raise the front trail and insert the axle and wheel assembly in place in the firing position axle bearings. Turn the axle sleeve through 90° by means of the axle sleeve lock. Lock the axle in position.

c. Join the front and rear trails. Lock them together by means of the trail connecting mechanism and insert the trail connecting mechanism locking pin.

d. Slide the cradle into position on the rockers, making certain that the rear cradle locking pins are all the way back into the notched bearings on the rocker. Press the trunnion hooks forward and lock in that position by pushing the trunnion hook latches rearward.

e. Using two lifting bars inserted through the lifting bar holes in the bottom sleigh, lift the bottom sleigh in position at rear of cradle. Line up the sleigh sides with cradle ways; then move the bottom sleigh forward (fig. 27). Remove the lifting bars and push the bottom sleigh all the way forward into position.

f. Pull the piston rod latch lever back; push the piston rod latch down around the recoil piston rod and behind the piston rod nut; lock it in that position by means of the latch lever (fig. 25).

g. Place the breech ring in position on the rear end of the bottom sleigh (fig. 24).

h. Lift the howitzer tube into position, using a lifting bar through the rear eyebolt, making certain that the front eyebolt is in an upright position. Slide the tube into the breech ring (fig. 23). Turn the tube clockwise as far as it will go. See paragraph 106 for procedure, if it proves difficult to assemble the tube to the breech ring.

i. Place the top sleigh in position over the howitzer tube. Slide it forward so that the top sleigh hooks engage the notches in the bottom sleigh (fig. 16).

j. Using the handspike socket, turn the top sleigh clamping latch one-quarter turn in a clockwise direction and lock the top sleigh in position. Insert the top sleigh clamping latch pin in the top sleigh clamping latch (fig. 19).

k. Mount the telescope mount, telescope, and mount support in position in the sight bracket.

l. In the case of airborne matériel which is not to go into action at the point of parachute delivery but must be transported manually by the gun crew, place the drawbar in position in the rear trail and insert the drawbar mounting pin in the trail and drawbar. Replace the cotter pin. Swing the drawbar back against

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Figure 39. Howitzer arranged for manual transportation by gun crew after parachute delivery.

the trail spade and insert the locking pin to lock the drawbar in position. Raise the rear trail, depress the caster wheel latch assembly (fig. 31), and insert the caster wheel yoke into its socket body. The ammunition, tools, and equipment are loaded upon the howitzer as shown in figure 39.

Section VIII. PARACHUTE DELIVERY

29. General

a. For delivery by parachute from C–46 and C–47 airplanes, the 75-mm pack howitzer with 75-mm howitzer carriage M8 is disassembled according to procedure set forth in paragraphs 25, 26, and 27.

b. Nine paracrate loads are required for parachute delivery of the howitzer and 18 rounds of ammunition. The howitzer is divided into seven loads and the ammunition into two loads. Three of these loads comprise the door load which is pushed from the door of the plane and the remaining six loads are dropped from parachute pack racks beneath the airplane. To insure safe landing, it is desirable to drop these loads at a minimum altitude of 600 feet.

c. A standard 24-foot cargo parachute is used with each load.

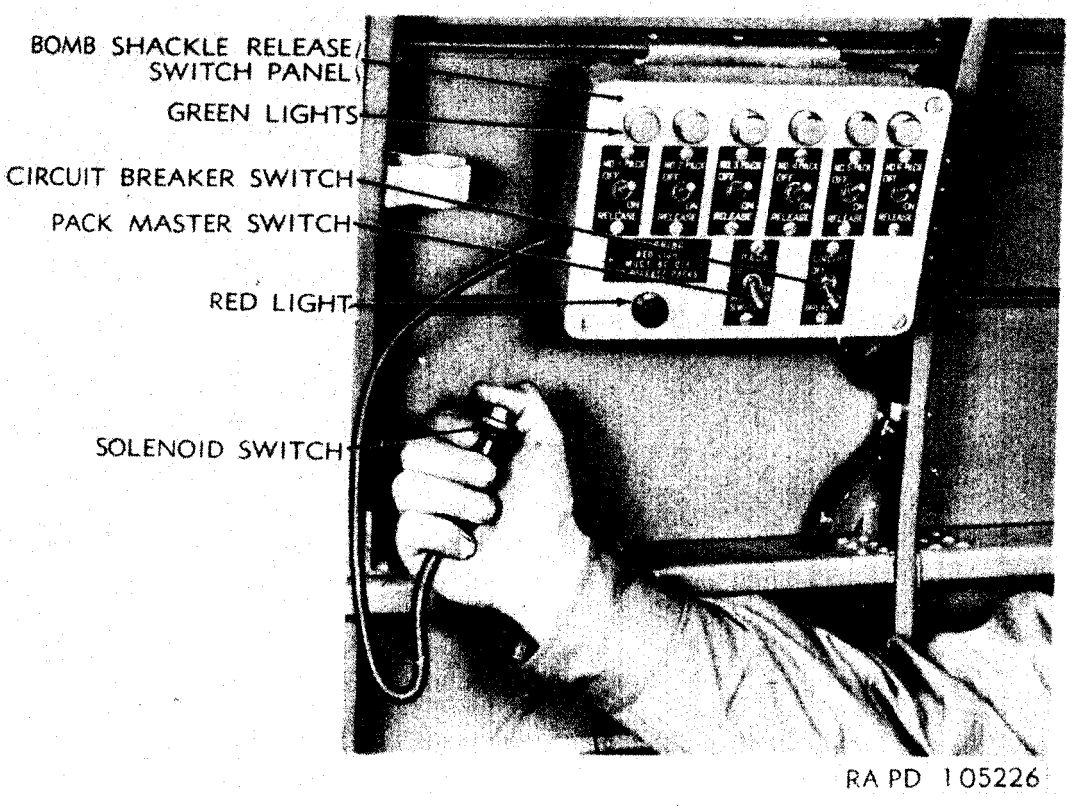


Figure 40. Releasing parachute pack rack loads without intervalometer.

The cargo parachutes may be colored to differentiate between the various paracrate loads and provide for quick identification. The loads comprising the door load are dropped first; then the loads carried in the parachute pack racks are released consecutively. When the solenoid switch is used with the parachute pack rack switch panel for dropping the loads (fig. 40), they are released in succession as rapidly as possible; but when the intervalometer is used (fig. 126), the interval of the successive release of the parachute pack racks is automatic.

Caution: The salvo release must not be used for these loads.

d. On the ground the howitzer is assembled according to procedure set forth in paragraph 28.

30. Quick-release Fastenings

a. The suspensions and harnesses for paracrates are secured by means of a quick-release fastening which is very quickly unfastened by pulling on the free end of the webbing. The quick-release fastening is made as follows:

(1) Pass the end of the webbing *A* through both metal loops of the buckle (fig. 41, A).

(2) Make a fold *B* in the webbing and pass it back through the large metal loop (fig. 41, B).

(3) Hold loop *B* in one hand; with other hand tighten fastening by pulling webbing through both metal loops in direction indicated by arrows, forming loop *C* in the webbing (fig. 41, C).

(4) Take up slack by pulling webbing in loop *B* as indicated by arrows, thereby closing loop *C* and tightening it down against the metal loops. Hold the thumb against loop *C* to keep the fastening from loosening (fig. 41, D).

(5) Completed fastening is shown in figure 41, E, with arrows indicating the direction of the webbing through the various steps in making the fastening.

(6) The quick-release fastening is quickly released by pulling end *A* (fig. 41, F).

b. No harness is used with metal paracrates. Metal straps and suspensions are looped around the paracrates and these are quickly released by means of clasps. Pulling the lever of the clasp outward opens the clasp.

31. Wood Paracrate Loads.

The howitzer and ammunition are packed in nine paracrate loads. The component parts of these loads and weights when using wood paracrates are as follows:

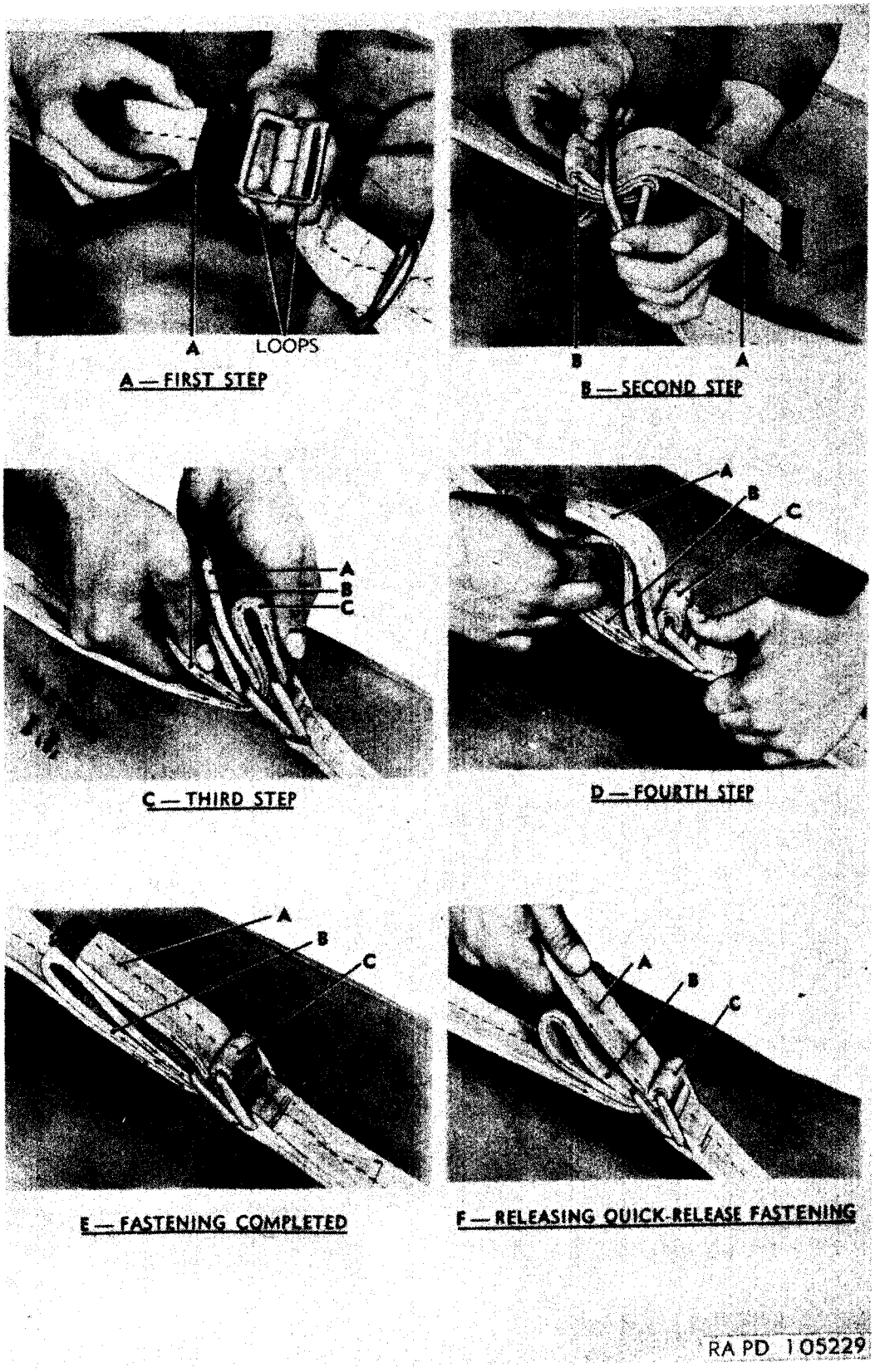


Figure 41. Method of preparing quick-release fastening.

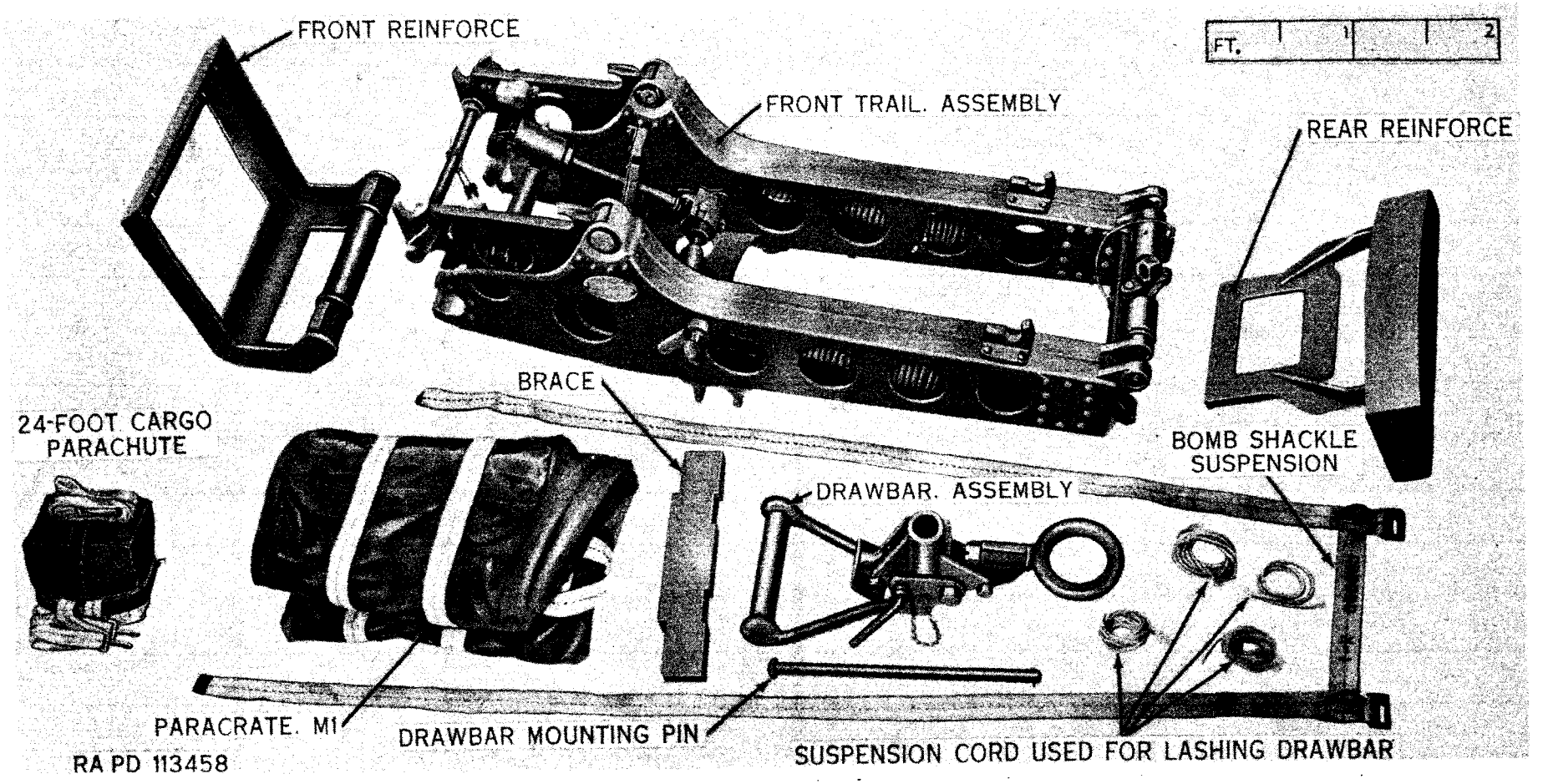


Figure 42. Paracrate load M1 displayed.

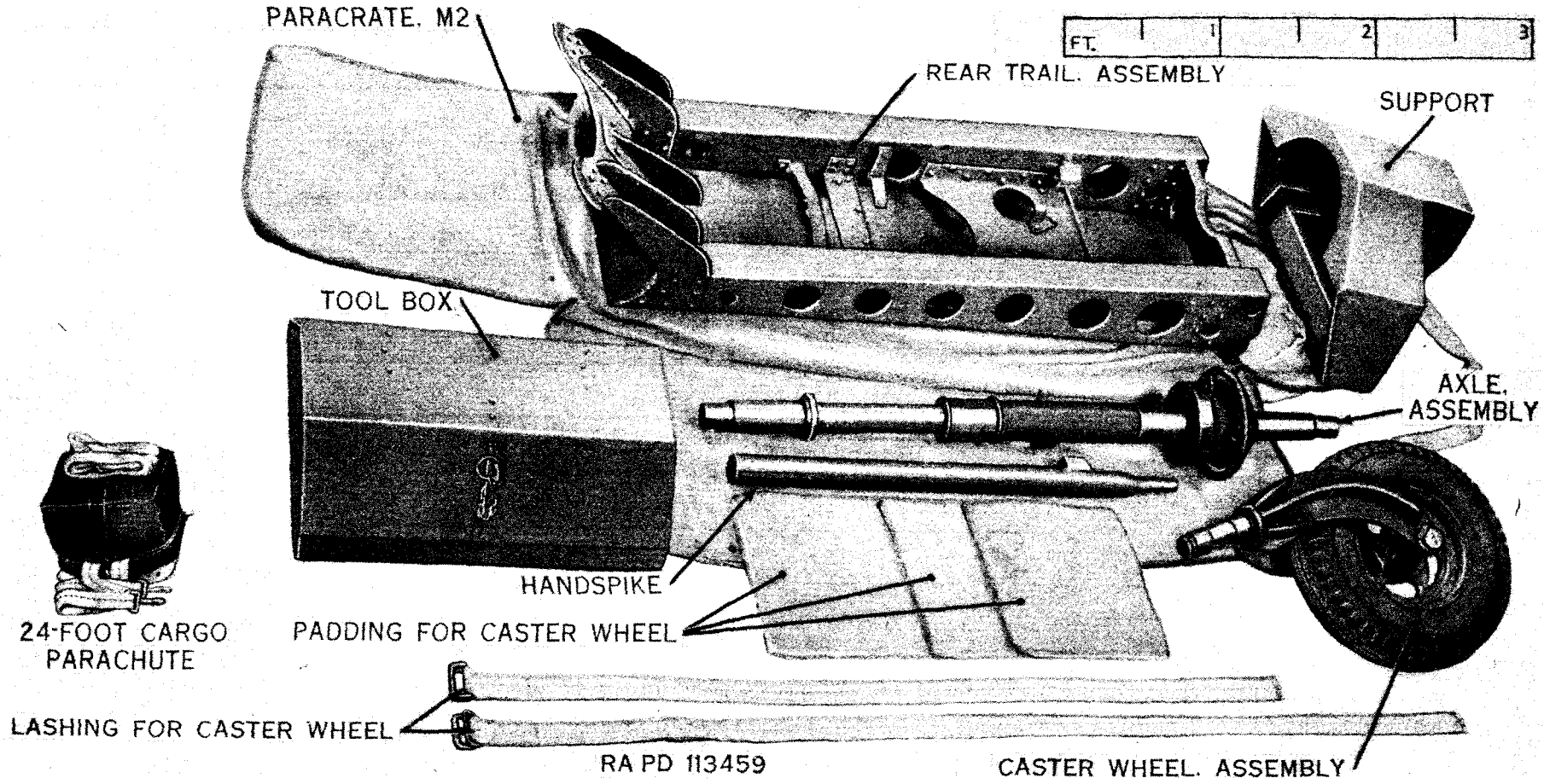


Figure 43. Paracrate load M2 displayed.

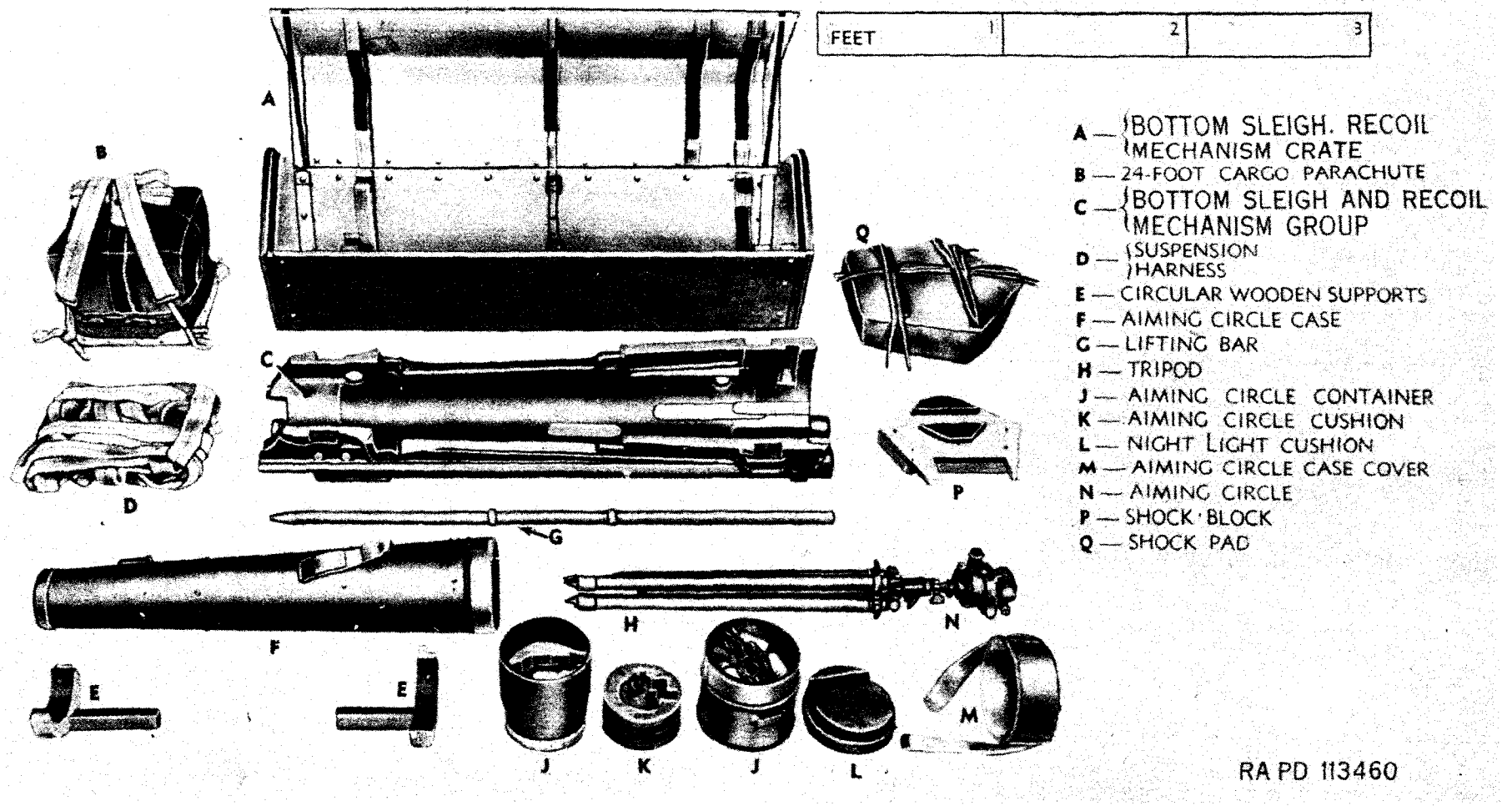


Figure 44. Paracrate load M3 displayed.

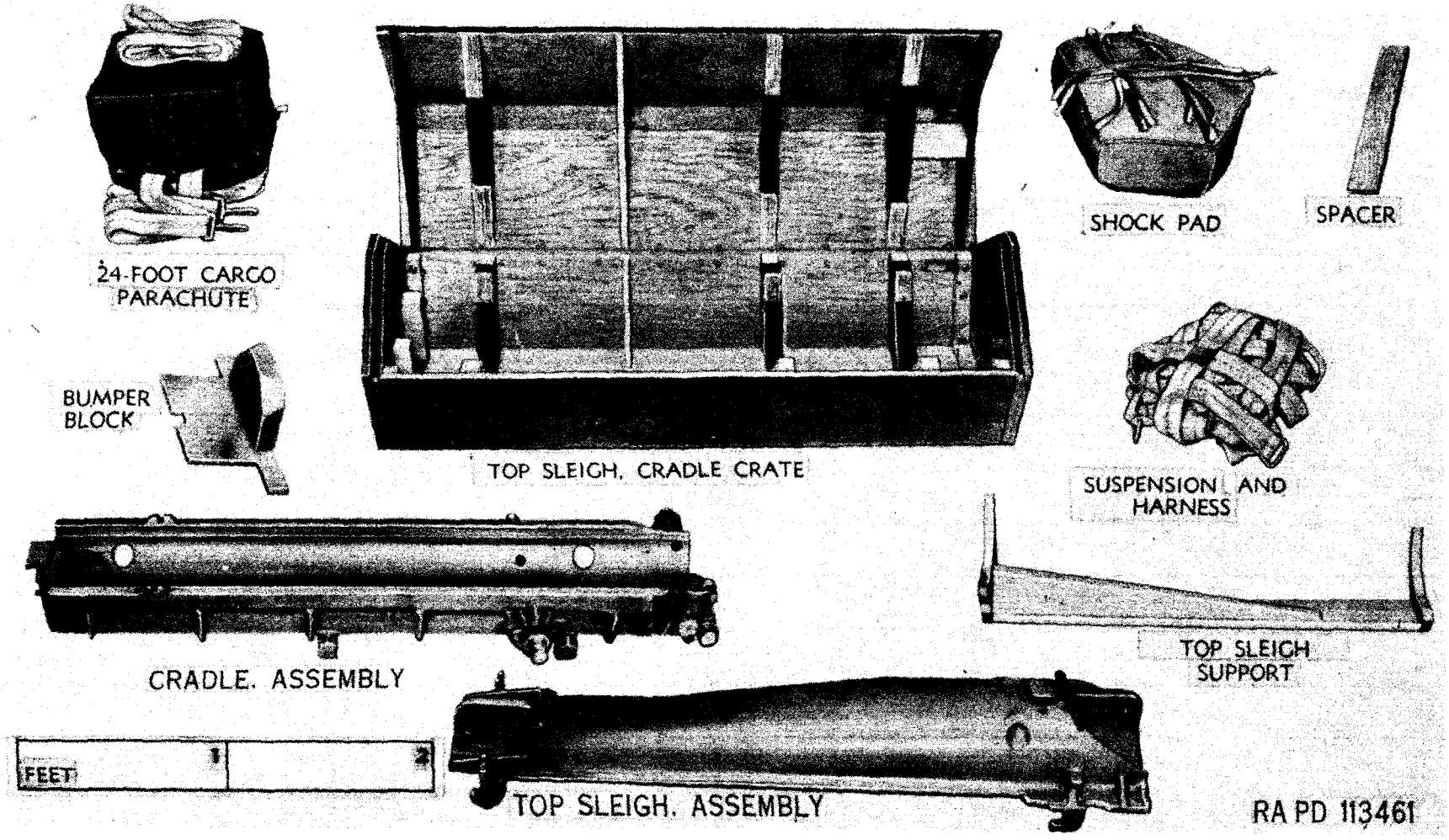


Figure 45. Paracrate load M4 displayed.

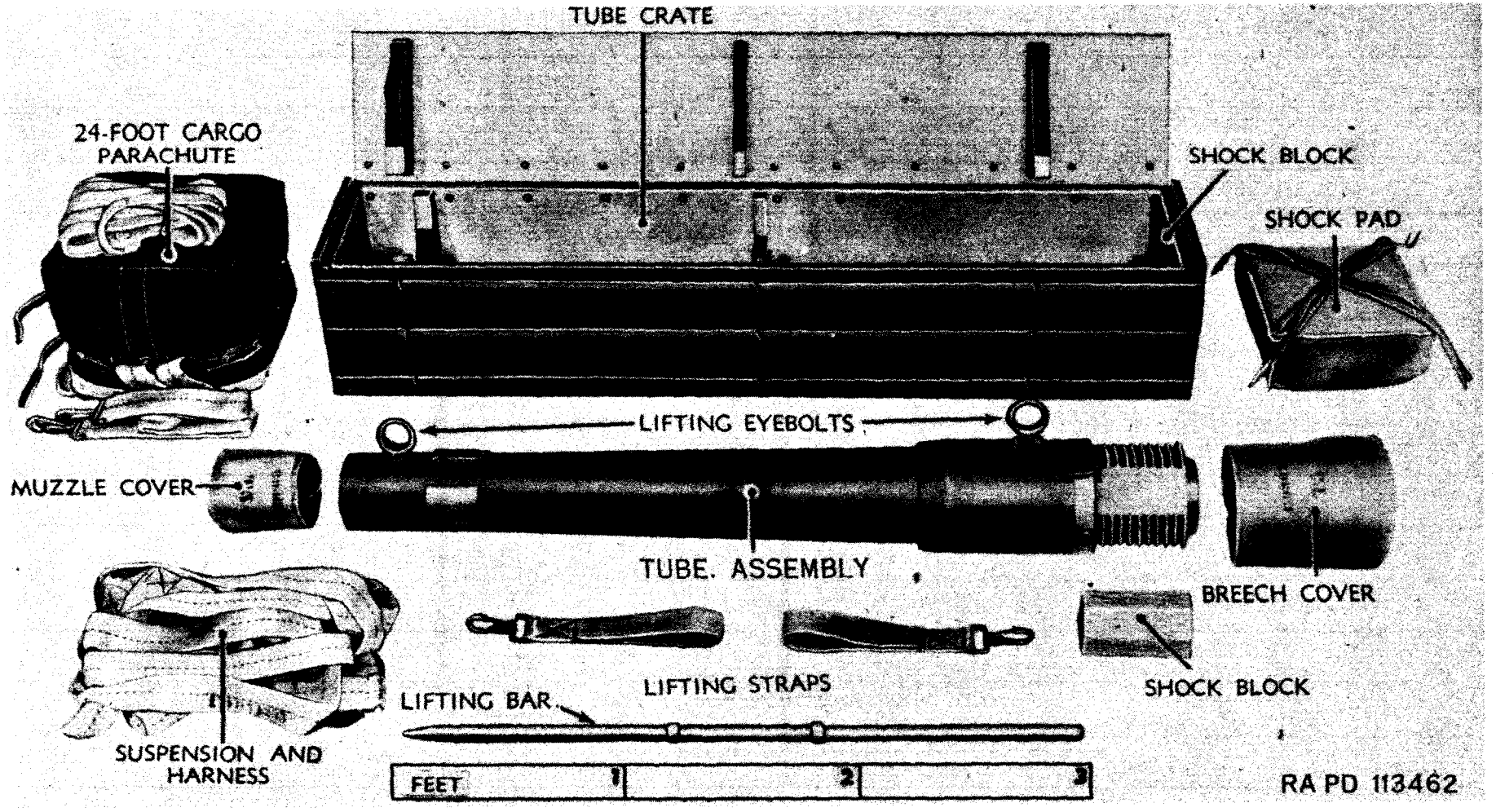


Figure 46. Paracrate load M5 displayed.

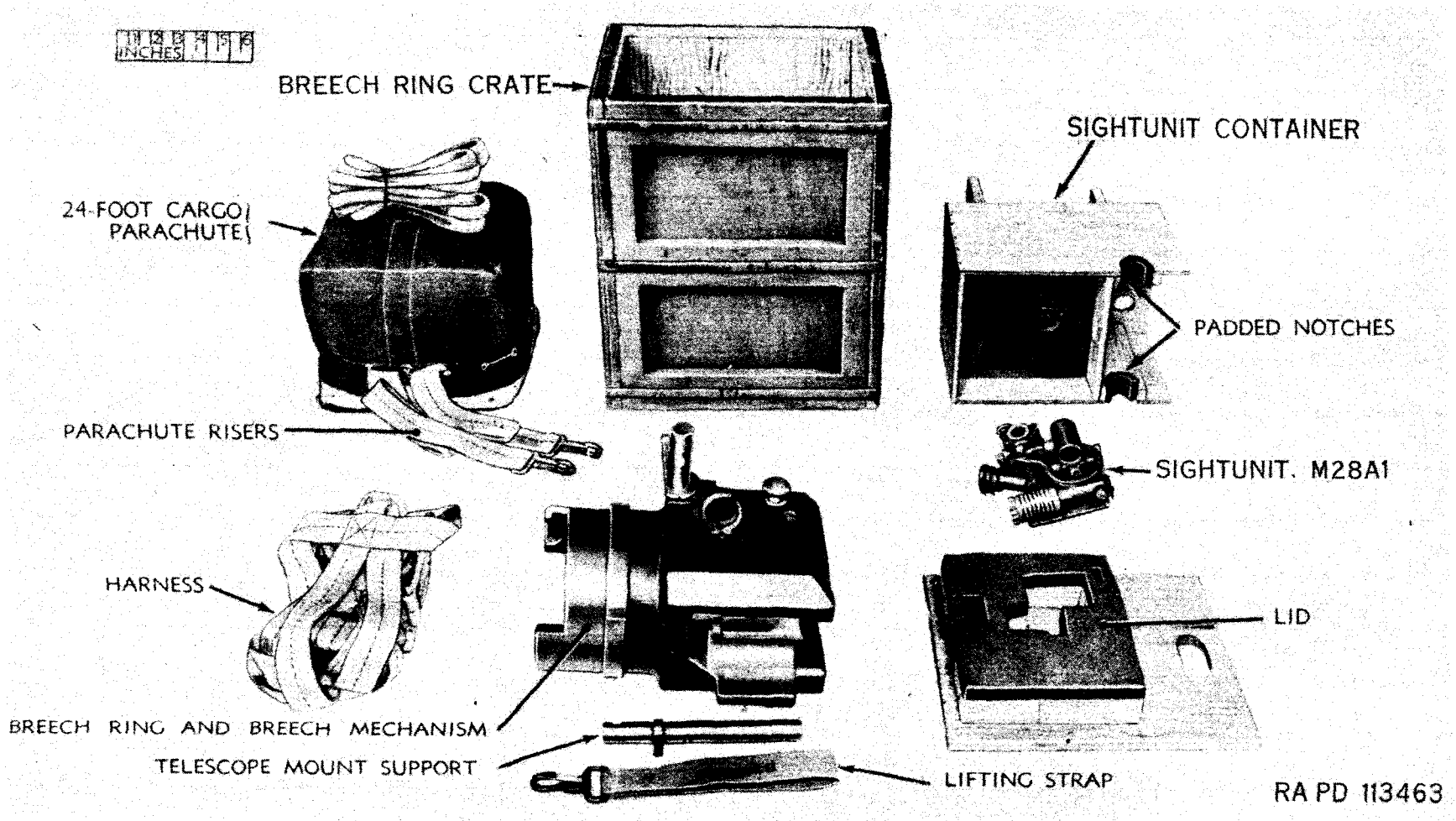


Figure 47. Paracrate load M6 displayed.

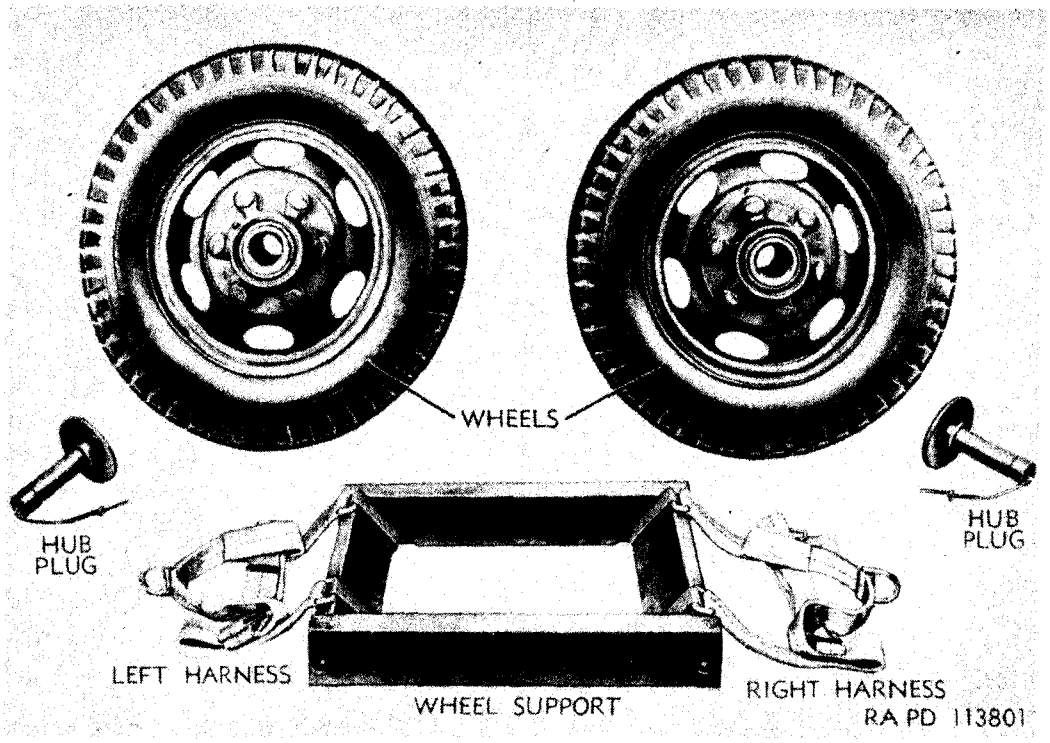


Figure 48. Paracrate load M7 displayed.

a. Paracrate Load M1 (fig. 42). See paragraph 32 for loading instructions.

	Pounds
Front trail assembly	230
Lifting bar	9
Drawbar	20
Paracover M1, front reinforce, rear reinforce, and brace	58
Total weight	317

b. Paracrate Load M2 (fig. 43). See paragraph 33 for loading instructions.

Rear trail	95
Axle and traversing mechanism	65
Trail handspike	7
Bore brush staff	6
Caster wheel	40
Spare parts and tool box	40
Paracover M2, rear support, center support, and front support	38
Total weight	291

c. Paracrate Load M3 (fig. 44). See paragraph 34 for loading instructions.

Bottom sleigh and recoil mechanism	217
Aiming circle with case	20
Crate	73

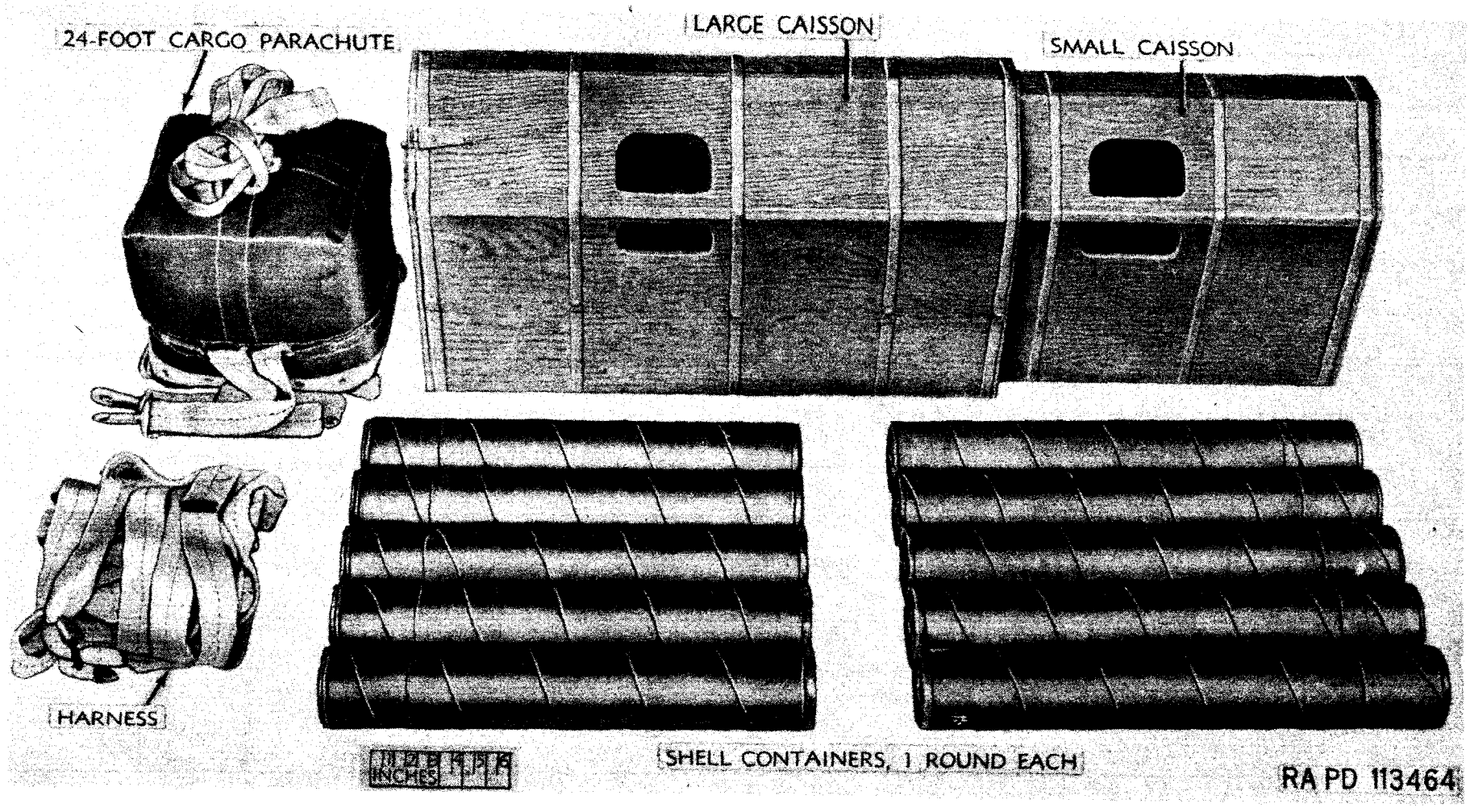


Figure 49. Parachest load M8 displayed.

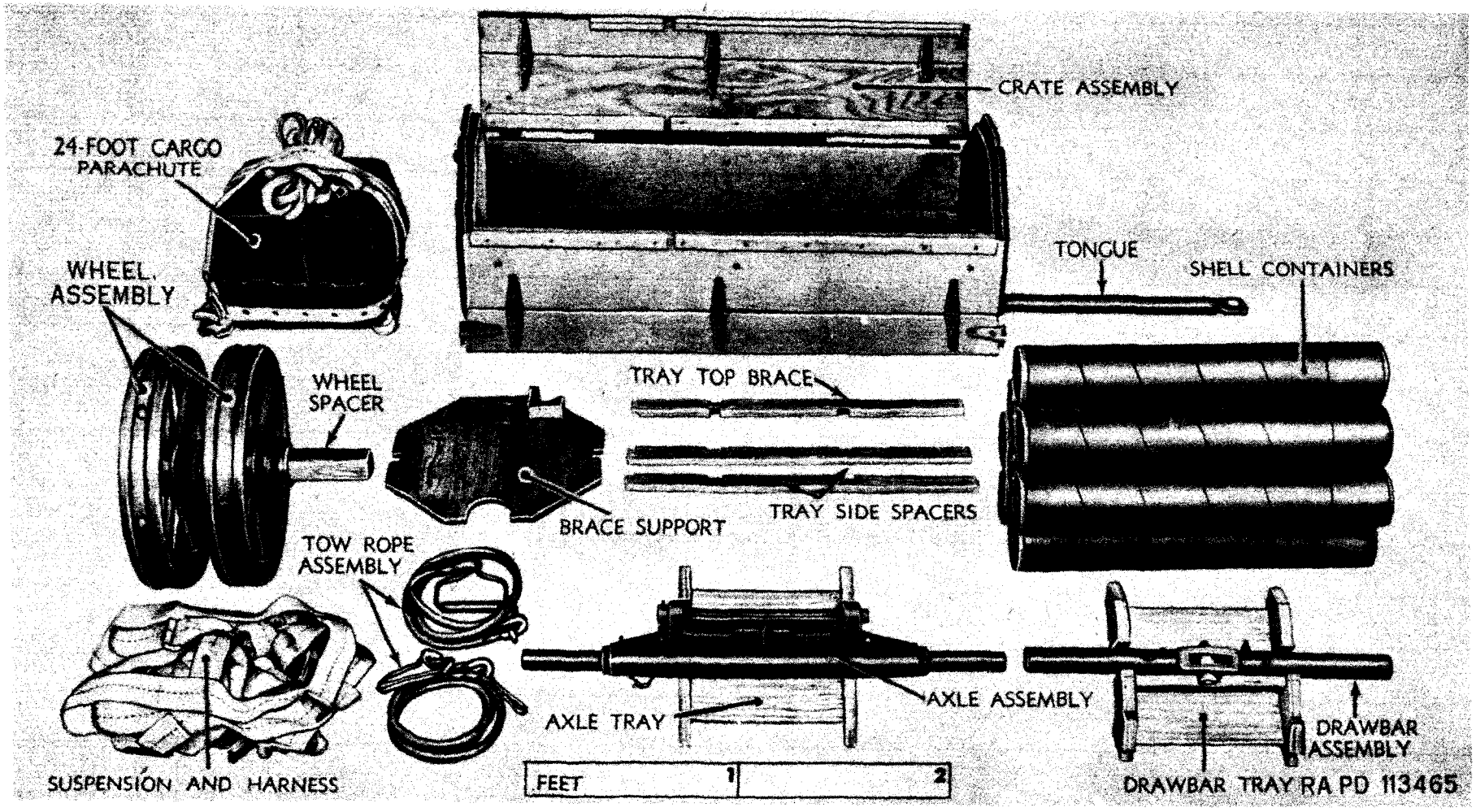


Figure 50. Paracaisson load M9 displayed.

	Pounds
Lifting bar	9
Total weight	319

d. Paracrate Load M4 (fig. 45). See paragraph 35 for loading instructions.

Cradle	105
Top sleigh	108
Top sleigh and cradle crate	87
Total weight	300

e. Paracrate Load M5 (fig. 46). See paragraph 36 for loading instructions.

Tube	221
Tube crate	49
Lifting bar	9
Total weight	279

f. Paracrate Load M6 (fig. 47). See paragraph 37 for loading instructions.

Breech assembly	121
Telescope with mount	13
Breech crate	45
Total weight	179

g. Paracrate Load M7 (fig. 48). See paragraph 38 for loading instructions.

Wheels (two)	180
Crate	22
Total weight	202

h. Parachest Load M8 (fig. 49). See paragraph 39 for loading instructions.

Ammunition, 10 rounds in individual fiber containers	223
Large caisson and small caisson	47
Total weight	270

i. Paracaisson Load M9 (fig. 50). See paragraph 40 for loading instructions.

Paracaisson	105
Ammunition, 8 rounds in individual fiber containers	176
Total weight	281

j. Total Weights.

Weight of nine parachutes	207
Total weight of the nine paracrate loads including parachutes	2645

32. Packing Paracrate Load M1

a. Place the front reinforce in the front axle bearings of the front trail and pivot to the rear over the rockers (figs. 51 and 52).

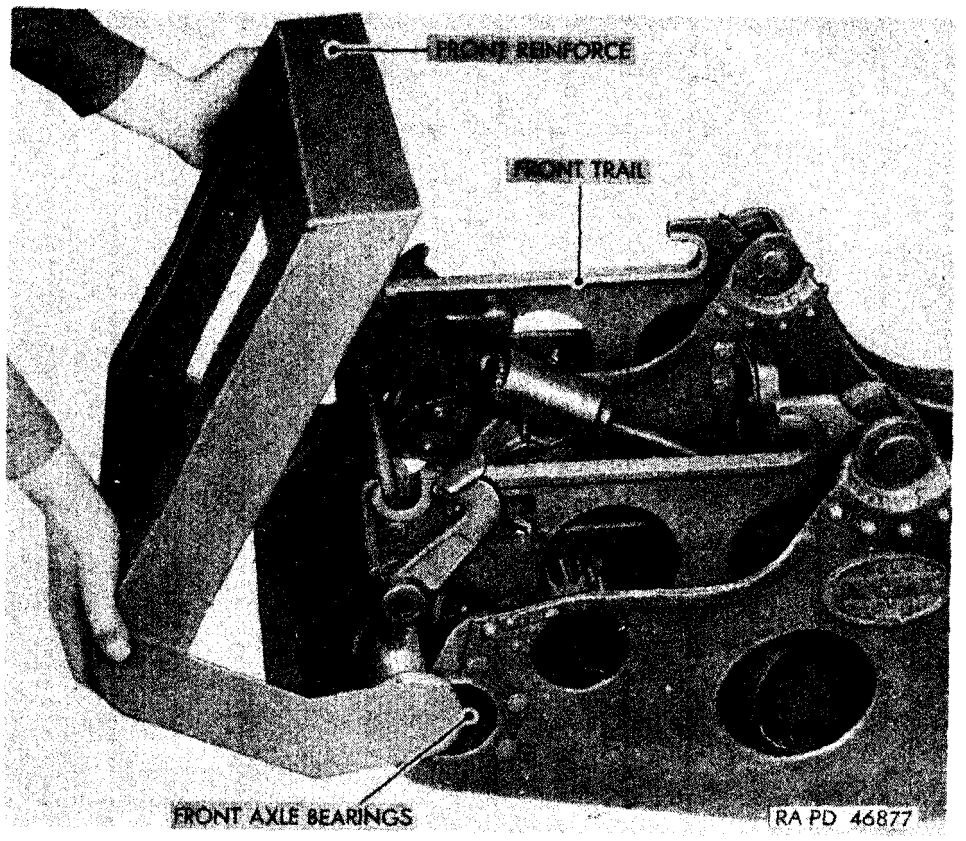


Figure 51. Fitting front reinforce onto front trail assembly.

The elevating mechanism should be fully depressed and the elevating crank knobs turned in the trail-lightening holes, so that the front reinforce fits snugly over the highest part of the trail members. When reinforce is fitted, elevate the piece about one-half turn to tighten reinforce in place.

b. Place the rear reinforce bosses in the trail hinge bosses (fig. 53) and push down to line-up holes in the reinforce bosses with those in the trail hinge. Make certain that reinforce is up snug against the rear of trail. Lock reinforce in position by actuating trail-connecting mechanism with handspike (fig. 54).

c. Place the brace in the rear axle bearings on the bottom of the trail (fig. 55). If the brace is pressed firmly into the bearings, making a snug fit, it will usually be held in place by friction. However, if the fit is loose, the brace should be tied to the trail members with shock cord.

d. Lay out the canvas paracrate in a position to receive the trail and supports.

e. Place the front trail and supports in the cover. Place the drawbar on the trail and lash securely in three places using shock cord. Place a lifting bar on the trail with the pointed end of the bar toward the front end of the trail. Lash the bar securely in two places using shock cord (fig. 56). Close and

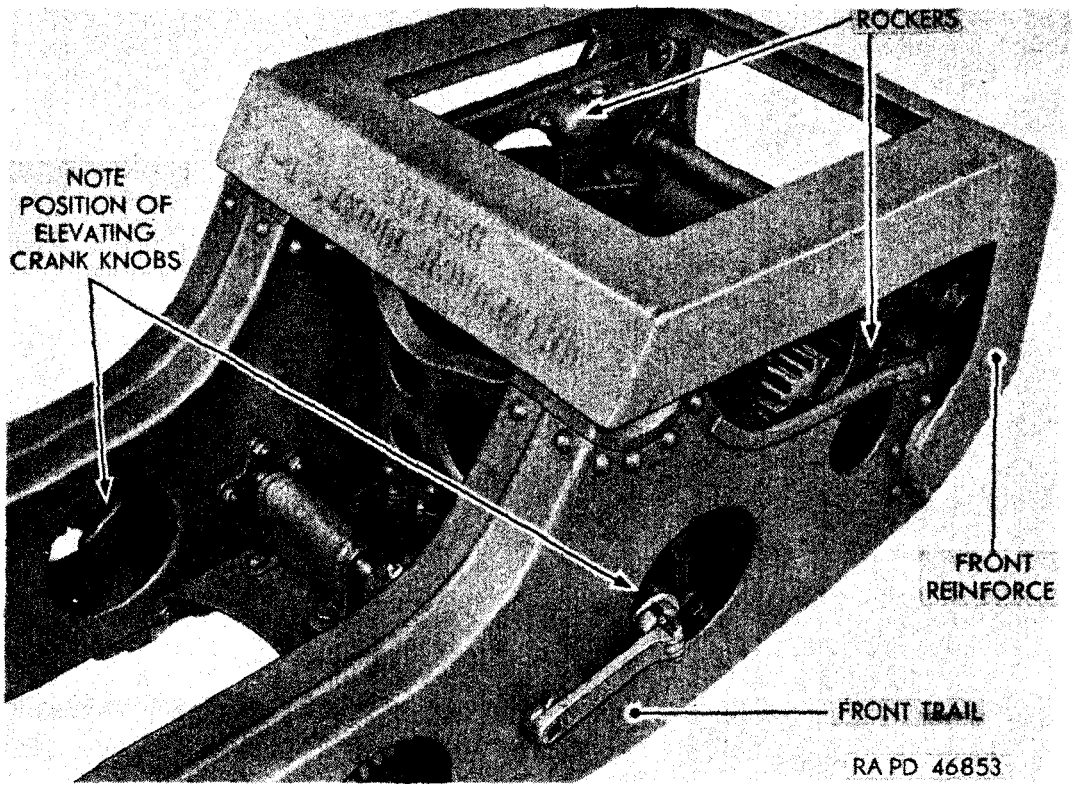


Figure 52. Front reinforce in place on front trail assembly.

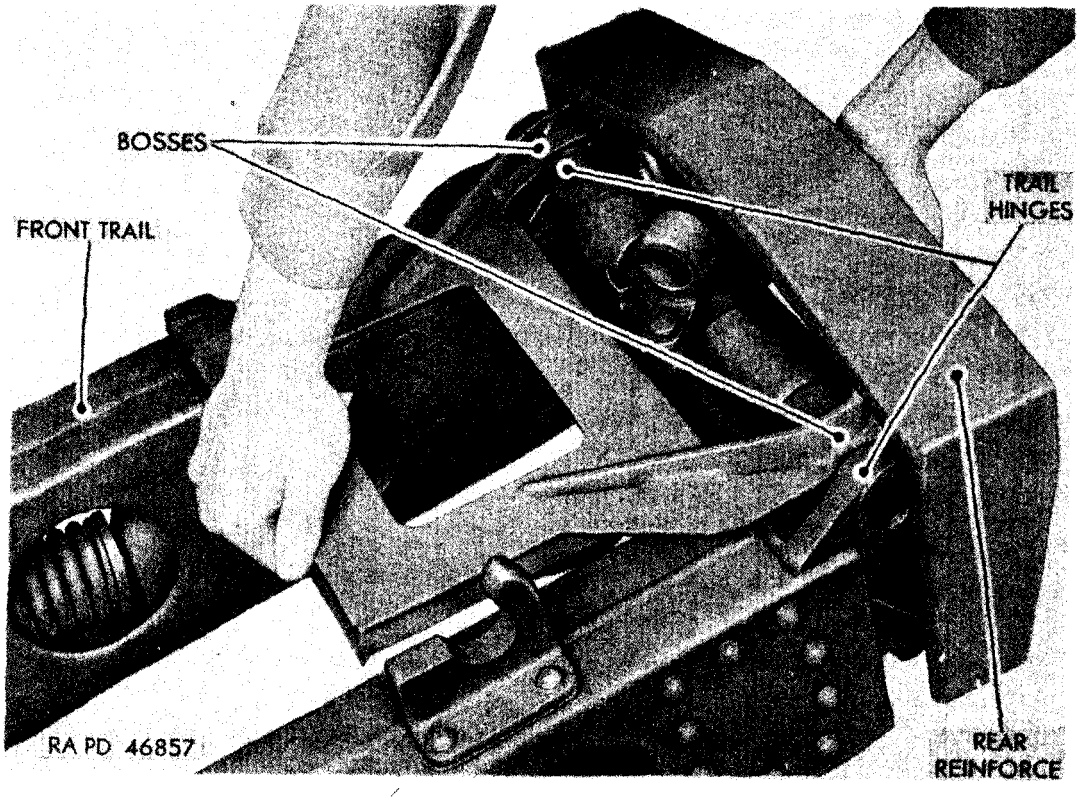


Figure 53. Fitting rear reinforce onto front trail assembly.

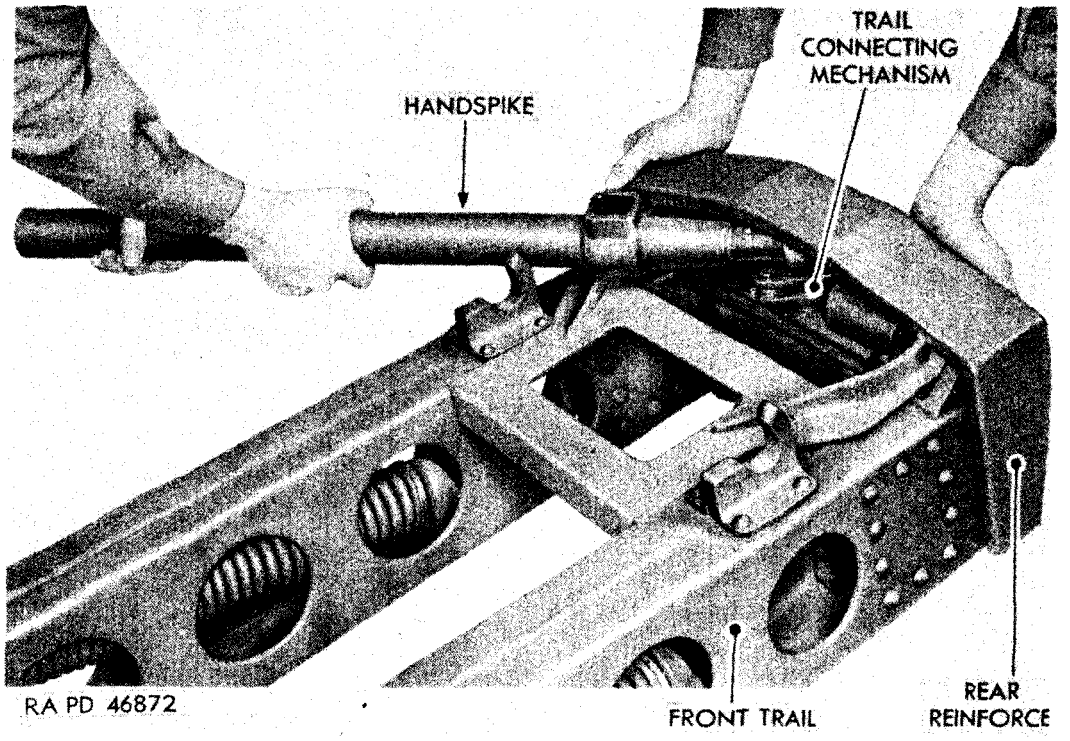


Figure 54. Locking rear reinforce in place on front trail assembly.

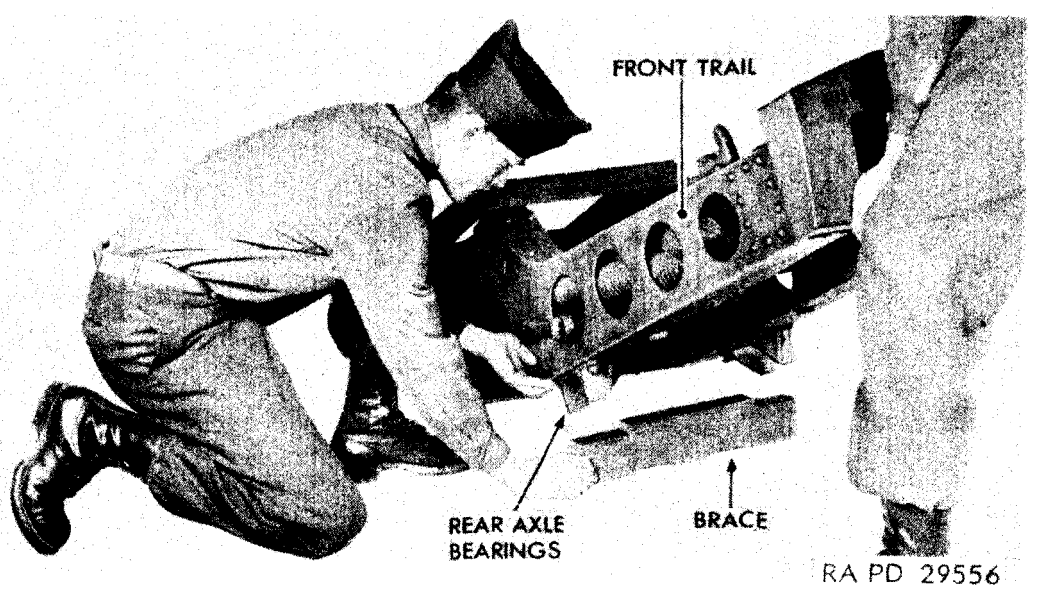


Figure 55. Installing brace under front trail assembly.

secure the cover with the 11 button snap fasteners.

f. Tighten harness (fig. 57). Complete this operation with the quick-release fastening, instructions for which are given in paragraph 30.

g. Turn the paracrate load M1 over so that the button snap fasteners on the cover are upright. Thread the suspension webbing underneath the harness webbing. If the airplane is equipped

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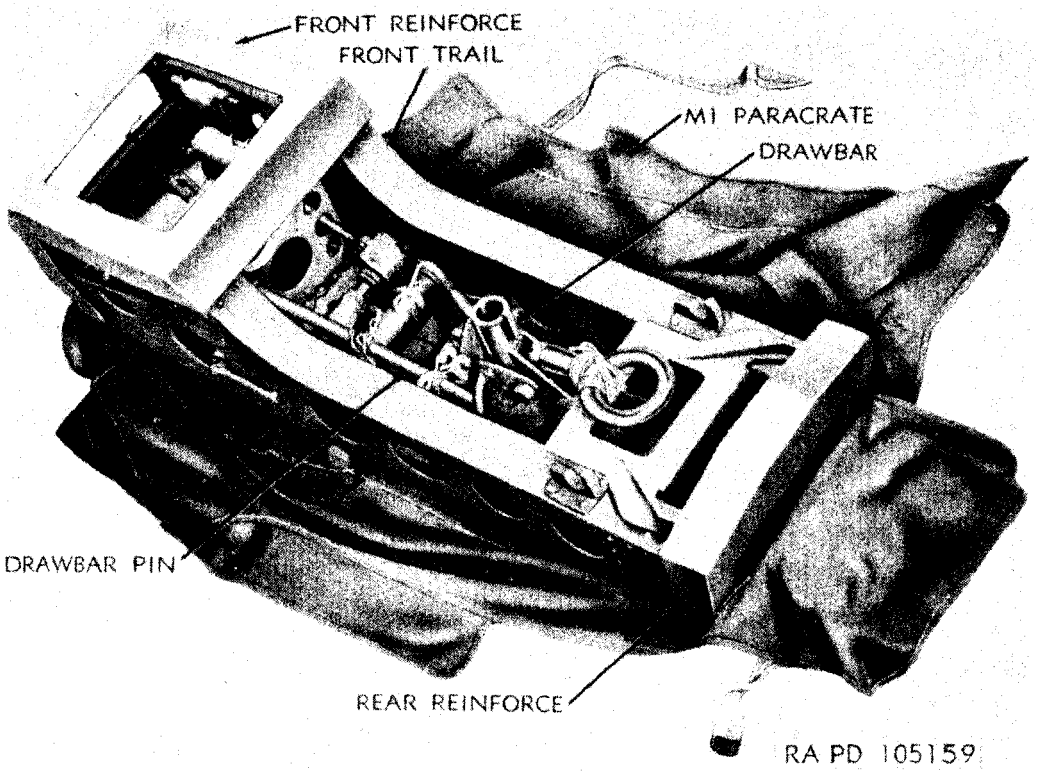


Figure 56. Paracrate M1 loaded—paracrate open.

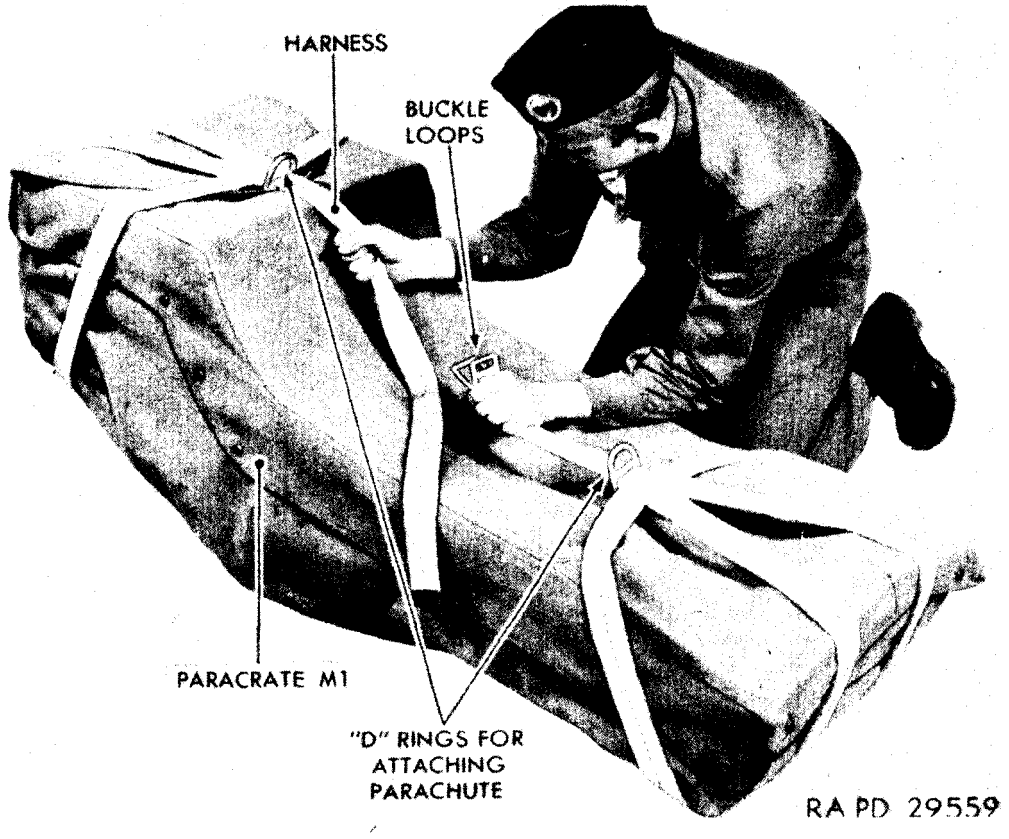


Figure 57. Tightening harness of paracrate M1.

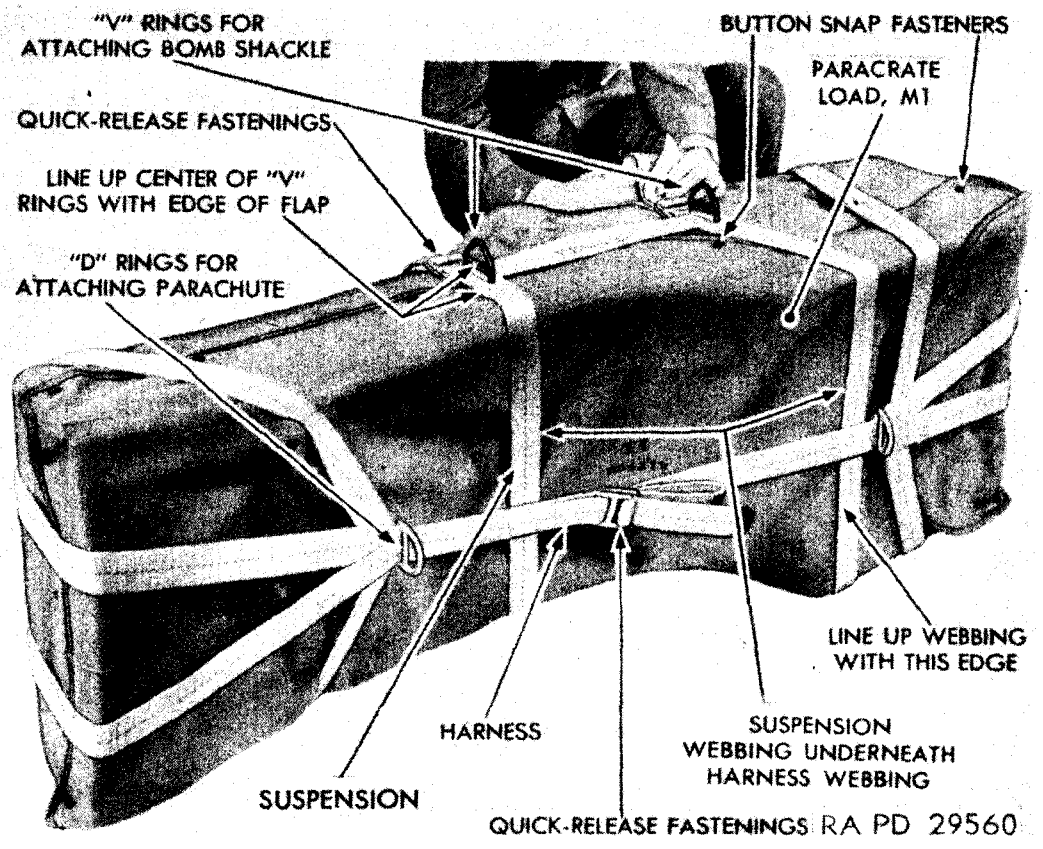


Figure 58. Fastening suspension for paracrate load M1.

with standard parachute pack racks (fig. 78), line up the front webbing of the suspension with the rear edge of the large end of the trail. Center the bomb shackle "V" rings with the bottom edge of the cover flap (fig. 58). If the airplane is equipped with modified parachute pack racks (fig. 79), locate the suspension so as to balance the weight of the paracrate (par. 41*c*).

h. Complete the suspension, tightening with two quick-release fastenings (par. 30).

i. The load is now complete except for the parachute, which will be attached at the airplane according to procedure set forth in paragraph 42.

33. Packing Paracrate Load M2 (fig. 43)

a. Turn the rear trail upside down and put the rear and center supports in place; one just ahead of the front cross support, the other near the rear cross support in line with the third hole from the rear of the trail (fig. 59).

b. Fit the axle into the recesses in the rear and center supports, the traversing handwheel toward the front of the trail and the other end of the axle inserted in the axle fastening socket on the rear trail spade (fig. 59).

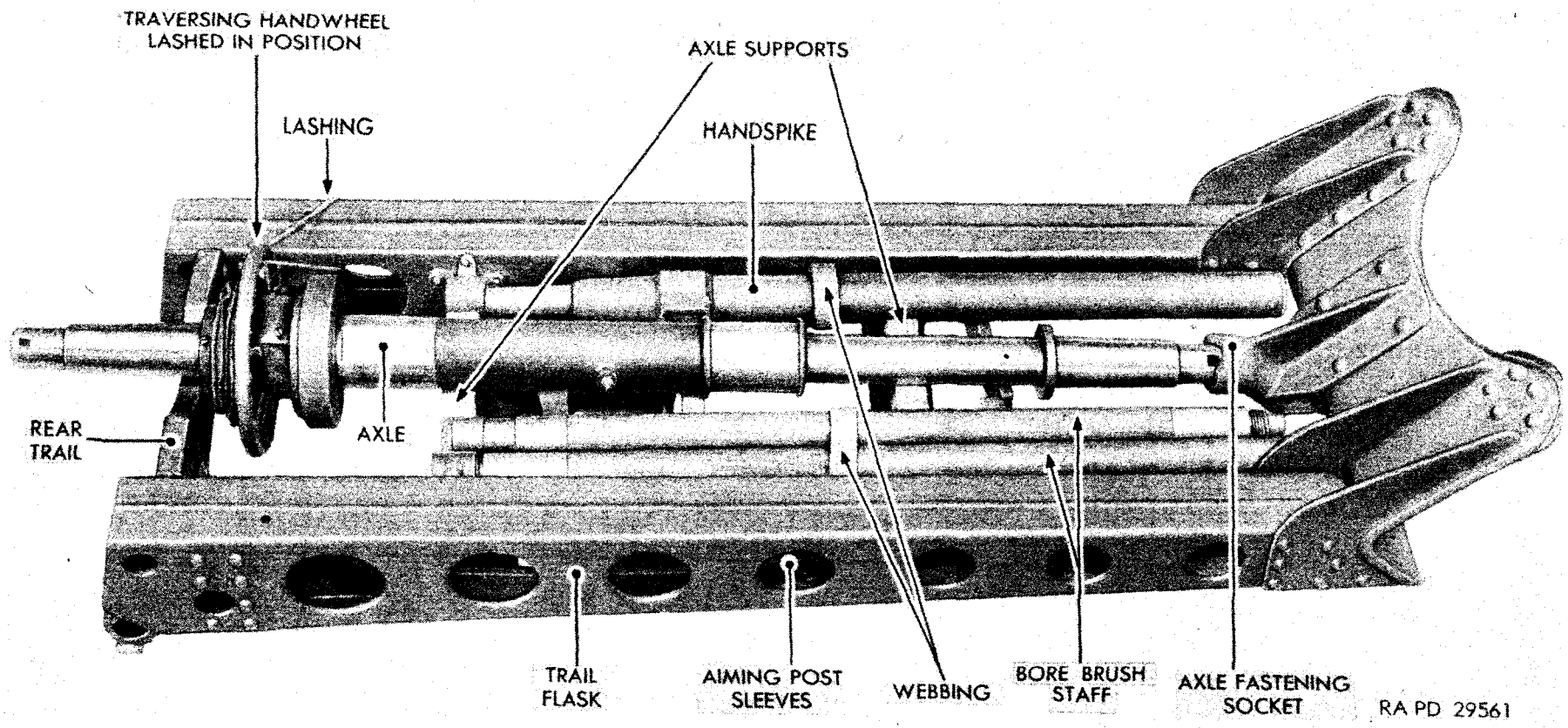


Figure 59. Rear trail assembly with part of load for paracrate M2 in place.

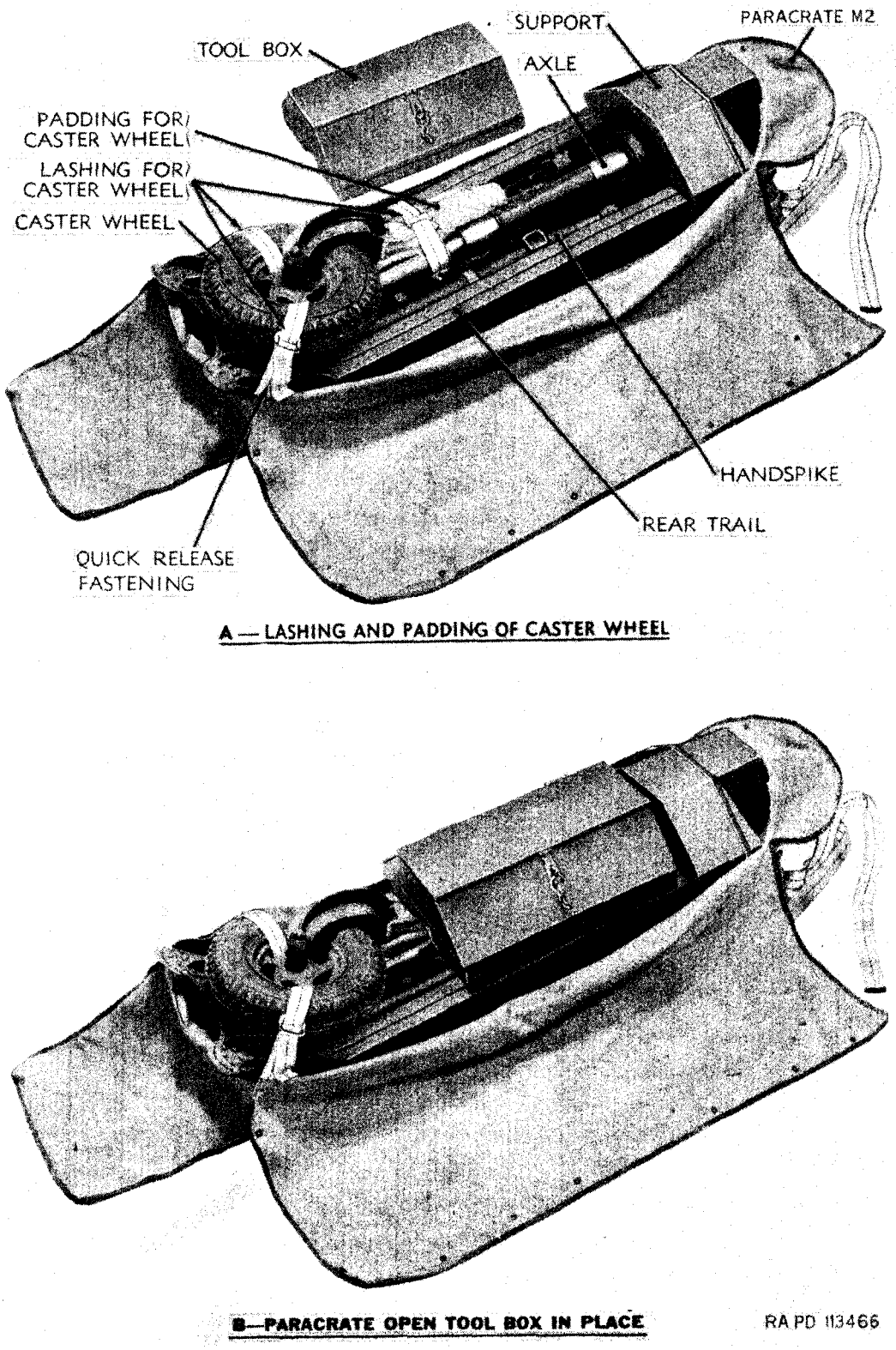


Figure 60. Paracrate M2 loaded—paracrate open.

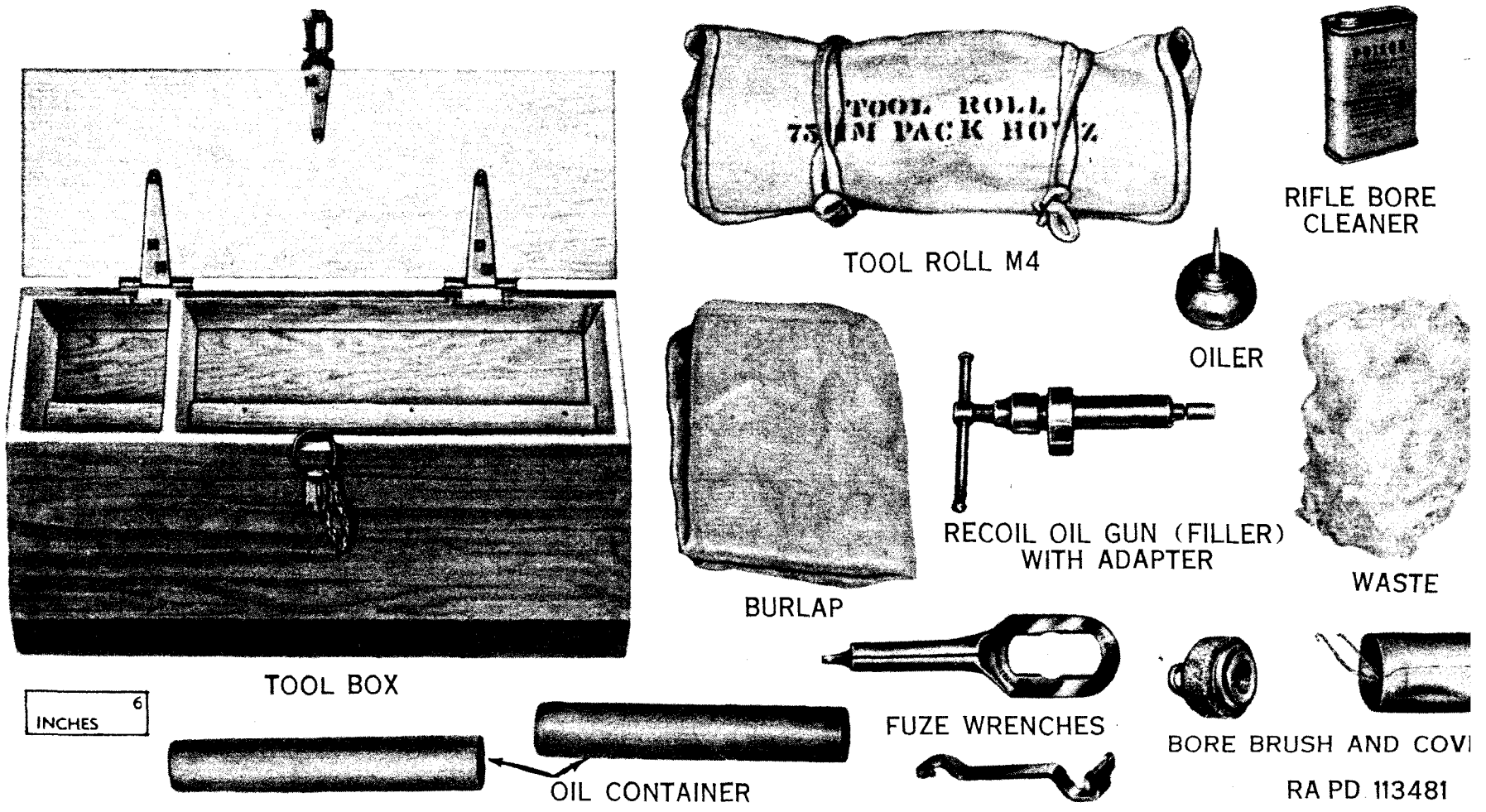


Figure 61. Tool box and contents for paracrate load M2.

c. Turn the traversing handwheel and slide the axle sleeve forward until the axle sleeve lock plunger is firmly engaged in the hole in the trail bracket. This locks the axle in position on trail. Tie traversing handwheel with 5-cord lashing (fig. 59).

Caution: If the traversing mechanism cover becomes pinched between the handwheel and traversing mechanism, the axle cannot be locked in the trail.

d. Put the cleaning staff-sections beside the axle in the grooves cut in the axle supports and secure with web fastener attached to trail. Place handspike on other side of axle with the tapered end inserted into the recess provided and the larger end resting on the spade. Secure with web fastener attached to trail (fig. 59).

e. Wrap shaft of caster wheel fork with padding and place the caster wheel on the rear trail. Lash it securely in place with webbing (fig. 60, A).

f. Pack the tool box with the following items: rifle bore cleaner (in the small section), two oil containers, fuze wrenches, oiler, recoil oil filler gun with adapter, bore brush with cover, waste, burlap, oil release tool, tool roll M4, complete with tools (fig. 61). Make certain that the complete list of tools is packed with tool roll M4.

g. Fit the front support over front end of trail. Fit tool box, completely packed, over on rear trail (fig. 60, B). Put aiming post sleeves in the trail flask (fig. 59).

h. Place the load into paracrate M2, close cover, and secure with button snap fasteners. Adjust suspension and tighten with quick-release fastenings (par. 30).

i. Fit the suspension in place, with the "V" rings on the same side of the trail as the button snap fasteners. Move the rear "V" ring on the suspension harness as far to the left of the load as possible (fig. 96, B) so that the load M2 will hang at an angle when suspended from the bomb shackle. This will provide greater clearance between the rear of the load M2 and the nose assembly on pack rack No. 3. Tighten the suspension harness with quick-release fastening (fig. 41).

Note. When the airplane is equipped with standard parachute pack racks, the suspension should be placed so that the rear strap almost covers the middle strap of the harness, which will bring the "V" rings into the correct position for the bomb shackle (fig. 78). When the airplane is equipped with the modified parachute pack rack (fig. 79), the suspension is placed so as to balance the weight par. (41*c*).

j. The load is now complete except for the parachute, which will be attached at the airplane according to procedure set forth in paragraph 42.

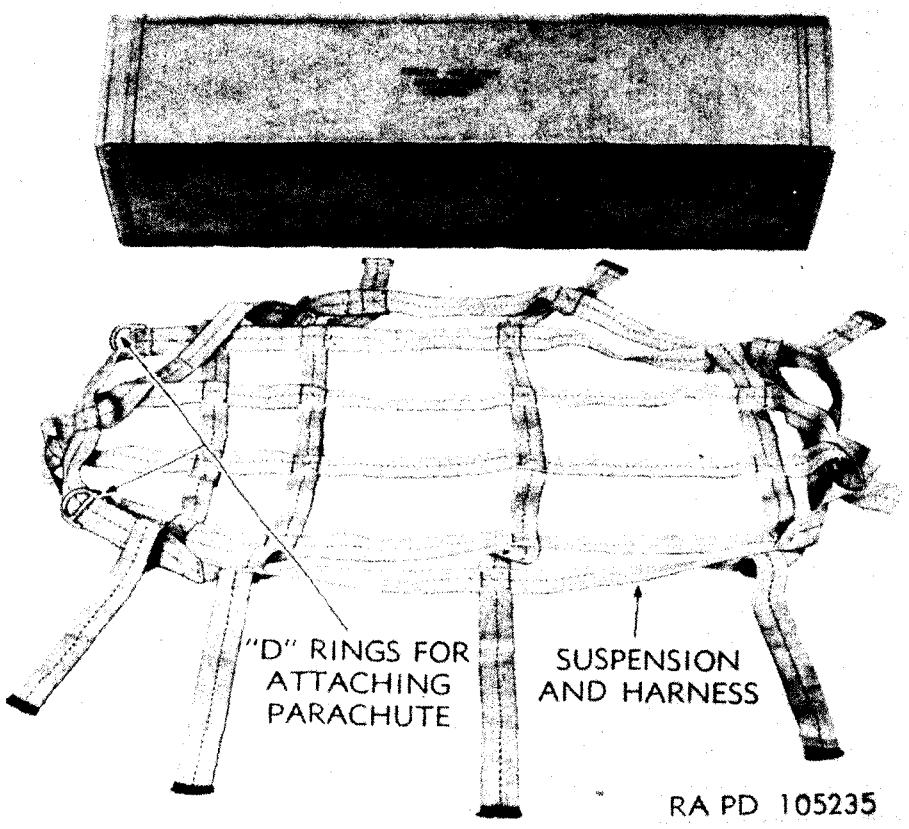


Figure 62. Paracrate M3 with suspension and harness.

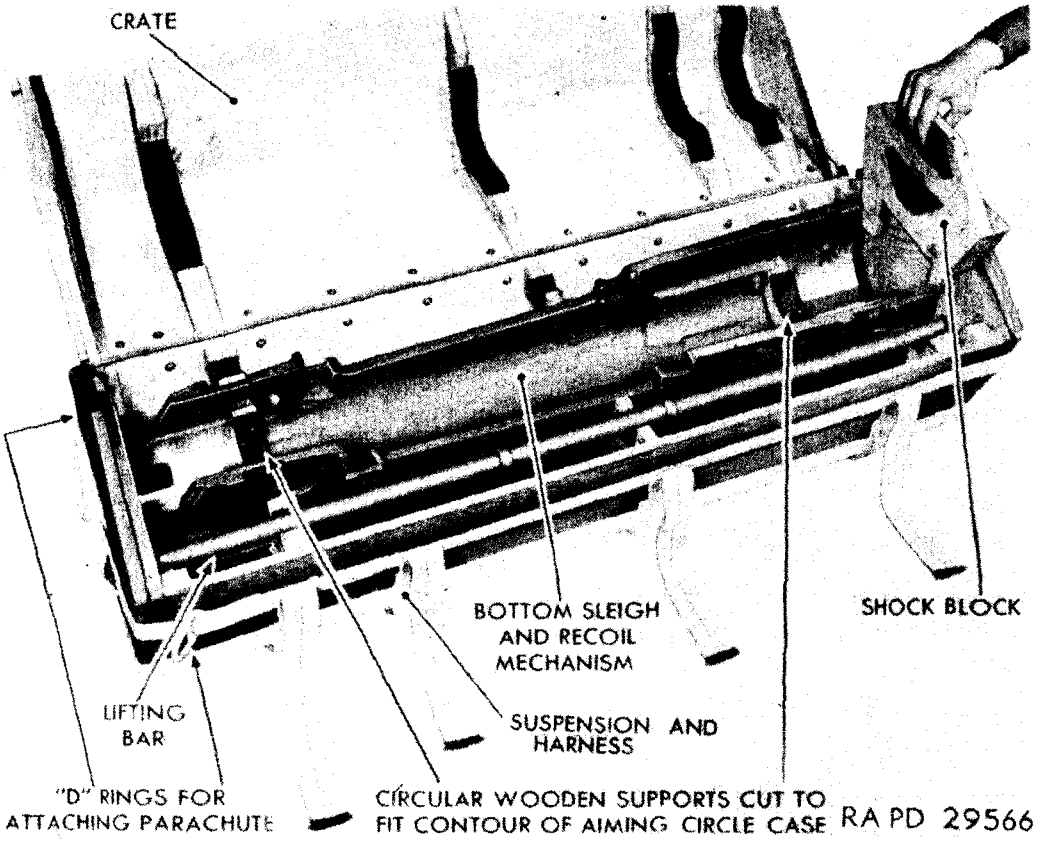


Figure 63. Bottom sleigh and lifting bar in place in paracrate M3.

a. Spread out suspension and harness in position to receive crate (fig. 62). Place "D" rings, for attaching parachute on the top end of the crate. Place empty crate in harness and tighten webbing across sides and bottom.

b. Place the bottom sleigh in crate with the breech end toward the bottom end of the crate. Fit shock block at breech end between bottom sleigh and end of crate. Fit circular wooden supports into contour of bottom sleigh, the lower ends of the "T's" against the opposite ends of the crate (fig. 63).

c. Put aiming circle in container; then place aiming circle container and tripod into metal carrying case (fig. 64).

d. Fit aiming circle case into contour of circular wooden supports so that it fits lengthwise into the bottom sleigh with larger end toward the breech end of the sleigh. Place one lifting bar in notches provided on either side of sleigh (fig. 65) with pointed end toward front end of cradle.

e. Close crate and tighten harness with quick-release fastenings (par. 30).

Note. If harness is properly fitted with all webbing straight so that the "D" rings for attaching parachute are placed as shown in figure 66, the "V" rings for attaching to bomb shackle will line up accordingly in the correct location.

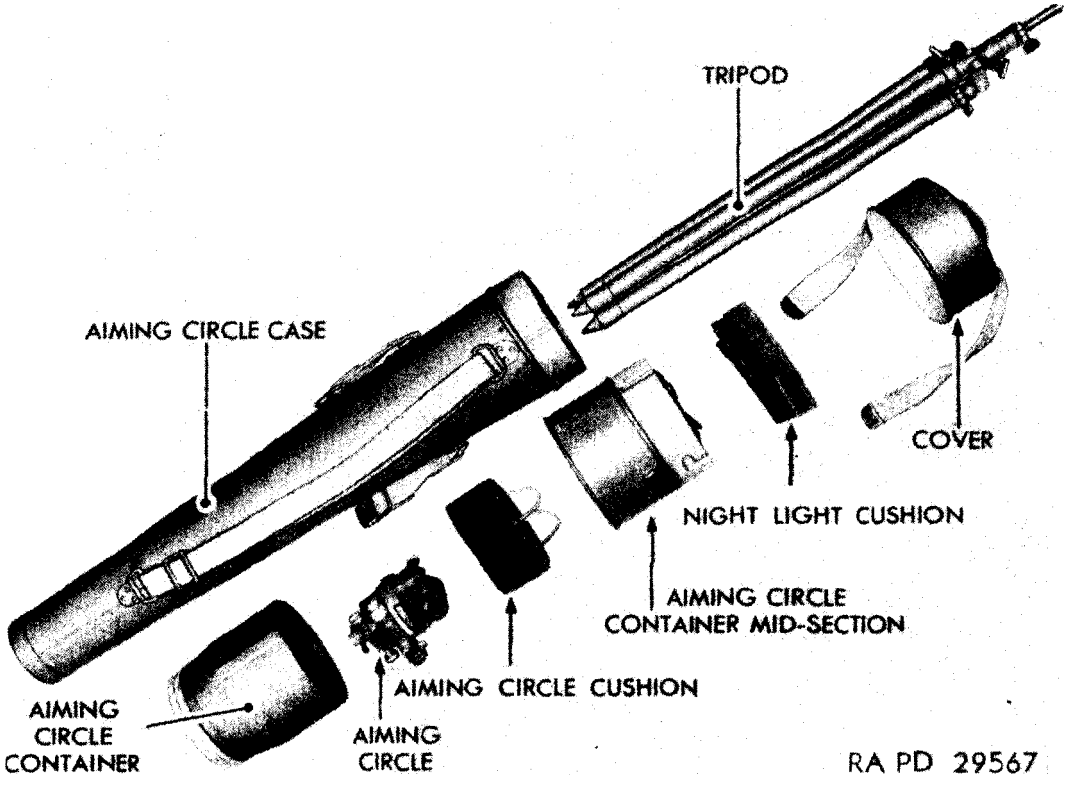


Figure 64. Aiming circle and case.

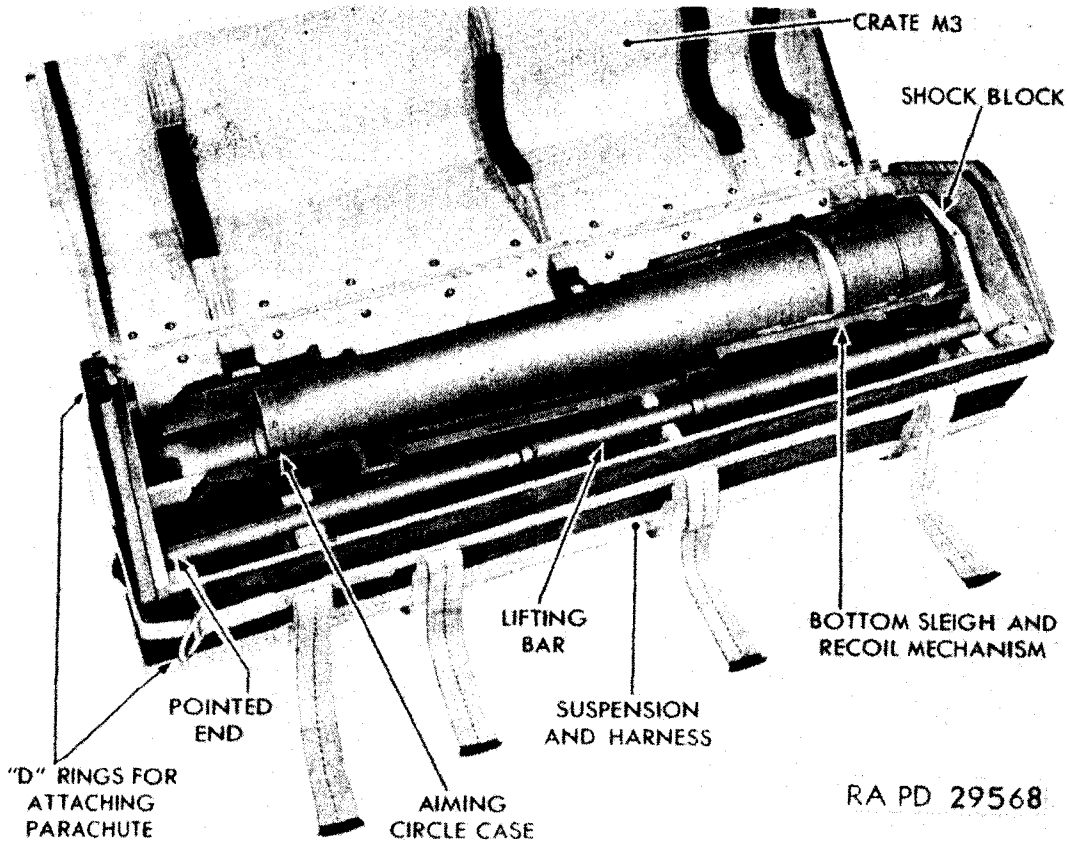


Figure 65. Paracrate M3 loaded—cover open.

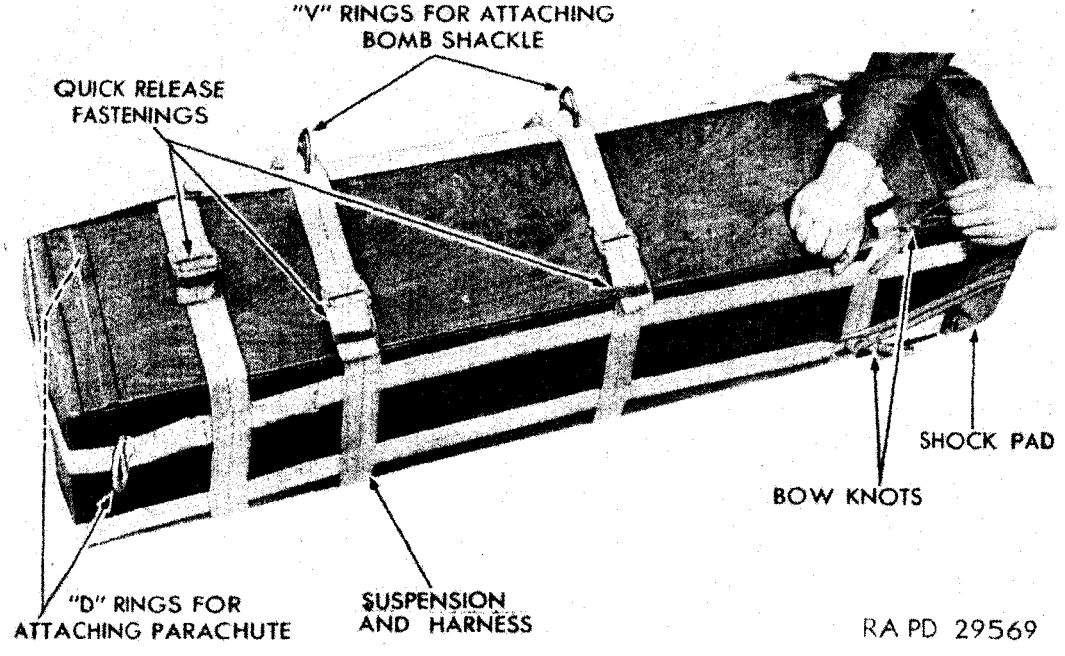


Figure 66. Tying shock pad to paracrate load M3.

f. Tie shock pad to bottom end of crate in this manner—Place shock pad against bottom end of crate with the side of the pad to which the tie-downs are anchored away from the crate and tie to harness webbing (fig. 66).

g. The load is now complete except for the parachute, which will be attached at the airplane according to procedure set forth in paragraph 42.

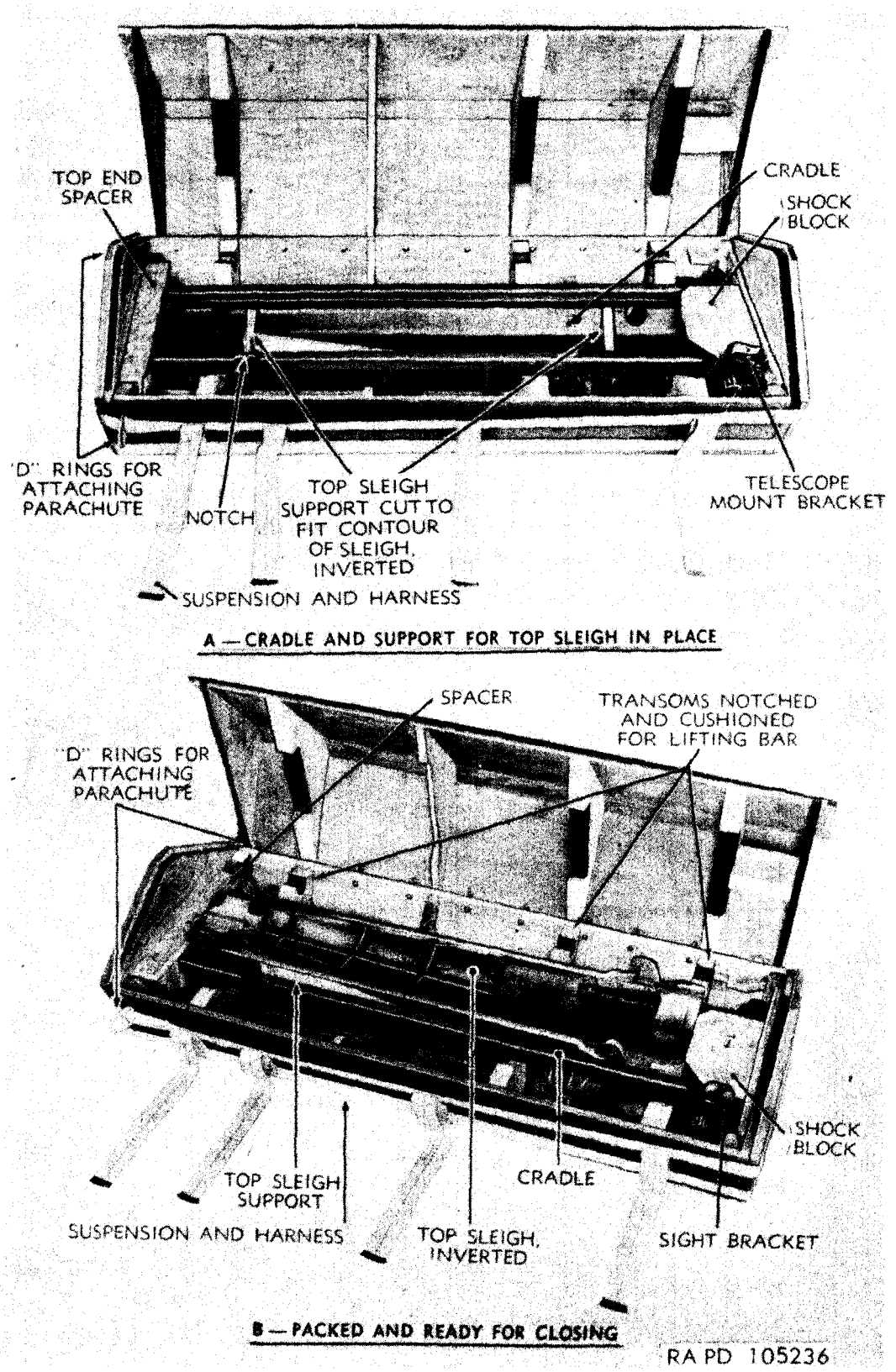


Figure 67. Paracrate M4 loaded—cover open.

35. Packing Paracrate Load M4 (fig. 45)

a. Spread out suspension and harness in position to receive top sleigh and cradle crate, placing "D" rings for attaching parachute on the top end of the crate (fig. 62). Place empty crate in harness and tighten webbing across sides and bottom.

b. Fit cradle into crate, heavy end toward the bottom end, so that the sight bracket is in lower left-hand corner. Fit shock block and top end spacer into place. Fit top sleigh support into contour of cradle with small end of the support lined up with notches in top of cradle (fig. 67, A).

c. Invert top sleigh and fit against top sleigh support with breech end toward the bottom end of the crate (fig. 67, B).

d. Close crate and tighten harness with quick-release fastening (par. 30).

Note. If harness is properly fitted with all webbing straight so that the "D" rings for attaching parachute are placed as shown in figure 66, the "V" rings for attaching to bomb shackle will line up accordingly in the correct location.

e. Tie shock pad to bottom end of crate in this manner—Place shock pad against bottom end of crate with the side to which the tie-downs are anchored away from the crate, and tie to harness webbing (fig. 66).

f. The load is now complete except for the parachute, which will be attached at the airplane according to procedure set forth in paragraph 42.

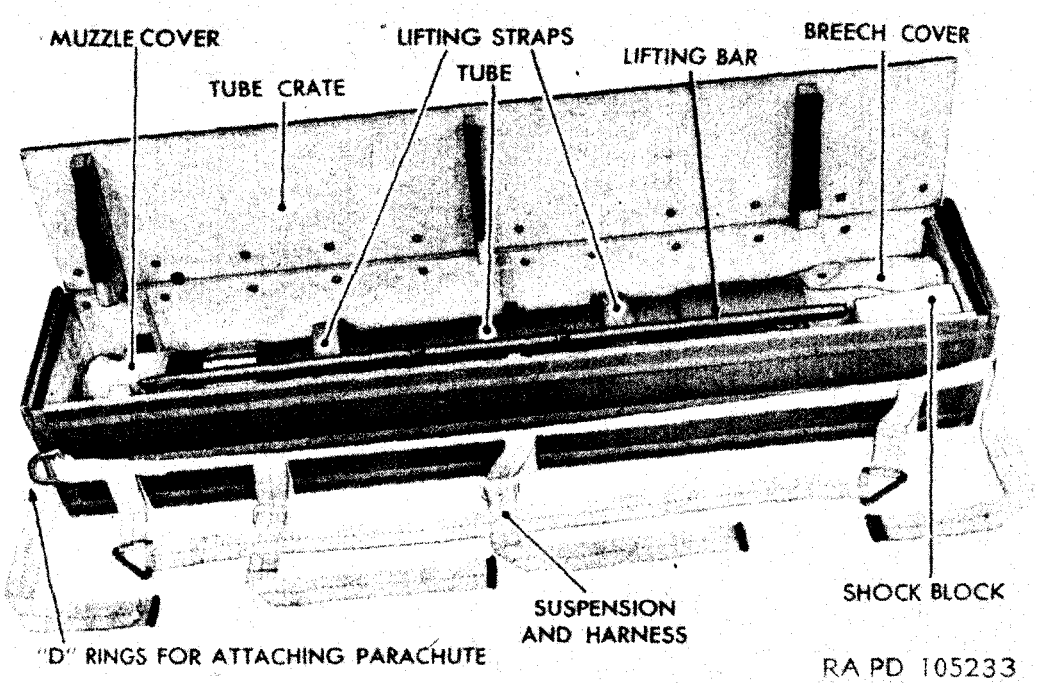


Figure 68. Paracrate M5 loaded—cover open.

36. Packing Paracrate Load M5 (fig. 46)

a. Spread out suspension and harness in position to receive tube crate. Place "D" rings for attaching parachute on the top end of the crate (fig. 62). Place empty crate in harness and tighten webbing across sides and bottom.

b. Slip covers over breech and muzzle ends of tube. Use lifting straps to lift tube into crate, breech end toward the bottom end, leaving straps in place. Rotate tube to put lifting eye in muzzle against side of crate away from hinge. Place shock block against locking lug at breech end of tube between tube and side of crate away from hinge. Place a lifting bar in position alongside of the tube and on the same side as the wooden block, pointed end away from block (fig. 68).

c. Close crate and tighten harness with quick-release fastening (par. 30).

Note. If harness is properly fitted with all webbing straight so that "V" rings for attaching parachute are placed at top end of the crate, as shown in figure 69, the "V" rings for suspension from bomb shackle will line up accordingly.

d. Tie shock pad to bottom end of crate in this manner—Place shock pad against the bottom end of the crate with the side to which the tie-downs are anchored away from the crate, and tie to harness webbing (fig. 66).

e. The load is now complete, except for the parachute which will be attached at the airplane according to procedure set forth in paragraph 42.

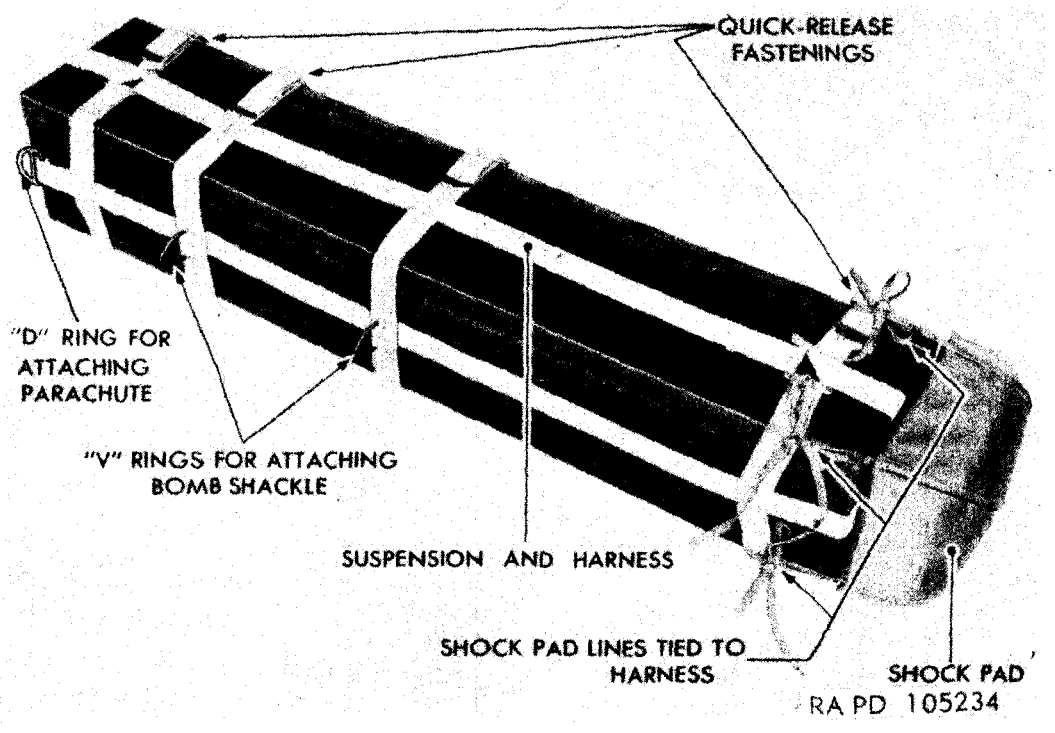


Figure 69. Paracrate M5 with harness in place and shock pad attached.

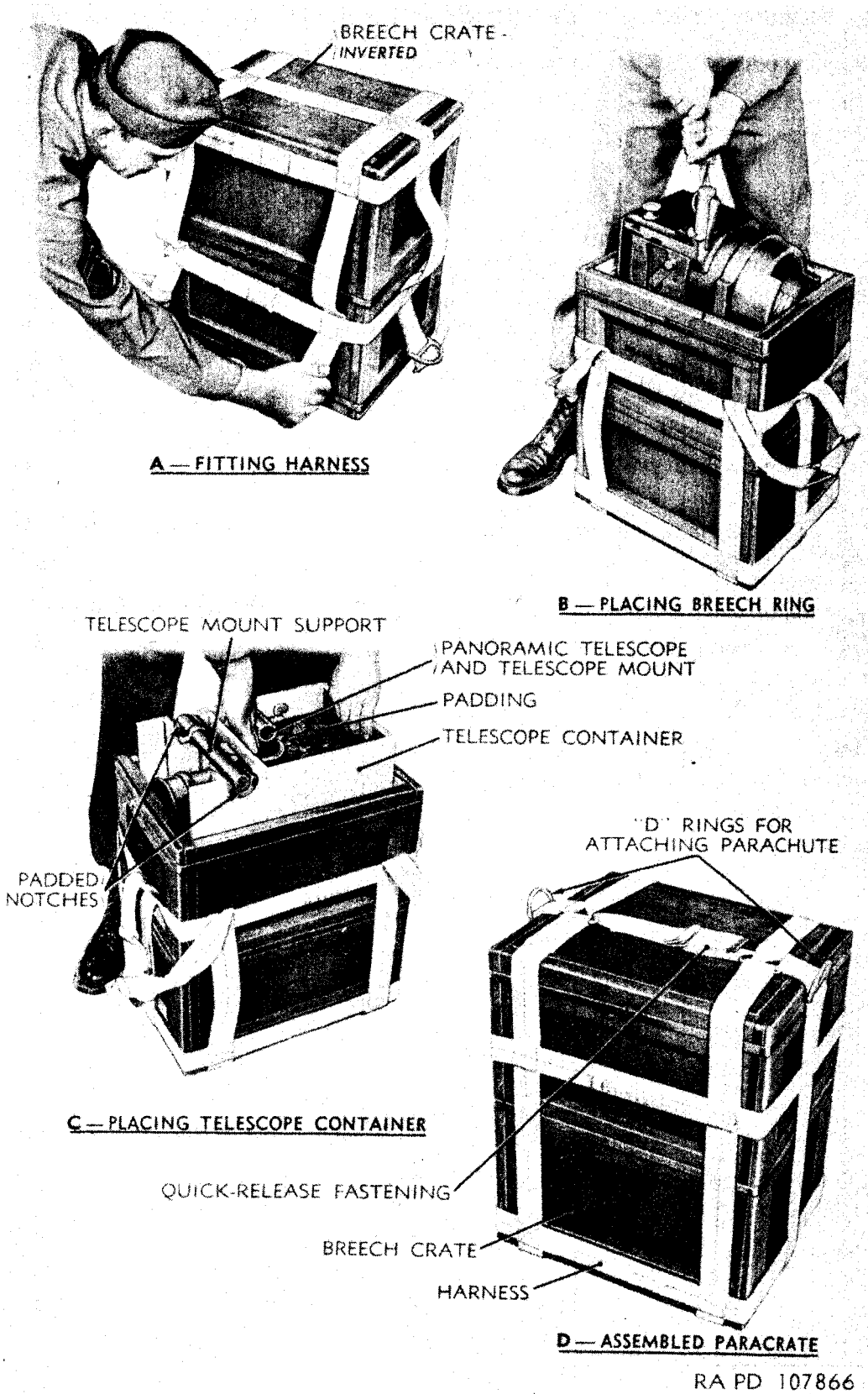


Figure 70. Packing and assembling paracrate load M6.

37. Packing Paracrate Load M6 (fig. 47)

a. Invert crate and fit harness, taking care to get webbing straight and fitted snugly.

Note. Position of "D" rings for attaching parachute is important (fig. 70).

b. Use lifting strap to lift breech mechanism into crate (fig. 70).

c. Place telescope and telescope mount into telescope container, fitting projections into spaces cut out of the padding to receive them. Lay telescope mount support in padded notches in the telescope container. Slip the telescope container, with telescope and telescope mount packed therein, into the crate (fig. 70).

d. Fit lid into place on crate. Tighten harness with quick-release fastening (par. 30) (fig. 70).

e. The load is now complete except for the parachute, which will be attached at the airplane according to procedure set forth in paragraph 42.

Note. This load is one of the units in the door load, arrangement of which is set forth in paragraph 44.

38. Packing Paracrate Load M7 (fig. 48).

a. Insert hub plugs with large ends on the inner side of the wheel hubs. Secure with cotter pins inserted through hub plugs

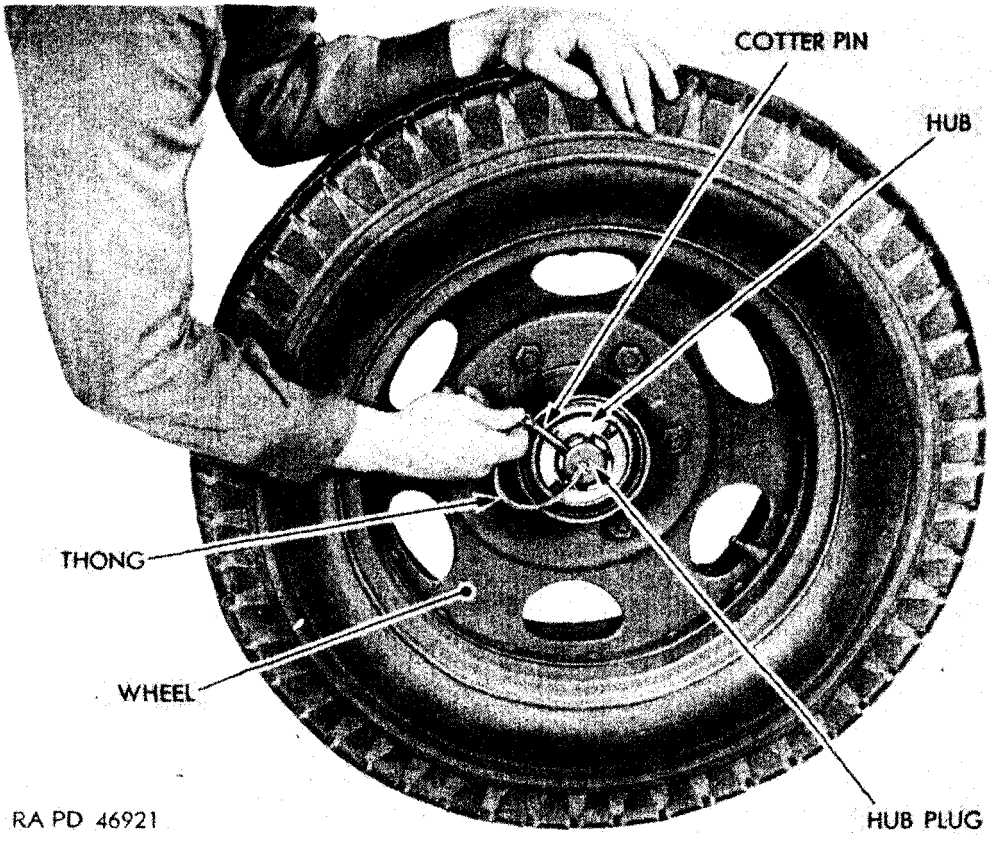


Figure 71. Securing hub plug in wheel.

and linchpin openings in hubs (fig. 71).

b. Place wheels upright in crate, outer sides facing each other. Adjust harness (fig. 72). Tighten with quick-release fastening (par. 30). Lash the "D" rings on top of the tires together with shock cord.

c. The load is now complete except for the parachute, which will be attached at the airplane according to procedure set forth in paragraph 42.

Note. This load is one of the units in the door load, arrangement of which is set forth in paragraph 44.

39. Packing Parachest Load M8 (fig. 49)

a. Load five shell containers, each with 1 round of ammunition, into each section of the caisson (fig. 73).

Caution: Load containers so that fuzed ends of shells are toward the center.

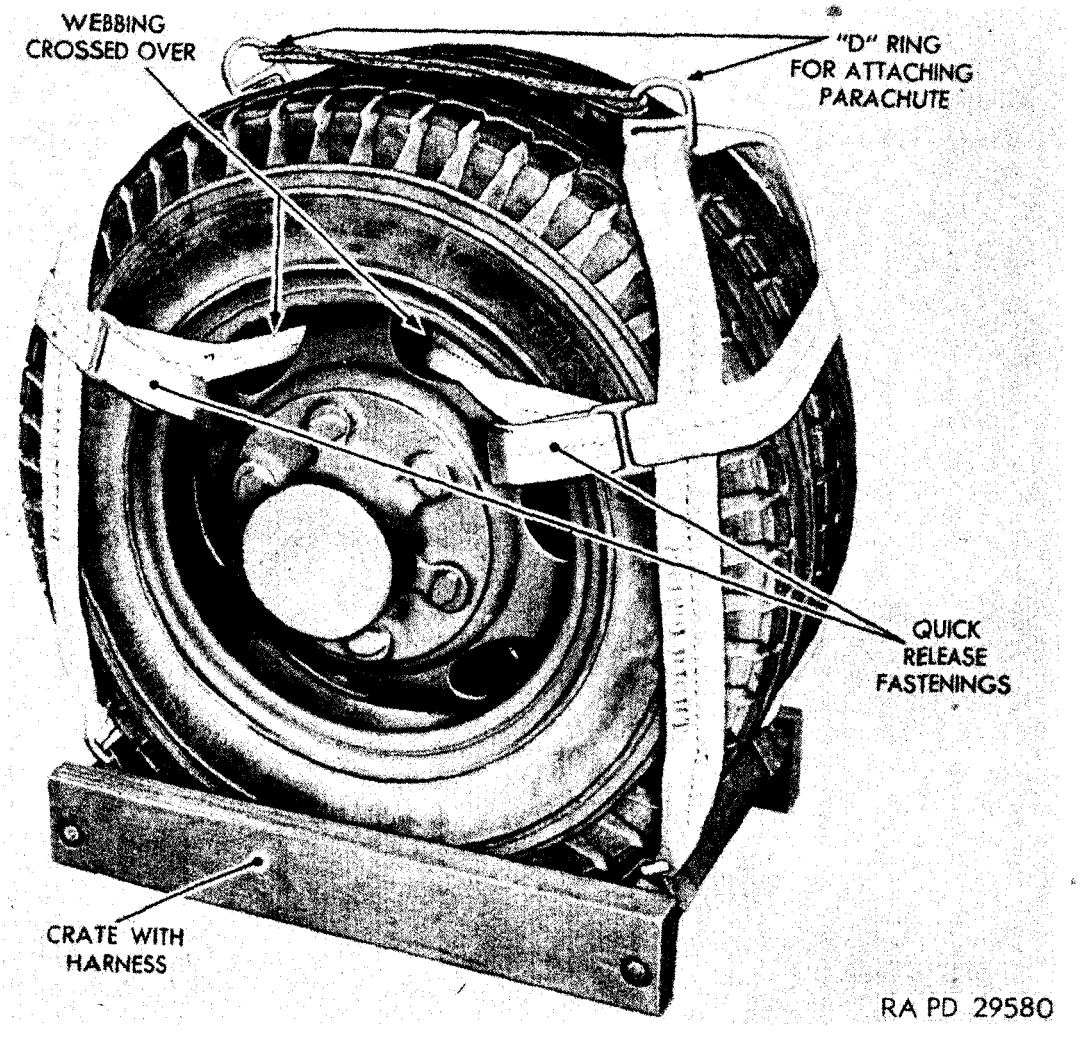


Figure 72. Paracrate load M7 ready for parachute.

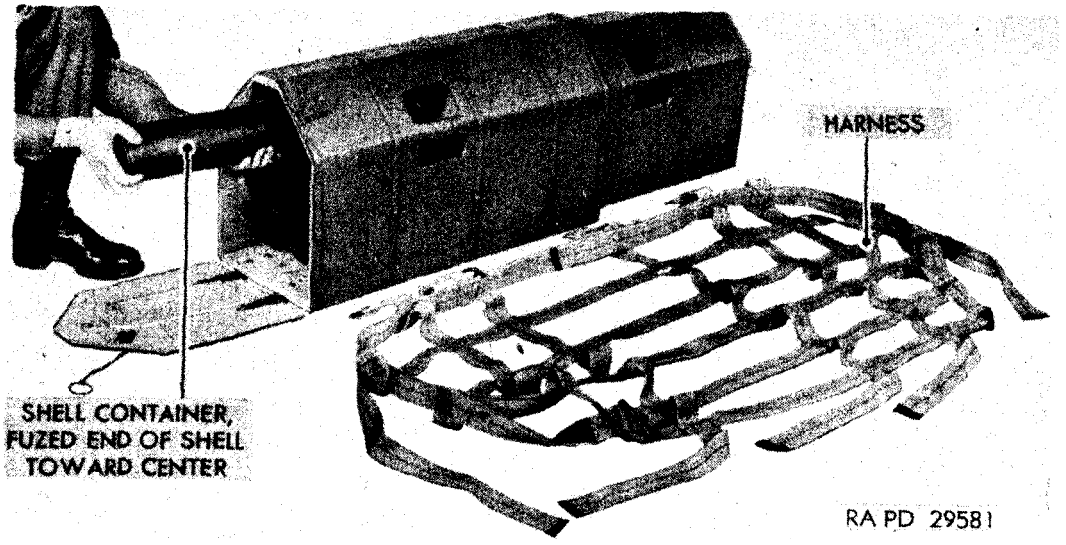


Figure 73. Placing ammunition in parachest M8.

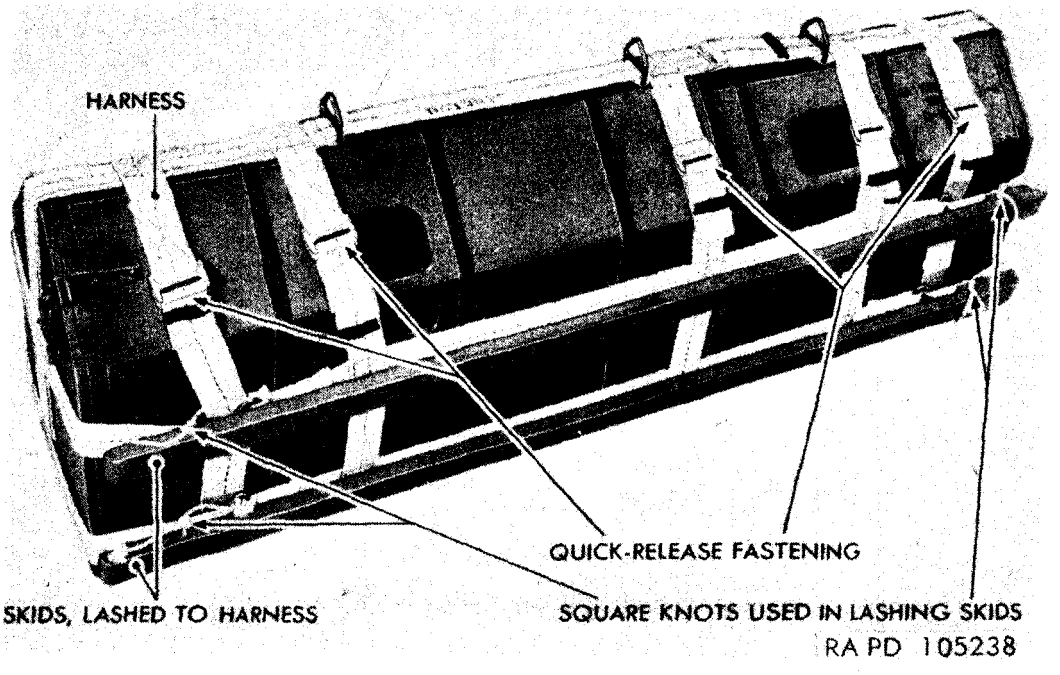


Figure 74. Parachest M8 assembled and suspension fastened in place.

b. Close caisson. Fit harness in place and tighten with quick-release fastening (par. 30).

Caution: Be sure that "V" rings for attaching parachute are lined up along top of the caisson (fig. 74).

c. Tie skids lengthwise alongside of caisson, using shock cord and bow knots to fasten skids to harness webbing (fig. 74).

d. The load is now complete except for the parachute, which will be added at the airplane according to procedure outlined in paragraph 42.

Note. This load is one of the units in the door load, arrangement of which is set forth in paragraph 44.

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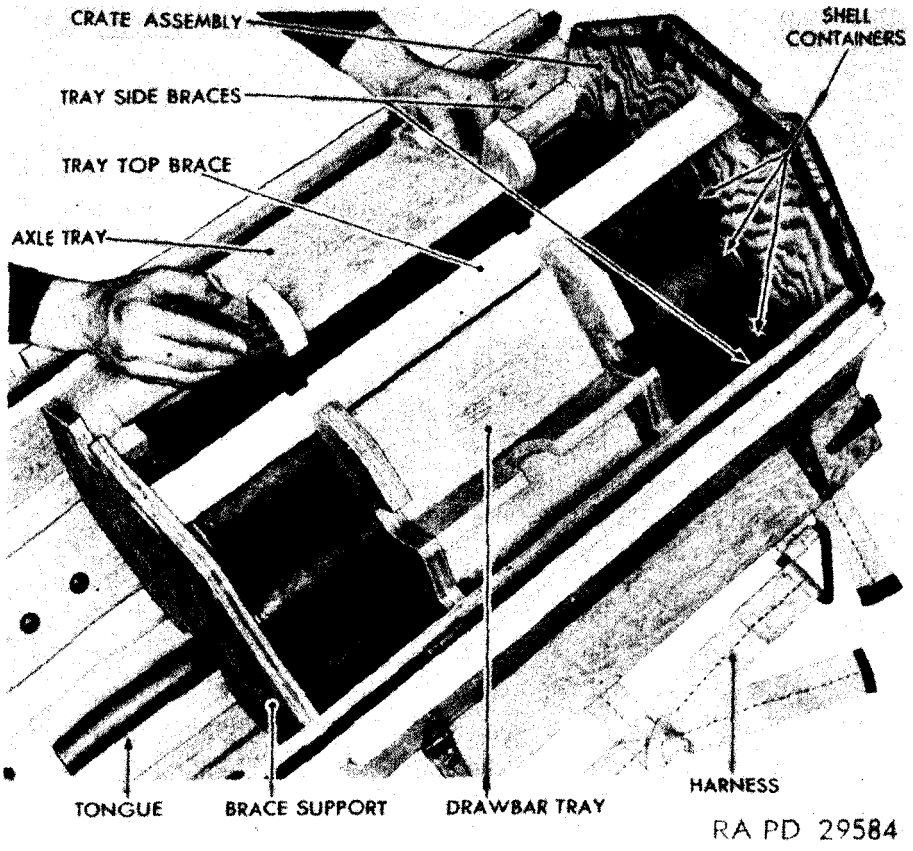


Figure 75. Putting axle tray in place in paracaisson M9.

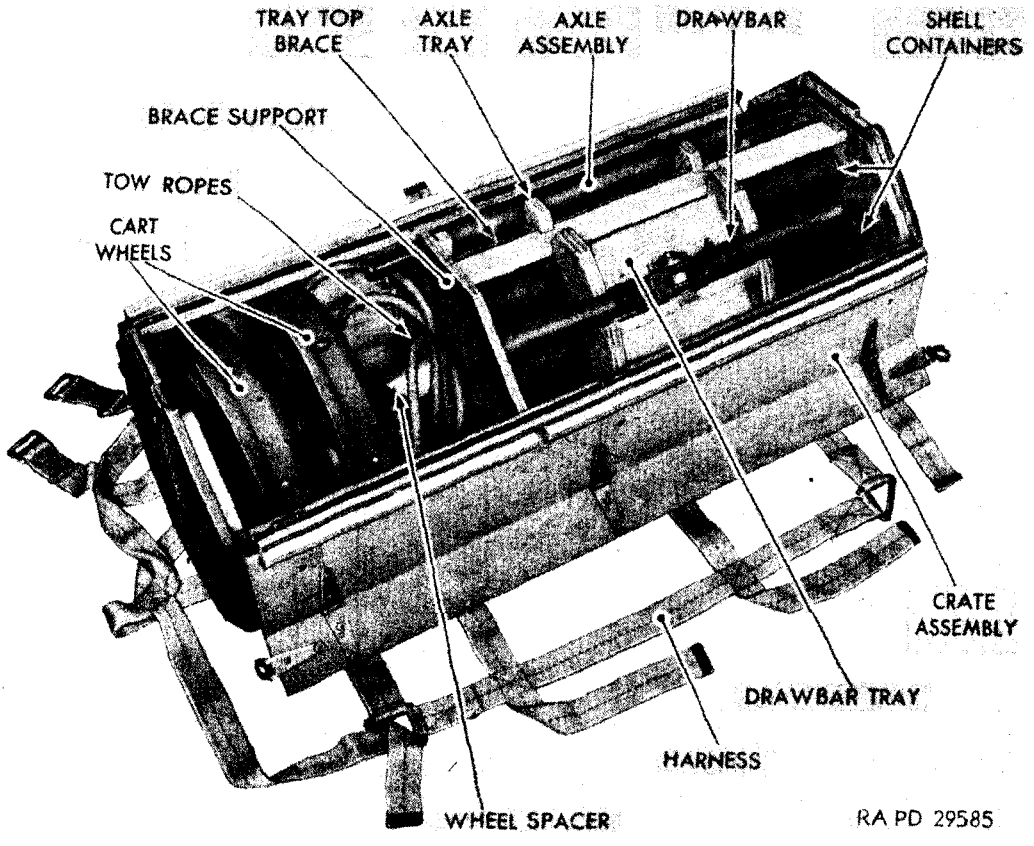


Figure 76. Paracaisson M9 loaded—cover open.

40. Packing Paracaisson Load M9 (fig. 50)

a. Spread out the suspension and harness in position to receive the crate assembly. Place "D" rings for attaching parachute and bomb shackle so that when crate assembly is closed and harness tightened, "D" rings will be positioned in top center, as in figure 77.

b. Place empty crate assembly in harness and tighten across sides and bottom.

c. Place the eight shell containers, each with 1 round of ammunition, lengthwise in the forward end of the crate assembly.

Caution: Load containers with fuzed ends of shell pointing toward the rear of the crate (fig. 75).

d. Fit the brace support crosswise of the crate into spaces provided (fig. 75).

e. Fit the tray side braces and the tray top brace along sides and top, between brace support and front end of crate, in notches provided (fig. 75).

f. Fit axle tray and drawbar tray into notches provided in tray side braces and tray top brace. These trays are cut out on the under side to fit contour of the shell containers packed below. The drawbar tray is fitted to the right of the tray top brace, the axle tray to the left (fig. 75).

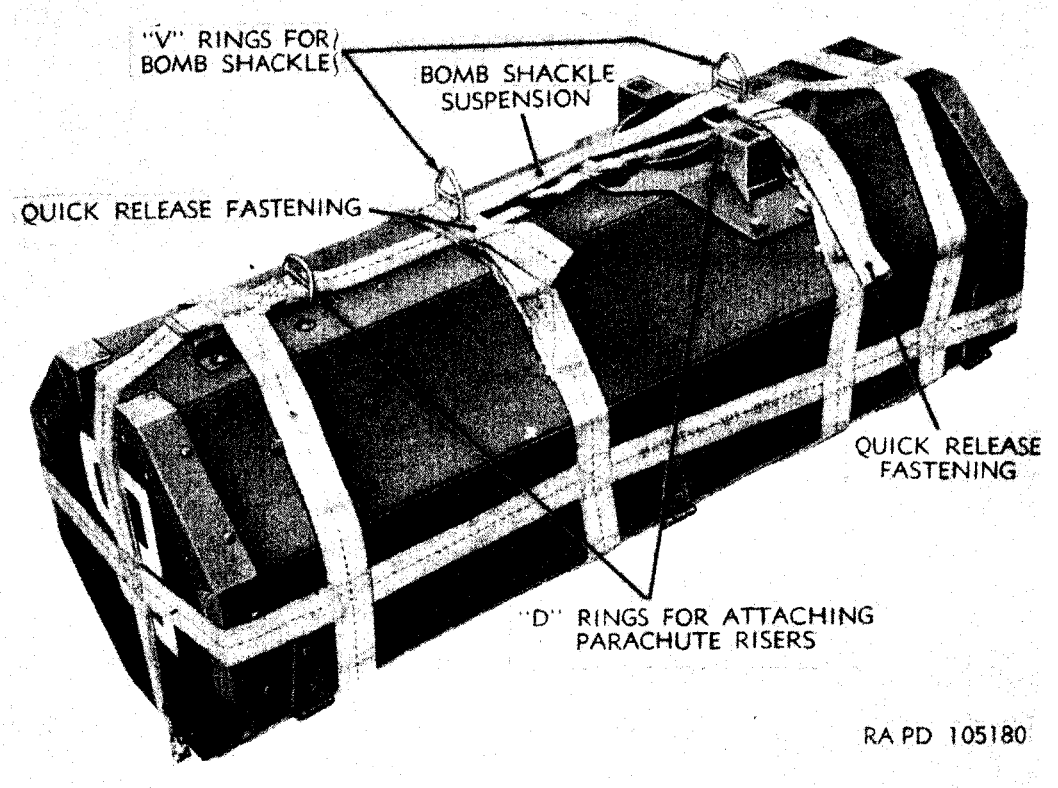


Figure 77. Paracaisson M9 assembled and suspension fastened in place.

g. Place axle and drawbar in their respective trays (fig. 76).

h. Put wheels on wooden wheel spacer, with outer faces of hubs together, and set crosswise of the crate with long end of spacer against the brace support. Put the two tow ropes, with handles, between wheels and the brace support (fig. 76).

i. Close crate and tighten harness with quick-release fastening (par. 30) (fig. 77).

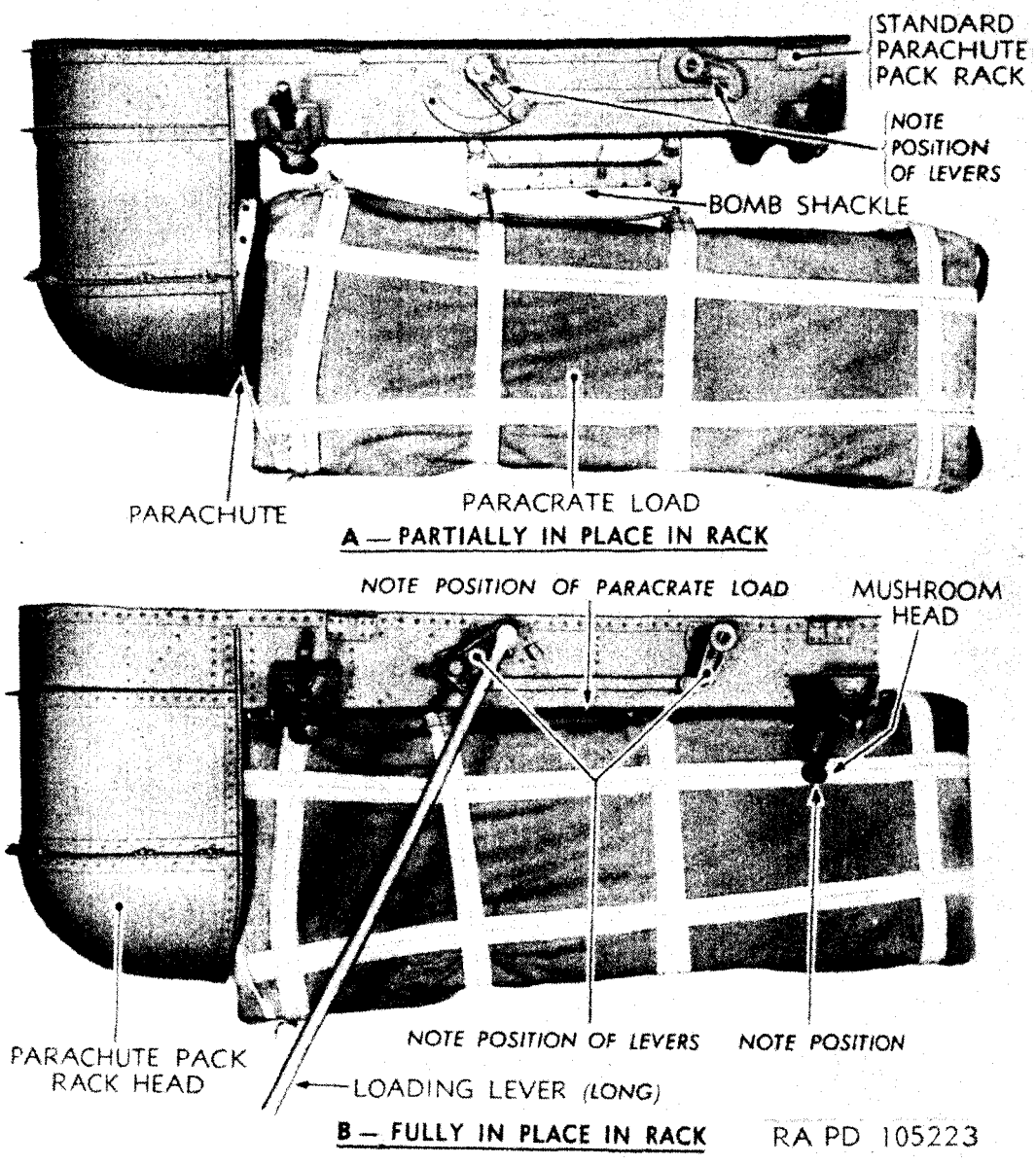


Figure 78. Standard parachute pack rack for C-47 airplane with load.

j. The load is now complete except for the parachute, which will be attached at the airplane according to procedure set forth in paragraph 42.

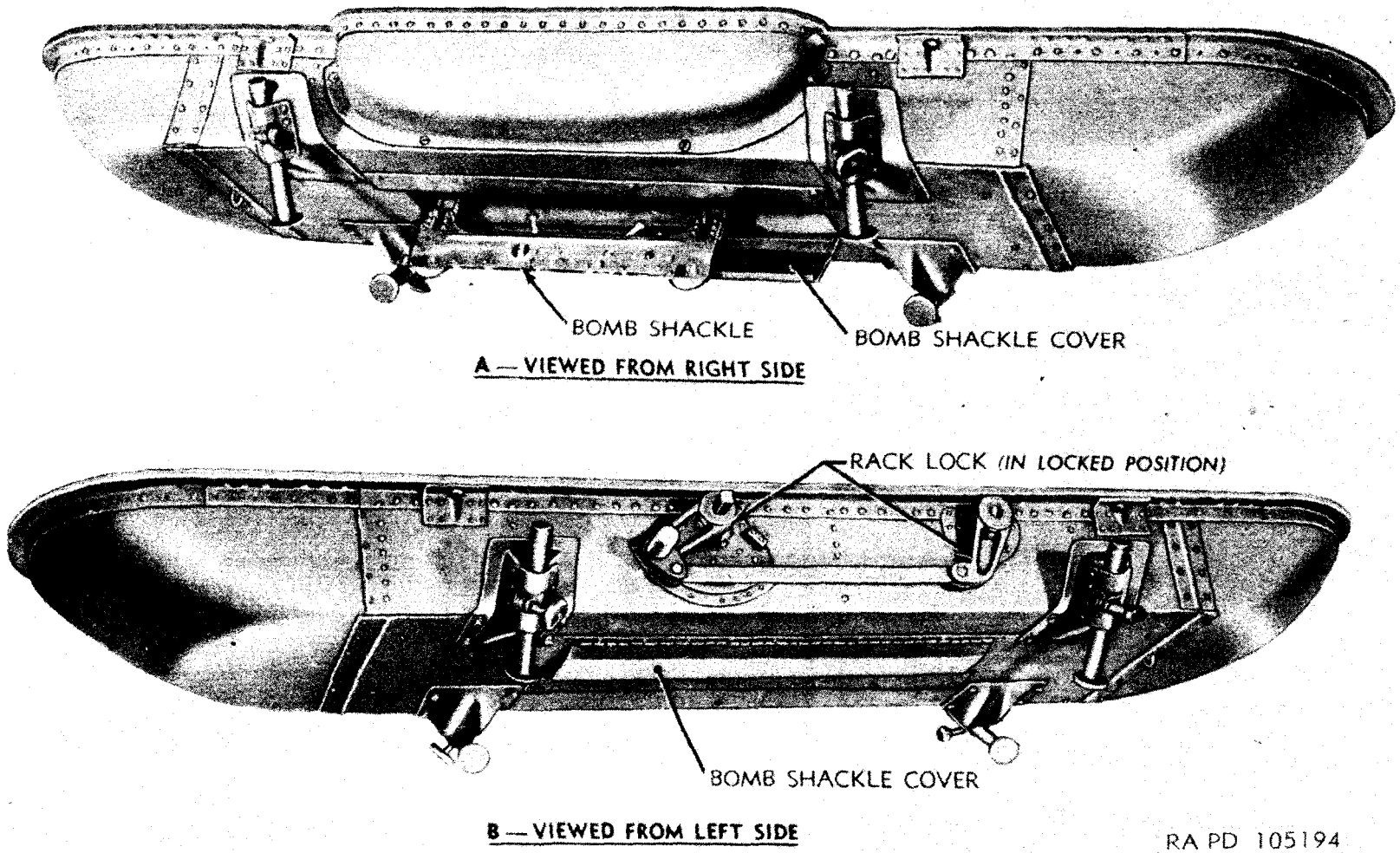


Figure 79. Modified parachute pack rack for C-47 airplane.

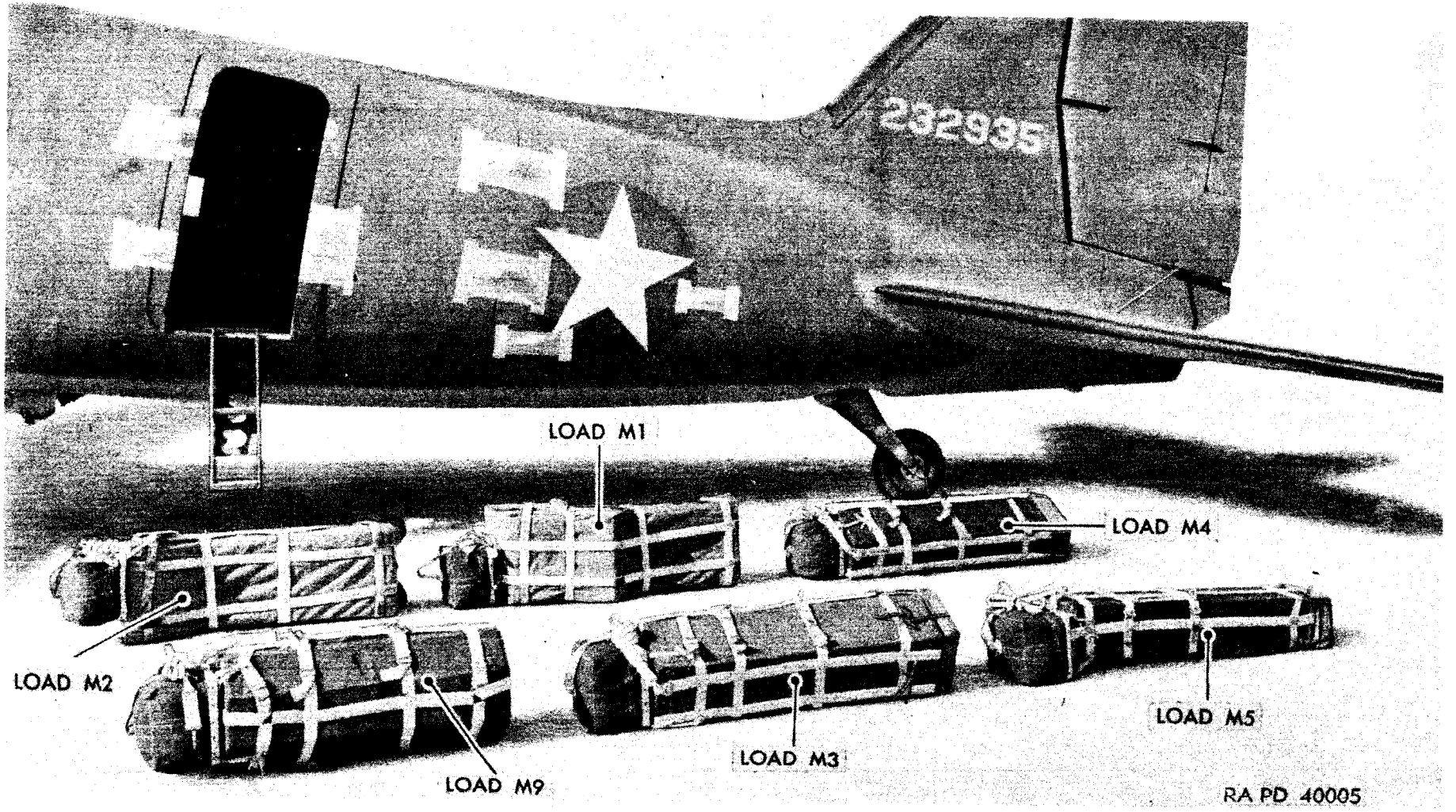


Figure 80. Parachute pack rack loads ready for mounting and arranged in relative loading position on C-47 airplane with standard racks.

41. General Instructions for Loading Wood Paracrates on Airplane

a. The 75-mm. pack howitzer matériel is disassembled and packed into the various paracrate loads (sec. VII); then it is transported to the airplane where the parachutes are attached just before the loads are placed in the parachute pack racks or in the airplane as the door load (pars. 42 and 44).

b. Before the paracrate loads are attached in place in the parachute pack racks, an inspection should be made to make certain that the parachute pack racks are in place and properly secured. The bomb shackles should be checked to see that they are in working order and that none are missing. Six bomb shackles are required The bomb shackle release mechanism must be checked for operation (par. 43*c*). The jump signal lights and warning bell must be checked for proper operation. The parachute pack racks, bomb shackles, bomb shackle release mechanism signal lights, and warning bell are equipment with the airplane. The airplane crew chief is responsible for their being in proper working order.

c. The C–47 airplane may be equipped with either standard or modified parachute pack racks (figs. 78 and 79). Both types of parachute pack racks operate identically. The bucket shaped head of the standard parachute pack rack houses the parachute at-

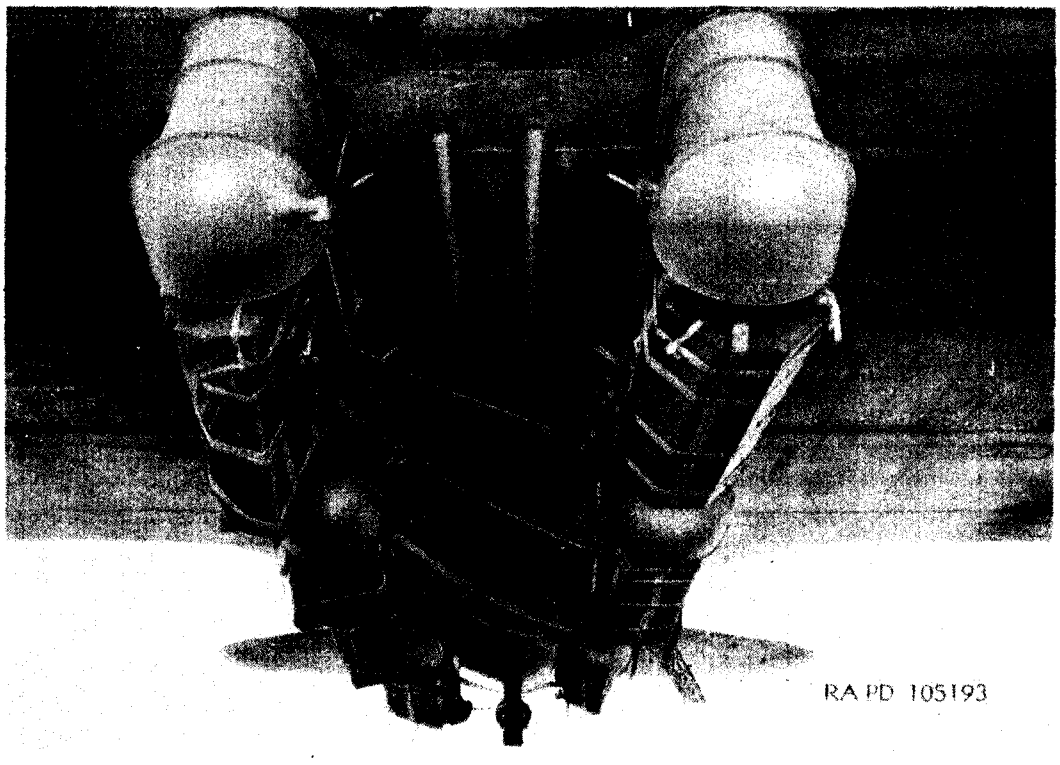


Figure 81. Wood paracrates loaded on standard parachute pack racks on C-47 airplane.

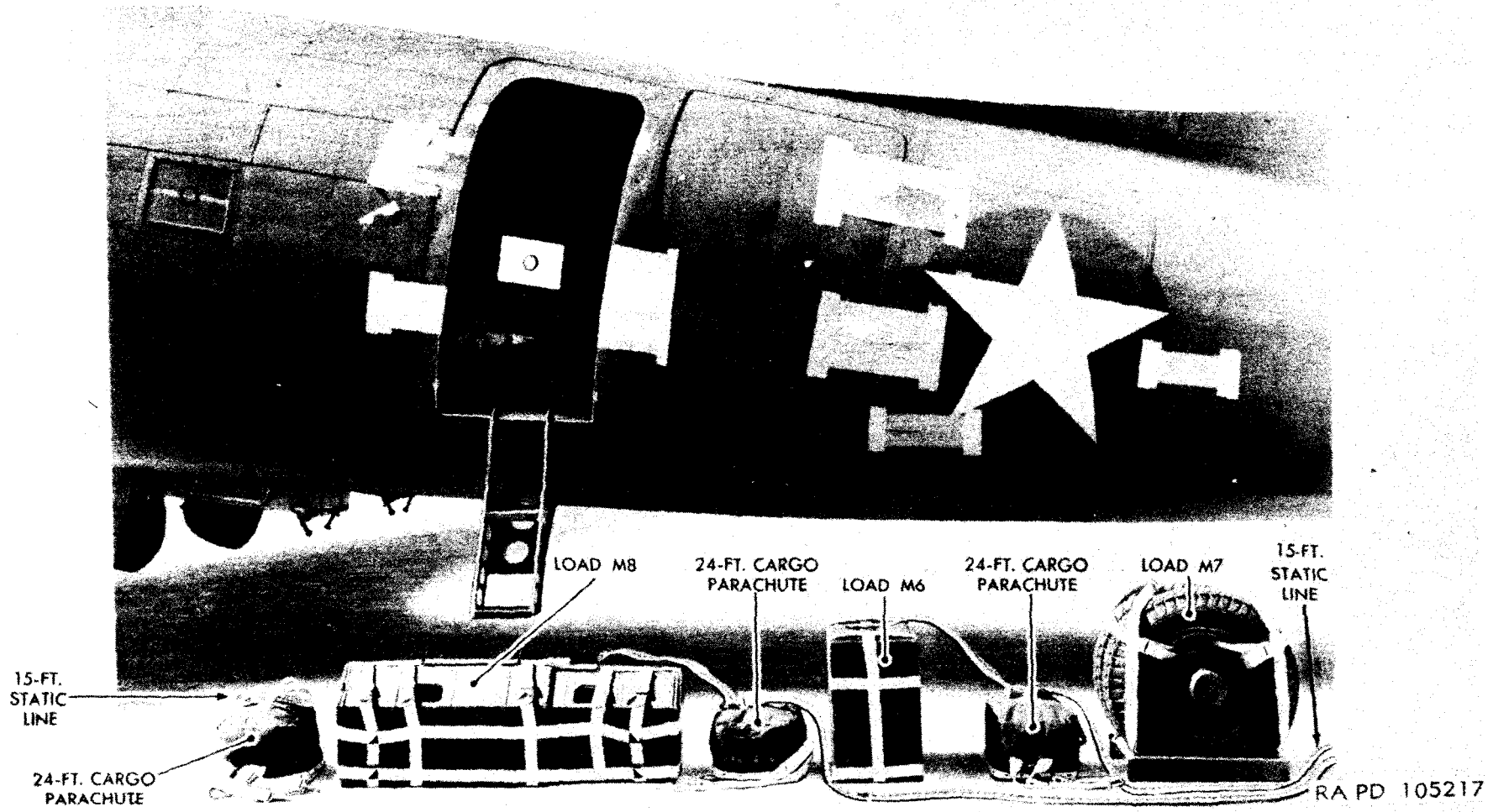


Figure 82. Paracrate loads comprising the door load when using wood paracrates on C-47 airplane with standard racks.

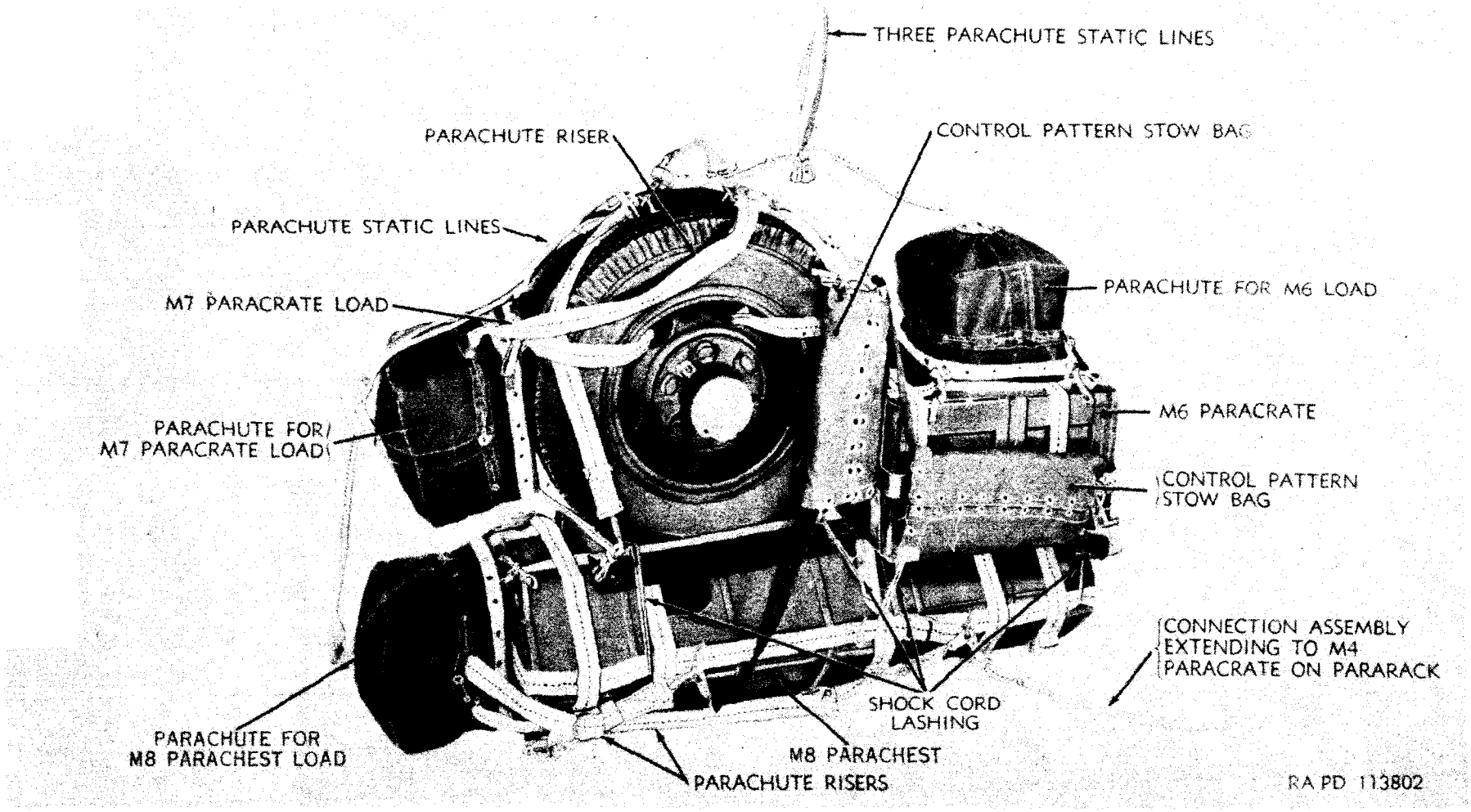


Figure 83. Wood paracrate door load with control pattern.

tached to the paracrate. For this type of parachute pack rack, the forward strap of the suspension must be located approximately 1 foot from the front of the paracrate. For the modified parachute pack rack, the suspension may be located to balance the weight of the paracrate (par. 33*i*). However, the suspension

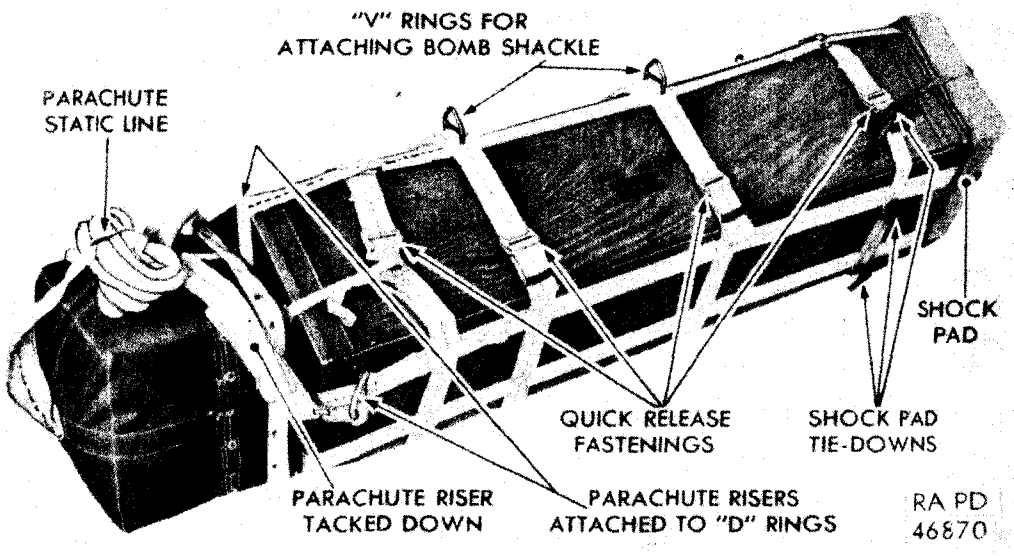


Figure 84. Paracrate M4 with parachute and shock pad attached.

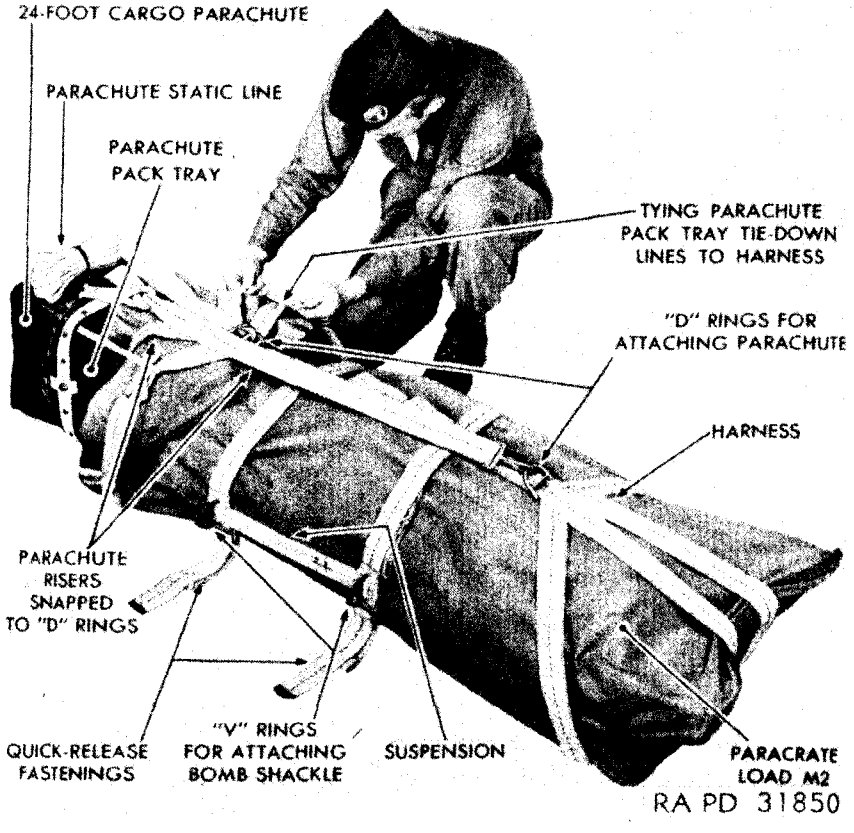


Figure 85. Tying parachute to paracrate M2.

is attached to the harness for most wood paracrates and need not be relocated for the modified rack.

42. Parachute Instructions for Wood Paracrate Loads

a. A 24-foot cargo parachute is attached to each of the following paracrate loads: M1, M2, M3, M4, M5, and M9. These are the six paracrate loads that are mounted in the parachute pack racks under the fuselage of the airplane (fig. 81).

b. Paracrate loads M3, M4, and M5 have been fitted with shock pads (figs. 66 and 69). The parachutes are attached to the ends of these paracrates opposite the shock pads (fig. 84).

c. The parachute is attached to the front end of front trail of load M1; to load M2 at the front end of rear trail; and to load M9 at the ammunition end of the paracaisson (fig. 80).

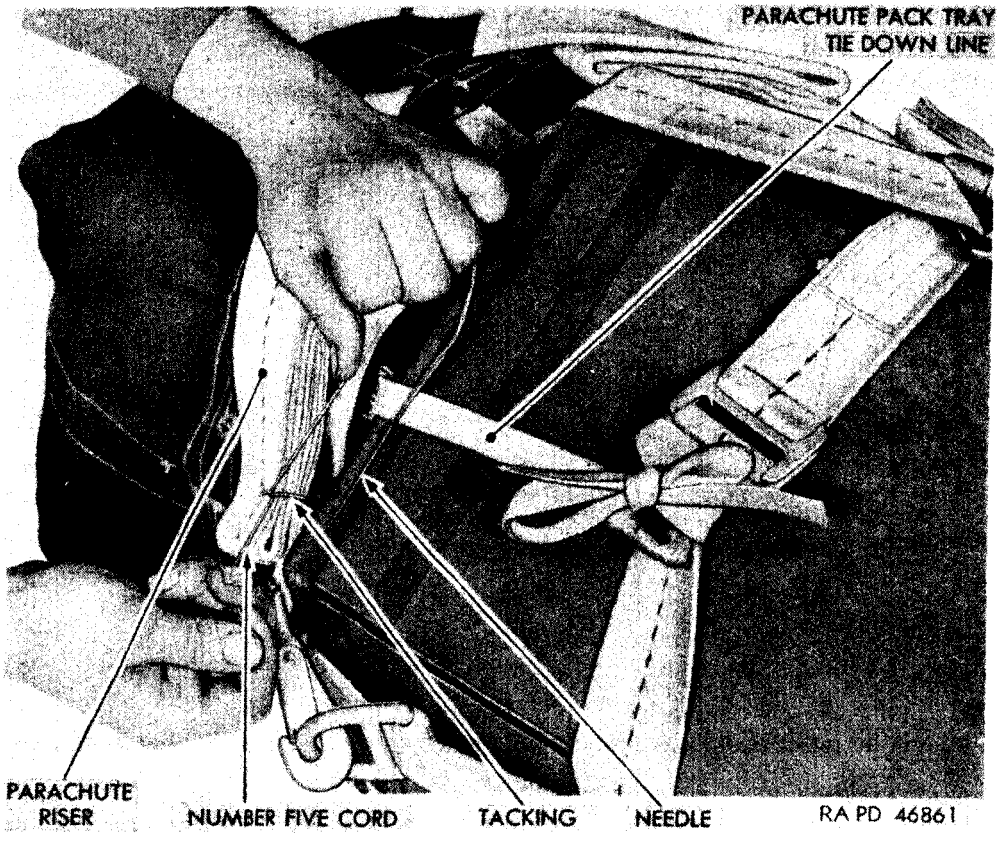


Figure 86. Tacking down parachute riser.

d. Place the bottom of the parachute pack tray up against the paracrate ends as designated above. Secure the parachutes to the harnesses on the paracrates by means of the parachute pack tray tie-down lines (figs. 84, 85, and 86), using bowline knots.

e. Attach the two parachute risers of each parachute to the

harness "D" rings on the paracrates, by means of the snap on the end of each parachute riser.

Note. With loads M1, M2, and M9, it will be necessary to pull one riser out of the parachute in order to reach the "D" ring farthest from the parachute. This should be done by the parachute maintenance section before arrival at the airfield.

f. Neatly fold the unused length of each parachute riser. Tack fold together, using a heavy needle and single strand of No. 5 cord. Run the No. 5 cord through the fold once and tie in a knot (fig. 86).

Note. The purpose in tacking the risers is to prevent parachute risers from being fouled when loads are released from bomb shackles. The tacking is pulled out automatically when the load drops.

43. Instructions for Loading Wood Paracrates on Airplane

a. While the parachutes are being attached to the paracrate loads, the jump master goes underneath the fuselage of the airplane. He pulls out the knob on the parachute pack rack lock lever and pushes the lever rearward until the lock plunger engages the rear hole (fig. 87).

Note. The bomb shackle is not removed at this point.

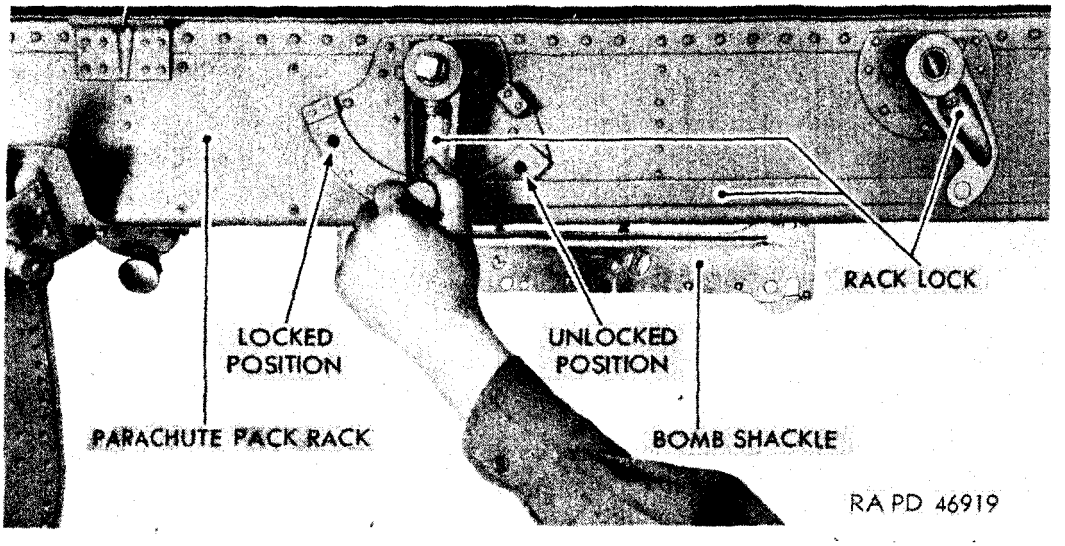


Figure 87. Moving parachute pack rack lock into unlocked position.

b. Next, the jump master reaches up into each parachute pack rack and places the bomb shackle release mechanism arms in the cocked position by pushing the rear arm to the rear and the front arm to the front as far as they will go (fig. 88).

c. The jump master enters the airplane and places the circuit breaker switch on the parachute pack rack switch panel in the ON position. With the placing of this switch in the ON position and the electrical circuits of the plane energized, the red warning light, lower left of the parachute pack rack switch panel, will

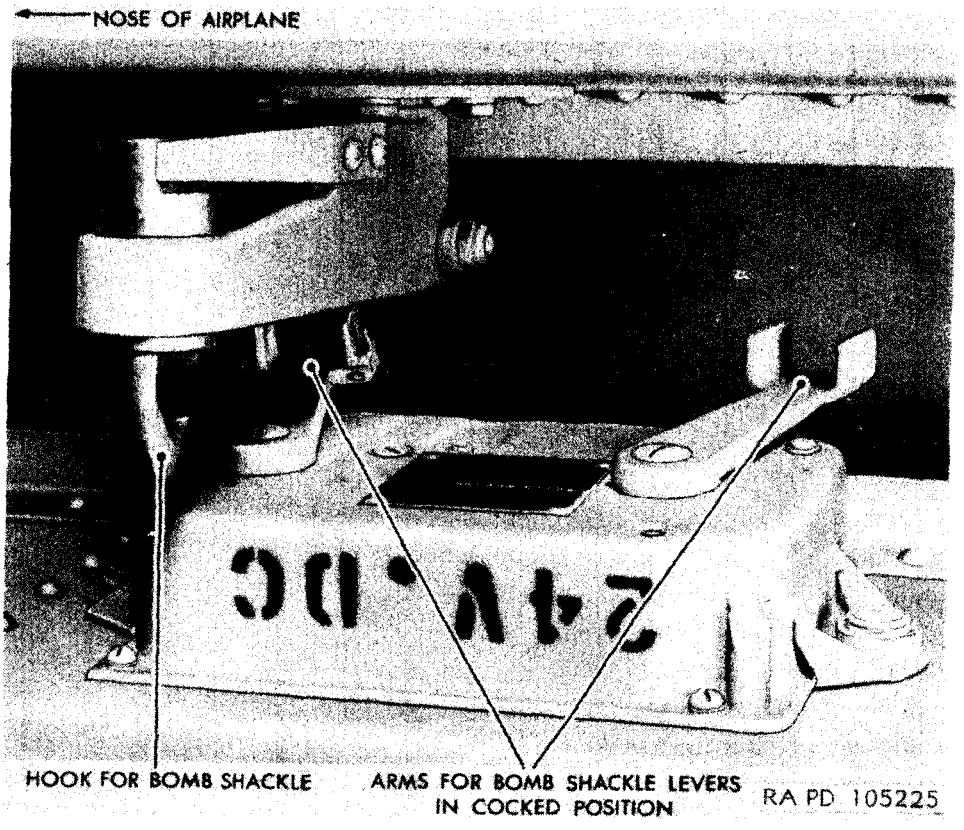


Figure 88. Placing bomb shackle release mechanism arms in cocked position.

come on. The jump master then places the pack master switch in the ON position. With the placing of this switch in the ON position, the red warning light will go off and if the parachute pack racks are in proper working order and in the cocked position, the six green indicator lights on the parachute pack rack switch panel will come on. The jump master then presses the solenoid switch six times. This releases the six bomb shackles release mechanisms in succession (figs. 40 and 126). Each green light will go out and the release mechanism for that parachute pack rack returns to the unlocked or uncocked position. Each toggle switch should be checked for individual release of its bomb shackle release mechanism. If the intervalometer method of release is to be used, its proper operation must be checked (par. 52*b*).

Note. This is an important function of the jump master and must be performed prior to the loading of the parachute pack racks as an assurance that the release mechanisms are functioning properly.

d. The pack master switch and the circuit breaker switch are placed in the OFF position, and the six bomb shackle release mechanisms of the parachute pack racks are again placed in the cocked position.

e. Load M2 is placed in position below parachute pack rack No. 5, with the parachute end of the load toward the front of

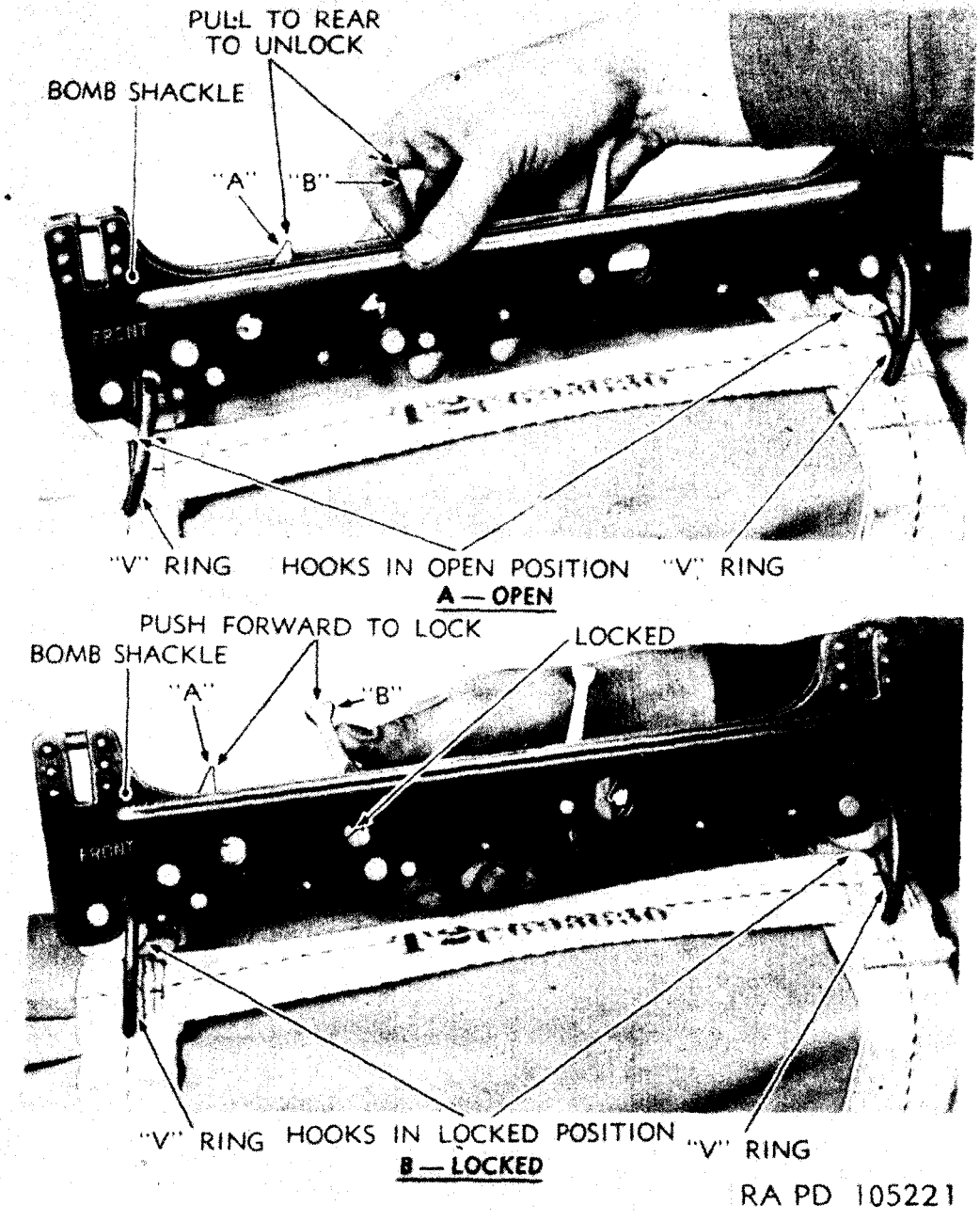


Figure 89. Attaching bomb shackle to load.

the rack and the bomb shackle attaching "V" rings upright (fig. 89, A).

f. Attach the bomb shackle to the "V" rings on the harness, making certain that the word FRONT on the bomb shackle is toward the parachute end of the load.

Note. The bomb shackle is unlocked by pushing levers, marked "A" and "B," to the rear (fig. 89, A).

It is locked, after being hooked around the "V" rings, by pushing lever "A" forward, then pulling back on lever "B" and releasing

it so that it moves forward into the locked position (fig. 89, B).

g. Lift the load and attach the parachute static line snap in place on the anchor bar on the inside of the parachute pack rack head (fig. 90).

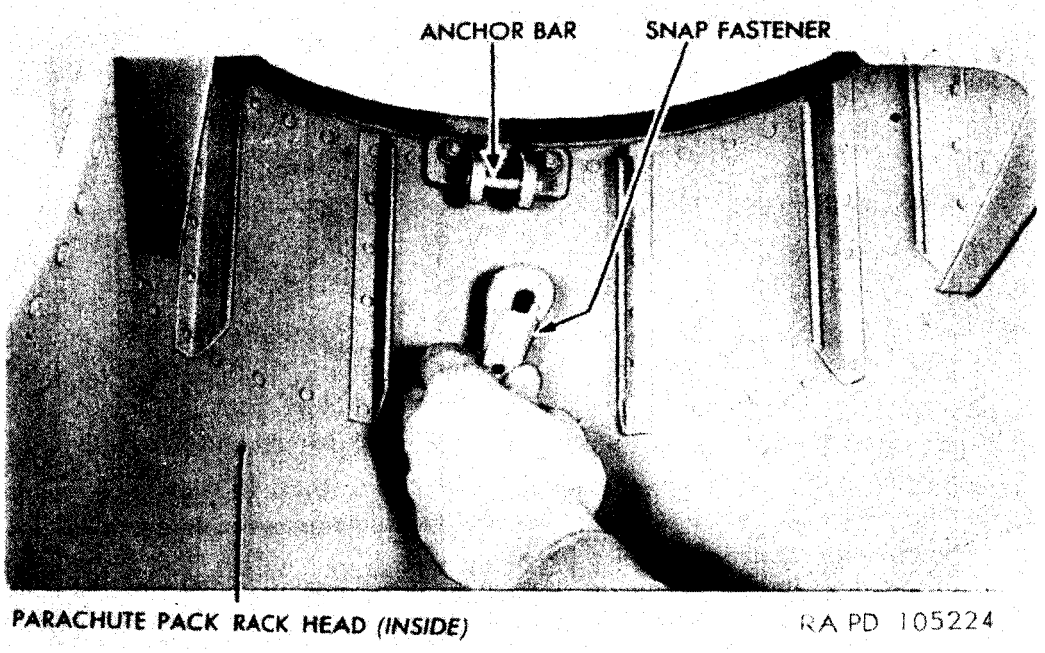


Figure 90. Attaching static line to anchor bar inside parachute pack rack head.

h. Lift the load until the parachute end can be placed in the parachute pack rack head. Hook bomb shackle ends on to the hooked levers inside the parachute pack rack (fig. 78, A).

i. While two men continue to lift the load, place the long loading lever on the pivot shaft of the forward lever of the loading mechanism. Pull out on the knob of the lever lock and push the long loading lever forward.

Caution: Be sure that loading lever is not operated unless men are lifting the load. Lock the plunger of the lock lever in the forward hole (fig. 78, B).

Note. Make sure that the two long levers which project from the top of the bomb shackle are in place between the ears of the bomb shackle release mechanism arms (fig. 88).

j. Steady the load on each side of the rear by lowering the mushroom head bar on each side so that mushroom head rests against the load. Remove the long loading lever (fig. 78, B).

k. Following this same procedure, mount the remaining five paracrate loads into parachute pack racks as follows: load M1 in rack No. 3; load M3 in rack No. 4; load M4 in rack No. 1; load M5 in rack No. 2; and load M9 in rack No. 6 (figs. 80 and 81) (par. 5).

44. Instructions for Loading the Door Load on Airplane

a. A 24-foot cargo parachute is attached to each of the following paracrate loads which comprise the door load: M6, M7, and M8 (fig. 83). The three loads are placed individually into the airplane in the space opposite the door. The parachutes are then attached to each of the three loads, before the loads are grouped together. The parachutes are attached to the harnesses of paracrate M6, load M7, and parachest M8 in the same manner as outlined in paragraph 42 and are placed as shown in figure 83.

b. The parachest load M8 is turned over on the side, skids down, with the small end of the parachest nearest the airplane door and with the "V" rings pointing toward the nose of the airplane.

c. Paracrate load M6 is placed on its side on top of and flush with the small end of parachest M8 with the top or lid end of paracrate M6 facing the airplane door; then paracrate load M7 is mounted on top of the large end of parachest load M8, as close as possible to load M6. In this position, the parachute attached to load M7 will be just above and parallel to the parachute on load M8.

d. The static lines from the M8, M7, and M6 parachutes are

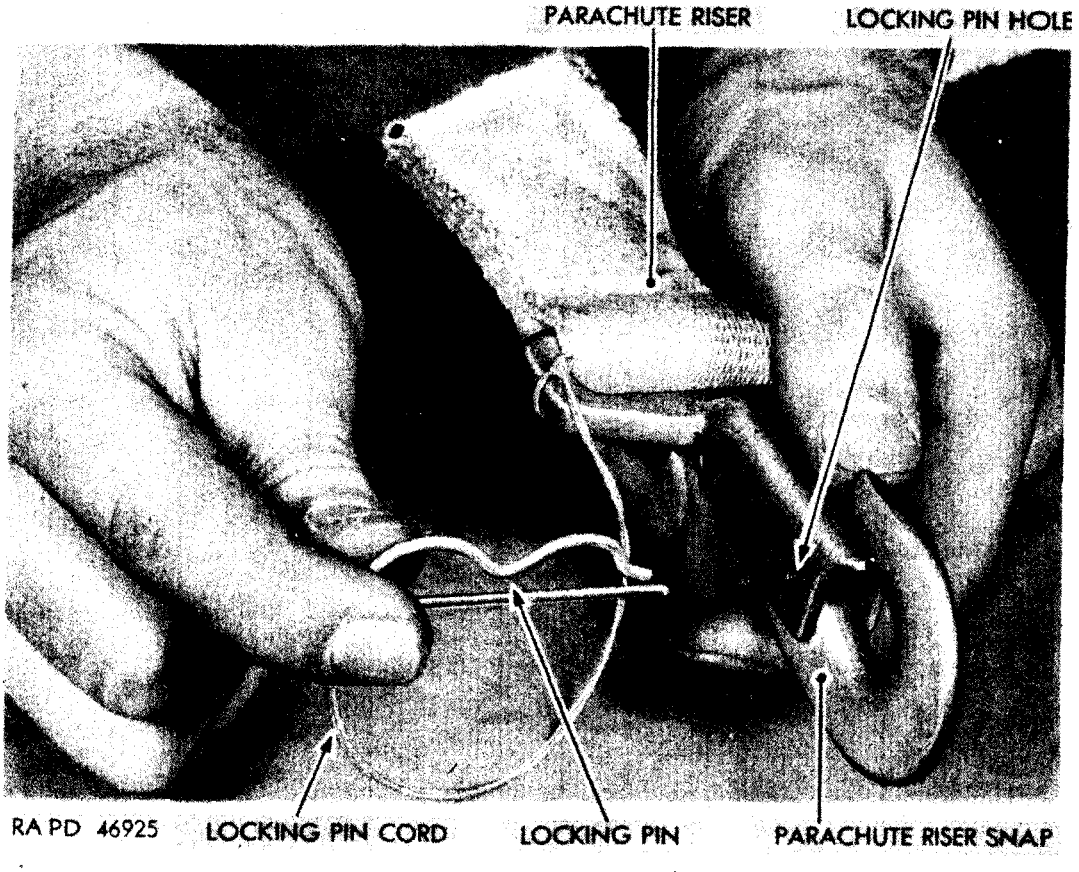


Figure 91. Inserting parachute riser snap locking pin into snap.

hooked to the anchor cable in the airplane (fig. 124).

e. Loads M7 and M6 are each lashed to the harness of load M8 in four places, two on each side of the two upper loads. Two turns of 75-pound shock cord are used for each one of these lashings which should go to "V" rings or to points at which webbings cross.

f. All unused lengths of parachute risers and static lines are taken up by neatly folding and tacking. Tack as described in paragraph 42*f*.

g. Secure all riser snaps with locking pins (fig. 91).

h. After assembling the door load, it is moved about 5 feet forward of the forward edge of the door and lashed down. It is not moved to its dropping position (fig. 124) in the door until the plane has reached level flight and on signal from the pilot or crew member (par. 52).

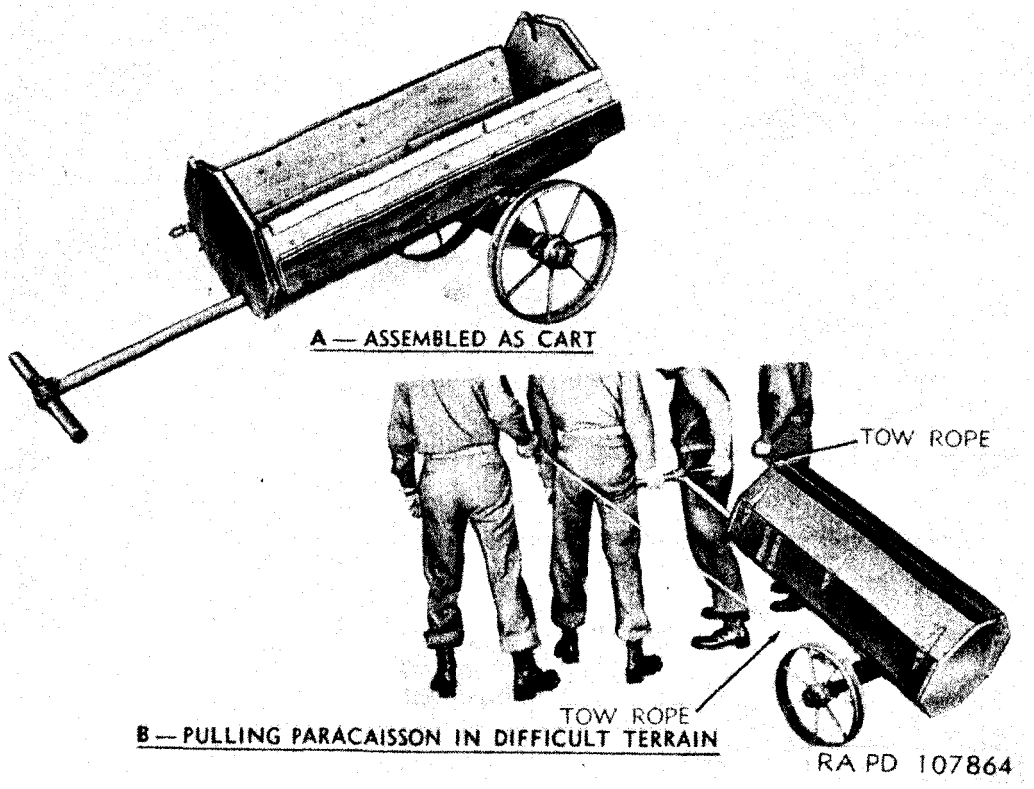


Figure 92. Wood paracaisson M9 assembled as a cart.

45. Disassembly and Assembly of Wood Paracaisson M9

a. General. The assembled paracaisson is a small, two-wheeled vehicle which serves a dual purpose (fig. 92). The body of the vehicle serves as a paracaisson for packing and transporting ammunition as well as the components of the vehicle (par. 40) (fig. 50). When assembled, the paracaisson becomes a handy

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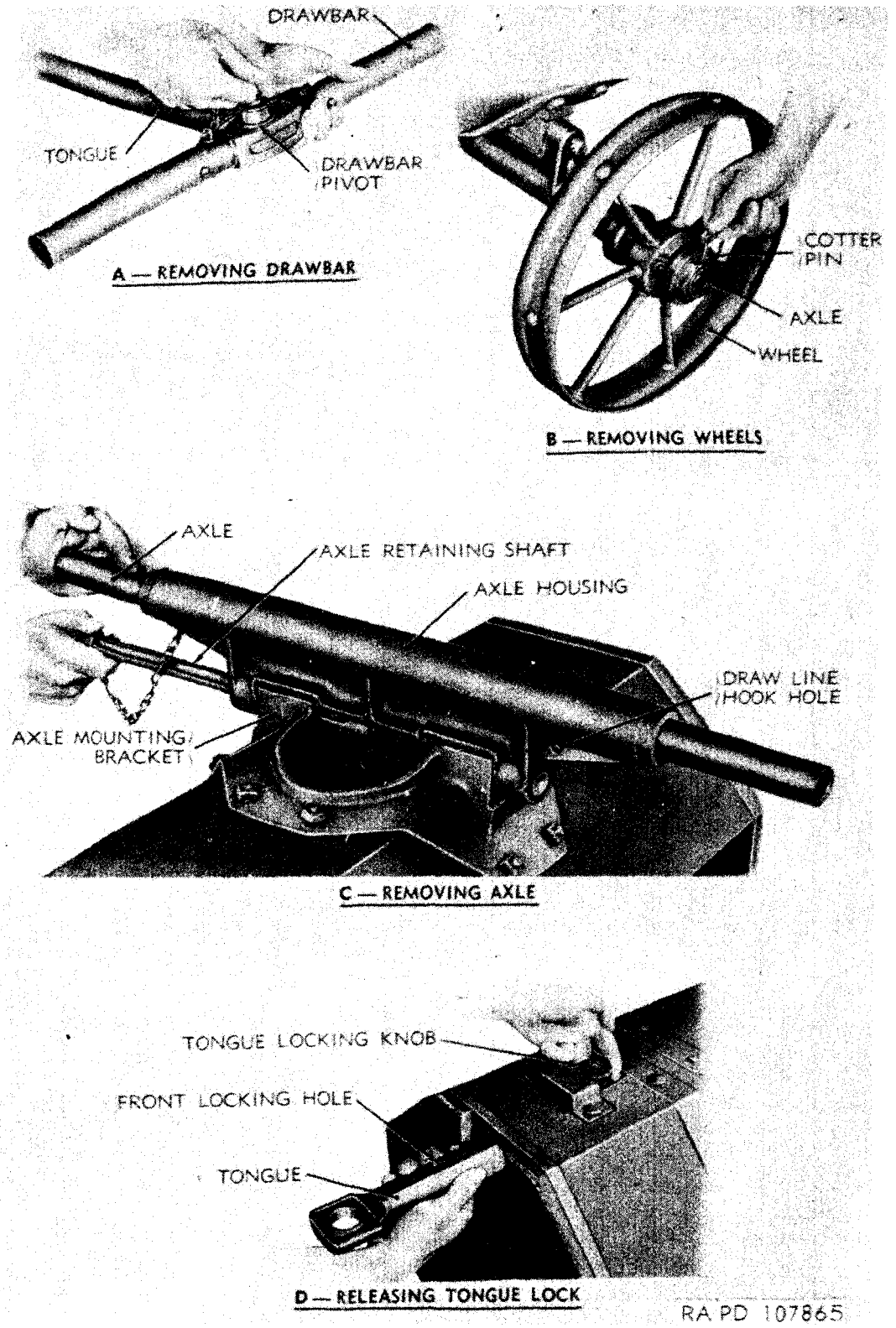


Figure 93. Disassembling wood paracaisson M9.

utility cart or ammunition caisson (fig. 92).

b. Disassembly of Paracaisson for Paracrate Packing. (1) Pull the drawbar pivot out of the drawbar and tongue. Remove drawbar (fig. 93, A).

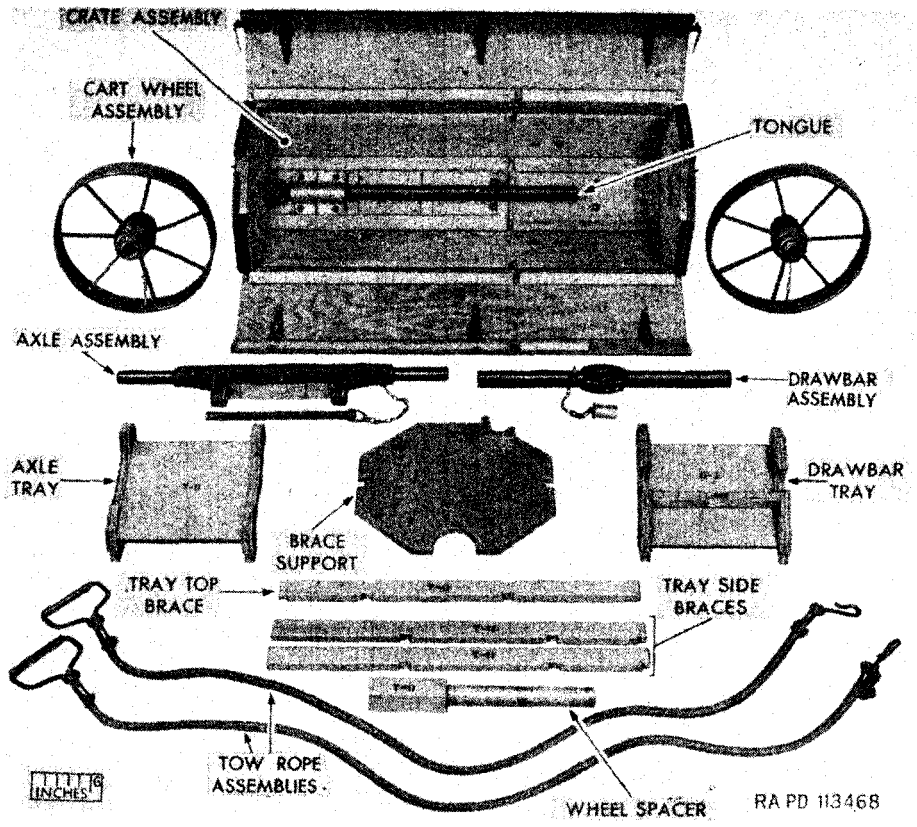


Figure 94. Wood paracaisson M9 disassembled.

(2) Remove cotter pins from wheels and axle (fig. 93, B).

(3) Turn the paracaisson upside down. Remove the wheels. Pull the axle retaining shaft from the axle and axle mounting bracket (fig. 93, C). Further disassembly of wheels for cleaning or other similar purposes may be accomplished as follows: Remove the machine screw and roller bearing lock nut on outer end of hub; remove oil seal and outer taper roller bearing; and remove snap ring, oil seal, and taper roller bearing on inner end of hub.

(4) Lift up on the tongue knob, push the tongue into the crate assembly, and lock in the front hole in the tongue (fig. 93, D).

(5) The paracaisson is now completely disassembled for paracrate packing (fig. 94).

c. Assembly of Paracaisson as a Hand Cart. (1) Place the crate upside down. Release the tongue locking knob and pull out on the tongue far enough to lock the tongue in the fully extended position.

(2) Place the axle in position and secure with the axle retaining shaft. Slide the wheels in position on the axle spindles and secure with the cotter pins.

(3) Assemble the drawbar to the tongue and insert the drawbar pivot. Turn the assembled paracaisson in an upright position on its wheels.

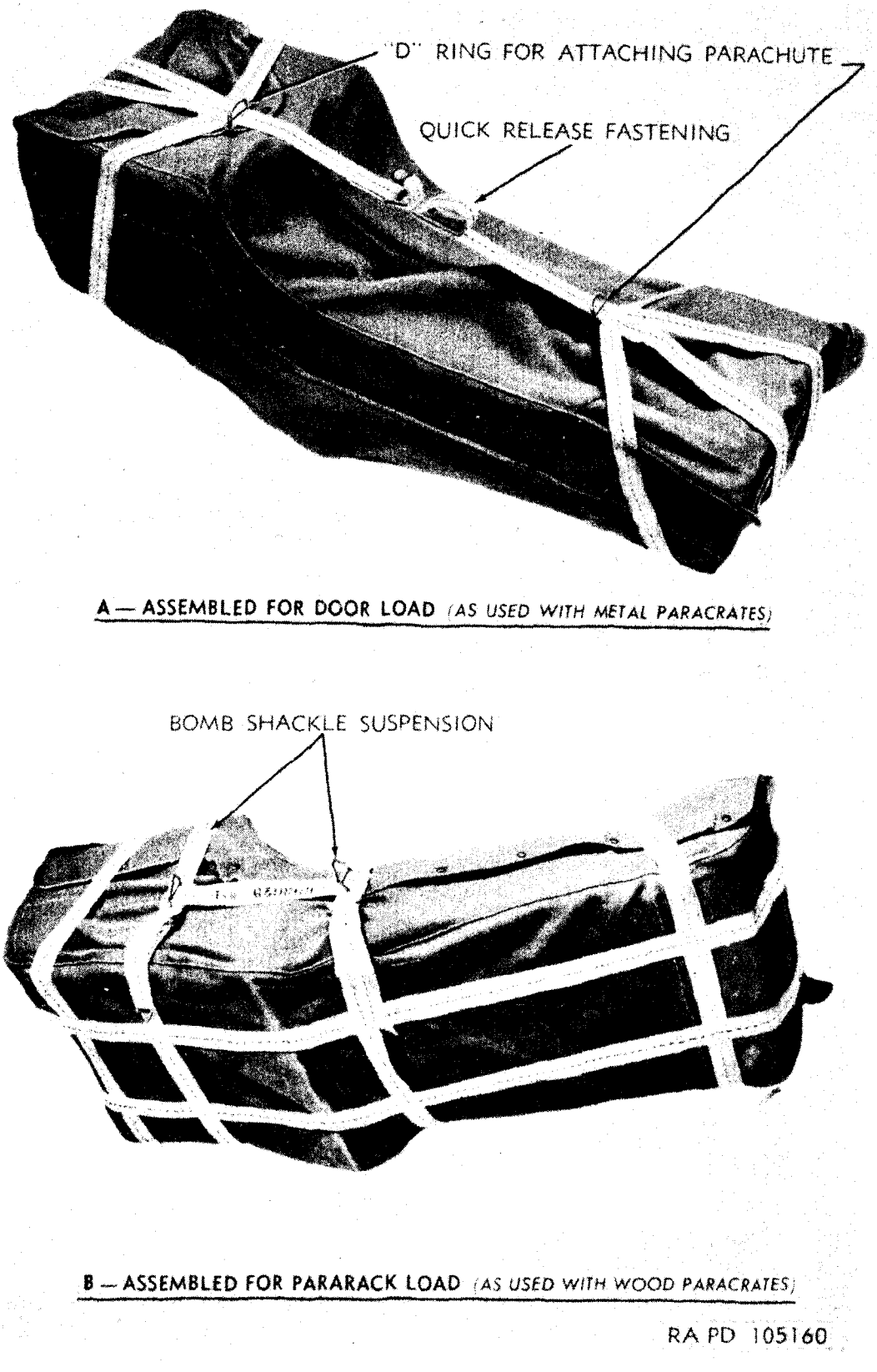


Figure 95. Paracrate M1 assembled and suspension in place.

(4) The paracaisson is now assembled as a vehicle and can be loaded with 18 rounds of ammunition. However, the normal practice is to carry the 10 rounds in the wooden parachest M8 on the trail of the howitzer carriage as shown in figure 48. The two tow ropes are attached to the axle by means of hooks which hook through holes in the axle (figs. 93, C and 94). The tow



Figure 96. Paracrate M2 assembled and suspension in place.

ropes are used only when the terrain is such that four men are required to pull the load (fig. 92).

46. Metal Paracrate Loads

The howitzer and ammunition are packed in nine paracrate

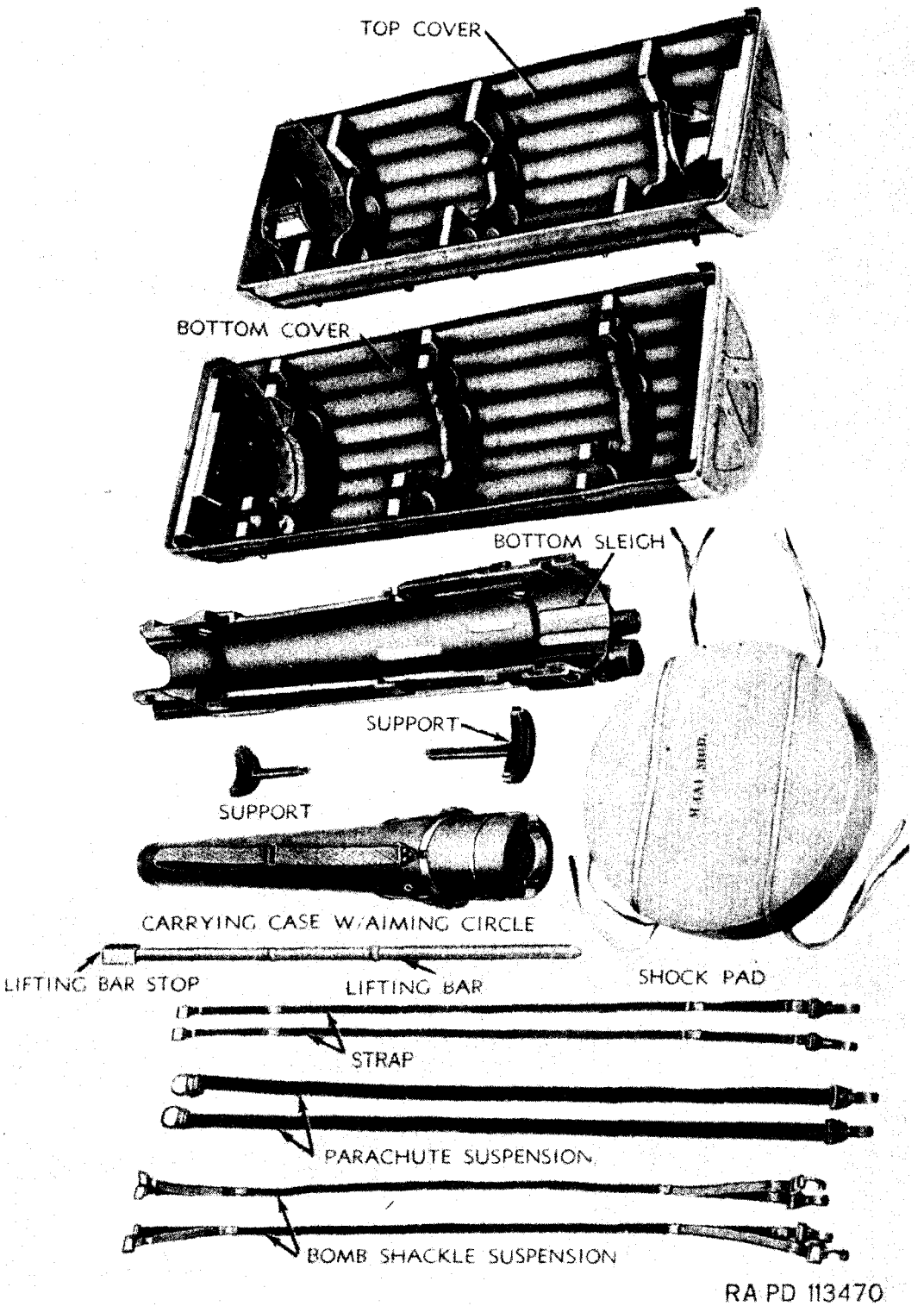


Figure 97. Paracrate M3A2 and load displayed.

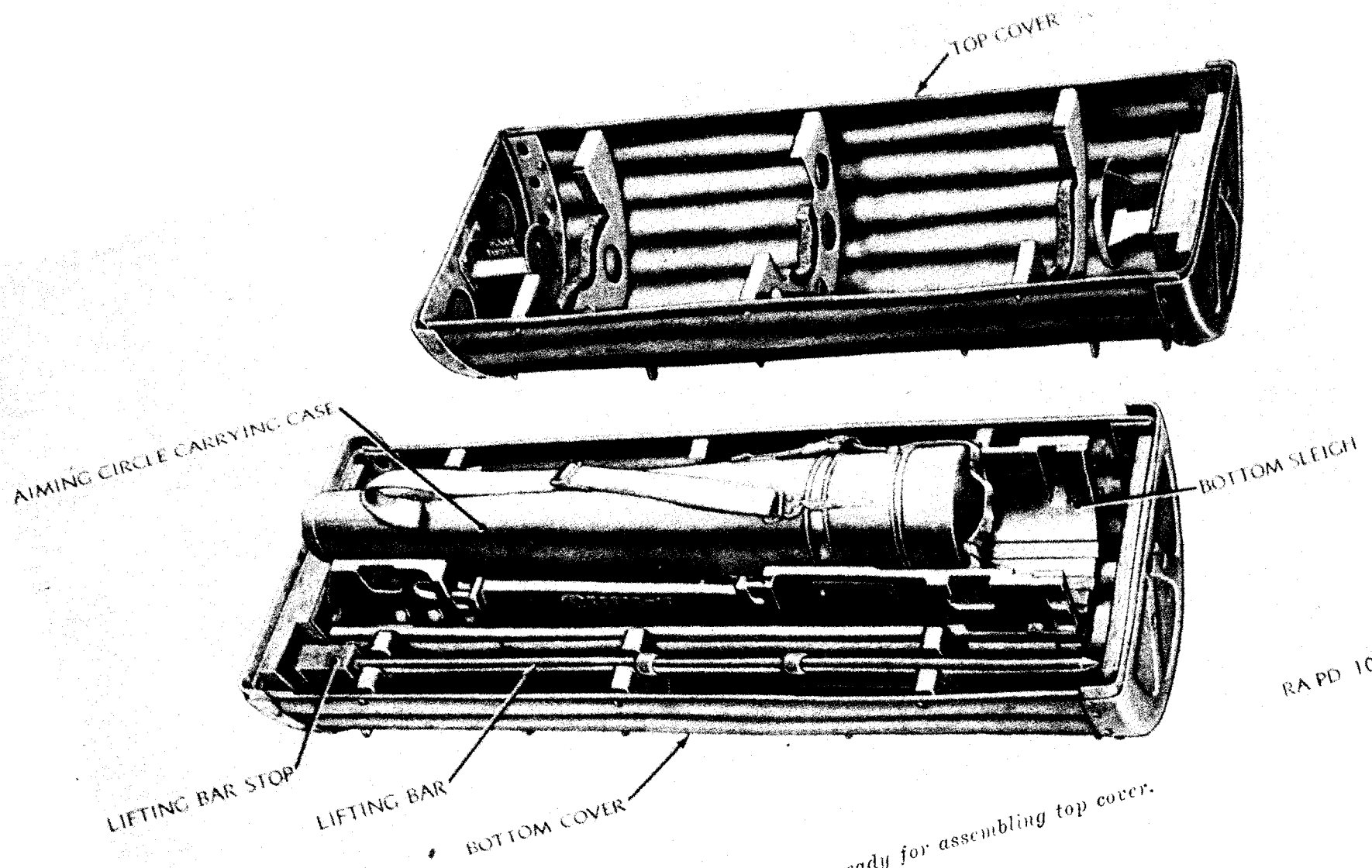


Figure 98. Paracrate M3A2 loaded ready for assembling top cover.

loads. The component parts of these loads and the weights when using metal paracrates are as follows:

a. Paracrate Loads M1 and M2. These loads are used with both wood and metal paracrates (par. 31). However, they are used in the door load with the metal paracrates and the bomb shackle suspension is not required (figs. 95 and 96).

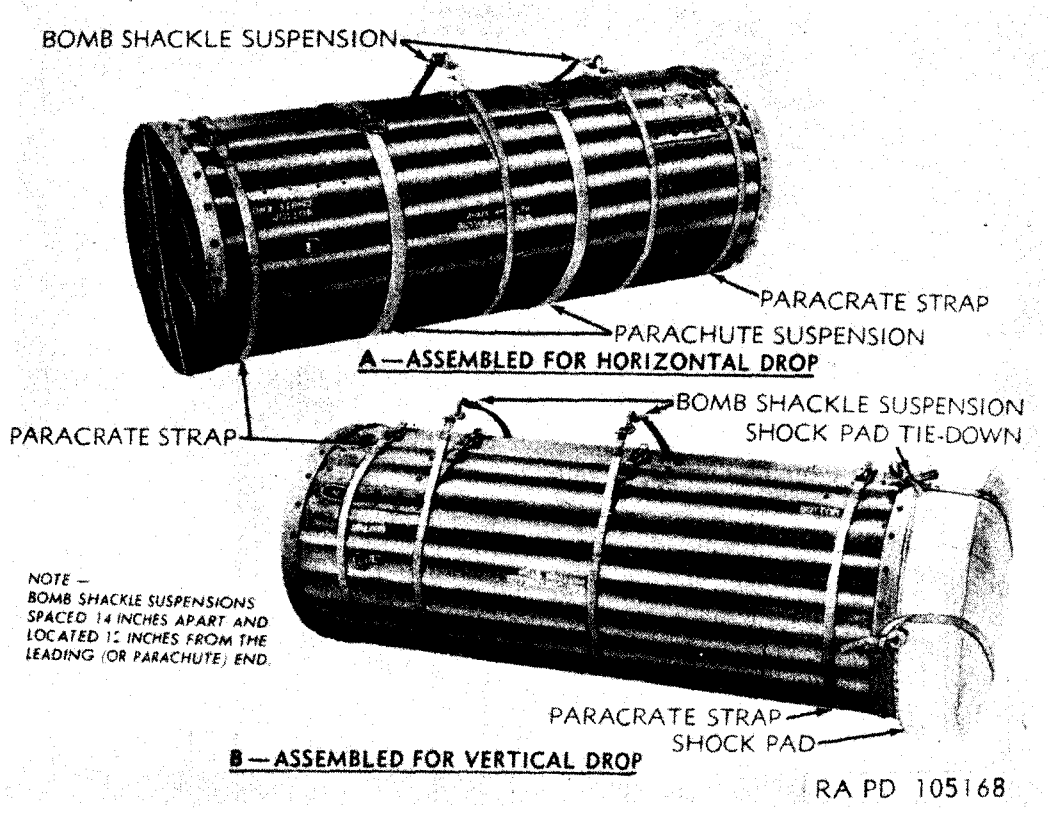


Figure 99. Paracrate M3A2, M4A2, or M5A2 assembled—bomb shackle suspensions arranged for standard parachute pack rack.

b. Paracrate Load M3A2 (figs. 97, 98, 99, and 100).

	Pounds
Bottom sleigh	217
Aiming circle with case	20
Lifting bar	9
Paracrate M3A2	123
Total weight	369

c. Paracrate Load M4A2 (figs. 99, 100, 101, and 102).

	Pounds
Cradle	105
Top sleigh	108
Lifting bar	9
Paracrate M4A2	124
Total weight	346

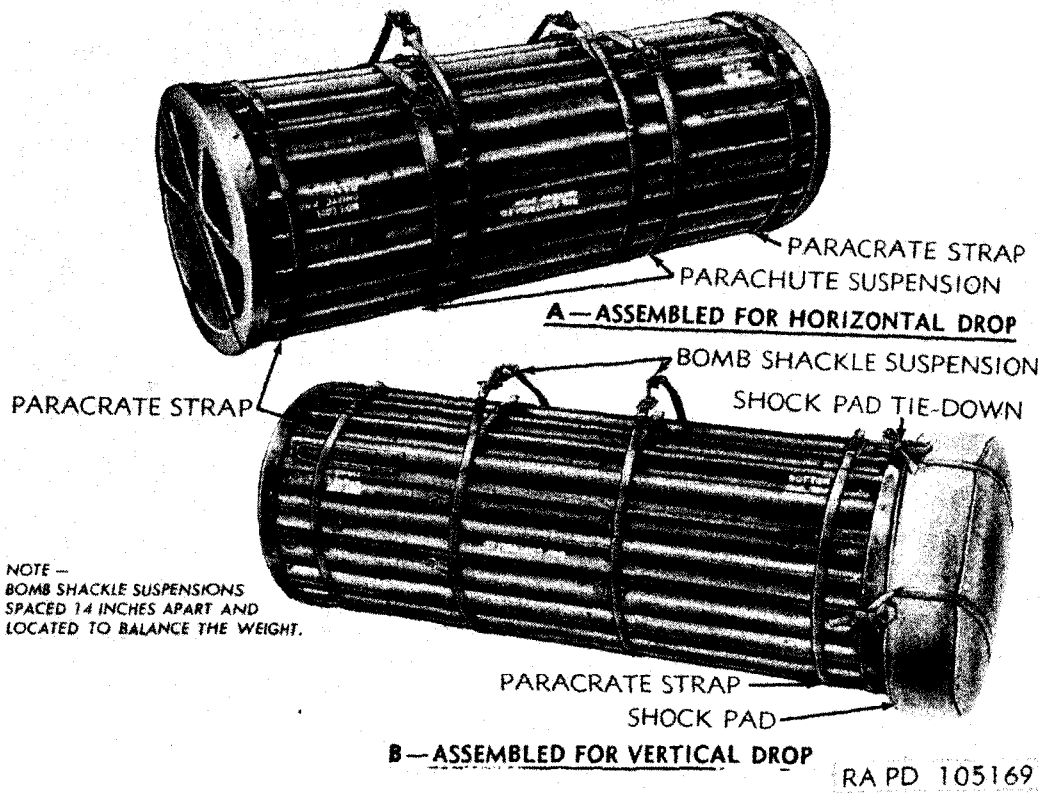


Figure 100. Paracrate M3A2, M4A2, or M5A2 assembled—bomb shackle suspensions arranged for modified parachute pack rack of C-47 airplane and standard pack racks of C-46 airplane.

d. Paracrate Load M5A2 (figs. 99, 100, 103, and 104).

	Pounds
Tube	221
Lifting bar	9
Paracrate M5A2	120
Total weight	350

e. Paracrate Load M6A1 (figs. 105 and 106).

	Pounds
Breech assembly	121
Telescope and mount	11
Paracrate M6A1	146
Total weight	278

f. Paracrate Load M7A1 (figs. 107 and 108).

	Pounds
Wheels (two)	180
Paracrate M7A1	22
Total weight	202

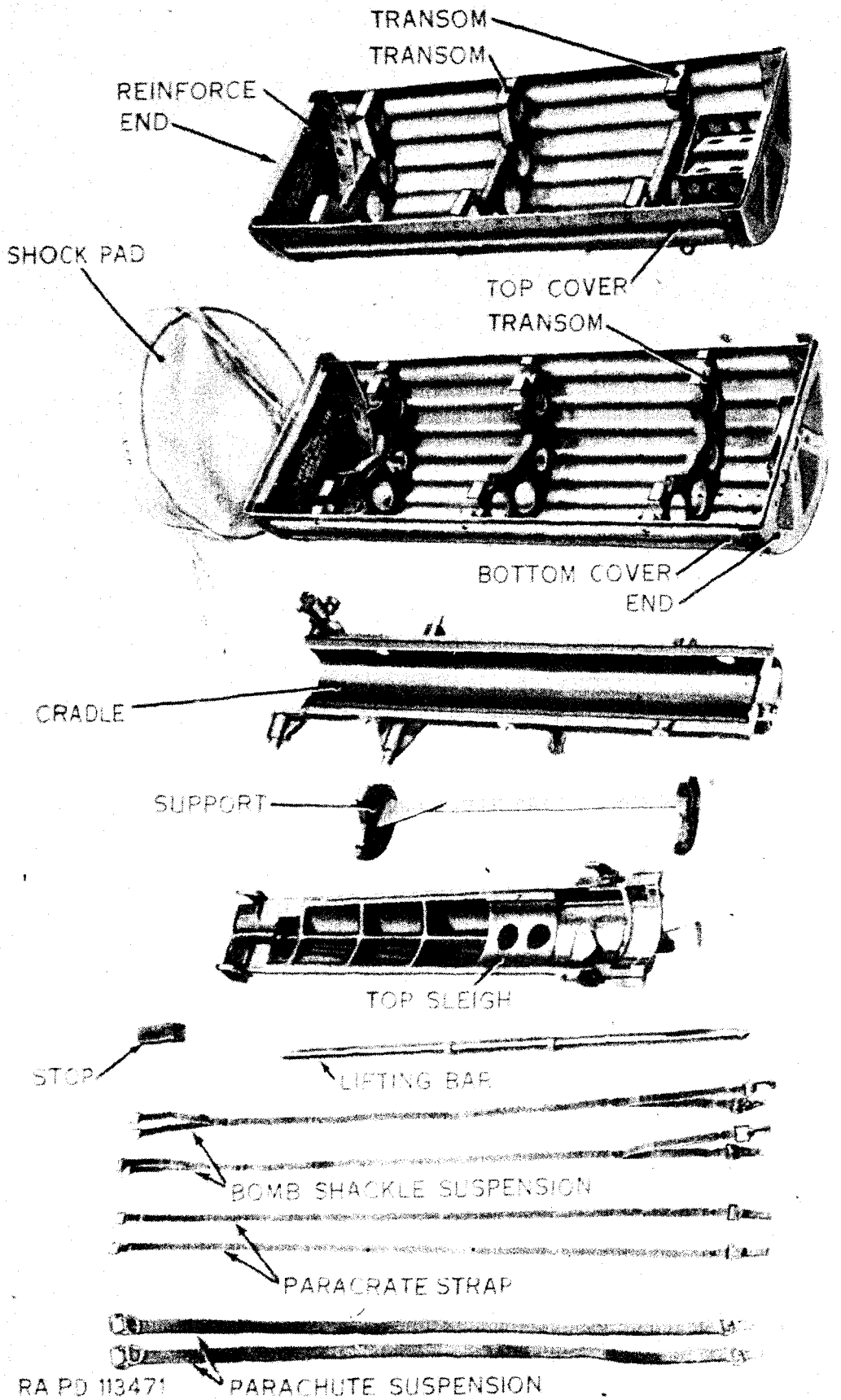


Figure 101. Paracrate M4A2 and load displayed.

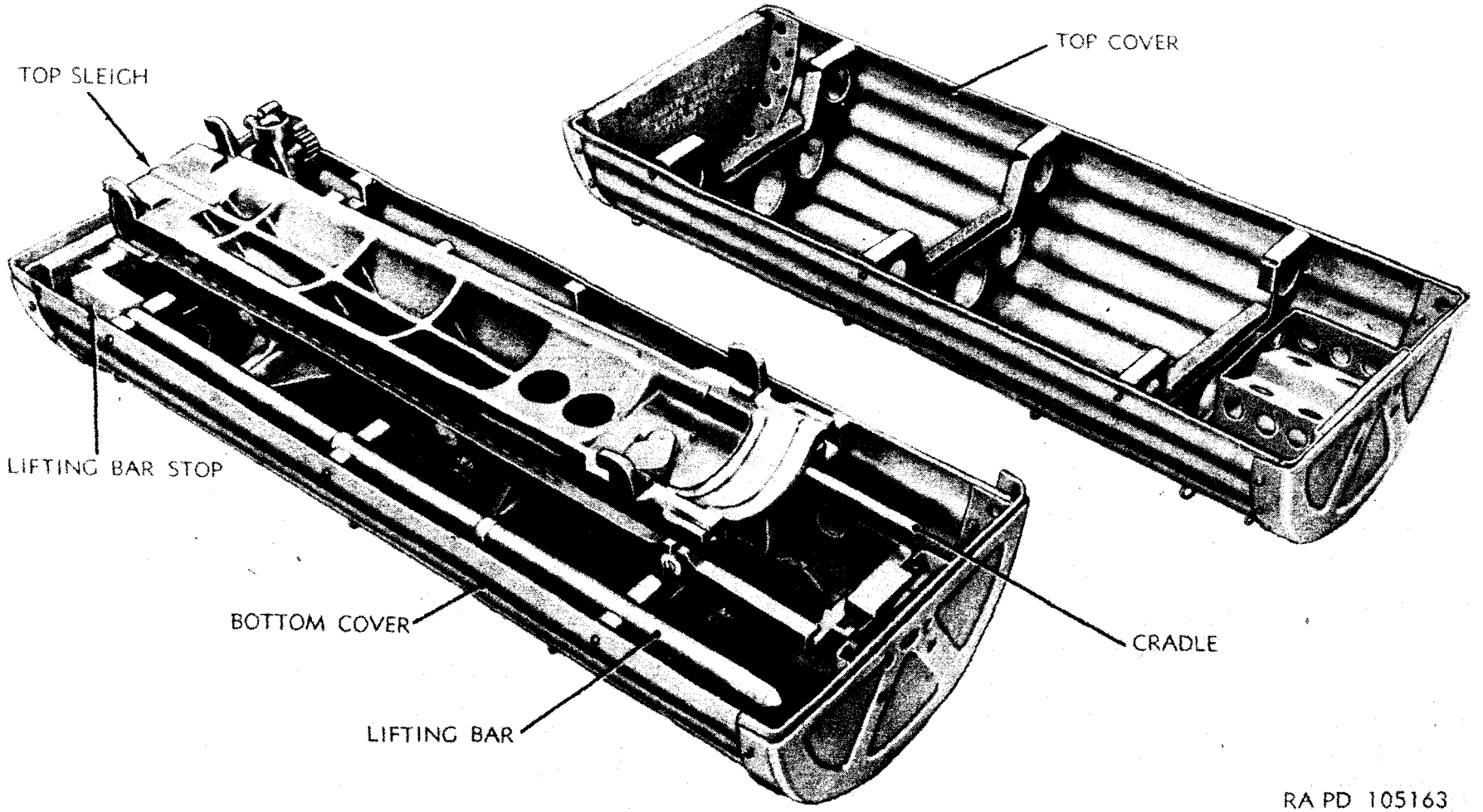


Figure 102. Paracrate M4A2 loaded ready for assembling top cover.

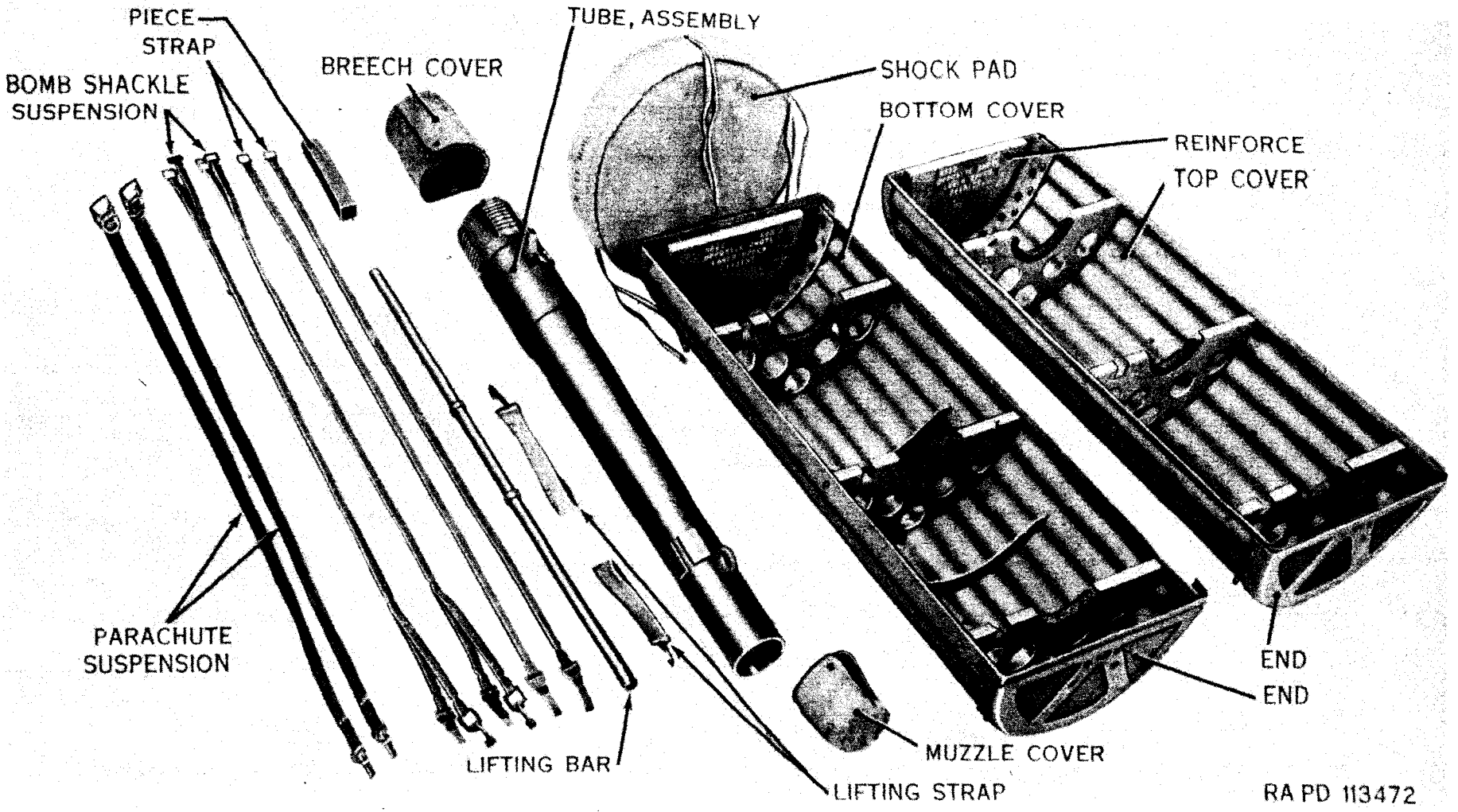


Figure 103. Paracrate M5A2 and load displayed.

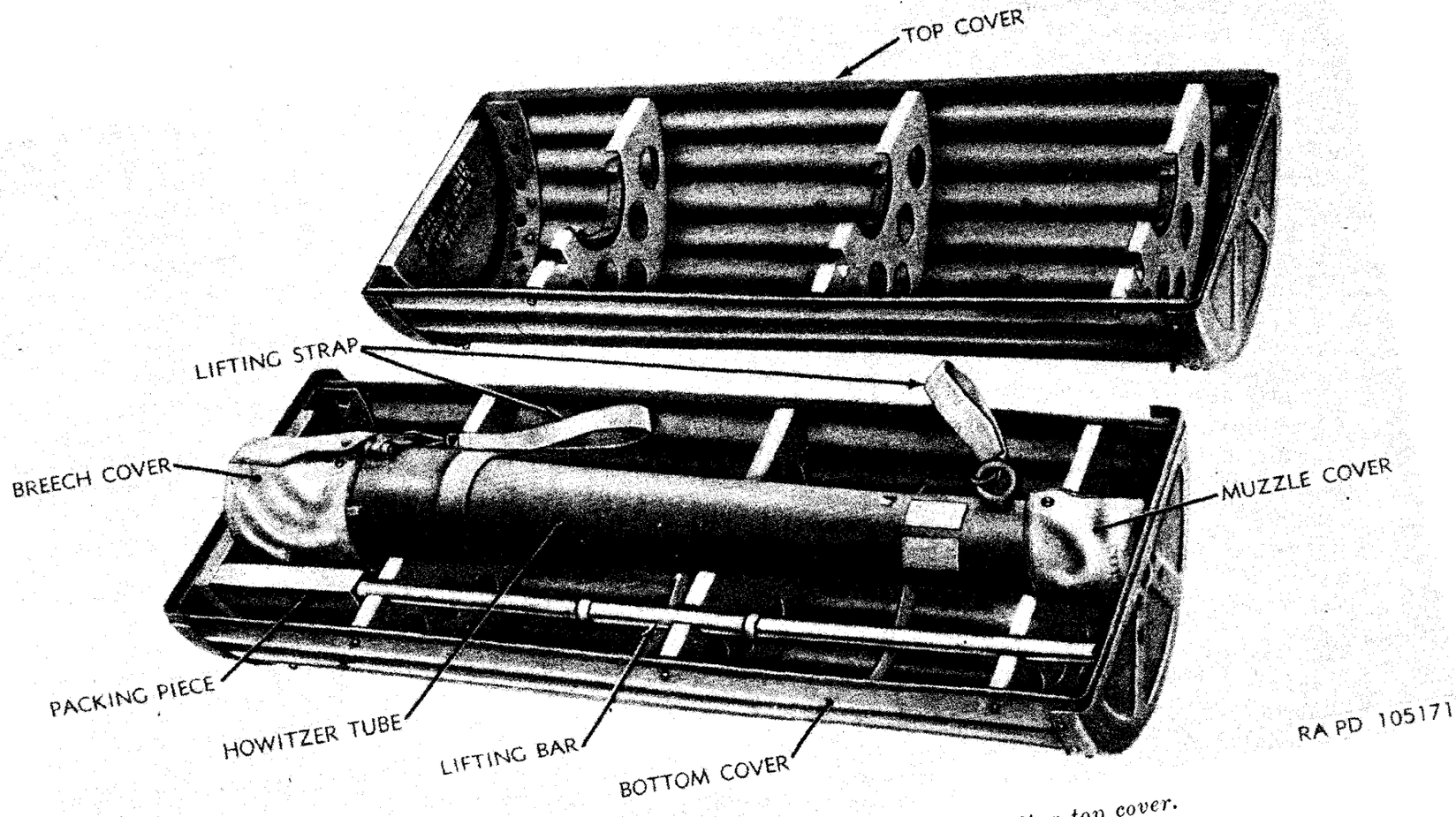


Figure 104. Paracrate M5A2 loaded ready for assembling top cover.

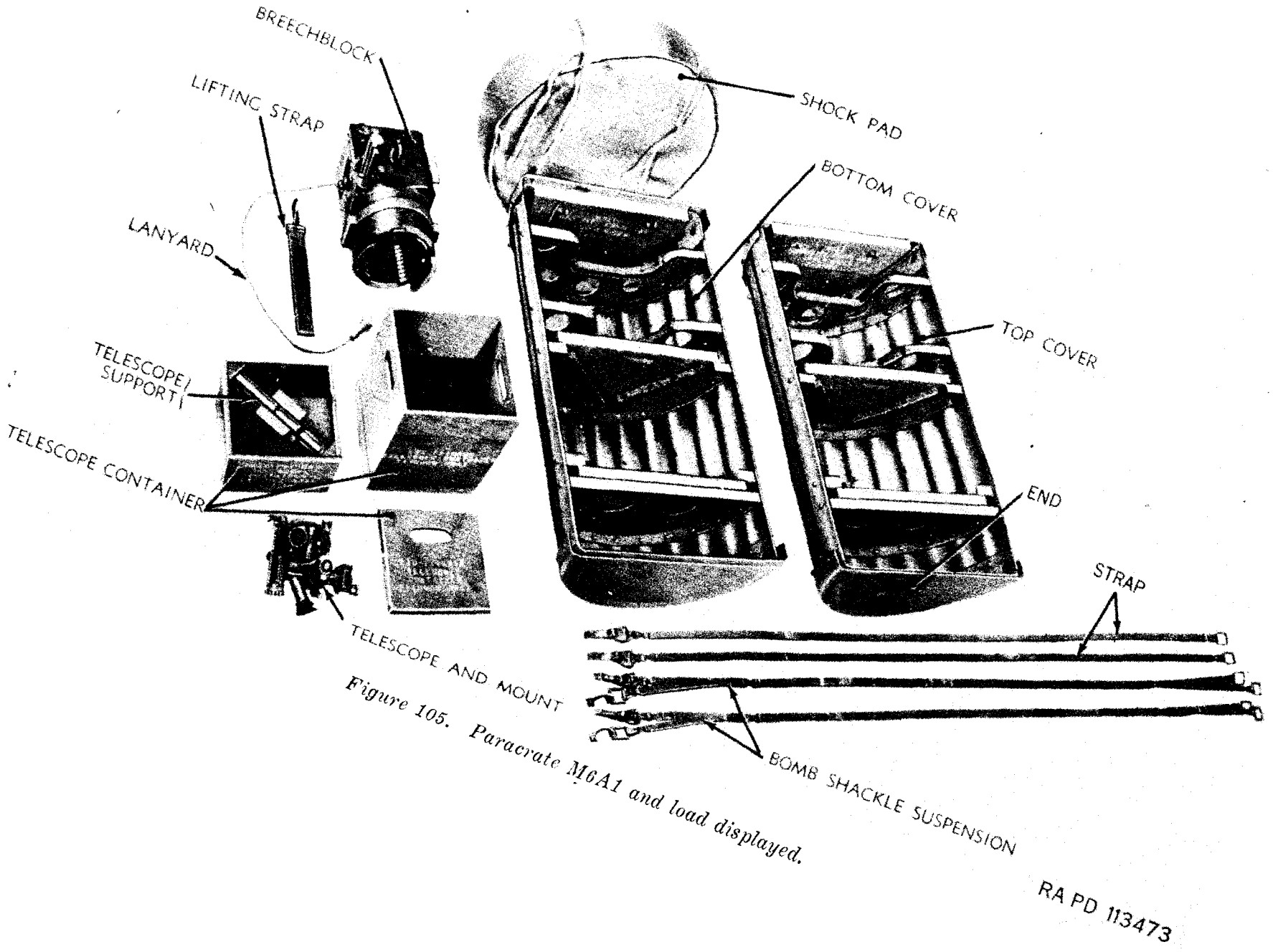


Figure 105. Paracrate M6A1 and load displayed.

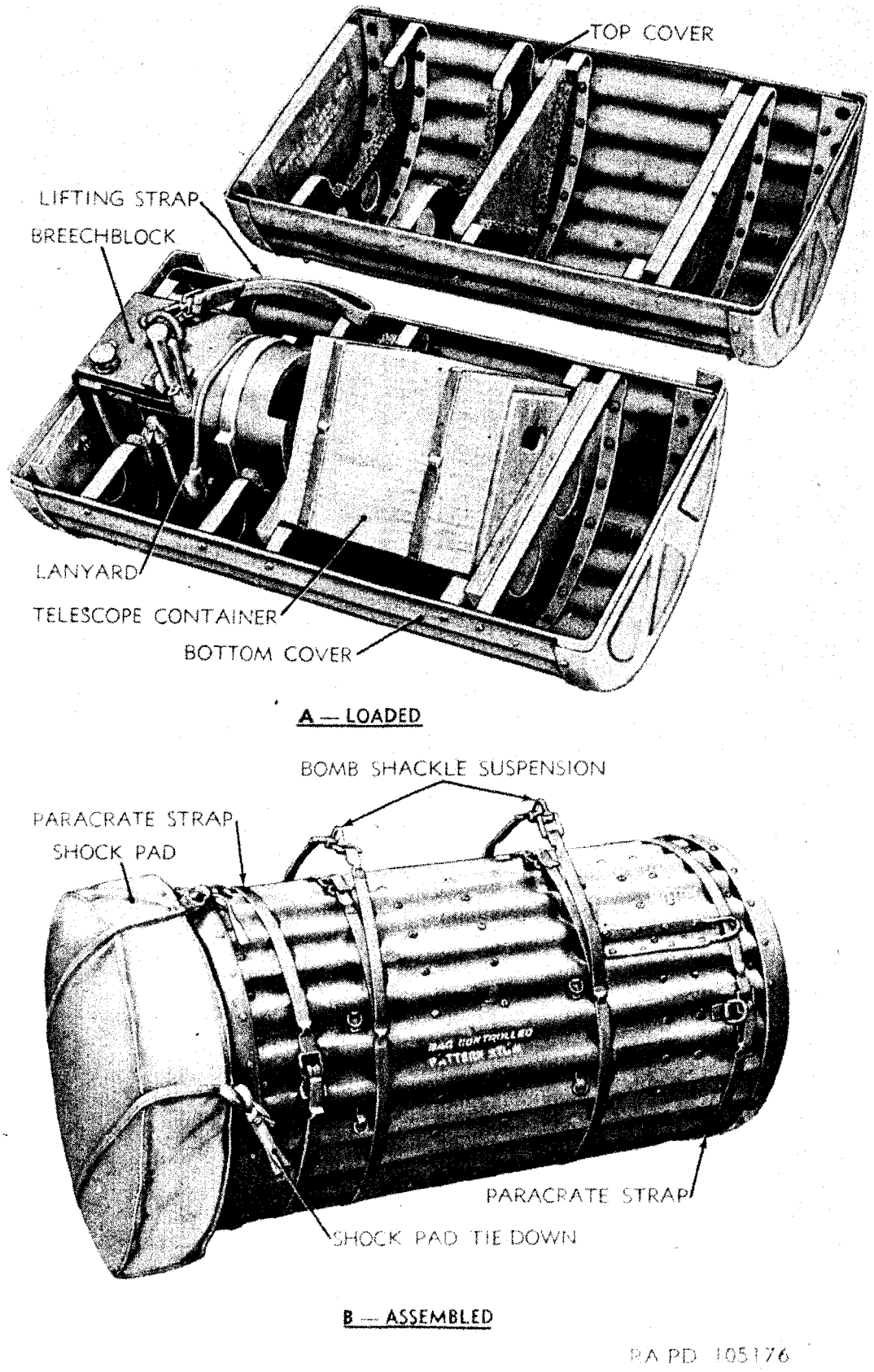


Figure 106. Paracrate M6A1 loaded and ready for assembling top cover and paracrate M6A1 assembled with shock pad attached.

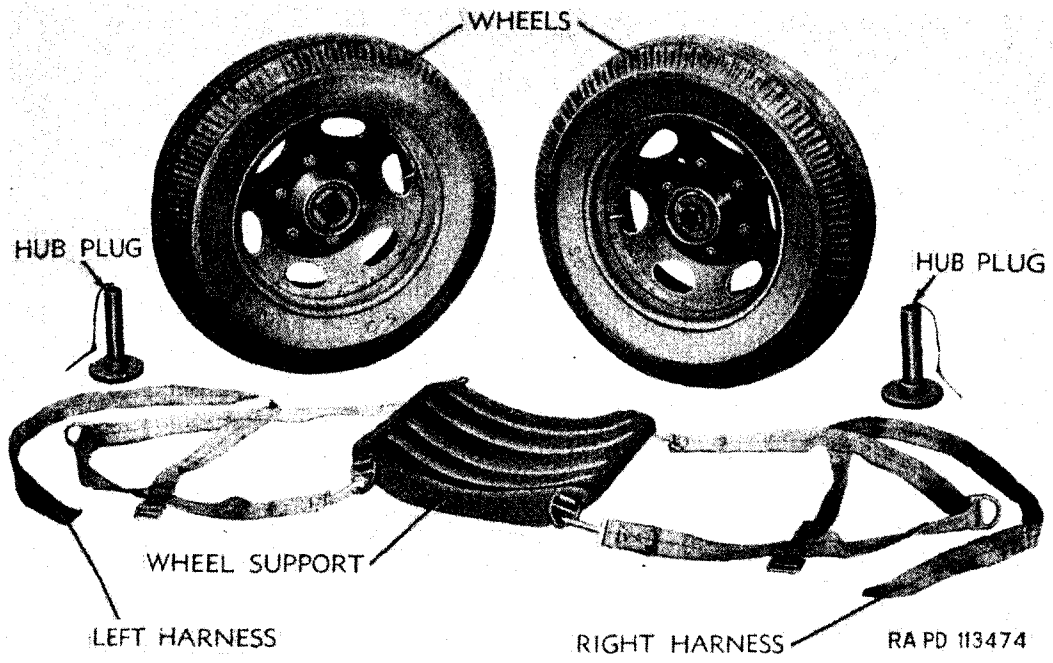


Figure 107. Paracrate M7A1 and load displayed.

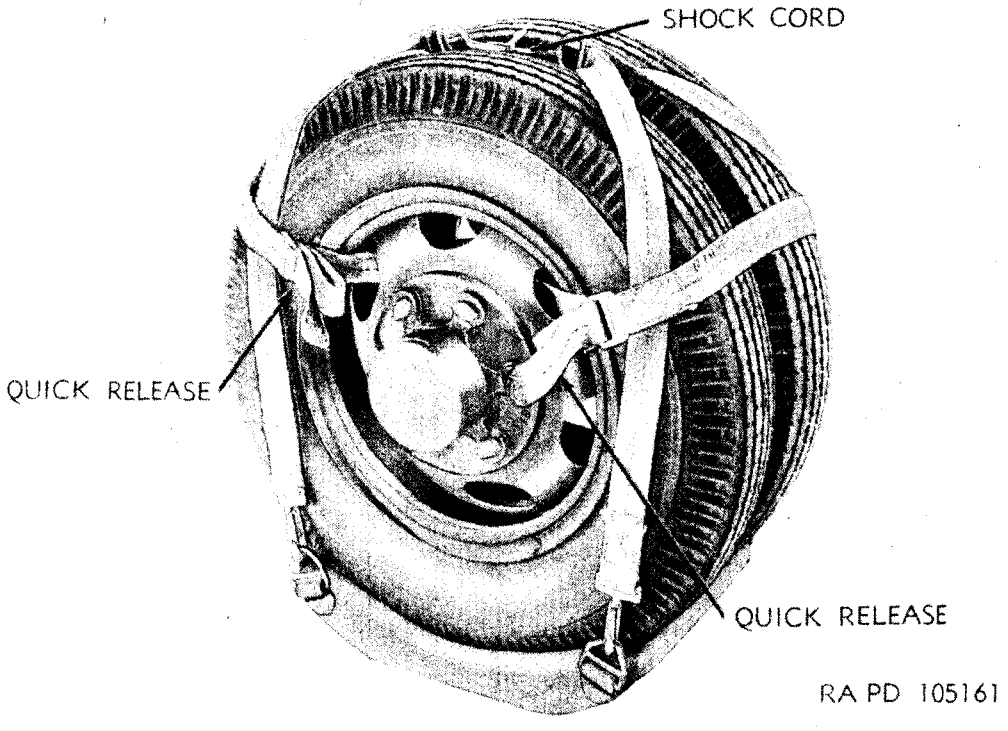


Figure 108. Paracrate M7A1 loaded and suspension in place.

g. Parachest Load M8A1 (figs. 109, 110, and 111).

	Pounds
Ammunition, 10 rounds in individual fiber containers	223
Parachest M8A1	114
Total weight	337

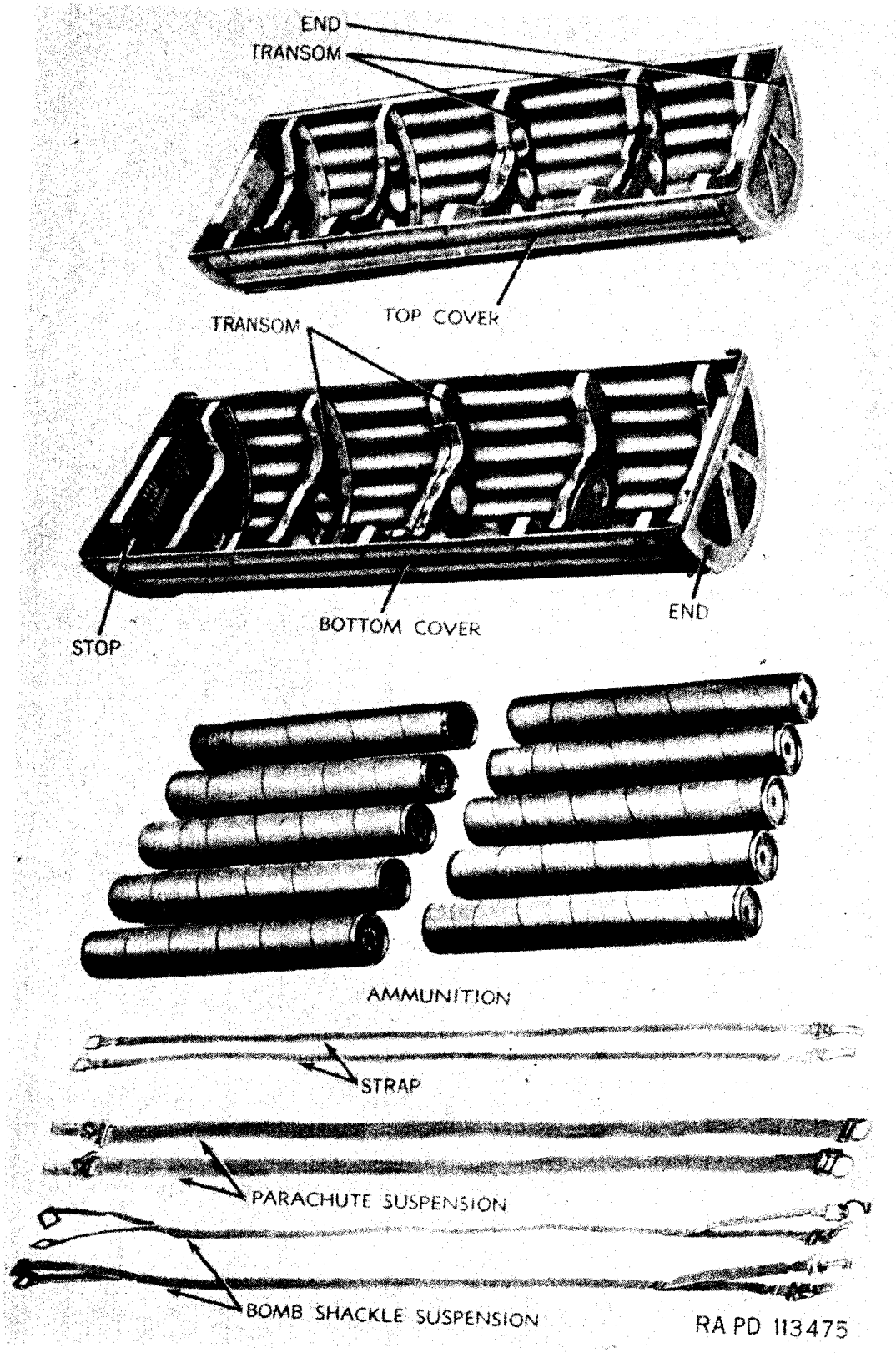
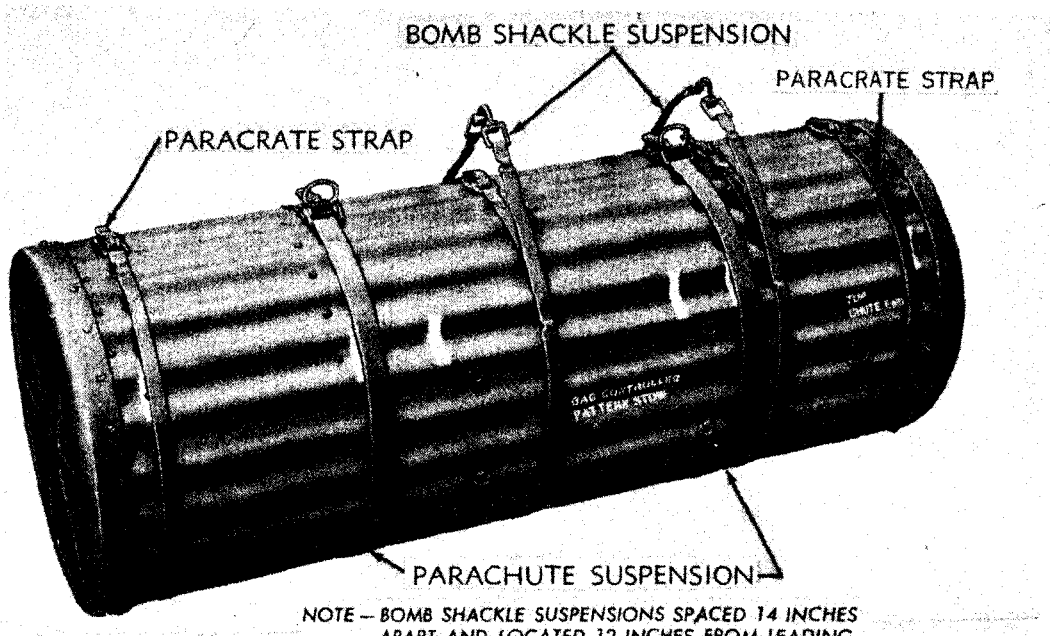


Figure 109. Parachest M8A1 and load displayed.

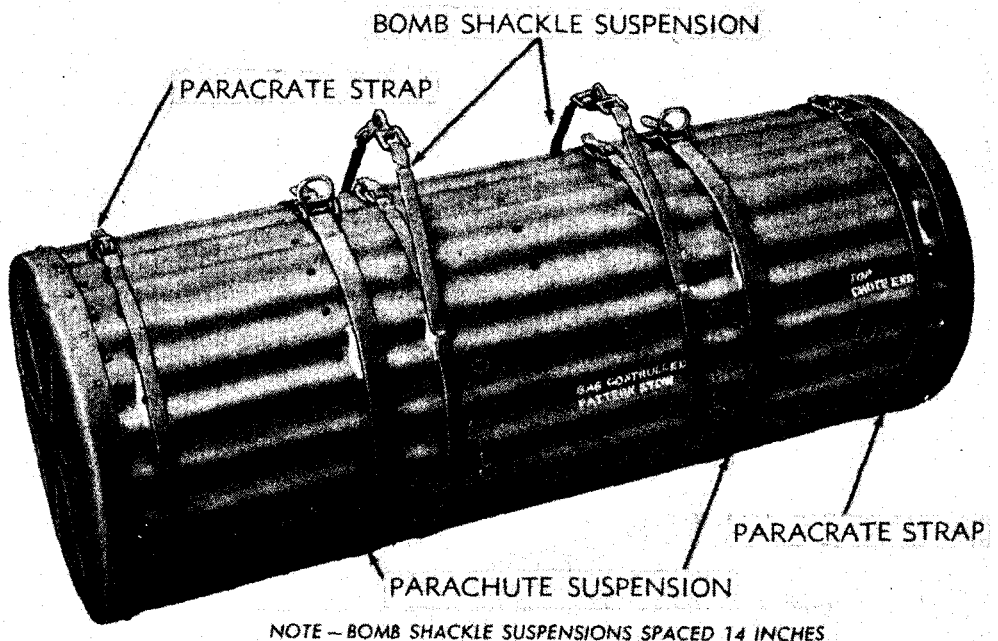
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Figure 110. Parachest M8A1 loaded ready for assembling top cover.



NOTE – BOMB SHACKLE SUSPENSIONS SPACED 14 INCHES APART AND LOCATED 12 INCHES FROM LEADING (OR PARACHUTE) END.

A – BOMB SHACKLE SUSPENSIONS ARRANGED FOR STANDARD PARARACK



NOTE – BOMB SHACKLE SUSPENSIONS SPACED 14 INCHES APART AND LOCATED TO BALANCE THE WEIGHT.

B – BOMB SHACKLE SUSPENSIONS ARRANGED FOR MODIFIED PARARACK

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Figure 111. Parachest M8A1 assembled and suspension in place.

h. Paracaisson Load M9A2 (figs. 112 and 113).

	Pounds
Ammunition, 8 rounds in individual fiber containers	178
Paracaisson M9A2	134
Total weight	312

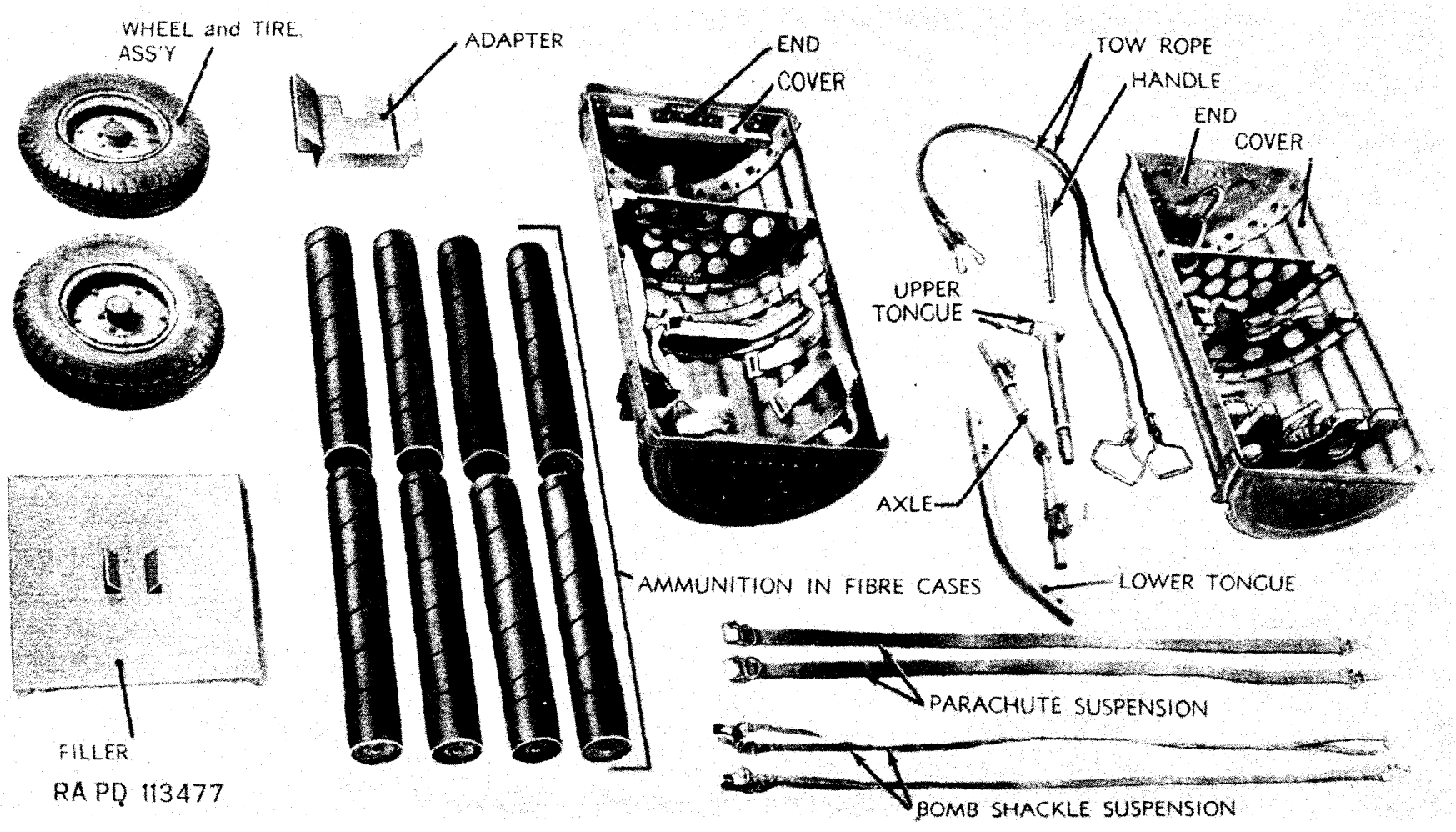


Figure 112. Paracaisson M9A2 and load displayed.

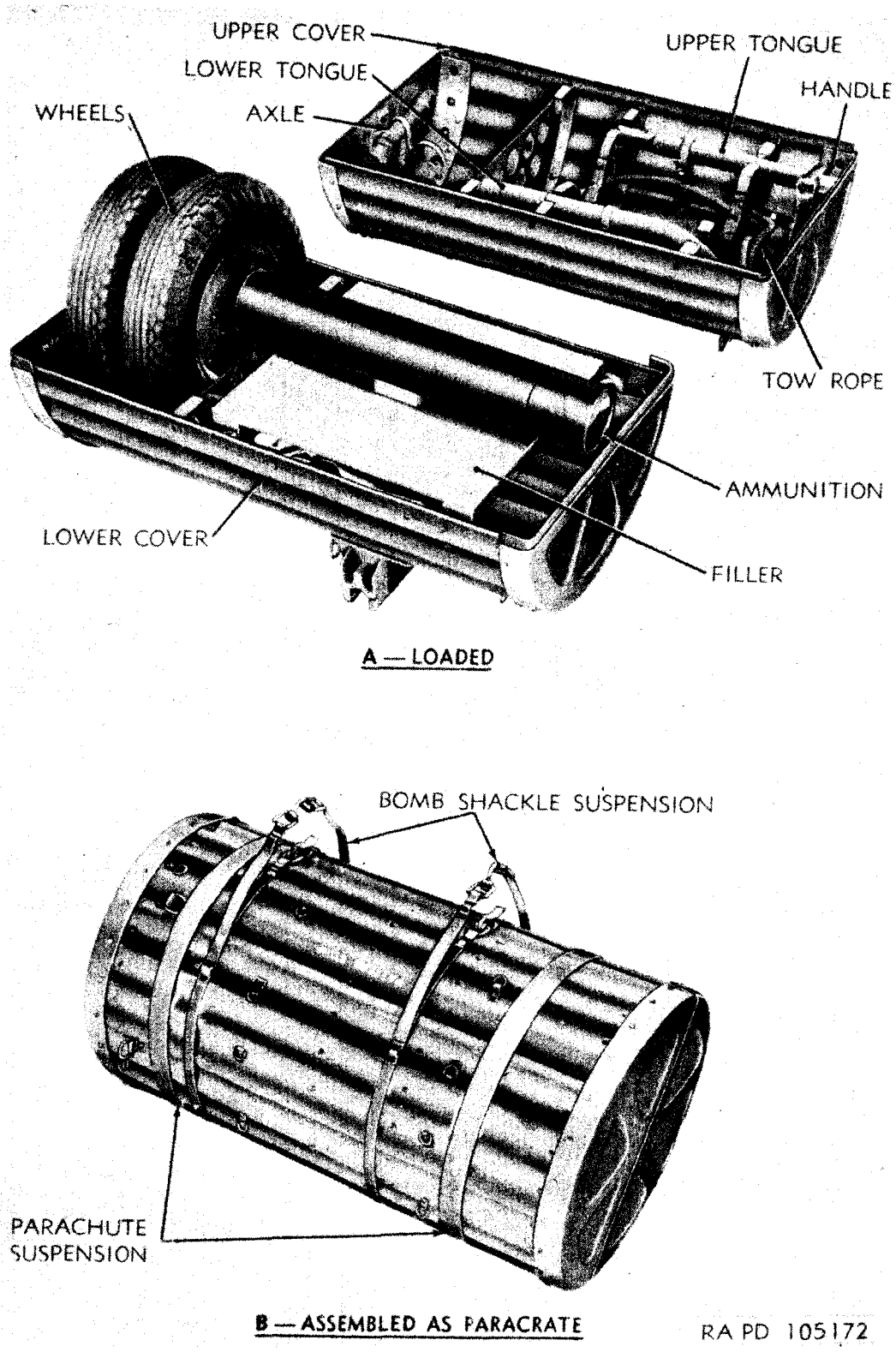


Figure 113. Paracaisson M9A2 assembled and suspension in place.

i. Total weights.

Weight of nine parachutes	207
Total weight of paracrate loads and parachutes	3009

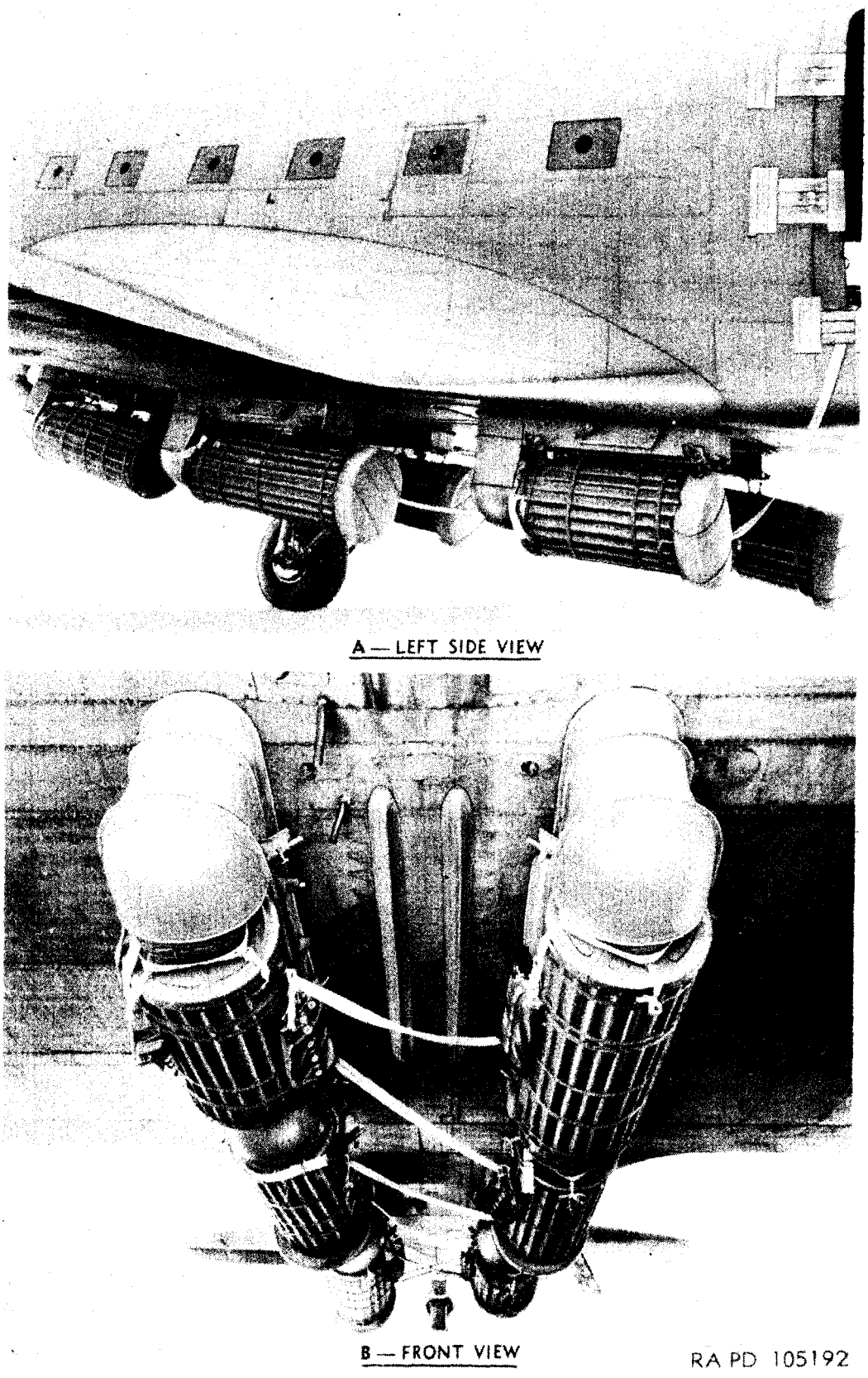


Figure 114. Metal paracrates loaded on standard pararacks of C–47 airplane.

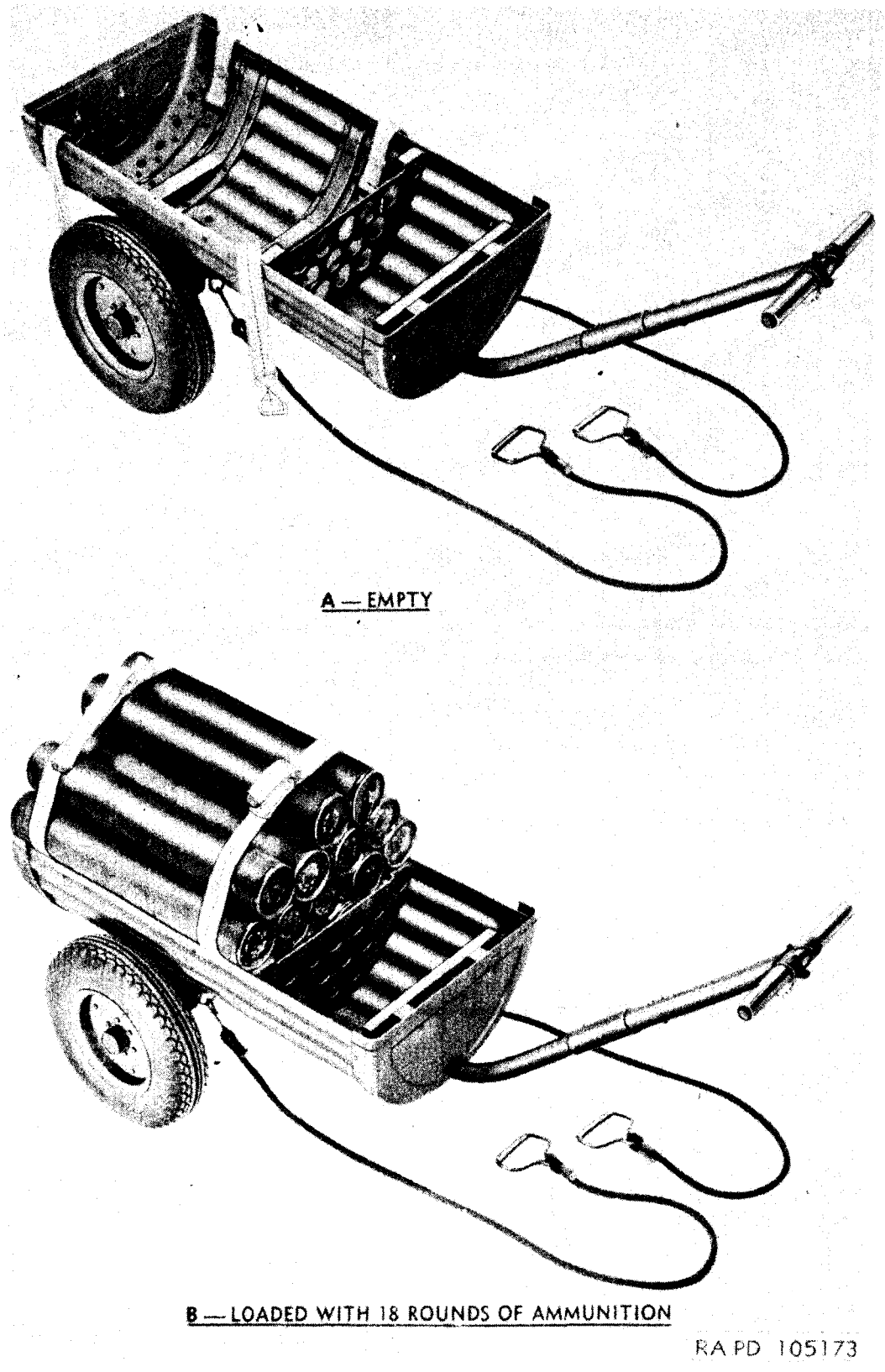


Figure 115. Metal paracaisson M9A2 assembled as a cart.

47. Disassembly and Assembly of Metal Paracaisson M9A2

a. General. The assembled paracaisson is a two-wheeled, pneumatic-tired hand cart used for manual transport of ammunition. It can be loaded with 18 rounds (fig. 115). The bottom cover

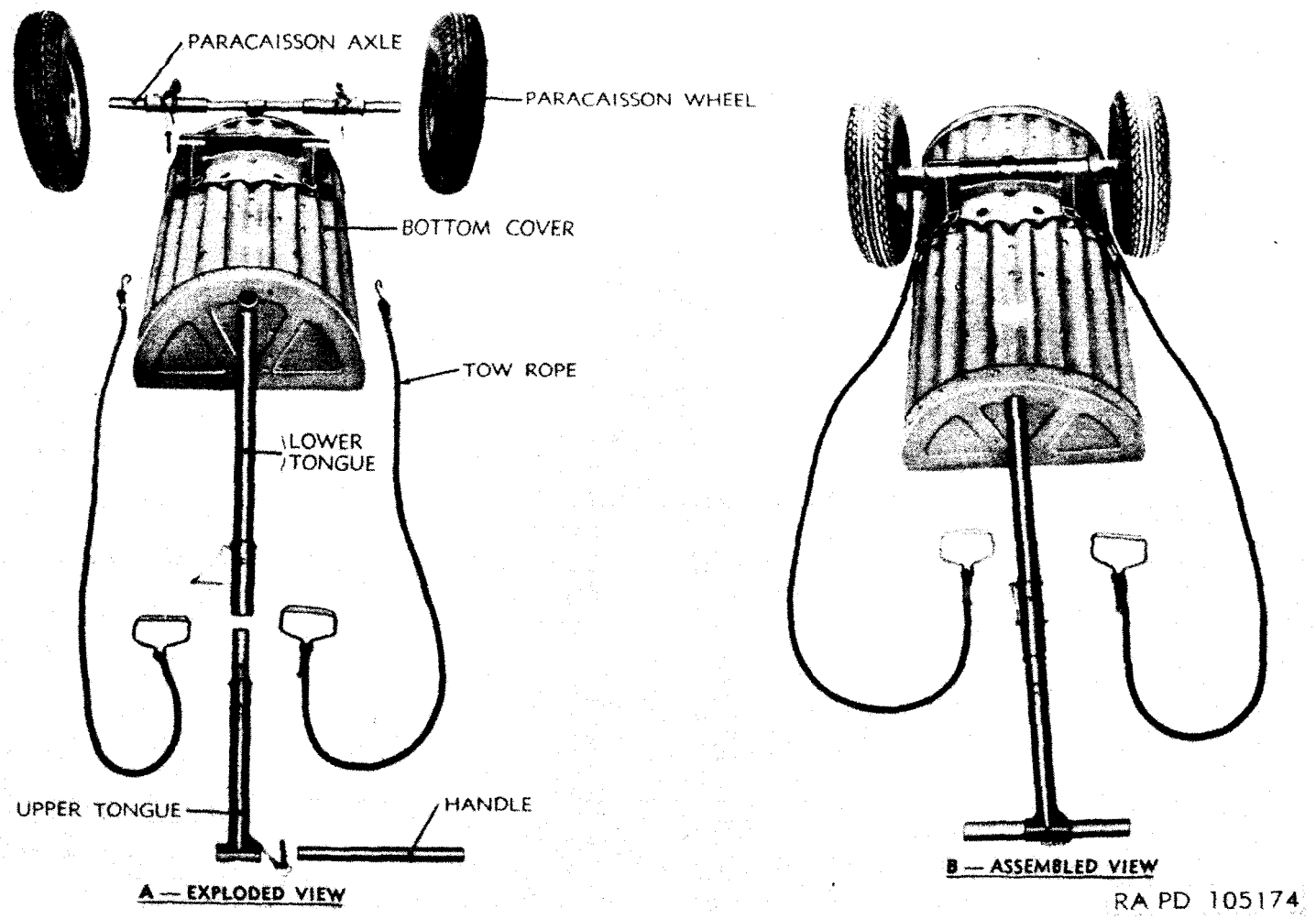


Figure 116. Metal paracaisson M9A2—assembled and disassembled views.

serves as the body of the vehicle and together with a top cover forms a paracrate for packing and transporting 8 rounds of ammunition as well as the components of the vehicle (figs. 112 and 113).

b. Disassembly of Paracaisson for Paracrate Packing (fig. 116). (1) Pull out the handle pin which is chained to the upper tongue. Remove the handle from its transverse position and telescope it into the upper tongue with the locking hole end protruding. Lock the handle in the telescoped position by again inserting the handle pin and engaging the locking hole nearer the end of the handle.

(2) Pull the pin from the tongue bracket inside the bottom cover and remove the tongue. Remove the pin which locks the upper and lower tongues together and separate these telescoped sections.

(3) Pull out the pins and release the wheel latches. Remove the wheels.

(4) Pull out the axle locking pins and rotate the axle about one-quarter turn until the flat surfaces on the axle match the openings in the axle bearings freeing the axle. Remove the axle. The hinge at the center of the axle permits folding to facilitate packing.

(5) The paracaisson is now completely disassembled for paracrate packing.

c. Assembly of Paracaisson as a Hand Cart. (1) Clean the axle and axle bracket on the bottom cover. Face the axle around so that the flat surfaces fit into the openings of the axle bracket. Insert the axle in the bracket and rotate it about one-quarter turn until the hole in the flange on the inner end of each axle bearing alines with a hole in the side of the axle bracket. Secure the axle in place by inserting the locking pins chained to the axle.

(2) Clean and lubricate the wheel bearings and the axle shafts. Assemble the wheels and engage the wheel latches on the axle. Insert the pins to secure the wheel latches. The wheel latch engages a flange on the inner end of the wheel bearing and permits free rotation of the wheel while locking it in position on the axle.

(3) Telescope the upper tongue into the lower tongue and secure the assembly by means of the pin provided. Insert the lower tongue into its bracket in the bottom cover and secure by means of the pin provided.

(4) Pull out the handle pin which is chained to the upper tongue and remove the handle from its telescoped position in the upper tongue. Install the handle in its transverse position in the upper tongue and lock it in place by again inserting the handle pin, engaging the center locking hole of the handle.

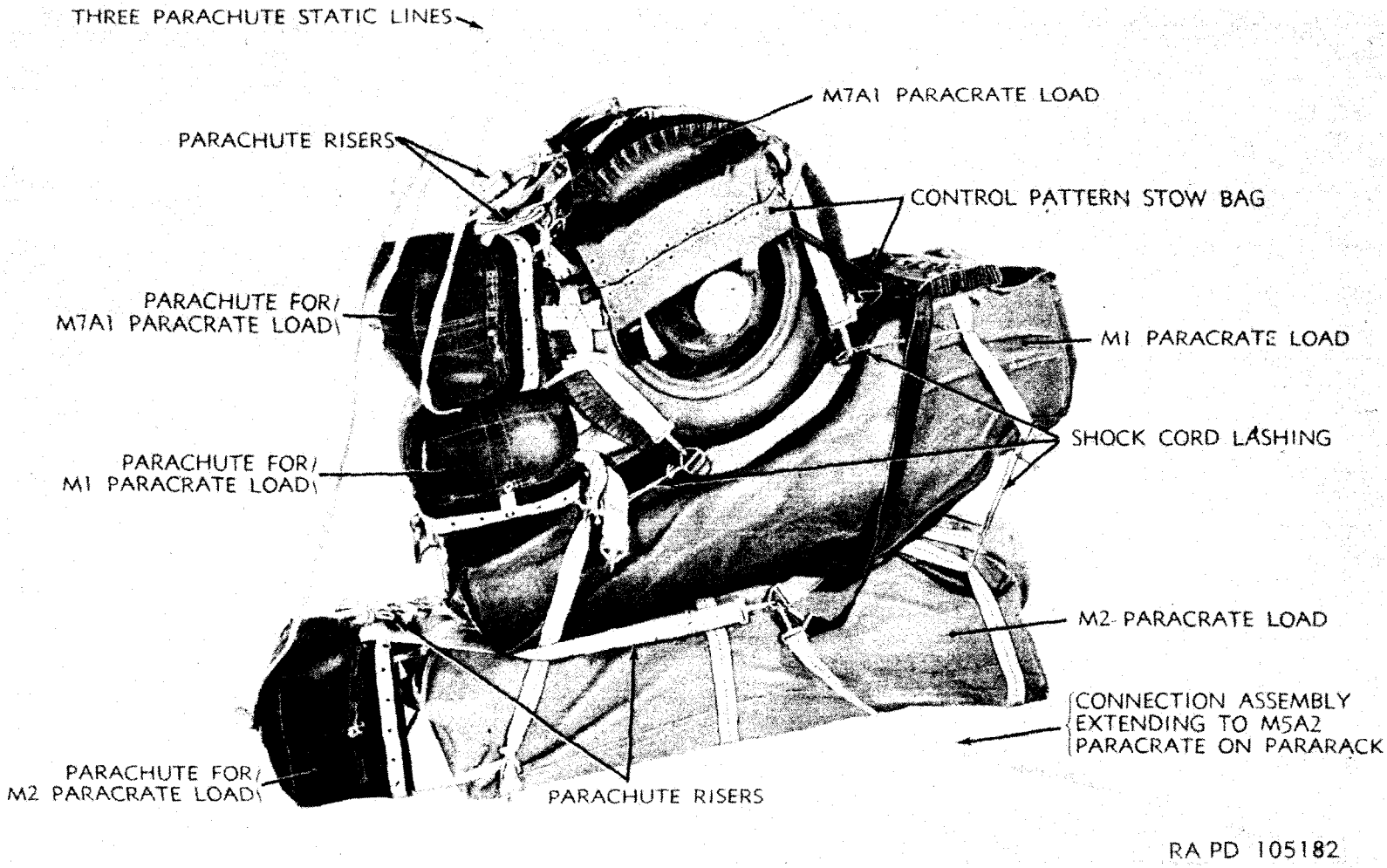


Figure 117. Metal paracrate door load with control pattern in place.

(5) The paracaisson is now completely assembled as a vehicle and ready to be loaded with 18 rounds of ammunition for manual transport. The two tow ropes are attached to eyes on the axle bracket only when the terrain is such that four men are required to pull the load (fig. 92).

48. Instructions for Loading Metal Paracrate Loads on Airplane

a. When metal paracrates M3A2, M4A2, M5A2, M6A1, M7A1; parachest M8A1; and paracasson M9A2 are used in lieu of paracrates M3, M4, M5, M6, M7; parachest M8; and paracaisson M9, respectively, the order of loading is as prescribed in paragraph 5 (fig. 114).

b. Paracrates M1, M2, and M7A1 are loaded inside the airplane to form the door load as shown in figures 117 and 126.

c. The three paracrates of the door loads are tied together with 75-pound shock cord similar to the method prescribed in paragraph 44*c*. The G–1 type cargo parachutes are attached to the three door loads as shown in figure 117.

d. The control pattern is attached to the loads in the same manner as for wood paracrates except that the metal paracrates have no harness (par. 50).

(1) The tabs of the stow bags are tied to the small rings provided on each metal paracrate.

(2) The "V" ring which connects each load to the webbing is tied to the special ring provided on the metal paracrates with three turns of 450-pound tensile strength line or equivalent.

49. Aluminum Alloy Paracrate Loads

The howitzer and ammunition are packed in nine paracrate loads. The illustrations referred to are for the metal paracrates; however, only slight differences exist between the two types and the loads are identical. The component parts of these loads and the weights when using aluminum paracrates are as follows:

a. Paracrate Loads M1, M2, and M7A1. These loads comprise the door load in both metal and aluminum paracrates (par. 46). See paragraphs 31, 32, and 38 for loading instructions.

b. Paracrate Load M13 (figs. 97, 98, 99, and 100). See paragraph 34 for loading instructions.

	Pounds
Bottom sleigh	217
Aiming circle with case	20
Lifting bar	9
Paracrate M13	70
Total weight	316

c. Paracrate Load M14 (figs. 99, 100, 101, and 102). See paragraph 35 for loading instructions.

	Pounds
Cradle	105
Top sleigh	108
Lifting bar	9
Paracrate M14	73
Total weight	295

d. Paracrate Load M15 (figs. 99, 100, 103, and 104). See paragraph 36 for loading instructions.

Tube	221
Lifting bar	9
Paracrate M15	70
Total weight	300

e. Paracrate Load M16 (figs. 105 and 106). See paragraph 37 for loading instructions.

Breech assembly	121
Telescope and mount	11
Paracrate M16	70
Total weight	202

f. Parachest Load M17 (figs. 109, 110, and 111). See paragraph 39 for loading instructions.

Ammunition, 10 rounds in individual fiber containers	223
Parachest M17	70
Total weight	293

g. Paracaisson Load M18 (figs. 112 and 113). See paragraph 40 for loading instructions.

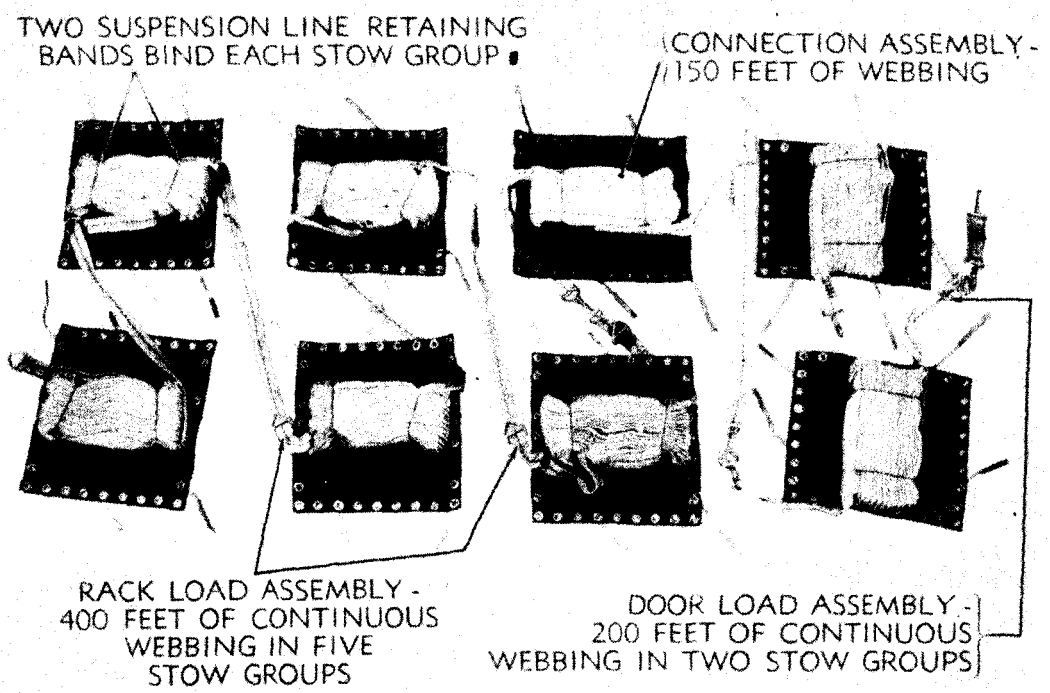
Ammunition, 8 rounds in individual fiber containers	178
Paracaisson M18	100
Total weight	278

h. Total weights.

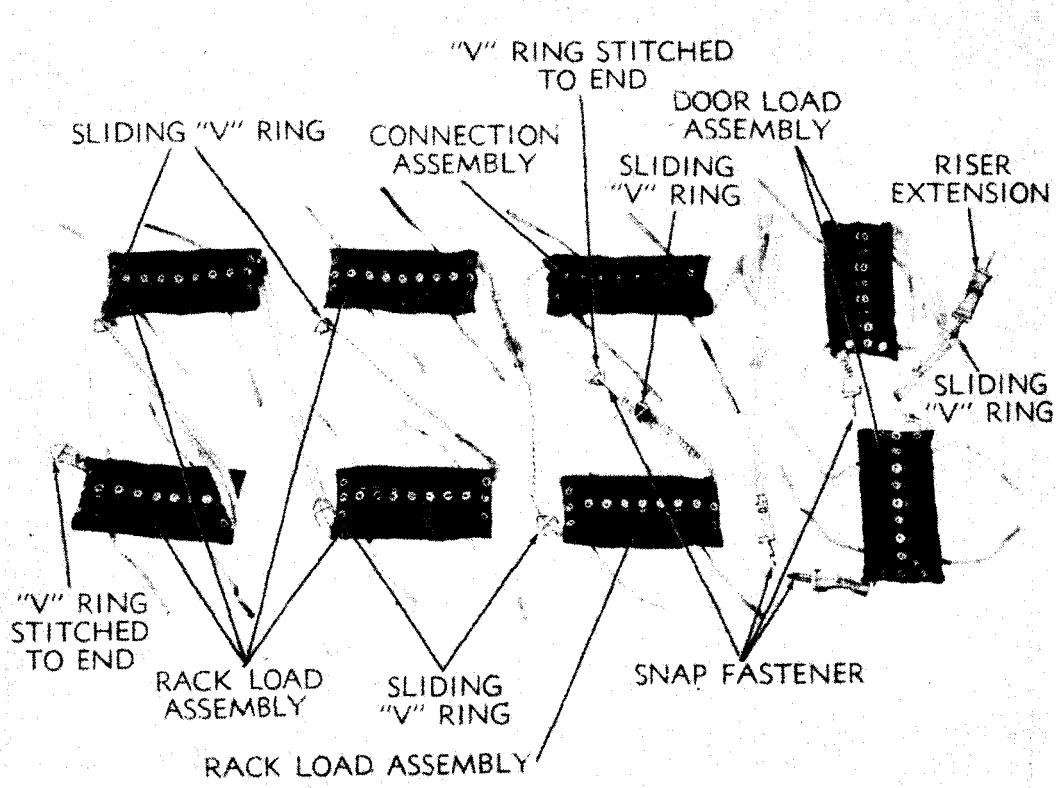
Weight of nine parachutes	207
Total weight of paracrate loads and parachutes	2701

50. Control Pattern Harness M2

a. General. The control pattern is employed in dropping the loads of the 75-mm pack howitzer by parachute to control the dispersion of the individual loads during descent. The control pattern is 750 feet of webbing 1¾ inches wide, to which each of the nine loads is connected by a "V" ring or a snap fastener. After release from the airplane, each load, except the two loads at the ends of the webbing, will slide freely along the webbing. The control so gained provides for—



A — WEBBING STOWED AND STOW BAGS UNLACED



B — WEBBING STOWED AND STOW BAGS LACED

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Figure 118. Control pattern harness M2.

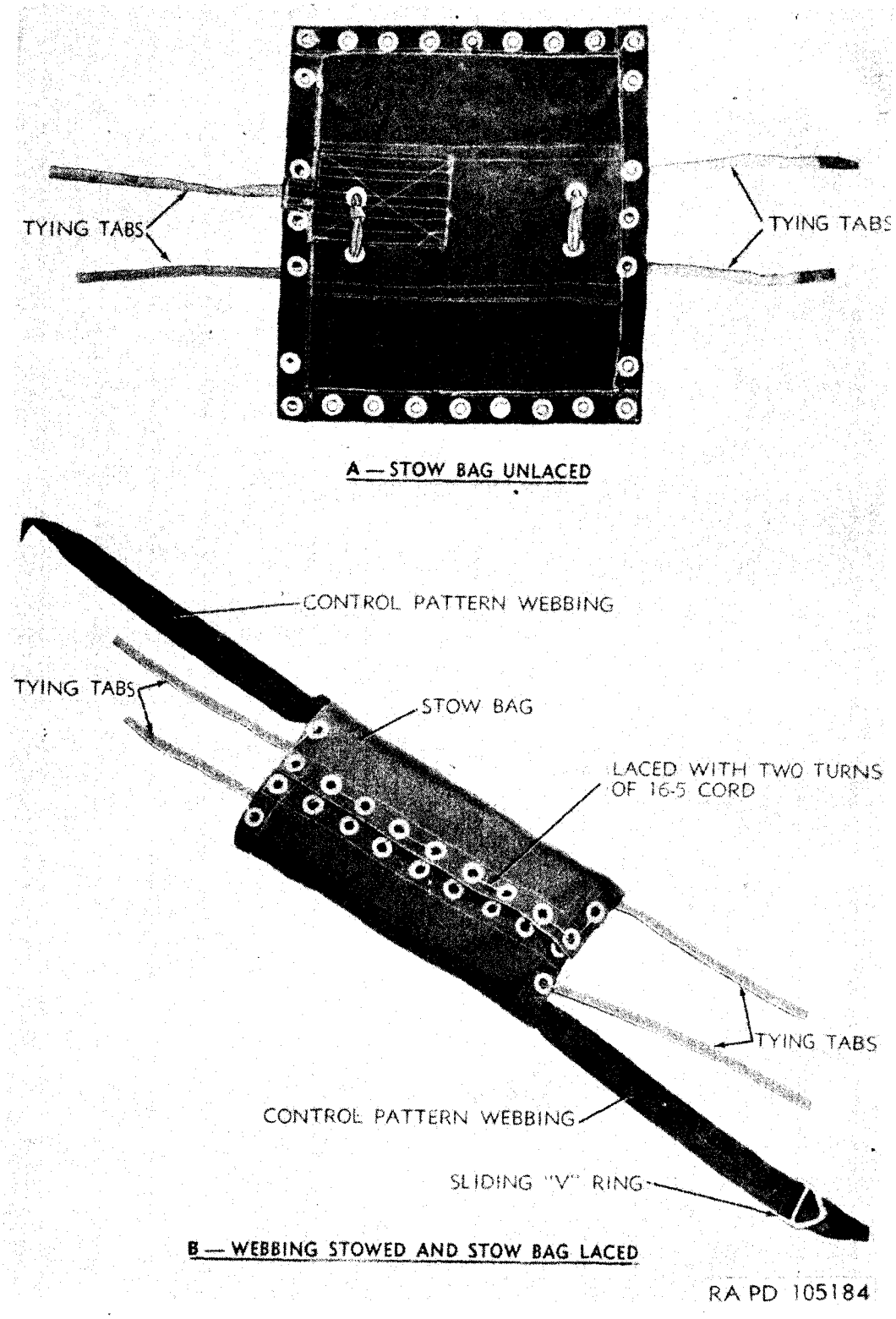


Figure 119. Stow bag for control pattern harness M2.

(1) A relatively small ground pattern of the howitzer loads, which expedites the assembly of the howitzer.

(2) A means of locating the loads of the howitzer when dropped during darkness and/or into woods, swamps, high grass, jungle

or other terrain where visibility on the ground is very limited.

(3) A safety measure for each howitzer load in that a load is supported during descent by its connection to the other howitzer loads when its parachute does not function to the fullest extent.

b. Construction. The control pattern (fig. 118) is constructed in three separate assemblies—the rack load assembly, the door load assembly, and the connection assembly. The three assemblies, when attached to the nine howitzer loads in the prescribed manner, connect all loads to the webbing.

(1) The stow bag is a container constructed of heavy duck for stowing the stow groups of the assemblies listed in preceding paragraphs (fig. 119).

(2) Splicing of the webbing is accomplished by placing the parts to be spliced flat together, tapering the ends, and stitching in such a way that "V" rings will slide freely over the splice.

c. Rack Load Assembly. (1) The rack load assembly, which controls the six loads dropped from the external parachute pack racks of the airplane, is constructed of 400 feet of 2,900-pound tensile strength type C–8 webbing, six "V" rings, one snap fastener, and five stow bags. To assemble the rack load assembly, five "V" rings are threaded onto the webbing, and one "V" ring is stitched to one end of the webbing. The snap fastener is stitched to the opposite end of the webbing. The webbing is then stowed into five separate stow groups with stows approximately 16 inches in length. Each stow group is then held in place with two suspension line retaining bands. The webbing is stowed so that upon completion the position of the "V" rings, the snap fastener, and the unstowed webbing are as follows (fig. 118):

1st "V" ring—Stitched to one end of the webbing.

2d "V" ring—Threaded onto the webbing between the 1st and 2d stow group.

3d "V" ring—Threaded onto the webbing between the 2d and 3d stow group.

4th "V" ring—Threaded onto the webbing between the 3d and 4th stow group.

5th "V" ring—Threaded onto the webbing between the 4th and 5th stow group.

6th "V" ring—Threaded onto the webbing between the 5th stow group and the snap fastener.

Snap fastener—Stitched to the end of the webbing opposite to the 1st "V" ring.

(2) All these "V" rings except the first "V" ring slide freely along the webbing of the rack load assembly.

(3) Approximately 1 foot of webbing is left unstowed between

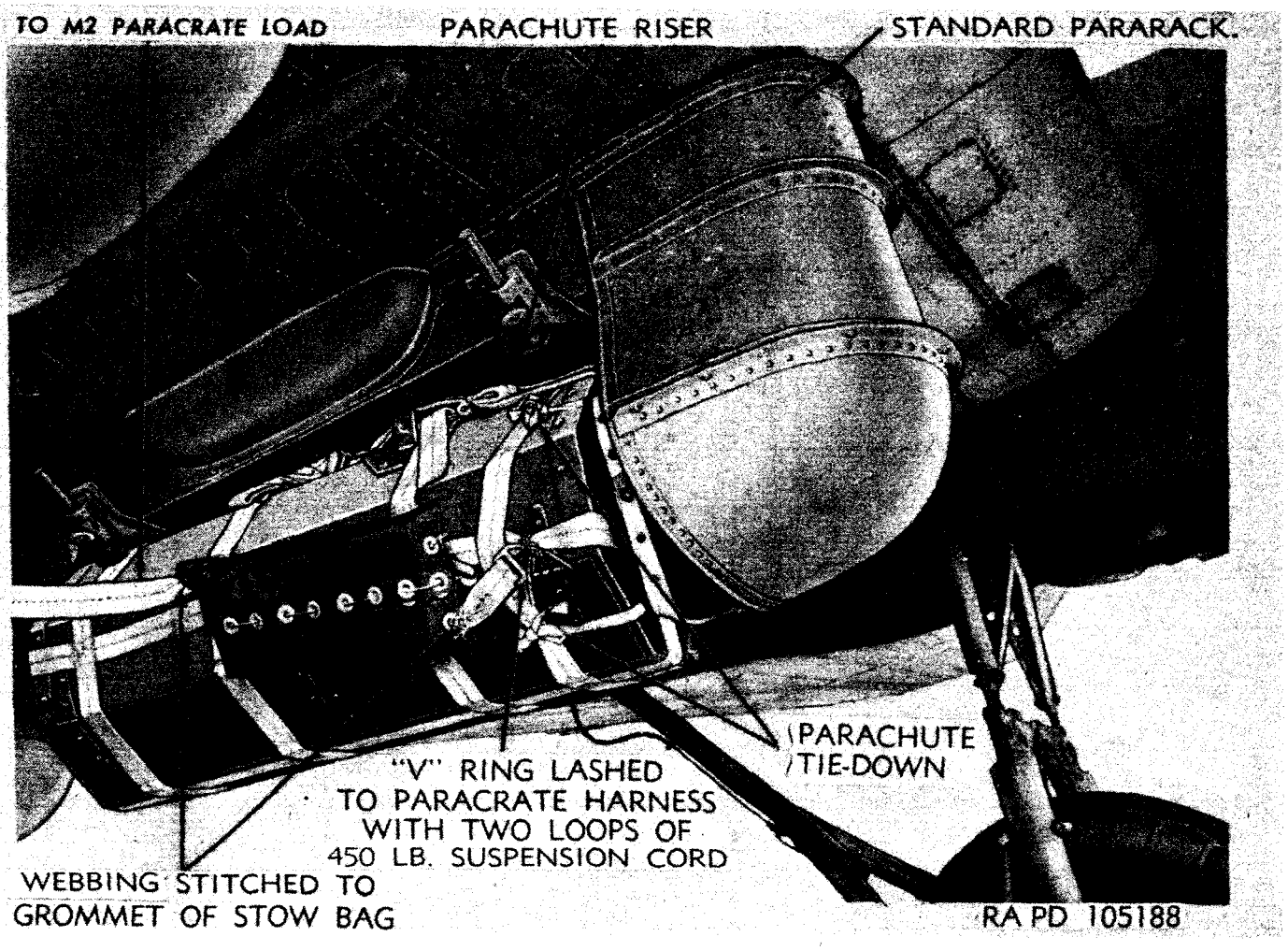


Figure 120. Wood paracaisson M9 loaded on No. 6 parachute pack rack of C–47 airplane.

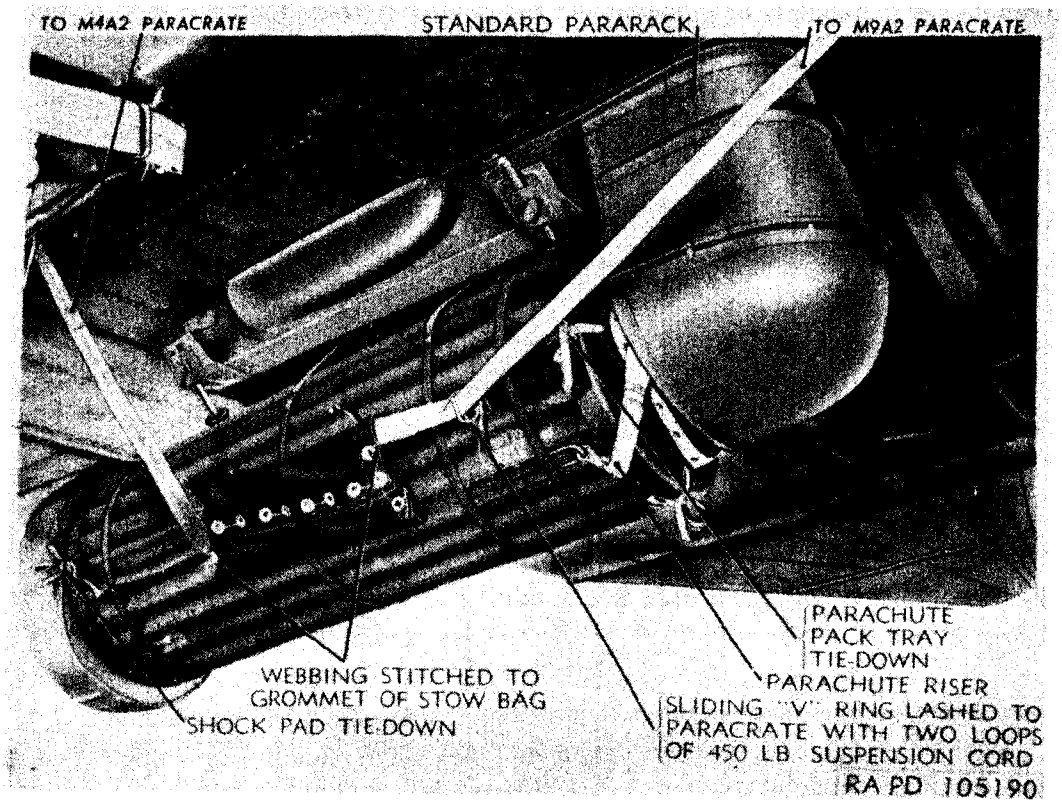


Figure 121. Metal paracrate M3A2 loaded on No. 4 parachute pack rack on C–47 airplane wtih standard racks.

the first "V" ring and the first stow group, between each stow group, and between the last stow group and the snap fastener After the stow groups have been made and secured with suspension line retaining bands as outlined above, each stow group is placed into a stow bag, and the stow bags are laced with two turns of 16–5 cord (figs. 118 and 119).

d. Door Load Assembly. The door load assembly, which controls the three loads dropped from the door of the airplane, is constructed of 200 feet of 2,900-pound tensile strength type C–8 webbing, two snap fasteners, one "V" ring, two stow bags, and a 1-foot riser extension (having a snap fastener stitched to each end). The door load assembly is assembled in the same manner as the rack load assembly. One "V" ring is threaded onto the webbing and a snap fastener is stitched to each end of the webbing. The webbing is then stowed with stows of approximately 16 inches into two stow groups, placing the loose "V" ring between the stow groups and leaving approximately 1 foot of unstowed webbing between each snap fastener and the adjacent stow group and approximately 1 foot of unstowed webbing between the two stow groups. The riser extension is snapped to the "V" ring between the stows. Each stow group is then se-

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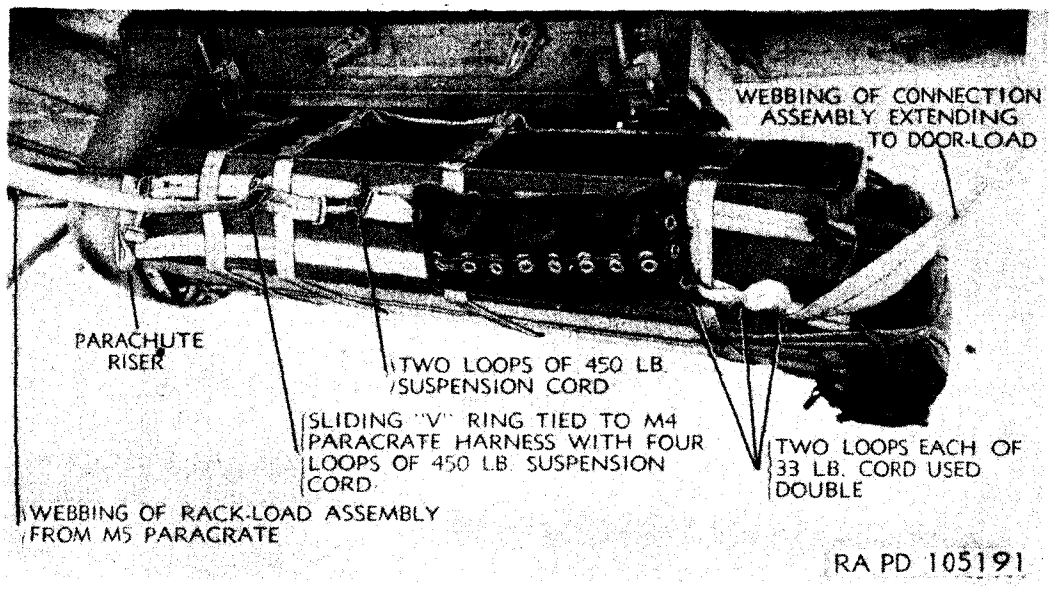


Figure 122. Wood paracrate M4 loaded on No. 1 parachute pack rack on C–47 airplane with standard racks—showing lashing of control pattern harness M2.

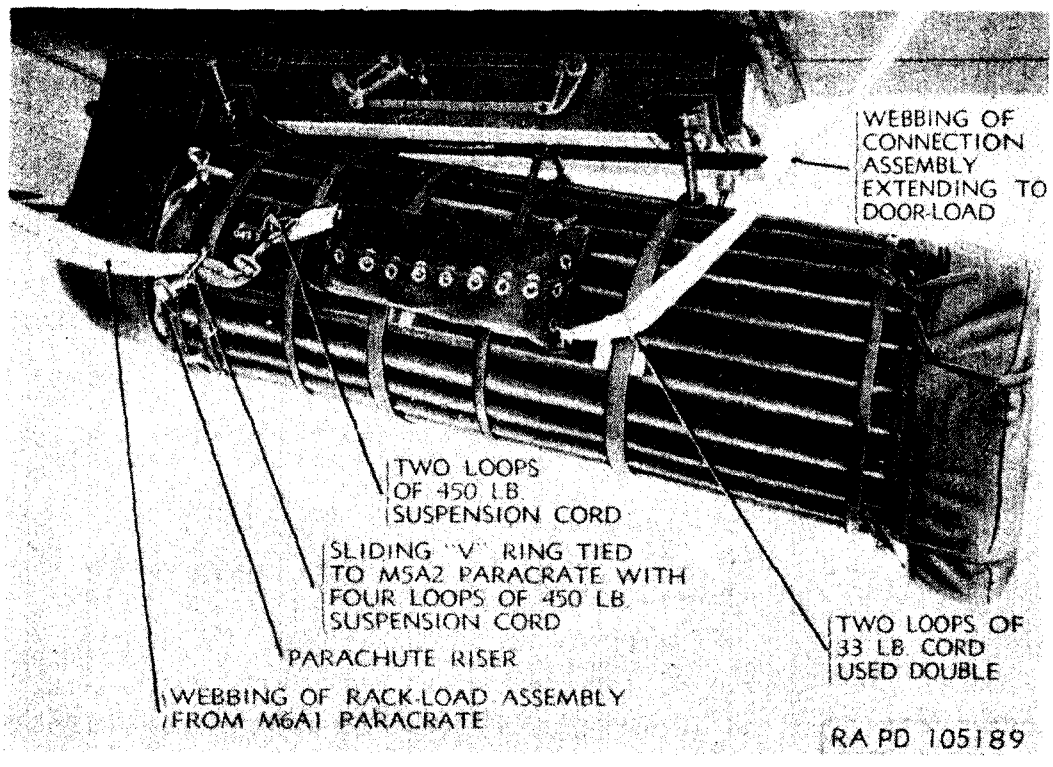


Figure 123. Metal paracrate M5A2 loaded on No. 1 parachute pack rack of C–47 airplane with standard racks—showing lashing of control pattern harness M2.

cured with suspension line retaining bands and placed into a stow bag. Stow bags are laced with two turns of 16–5 cord (figs. 118 and 119).

e. Connection Assembly. The connection assembly, which connects the rack and the door load assemblies, is constructed of

150 feet of 2,900-pound tensile strength type C–8 webbing, one "V" ring, one snap fastener, and one stow bag. To assemble the connection assembly, the "V" ring is stitched to one end of the webbing and the snap fastener is stitched to the other end. The webbing is then stowed, using approximately 16-inch stows, into one stow group so that approximately 1 foot of unstowed webbing is left at the end of the webbing to which the "V" ring is stitched, and approximately 30 feet is left at the end of the webbing to which the snap fastener is stitched. The stow group is then secured with suspension line retaining bands and placed into a stow bag. The stow bag is then laced with two turns of 16–5 cord (figs. 118 and 119).

51. Attaching Control Pattern Harness to Paracrate Loads

a. Rack Load Assembly. The six loads are first placed in the external parachute pack racks of the airplane, having been prepared for dropping as outlined in paragraphs 31 to 37, inclusive, and paragraph 41. Attachment of the stow bags to the loads is made by tying the tabs provided on the stow bags to the paracrates on the side of the load toward the center of the airplane. When wood paracrates are used, the stow bags are tied to the webbing. When metal paracrates are used, the stow bags are tied to the small rings provided on each metal paracrate (par. 48 *d*) (figs. 120, 121, 122, and 123). The "V" rings are attached to the loads by tying them to the webbing of wood paracrates or to the rings provided on metal paracrates. Each "V" ring is tied adjacent to and in front of the stow bag with two turns of 450-pound silk suspension line or the equivalent. As the "V" rings and stow bags are tied to the successive loads, the necessary amount of webbing must be pulled from the stow bags. The amount of webbing removed from the stow bags must be no more than the minimum required to reach from one load to the next. The webbing which runs out of each end of the stow bag is then tacked to the bag, using two turns of 16–5 cord through the grommets at the open end of each stow bag. The sequence of attaching the stow bags and the "V" rings to the loads is as follows:

(1) The "V" ring at the end of the webbing and the first stow bag are tied to the load in parachute pack rack No. 6.

(2) The second stow bag and the "V" ring between stow bag No. 1 and stow bag No. 2 are attached to the load in parachute pack rack No. 5.

(3) The third stow bag and the "V" ring between stow bag No. 2 and stow bag No. 3 are attached to the load in parachute pack rack No. 4.

(4) The fourth stow bag and the "V" ring between stow bag No. 3 and stow bag No. 4 are attached to the load in parachute pack rack No. 3.

(5) The fifth stow bag and the "V" ring between stow bag No. 4 and stow bag No. 5 are attached to the load in parachute pack rack No. 2.

(6) The "V" ring between the fifth stow bag and the snap fastener is attached to the load in pack rack No. 1 (figs. 122 and 123).

(7) The snap fastener at the end of the webbing is attached to the "V" ring at the end of the connection assembly (figs. 122 and 123) and is secured by a cotter pin or the equivalent (fig. 91).

b. Door Load Assembly. (1) The door loads are first prepared for dropping as outlined in paragraphs 37, 38, 39, and 44 for wood paracrates and paragraphs 32, 33, 38, and 48 for metal paracrates. The static lines of the three door load parachutes are left extended a full 15 feet in length and each static line is hooked to the anchor cable. The three static lines are tied together with 75-pound shock cord just below the three static line snap fasteners. The excess static lines are gathered up and held by suspension line retaining bands. The door load assembly is attached as indicated in figures 83 and 117.

(2) The procedure when using wood paracrates is as follows (fig. 83):

(*a*) One stow is tied horizontally on the side of the load M6 toward the front of the airplane the short end of the webbing and the snap fastener towards the door.

(*b*) The other stow is tied vertically on the side of the load M7 toward the front of the airplane between the axle hub and the load M6, with the short end of the webbing and the snap fastener down.

(*c*) The snap fastener on the webbing coming from the stow bag on the load M6 is snapped to the parachute riser "D" ring on the main lift webbing of the load M6 and is secured with a cotter pin or the equivalent.

(*d*) For attaching the door assembly to the load M7, a 1-foot length of C–8 webbing with one snap fastener stitched to each end is used. One snap fastener is hooked to the "D" ring on the load M7 at the point of parachute suspension. The snap fastener is hooked to the sliding "V" ring between the two stow bags on the door load assembly. Both snap fasteners are secured with cotter pins or the equivalent.

(*e*) The snap fastener on the end of the webbing coming from the stow bag on the load M7 is snapped to the "V" ring at the point of parachute suspension on the load M8 that is nearest the

parachute on the load M8 and is secured with a cotter pin.

(3) The procedure when using metal paracrates is as follows (fig. 117):

(*a*) The snap fastener on the end of the connection assembly and the snap fastener on one end of the door load assembly are snapped onto the parachute riser "D" ring on the side of the load M2 which faces the front of the airplane.

(*b*) The first stow bag and sliding "V" ring of the door load assembly are placed and tied on the horizontal surface of the load M1 near the door.

(*c*) The second stow bag of the door load assembly is tied to the load M7A1. The other snap fastener of the door load assembly is attached to the point of parachute suspension of the load M7A1.

c. Connection Assembly. (1) The snap fastener at one end of the webbing is snapped to the parachute riser "D" ring nearest the door of the airplane of the bottom load (figs. 83 and 117) and is secured with a cotter pin or the equivalent (fig. 91). The stow bag and the end of the webbing with the "V" ring attached to it are passed out of the door and underneath the airplane to the load in parachute pack rack No. 1 (figs. 122 and 123). There the stow bag is tied to the webbing of the load in rack No. 1 and the webbing tacked to the stow bag in the same manner prescribed for the stow bags of the rack load assembly.

(2) The "V" ring is tied to the webbing of the load in front of the stow bag with two turns of 450-pound silk suspension line or its equivalent. The snap fastener at the rear of the rack load assembly is then snapped to the "V" ring of the connection assembly webbing and is secured with a cotter pin or its equivalent (*a* (7) above) (figs. 122 and 123).

(3) Masking tape is applied over the juncture of door frame and the floor of the airplane to prevent the webbing from being caught. The connection assembly webbing is then pulled taut from its connection to the load in rack No. 1 to the door of the airplane. To hold the webbing taut, masking tape is applied over the webbing on the exterior of the airplane for a distance of about 1 foot below the door; over the webbing on the floor of the airplane for a distance of about 1 foot below the door; and over the webbing on the floor of the airplane for a distance of approximately 6 inches inside the door (figs. 116, 124, and 125).

52. Dropping Technique (When Using Wood or Metal Paracrates)

a. Without the Intervalometer. The procedure for dropping the loads when the airplane is not equipped with the intervalometer is as follows:

(1) On the 10-minute warning bell, the door load is unlashed

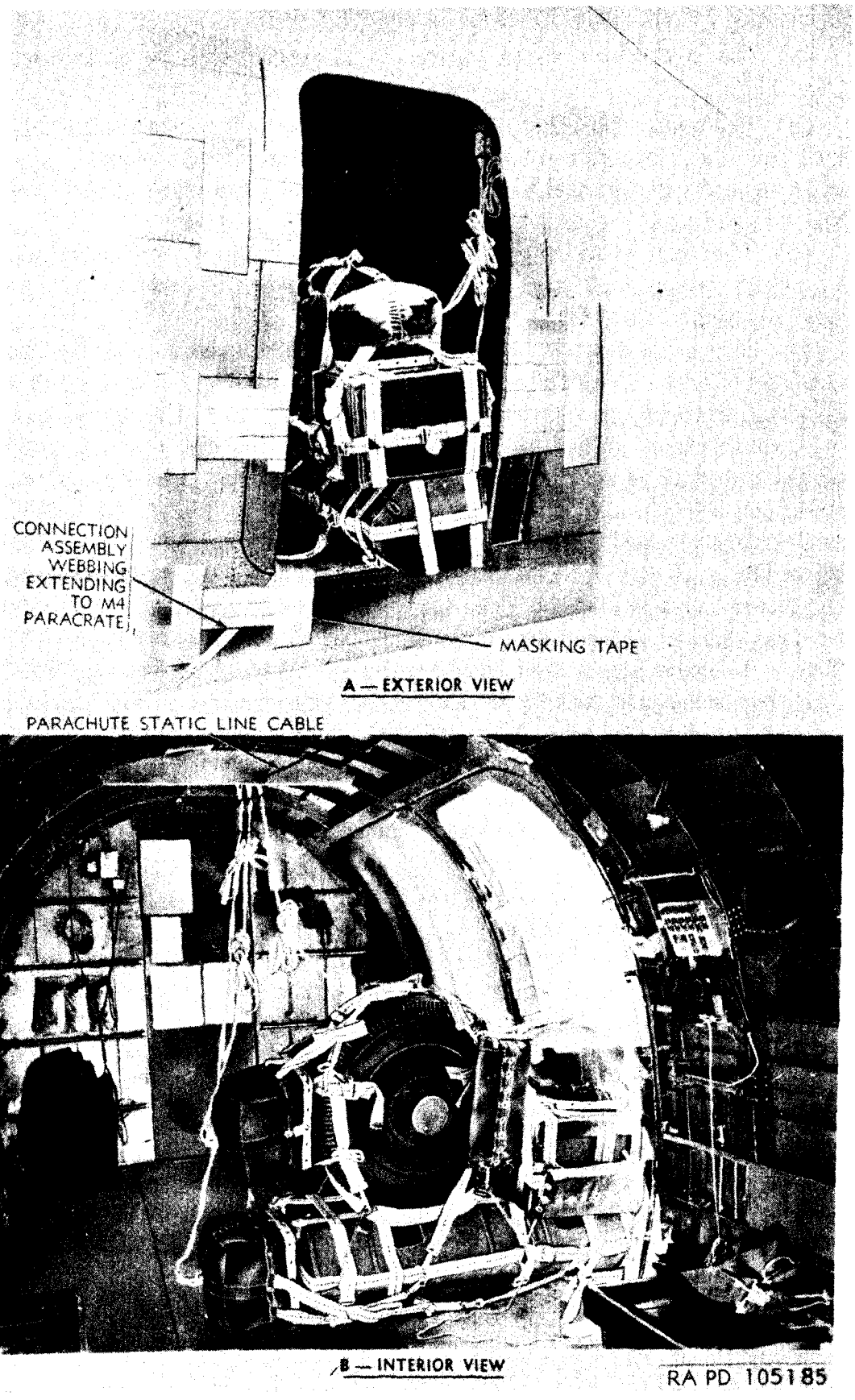


Figure 124. Wood paracrate door load in position for dropping.

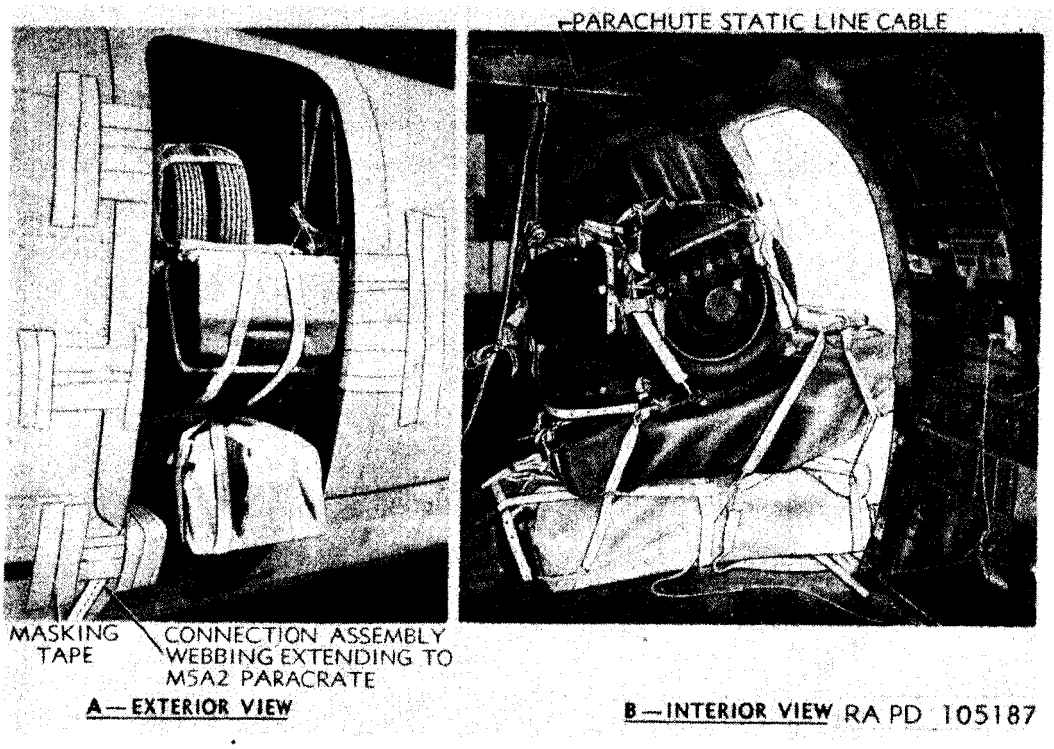


Figure 125. Metal paracrate door load in position for dropping.

from its cargo position in the airplane and is pushed about 1 foot out of the door (figs. 124 and 125). The circuit breaker switch on the parachute pack rack switch panel (fig. 40) is placed in the ON position.

(2) On the red jumper's signal light, the pack master switch is placed in the ON position. The red warning light, lower left corner of the parapack rack switch panel, will go off and the six rack indicator green lights will come on. This places the racks in firing position. *Care should be taken that they are not prematurely fired.*

(3) On the green jumper's signal light, the door load is pushed from the airplane. The jump master's attention should be on the door load and not on the personnel pushing the load out.

(4) The instant the door load clears the door of the airplane, the jump master, holding the solenoid switch in one hand, hits the solenoid button with the base of the palm of his other hand repeatedly in rapid succession until all the green indicator lights are off.

b. With the Intervalometer. When the airplane is equipped with the intervalometer (bomb release interval control assembly type B–2A), electrically wired to the parachute pack rack switch panel (fig. 126), the following procedure is employed:

(1) Set the intervalometer with the toggle switch at "Train." Set at more than 6 on "Bombs to be released." Set 110 on

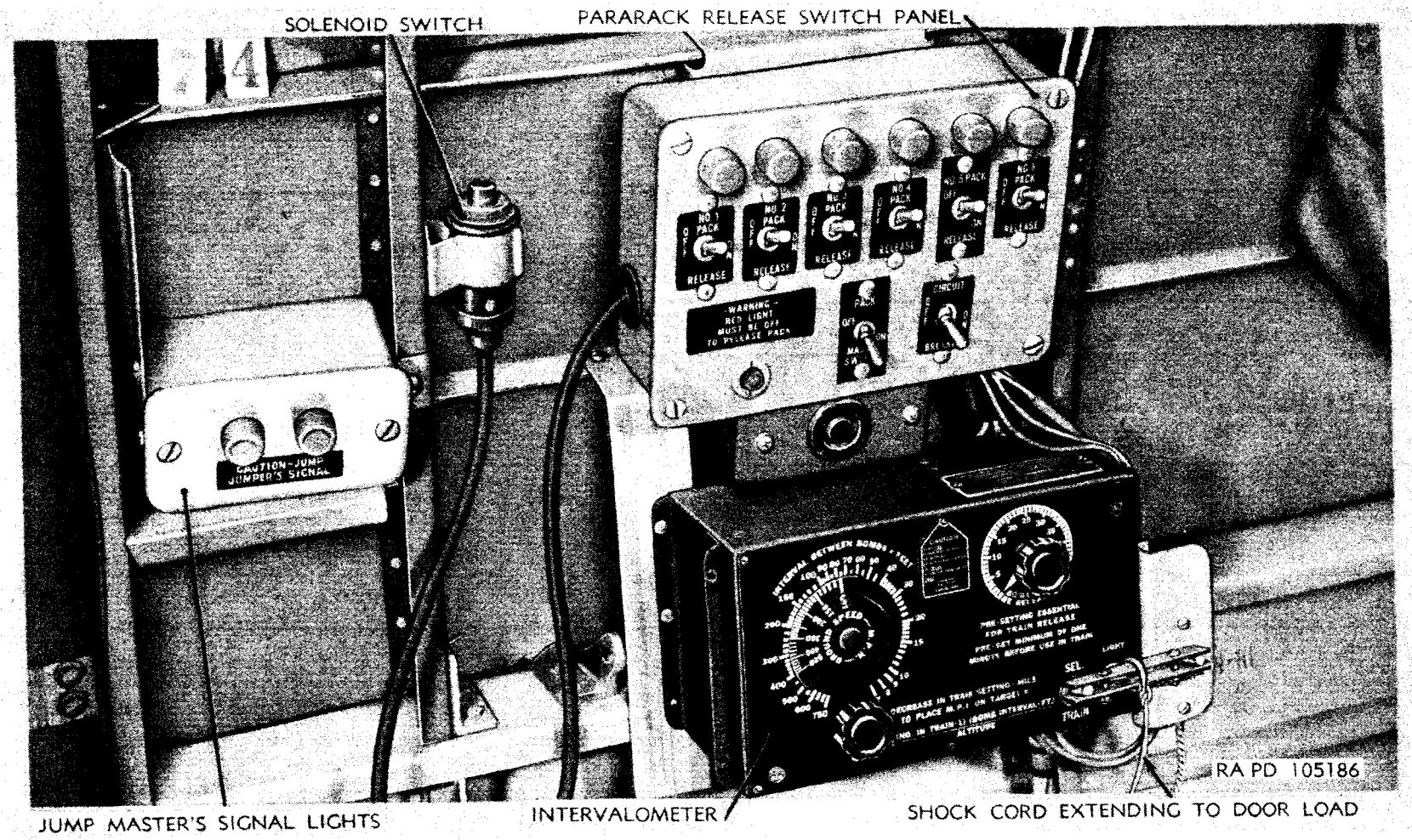


Figure 126. Parachute pack rack release switch panel, jumper's signal lights, and intervalometer.

"Ground Speed MPH" dial opposite 23 on "Interval Between Bombs Equal Feet" scale.

(2) If a special tripping toggle switch is mounted against the intervalometer and the toggle is strapped to the "Sel-Train" toggle switch of the intervalometer, tie a 4-foot length of 75-pound break cord to the clamp joining both toggles (fig. 126); but if the special tripping toggle switch is not used, tie the 4-foot length of 75-pound break cord to the No. 6 toggle switch of the parapack rack switch panel. Pass the free end of the break cord from forward to aft through the safety belt ring directly under the intervalometer. To the free end of the 75-pound break cord, tie a 3-foot length of 16–3 break cord.

(3) On the 10-minute warning bell, the door load is unlashed from its cargo position and is pushed about 1 foot out of the door (figs. 124 and 125), and the free end of the 16–3 break cord is tied to the center "V" ring on the side of the harness of the bottom load.

(4) After positioning and rigging the door load on the 10-minute warning bell (figs. 124 and 125), the circuit breaker switch on the parachute pack rack switch panel is placed in the ON position. At the 2-minute red jumper's signal light, the pack master switch is placed in the ON position. With the placing of the pack master switch in the ON position, the No. 6 toggle switch on the parachute pack rack switch panel becomes the operating switch. If a special tripping toggle switch is mounted against the intervalometer and this toggle is strapped to the "Sel-Train" toggle switch of the intervalometer (fig. 126), these strapped toggle switches together become the operating switch.

(5) As the door load is pushed from the door of the airplane, the jump master carefully observes the action of the cord connection between the bottom load and the switch to insure that the switch is tripped by the cord attachment at the instant the door load clears the door of the airplane. He will trip the switch manually if necessary.

53. Unpacking Paracrate Loads

a. The point of assembly for the 75-mm. howitzer matériel is that point where the front trail, paracrate load M1, lands.

b. All loads are unpacked where they land and the various units of the matériel rushed to the point of assembly with the least possible delay.

c. No definite order of unpacking is followed. The quick-release fastenings are jerked open and the matériel removed from the paracrates in the fastest possible time.

d. In actual combat, paracrates and parachutes will remain

where they land until a more opportune time warrants their being retrieved.

54. Use of Control Pattern Harness M2 with other Artillery Loads

In addition to its application to the loads of the 75-mm pack howitzer section, the control pattern may be employed with all other loads dropped by parachute in the parachute field artillery battalion. The principles of its attachment and functioning are the same as described for the 75-mm pack howitzer section loads. When it is desired to use but one door load, the door load assembly may be omitted and the snap fastener at the end of the connection assembly is snapped to a point of parachute suspension on the door load. If no door loads are used, the rack load assembly only is applied to the loads in the external parachute pack racks, and the door load and connection assemblies are not employed.

Section IX. AIRPLANE DELIVERY

55. General

a. Before the 75-mm pack howitzer matériel can be loaded in the airplane, certain preliminary precautions must be taken.

(1) If the rear door of the airplane has not been opened, the gun loading squad will assist the crew chief of the airplane in opening the door.

(2) The forward door must be opened and fastened in place by the airplane crew chief.

(3) The ramps must be installed and checked for safety.

(4) The floor tie-down rings must be screwed into the socket at the places needed for the proper loading of the matériel.

(5) The hinged banks of seats must be lowered. Parachutes and other loose equipment must be placed so as to leave a clear passage for the loading operation.

b. A loading ramp is equipment with the airplane when used for transporting the 75-mm howitzer matériel as a unit. It is built in sections which can be handled easily and can be readily installed by the loading crew.

c. Lashings are made to tie-down rings screwed into the floor. Airplanes are normally equipped with eight tie-down rings which are placed in a canvas pocket on the rear bulkhead of the cargo compartment. The floor fittings into which the tie-down rings are screwed are designed for either 500- or 1,500-pounds applied load. The 1,500-pound tie-downs may be identified by three rows of rivets parallel to the length of the floor at the ring socket fitting. The floor tie-downs are referred to by numbers from 1

to 12, counting from front to rear; that is, No. 1 tie-down is nearest the nose of the airplane.

d. Station numbers are marked on the inside of the main cargo compartment. The fuselage station numbers are painted on the transverse ceiling beams. These numbers represent distance in inches from the nose of the airplane.

Note. Cargo station numbers painted on the side walls indicate distance in inches from the main cabin forward bulkhead. Fuselage station numbers are normally used by airborne units in computing loads. All cargo is positioned and lashed at a specified station number.

e. Safe transportation of cargo by airplane is dependent upon the following factors:

(1) Distribution of load to avoid excess weight concentration on the floor structure of the airplane.

(2) Limitation of the maximum weight of the load to the gross design weight loading of the aircraft.

(3) Placing of the load to insure that the loaded airplane's center of gravity is within the designed stability limits.

(4) Lashing and tying down of the load to prevent shifting of the cargo in flight.

f. Extreme care must be exercised in the actual loading operations, since aircraft structure, unlike most other types of mobile equipment, is of unusually light construction. It will not withstand sudden or severe blows. Damage can be of sufficient seriousness as to cause the aircraft to be withdrawn from the effort.

g. The 75-mm pack howitzer matériel is secured in the airplane in one of three positions—with the axle either at fuselage station 234, 281, or at 351. A different tie-down is used for each position (fig. 132). The loading procedure is the same in all three posi-

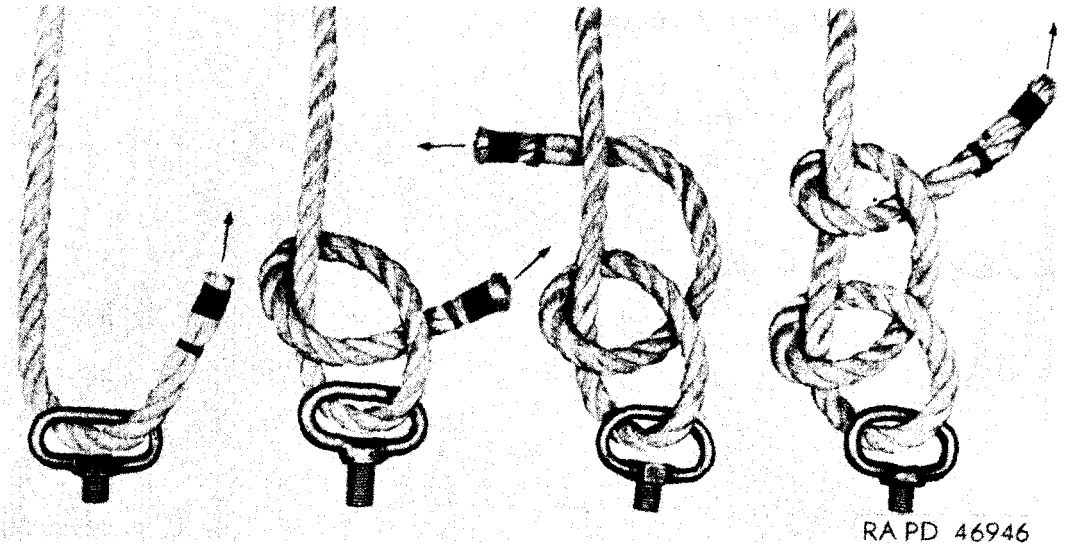


Figure 127. Method of tying double half hitch.

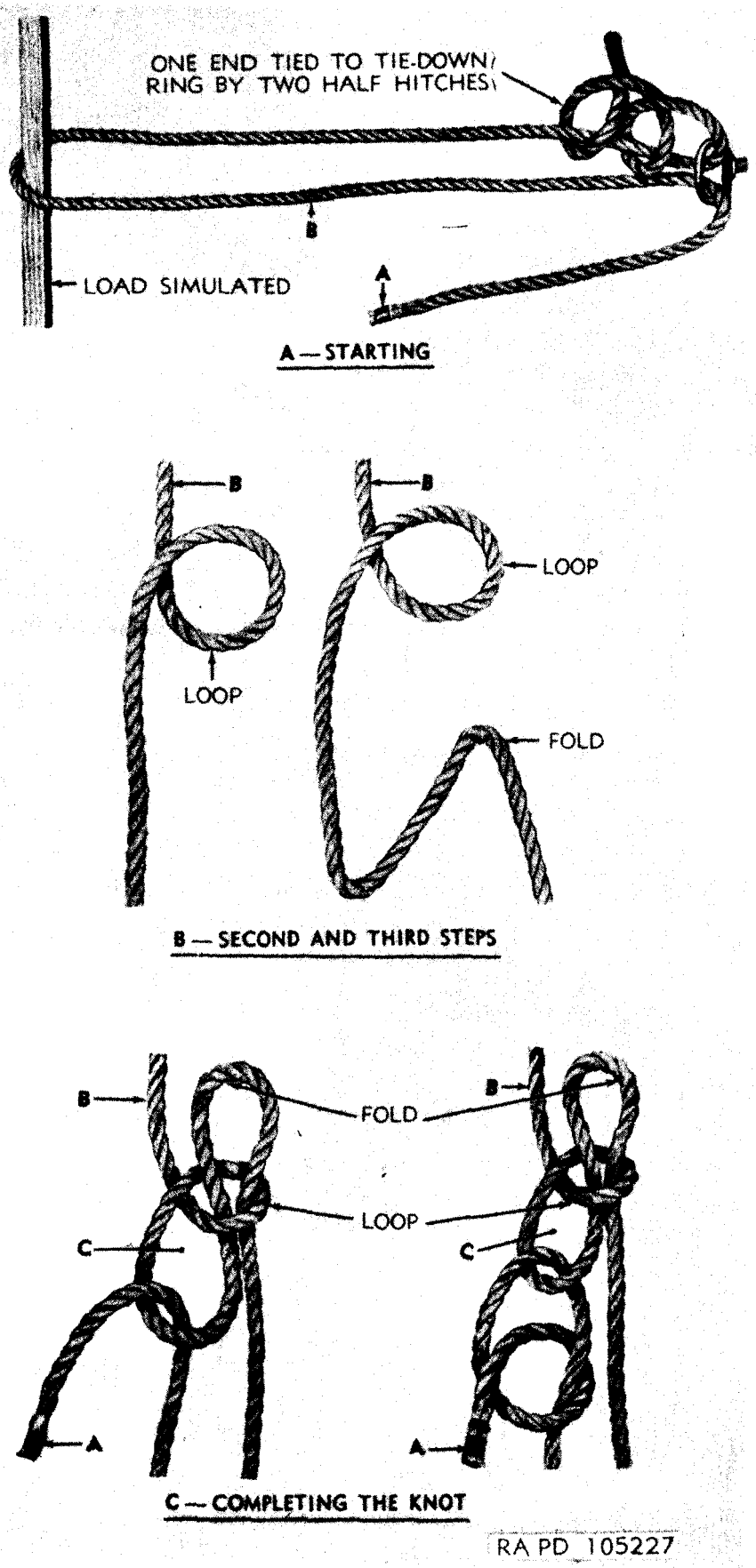


Figure 128. Method of tying Baker bowline knot.

tions, the only change being in the use of different tie-downs for the lashings. The piece is loaded with the axle at station 234, unless auxiliary cabin fuel tanks are in the cargo compartment, in which case station 281 is used. When the ¼-ton, 4 x 4 truck is also loaded with the howitzer, station 351 is used.

h. Rope is ordinarily used for all lashings. Straps, cable, or chain may be used.

Note. Two extra ropes should be carried in the plane to provide for emergency lashing.

When rope is used, the tie-down is prepared by tying rope to the tie-down ring by means of two half hitches. The knot used in completing the lashing is the Baker bowline. Every member of the loading crew must be able to tie these two knots.

(1) *Double half hitches.* Bring the free end of the rope through the tie-down ring. Pass the end around the rope and through its own loop to complete one-half hitch. Repeat the procedure in the same direction and then tighten complete knot (fig. 127).

(2) *Baker bowline.* The rope is passed through the tie-down ring and fastened to it with two half hitches (fig. 128, A). Pass the running end of the rope around the equipment to be lashed and back through the tie-down ring. A loop B is formed in the rope. The rope is grasped and folded as shown in the third step

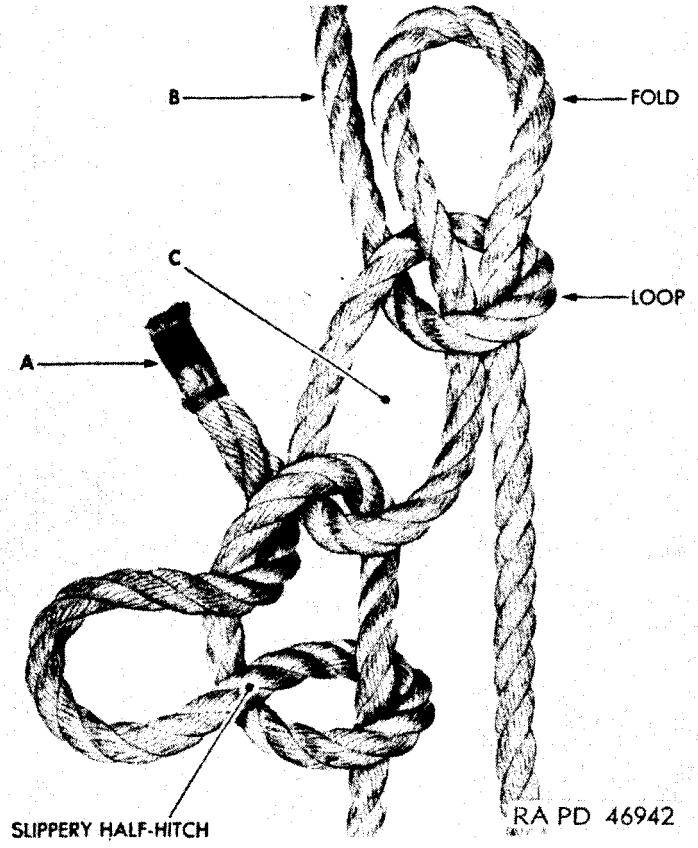


Figure 129. Method of tying slippery half hitch.

(fig. 128, B). The fold is then passed up through the loop with the running end passing up through loop C (fig. 128, C). At this point, pull on the running end A and secure equipment as tight as possible. Complete the Baker bowline knot by fastening with a half hitch around itself (fig. 128, C).

(3) *Slippery half hitch.* The slippery half hitch is a variation of the half hitch, to facilitate untying the knot. It is simply a bight on a loop in the running end of the rope instead of a bight on the end itself (fig. 129).

56. Loading Matériel into Airplane

a. Preparing Lashings. Determine that the equipment necessary to lash the matériel in place is on hand (fig. 130). Prepare all lashings before loading the piece into the airplane. To do this, tie ropes to the tie-down rings which are fastened to the airplane fuselage at points determined by the fuselage station to be used (fig. 131).

Note. The tie-down rings are part of the airplane equipment and are obtained from the crew chief before starting to load the howitzer.

After lashings are secured, coil the ropes neatly beside their respective rings so they will not become tangled or get caught under the wheels of the howitzer (fig. 133).

b. Setting up Ramps. Move the parachutes to a place in the airplane where they will not interfere with the loading. Take

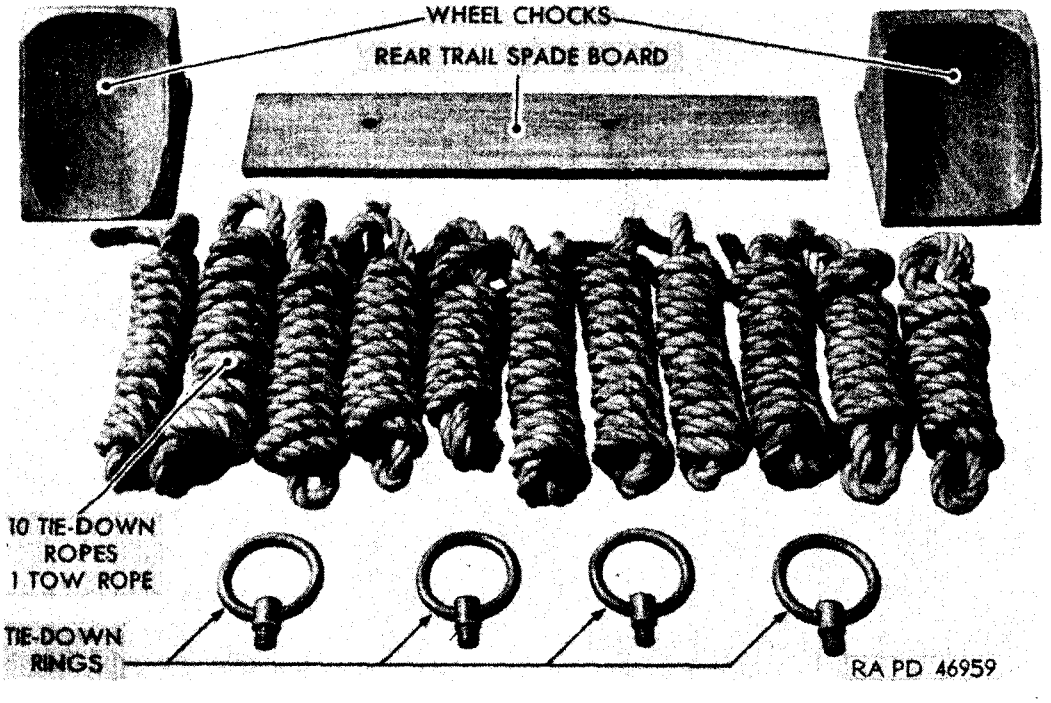


Figure 130. Equipment used in lashing matériel in airplane.

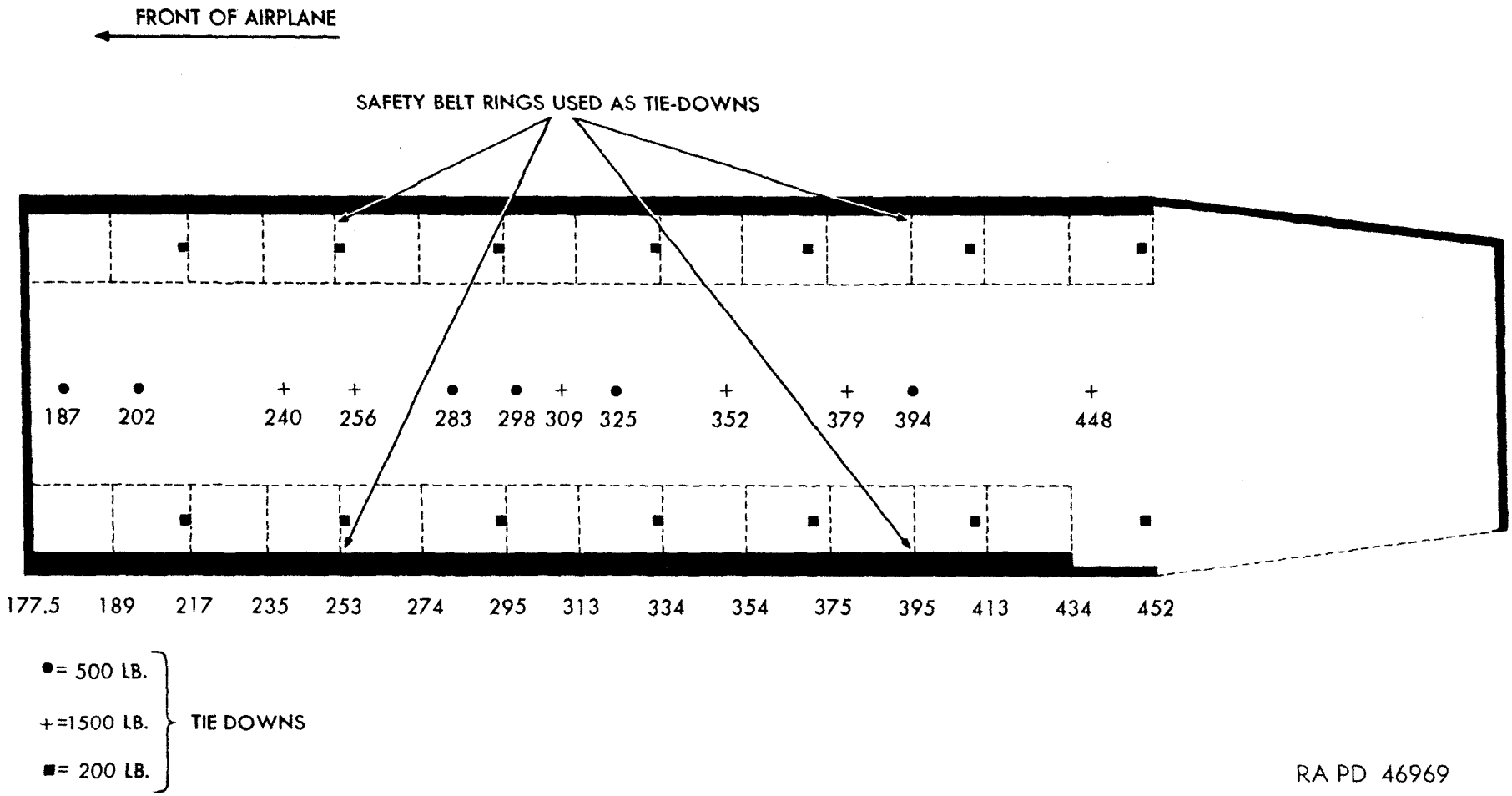


Figure 131. Floor plan of C–47 airplane showing fuselage station tie-down numbers and positions.

WITH AXLE AT FUSELAGE STATION NO.	TIE-DOWN NUMBERS	200-LB. TIE-DOWNS AT STATION NO.	WITH SAFETY BELT RINGS AT STATION NO.
234*	2, 4, 5 AND 8 ARE USED	333	178
281	4, 6, 7 AND 11 ARE USED	411	253
351	8, 10, 11 AND 12 ARE USED	450	313

*CANNOT BE PLACED HERE WHEN AUXILIARY CABIN TANKS ARE IN PLACE

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Figure 132. Tie-down positions for fuselage stations 234, 281, and 351 in C–47 airplane.

the ramps from under the seats and fold the seats down. Carry the ramps outside and set them in position. Secure the ramps in place by fitting the ramp pins into holes in the door sill. Insert the forward ramp pin in the second hole aft of the forward door jamb and place the rear ramp parallel to and exactly 36 inches from the forward one.

Note. To determine this distance accurately, use a steel tape measure close to the lower end of the ramp.

c. Loading Materiel into Airplane. (1) Tie tow rope to top sleigh lifting handle of the howitzer and take the free end of the rope into the airplane. If the carriage is not equipped with a caster wheel, place a board just inside the airplane at the top of the rear ramp for the howitzer trail to rest upon.

(2) Have the men take positions as follows: Two men at the top of the ramps to handle the tow rope; chief of section inside the airplane to assist the men with the tow rope; one man behind each wheel; and two men at the rear of the trail (fig. 134).

(3) Roll the piece, muzzle first and howitzer traversed to the left, up the ramps and into the airplane. As the hubs clear the doorway, move the trail to the right without touching the right door jamb and roll the piece forward until the lunette clears the right door jamb (fig. 135). Move the howitzer up in the cargo compartment until the axle is just forward of the desired fuselage station. Chock the wheels and if the carriage is not equipped with a caster wheel, place the trail spade upon the board provided for that purpose.

Note. When moving the piece forward into the cargo compartment, direct it somewhat closer to the left wall than to the right to permit unobstructed use of the seats along the right side.

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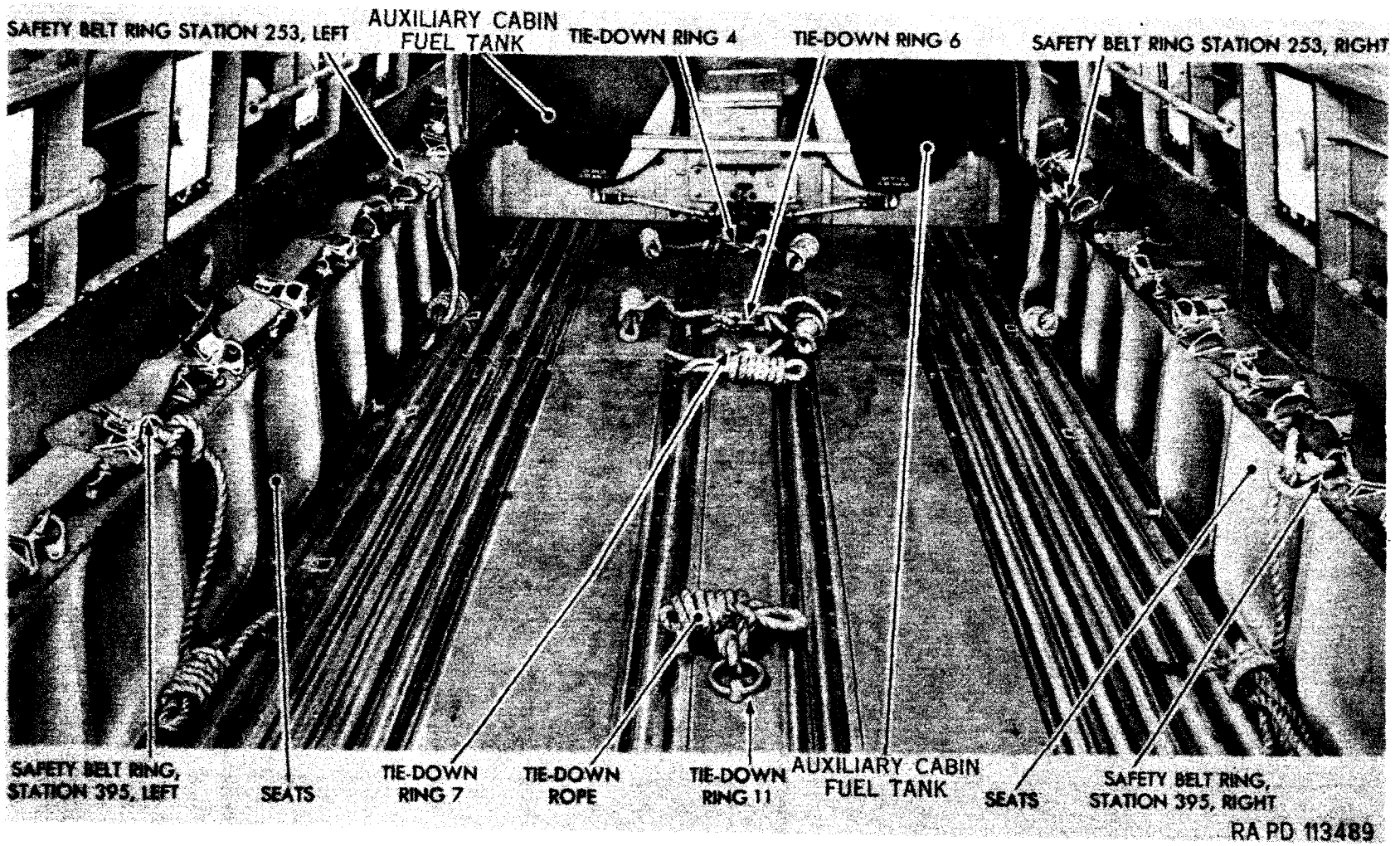


Figure 133. C–47 airplane prepared for lashing howitzer at station 281.

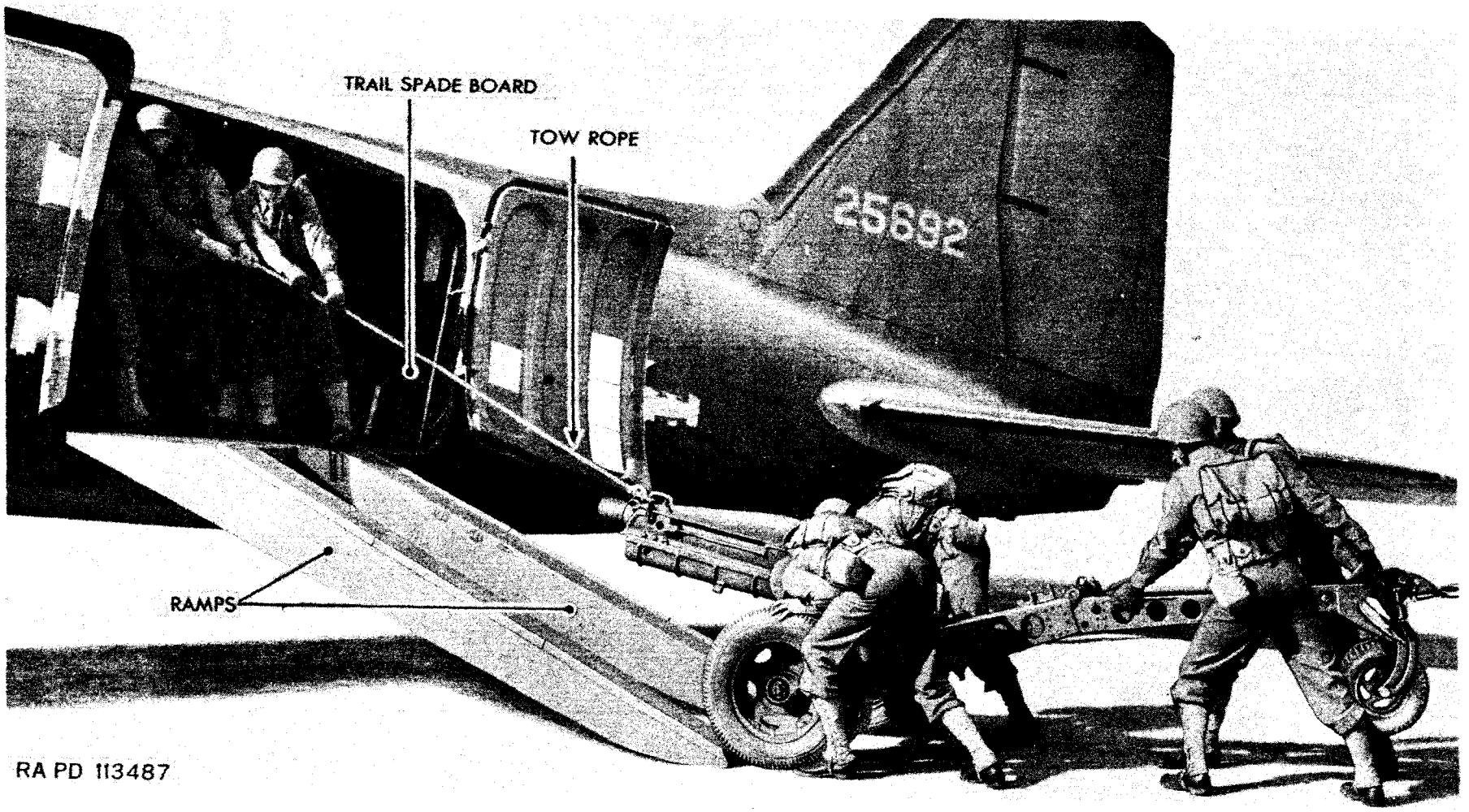


Figure 134. Loading the 75-mm pack howitzer matériel into the C–47 airplane.

d. Completing the Lashings (fig. 136). (1) From tie-down ring 6, make a lashing diagonally forward to the left, under and over the axle, but do not tighten. Make a similar lashing diagonally forward to the right from tie-down 6, under and over the axle, but do not tighten. Make a diagonal lashing back from tie-down ring 4 to the left side of the axle and another diagonal lashing back from the same ring to the right side of the axle.

(2) Remove the wheel chocks and allow the piece to drift back against the forward lashings to tighten lashings. Replace the wheel chocks.

(3) Bring the ramps into the airplane and stow them under the seat or lash to the trail.

(4) Make the following lashings: a vertical lashing from tie-down ring 7 to the breech lifting ring, but do not tighten; a vertical lashing from tie-down ring 11 to the trail handspike receiver; a lateral lashing from the safety belt ring on the left at station 253 to the top sleigh handle, and a similar lashing from the safety belt ring on the right at station 253 to the top sleigh handle; a lateral lashing from the left of the rear trail to the safety belt ring at station 395 on the left, and a lateral lashing from the right of the rear trail to the safety belt ring at station 395 on the right.

(5) Elevate the muzzle to tighten lashings to the top sleigh handle and then tighten the vertical lashing to the breech lifting ring.

Note. Use the Baker bowline knot for tightening all lashings. See paragraph 55 *h* (2) for instructions for tying the Baker bowline knot.

e. Stowing the Ramps. Unhook the ramps from the doorway and stow them under the seats or other available space. Close the airplane doors.

57. Unloading Matériel from Airplane

a. Preparing to Unload. (1) While the airplane is still taxiing after landing, take ramps from under seats (if stowed there), fold seats down, and stow parachutes out of the way.

(2) When the airplane stops, see that wheel chocks are firmly in place and then untie all lashings. Place ramps in the same position as for loading.

(3) Two men are required to remain outside at the door of the airplane to handle the trail. The other men take same positions as when moving the piece forward in the cargo compartment during the loading procedure.

b. Unloading. (1) Remove wheel chocks and allow piece to roll slowly to rear of the airplane, taking care to guide the trail toward

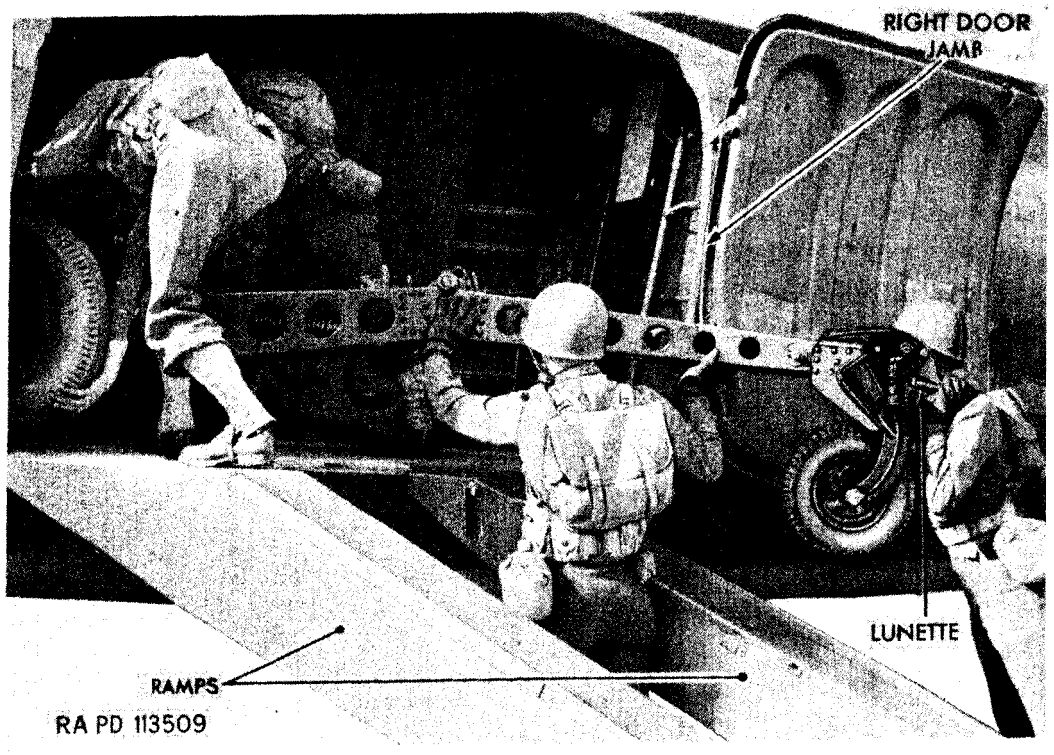


Figure 135. Swinging the trail to clear the doorway of C–47 airplane.

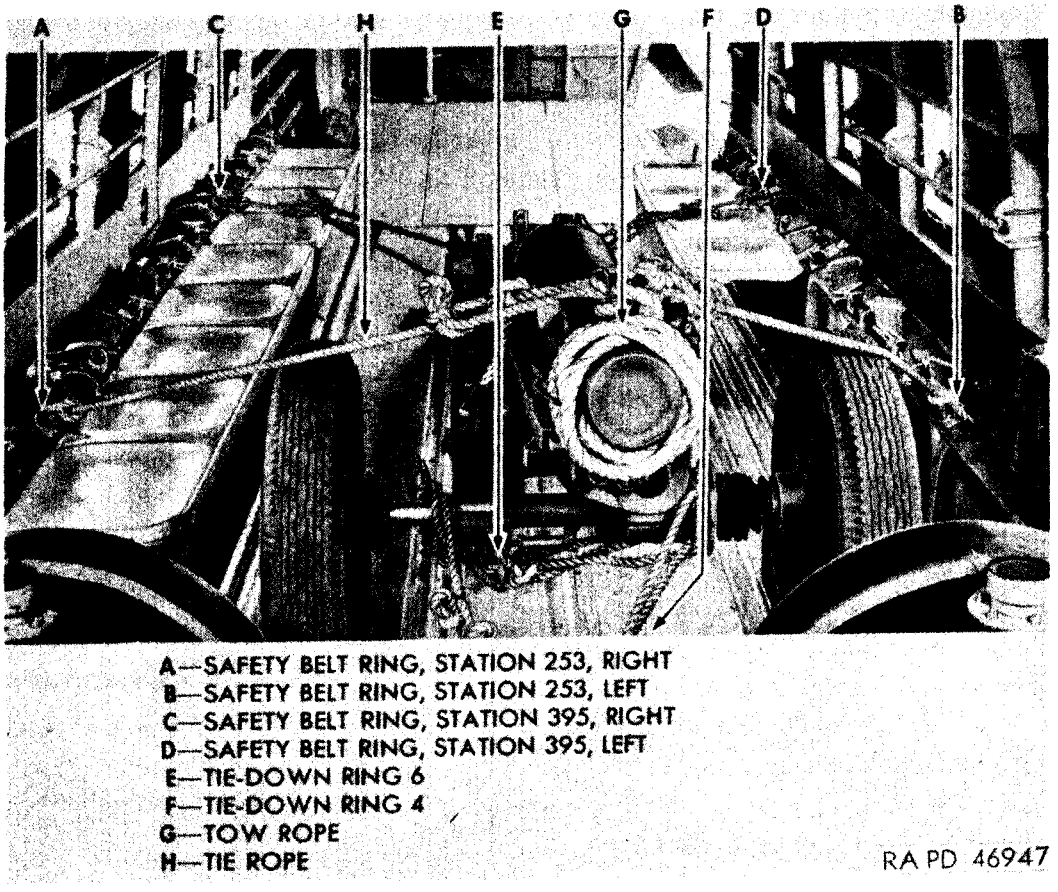


Figure 136. Matériel lashed in place in C–47 airplane—front view.

the right side of the cargo compartment so that the left wheel will clear the forward door jamb. When the wheel has clearance, lift the trail and pass it through the doorway to the men waiting there to receive it.

Caution: Whenever it is necessary to rest the trail spade upon the floor of the airplane, be sure to use the 36-inch by 10-inch by ¾-inch board as a buffer.

(2) See that the wheels of the howitzer carriage are properly alined with the ramps and then roll the howitzer slowly down and on to the ground. This done, remove the ramps and place them inside the airplane for the crew chief to stow.

Section X. GLIDER DELIVERY

58. General

a. The same general precautions for loading the matériel into an airplane (par. 55) must be followed for a glider in order to prevent serious damage to the glider. The necessary equipment for loading the matériel into the glider is illustrated in figure 137.

b. Rope ordinarily is used for all lashings. Straps, cables, or chains may be used. When rope is used, it is tied to the tie-downs with two half hitches. The knot used in completing the lashings is the Baker bowline. Every member of the loading crew must be able to tie these two knots. For instructions for tying these knots, see paragraph 55*h*.

c. Chains (with Evans tie-down expedients) are placed on the load in the same manner as ropes except that all chains are so placed as to have both ends toward the tie-downs. The single hook of the Evans tie-down expedient is hooked into the tie-down

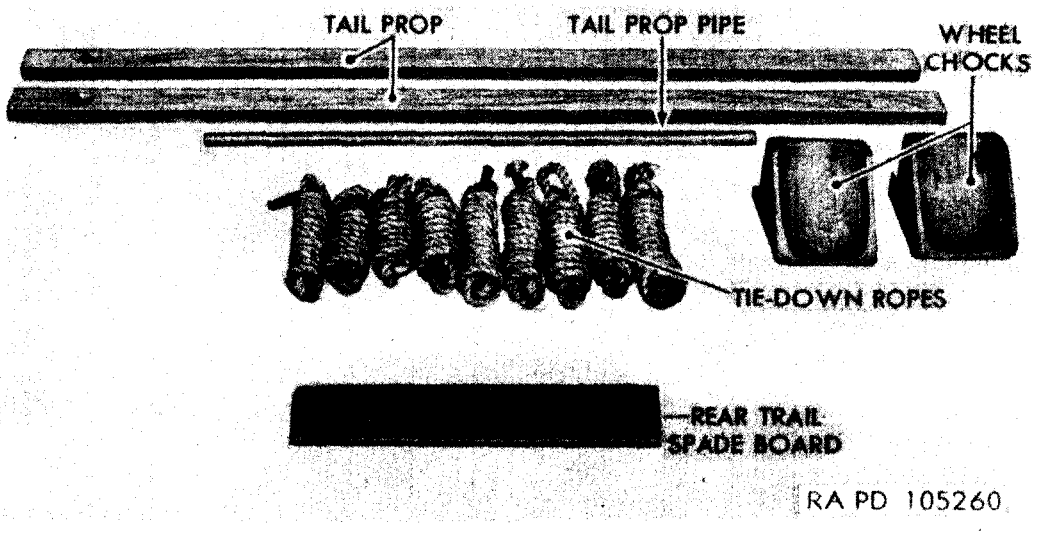


Figure 137. Equipment used in loading matériel into glider.

and each end of the chain is placed over one of the double hooks on the opposite end of the Evans tie-down expedient so that most of the slack is taken up. The jack is then utilized to take up the remainder of the slack and to put sufficient tension on the chain to hold the load securely in place. To unload, the release lever of the Evans tie-down expedient is pressed inward. This releases the tension on the chain. One or both ends of the chain are unhooked and the chain removed from the load. The rest of the unloading procedure is as outlined for ropes.

59. Loading the Matériel into a Glider

a. Raising the Tail. (1) Before raising the tail of the glider, set the brakes firmly and chock both wheels securely forward and aft.

(2) Raise the tail by lifting on the forward hand grips, which will be found in two places on each side of the tail, marked LIFT.

(3) Prop up the tail with two wooden tail props and the length of ¾-inch or 1-inch pipe. Run pipe through the tail from one side to the other, through the openings formed by the hand grips. Set up the tail props, one on each side, and insert the projecting ends of the pipe into the holes in the tail props (fig. 138).

b. Opening the Nose. (1) Unlatch the nose from the cargo

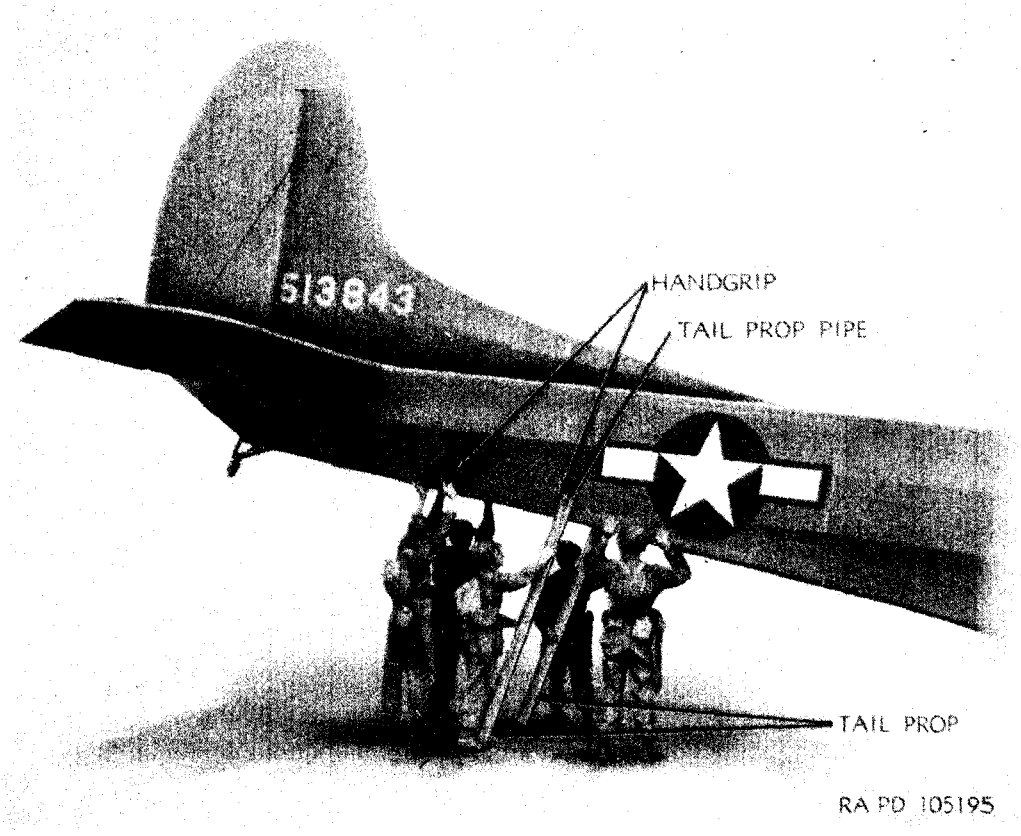


Figure 138. Propping up the tail of the glider.

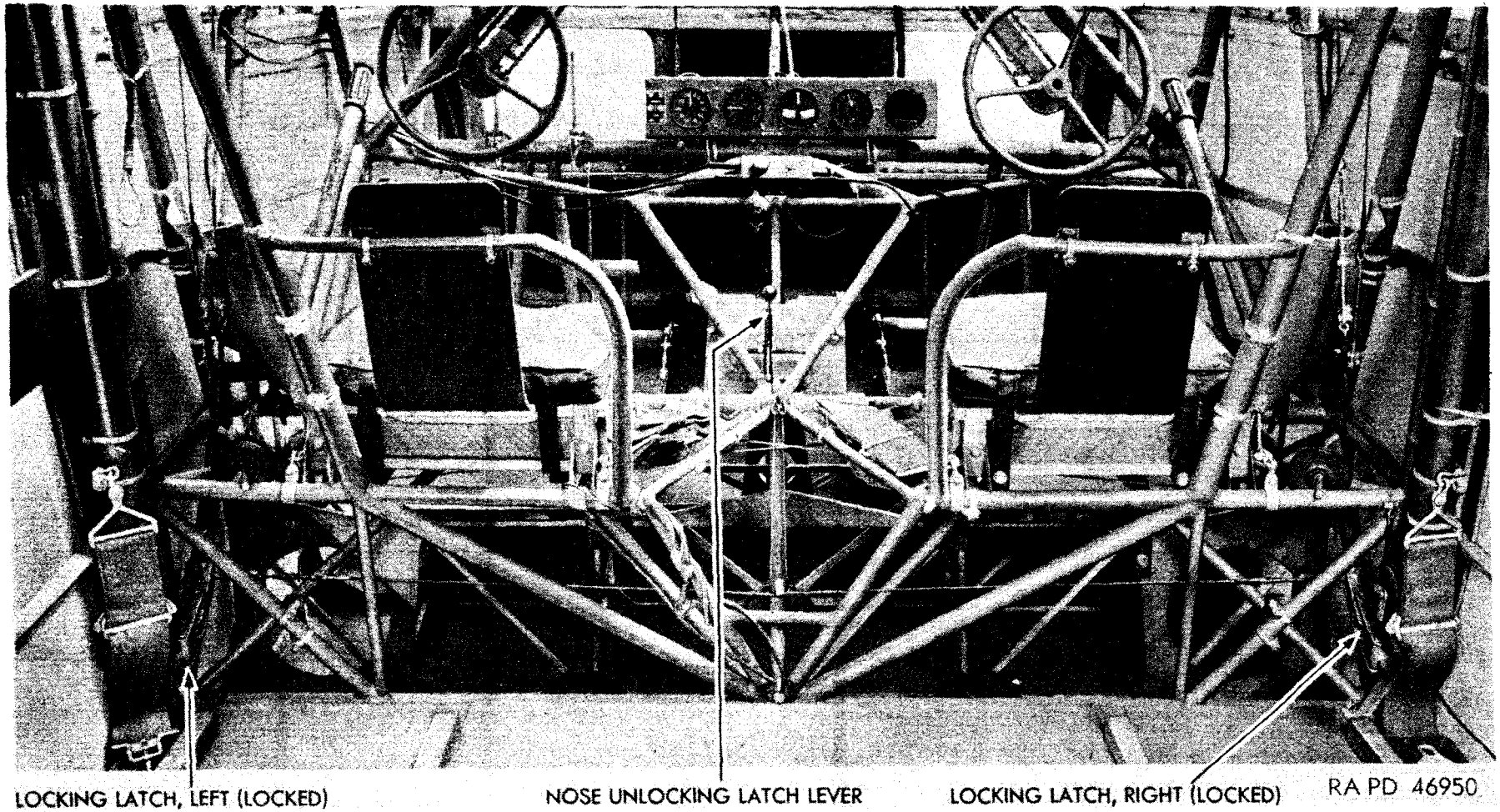


Figure 139. Glider nose latch in locked position.

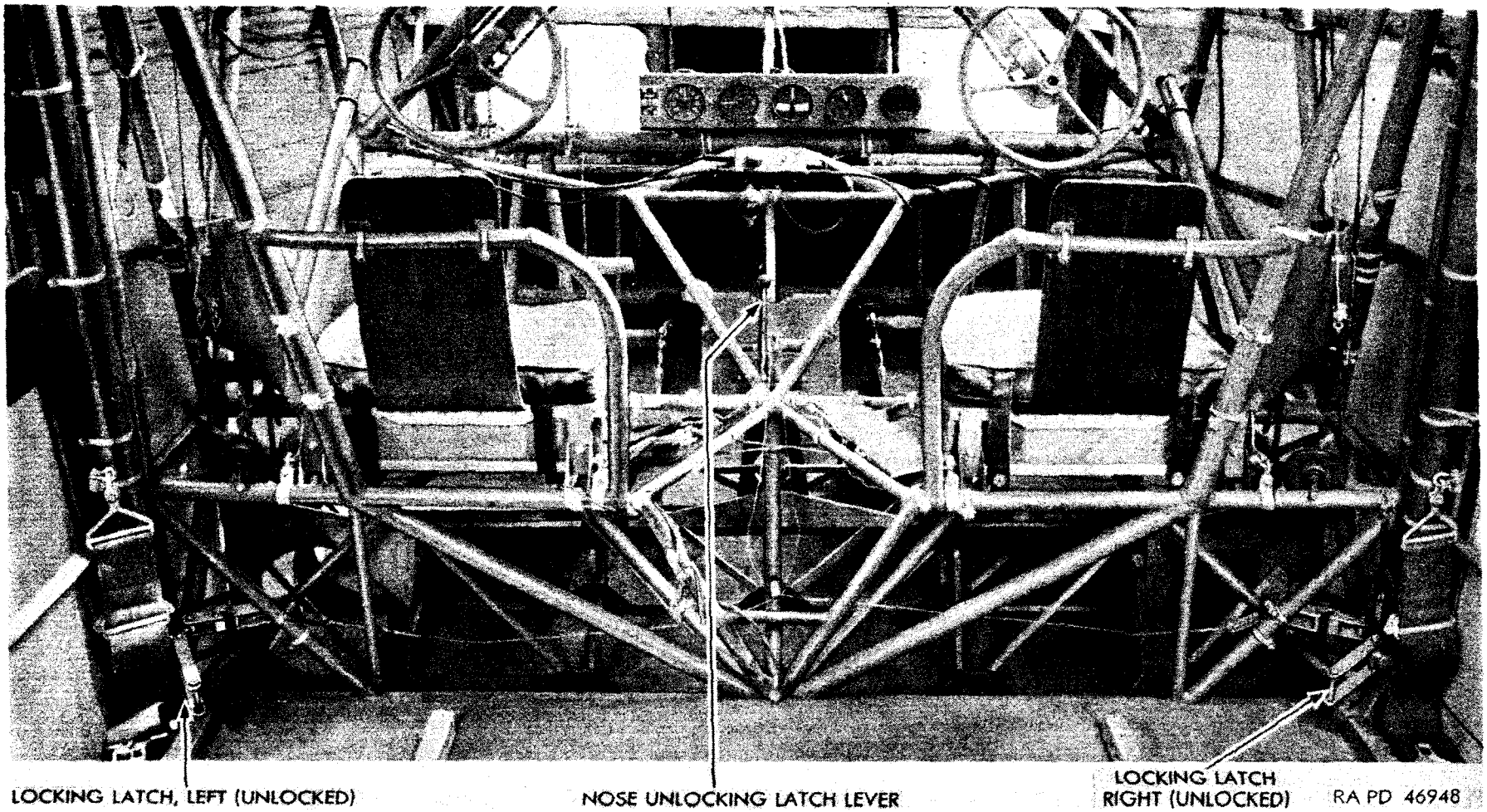


Figure 140. Glider nose latch in unlocked position.

compartment by means of the nose unlocking latch, which is operated by a lever in front center of control compartment (figs. 139 and 140).

(2) Lift the nose to the fully opened position while at the same time operating the nose lock inside the glider.

Note. This is a friction device which slides on a rod in the upper right side of the cargo compartment, above and slightly forward of the right rear personnel door. It is fastened to a cable which holds weight of nose when lifted. As nose is lifted, the nose lock is pushed back and when nose is fully raised, lock is pushed all the way back (fig. 141).

Caution: The nose locking bar must be clean and free of grease or oil.

(3) As a safety precaution, fasten the automatic nose lifting cable to one of the steel tubes in top rear of the cargo compartment (fig. 142).

c. Preparing for Loading. (1) Remove the right and left front banks of seats (fig. 143).

(2) Lower hinged ramps into place (fig. 144).

(3) Secure lashings to tie-downs in the following order: the rear tie-down; the right No. 1 and left No. 1; the right No. 2; the right No. 3 and left No. 3; and the right No. 6 and left No. 6 tie-downs (figs. 144 and 145).

Note. Secure all ropes to tie-downs with two half-hitches.

For instructions for tying this knot, see paragraph 55*h*(1).

d. Loading the matériel into the glider. (1) Roll the howitzer into the cargo compartment (fig. 146) until the lunette touches the rear tie-down.

(2) Chock both wheels at the front (fig. 147). Place rear trail spade board beneath the rear trail if the carriage is not equipped with a caster wheel.

(3) Make front lashing from axle to tie-down stations No. 1, right and left; pass the ropes over the axle inside the front trail (fig. 147).

(4) Place ammunition and equipment under the front end of howitzer in position for lashing to the nose tubing after the nose has been closed.

(5) Fold the ramps back into the cargo compartment.

e. Closing the nose of the glider. (1) Unfasten the automatic nose lifting cable (fig. 142).

(2) Lift the nose slightly (fig. 148) to take pressure off the nose lock so that the lock can be pushed forward to approximately 4 inches from the forward end of the rod upon which it slides (fig. 142).

(3) Lower the nose until the lock catches it shortly before it is completely closed.

(4) Change grip on the nose, to keep fingers clear.

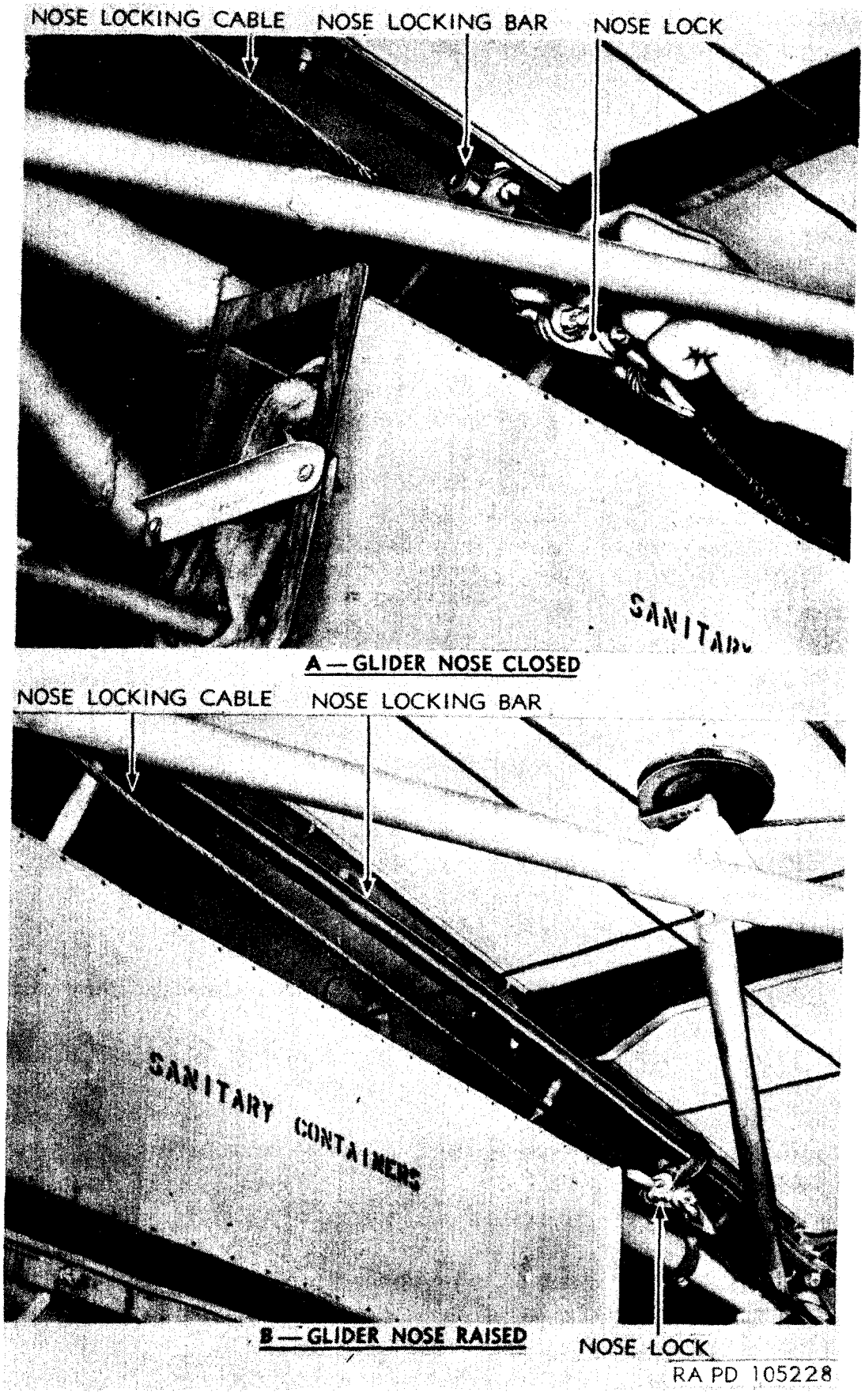


Figure 141. Position of glider nose lock for nose in closed and raised positions.

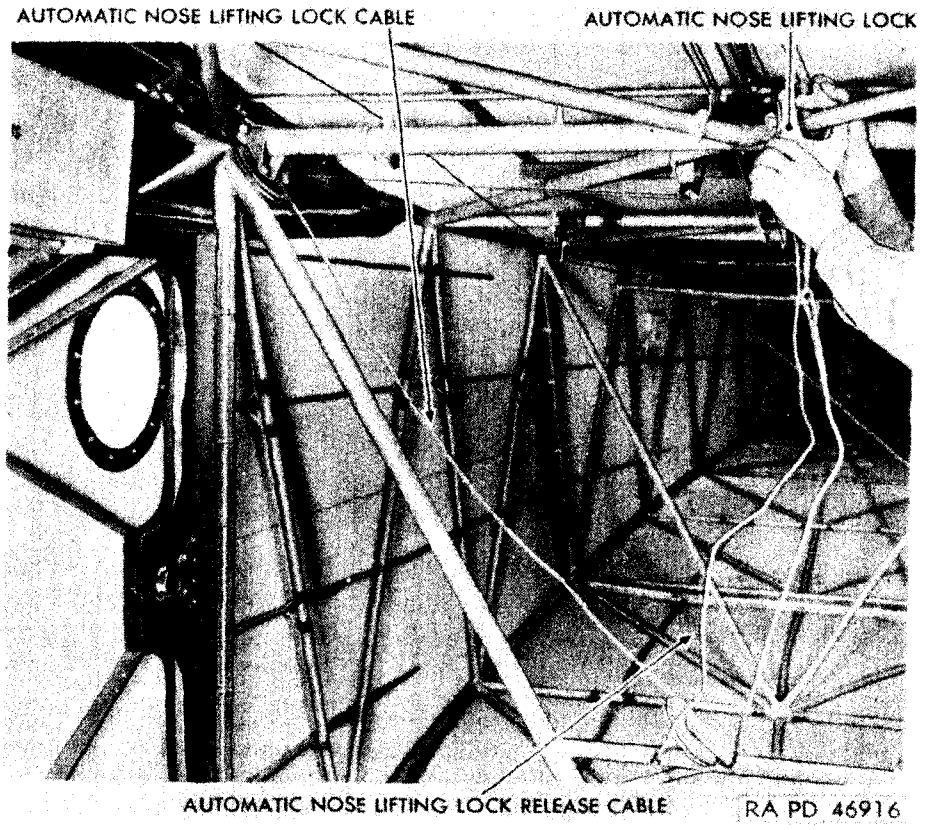


Figure 142. Fastening automatic nose lifting and locking device.



Figure 143. Removing front seats from glider.

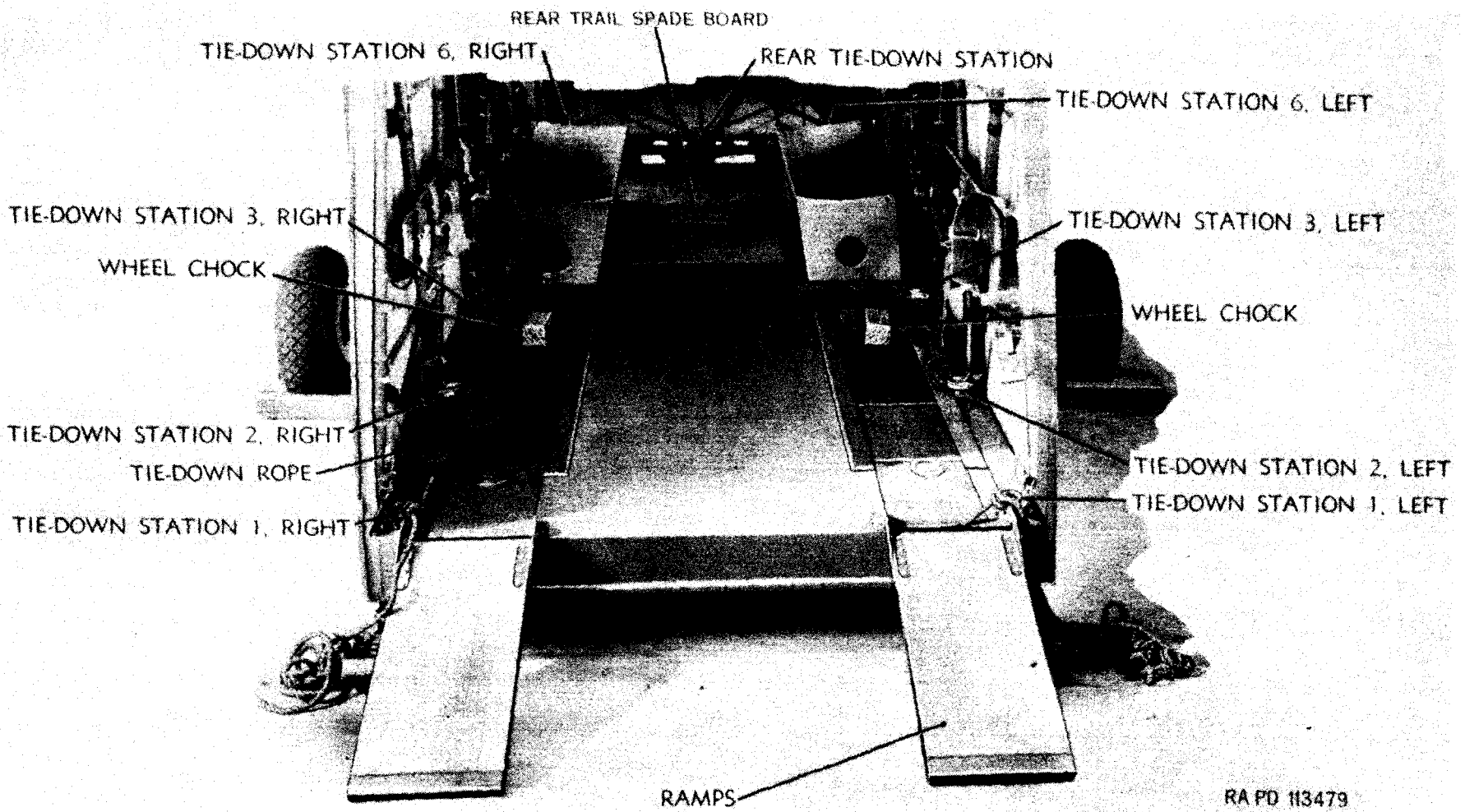


Figure 144. Lashing appurtenances of glider.

(5) Lift nose slightly to release nose lock. Push nose lock completely forward and lower nose gently to completely closed position.

(6) Lock nose of the glider in the closed position.

f. Lowering the Tail. (1) Grasp the ¾-inch pipe where it passes through the lifting handles one on each side. Lift on this pipe until the weight of the tail is taken off the tail props. Remove the tail props and lower the tail gently to the ground.

Caution: Do not drag the tail props out from under the tail as a means of lowering the tail. This will allow the weight to drop suddenly and with sufficient force to bend the tail wheel and make the glider unsafe for flying.

(2) Lash tail props and tail lifting pipe to howitzer trail.

g. Completing the Lashings. (1) As the tail of the glider is lowered, the front lashings to the howitzer are tightened by the drift of the howitzer to the rear.

(2) Kick wheel chocks tightly under wheels.

(3) Complete the following lashings: to front top sleigh handle from right No. 2 and left No. 2 tie-downs; to breech lifting ring from right No. 3 and left No. 3 tie-downs; to fourth lightening hole from rear trail spade on left side of trail; from left No. 6 tie-down to trail handspike receiver from rear tie-down.

Note. Use the Baker bowline knot for tightening all lashings. For instructions for tying this knot, see paragraph 55*h*(2).

(4) Elevate muzzle of piece to tighten lashings to top sleigh handle. Tighten lashings to the breech lifting ring (fig. 147).

(5) The ammunition crates are normally stowed beneath the howitzer and lashed against the nose tubing.

60. Unloading Matériel from Glider

a. Preparing to Unload. (1) Untie all lashings, after glider has stopped rolling.

(2) Unlash tail props and tail lifting pipe from howitzer trail. Raise tail and prop it in position (par. 50*a*) (fig. 138).

(3) Unlatch nose from cargo compartment (figs. 139 and 140).

(4) Remove chocks from in front of howitzer wheels.

(5) Lift the nose of the glider (par. 50*b*) (fig. 146), at the same time operating nose lock. Make sure nose is locked in its fully opened position (fig. 141).

b. Unloading. (1) Unload any ammunition and equipment carried in front of the howitzer.

(2) Lower hinged ramps into position.

(3) Lift rail and roll howitzer out of the glider (fig. 149).

(4) Replace ramps, close the nose, and lower the tail.

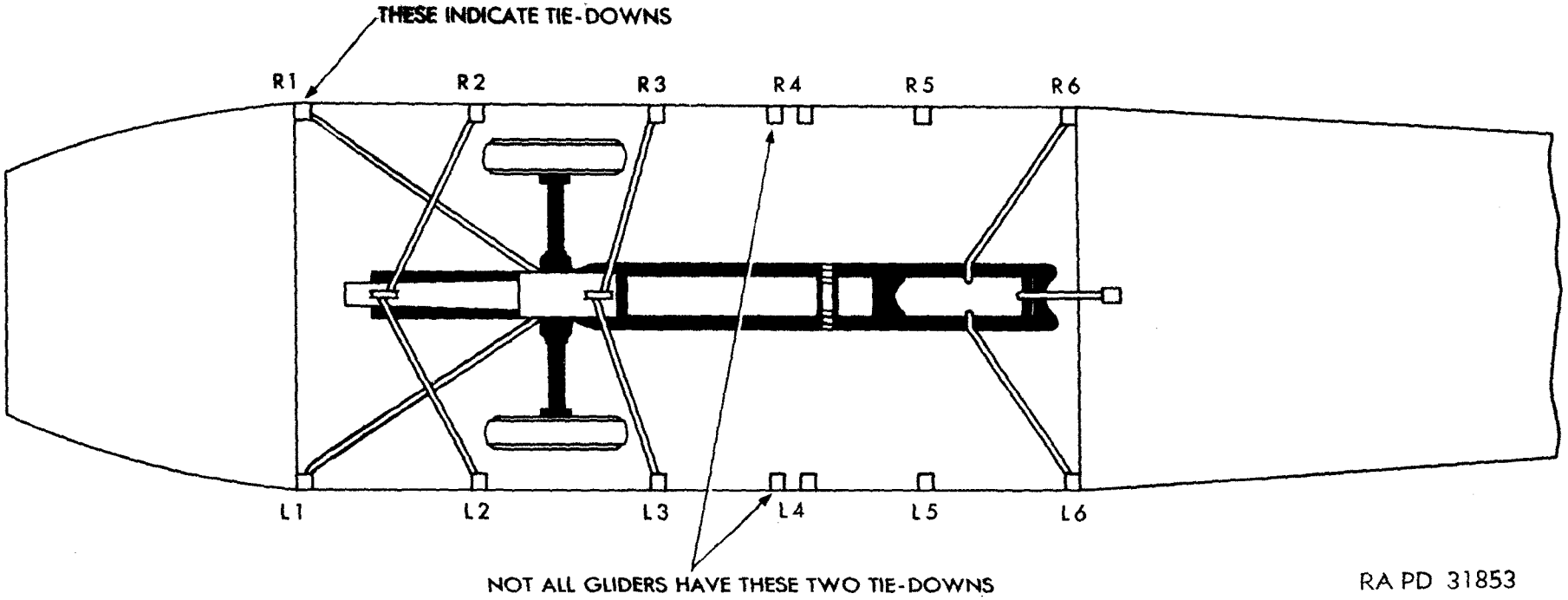


Figure 145. Floor plan of CG–4A and CG–15A type gliders—tie-down numbers and positions.

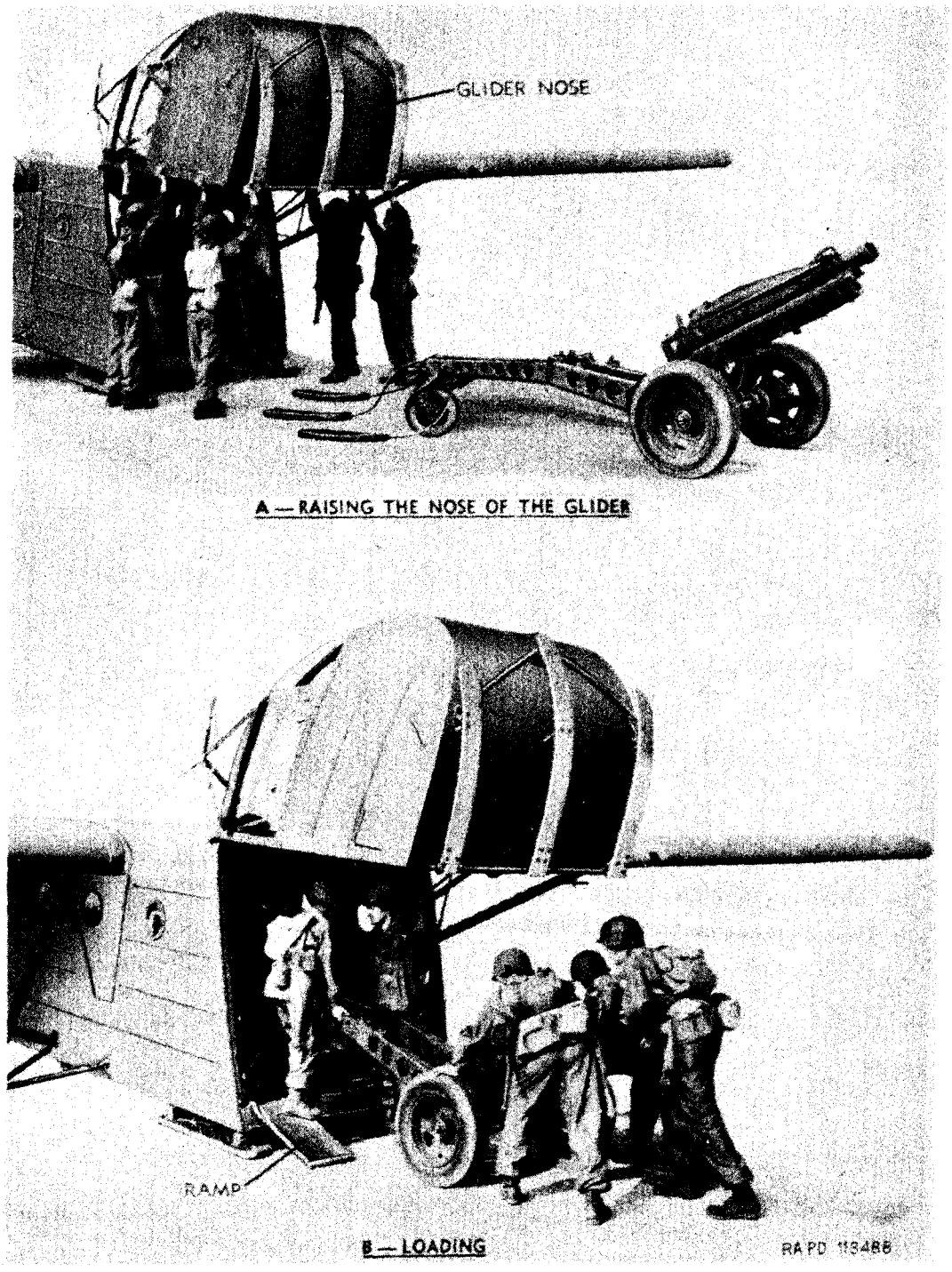


Figure 146. Loading 75-mm pack howitzer matériel into glider CG–4A or CG–15A.

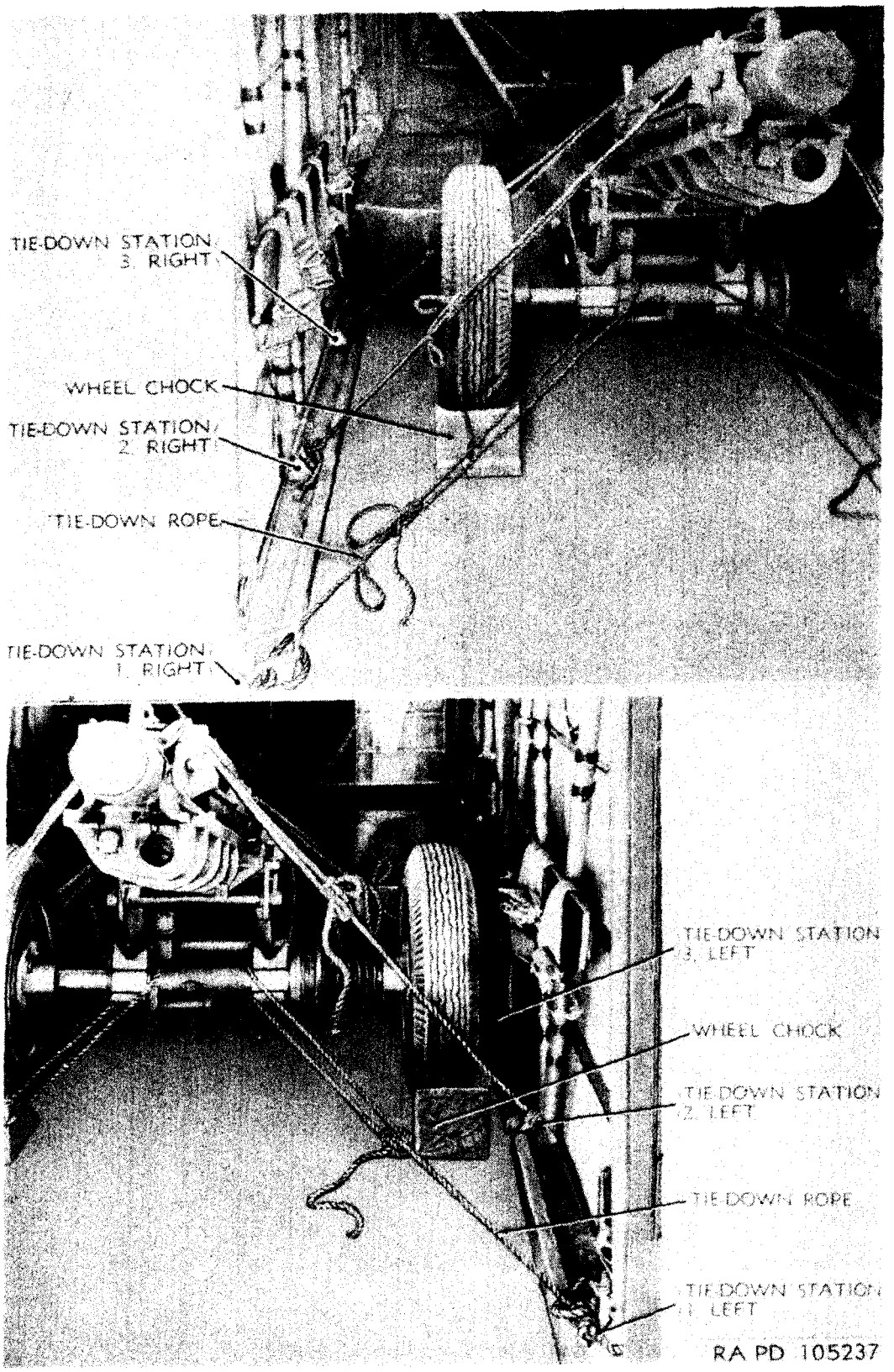


Figure 147. Front view of lashing of howitzer in glider CG–4A or CG–15A.

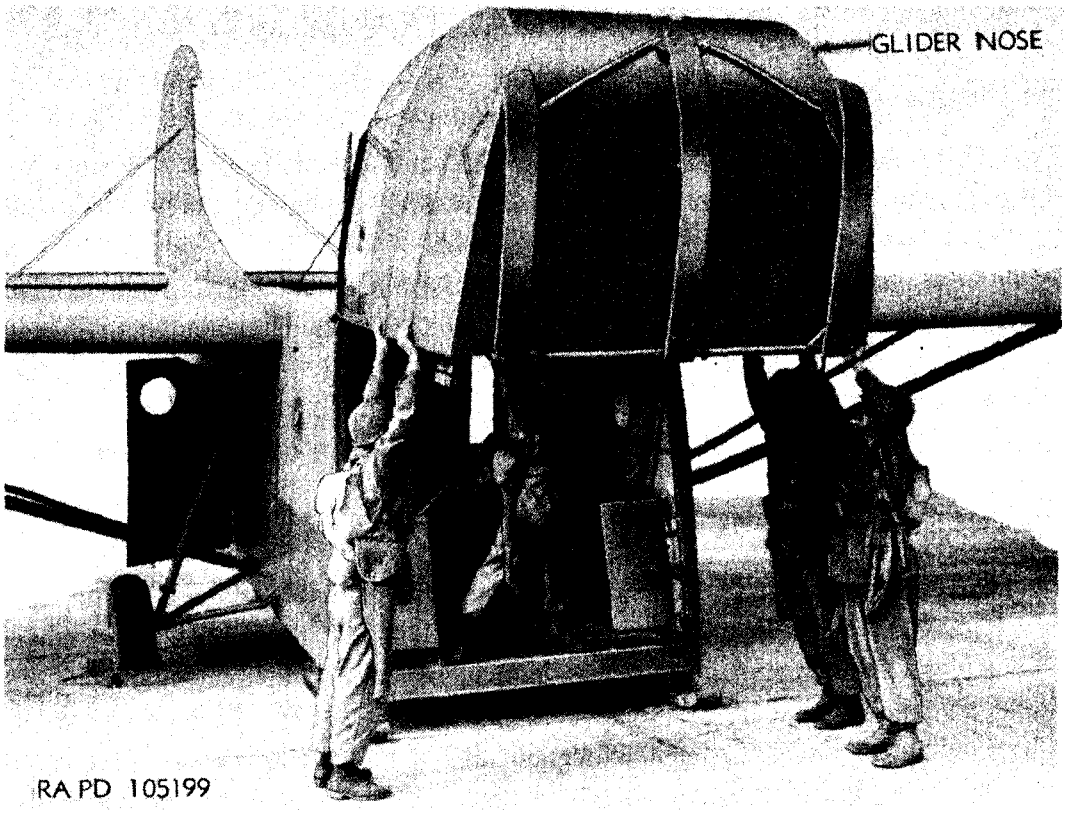


Figure 148. Closing nose of glider CG–4A or CG–15A.

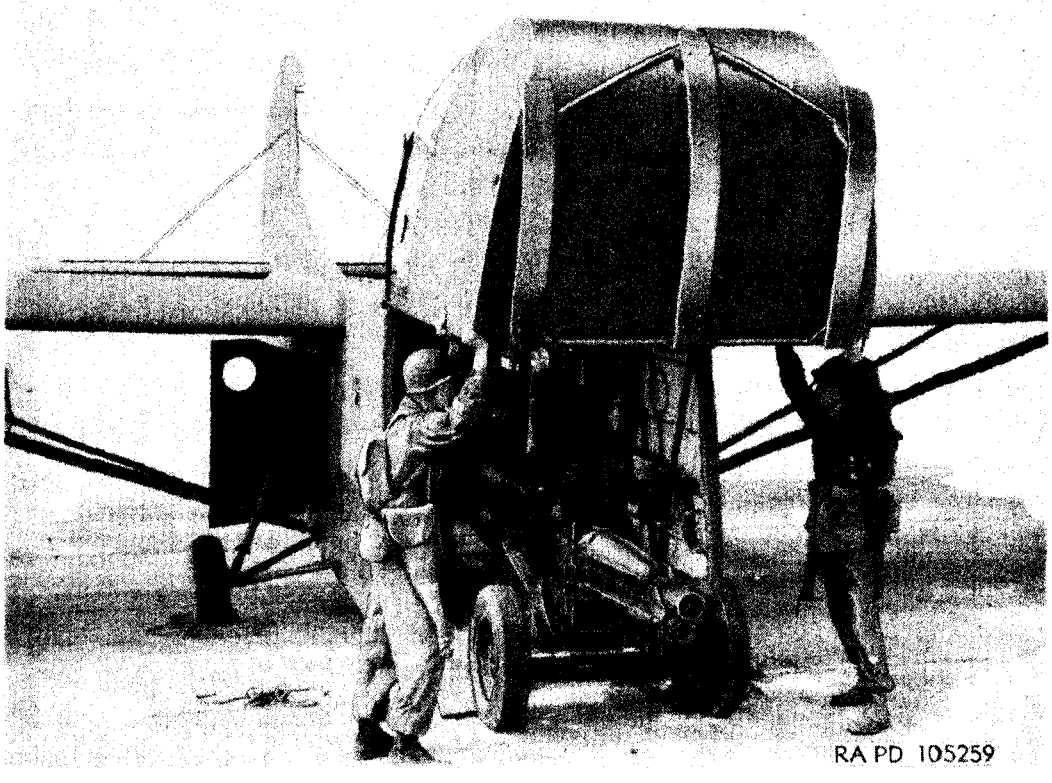


Figure 149. Unloading howitzer from glider CG–4A or CG–15A.

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Section XI. ANIMAL TRANSPORT

61. General

a. The 75-mm. pack howitzer M1A1 and carriage M8 can be disassembled into pack loads and fastened to appropriately shaped saddles for transport on pack animals.

b. The disassembly and assembly for animal transport is the same as for parachute delivery and is described in section VII.

c. For animal transport, the matériel is carried in eight mule pack loads per howitzer, including one mule pack load for fire control instruments. Ammunition is carried on additional animals.

62. Mule Pack Loads

The components of each of the eight mule pack loads and the weights are as follows:

a. Howitzer Tube Mule Pack Load. The components of this load are the tube, with muzzle and tube covers, and two lifting bars. The payload weighs 241 pounds. The saddle and accessories weigh 115 pounds. The total weight on the mule is 356 pounds.

b. Bottom Sleigh and Recoil Mechanism Mule Pack Load. The components of this load are the bottom sleigh and two oil cans for recoil oil. The payload weighs 232 pounds. The saddle and accessories weigh 111 pounds. The total weight on the mule is 343 pounds.

c. Cradle and Top Sleigh Mule Pack Load. The components of this load are the cradle, top sleigh, and handspike M3. The payload weighs 222 pounds. The saddle and accessories weigh 112 pounds. The total weight on the mule is 334 pounds.

d. Front Trail.Mule Pack Load. The front trail alone comprises this load. The payload weighs 231 pounds. The saddle and accessories weigh 116 pounds. The total load on the mule is 347 pounds.

e. Rear Trail and Axle Mule Pack Load. The components of this load are the axle and traversing mechanism, rear trail, accessory chest M1, tool chest M3, manta pack cover, and two cleaning staffs. The payload weighs 247 pounds. The saddle and accessories weigh 116 pounds. The total weight on the mule is 363 pounds.

f. Breech Mechanism and Implement Mule Pack Load. The components of this load are the breech assembly, two lifting bars, breech cover M1, and miscellaneous implements. The payload weighs 221 pounds. The saddle and accessories weigh 128 pounds. The total weight on the mule is 349 pounds.

g. Wheel and Ammunition Mule Pack Load. The components of

this load are two small arms ammunition chests and the two wheels. The payload weighs 239 pounds. The saddle and accessories weigh 119 pounds. The total weight on the mule is 359 pounds.

h. Fire Control and Instrument Mule Pack Load. The components of this load are two aiming circles M1 with equipment, one range finder with equipment, one surveying equipment set, and one battery commander's telescope with equipment. The payload weighs 209 pounds. The saddle and accessories weigh 149 pounds. The total weight on the mule is 358 pounds.

63. Loading Pack Loads on Mules

a. The number of mules authorized per battery is established by pertinent TE's. In general, each firing battery has four howitzers and requires 28 animals for the howitzer loads, one animal for the fire control instrument load, and 16 animals for the ammunition loads, plus the animals necessary for other battery equipment. The headquarters battery requires two animals for fire control instrument loads, plus the animals necessary for other battery equipment.

b. When the rear trail assembly is raised into pack position without the use of a lifting bar, the man lifting the spade end has to stand behind the pack animal, where he is in danger of being kicked; or two men have to lift from the side in a position of disadvantage. In order to permit the use of the lifting bar in the end holes of the trail, therefore, the bushings are to be removed from the rear trail of those 75-mm pack howitzer carriages M8 used by pack animal units.

c. The bushings are welded in the rearmost hole through the sides of the trail and are used to position the drawbar mounting pin. Break the welds holding the bushings in place with a cold chisel, taking care not to damage the bushings or the rear trail. Remove the bushings and store them in the equipment chest where they will be retained by the using unit as special equipment. Remove any burs and repaint where necessary.

Section XII. OPERATION UNDER UNUSUAL CLIMATIC CONDITIONS

64. General

a. The procedures for the mechanical operation of the howitzer are the same under either normal or unusual climatic conditions. In addition to the normal preventive maintenance service specified throughout this manual, special care in cleaning and lubrication should be observed where extremes of temperature, humidity,

and atmospheric conditions are present. Proper cleaning, lubrication, and storage and handling of lubricants not only insure proper operation and functioning but also guard against excessive wear of the working parts and deterioration of the matériel.

b. See TM 9–2853 for instructions to protect matériel when completely submerged in deep water fording or when engaged in surf landing operations.

65. Operation in Cold Climates

a. In climates where the temperature is consistently below freezing, it is necessary to prepare the howitzer for cold weather operation. Using arms will perform all disassembly prescribed in part three, thoroughly clean all the parts, and then change to the greases and lubricants prescribed for that temperature range (lubrication order). Ordnance maintenance personnel are responsible for disassembling, cleaning, adjusting, and changing to cold weather lubricants all other assemblies and mechanisms.

b. In cold climates, contamination of lubricants with moisture from snow, rain, or condensation of moisture in partly filled containers is the source of many difficulties. Containers will be kept covered at all times and stored in a warm place, if possible.

c. Matériel placed directly on the ground, ice, or snow will freeze in place, making it difficult or impossible to move without digging it loose, as well as causing serious damage to the tires. Use of the following methods will prevent this condition:

(1) Coat the portion of the spades and aiming posts which contact the ground, ice, or snow with grease to keep them from freezing in place.

(2) Place a protective layer of waterproof paper, tar paper, roofing paper, straw, hay, or other dry material under the wheels or sleds, tool chests, and accessories to keep the moisture and ice from coming in contact with them.

(3) The tires will develop a flat surface at the point of contact, necessitating special precautions when moving as towed transport (*g*(3), below). To prevent the development of flat surfaces keep the carriage axle blocked up whenever the weapon is inactive.

d. Whenever the metal parts of the matériel or equipment are cold and the surrounding air temperature rapidly becomes warmer or when the matériel is moved into a warmer area, such as a heated building, a condensation of moisture vapor will occur upon the cold surface. This condition is known as "sweating." It can be prevented as follows:

(1) Do not bring any cold matériel indoors unless it is absolutely necessary. It is best to leave it outdoors, but protected from snow with proper covers. Snow-tight lockers at outdoor

temperatures are recommended for keeping binoculars, telescopes, and other equipment.

(2) If it is necessary to bring instruments or other equipment from low temperatures to room temperatures, use "anticondensation" containers. These containers can be specially made tight-fitting, cloth-framed boxes, or any other fairly airtight containers with heat conducting walls. Place the cold equipment in the container. Have the container at outside temperature so that it will contain cold dry air. Close the top, bring it indoors, and allow it to come to room temperature. The cold, dry air expands as it warms, breathing outward, and therefore, no warm, humid air from the room comes in contact with the matériel and there is no condensation on it. When the matériel is entirely at room temperature, sweating will not occur when it is removed from the container.

(3) If condensation occurs on cold matériel, it must be disassembled, cleaned, thoroughly dried, and lubricated after it reaches room temperature, to prevent rust or corrosion. Do not operate the matériel before thoroughly drying, as the moisture will form an emulsion with the oil or grease necessitating removal of the emulsified lubricant and relubricating the matériel. Do not move matériel having moisture on it, caused by condensation, into the outdoor temperature as the parts will become covered with frost and may not function.

e. Exercise the various controls (sec. V) throughout their entire range, at intervals as required, to aid in keeping the controls from freezing in place and to reduce the effort required to operate them.

f. The preventive maintenance schedules listed in paragraphs 91 and 92 will be followed. In addition, particular attention will be given to the following points:

(1) Protect matériel, when not in use, with the proper covers, making sure that they are serviceable, in good state of repair (par. 89), and are securely fastened so that snow or ice will be kept from the operating parts. Provide as much protection as practical for the wheels and tires and other parts of the matériel and associated equipment.

(2) Keep snow and ice from collecting on the matériel, paying particular attention to all operating parts, fire control instruments, and the teeth of the rocker assemblies, pinions, and traversing wheel and axle.

(3) Lubrication of the matériel in cold climates is covered in paragraph 82*a*.

(4) Cleaning of the matériel in cold climates is covered in paragraph 86.

g. In addition to the procedures for traveling outlined in paragraph 23, particular attention will be given to the following:

(1) Make a thorough inspection and provide as much protection as possible for all parts. See that covers are properly installed and securely fastened.

(2) More than usual care should be taken when traveling over rough terrain because the suspension assemblies will be stiff and may be easily damaged by any unnecessary shock.

(3) Rubber tires are more brittle and easily damaged in cold temperatures. When starting to travel, take care to keep the speed at a minimum until the flat spot in the tire, if present, has been worked out and the tire has regained its natural shape.

(4) Do not fold canvas when wet or frozen. See paragraph 89 for care of canvas.

h. Friction between recoil slides and guides absorbs an appreciable portion of the energy of recoil. Thickened or congealed lubricant increases this friction, shortens recoil, and retards counterrecoil. Be sure that slides and guides are kept clean and are sparingly lubricated.

Caution: Do not remove recoil oil to increase the rate of recoil and counterrecoil.

i. Set the respirator valve at the 3 position (par. 17*d*) when preparing to fire. As the speed of counterrecoil increases due to warming of the recoil oil, readjust the respirator as required.

j. For cold weather operation of sighting and fire control equipment, see paragraph 172.

k. For the use of the snow skis M13 in cold weather, see paragraph 69.

66. Operation in Hot Climates

a. Constantly observe the operation of the recoil mechanism as prescribed in paragraph 21, to be sure that expansion of the oil due to the heat does not result in an excess reserve, with resultant damage to the mechanism.

b. In addition to the tire maintenance prescribed in paragraph 157, keep tires covered, with materials which may be available, to protect them from the direct rays of the sun to prevent excessive air pressure and deterioration of rubber.

c. For precautions in handling ammunition in high temperatures, see paragraphs 163 and 164.

67. Operation Under Severe Dust or Sand Conditions

a. Exercise particular care to keep sand and dust out of the mechanisms and oil receptacles when carrying out inspection

and lubrication operations or when making adjustments and repairs.

b. Keep all covers in place as much of the time as operations permit, making sure that they are in a good state of repair (par. 89) and are securely fastened, to keep as much sand as possible from operating parts.

c. When preparing to fire (par. 17), make sure that all dirt or sand has been cleaned from the bore and chamber; otherwise firing will result in rapid erosion of the bore and early condemnation of the tube.

d. When the howitzer is active, remove all excess lubrication from the rocker assemblies and pinions and traversing area of the axle, as there will be less wear from nearly dry operation than from oil contaminated with dust and dirt, because of its abrasive action.

68. Operation Under Conditions of High Humidity, Rain and Mud, or Salty Atmosphere

a. Inspect and maintain the matériel frequently as rust and corrosion are greatly accelerated in moist or salty atmospheres. Take care to inspect interiors and small parts of mechanisms.

b. Canvas covers and other items which may deteriorate from mildew or be attacked by insects or vermin will be inspected, cleaned, aired, and dried frequently, as outlined in paragraph 89.

c. Keep ammunition free from mud, corrosion, or foreign matter. Provide proper drainage around the emplacement to keep it as dry as possible.

d. In muddy terrain, wash off all mud and caked dirt, paying especial attention to all operating parts, latches, locks, and the wheel assemblies.

e. When operating as towed matériel, install the snow skis (par. 69) to aid in moving across very soft or muddy earth.

69. Snow Skis M13 (T15)

a. General. Snow skis M13 (T15) (fig. 150) are used to facilitate the towing of the howitzer and carriage over swampy areas, soft or boggy ground, and snow and ice. These skis are issued in pairs, each ski fitting under one wheel. Although essentially for use over soft or swampy ground, the skis may remain under the carriage wheels for short distances over hard ground. Because the time for installing the snow skis is approximately 15 minutes per pair for three men and approximately 10 minutes per pair for removal, their removal is advisable when more than a few hundred feet of hard ground are encountered. The skis do not

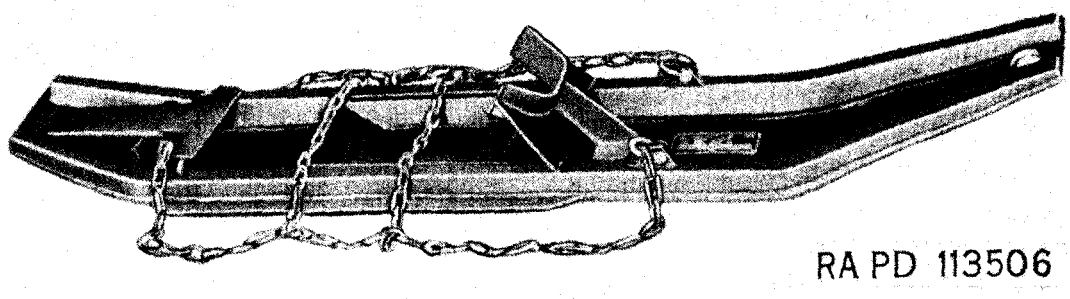


Figure 150. Snow ski M13 (T15).

have to be removed for firing. The matériel is towed in the normal manner and also can be backed.

b. Description. The snow skis have keels on a flat bottom surface for steerage and a curved prow on both ends to negotiate rough terrain and to facilitate maneuvering backward and forward. Wheel wells receive the tires of the howitzer carriage and a harness assembly secures the wheel to the ski (fig. 151).

c. Installation. Place the skis in position between the carriage and prime mover with the prows "toed out" forming a V, the dimension between the tire wells of the skis being approximately equal to the center-to-center distance between tire treads. The tire harness should lay slack alongside the ski shoe. Tow the howitzer onto the skis and then, with the matériel stationary, pull inward on the ski prows until the ski lines up with the wheels and the tire settles into the tire well. Place the tire harness over the wheel and fasten securely with the locking device so that the harness is taut. The slack in the chain can be taken up by placing the chain shackles in appropriate chain link.

d. Removal. Unlock the tire harness and remove the harness from over the wheel. Pull out on the prows of the skis until they are "toed out" forming a V. Tow the carriage off the skis.

Section XIII. DEMOLITION TO PREVENT ENEMY USE

70. General

a. The destruction of the matériel, when subject to capture or abandonment in the combat zone, will be undertaken by the using arm only on authority delegated by the division or higher commander as a command function when such action is deemed

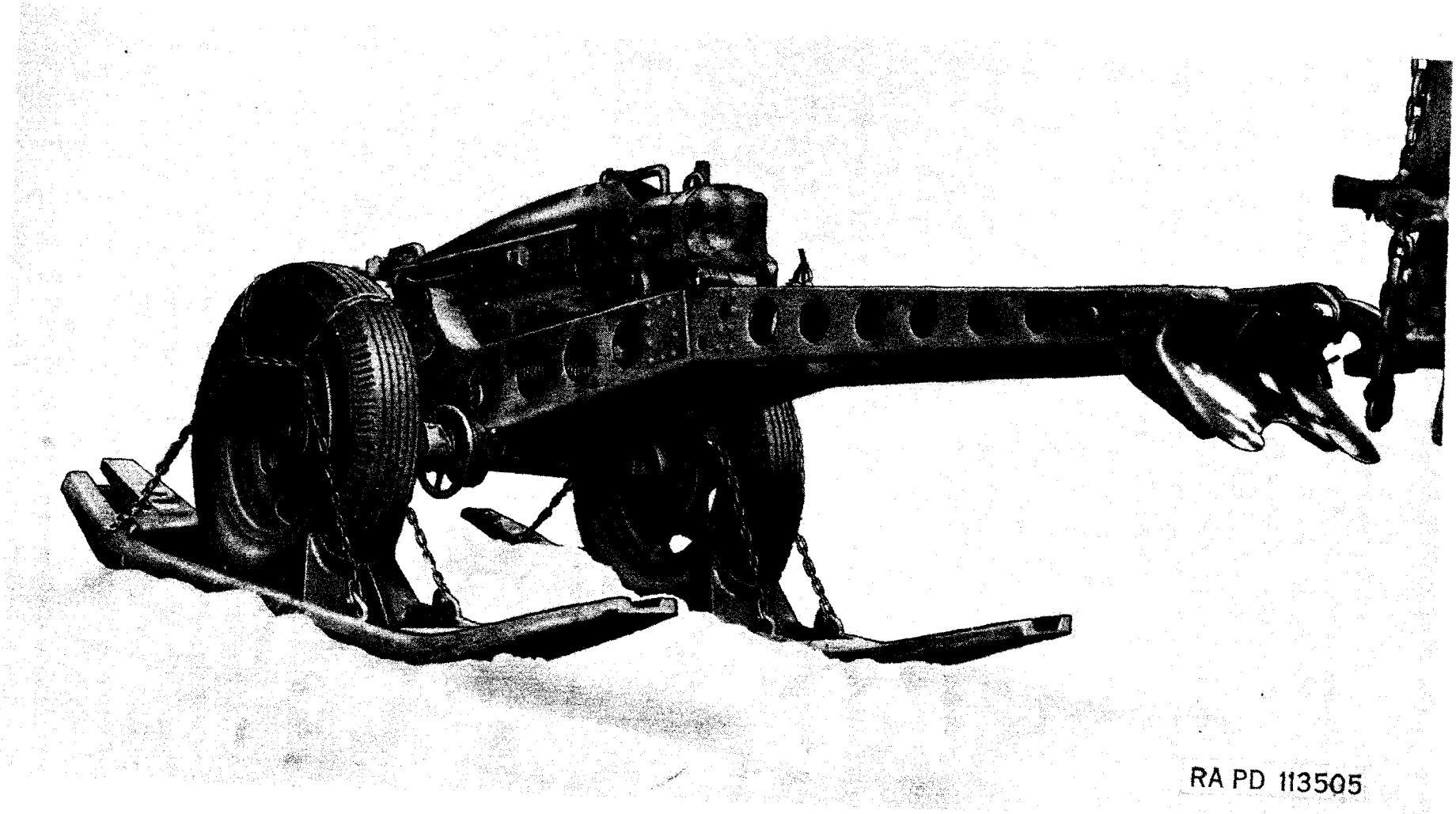


Figure 151. 75-mm howitzer matériel mounted on snow skis M13 (T15).

necessary as a final resort to keep the matériel from reaching enemy hands.

b. Adequate destruction of artillery matériel means damaging it in such a way that the enemy cannot restore it to usable condition in the combat zone either by repair or by cannibalization. Adequate destruction requires that—

(1) Enough parts essential to the operation of the matériel must be damaged.

(2) Parts must be damaged beyond repair in the combat zone.

(3) The same parts must be destroyed on all matériel, so that the enemy cannot make up one operating unit by assembling parts from several partly destroyed units.

c. The tube and breech are the most vital parts of any piece of artillery. These are the first things to damage. After the tube and breech mechanism in importance comes the recoil mechanism, sighting and fire control equipment, carriage, tires, gun book, and firing tables.

71. Destruction of Tube Assembly and Recoil Mechanism

Four methods, in order of preference, are given for the destruction of the tube assembly and the recoil mechanism. If possible, the carriage (par. 72) should be destroyed simultaneously. Prior to destruction of matériel, remove all optical sights for evacuation or destruction as prescribed in paragraph 74.

a. Method No. 1. (1) Remove filling plug on recoil mechanism and insert the oil release, allowing recoil oil to drain. It is not necessary to wait for the recoil oil to drain completely before firing the weapon as described in (4) below.

(2) Place the tube at approximately zero degree elevation and insert an armed (safety pin removed) HE antitank grenade M9A1 or an armed antitank rocket M6 into the breech end of the tube with the ogive (nose end) facing back toward the breech, so that the nose is about 18 inches forward of the commencement of rifling; or jam a point detonating HE round in the muzzle.

(3) Load howitzer with HE round, unfuzed if possible. Base-detonating HE shell cannot be used in this method.

(4) Fire the weapon, using a lanyard at least 100 feet long. The person firing should be under cover to the rear of the piece and approximately 20° off the line of fire.

(5) The danger zone is approximately 200 yards and the elapsed time is from 2 to 3 minutes.

b. Method No. 2. (1) Insert a charge of two ½-pound TNT blocks in the muzzle end of the tube and a charge of five blocks in the chamber, first preparing them for simultaneous detonation

by the use of detonating cord passed through the bore to connect the charges.

(2) At the same time, if practicable, prepare the carriage for simultaneous demolition, as outlined in paragraph 72, by connecting the charge in the muzzle end of the tube and the charge near the elevating mechanism with detonating cord.

(3) Close the breechblock. Plug the muzzle tightly with mud or earth to a distance of approximately 9 inches.

(4) Detonate all charges which have been connected with detonating cord by means of one nonelectric cap inserted in one of the blocks of TNT and igniting the cap with at least 5 feet of safety fuze. (Electric detonation, using electric caps, demolition reel, and exploder, may be used if available.) See FM 5–25 for details of demolition planning and execution.

(5) The danger zone is approximately 200 yards and the elapsed time is from 10 to 15 minutes. Five feet of safety fuze will burn approximately 3½ minutes.

c. Method No. 3. (1) Fire one howitzer at the others from a position 200 yards distant. Use HE or HE, AT shell. Two or more hits on a vital spot should suffice.

(2) Destroy last howitzer and carriage by best means available.

d. Method No. 4. (1) Insert four unfuzed incendiary grenades M14 end to end midway in the tube at near zero elevation. Ignite these four grenades by a fifth one equipped with a 15-second delay detonator. The elapsed time is from 2 to 3 minutes. The metal from the grenades will fuze with the tube and fill the grooves.

(2) Destroy the remaining parts by other means.

72. Destruction of Carriage

Whenever possible, destruction should be accomplished simultaneously with the destruction of the tube assembly and recoil mechanism (par. 71*c*). When this cannot be done, destruction of the tube assembly and recoil mechanism will have priority.

a. Method No. 1. Place one unfuzed, boostered, point-detonating HE shell inside the front trail assembly between the transom and elevating crankshaft. Place a ½-pound TNT block over the booster of the shell. Connect the TNT block with detonating cord and detonate it with a nonelectric cap ignited by at least 5 feet of safety fuze. The danger zone is approximately 200 yards and the elapsed time is from 3 to 4 minutes. The safety fuze will burn approximately 3½ minutes.

b. Method No. 2. Place six ½-pound TNT blocks inside the front trail assembly between the transom and the elevating crankshaft. Detonate the TNT charge using detonating cord, a tetryl nonelectric cap, and at least 5 feet of safety fuze. The danger zone

is approximately 200 yards and the elapsed time is from 4 to 5 minutes. The fuze will burn approximately 3½ minutes.

73. Destruction of Tires

Rubber is such a critical item that whenever matériel is subject to capture or abandonment an attempt to destroy pneumatic tires must always be made, even if time will not permit destruction of the remainder of the weapon. With adequate planning and training, however, the destruction of tires may be accomplished in conjunction with the destruction of the weapon without increasing the time necessary.

a. Method No. 1. (1) Ignite an incendiary grenade M14 under each tire.

(2) To insure the best result when this method is combined with the destruction by TNT of the carriage, be certain that the incendiary fires are well started before detonating the TNT.

b. Method No. 2. Damage the tire with an ax, pick, or heavy machine gun fire. Be sure to deflate the tire before damaging with ax or pick. Pour spare gasoline on the tires and ignite.

74. Destruction of Fire Control Equipment

a. All fire control equipment, including optical sights and binoculars, is difficult to replace. It should be the last equipment to be destroyed if there is any chance of personnel being able to evacuate.

b. If evacuation of personnel is made, all possible items of fire control equipment should be carried.

c. If evacuation of personnel is not possible, fire control equipment will be thoroughly destroyed as follows:

(1) Firing tables, trajectory charts, slide rules, and similar items will be thoroughly burned.

(2) All optical equipment will be thoroughly smashed.

75. Destruction of Ammunition

For destruction of ammunition, see TM 9–1901.

PART THREE

MAINTENANCE INSTRUCTIONS

Section XIV. GENERAL

76. Scope

Part three contains information for the guidance of the using organizations responsible for the organizational maintenance of this matériel. It contains information needed for the performance of the scheduled inspection, cleaning, lubrication, and preventive maintenance services as well as description of the major groups and assemblies, their authorized disassembly and assembly, and their functions in relation to other components of the equipment.

Section XV. ORGANIZATIONAL SPARE PARTS, TOOLS, AND EQUIPMENT

77. Organizational Spare Parts, Tools, and Equipment

a. Spare Parts. A set of organizational spare parts is supplied to the using arm for field replacement of those parts most likely to become worn, broken, or otherwise unserviceable.

b. Tools and Equipment. A set of organizational tools and equipment is supplied to the using arm for maintaining and using the matériel. This set contains items required for disassembly, assembly, cleaning, and preserving the 75-mm pack howitzer matériel. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stored in the chest and/or roll provided for them.

c. List of Spare Parts, Tools, and Equipment. (1) Spare parts, tools, and equipment supplied for the 75-mm howitzer M1A1 and carriage M8 are listed in Department of the Army Supply Catalog pamphlet ORD 7 SNL C–20. This pamphlet is the authority for requisitioning replacements. Spare parts, tools, and equipment for the 37-mm subcaliber equipment are covered in paragraph 190.

(2) Spare parts and equipment supplied for the on-carriage sighting and fire control equipment are listed in Department of the Army Supply Catalog pamphlet ORD 7 SNL F–106 for the telescope mount M3A1 and the panoramic telescope M1 and in Department of the Army Supply Catalog pamphlet ORD 7 SNL F–205 for the aiming post and instrument lights. These pamphlets are the authorities for requisitioning replacements.

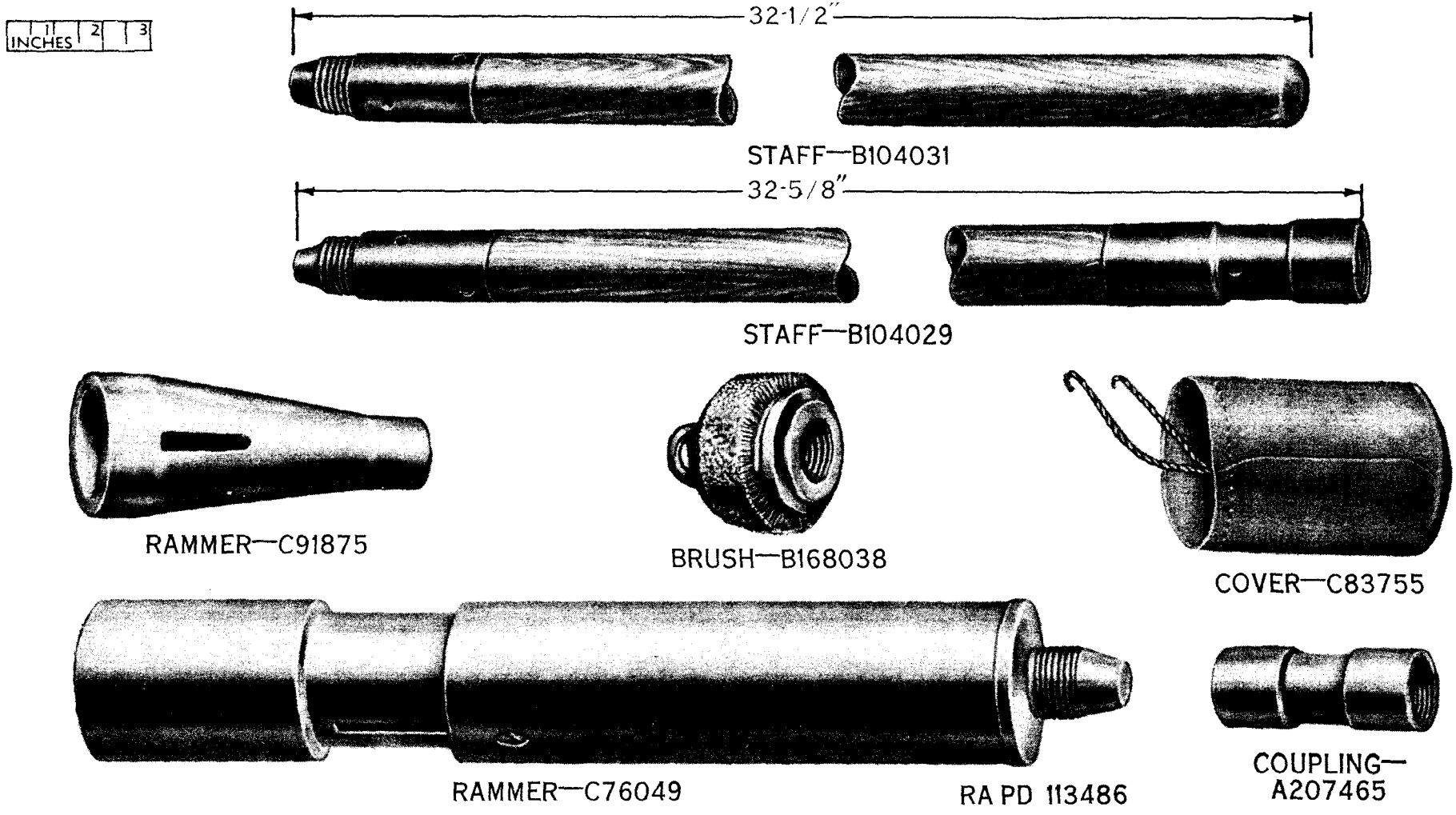


Figure 152. Special equipment for 75-mm pack howitzer M1A1.

78. Specially Designed Tools and Equipment

a. Certain tools and equipment listed in Department of the Army Supply Catalog pamphlet ORD 7 SNL C–20 are especially designed for maintenance, repair, and general use with the 75-mm howitzer matériel. These tools and equipment are listed in table I for information only. Table I also lists items of equipment which are especially designed for general use with the on-carriage sighting and fire control equipment. These items of equipment are listed in Department of the Army Supply Catalog pamphlets ORD 7 SNL F–106 and ORD 7 SNL F–205. These pamphlets will be used for requisitioning replacements.

b. In this list of special tools is included a fuze wrench M7A1, which replaced the fuze wrench M7. The fuze wrench M7A1 is now the substitute for the fuze wrench M18 (T12E1) (fig. 153, 41–W–1496–135).

(1) All old type fuze wrenches M7 should be salvaged through supply channels. The fuze wrench M7 can be identified by the rectangular shape of the wrench head.

(2) Some of the fuze wrenches M7A1 have been incorrectly marked M7. All fuze wrenches M7A1 which are marked M7 should be remarked M7A1. The M7A1 wrenches can be identified by the curved contour of the wrench head (fig. 153, 41–W–1596–50).

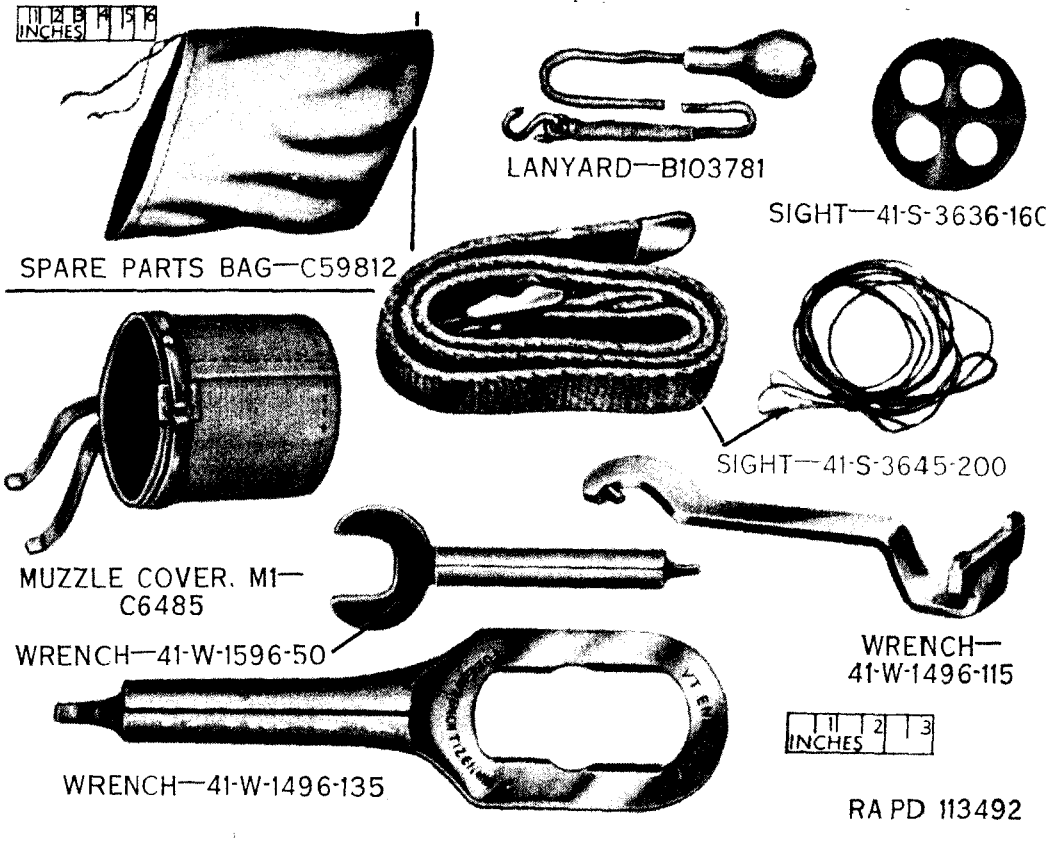


Figure 153. Special tools and equipment for 75-mm pack howitzer M1A1.

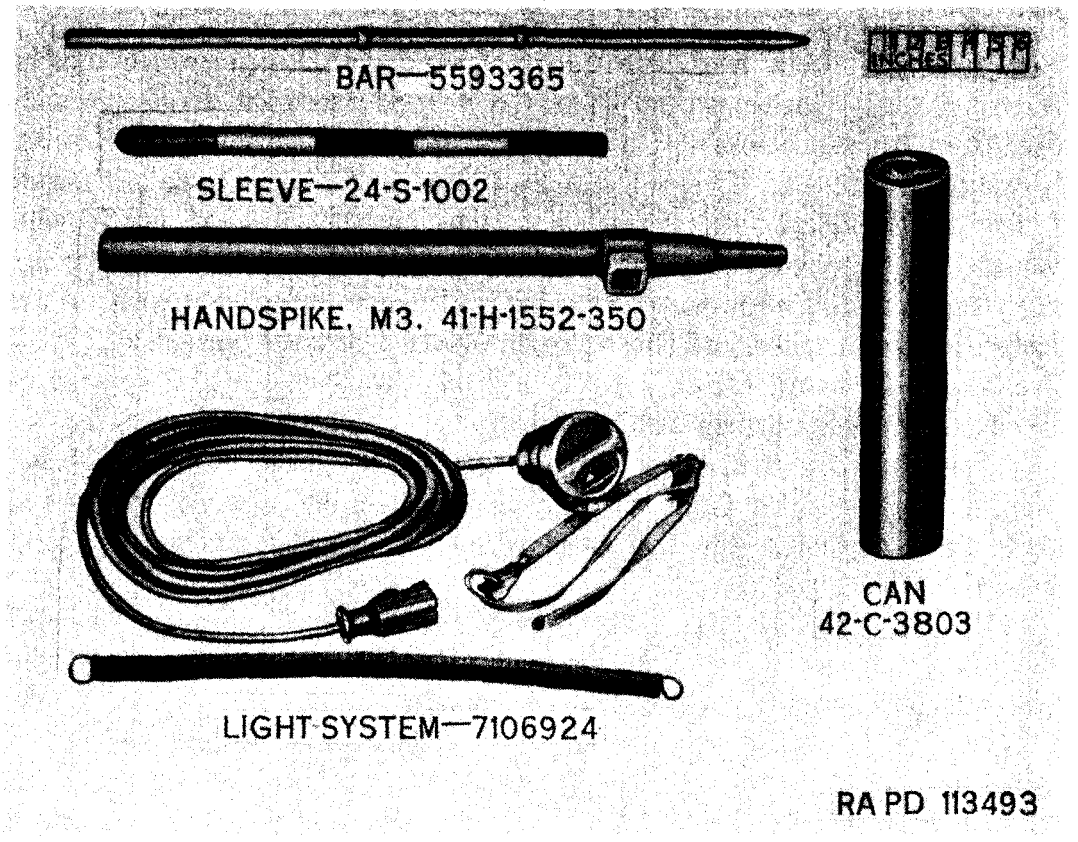


Figure 154. Special equipment for 75-mm howitzer carriage M8.

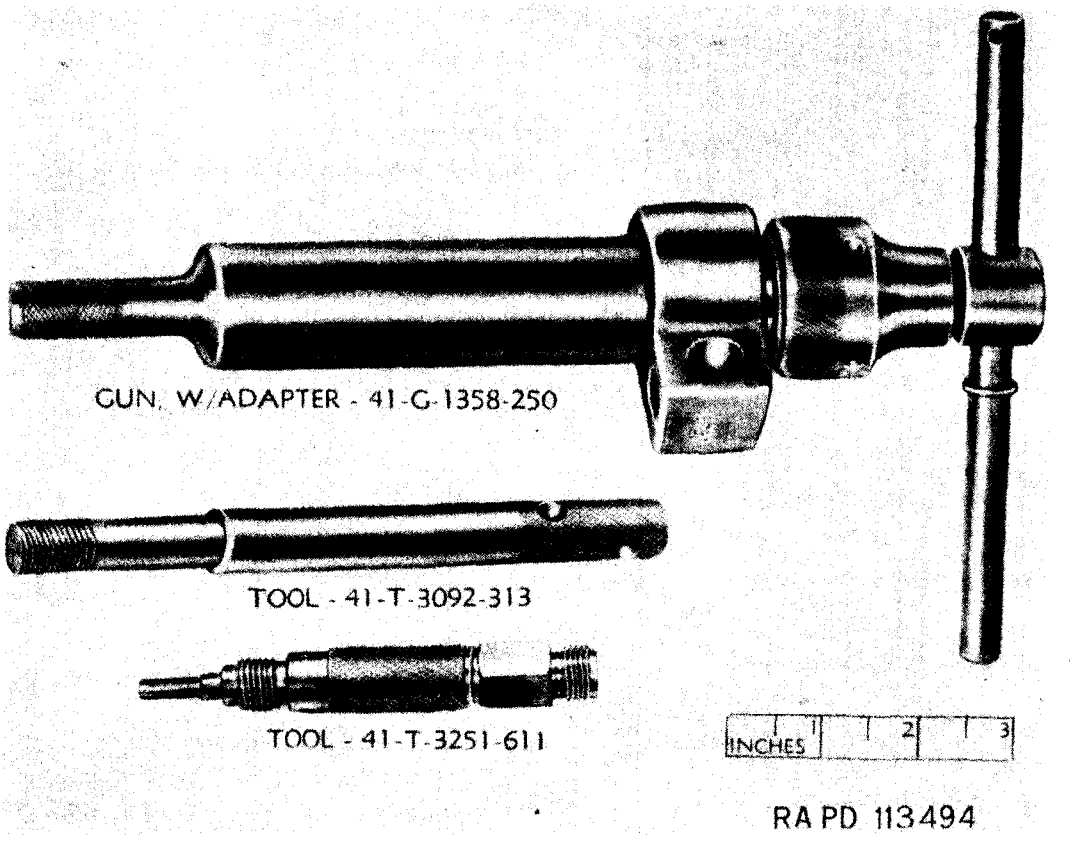


Figure 155. Special tools for 75-mm howitzer carriage M8.

Table I. Specially Designed Tools and Equipment

Item	*Identifying Number*	*References*		*Use*
		Fig.	*Par.*	
For Howitzer (Pack), 75-mm, M1A1				
BAG, canvas, spare parts, 13½ x 10½ in.	C59812	153	9	——
BRUSH, bore, 75-mm, M9	B168038	152	85	——
COUPLING, unloading, rammer	A207465	152	22	For use w/rammer, unloading, M1.
COVER, bore brush, M516	C83755	152	9, 85	——
COVER, muzzle, M1	C6485	153	16	——
LANYARD, firing, 3 ft., M8	B103781	8, 153	12	——
RAMMER, cleaning and unloading, M3	C91875	152	22	——
RAMMER, unloading, M1	C76049	152	22	——
SIGHT, bore, breech	41–S–3636–160	153	182	——
SIGHT, bore, muzzle	41–S–3645–200	153	182	——
STAFF-SECTION, end (33½ in. long)	B104031	152	16, 22	Used with bore brush or rammers.
STAFF-SECTION, intermediate (32⅝ in. long)	B104029	152	16, 22	——
WRENCH, fuze, M16 (T5)	41–W–1496–115	153	166	——
WRENCH, fuze, M18 (T12E1)	41–W–1496–135	153	166	——
or				
WRENCH, fuze, M71A, carb. steel (To be issued in lieu of Wrench 41–W–1496–135 until present supply is exhausted).	41–W–1596–50	153	78	——
For Carriage, Howitzer, 75-mm, M8 (For All Units)				
CAN, oil, recoil, 1½ qt. (3 in. diam. x 15 in. high).	42-C-3803	154	124	——
GUN (FILLER), oil, recoil, hand operated, screw type, M3, w/ adapter.	41–G–1358–250	155, 186	124	To establish reserve oil.
HANDSPIKE, M3	41–H–1552–350	11, 21, 154, 192	15, 16 143	To shift trail and disassemble rear trail assembly and trail fulcrum.
SLEEVE, aiming post, M1 (canvas, red and white, 30 in. over-all).	24–S–1002	154	——	——
TOOL, equilibrator locking, w/holes for pin handle, threaded one end, length over-all 7 in.	41–T–3092–313	155, 188	145	To remove equilibrator assembly.
TOOL, liquid, releasing	41–T–3251–611	155, 185	124	To drain reserve oil.

Table I. Specially Designed Tools and Equipment—Continued

Item	*Identifying Number*	*References*		*Use*
		Fig.	*Par.*	
WRENCH, spanner, face, offset handle, wheel nut, flat key type	41–W–3248–10	——	155	To remove roller bearing lock nut from hub-liner.
For Towed and Airborne Equipment Only				
BAR, lifting	5593365	15, 17, 23, 24, 27, 154	25	For disassembling howitzer for pack loads.
CABLE, hold-down, assembly	6554583	3	23	For securing howitzer to carriage when traveling.
COVER, canvas, over-all, M118A1, complete	7159027	——	23	——
DRAWBAR, assembly	6554580	18, 32	16, 23, 25, 27	——
LIGHT-SYSTEM, blackout, 6–8 volt, 14½ ft. cable, complete	7106924	154	23	——
For Animal Transport Equipment Only				
PACK, bottom sleigh and recoil mechanism	7107394	——	62	——
PACK, breech mechanism and implement	7107348	——	62	——
PACK, cradle and top sleigh	7107395	——	62	——
PACK, fire control instrument and survey	7123360	——	62	——
PACK, front trail	7107396	——	62	——
PACK, howitzer tube	7107393	——	62	——
PACK, rear trail and axle	7107397	——	62	——
PACK, wheel and ammunition	7111575	——	62	——
For Airborne Equipment Only				
HARNESS, control pattern, M2	7122038	118	50	——
PARACAISSON, M18	——	112, 113	49	——
PARACHEST, M17	——	109, 111	49	——
PARACRATE, M1	6554308	56, 95	46	——
PARACRATE, M2	6554307	60, 96	46	——
PARACRATE, M13	——	97, 98	49	——
PARACRATE, M14	——	101, 102	49	——
PARACRATE, M15	——	103, 104	49	——
PARACRATE, M16	——	105, 106	49	——
PARACRATE, M7A1	——	107, 108	46	——
WHEEL, caster, assembly	7120347	18, 31	16, 27	——
For Marine Corps Equipment Only				
CINCHA, M5, and clamp	7159045	——	——	——
HARNESS, shoulder	C6890	——	——	——
POLE, towing	C58154	——	——	——

Section XVI. LUBRICATION

79. General

This section contains information for properly lubricating and cleaning the matériel. Authorized cleaning and preserving materials are listed in table II (par. 83). Prescribed lubricants are listed in the lubrication order (fig. 156).

80. Lubrication Order

a. Lubrication order LO 9–319 (fig. 156) prescribes organizational lubrication and cleaning maintenance for the howitzer and carriage.

b. The locations of the lubricating fittings are illustrated in figures 157 and 158. The points illustrated are indicated along the border of the lubrication order (fig. 156) by corresponding circled numbers.

c. A lubrication order is placed on, or is issued with, each item of matériel and is to be carried with it at all times. In the event the matériel is received without a lubrication order, one will be requisitioned in conformance with instructions and lists in FM 21–6.

81. Lubrication—General Instructions

a. Lubricants are prescribed in the KEY on the lubrication order in accordance with three temperature ranges—above +32° F.; from +32° F. to 0° F.; and below 0° F. The time to change grades of lubricants is determined by maintaining a close check on operation of the matériel during the approach to prolonged periods when temperatures will be consistently in the next higher or lower range. Because of the time element involved in preparing for operation at different prevailing temperatures, a change to lubricants prescribed for a different range will be undertaken in accordance with weather forecast information. Ordinarily, it will be necessary to change lubricants only when expected air temperatures will be consistently in the higher or lower range, unless malfunctioning occurs sooner due to lubricants being of improper consistency.

Note. Seasonal changes of lubricants will be recorded in the Artillery Gun Book.

b. Service intervals specified on the lubrication orders and in the maintenance schedules (pars. 91 and 92) are based on normal operating conditions and continuous use of the matériel with frequent firing. Reduce these intervals under extreme condi-

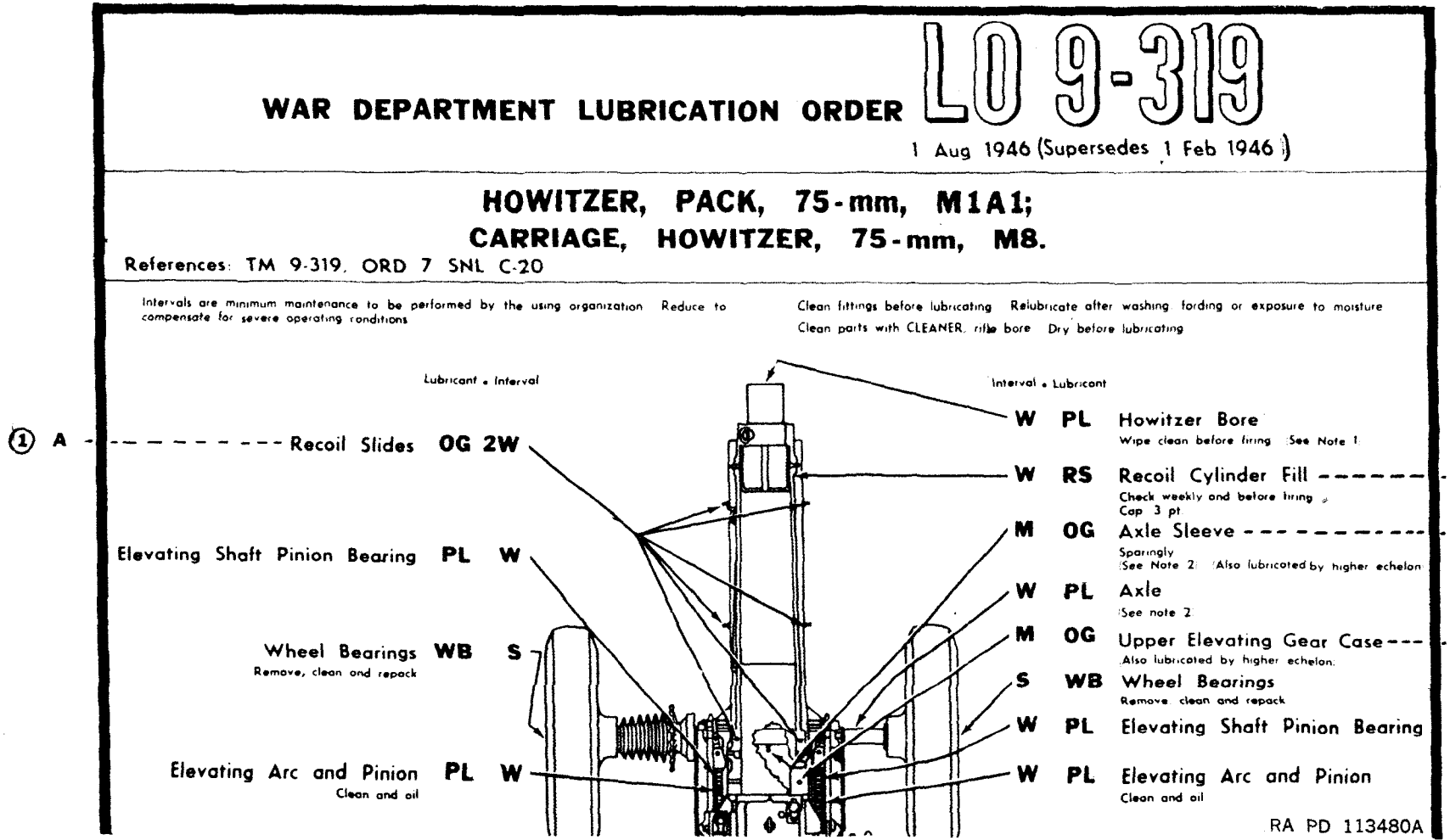
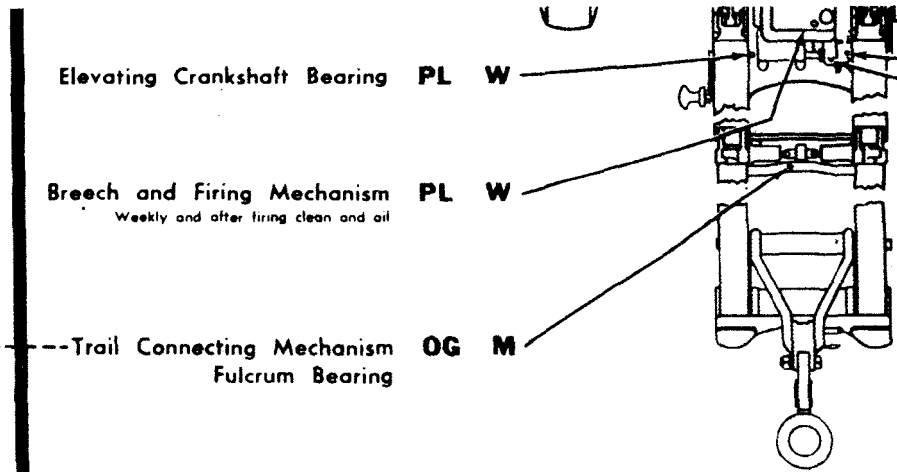


Figure 156. Lubrication order for 75-mm pack howitzer matériel.



Elevating Crankshaft Bearing PL W

Breech and Firing Mechanism PL W
Weekly and after firing clean and oil

② A — Trail Connecting Mechanism OG M
Fulcrum Bearing

W PL Elevating Crankshaft Bearing

M OG Lower Elevating Gear Case — ③ B
(Also lubricated by higher echelon)

—NOTES—

1. HOWITZER BORE—After firing and on 3 consecutive days thereafter, clean with CLEANER, rifle bore. After 4th cleaning wipe dry and oil if the howitzer will not be fired within the next 24 hours. Weekly clean with CLEANER, rifle bore, wipe dry and recoil.

2. AXLE SLEEVE, AXLE AND DUST COVER ASSEMBLY—Traverse completely to left and clean exposed surface of right axle and apply a film of PL. Traverse completely to right. Loosen retaining screws and clips left and right side of dust cover and slide dust cover to one side. Clean exposed portion of axle and coat with OG. Slide dust cover to other side and repeat operation. Reassemble and lubricate axle sleeve *through fitting as prescribed*.

OIL CAN POINTS—Weekly, lubricate front and rear cradle locking pins, cradle trunnion hooks and latch mechanism, front trail bearings, rocker pinion bearings, rocker trunnion bearings, elevating crank handles, interrupted threads of breech ring and tube, equilibrator pins, equilibrator stem guides and springs, equilibrator bearings, piston rod latch and lever, recoil indicator, axle sleeve lock, tap sleigh clamping latch and pin, trail fulcrum link and plunger joints, trail connecting mechanism housings and front and rear trail connecting hinges.

LUBRICATED AFTER DISASSEMBLY BY HIGHER ECHELON—Traversing mechanism, upper and lower elevating gear cases, axle sleeve.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 1 Aug 1946.

BY ORDER OF THE SECRETARY OF WAR
DWIGHT D EISENHOWER Chief of Staff

OFFICIAL:
EDWARD F WITSELL
Major General
The Adjutant General

—KEY—

LUBRICANTS	EXPECTED TEMPERATURES			INTERVALS
	above +32° F.	+32° F. to 0° F.	below 0° F.	
	PL–Medium	PL–Medium	PL–Special	W–Weekly
	OG–0	OG–00	OG–00	2W–2 Weeks
PL–OIL, lubricating, preservative				M–Monthly
OG–GREASE, O. D.				S–6 Months
WB–GREASE, general purpose, No. 2–all temperatures				
RS–OIL, recoil, special–all temperatures				

DISTRIBUTION: AAF (5); AGF (2); T (10); Dept (5); Arm & Sv Bd (1); Tech Sv (2); FC (1); PE (Ord O) (5); Dist 9 (3); Establishments 9 (3) except Am Establishments (0); Gen & Sp Sv Sch (5); A (ZI) (10), (Overseas) (3); CHQ (2); D (2); R 9 (1); Bn 9 (1); C 9 (1) except T/O & E 9–17, 9–500–Adm, Dep Am, Distr, Recovery, Bomb Disposal, Am Renovation Plat (GA) (0); One Copy to each of the following: T/O & E 6–187; 6–217T; 6–218T; 6–227T.

For explanation of distribution formula see FM 21–6.

Requisition additional Lubrication Orders in conformance with instructions and lists in FM 21-6 RA PD 113480B

Figure 156. Lubrication order for 75-mm pack howitzer materiel.

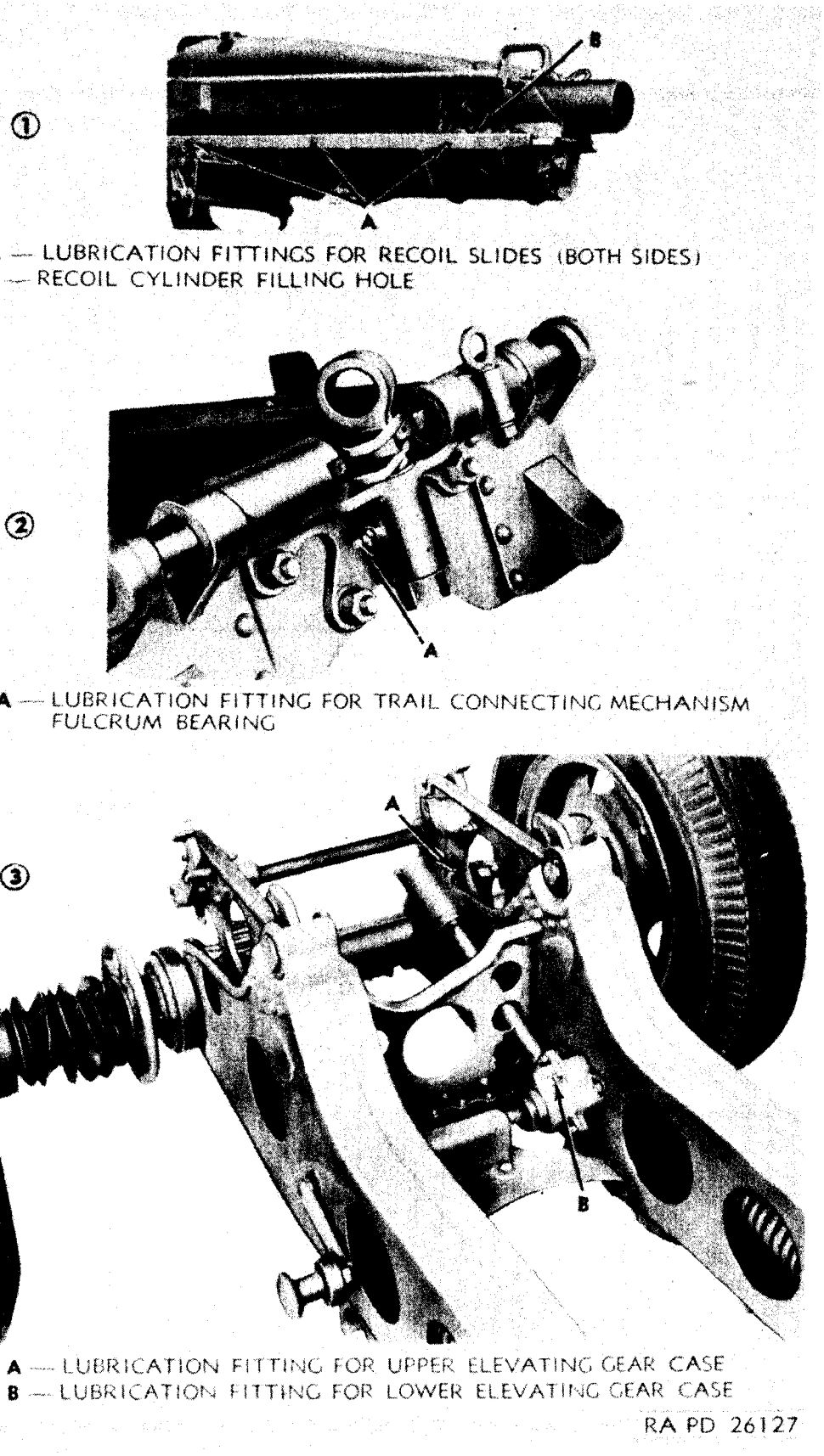


Figure 157. Location of lubricating fittings—Nos. 1–3 inclusive.

tions such as excessively high air temperatures, prolonged periods of traveling or firing, operation in sand or dust, immersion in water, or exposure to moisture. Any of these conditions may quickly destroy the protective qualities of the lubricant and make servicing necessary in order to prevent malfunctioning or damage to the matériel. See section XII for operation under unusual conditions.

c. Clean lubricating equipment both before and after use. Wipe lubricating fittings, oilholes, and surrounding surfaces clean before applying lubricant. Operate the lubricating guns carefully and in such a manner as to insure proper distribution of the lubricant. If lubricating fitting valves stick and prevent the entrance of lubricant, remove the fitting and determine and eliminate the cause. Replace broken or damaged fittings. If a fitting cannot be replaced immediately, cover with tape as a temporary expedient to prevent the entrance of dirt. Lubricating fittings and oilholes are circled with red paint for ready identification. The recoil mechanism filling plug is circled with green paint to indicate use of recoil oil (special). If the plug is circled with yellow paint notify ordnance maintenance personnel, as yellow paint indicates the use of recoil oil (heavy), which is not prescribed on the lubrication order.

d. Lubricate bearing surfaces equipped with lubricating fittings with the grease gun provided. Lubricate the points equipped with

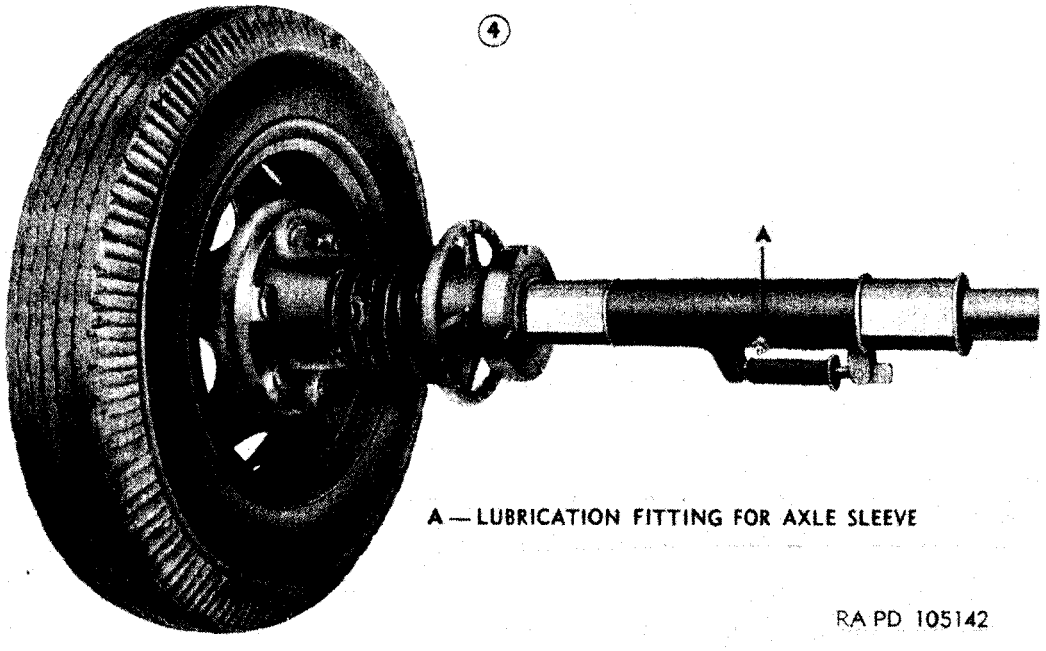


Figure 158. Location of lubricating fitting—No. 4.

oilholes with the oilcan provided therefor. Lubricate unpainted surfaces by applying the prescribed oil (fig. 156) with a cloth which has been saturated with the oil and then wrung out. Oil the bore by wrapping an oil saturated cloth around the cleaning brush and working it back and forth through the bore. See paragraph 157*c* for procedure in packing wheel bearings.

e. The lubrication order (fig. 156) designates the parts which are disassembled and serviced by ordnance maintenance personnel only.

82. Lubrication Under Unusual Climatic Conditions

a. Cold Climates. Lubrication at temperatures below 32° F. requires special precautions to prevent malfunction, mechanical failure, or undue wear. Excessive or improper oil or grease on operating parts will thicken or congeal, resulting in sluggish action or complete failure at low temperatures. Use only the lubricants prescribed (fig. 156) and apply sparingly. Due to the sparing amount of lubricant used under these conditions, more frequent servicing than is specified for operation under usual conditions (pars. 91 and 92) will be necessary.

b. Hot Climates. Special lubricants ordinarily will not be required at extremely high temperatures, as lubricants prescribed for temperatures above 32° F. provide adequate protection. However, more frequent servicing than specified in paragraphs 91 and 92 is necessary, because the heat tends to dissipate the lubricants.

c. Humid or Salt Air Climates. High humidity, moisture, or salt air tends to contaminate the lubricant, necessitating more frequent servicing than specified in paragraphs 91 and 92.

d. Dusty or Sandy Conditions. Dust and sand when mixed with the lubricant form an abrasive paste and cause extremely rapid wear of moving parts. The amount of lubricant used should be as light and sparing as is practical to obtain proper functioning, and the matériel should be serviced more frequently than specified in paragraphs 91 and 92. The rocker assemblies and pinions and traversing axle and handwheel should be wiped nearly dry before operating.

83. Cleaning and Preserving Materials

The cleaners, preservatives, and miscellaneous related items, exclusive of lubricants, required for use with this matériel are listed in table II. See TM 9–850 for more complete description and use of these materials. The items in this list have been extracted from Department of the Army Supply Catalog pamphlets ORD 3 SNL K–1 and ORD 3 SNL K–2, which are the authority for requisitioning, except for items which are issued by the Quartermaster Corps and are so indicated.

Table II. Cleaning and Preserving Materials

ALCOHOL, ethyl, grade 1 (for telescope eyepieces).
BRUSH, artists, round, camel's hair, No. 5.
BRUSH, paint, metal bound, flat (medium grade) No. 1 (3 in.).
BURLAP, jute, 8-oz., 40 in. wide.
CLEANER, rifle bore.
CLOTH, abrasive, aluminum oxide, sheets, 9 x 11 in., 5/0–180 (fine) and 3/0–120 (medium).
CLOTH, crocus, sheets, 9 x 11 in.
CLOTH, wiping, cotton.
COMPOUND, grease cleaning.
ENAMEL, rust-inhibiting, olive drab.
LACQUER, spraying, clear (for steel name plates).
NEEDLE, collar, regular bend, 4½ in.
OIL, neat's-foot (for leather goods).
PAINT, gasoline soluble (various colors as required for camouflage).
PALM, sewing.
PAPER, lens tissue, sheets, 7½ x 11 in., 100 sheets per book.
SOAP, issue (QM issue).
SOAP, liquid, lens cleaning.
SOAP, saddle (for leather goods).
SOLVENT, dry cleaning (QM issue).
SPONGE, natural or cellulose.
TAPE, adhesive, nonhygroscopic, O.D.
THINNER, enamel, synthetic (TS).
TWINE, jute.
WASTE, cotton, white.

84. Cleaning—General Instructions

a. General. (1) See preventive maintenance schedules (pars. 91 and 92) for cleaning intervals.

(2) Rifle bore cleaner is the prescribed cleaner for all surfaces.

(3) During removal from storage (app. I), dry cleaning solvent is the preferred cleaner for removing corrosion preventive compound. A mixture of one part grease cleaning compound to four parts of either dry cleaning solvent or kerosene can be used to completely remove the compound.

b. General Precautions in Cleaning. (1) Rifle bore cleaner will not be diluted.

Note. Rifle bore cleaner is not a lubricant. Parts which require lubrication will be wiped dry and oiled.

(2) Dry cleaning solvent evaporates quickly, has a drying effect on the skin, and if used without gloves may cause cracks in the skin and in some cases a mild dermatitis. Use only in well ventilated places. Do not use dry cleaning solvent to clean parts which have been exposed to powder fouling during firing, because it will not readily dissolve the corrosive salts from the powder and primer compositions.

(3) Avoid getting petroleum products, such as dry cleaning solvent, engine fuels, or lubricants on rubber parts, as the petroleum will harden, crack, and discolor the rubber. Wash rubber with clean or soapy water.

(4) Never use a solution of lye or other caustic to clean howitzer parts.

(5) The use of gasoline or benzine for cleaning is prohibited

as they present a fire hazard.

(6) Gloves should be worn when handling cleaned parts before lubrication as acid from the hands promotes quick rusting.

(7) Serious damage to sighting and fire control equipment as well as to component parts of the howitzer may result from the use of water, steam, or compressed air from a high pressure hose for cleaning purposes. The safest method of over-all cleaning is by sponging with clean water or, when necessary, with soapy water. Before cleaning the howitzer, remove telescopes and instrument lights from their mounts and install the cover for the mount.

85. Cleaning—Specific Procedures

a. General. (1) Refer to general instructions for cleaning (par. 84).

(2) For special precautions when cleaning in temperatures below 32° F, see paragraph 86.

b. Cleaning the Bore and Chamber. (1) Bring the tube to an approximately horizontal elevation. Assemble the bore brush to the cleaning staff (fig. 152). Apply the cleaner to the brush, insert it into the bore from the chamber end, and thoroughly scrub all surfaces with a pushing and pulling action. When clean, the bore will have a uniform gray appearance. Do not attempt to obtain a bright polished finish.

(2) To dry the bore and chamber, loosely wrap clean, dry jute burlap around the end of the cleaning staff to approximately the diameter of the bore and sew the burlap securely in place with jute twine. Dry all surfaces of the bore and chamber, replacing the jute burlap as is necessary.

(3) See paragraph 81*d* for procedure in oiling the bore.

(4) After firing, *when the tube has cooled until it can be touched with the bare hand,* and on 3 consecutive days thereafter, thoroughly clean the bore and chamber with rifle bore cleaner. Make sure that all surfaces, including the rifling are left well coated with the cleaner. *Do not wipe dry.* After the fourth cleaning, if the howitzer probably will not be fired within the next 24 hours, wipe dry, and oil.

(5) When the weapon is not being fired, thoroughly clean the bore and chamber and renew the oil film weekly.

c. Cleaning the Breech Mechanism and Firing Lock. (1) Disassemble the breech mechanism (par. 114) and the firing lock (par. 119).

(2) After firing, and on 3 consecutive days thereafter, clean the parts with a cloth or sponge saturated in rifle bore cleaner.

Use a bath for small parts. Suitable brushes may be used, if available.

(3) Wipe dry and apply a film of the prescribed oil (par. 80).

(4) Reassemble and install the parts (pars. 115 and 120).

(5) When the howitzer is not being fired, thoroughly clean and renew the oil film weekly.

d. Cleaning the Matériel in General. (1) Rifle bore cleaner also will be used to clean other unpainted operating parts of the howitzer matériel. After cleaning, wipe dry and apply a film of the prescribed oil (par. 80).

(2) Painted surfaces in general will be cleaned with clean water or with warm soapy water by swabbing with a saturated cloth or sponge. Rinse parts thoroughly with clean water and wipe dry.

(3) Sighting and fire control instruments will be cleaned as prescribed in paragraph 172.

86. Cleaning Under Unusual Climatic Conditions

a. General. The mechanical procedures for cleaning the matériel (par. 85) are the same for all temperatures or climatic conditions; however, certain precautions must be observed when cleaning at temperatures below 32° F.

b. Cleaning with Rifle Bore Cleaner at Temperatures below 32° F. (1) Do not under any condition dilute rifle bore cleaner.

(2) Do not add antifreeze to rifle bore cleaner.

(3) Store the cleaner in a warm place, if practical, and shake well before using.

Section XVII. PREVENTIVE MAINTENANCE SERVICE

87. General

Preventive maintenance services prescribed by Army Regulations are a function of using organization maintenance personnel. This section contains important general preventive maintenance procedures and schedules of preventive maintenance service allocated to the crew and to the battery mechanic. Special maintenance of specific groups is covered, when necessary, in the section pertaining to the group. Special maintenance for operation under unusual climatic conditions is covered in section XII. Battery personnel will disassemble only so far as is described in this manual. If nature of repair requires further disassembly, it will be accomplished by ordnance maintenance personnel.

88. Common Preventive Maintenance Procedures

The following general preventive maintenance will be observed in addition to that referred to in the schedules in paragraphs 91 and 92.

a. Rust, dirt, grit, gummed oil, and water cause rapid deterioration of internal mechanisms and outer unpainted surfaces. Particular care should be taken to keep all bearing surfaces cleaned and properly lubricated. Remove all traces of rust or corrosion from unpainted bearing surfaces with crocus cloth, which is the coarsest abrasive to be used by the using arm for this purpose.

b. Loose parts will be kept tightened and broken parts replaced or repaired. Bolts, nuts, and screws should be kept tightened, cotter pins spread properly, and threads oiled and free from burs or bruises.

c. At least every 6 months check to see that all modifications have been applied. A list of current modification work orders is published in FM 21–6. No alteration or modification will be made, except as authorized by modification work orders.

d. Check tools, equipment, and spare parts for completeness (sec. XV). Replace missing items and turn in for repair all damaged items. Use only tools that are provided and see that they are serviceable. After use, items which are susceptible to rust or corrosion must be thoroughly cleaned as outlined in paragraph 84, coated with a film of the oil prescribed in the lubrication order (par. 80), and stored in their proper chests or tool rolls.

e. Should a shell burst near the howitzer, be sure, before firing the next round, that the weapon has not been damaged. Serious damage will be reported to the ordnance officer.

89. Care of Canvas

To prevent formation of damaging mildew, shake out and air the canvas covers for several hours at frequent intervals. Repair without delay any loose grommets or rips in the canvas. A steel sacking needle and jute twine are furnished for this purpose. Detailed instructions are contained in TM 9–850. Failure to make immediate repairs may allow a minor defect to develop into major damage. Mildewed canvas is best cleaned by scrubbing with a dry brush. If water is necessaryy to remove dirt, it must not be used until mildew has been removed. If mildew is present, examine fabric carefully by stretching and pulling for evidence of rotting or weakening. If fabric shows weakness, it is probably not worth retreatment. If not damaged, retreat the canvas as outlined in TM 9–850. Oil or grease can be removed by scrubbing with issue soap and warm water. Rinse well with clear water and dry.

Caution: At no time is gasoline or dry cleaning solvent to l used to remove oil or grease spots from canvas. Wet canvas shou be thoroughly dried before folding.

90. Painting

a. Painting is for the purpose of preserving outside nonoperating surfaces of the matériel from which the protective finish has become removed by corrosion, wear, removal of corrosion, or other causes. Painting is also used to prevent reflection of light from parts which are or have become shiny and for disruptive pattern painting for camouflage. See TM 9–2851 for painting instructions; see FM 5–20D for camouflage painting of artillery matériel. Paints are listed in Department of the Army Supply Catalog pamphlet ORD 3 SNL K–1, which is the authority for requisitioning.

b. When the matériel is to be entirely repainted or spot painted for the prevention of corrosion, use olive drab, synthetic, lustreless enamel and synthetic enamel thinner. Preservative lubricating oil, medium, can be used as a temporary expedient to prevent corrosion of damaged areas until they can be painted.

c. All dirt, oil, or grease should be cleaned from the area to be painted by one of the methods outlined in paragraph 85 and any corrosion should be removed with aluminum oxide abrasive cloth or sandpaper, leaving the area clean and dry. Thin the paint to a painting consistency and carefully brush it on the surface to be painted, taking care to prevent running or dripping onto other parts of the matériel. Do not paint over name plates or serial numbers or polished surfaces.

d. Name plates which have become corroded or rusty will be carefully cleaned and coated with clear lacquer.

e. Sighting and fire control instruments will not be painted by the using arms.

91. Organizational Maintenance Schedules (Crew)

The following schedule contains information for inspection and maintenance of points for which the crew is responsible. Detailed instructions are included, or the proper paragraph is indicated. Service intervals are based on active use under temperate climatic conditions. Reduce intervals for unusual climatic conditions as outlined in section XII. Extend the intervals when not in use.

Point	*Preventive maintenance*	*Detailed instructions*
	Before Firing	
Bore and chamber	Wipe dry	Pars. 17 and 85*b*.
Breech and firing mechanisms	Check for proper functioning	Pars. 12*a* and 19.
Recoil mechanism	Check for excessive oil leakage. Drain and re-establish oil reserve.	Pars. 98 and 124.
Respirator	Adjust the respirator	Par. 17*d*.
	During Firing	
Recoil mechanism	Observe behavior and check for (1) smooth operation, (2) length of recoil, (3) complete return to battery without shock, and (4) excessive oil leakage.	Par. 21.
	After Firing	
Bore and chamber	Clean thoroughly every day until "sweating" is removed. Oil as prescribed.	Pars. 81*d* and 85*b*.
Breech mechanism and firing lock.	Disassemble, clean, and oil daily until "sweating" is removed.	Pars. 84, 85*c*, 114, and 119.
Rocker assemblies and pinions	Clean and oil	Pars. 80 and 143.
Howitzer in general	Inspect over-all and correct any deficiencies.	Pars. 80 and 81.
Traversing area of axle	Clean and oil	Pars. 91 and 152.
	Weekly Service	
All oilcan points	Wipe clean and oil	Pars. 80 and 81.
Bore and chamber	Examine for evidence of powder fouling or corrosion. Clean, if necessary, and oil.	Pars. 85*b* and 110.
Breech mechanism and firing lock.	Examine for evidence of corrosion or other damage. Check for smooth, free operation. Clean, if necessary, and oil.	Pars. 116 and 121.
Carriage	Observe general condition. Check for cleanliness, rust, loose parts, proper lubrication, and condition of paint.	Pars. 81 and 82.
Covers	Check for proper installation and condition of canvas.	Par. 89.
Elevating mechanism	Check for smoothness of operation throughout entire range. Clean and oil.	Pars. 80 and 81.
Recoil mechanism	Check for excessive oil leakage. Keep respirator in closed position.	Pars. 98 and 126.
Sighting and fire control instruments.	Wipe clean and oil external unpainted metal surfaces. Clean all lenses.	Par. 172
Tires and wheels	Check condition and air pressure	Par. 157.
Traversing mechanism	Check for smoothness of operation throughout entire range. Clean and oil.	Pars. 91 and 152.

Point	Preventive maintenance	Detailed instructions
	Bi-Weekly Service	
Recoil slides lubricating fittings	Wipe clean and lubricate	Pars. 80 and 81.
	Monthly Service	
All grease fittings	Wipe clean and lubricate	Pars. 80 and 81.
Eyeshields of telescope	Clean and dry	Par. 172.
Felt washers on worms of telescope mount.	Oil	Par. 172.
Nuts, bolts, and screws on all sighting equipment.	Keep tight	Par. 172.
Threads of clamping screws	Clean and oil	Par. 80.
	Before Traveling	
Howitzer materiel in general	Prepare for traveling	Par. 23.
Blackout-lighting system	Check installation and operation	Par. 23.
Breech	Inspect to make certain a round of ammunition has not been left in the chamber.	
Covers	Check installation	Par. 23.
Drawbar and pintle	Check engagement and safety pin	Par. 23.
On-carriage equipment and tool chests.	Check installation and loading	Par. 23.
Traveling locks and latches	Check for proper alinement and engagement.	Par. 23.
Wheels and tires	Inspect general condition and air pressure.	Par. 157.

92. Organizational Maintenance Schedule (Battery Mechanic)

In general, the battery mechanic is issued necessary tools and either performs or supervises all authorized disassembly, maintenance, or adjustments pertaining to the wheel bearings, recoil mechanism, and the equilibrator. The battery mechanic also makes a systematic check to see that all crew maintenance (par. 91) has been properly performed at the prescribed intervals and that the matériel is in the best operating condition possible.

Point	Preventive maintenance	Detailed instructions
	Monthly Service	
Backlash in telescope mount	Check	Par. 179.
Recoil mechanism	Check for leakage of nitrogen and recoil oil. Paint where necessary.	Pars. 17 and 90.
Recoil oil	Check reserve supply for water	Par. 127.
Recoil slides	Clean entire length of slides, inspect for damage, and lubricate.	Pars. 80 and 126.
Respirator	Clean	Par. 126.
Equilibrator	Check adjustment and general condition.	Pars. 147 and 148.
	6-month Service	
Wheel bearings	Clean, repack, and adjust	Pars. 156 and 157.

Section XVIII. MALFUNCTIONS AND CORRECTIONS

93. General

A malfunction is an improper or faulty action of some component part of the weapon, or defective ammunition, that may result in failure to fire or other stoppage or damage to the weapon. The following paragraphs tell how to determine the cause of the malfunction and how to remedy it.

94. Failure to Fire

a. If the howitzer fails to fire, first check to see that the breechblock is completely closed; otherwise, the firing pin may strike the cartridge case instead of the primer.

b. Attempt to fire the piece twice more. If it still does not fire, wait 60 seconds and then open the breech. Should the complete round be extracted, separate the projectile from the cartridge case.

c. Immediately glance at the primer in the base of the cartridge case and if the indent is normal, throw the cartridge case clear of all personnel due to the continued possibility of a hangfire. Reload with another cartridge case or round and resume firing.

d. If the indent on the primer is light or if there is no indent, indication is given that the firing lock is not functioning properly. Remove the firing lock (par. 114*d*), replace it with the spare firing lock, reload, and resume firing.

e. If the malfunction was caused by a defective firing lock, correct it as follows:

(1) If there was no indent on the primer, the cause may either be that the firing pin is broken or deformed or that the firing spring or sear spring is weak or broken. Disassemble the malfunctioning firing lock (par. 119) and replace any defective parts.

(2) If the indent on the primer was light or if it fired only after several percussions, indication is given that the firing lock parts are not working freely or that the firing spring is weak. Disassemble the firing lock, clean all parts, and remove any corrosion or burs or foreign matter. Replace firing spring if weak or damaged.

(3) Apply a light film of oil (par. 80) and reassemble (par. 120).

95. Failure to Extract

a. If, when the breech is opened, the fired cartridge case is not automatically extracted, remove the cartridge case as outlined in paragraph 20.

b. Remove and examine the extractor (par. 112*c*). Replace, if broken or if the lip is worn to a degree that it will not positively contact the rim of the cartridge case.

c. If extractor is not defective, then examine the removed cartridge case for undersize rim not engaged by the extractor; or, if cartridge case was removed with difficulty, examine it for bulges or damages and examine the chamber for fouling or foreign matter. Clean chamber, if necessary (par. 85*b*).

96. Seized Breechblock

If breechblock is seized and can neither be closed nor opened without using undue force, inspect for removable obstructions or other cause and correct, if possible. If malfunction cannot be corrected, report seizure to ordnance maintenance personnel.

97. Oil Index Fails to Move

a. If, when establishing the oil reserve (par. 124), the oil is pumped against evident pressure and the oil index fails to move from the bottom of the recess, indication is given that the oil index is broken, stuck, or the packing is too tight.

b. Drain off the reserve oil (par. 124). Screw in one-half a fill of the oil filling gun and tap the index lightly during this operation. If this does not free the index, notify ordnance maintenance personnel.

98. Excessive Leakage of Recoil Oil

If more than a normal leakage of a few drops of dark oil appears around the recoil stuffing box head, oil index, or the filling plug hole, notify ordnance maintenance personnel.

99. Howitzer Returns to Battery with Shock

a. If the howitzer "slams" into battery, it may be due to improper adjustment of the respirator. Increase the buffing action of the respirator (par. 17*d*).

b. There may be an excess oil reserve caused by incorrect filling or by expansion of the recoil oil due to heat from rapid firing. Establish the correct oil reserve (par. 124). If the excess is due to overheating, allow the howitzer to cool before continuing to fire or drain off a slight amount of recoil oil.

c. If the howitzer still returns with excessive shock, notify ordnance maintenance personnel.

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100. Howitzer Fails to Return to Battery or Slides Out of Battery When Elevated

a. There may be deficient oil reserve. Reestablish correct oil reserve (par. 124).

b. The gas pressure may be low. This is indicated if the oil index shows deficiency after being properly filled, if the oil has an emulsified appearance when released, if the oil does not spurt out, or if the oil screw filler works easily when reestablishing the oil reserve. Report the malfunction to ordnance maintenance personnel.

101. Howitzer Counterrecoil Action Is Jerky

a. If the counterrecoil action is not smooth, indication is given that the sleigh sliding surfaces may be dirty, corroded, lack lubrication, or that air or water has been introduced into the recoil oil.

b. Remove the top sleigh (par. 15), remove any corrosion or obstructions, clean and lubricate all sliding surfaces (par. 80).

c. If oil is foamy or has air bubbles or water in it (par. 127) when oil reserve is released, the entire oil supply must be drained and refilled by ordnance maintenance personnel.

102. Howitzer Overrecoils or Underrecoils

a. If the howitzer overrecoils or consistently recoils its maximum distance (par. 21), drain off the oil reserve and reestablish the correct reserve (par. 124). If trouble persists, notify ordnance maintenance personnel.

b. If the howitzer underrecoils (par. 21), check for correct oil reserve. However, if the recoil oil is very cold, the recoil action will be sluggish. The recoil will become normal after firing warms up the oil. Check the sleigh and recoil slides for cleanliness and proper lubrication.

103. Howitzer Is Difficult to Elevate or Depress

If the elevating cranks require excessive force to operate them, check for and remove any obstructions from the rocker assemblies, pinions, and exterior parts of the elevating mechanism and equilibrator. Clean and lubricate the elevating mechanism. If necessary, adjust the equilibrator as outlined in paragraph 147*b*. If trouble persists, or if there are broken gear teeth or broken equilibrator springs, notify ordnance maintenance personnel.

104. Howitzer Is Difficult to Traverse

If the traversing handwheel requires excessive force to operate it, clean and lubricate the traversing mechanism and the exposed axle. Check for and remove and obstructions. If trouble persists, notify ordnance maintenance personnel.

105. Wheels Loose on Hubs or Spindles

Check wheel stud nuts for tightness. If bearings are worn or damaged or if wheel is excessively loose on the axle when linchpin is inserted, notify ordnance maintenance personnel.

106. Tube and Breech Ring Not Readily Disassembled or Assembled

a. Difficulty in removing the howitzer tube from the breech ring may result from rust, dirt and grit, or burs on the interrupted thread.

(1) Use a strap wrench, if available, to turn the tube counterclockwise until the eyebolt is vertical. Pull the tube forward out of the breech ring.

(2) Smooth any burs with crocus cloth and clean and oil all finished surfaces.

b. If the difficulty is not due to cleanliness but due to actual interference of metal as when a new tube is assembled to the breech ring, then proceed as follows:

(1) Bring the tube into proper alinement for assembly to the bottom sleigh by applying pressure by hand on the eyebolt.

(2) If the key slots in the muzzle hoops are not in the proper position for assembly to the sleigh, note whether the breech hoop lugs and breech ring stops are in contact. If the stop and the lugs are in full contact, remove approximately 0.005 inch from each contact face of the breech ring tube stops.

(3) Reassemble the tube to the breech ring. If the stop lugs are in full contact and the tube does not aline properly, repeat the above procedure.

(4) If the breech ring stops and the breech hoop lugs do not come into full contact and the tube is not alined properly, disassemble the tube from the breech ring and place a thin coat of prussian blue on the tube cone seat in the breech ring. Reassemble the tube, exerting hand pressure, and again disassemble. The prussian blue deposited on the tube will indicate where interference occurs. Polish the area on tube where the prussian blue was deposited with crocus cloth or on oilstone. Repeat this procedure until the tube can be brought into proper alinement by

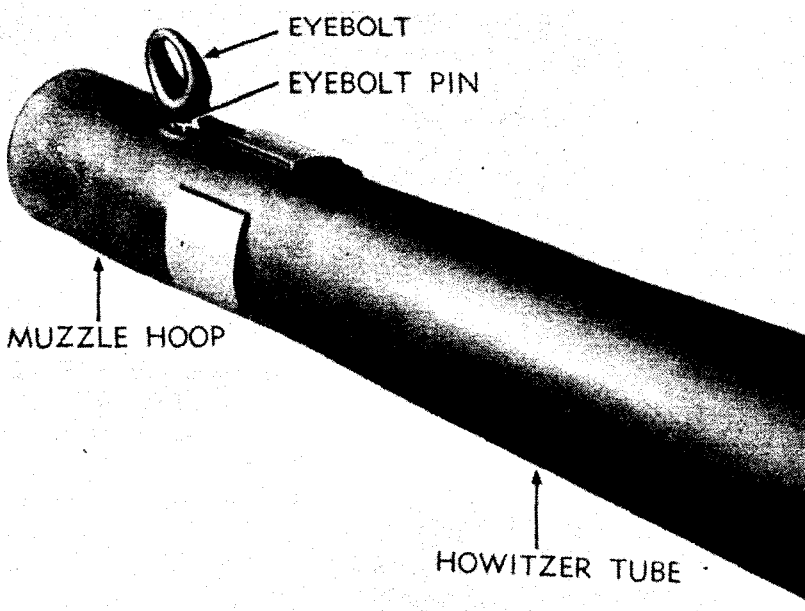
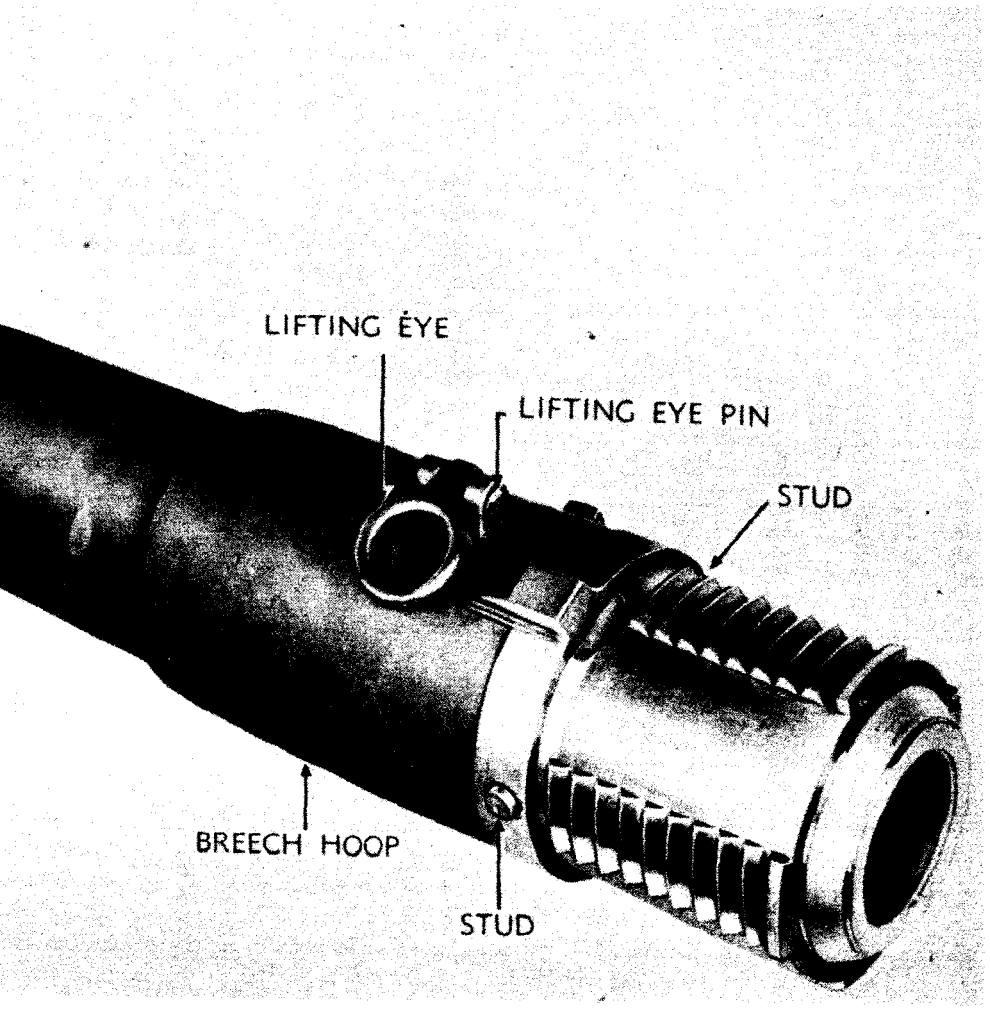


Figure 159.



Howitzer tube assembly.

applying only hand pressure to the eyebolt.

Note. Whenever it is difficult to remove a tube from the breech ring, use a strap wrench, if available, to turn the tube. Do not use a bar through the front eyebolt. The use of a strap wrench insures that the eyebolt will not be sheared off in the disassembly of a tight tube.

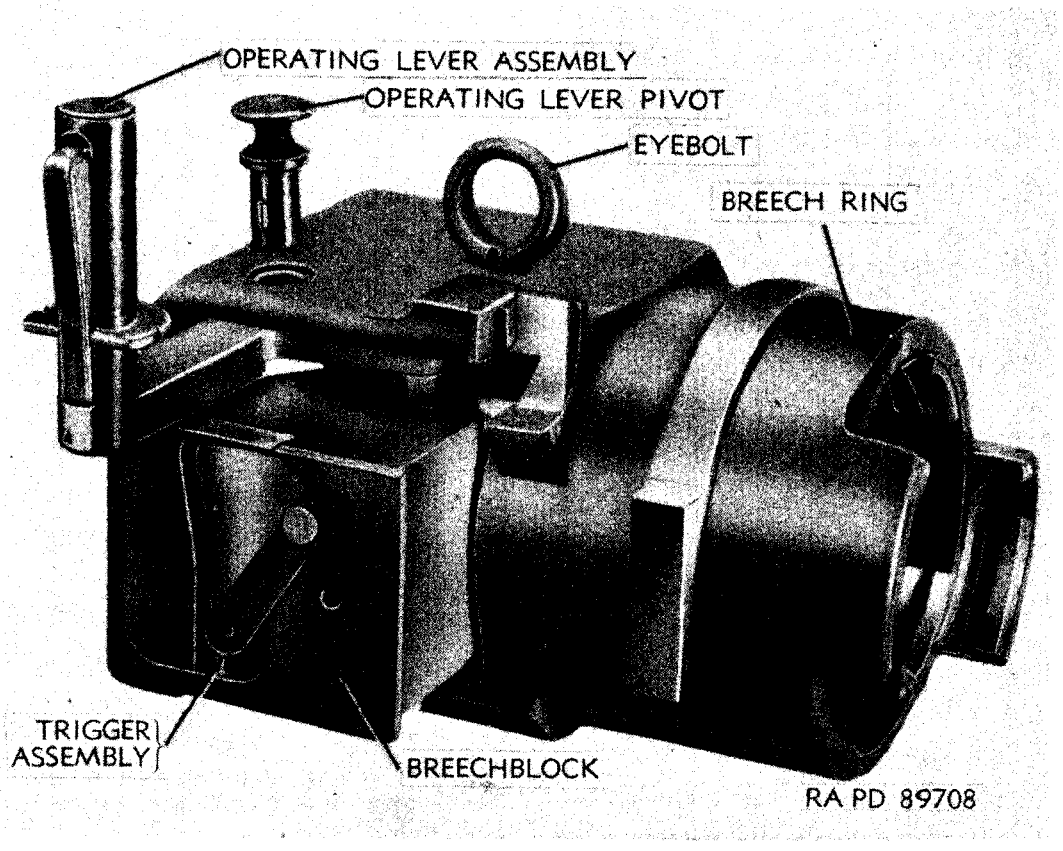


Figure 160. Breech ring assembly.

Section XIX. 75-MM PACK HOWITZER M1A1— TUBE AND BREECH RING

107. Description of Tube and Breech Ring

a. The howitzer tube assembly (fig. 159) and the breech ring assembly (fig. 160) when assembled together from the barrel of the howitzer. The tube assembly is provided with lifting eyes through which lifting bars can be inserted. Leveling plates, inlaid in the top of the breech ring, form seats for the gunner's quadrant.

b. The tube is attached to the breech ring by means of interrupted screw threads. The interrupted threads enable rapid disassembly and reassembly of the tube and breech ring. Only one-eighth of a turn is required to lock these parts together. Two lugs of the breech ring that fit into mating recesses in the bottom

sleigh, lock the breech ring to the bottom sleigh of the recoil mechanism.

108. Removal and Installation of Tube Assembly and Breech Ring

a. Remove the top sleigh assembly as outlined in paragraph 25*c* and *d*.

b. Remove the tube assembly as outlined in paragraph 25*e* and *f*.

c. Remove the breech ring as outlined in paragraph 25*g*.

d. Install the breech ring as outlined in paragraph 28*g*.

e. Install the tube assembly as outlined in paragraph 28*h*.

109. Disassembly and Assembly of Tube and Breech Ring

No disassembly or assembly of the tube and breech ring is authorized for the using arms.

110. Maintenance of Tube Assembly and Breech Ring

a. Clean and oil the bore and chamber as prescribed in paragraphs 81*d* and 85*b* at intervals as outlined in the schedule in paragraph 91.

b. Inspect the painted surfaces for any damaged areas and repaint, if necessary, as outlined in paragraph 90. Do not paint over the leveling plates or polished surfaces.

c. Inspect the bore for raised, flattened, chipped, or stripped lands, gouges, or other damage. Notify ordnance maintenance personnel for correction of serious deficiencies.

d. Decoppering of the bore by using arms is not authorized. A decoppering action will occur, however, whenever reduced charge rounds are fired after a series of normal charge rounds. The gradual coppering action again proceeds whenever firing of normal charge rounds is resumed. If coppering is excessive to the degree where insertion of the round into the chamber becomes difficult, notify ordnance maintenance personnel for correction.

e. The determination of serviceability and the replacement of unserviceable tubes is a function of ordnance maintenance personnel. The accuracy life of the tube, however, depends largely upon the care taken by the battery personnel in its maintenance, the type of rounds fired, the charge number of the propelling charge, and the rate and duration of firing. Experience indicates that the tube used in this howitzer, providing it has not been accidentally damaged and has been properly maintained, can fire 20,000 equivalent full charge rounds before erosion progresses to the point where condemnation is warranted. The Artillery Gun Book contains information on calculating equivalent full charge rounds.

f. If the retaining screw for the breechblock operating handle catch should work loose, it will be necesary to stake it in place. Grind two small notches about one-sixteenth inch deep in the screw seat in the catch, since the catch is too hard to cut with a chisel or file. Insert the catch in its dovetail slot in the breech ring, screw in the retaining screw, and stake it in place.

Section XX. BREECH MECHANISM

111. General

a. The breech mechanism (fig. 161) is housed in the breech ring and is composed principally of the breechblock, the breechblock operating lever, and the extractor. In addition, it houses the firing lock, trigger, and trigger shaft, which are considered components of the firing mechanism. These are covered in detail in section XXI, except those operations which are essential for the assembly and disassembly of the breech mechanism and are covered in this section.

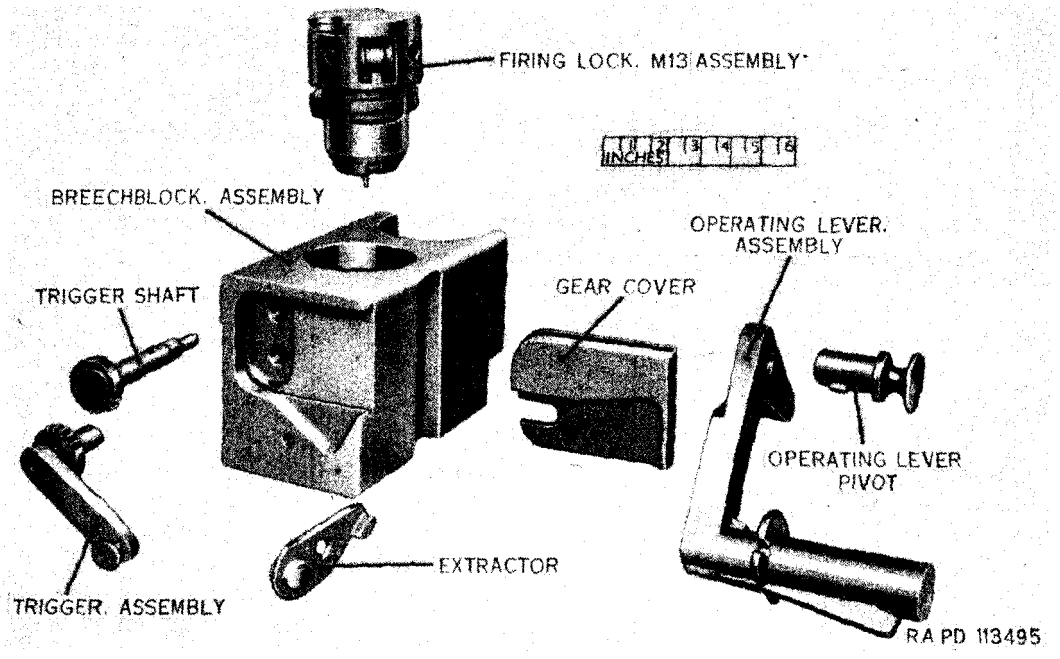


Figure 161. Breech mechanism—exploded view.

b. The purpose of the breech mechanism is to open the breech so that a round of ammunition can be inserted and to close the breech so that the round can be fired.

c. The breechblock is a horizontal-sliding-wedge type and is manually operated by means of the breechblock operating lever. When the lever is unlatched and rotated to the rear, it cams the

breechblock horizontally to the right, thereby opening the breech. With the breech open and a round inserted in the chamber, the breechblock is cammed back into the breech ring when the operating lever is manually rotated forward. The front face of the breechblock is beveled and, as the breech is closed, the beveled face contacts the base of the cartridge case and seats it in the chamber.

d. When the breech is completely closed, the breechblock operating lever engages and is locked in the closed position by a catch located in the upper right corner of the breech ring.

e. The extractor is seated in the right side of the breech ring under the breechblock. As the breech is closed, a camming groove in the breechblock rotates the extractor about its seat in the breech ring until the lip end of the extractor is in a recess in front of the rim of the cartridge case. When the breech is opened, the extractor lip, which is in engagement with the rim of the cartridge case, is cammed sharply to the rear, thereby extracting the case from the chamber and ejecting it from the howitzer.

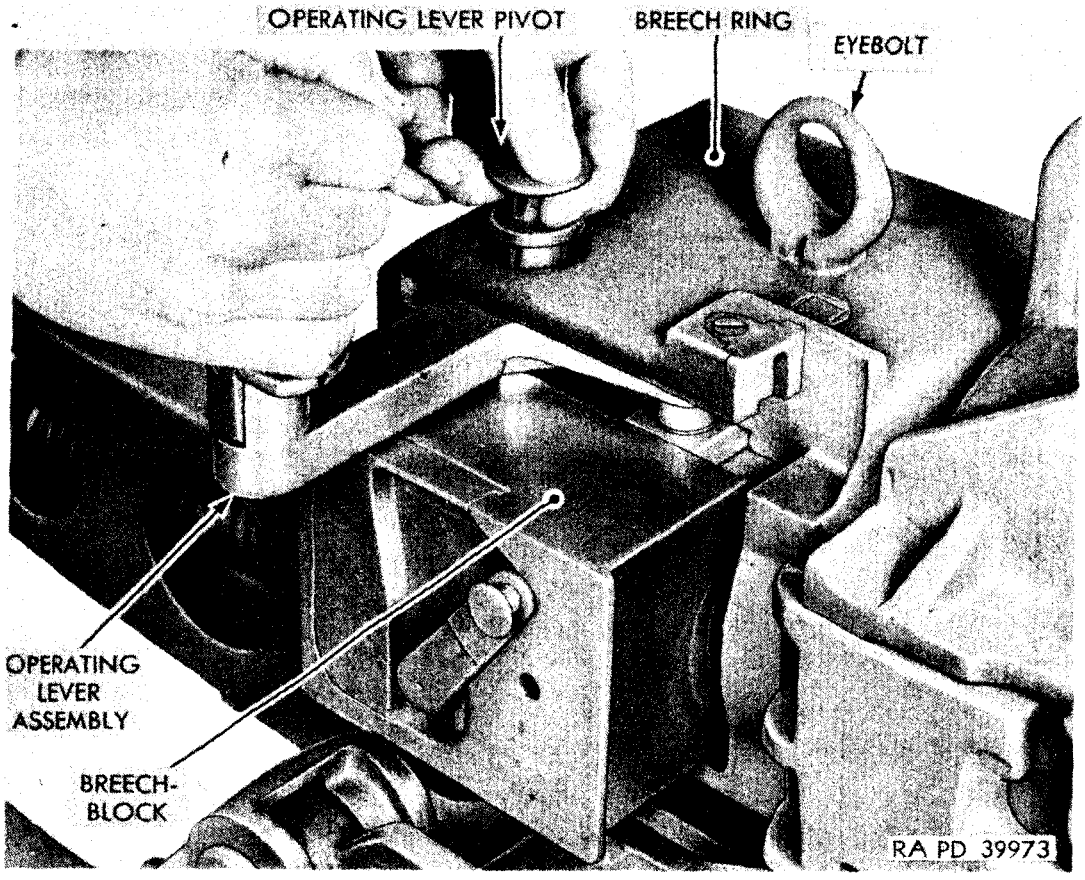


Figure 162. Removing operating lever pivot from breech ring.

112. Removal of Breech Mechanism

a. Open the breech to the point where the assembly line on the breechblock operating lever coincides with the side of the breech ring (fig. 162), and lift out the breechblock operating lever pivot.

b. Slide the breechblock to the right and remove the breechblock operating lever when the cross head has cleared the breech ring (fig. 163).

c. Continue sliding the breechblock to the right and remove it from the breech ring. Rotate the extractor out of its seat in the rear face of the chamber and lift the extractor from the breech ring (fig. 164).

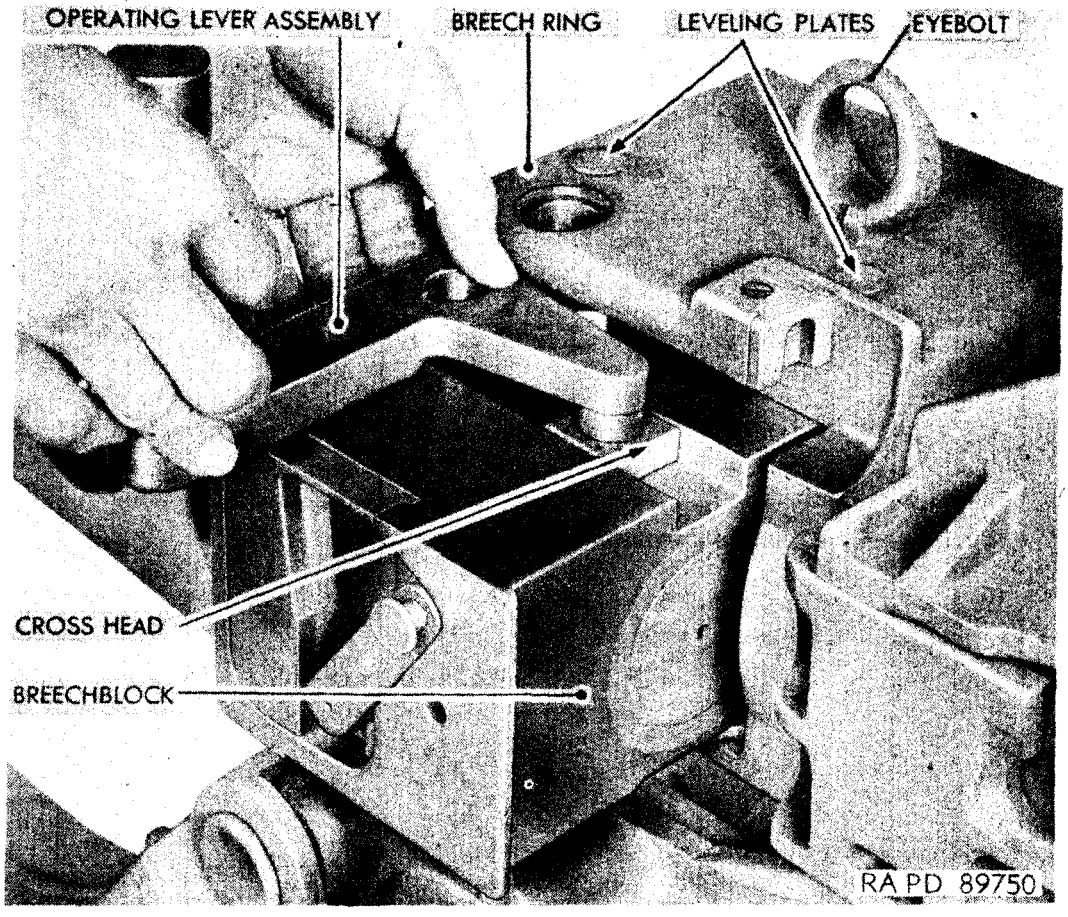


Figure 163. Removing breechblock operating lever.

113. Installation of Breech Mechanism

a. Insert the long trunnion of the extractor into its seat in the breech ring so that the lip of the extractor is in the position of full extraction.

b. Insert the breechblock into the breech ring from the right, making sure that the short trunnion on the extractor engages in

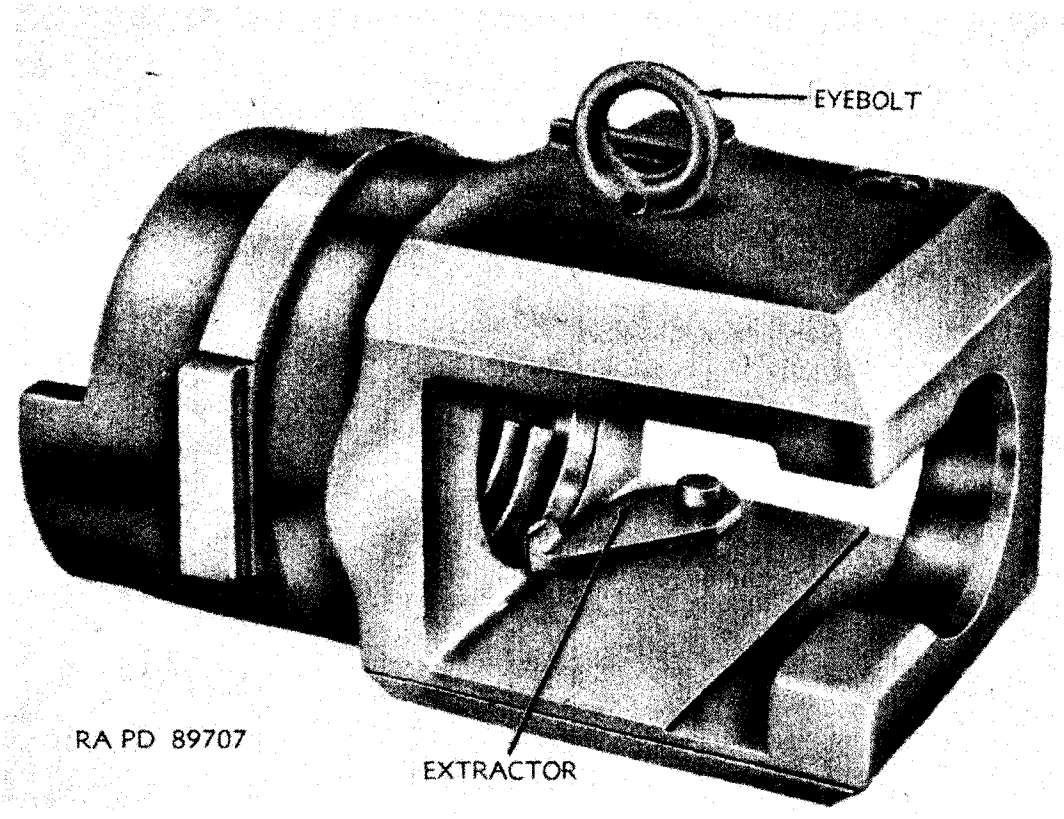


Figure 164. Breech ring with extractor—breech mechanism removed.

its slot in the bottom of the breechblock.

c. Insert the cross head of the breechblock operating lever into the groove as shown in figure 163. Slide the breechblock and breechblock operating lever to the left until the assembly line on the operating lever coincides with the side of the breech ring (fig. 162). Aline the key on the breechblock operating lever pivot with the keyway in its hole in the breech ring and seat the pivot (fig. 162).

d. Close the breech.

114. Disassembly of Breech Mechanism

a. Remove the breechblock from the breech ring (par. 112). Place it upon a clean surface with the rear face uppermost. Slide the gear cover out of the breechblock (fig. 165).

b. Remove the trigger assembly from its hole in the breechblock (fig. 166).

c. Using the knob end of the trigger assembly, pry the trigger shaft out from the breechblock (fig. 167) and remove the trigger shaft.

d. Rotate the firing lock one-sixth of a turn in either direction and withdraw it from the breechblock (fig. 168). Disassembly of

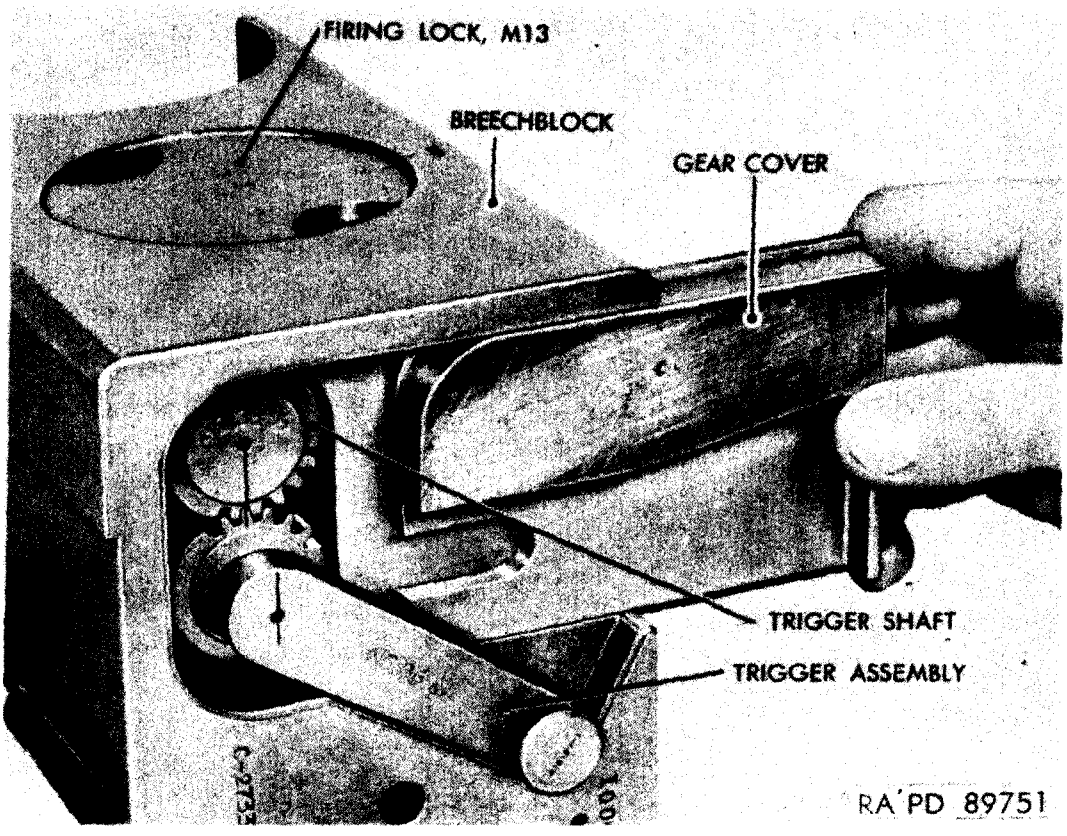


Figure 165. Removing gear cover from breechblock.

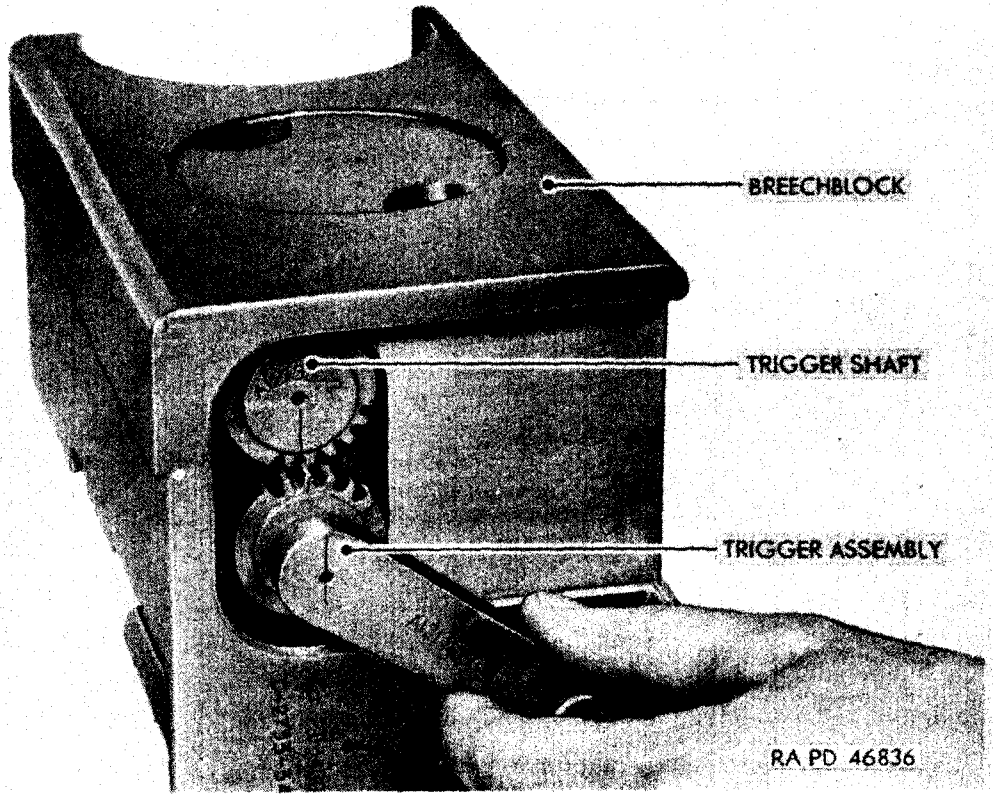


Figure 166. Removing trigger from breechblock.

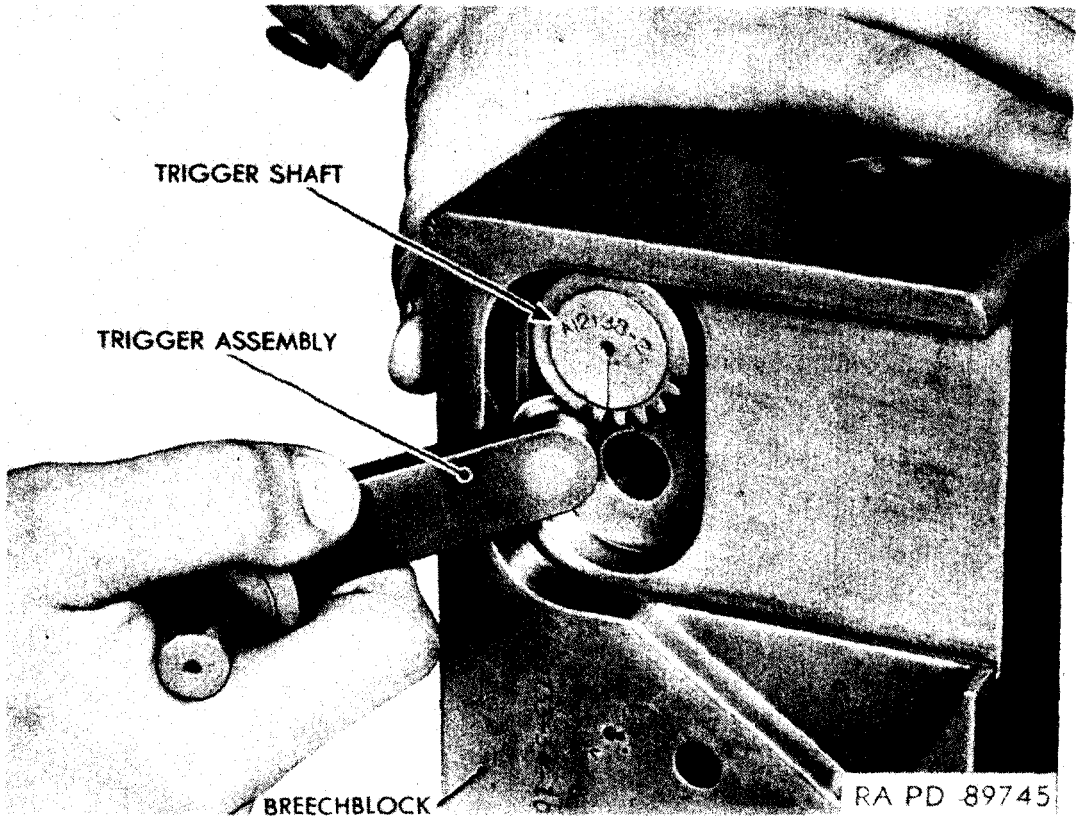


Figure 167. Removing trigger shaft from breechblock.

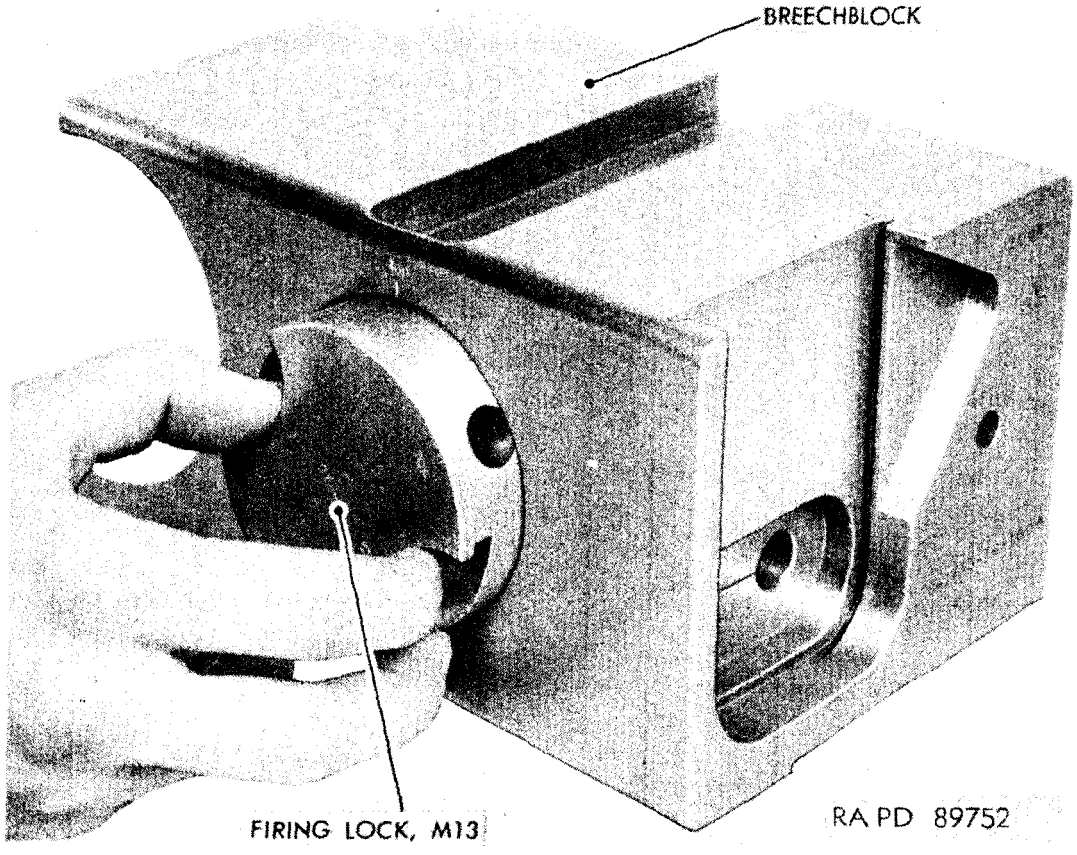


Figure 168. Removing firing lock from breechblock.

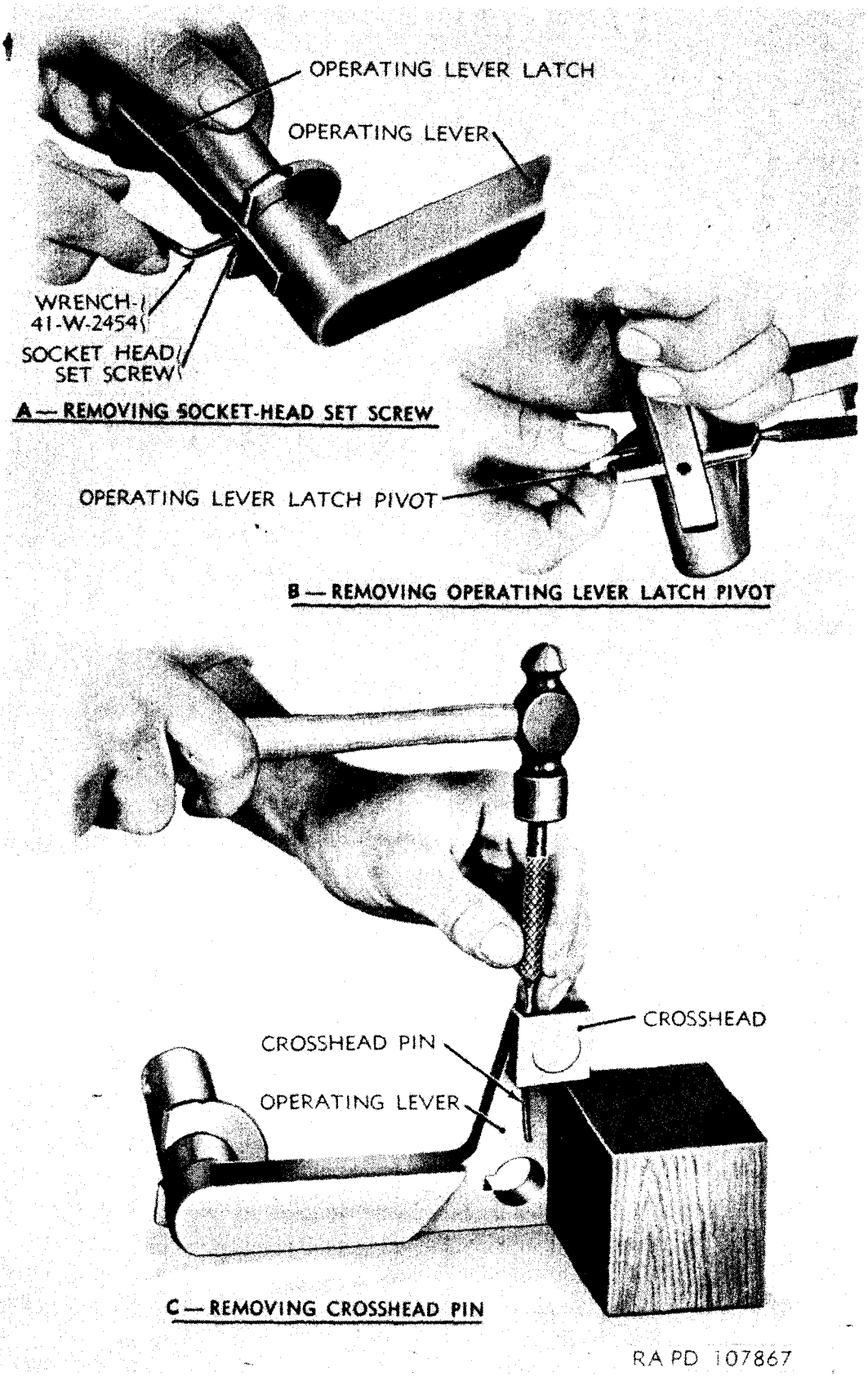


Figure 169. Disassembling breechblock operating lever.

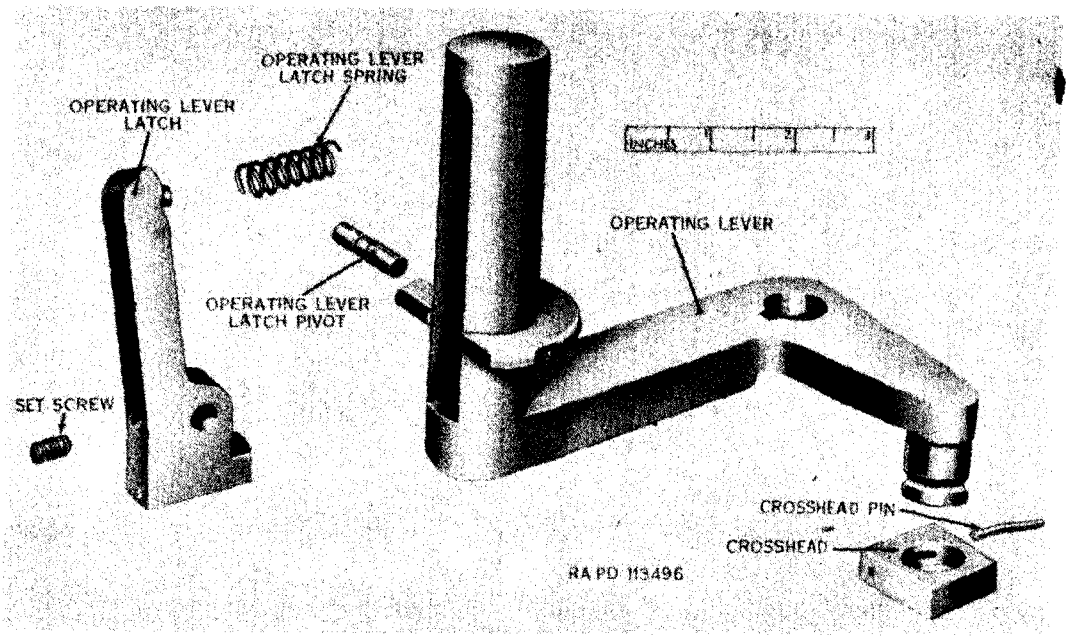


Figure 170. Exploded view of breechblock operating lever.

the firing lock is covered in paragraph 119.

e. The breechblock bushing, through which the firing pin protrudes, is not disassembled by the using arms.

f. To disassemble the breechblock operating lever assembly (fig. 170), proceed as follows:

(1) Remove the socket-head setscrew from the operating lever latch (fig. 169, A).

(2) Press the operating lever latch into the operating lever until they are parallel. Withdraw the operating lever latch pivot, using a drive pin punch to start it (fig. 169, B).

(3) Remove the latch and latch spring.

(4) Support the cross head on a small wooden block. Drive out the cross head pin (fig. 169, C) and remove the cross head.

115. Assembly of the Breech Mechanism

a. To assemble the breechblock operating lever assembly (fig. 170) proceed as follows:

(1) Slide the cross head into place on the stud; then secure the cross head pin.

(2) Place the latch spring in the handle of the operating lever. Place the latch in position with the stud of the latch in the spring. Press on the latch and line up the pivot holes; then insert the pivot.

(3) Secure the pivot in place with the socket-head setscrew.

b. Insert the firing lock into its recess in the breechblock so that the alining mark is at the top; then rotate the firing lock

one-sixth of a turn in either direction as the lugs enter their recesses. Push the lock in until its rear surface is flush with the rear face of the breechblock and rotate it back until the alining marks on the lock and breechblock coincide.

c. Insert the trigger shaft and trigger, matching the assembling line on the trigger shaft gear with those on the block and trigger gear.

d. Slide the cover into place in the breechblock to retain the trigger shaft and trigger.

116. Maintenance of Breech Mechanism

a. Disassemble, clean, and oil the breech mechanism as prescribed in paragraph 85*c* at intervals as outlined in the schedule in paragraph 91.

b. Repaint any damaged painted areas (par. 90). Do not paint over any operating surfaces.

c. Remove any corrosion, burs, or scored areas with crocus cloth.

d. Replace the extractor if it is broken, worn, or damaged so as to fail to extract.

e. Replace the trigger shaft detent spring if it is weak or broken.

f. Keep the breechblock operating lever clean and oiled and free of corrosion or burs. If the operating lever handle fails to engage the catch due to a weak or broken spring, notify ordnance maintenance personnel for correction. See paragraph 110*f* if the catch retaining screw accidentally becomes loose.

Section XXI. FIRING MECHANISM

117. General

a. The firing mechanism is composed principally of the firing lock, trigger assembly, and the trigger shaft, which are housed in the breechblock (fig. 165) and of the lanyard, which is attached to the trigger assembly knob when firing (fig. 8).

b. The purpose of the firing mechanism is to fire the round of ammunition.

c. As the lanyard is pulled to the rear, it rotates the trigger asembly counterclockwise. The gear teeth in mesh with the trigger shaft rotate the trigger shaft clockwise.

d. The trigger shaft is housed in the breechblock and the squared end of the shaft is engaged with the trigger fork in the firing lock as shown in figure 171, A. When the shaft is rotated

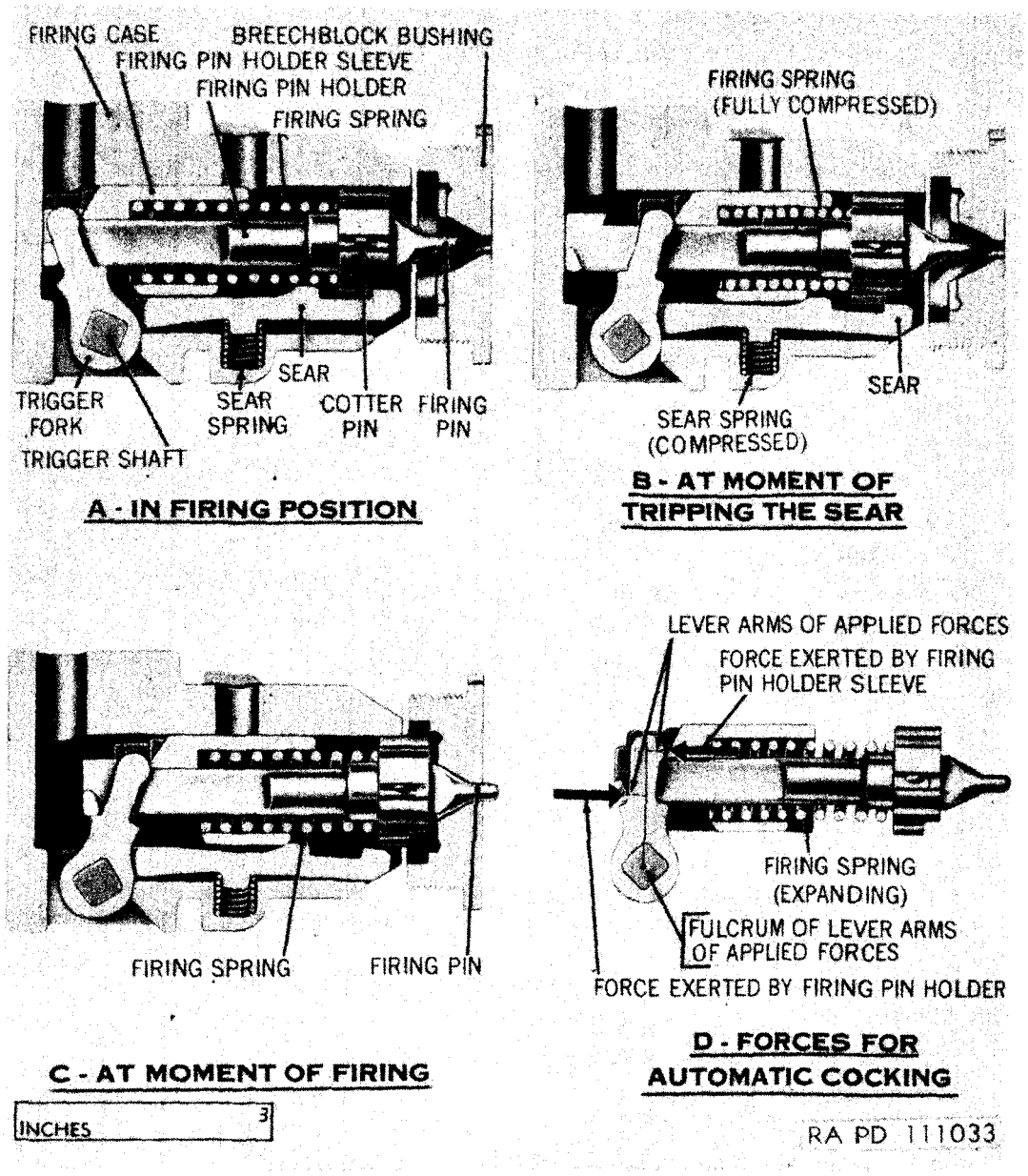


Figure 171. Firing lock M13—sectional view.

clockwise, its squared end rotates the trigger fork in the firing lock forward as shown in figure 171, B.

e. The firing lock M13 is a continuous-pull, safety type of firing mechanism which remains in a safe position at all times until the lanyard is pulled to compress the firing spring and actuate the mechanism.

(1) As the trigger fork is rotated forward, it forces the firing pin holder sleeve forward, thereby compressing the firing spring (fig. 171, B). The sleeve continues to be forced forward until it trips the sear. This releases the firing spring holder and allows the compressed firing spring to expand and snap the firing pin forward as shown in figure 171, C. The firing pin strikes and

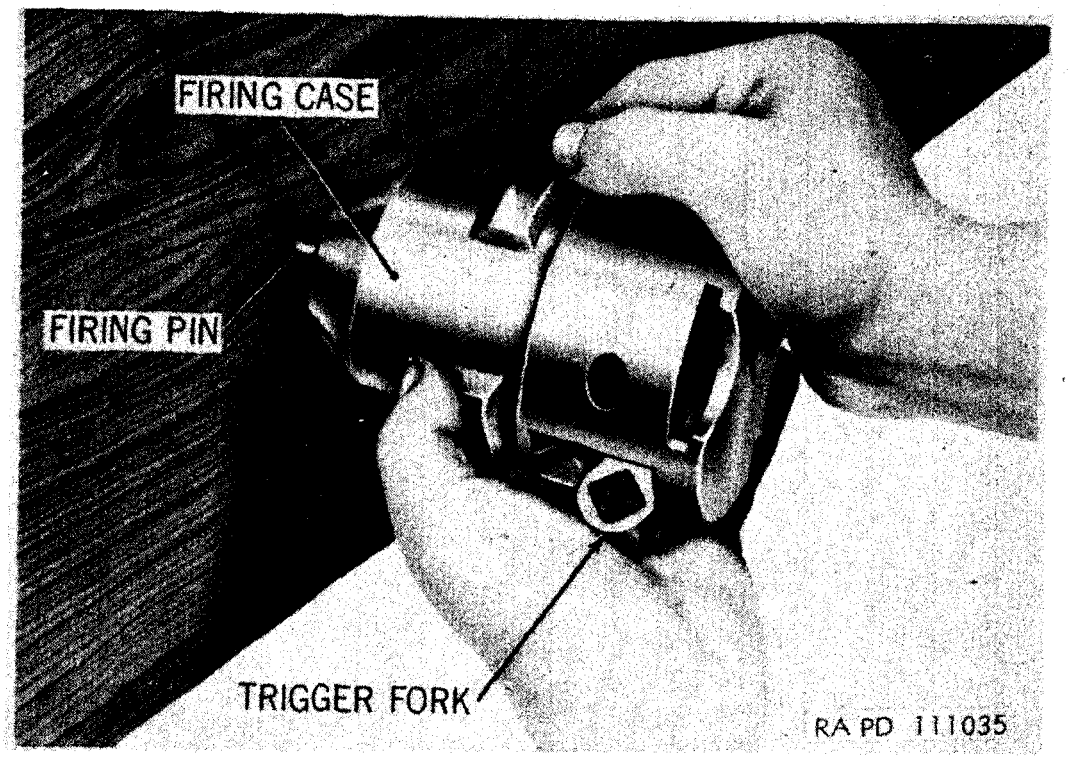


Figure 172. Removing trigger fork from firing lock.

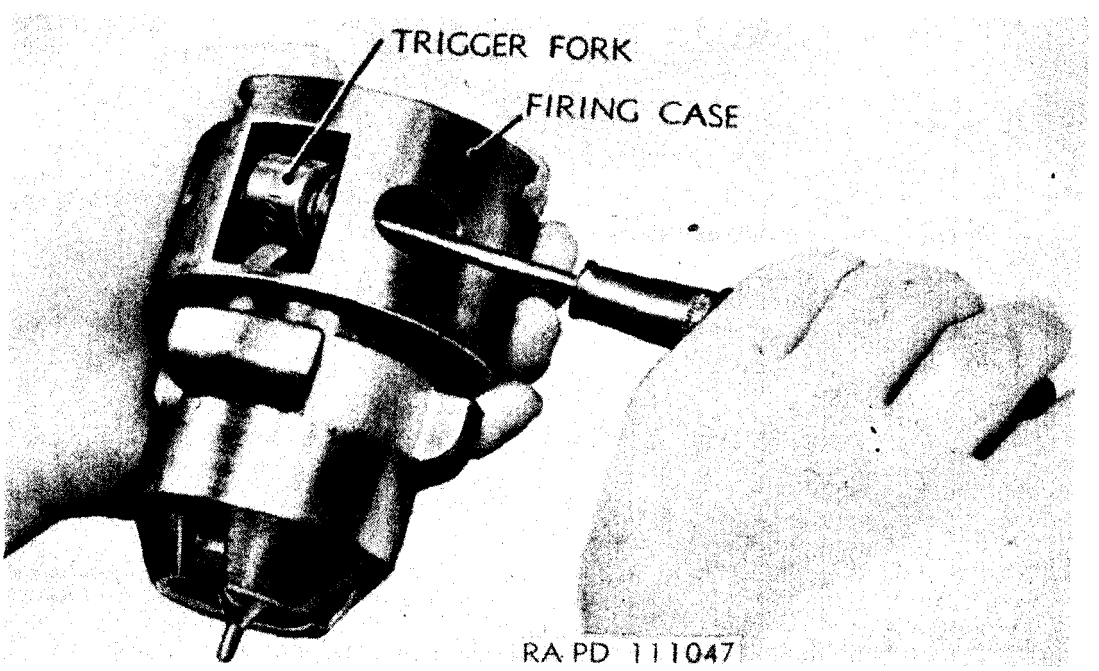


Figure 173. Removing trigger fork from firing lock—alternate method.

detonates the primer in the cartridge case, which in turn ignites the propelling charge.

(2) When the pressure on the trigger fork is released, the firing spring continues to expand with equal force forward and to the rear. The forward pressure is applied to the middle rear

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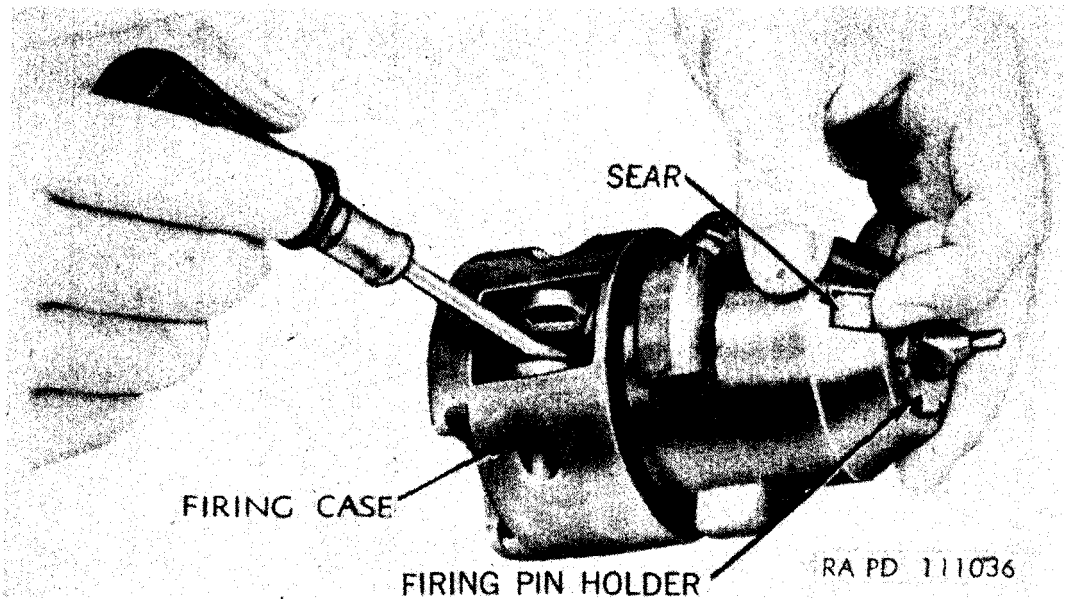


Figure 174. Removing firing pin holder and sleeve from firing case.

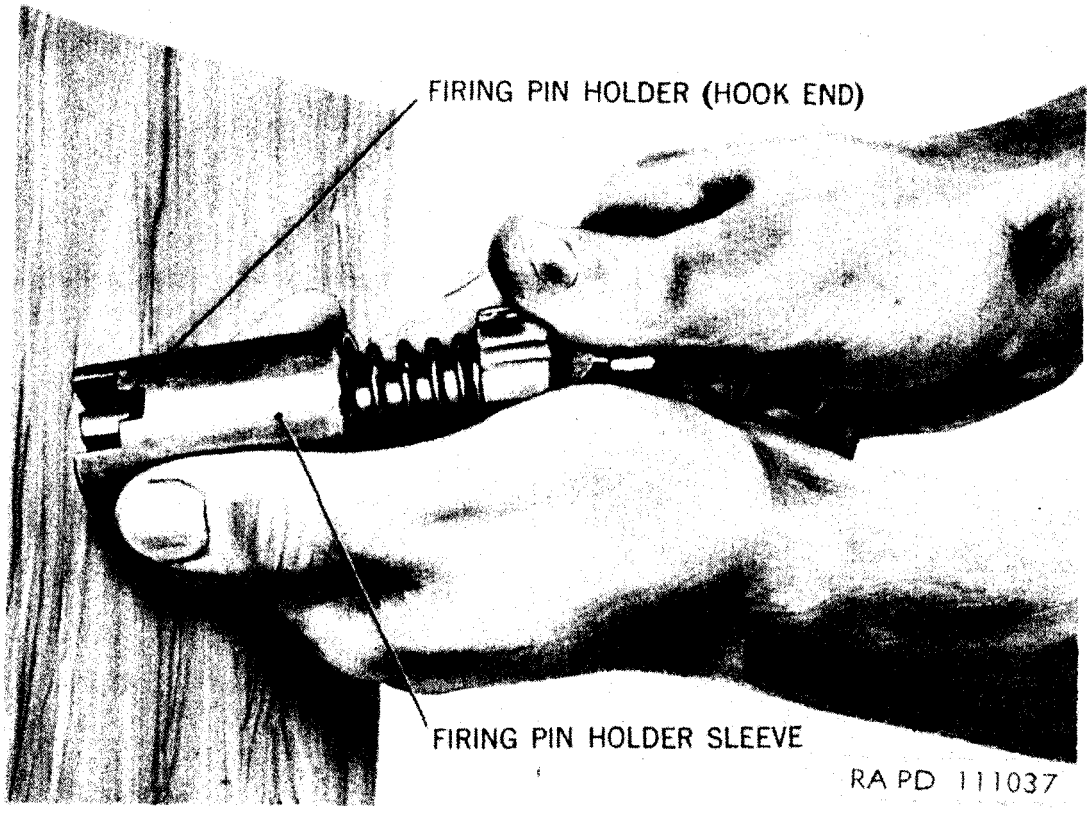


Figure 175. Removing sleeve from firing pin holder.

surface of the trigger fork by the T on the firing pin holder as shown in figure 171, D. The rearward pressure is applied to the top front surface of the trigger fork by the holder sleeve (fig. 171, D). Since the rearward pressure exerted to the top front surface acts on a longer lever arm than that of the forward pres-

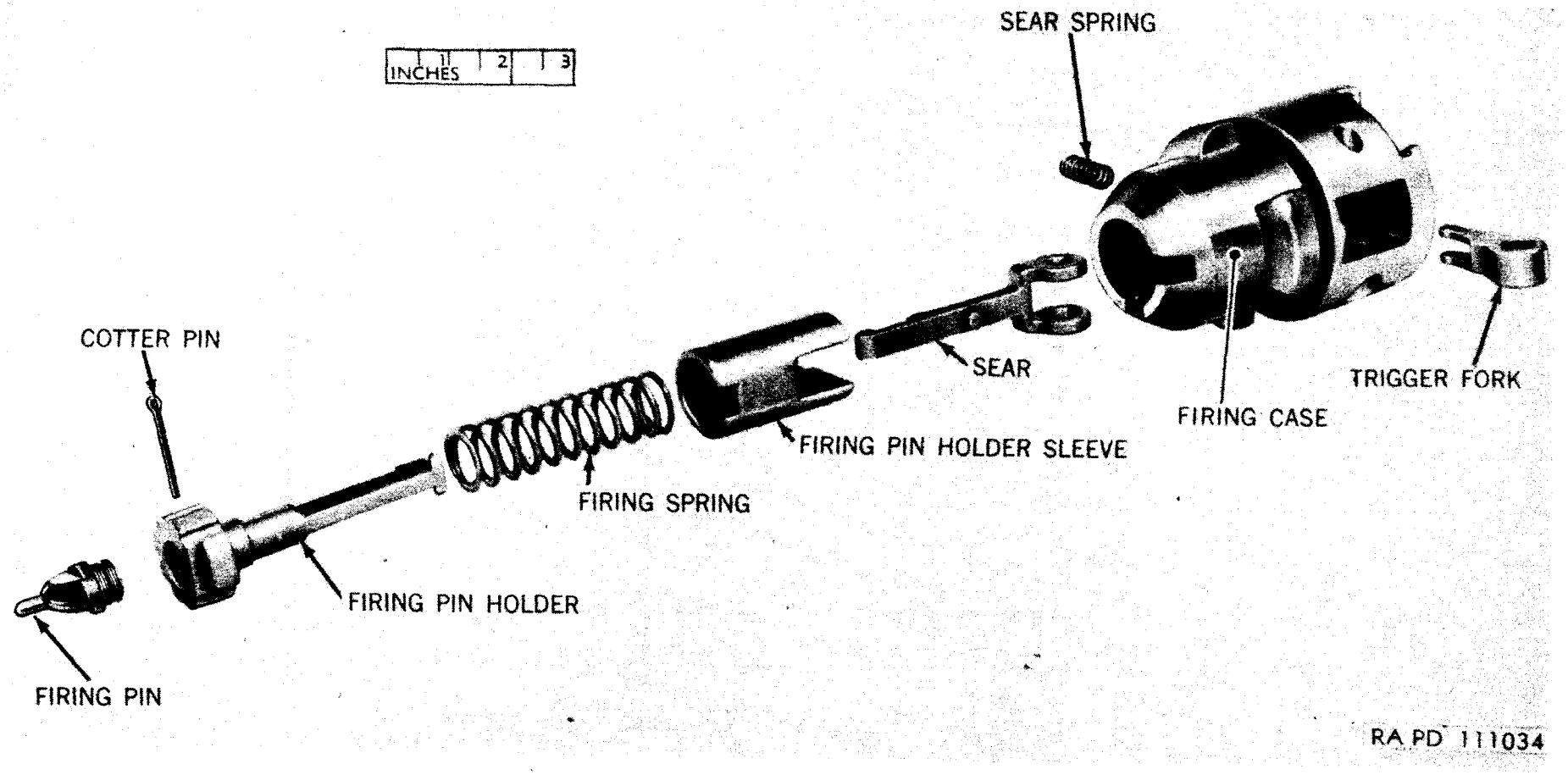


Figure 176. Firing lock M13—exploded view.

sure, the trigger fork rotates rearward and moves the holder rearward until the sear again engages the holder as shown in figure 171, A.

118. Removal and Installation of the Firing Mechanism

a. The firing mechanism is removed during the disassembly of the breech mechanism as outlined in paragraph 114.

b. The firing mechanism is installed as outlined in paragraph 115. After installation of the breech mechanism, test the firing mechanism for freedom of operation by attaching the lanyard and pulling.

Caution: Be sure the howitzer is not loaded.

119. Disassembly of Firing Lock M13

a. Remove the trigger fork by grasping the firing case, with trigger fork down, and pressing the firing pin against a solid surface (fig. 172). The trigger fork will fall free of the firing lock into the hand. An alternate method is to pry the trigger fork out of the firing case with a screw driver, first through the trigger shaft hole (fig. 173) and then from the outside of the case.

b. Press the front end of the sear out of engagement with the firing pin holder; at the same time pry the assembled sleeve and holder forward (fig. 174) until they can be grasped and pulled from the firing case. Shake out the sear and sear spring.

c. To disassemble the firing pin holder and sleeve, grasp the front end of the firing pin holder sleeve and place the lower rear end of the sleeve against a solid surface. Push the firing pin holder down to unhook it from the sleeve (fig. 175). Allow the holder to recede out of the sleeve, freeing the spring.

d. Remove the cotter pin from the firing pin holder and unscrew the firing pin.

120. Assembly of Firing Lock M13 (fig. 176)

a. Screw the firing pin into the firing pin holder, insert the cotter pin and spread the ends carefully so that they will not rub against the firing case. Assemble the firing spring over the holder and the sleeve over the spring and holder (fig. 175) and, pushing the rear of the holder against a solid surface, compress the spring enough to hook the T of the holder in the T-slot of the sleeve.

b. Insert the sear spring into its seat in the bottom of the firing case, using a screw driver between two coils of the spring (fig. 177). Assemble the sear into the case, so that the sear spring stud enters the sear spring.

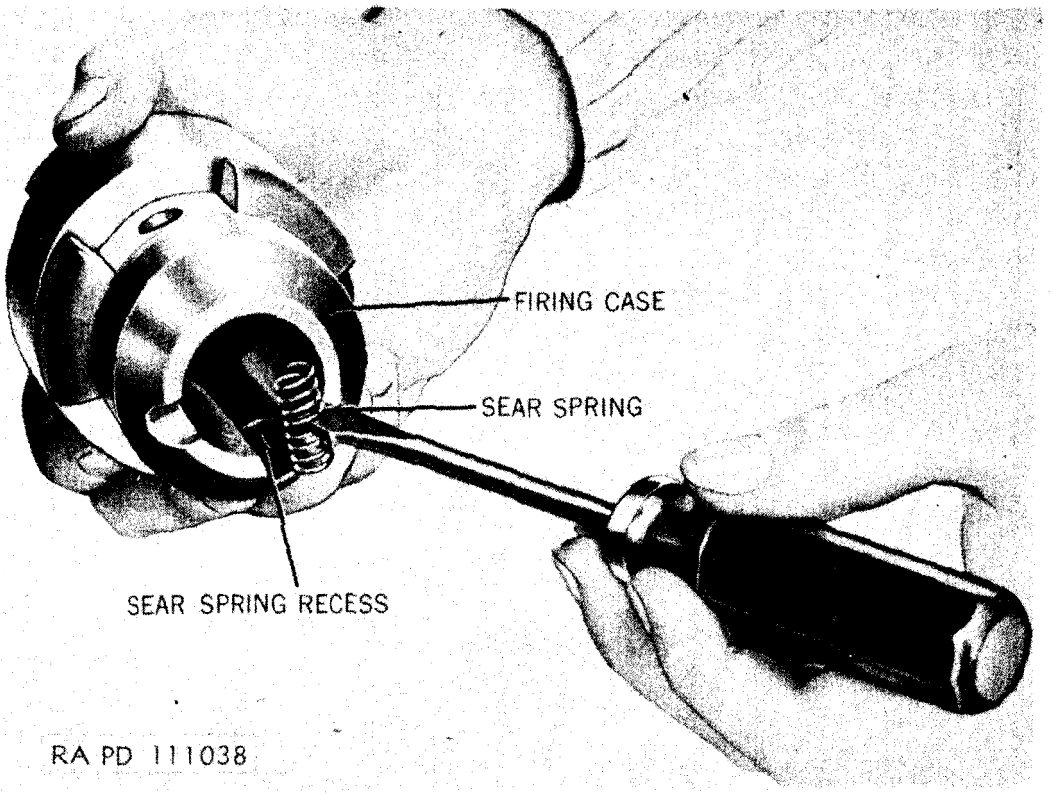


Figure 177. Inserting sear spring into firing case.

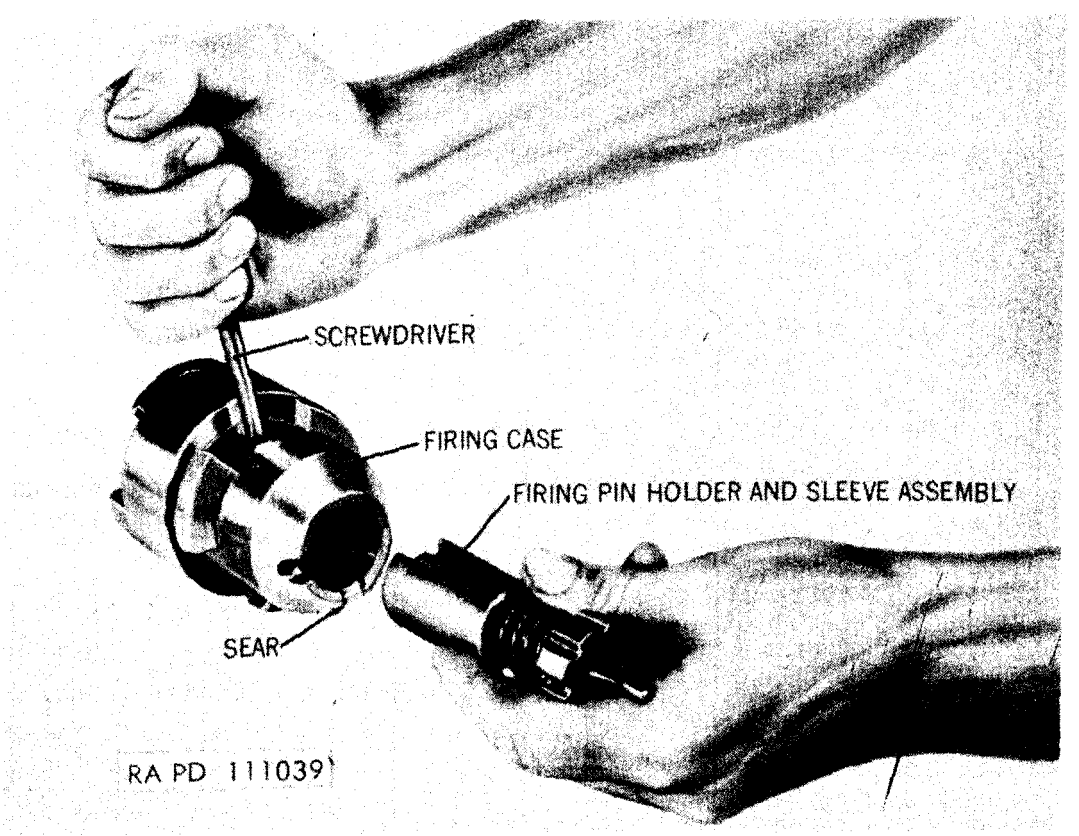


Figure 178. Inserting firing pin holder and sleeve into firing case.

c. Press the sear down with a screw driver inserted through the hole in the firing case (fig. 178) and insert the assembled firing pin holder and sleeve into the case with the flat portion of the sleeve and the sear notch of the holder downward, so that they will engage the sear. Hold the sear from slipping backward, withdraw the screw driver, and push the holder back until it is latched by the sear.

d. Insert the trigger fork into the opening in the bottom of the case, having the part marked MUZZLE FACE toward the front (fig. 179). Push the trigger fork in until it snaps into position.

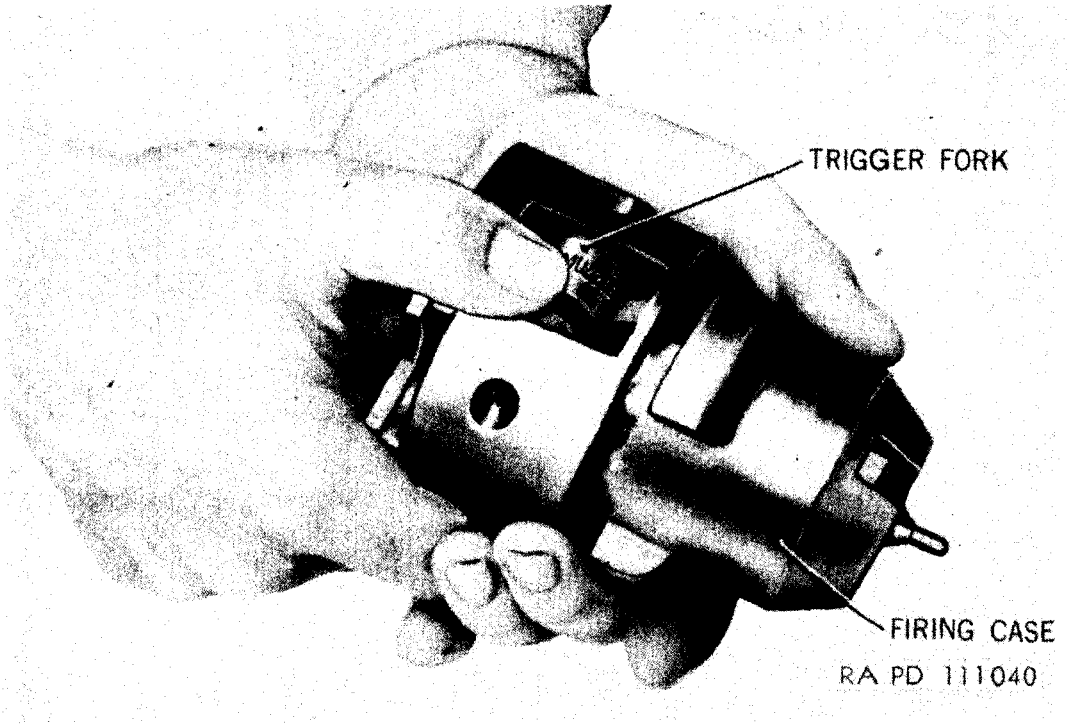


Figure 179. Inserting trigger fork into firing lock.

121. Maintenance of Firing Mechanism

a. Keep parts clean and properly lubricated (pars. 80 and 85*c*). Remove corrosion or burs and polish roughened bearing surfaces with crocus cloth.

b. If the firing pin is worn, damaged, or deformed, replace it. If the sear spring or firing spring is weak or broken, replace it. If the firing pin holder or cotter pin is worn or damaged, replace it. Replace complete firing lock for irreparable deficiencies in other parts not issued.

c. If the lanyard cord or strap is weak, frayed, or broken, replace it. Apply neat's-foot oil to keep leather lanyards and straps soft and pliable.

Section XXII. RECOIL MECHANISM

122. General

a. The recoil mechanism (fig. 180) is composed of the bottom sleigh assembly, the recuperator cylinder, and the recoil cylinder. These parts together with the tube and breech ring, which are securely locked to the bottom sleigh assembly, are known as the recoiling parts. The recoil mechanism serves to absorb the energy and shock of firing by gradually checking and stopping the rearward movement of the recoiling parts. It returns them into the battery position during counterrecoil, provides proper buffing action to prevent "slamming," and it holds them in the battery position by the force of compressed nitrogen in the recuperator cylinder. It is of the hydropneumatic, constant recoil type, employing a floating piston to separate the recoil oil from the nitrogen gas. A pneumatic respirator in the recoil cylinder provides the counterrecoil buffing action.

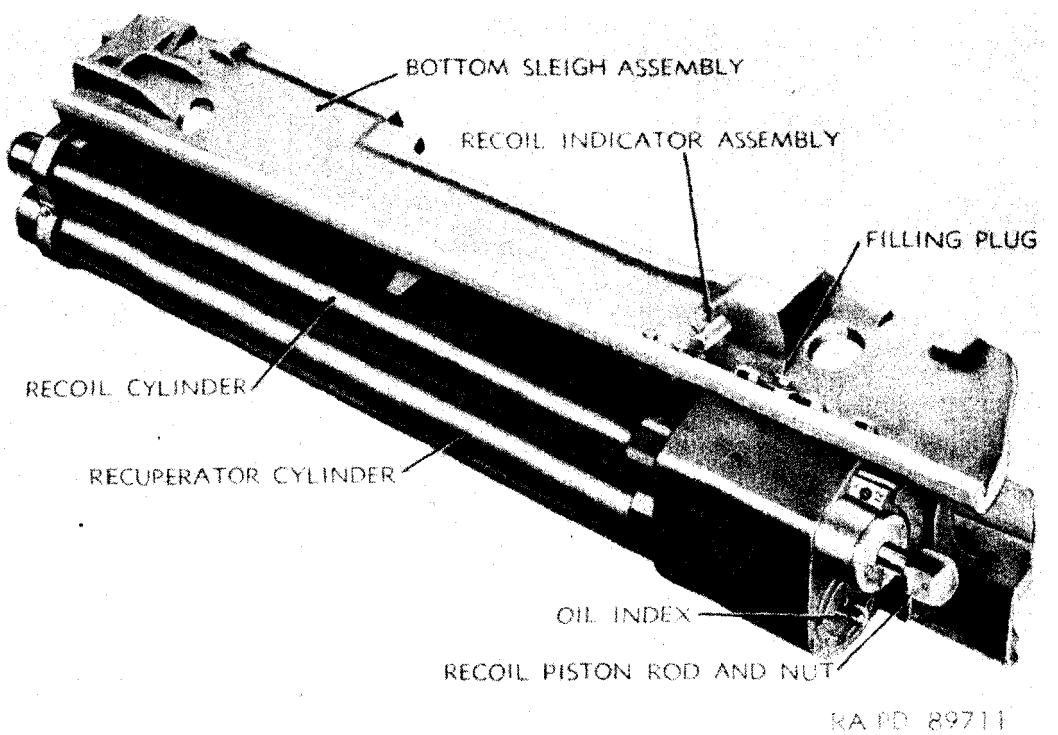


Figure 180. 75-mm howitzer recoil mechanism M1A4.

b. The bottom sleigh assembly houses and supports the recuperator cylinder, the recoil cylinder, and the tube and breech ring. The sleigh has two rails which slide on the stationary cradle to guide and support the recoiling parts. A recoil indicator is bolted to the bottom sleigh to provide a means of measuring the length of recoil (par. 21*c*).

c. The recuperator cylinder contains compressed nitrogen gas held between the floating piston and the rear head. The front head contains the oil index mechanism.

d. The recoil cylinder contains recoil oil which can pass back and forth between the recoil cylinder and recuperator cylinder by means of connecting passages. A recoil piston, which is secured to the cradle by a piston rod nut, holds this oil and separates it from air which fills the rear portion of the cylinder. A stuffing box in the front head prevents leakage of oil past the piston rod. The rear head of the cylinder houses the respirator, which controls the escape of the air through an adjustable valve. A filling plug is located on the bottom sleigh near the front end and provides a means of inserting oil into the recoil cylinder.

123. Functioning

a. Action in Recoil (fig. 181). (1) When the howitzer is fired, the force of the expanding gas propels the projectile out of the bore. This same force also reacts against the breechblock and forces the bottom sleigh and the tube and breech ring rearward. The recoil piston and recoil piston rod, being attached to the cradle, remain stationary. As the sleigh moves back in recoil, the recoil oil in the recoil cylinder is forced through a connecting port into the regulator body of the recuperator cylinder.

(2) The pressure of the oil entering the regulator opens four one-way valves, allowing the oil to pass by a throttling orifice and push upon the floating piston diaphragm in the recuperator cylinder, forcing it to the rear, and further compressing the nitrogen gas behind the piston.

(3) As the floating piston is forced to the rear, it works against and greatly compresses the nitrogen gas in the recuperator cylinder. At the same time a tapered control rod fastened to the diaphragm is drawn through the throttling opening, closing it gradually, and stopping the flow of oil at the moment that the recoiling parts are brought to rest.

(4) The energy of the recoiling parts is principally exhausted in the work of compressing the nitrogen gas, by the action of throttling the oil, and in the friction of moving parts.

b. Action in Counterrecoil. (1) When the recoiling parts are brought to rest at the end of recoil, the unbalanced force of the greatly compressed nitrogen gas forces the floating piston and diaphragm forward, pushing the recoil oil back through the regulator into the recoil cylinder against the back of the recoil piston (fig. 182), thereby returning the recoiling parts to battery position.

(2) However, the oil does not return through the channels in the regulator by the way in which it entered. The one-way reg-

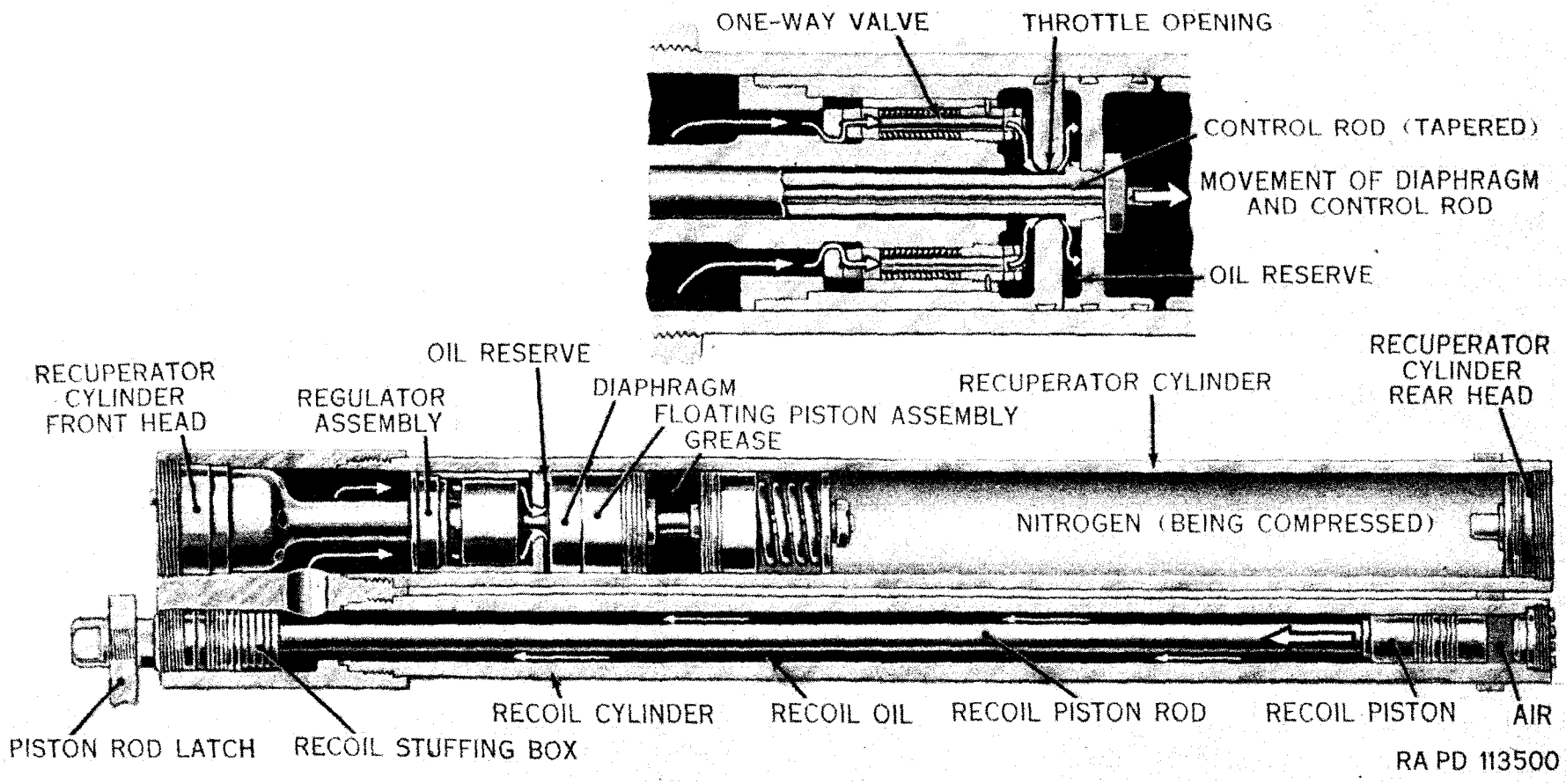


Figure 181. Recoil mechanism at start of recoil—sectional view.

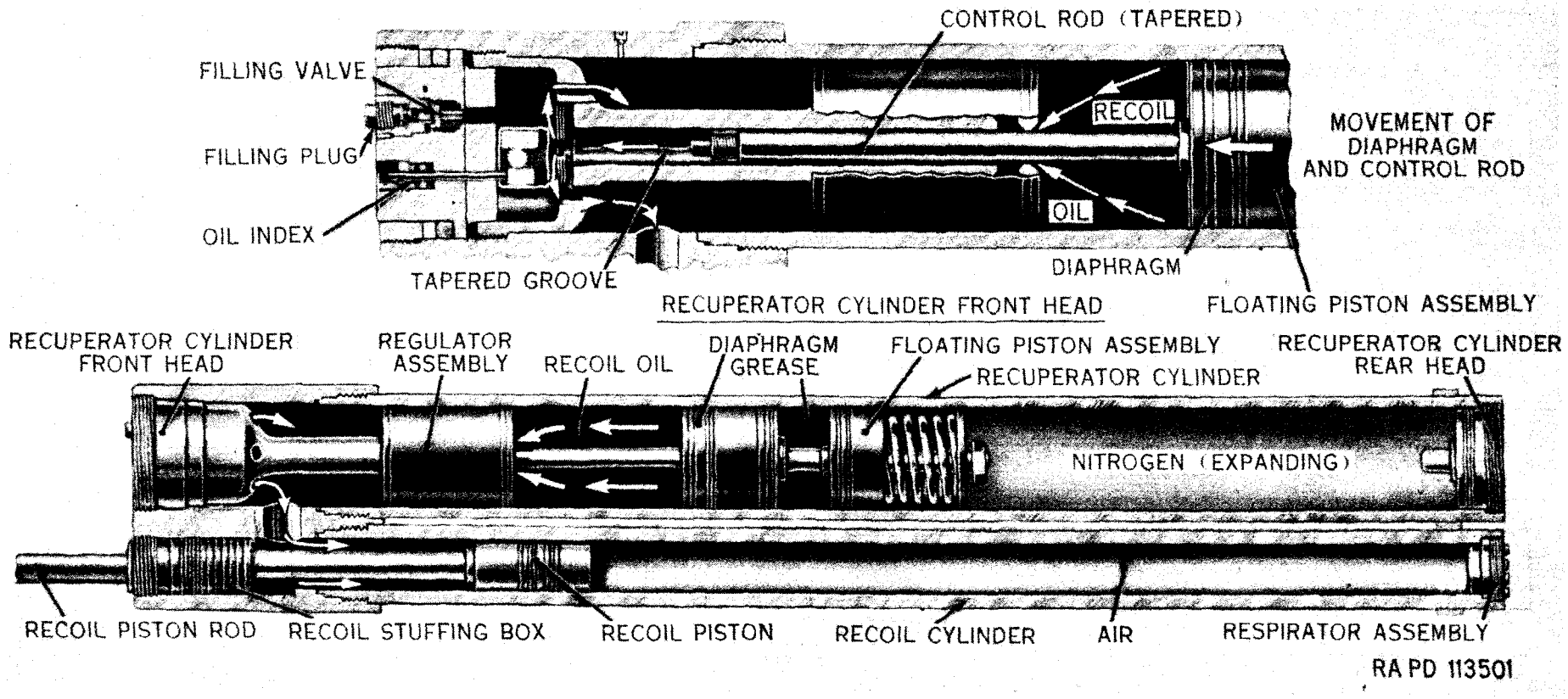


Figure 182. Recoil mechanism during counterrecoil—sectional view.

ulator valves are closed under pressure of the regulator valve springs. The returning oil is diverted to the central bore of the regulator, where another throttling action takes place as the oil passes by the control rod piston through grooves of decreasing depth (fig. 182) cut in the walls of the regulator bore.

(3) By the return of oil past these tapered clearances, together with the cushioning effect of the respirator, the speed of counterrecoil is controlled and reduced so as to return the howitzer to battery without shock.

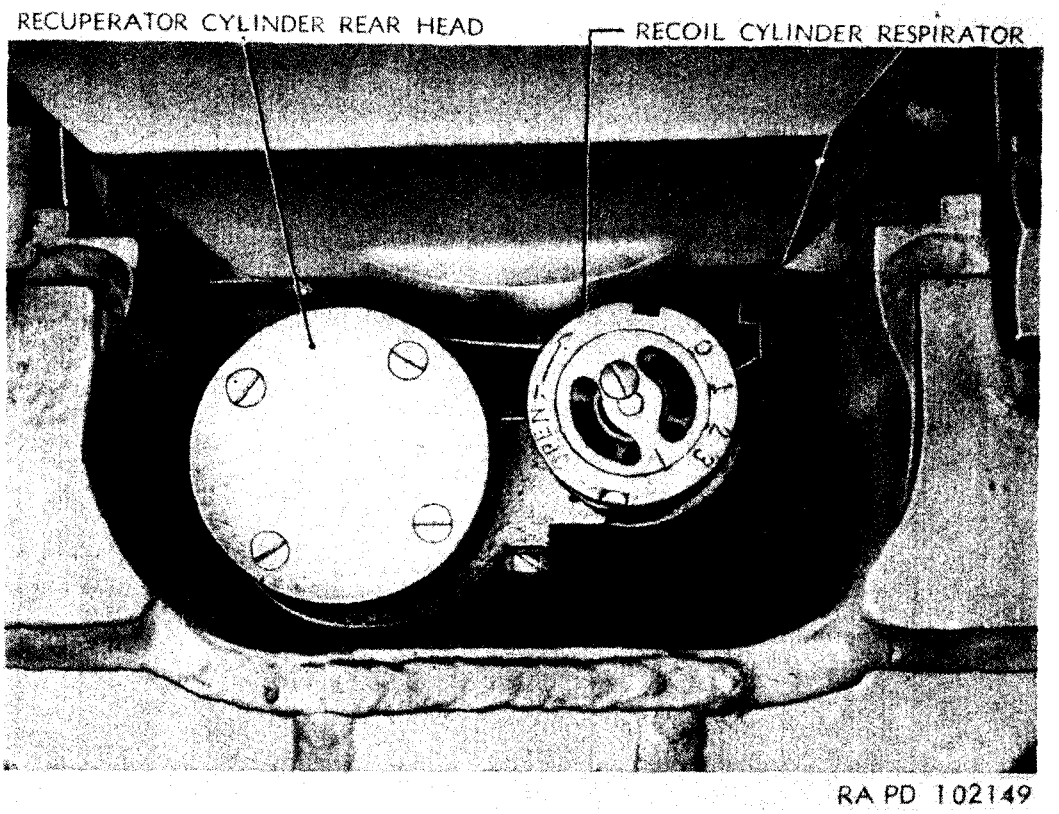


Figure 183. Location of respirator.

c. Action of the Respirator. (1) When the howitzer is level or depressed, the effect of the force of gravity is to increase the velocity of counterrecoil, causing slamming into battery. Since the throttling grooves are not adjustable, changes in counterrecoil velocity due to angle of elevation of the tube or to cold sluggish recoil oil are compensated for by an adjustable pneumatic counterrecoil buffer, called the respirator. The respirator is located in the rear head of the recoil cylinder (fig. 183).

(2) It is provided with a four-position adjustable orifice, to provide variation in the rate at which air is permitted to escape from the recoil cylinder during counterrecoil. This orifice is con-

trolled by a valve which is attached to the head of the respirator. The throttling of the air provides the additional buffing action that eases the howitzer into battery without shock.

d. Oil Index and Oil Reserve. (1) The recoil mechanism is designed to operate properly when enough recoil oil is forced into the system so as to separate the floating piston diaphragm from the regulator, thereby securing equalized pressure of nitrogen gas and recoil oil on both sides of the floating piston and a state of equilibrium throughout the recoil system. This condition exists when the end of the oil index indicator rod is flush with the front face of the recuperator cylinder front head, indicating correct oil reserve.

(2) Whenever the oil reserve pressure is lower than the nitrogen gas pressure, a rod attached to the diaphragm moves forward with the floating piston diaphragm and actuates the pinion and rack oil index mechanism so as to cause the index indicator rod to recede into the oil index recess, indicating insufficient oil reserve.

(3) However, if the oil reserve is excessive, the oil index is mechanically unable to indicate this excess condition due to the construction of the mechanism indicator. This condition necessitates extreme care in establishing correct oil reserve.

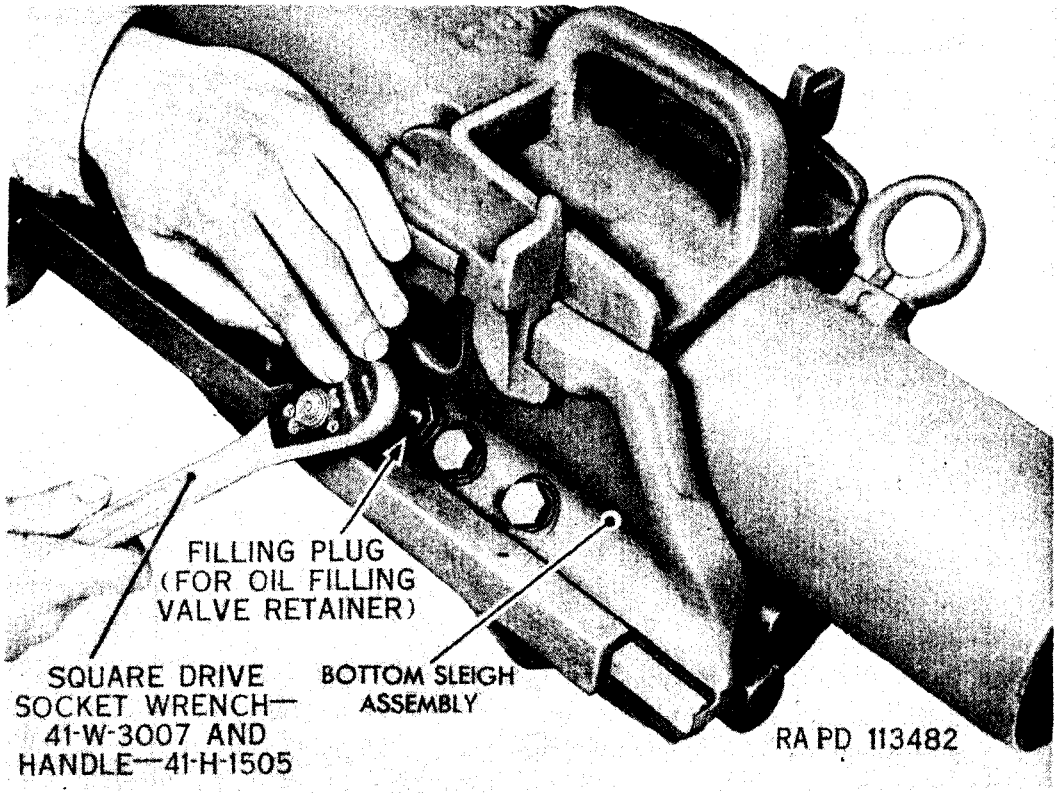


Figure 184. Removing filling plug for oil filling valve.

124. Draining and Reestablishing the Oil Reserve

a. To drain the oil reserve, remove the filling plug (fig. 184) with socket wrench 41–W–3007 and handle 41–H–1505. Insert the liquid releasing tool 41–T–3251–611 into the filling hole and hand tighten it. Using wrench 41–W–1000, further tighten the tool (fig. 185) until the oil reserve spurts out in a stream. If checking the reserve before firing, drain only enough oil to cause the oil index to recede slightly into the recess, and catch the oil in a suitable receptacle or waste material. For complete draining of the oil reserve, allow the oil to spurt out until the flow stops. Unscrew the liquid releasing tool.

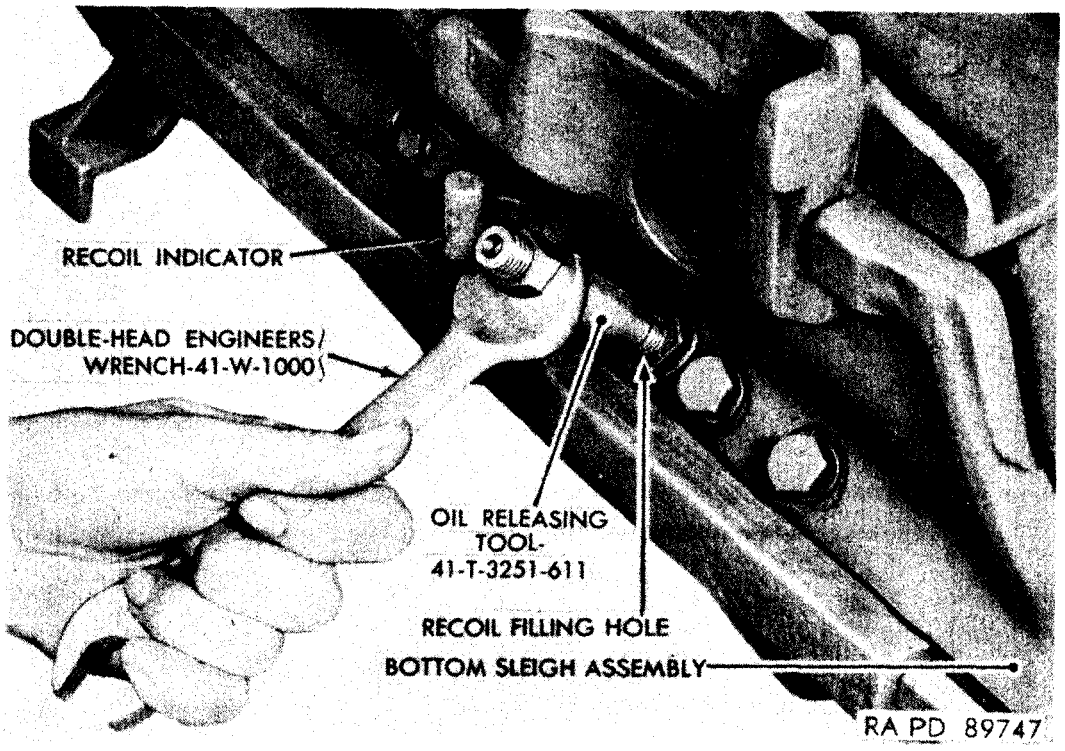


Figure 185. Installing oil releasing tool.

b. Inspect the recoil oil as described in paragraph 127. Use oil prescribed by the lubrication order (par. 80).

c. To fill the oil filling gun, turn the handle counterclockwise until screwed completely back, loosen the locking screw on the head, and remove the handle and head as a unit. Pour oil directly into the barrel of the oil filling gun, avoiding the formation of air bubbles. Replace handle and head as a unit and tighten the locking screw. Remove the cap from the nozzle head, hold the nozzle end up for a minute or two until all the air in the oil has risen to the surface, and purge the gun by turning the handle until no more air bubbles appear on the nozzle end.

d. To reestablish the oil reserve, screw the nozzle of the gun into the filling hole, taking care not to cross the threads. Before tightening, turn the handle slightly so that oil will force out any air in the filling hole. Operate the gun with both hands and avoid lateral pressure on, and possible breakage of, the threaded nozzle (fig. 186). When the oil index shows full reserve (approximately one-half a fill), unscrew the gun and install the filling plug.

e. If oil index fails to move against evident pressure, see paragraph 97 for corrective action. If it still fails to move, the howitzer may be fired in an emergency until the piece either fails to return to battery or returns with shock, in which case see paragraph 99 or 100.

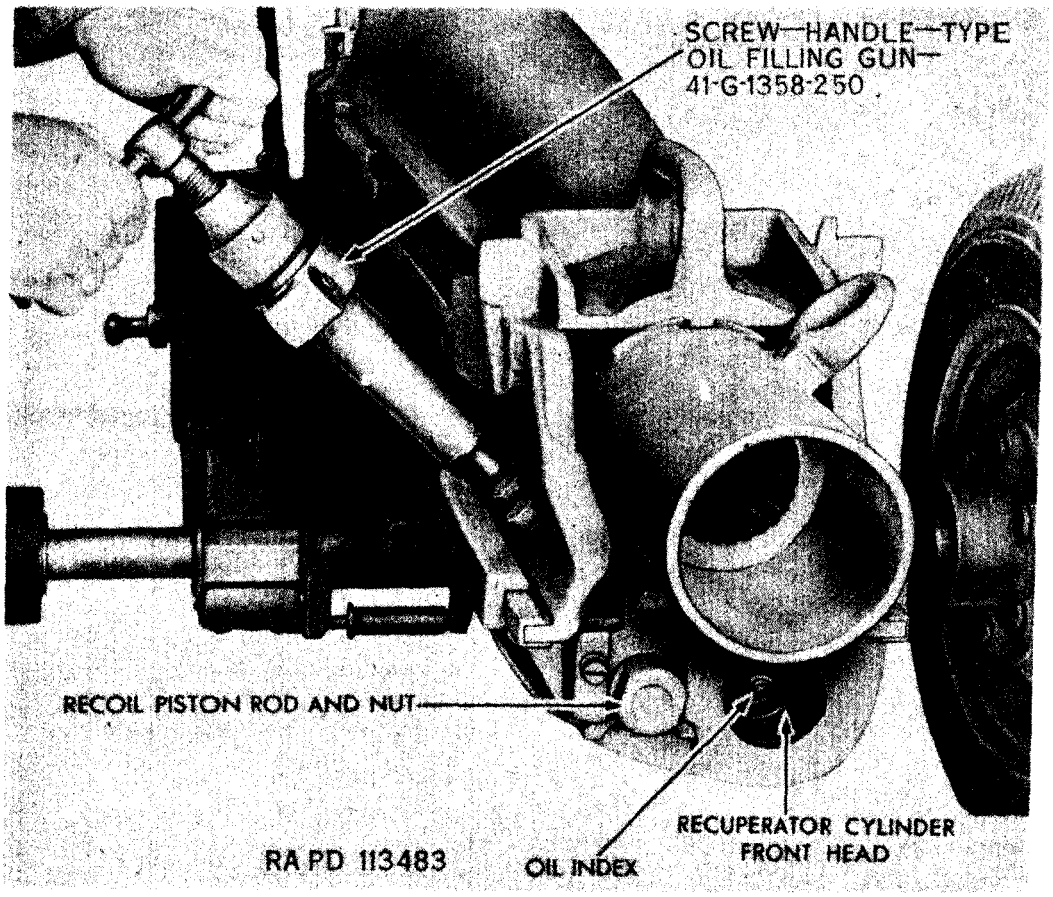


Figure 186. Injecting reserve oil into recoil mechanism.

125. Removal and Installation of Recoil Mechanism

a. The recoil mechanism is an integral part of the bottom sleigh and is removed and installed with the bottom sleigh.

b. Remove the top sleigh, tube, and breech ring as outlined in paragraph 25.

c. Remove the bottom sleigh as outlined in paragraph 26.

d. Place the bottom sleigh assembly on suitable blocking to prevent damage to the recoil cylinder or the recuperator cylinder.

e. To install the recoil mechanism, slide the bottom sleigh onto the cradle and secure the piston rod in place with the piston rod latch as outlined in paragraph 28*e* and *f*.

126. Maintenance of Recoil Mechanism

a. Battery maintenance of the recoil mechanism is limited to exterior cleaning (par. 85), painting (par. 90), draining and reestablishing the oil reserve (par. 124), and to checking for proper length of recoil or faulty recoil or counterrecoil (par. 21).

b. Keep the recoil slides and sleigh rails clean, properly lubricated, and free from burs, scoring, corrosion, or other damage.

c. Every precaution must be taken in servicing the recoil mechanism to keep recoil oil, liquid releasing tool, oil filling gun, and areas around the filling plug clean, and to prevent dust, sand, or dirt from getting inside the finely machined surfaces, as foreign matter may cause irreparable damage.

d. When the weapon is not being fired, keep the valve of the respirator set at "0" in order to keep accumulations of moisture or dust out of the recoil cylinder. Keep respirator as clean as possible.

127. Care of Recoil Oil

a. Water or foreign matter must not be introduced into recoil oil or the recoil mechanism. Exposure of recoil oil in an open container or partly filled container may result in an accumulation of water, either directly or by condensation of moisture on the sides of the container. Drained recoil oil should not be reused, except in emergency.

b. If recoil oil has been exposed to moisture or if it is to be reused in an emergency, it should be tested for water as follows:

(1) Use a clean glass bottle of 1-pint capacity filled with the recoil oil. Allow the bottle to stand undisturbed for several hours. If water is present, it will sink to the bottom. When the bottle is lightly tilted, drops or bubbles will form. Invert the bottle and hold to the light. Water, if present, may be seen in the form of droplets slowly sinking in the oil. If the oil has a cloudy appearance, it may be ascribed to finely divided particles of water scattered throughout the oil.

(2) Another test for water is to heat a shallow pan of oil to 212° F. (boiling point of water). Water in the oil will appear on the surface as tiny bubbles and will be disclosed by this test when not determinable by the settling test.

(3) Should either of these tests show water, the oil on hand should not be used but should be returned through supply channels for reclamation.

c. Drained recoil oil, if it is to be reused in an emergency, must be strained through clean lintless cloth or linen to exclude foreign matter.

d. Take especial care to preserve the identity and grade of recoil oil. Do not mix recoil oil of different grades or other oil. Do not use recoil oil as a lubricant. Keep it protected from excessive heat.

Section XXIII. 75-MM PACK HOWITZER CARRIAGE M8

128. General

a. The 75-mm pack howitzer carriage M8 can be separated into major components for paracrate loads in parachute delivery (sec. VIII) or for mule pack loads in animal transport (sec. XI). The major groups comprising the carriage are the top sleigh, cradle, front trail, rear trail, axle and traversing mechanism, and wheels and tires.

b. In the firing position (fig. 1), the axle and traversing mechanism are mounted well forward to increase the firing stability of the carriage.

c. In the traveling position (fig. 3), the axle and traversing mechanism are mounted near the center of the front trail to better balance the carriage for traveling.

d. The description, functioning, removal, installation, disassembly, assembly, and maintenance of each of these units are covered in separate sections.

Section XXIV. TOP SLEIGH ASSEMBLY

129. General

a. The top sleigh is composed of the top sleigh body, top sleigh clamping cam, top sleigh clamping latch, top sleigh clamping latch pin, cam bushing, and a thong for retaining the latch pin (fig. 15).

b. The top sleigh retains the howitzer in the bottom sleigh and also forms a covering for it.

c. The clamping cam, hand operated by means of the socket of the handspike (fig. 15) forces the top sleigh forward so that hooks on the top sleigh engage notches in the bottom sleigh. By inserting the top sleigh clamping latch pin, the clamping cam is retained in position.

130. Removal and Installation of the Top Sleigh

a. Remove the top sleigh as outlined in paragraph 25*c* and *d*.

b. Install the top sleigh as outlined in paragraph 28*i* and *j*.

131. Disassembly of the Top Sleigh

No disassembly of the top sleigh is authorized for the using troops.

132. Maintenance of the Top Sleigh

a. Clean the top sleigh at intervals as prescribed for the carriage (par. 91). Lubricate matching surfaces and locking lugs.

b. Keep the thong pliable by applying neat's-foot oil.

c. Remove any corrosion and repaint as necessary.

Section XXV. CRADLE ASSEMBLY

133. General

a. The cradle is a trough-shaped piece with a guide along its entire length to support the slides of the bottom sleigh. The cradle is closed at the front end, except for openings necessary for the latching of the recoil piston rod and for inspection of the oil index (fig. 25).

b. The piston rod latch slides vertically in grooves in the front end of the cradle and drops down behind the piston rod nut to secure the piston rod to the cradle. With the bottom sleigh and howitzer in the cradle, the latch cannot be disengaged, as interference with the howitzer tube prevents the latch from raising. A spring actuated piston rod latch lever is provided for holding the piston rod latch in either the open or locked position.

c. Near the rear end of the cradle are four cradle locking pins which are secured in notched bearings on the rockers. The cradle is thereby firmly locked to the rockers (fig. 30).

d. The sight bracket is attached to the left side of the cradle. The bracket provides for removal of the telescope mount. A spring actuated sight retaining shaft, operated by a knob (fig. 22) and a spring controlled plunger hold the telescope mount in place and provide for adjustment to secure accuracy of alinement of the sight in azimuth.

134. Removal and Installation of Cradle Assembly

a. Remove the top sleigh, tube, and breech ring (par. 25).

b. Remove the bottom sleigh and cradle assembly as outlined in paragraph 26.

c. Install the cradle assembly as outlined in paragraph 28*d*.

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135. Disassembly of Cradle Assembly

a. To disassemble the piston rod latch from the cradle unscrew and remove piston rod latch screw and washer (fig. 26). Pull piston rod latch lever out of engagement with piston rod latch and lift piston rod latch up out of cradle.

b. No other disassembly of the cradle assembly is authorized for the using arm.

136. Assembly of Cradle Assembly

Pull the piston rod latch lever back into the disengaged position and slide the piston rod latch down into the retaining grooves in the cradle front transom. Install the piston rod latch screw and washer.

137. Maintenance of Cradle Assembly

a. Clean and lubricate all finished surfaces as prescribed in the preventive maintenance schedules (pars. 91 and 92). Pay particular attention to the guides in which the sleigh rails slide.

b. Remove any corrosion and repaint as necessary (par. 90).

c. Make sure that the piston rod latch lever (fig. 26) and the sight retaining shaft knob (fig. 22) operate freely.

d. Report all worn or damaged parts to ordnance maintenance personnel.

e. When necessary (par. 133*d*), adjust the accuracy of alinement of the sight in azimuth by means of the headless screw located on the lug on the top rear side of the sight bracket, after first loosening the lock nut. Retighten the lock nut after proper adjustment is secured.

Section XXVI. REAR TRAIL ASSEMBLY

138. General

a. The rear trail consists of a right and left member, each formed of two flasks welded together to form a box-like section, and the box-like sections are joined together by transoms. It is fitted with a spade to prevent backward movement of the piece when the howitzer is fired (fig. 2). A socket is provided above the spade for the purpose of maneuvering the carriage by use of the handspike. Two cleaning staff-sections are transported on the inside of the rear trail.

b. In matériel issued to airborne units, a caster wheel socket body (fig. 31) is attached to the drawbar by two bolts and nuts. A latch fastens the caster wheel fork in the socket body. The

drawbar is removed from the rear trail and packed with the front trail for parachute delivery. The caster wheel fork is unlatched from the caster wheel socket body of the drawbar and is packed with the rear trail.

139. Removal and Installation of Rear Trail Assembly

Caution: Do not attempt to disconnect the rear trail from the front trail unless the howitzer sleigh and cradle are first removed.

a. Remove the rear trail assembly as outlined in paragraph 27*a* and *b*.

b. Install the rear trail assembly as outlined in paragraph 28.

140. Disassembly of Rear Trail Assembly

a. Remove the caster wheel from the caster wheel socket body as outlined in paragraph 27*a*.

b. Disassemble the caster wheel socket body from the drawbar by unscrewing the two nuts, removing the lock washers, and withdrawing the two bolts which fasten the socket body to the drawbar (fig. 31).

c. Remove the wheel from the fork by removing the cotter pin from the castellated nut, unscrewing the nut, and withdrawing the axle. Remove the bearings. Some caster wheels are equipped with taper roller bearings and some with straight bearings.

d. In the case of wheels which are made of disks bolted together, deflate the tire, remove the bolts, and separate the disks. Remove the tire and tube. In the case of other wheels, deflate the tire completely and then remove the tire with appropriate tire irons.

e. Remove the drawbar mounting pin and drawbar as outlined in paragraph 27*a*.

f. No other disassembly of the rear trail assembly is authorized for using arm.

141. Assembly of Rear Trail Assembly

a. Install the drawbar as outlined in paragraph 28*l*.

b. Assemble the caster wheel socket body to the drawbar using the two bolts, nuts, and lock washers which fasten the socket body to the drawbar body (fig. 31).

c. In the case of caster wheels with solid disks, insert the deflated tube in the tire. Inflate the tube slightly to avoid pinching the tube. Pull one tire bead over the wheel with the tire iron and insert the valve stem of the tube in the hole in the wheel. Force the other tire bead over the wheel rim. Inflate to 35 pounds and screw cap onto valve stem. In the case of caster wheels with

separate disks, assemble the tire and tube onto the disk with the hole for the valve stem. Install the other disk and tighten the bolts. Inflate the tube to 35 pounds and screw cap onto valve stem.

d. To assemble the caster wheel to the fork, aline the wheel in the fork and insert the axle into the fork and wheel. Face the axle around so that the flat surface of the head engages the stop. Assemble washer and axle nut and tighten the nut until the wheel just turns freely without binding. Back off the nut to the nearest castellation, insert cotter pin, and spread the ends.

e. Install the caster wheel on the drawbar as outlined in paragraph 28*l*.

142. Maintenance of Rear Trail Assembly

a. Clean and lubricate in accordance with the preventive maintenance schedules (pars. 91 and 92).

b. Remove any corrosion and paint or touch up spots as required (par. 90).

c. Keep straps holding the cleaning staff-sections soft and pliable with neat's-foot oil.

d. See paragraph 157 for maintenance of tires and tubes.

Section XXVII. FRONT TRAIL ASSEMBLY

143. General

a. The front trail consists of a right and left side member, each member formed of two flasks welded together to form a box-like section. The two box-like sections are joined together by transoms and form a framework to carry the operating mechanisms and transmit the force of recoil to the rear trail and spade.

b. The forward part of the front trail carries the elevating mechanism, rockers, and equilibrators (fig. 9).

c. Axle bearings are provided at the front end of the trail in which the axle is fastened when the piece is in the firing position (fig. 36). At the bottom and to the rear of the trunnion bearings, two additional axle bearings are fitted for fastening the axle when the matériel is in the truck-drawn traveling position (fig. 36). Brackets on top and toward the rear of the front trail (figs. 1 and 2) support the cradle locking pins of the cradle when the matériel is in truck-drawn traveling position (fig. 3).

d. Inside each box-like member of the front trail and near the rear is an equilibrator bearing (fig. 188). These bearings support the rear ends of the equilibrators. The front ends of the equilibrators are supported in bearing surfaces in the rockers (fig. 187).

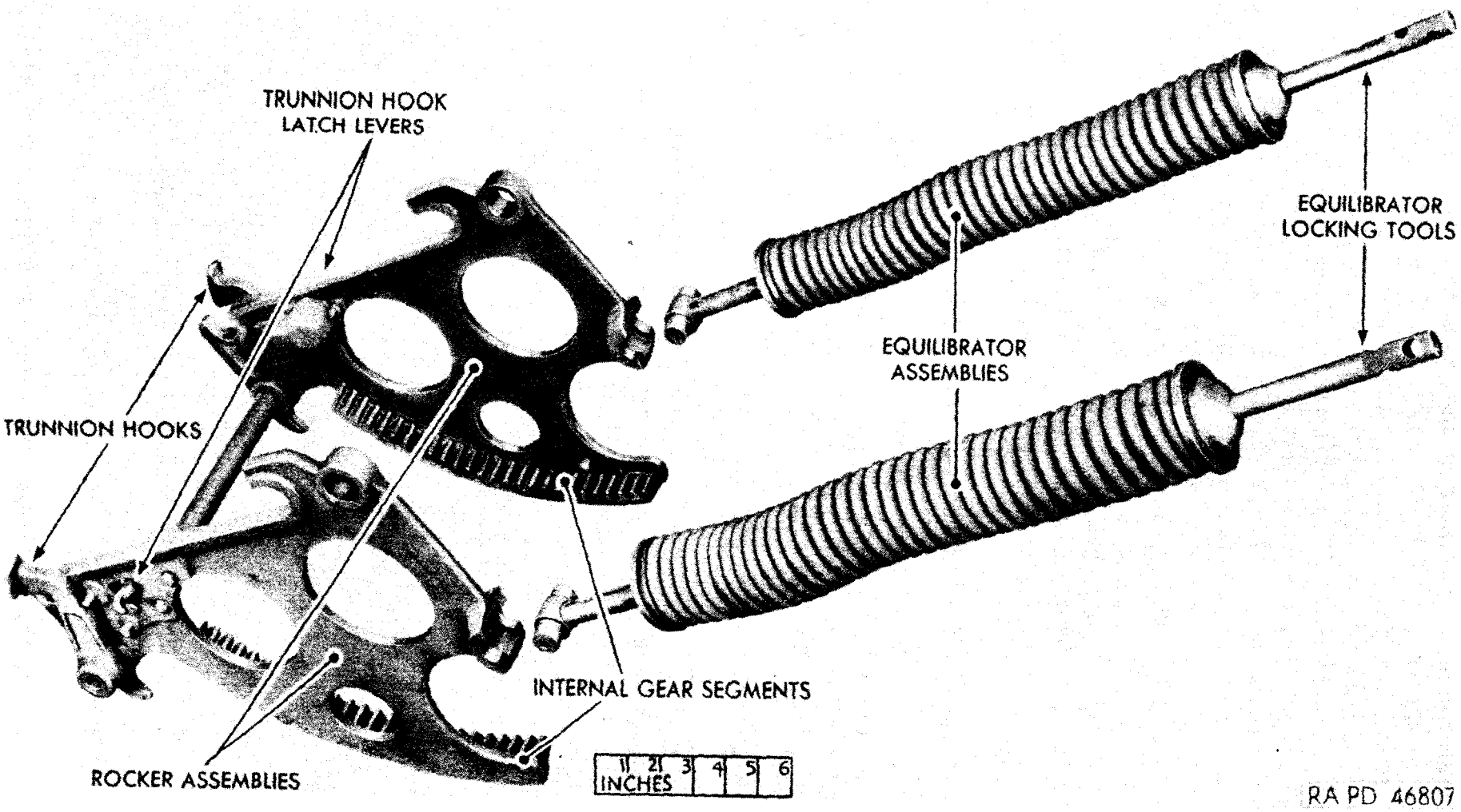


Figure 187. Equilibrator and rocker assemblies.

e. Trail hinges at the rear of the front trail (fig. 34) engage hinges on the front end of the rear trail, to join the front and rear trails. Two trail fulcrum plungers in the trail connecting mechanism housing pass through the eyes of the hinges (fig. 191). They are thrust into and withdrawn from the eyes of the trail hinges by means of the trail fulcrum and two fulcrum links. The fulcrum can be turned 90° by means of the handspike inserted into the eye of the fulcrum, after the cotter pin which locks the trail connecting mechanism has been withdrawn. Rotation of the fulcrum engages and disengages the plungers with the trail hinges.

f. A cotter pin, attached by thong and eyebolt, is provided for the trail connecting mechanism. It can be inserted only when the trail connecting mechanism is fully engaged.

144. Removal and Installation of Front Trail Assembly

The front trail assembly is separated from other assemblies when the axle and wheel assembly is removed from it as outlined in paragraph 27*d*. The front trail assembly is the starting point for assembling the matériel from pack loads.

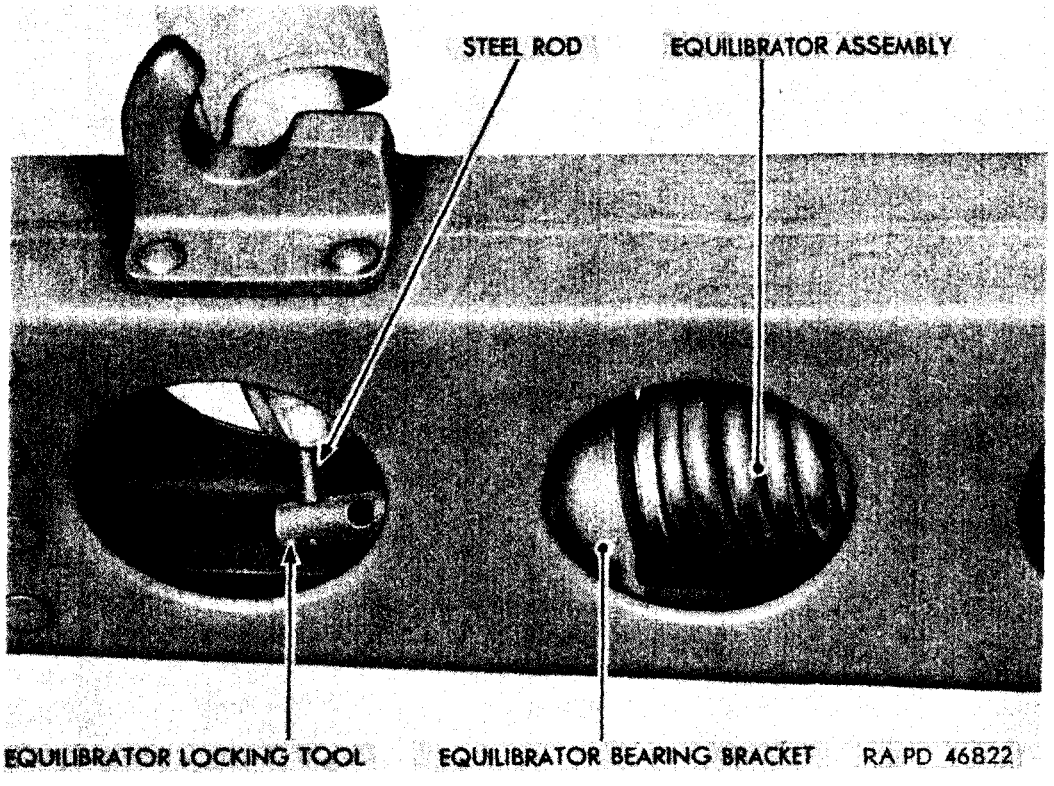


Figure 188. Setting equilibrator locking tool into position in equilibrator.

145. Disassembly of Front Trail Assembly

a. The equilibrators and rocker assembly may be removed from the front trail as follows:

(1) Depress the pack howitzer to zero elevation.

(2) Insert one of the equilibrator locking tools 41–T–3092–313 through the trail opening in the rear of the cup-shaped bearing bracket inside the front trails (fig. 188).

(3) Advance the equilibrator locking tool until it comes into contact with the equilibrator stem plug. Screw the locking tool into the plug as far as it will go with a $\frac{3}{8}$-inch diameter by 6-inch steel rod or 3/16-inch pin drive punch. There must be complete engagement of the threads to prevent stripping by the pressure of the spring.

(4) Repeat these operations (steps (2) and (3) above) on the other equilibrator.

Caution: One equilibrator cannot be removed without performing these steps to the other as it will place undue strain on the rocker assembly.

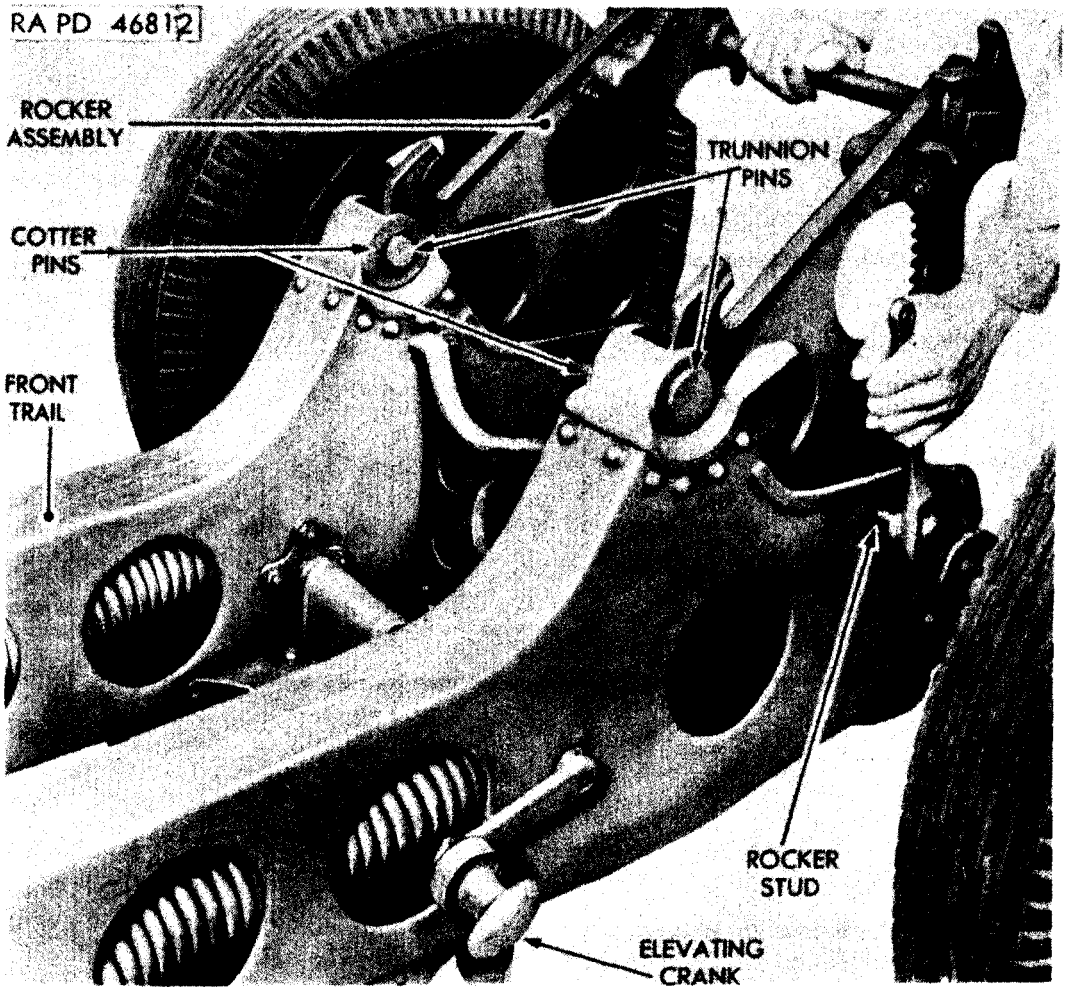


Figure 189. Removing rocker stud from front trail assembly.

(5) Remove the top sleigh, howitzer tube, breech ring, bottom sleigh, and cradle (pars. 25 and 26).

Caution: Make certain the equilibrators are securely locked by the equilibrator locking tools before starting to remove the rocker assembly.

(6) Elevate the rocker assembly and remove the rocker stud (fig. 189). Remove the cotter pin from each trunnion pin.

(7) Run the rockers out of mesh with the rocker shaft pinions. Push the trunnion pins out and lift the rocker assembly from the front trail.

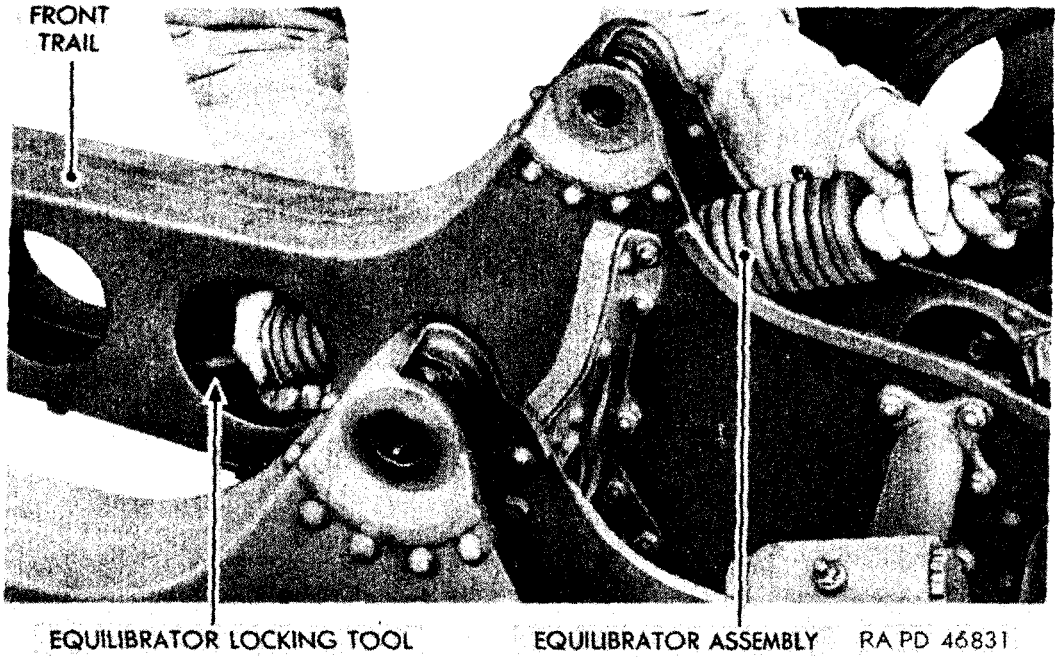


Figure 190. Removing equilibrator from front trail assembly.

(8) Remove the equilibrator assembly through the rocker opening in the front trail (fig. 190).

Caution: The using arm can only replace an equilibrator as a unit (fig. 190). Under no circumstances should an attempt be made to disassemble the equilibrator as the spring pressure when the locking tool is inserted is approximately 1,400 pounds.

b. The trail connecting mechanism may be removed from the front trail as follows:

(1) After the rear trail has been removed (par. 27*b*), insert the handspike in the eye of the trail fulcrum and turn the fulcrum until the trail fulcrum link pins are clear of the housing. Remove the cotter pins and the trail fulcrum pins (fig. 191).

(2) Remove the cotter pin from the trail fulcrum nut; then remove the nut with socket wrench handle 41–H–1505 and ¾-inch

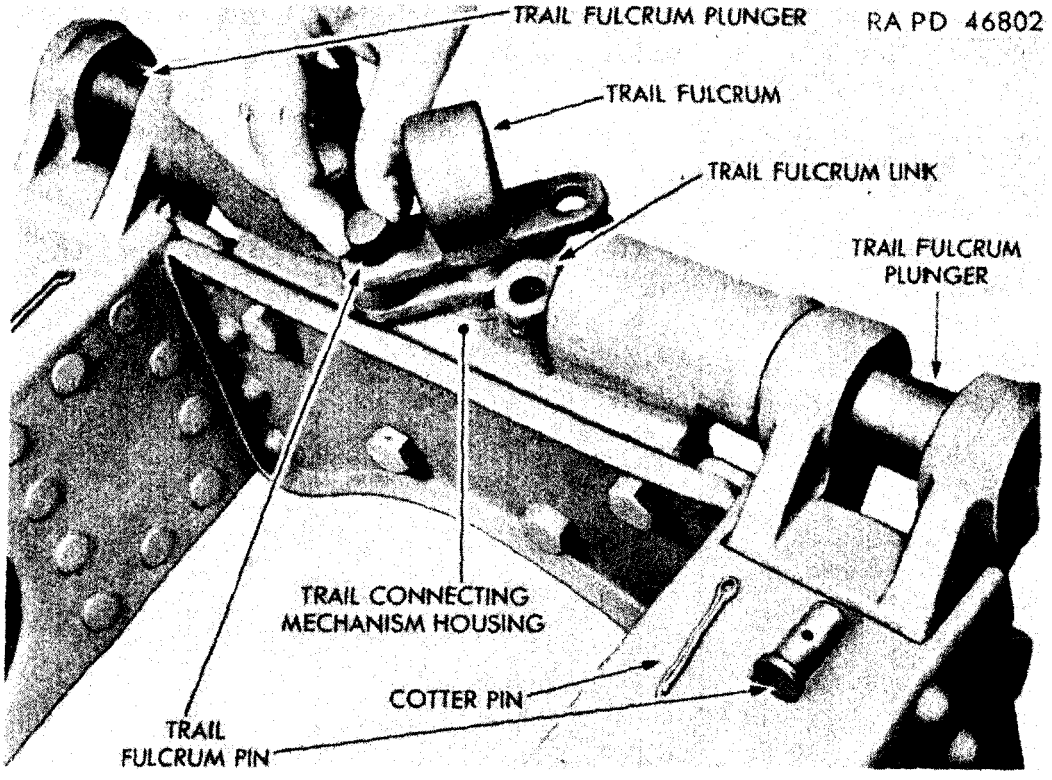


Figure 191. Disconnecting trail fulcrum from trail fulcrum link.

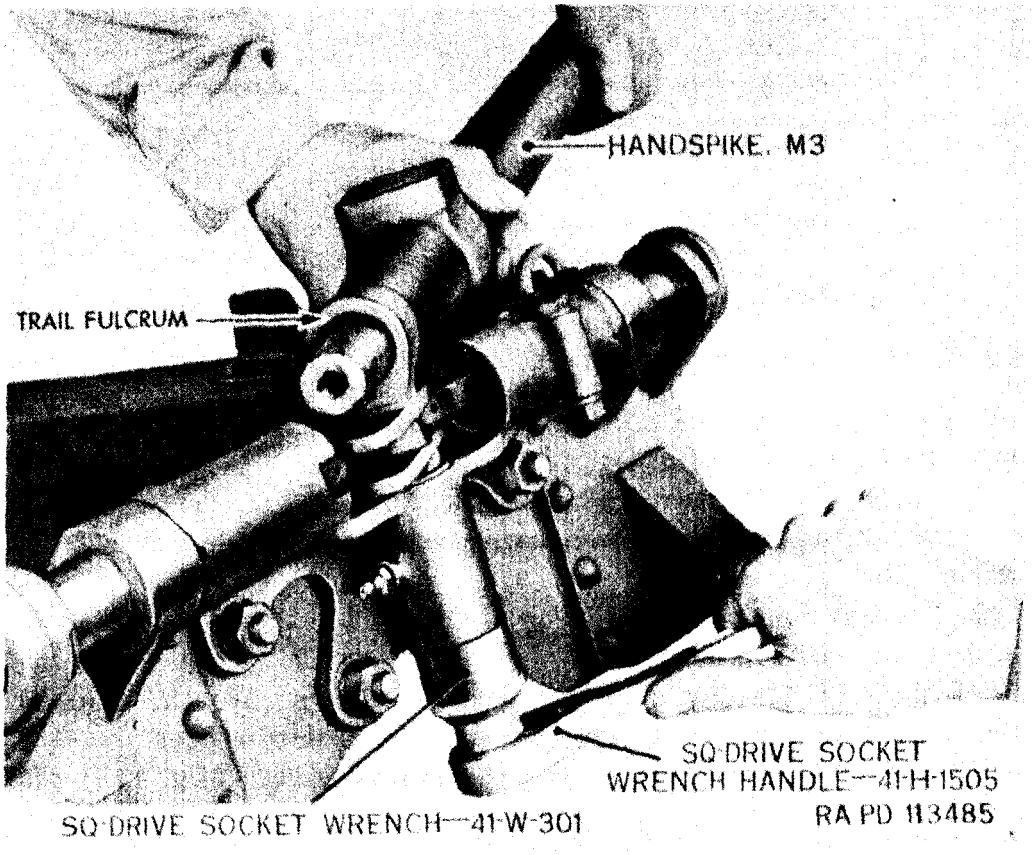


Figure 192. Removing trail fulcrum.

socket wrench 41–W–3017 (fig. 192), using the handspike to hold the trail fulcrum. Withdraw the trail fulcrum from its housing.

(3) Push the fulcrum link, fulcrum plunger, and fulcrum link pin out as an assembly (fig. 193). Remove the cotter pin and push the fulcrum link pin out to separate the fulcrum plunger and link.

(4) Repeat the above step to remove and separate the other fulcrum plunger and link.

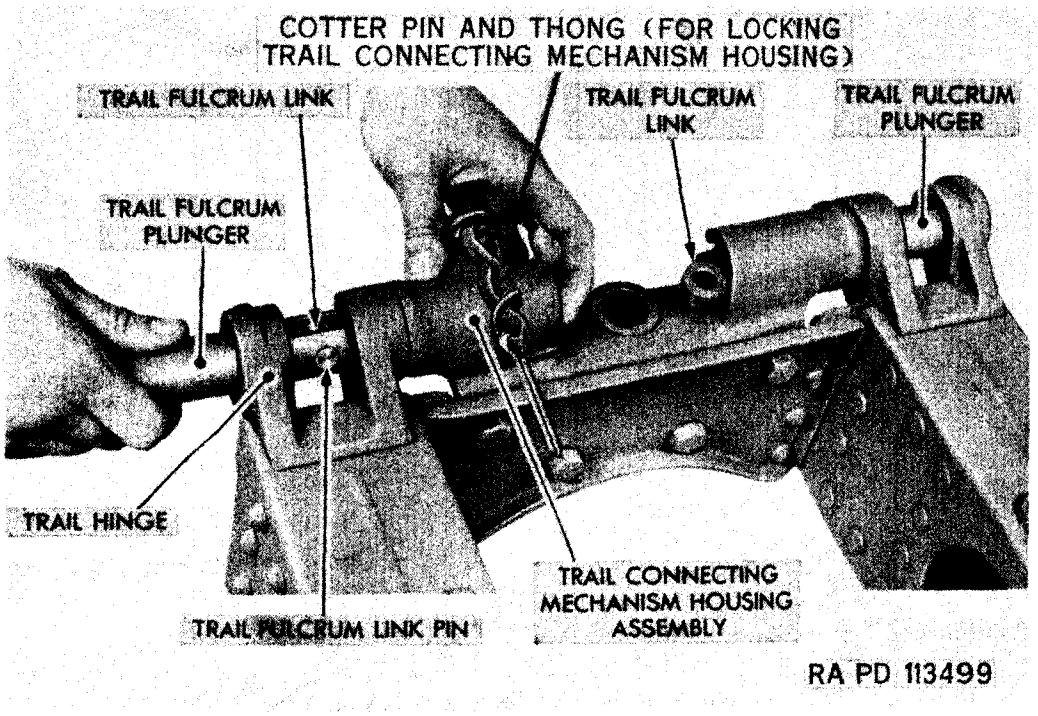


Figure 193. Removing trail fulcrum plunger, fulcrum link, and fulcrum link pin.

146. Assembly of Front Trail Assembly

a. To install the trail connecting mechanism on the front trail, the procedure is as follows:

(1) Place the fulcrum link and fulcrum plunger in place in the trail connecting mechanism housing and trail hinge. Insert the fulcrum link pin.

(2) Repeat the above step to install the other fulcrum link, plunger, and link pin.

(3) Put the trail fulcrum in position and secure the fulcrum links to the fulcrum with fulcrum pins and cotter pins.

(4) Install the fulcrum nut on the trail fulcrum (fig. 191) and secure with a cotter pin.

b. To install the equilibrators and rocker assembly in the front trail, the procedure is as follows:

(1) Insert the locking tools in both equilibrator assemblies. Place both equilibrator assemblies in position in the front trail.

(2) Install the rocker assembly in place in the front trail with the rocker gear segments in mesh with the rocker shaft pinions. Insert the trunnion pins through front trail and rockers with trunnion pinheads outside. Secure with cotter pins.

(3) Run the rocker assembly down so rocker stud can be screwed in. Screw the rocker stud in place in the right rocker.

(4) Run the rocker assembly down and engage the equilibrator trunnion pins in trunnion pin sockets on rear of rockers.

(5) Assemble cradle, bottom sleigh, breech ring, howitzer tube, and top sleigh to carriage (par. 28).

(6) Remove the equilibrator locking tools from both equilibrators with a 3/8-inch diameter by 6-inch steel rod or 3/16-inch pin drive punch.

(7) Test the elevating mechanism action by elevating and depressing howitzer several times. See paragraph 147*b* for procedure of adjusting the equilibrators.

147. Adjustment of Elevating Mechanism and Equilibrator

a. Excessive end play may develop between the elevating worm and wormwheel. This will impair smooth operation of the elevating mechanism and may be corrected in the following manner.

Caution: Under no circumstances will the ball bearing retainer be removed or backed out when equilibrators are unlocked, and/or when the howitzer, sleigh, or cradle are assembled.

(1) Install the equilibrator locking tools (par. 145*a*) and remove the howitzer, sleigh, and cradle (pars. 25 and 26).

(2) Loosen, but do not remove, the bearing retainer locking screw. Loosen just enough so that the ball bearing retainer can be turned (fig. 194).

(3) Using spanner wrench 41–W–3249–900 (fig. 194), adjust the ball bearing retainer as required.

(4) Screw the locking screw back in and lock retainer in place.

(5) Install the cradle, sleigh, and howitzer (par. 28) and remove the equilibrator locking tools.

(6) Test the operation of the elevating mechanism for smoothness.

b. The following procedure should be observed in adjusting the equilibrators:

(1) Place the howitzer at zero elevation.

(2) Install the equilibrator locking tool (par. 145*a*).

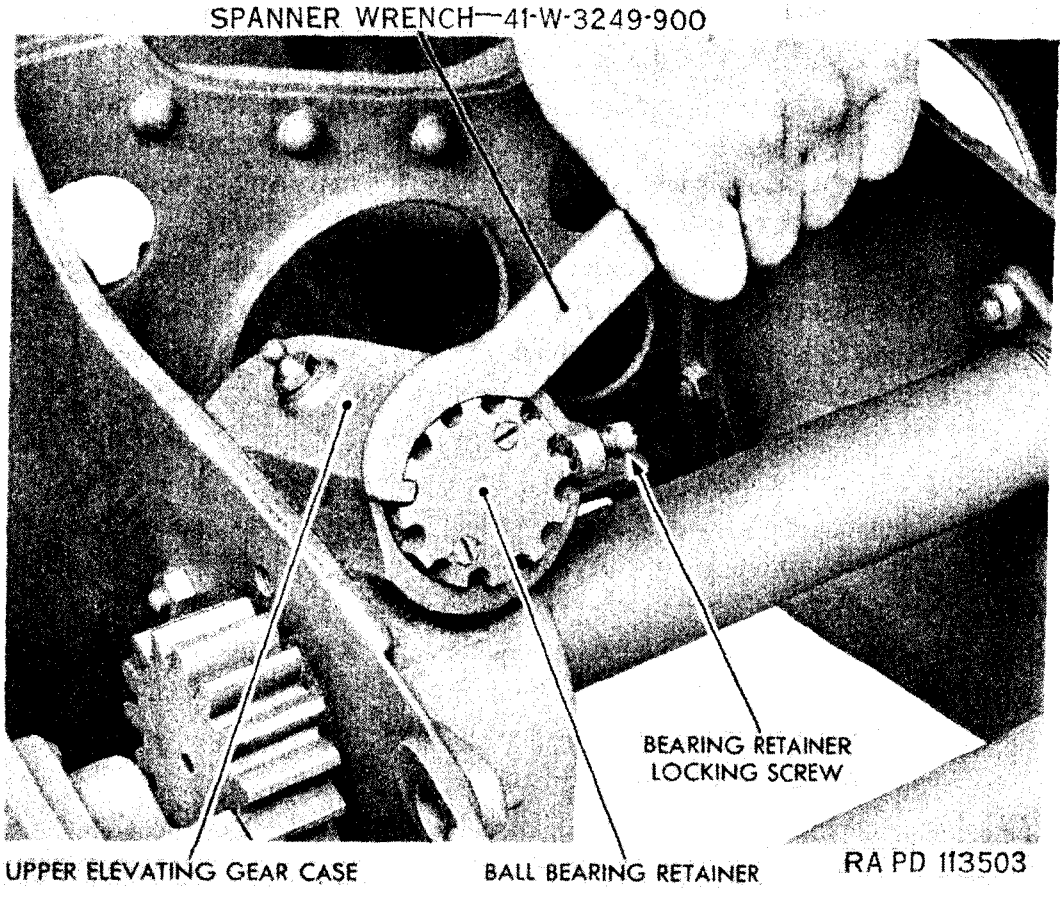


Figure 194. Adjusting ball bearing retainer for end play.

(3) Elevate the howitzer until the equilibrator trunnion pin is clear of the trunnion pin socket in the rocker.

(4) Release the equilibrator pin lock and make the desired adjustment by screwing the trunnion pin in for lesser tension or out for greater tension.

(5) After the adjustment is completed, reengage the lock, lower the rocker to seat the equilibrator trunnion pin, and remove the locking tool.

Caution: Do not attempt to remove the locking tool until the rocker is seated and the spring tension is released.

148. Maintenance of Front Trail Assembly

a. Clean and lubricate in accordance with maintenance schedules (pars. 91 and 92).

b. Repaint or touch up damaged spots as required (par. 90).

c. Keep the elevating mechanism and equilibrator properly adjusted.

Section XXVIII. AXLE AND TRAVERSING MECHANISM

149. General

a. The axle (fig. 195) is a round steel bar which is bored out at both ends and each end is fitted with an axle arm. The left arm is pinned in place, whereas the right arm is secured with a screw to permit disassembling.

b. The axle sleeve houses the axle and traversing mechanism. The sleeve may be inserted in the axle bearings on the trail by facing the sleeve around so that the flat surfaces fit into the openings of the bearings. The sleeve is locked in the bearings by turning it 90°.

c. When it is unlatched and swung perpendicular to the axle, the hinged handle of the axle sleeve lock serves as a lever to turn the axle sleeve (fig. 18). When the handle is folded back and latched against the axle sleeve, a tongue extending beyond the pivot of the axle sleeve engages a slot in the front trail (fig. 195). This prevents rotation of the axle sleeve and locks it to the front trail.

d. The traversing mechanism slides the axle in the axle sleeve, without rotating the axle, by means of ball bearings which act as an engaging thread to a spiral axle groove. Calibrations graduated in mils of traverse are cut into the top of the axle at the right end (fig. 13), and the right edge of the axle sleeve serves as the index for this traversing scale. The traversing mechanism is composed of the traversing nut, handwheel, handwheel machine screw, ball bearing, ball bearing cap, ball bearing nut, and 71 steel balls, five-sixteenths inch in diameter.

e. The bellows-like dust cover between the left axle arm and the traversing handwheel prevents the entry of dirt or foreign matter into the traversing mechanism. It also protects the grooved portion of the axle not covered by the axle sleeve. The dust cover does not rotate with the traversing handwheel.

150. Removal and Installation of Axle and Traversing Mechanism

a. Remove the axle and wheel assembly as outlined in paragraph 27*d*. Withdraw the linchpin (fig. 37) and remove the wheels from the axle.

b. Install the wheels onto the axle (par. 154*c*) and fasten the axle and wheel assembly to the front trail as outlined in paragraph 28*b*.

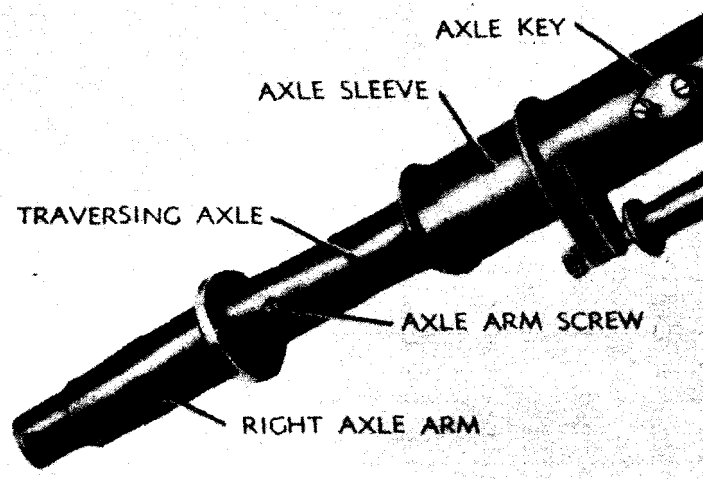
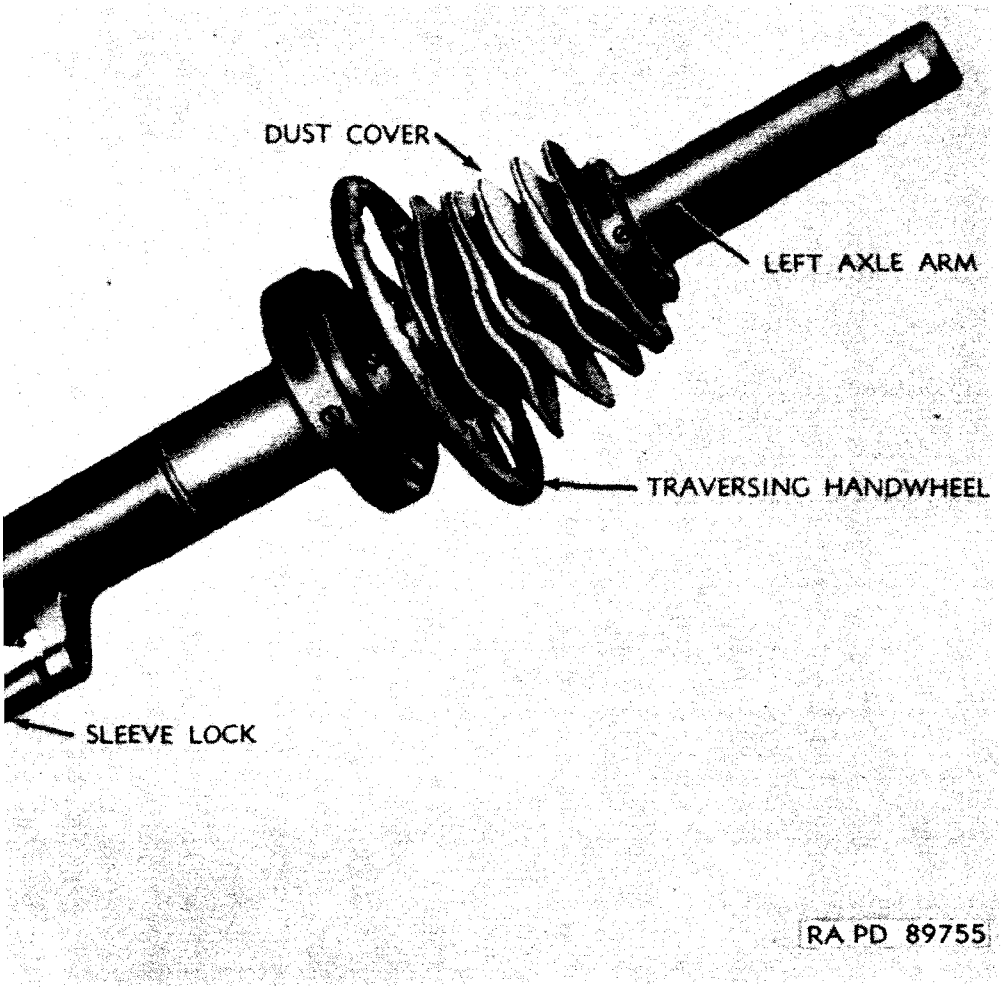

AXLE KEY
AXLE SLEEVE
TRAVERSING AXLE
AXLE ARM SCREW
RIGHT AXLE ARM

Figure 195.



Axle and traversing mechanism.

151. Disassembly and Assembly of Axle and Traversing Mechanism

a. To loosen the dust cover for maintenance and lubrication, remove the retaining screws which fasten the left clip to the left axle arm (fig. 195) and those which fasten the right clip to the axle sleeve. The dust cover then can be moved to expose the traversing mechanism grooves on the axle.

b. No other disassembly is authorized for the using arm.

c. After performing the prescribed maintenance, assemble the dust cover clips in place and secure them with the retaining screws.

152. Maintenance of Axle and Traversing Mechanism

a. Clean and lubricate in accordance with maintenance schedules (par. 91).. See Note 2 under Notes on the lubrication order (fig. 156) for instructions pertaining to cleaning and lubricating the axle sleeve and dust cover assembly.

b. Repaint or touch up damaged spots as required (par. 90).

c. Clean the leather dust cover with saddle soap. If further treatment is necessary to restore the pliability of the leather, apply light film of neat's-foot oil and wipe off excess.

Section XXIX. WHEELS AND TIRES

153. General

a. The wheels (fig. 196) are of the steel disk and rim type equipped with 6.00 by 16 pneumatic tires.

b. Each wheel consists of the hub parts, disk and rim, pneumatic tire, heavy-duty inner tube, and a tire locking ring.

c. The wheels rotate on tapered roller bearings which are mounted on hub liners.

d. The hub liners are secured to the axle arms by linchpins.

e. Rubber slip-on type hub caps were formerly used, but are no longer being issued. Any still in use are to be removed as soon as worn out or damaged.

154. Removal and Installation of Wheel Assembly

a. Remove the linchpins from the axle arms (fig. 37).

b. Support the axle and pull off the wheels (fig. 38).

c. To install the wheels, support the axle and place the wheels in position on the axle arms. Secure the wheels in place with the linchpins.

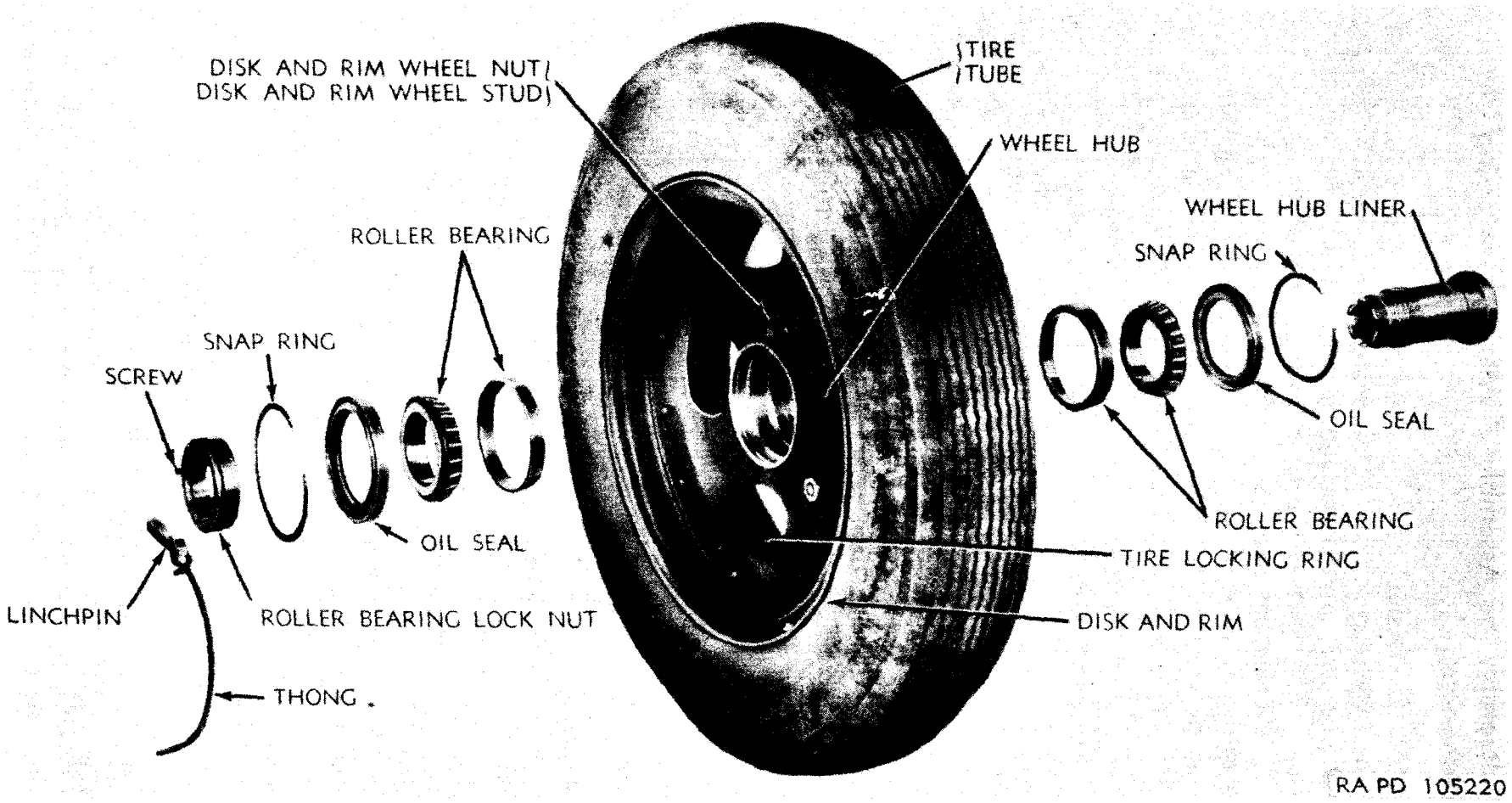


Figure 196. Wheel assembly—exploded view.

155. Disassembly of Wheel Assembly

a. To Remove Disk and Rim from Hub. (1) Loosen the disk and rim wheel nuts from the disk and rim wheel studs, using the stud nut wrench furnished. Jack up the wheel and remove the nuts from the studs.

(2) Pull the disk and rim from the hub.

b. To Remove Tire and Tube. (1) Remove the valve stem cap and completely deflate the tube. Replace the valve stem cap.

(2) Remove the tire locking ring by inserting a suitable tool, such as a heavy screw driver, starting at the notch and prying outward at the same time pounding down on the locking ring with a rubber mallet to disengage the ring from its gutter. Start at the notch and progress on around the wheel. Use caution, as any air pressure left in the tube will cause the ring to snap out and may cause injury.

(3) Remove the tire and the tube from the wheel.

c. To Remove Hub Liner and Bearings. (1) Remove the two screws from the roller bearing lock nut.

(2) Using screw driver as a pry, remove the snap ring.

(3) Unscrew and remove roller bearing lock nut, using spanner wrench 41–W–3248–10. Tap the hub liner out of wheel. Remove front oil seal and cone and roller of front (outside) roller bearing (fig. 196).

(4) Remove rear snap ring, oil seal, and cone and roller of rear (inside) roller bearing. Outer races of both bearings can be driven out with a long drift and hammer (fig. 196).

156. Assembly of Wheel Assembly

a. To install the tire and tube on the rim, partially inflate the tube, place it in the tire, eliminate any wrinkles, and place the tire on the rim, taking care that the valve stem is properly seated in its place. Install the locking ring by starting at one end and pounding it into its gutter progressively around the ring. Use caution, as it may snap out and cause injury. Inflate the tube to 20 pounds per square inch and replace the cap on the valve stem.

b. To install the disk and rim on the hub, place the disk in alinement with the disk and rim wheel studs on the hub. Secure tightly in place with the disk and rim wheel nuts.

c. To install the hub parts, first pack the bearings with grease (par. 158).

(1) Install the roller bearing outer races by driving them carefully into place with a drift and hammer.

(2) Place the cone and roller, oil seal, and snap ring in place in rear of wheel hub; then insert the hub liner.

(3) Place the front or outside cone and roller in place on hub

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liner and in wheel hub. Follow with oil seal and snap ring; then screw the wheel hub roller bearing lock nut on the wheel hub. Tighten the lock nut, using spanner wrench 41–W–3248–10, until there is no play in the bearing and the wheel rotates just freely without binding. Too tight an adjustment will cause the hub to overheat; too loose an adjustment will chip and score the bearings. When properly adjusted, lock the lock nut in place by tightening the two setscrews in the lock nut.

157. Maintenance of Wheel Assembly

a. Tires will give longer and better service when the following instructions are carefully observed:

(1) Whenever practicable, the tires should be kept covered from the direct rays of the sun.

(2) The air pressure should be maintained at 20 pounds. This prescribed air pressure is to be stenciled or painted on the matériel. Check the pressure before towing the carriage while the tires are still at normal atmospheric temperature. Do not release air after the carriage has been towed and the tires are warm. Pressures will return to normal as the tires cool. For low speeds over soft terrain, the air pressure may be reduced to 16 pounds; for high speeds over improved highways, the air pressure may be increased to 24 pounds.

(3) Grease, dry cleaning solvents, gas, and oil will deteriorate rubber. Remove any petroleum product immediately by washing with soap and warm water.

(4) Cuts, abrasions, and nail holes, should be repaired as soon as possible. A cut through the tread or sidewall rubber to the plies will allow water and dirt to enter deteriorating the cords and resulting in tire failure.

(5) Tires should be alternated from right to left side to allow them to wear evenly. Uneven tire wear may indicate a bent axle and should be reported to ordnance maintenance personnel for correction.

b. Look for stones wedged between the disk and rims or between the tires and rims. Pry them loose. If disk and rims are distorted or badly dented, notify ordnance maintenance personnel for replacement.

c. Clean the bearings with dry cleaning solvent or grease cleaning compound. Repack by kneading the prescribed grease (fig. 156) between the races around the rollers until the grease squeezes out on the other side of the bearing.

d. Keep the wheels painted and retouch any damaged painted areas. Use only rubber mallets when changing tires, as metal hammers will dent the rim and chip off the paint.

PART FOUR

AUXILIARY EQUIPMENT

Section XXX. GENERAL

158. Scope

Part four contains information for the guidance of the personnel responsible for the operation of this equipment. It contains only the information necessary to using personnel to properly identify, operate, and protect the ammunition, fire control equipment, and subcaliber equipment while being used or transported with the main equipment. Further information, if required, is contained in TM's listed in appendix II.

Section XXXI. AMMUNITION

159. General

Ammunition for the 75-mm howitzer M1A1 is issued in the form of fixed and semifixed rounds. A complete round consists of all the ammunition components required to fire the weapon once. It includes a cartridge case, primer, propelling charge and fuzed projectile. Fixed ammunition has a nonadjustable propelling charge, is loaded into the weapon as a unit, and is characterized by the rigid crimping of the cartridge case containing the primer and propelling charge to the projectile. Semifixed ammunition also is loaded into the weapon as a unit but has an adjustable propelling charge which is divided into sections for zone firing. The projectile is fitted freely in the neck of the cartridge case, permitting ready access to the propelling charge in the field.

160. Firing Tables

a. Firing data for this howitzer is provided in FT 75–I–4 and changes thereto and in graphical form in graphical firing table M40. Firing data on subcaliber ammunition is provided in FT 37–BJ–2 (abridged) and FT 37–BA–2 (abridged).

b. FM 21–6 contains a list of firing tables, trajectory charts, and trajectory diagrams. Graphical firing tables are listed in Department of the Army Supply Catalog pamphlet ORD 7 SNL F–237.

161. Classification

Dependent upon the type of projectile, ammunition for this howitzer is classified as high explosive (HE), high-explosive-antitank (HE, AT), chemical, blank, training, and drill. High-explosive projectiles are comparatively thin-walled projectiles containing a high-explosive bursting charge. They are intended principally for fragmentation or mining effect. High-explosive-antitank projectiles are high-explosive projectiles especially designed for penetrating armored targets. Chemical shell contain a chemical filler which produces either a toxic or an irritant physiological effect, a screening smoke, an incendiary action, or a combination of these. Chemical shell are of the burster type and contain a small charge of high explosive to rupture the shell upon functioning of the fuze and to scatter the filler. Blank ammunition contains no projectile and is provided for saluting and simulated fire. Training ammunition is inert but contains a chambered tube for firing a blank cartridge. Thus the round may be used both for training in service of the piece and simulated fire. Drill ammunition is completely inert and is used only for training in service of the piece.

162. Identification

a. Stenciling and Stamping. The various rounds may be identified as follows:

(1) *Stenciled on the shell.*

Caliber and type of cannon in which fired.
Kind of filler; for example, "TNT," "FS SMOKE."
"W/SUPPL CHG," "FOR FUZE M97" when applicable.
Type and model of projectile.
Weight-zone marking (except on high-explosive-antitank shell).
Lot number of loaded projectile. (Ordinarily, the projectile lot number is not required after the complete round is assembled. Hence, it is stenciled below the rotating band, in which position it is covered by the neck of the cartridge case in the assembled round.)

(2) *Stamping or stenciling on the cartridge case.*

Ammunition lot number (stenciled). The ammunition lot number will have an X suffix when the round is assembled with a steel cartridge case.
Type and model of projectile (stenciled).
Caliber and model of cartridge case (stamped in metal). The model designation has a B1 suffix when the case is made of steel.
Cartridge case lot number (stamped in the metal) (including initials or symbol of manufacturer).

Year of manufacture (stamped in metal).

(3) *Stamping on the fuze.*

Type and model of fuze.

Loader's initials and lot number.

Month and year loaded.

Action, when required; for example, "SQ" time in seconds on a graduated time ring, "DELAY" and length of delay as ".05" or ".15" sec; in addition to stamping, non-delay CP fuzes M78 have the tip painted white; tips of fuzes M78 with 0.025 seconds delay are not painted.

b. Ammunition Lot Number. A lot number is assigned all ammunition at the time of manufacture. It is marked on every loaded complete round of fixed and semifixed ammunition. It is required for all purposes, including reports on condition, functioning, and accidents in which the ammunition is involved.

c. Weight-zone Markings. Small variations in the weight of loaded shell occur due to manufacturing tolerances. Therefore, they are grouped into weight-zones and appropriate ballistic corrections are given in the firing tables for the variation in weight. The weight-zone of 75-mm howitzer projectiles is indicated thereon by crosses of the same color as the original markings. There are one, two, three or more such crosses, dependent upon the weight of the projectile. Two crosses signify standard or normal weight; that is, the weight at which no corrections for weight are necessary when computing firing data. An exception is the fixed high-explosive-antitank shell M66 which does not have weight-zone marking.

d. Painting. Artillery projectiles are painted primarily to prevent rust and secondarily to provide, by the color, a means of identification as to type. The color scheme is as follows:

(1) High-explosive—Olive drab, markings in yellow.

(2) Smoke—Gray, markings in yellow; one yellow band to denote a smoke-producing filler.

(3) Practice—Blue, markings in white.

(4) Training, and drill or dummy (inert)—Unpainted, because of cadmium-plated and bronze parts; but drill or dummy ammunition made of steel is normally painted black, markings being in white.

163. Care, Handling, and Preservation

a. Ammunition is packed to withstand conditions ordinarily encountered in the field. Care must be taken to keep packing boxes from becoming broken or damaged. All broken boxes must be repaired immediately and all markings transferred accurately to the new parts of the box. Complete rounds are shipped in

individual moisture-resistant fiber containers inclosed in a wooden packing box, or in individual metal containers when the ammunition is to be shipped to theaters where excessively humid conditions prevail. Nevertheless, since explosives are adversely affected by moisture and high temperature, due consideration should be given to the following:

(1) Do not break moisture-resistant seal until the ammunition is to be used.

(2) Protect ammunition, particularly fuzes, from high temperature and from the direct rays of the sun. More uniform firing is obtained if the rounds are at the same temperature.

(3) As some white phosphorus will melt above 105° F., WP shell in particular should be so stored as to avoid excessive temperature. When this is not possible, WP shell should be stored on their bases if practicable, even if it means rearranging shell within their packing; since upon melting and subsequent cooling and solidification, the void which is normally at the top will shift. Prematures have been caused by voids in the base end of WP shell and erratic results may result from voids in the side.

b. Do not attempt to disassemble any fuze.

c. Before loading the complete round into the weapon, each of the components should be free of foreign matter, sand, mud, moisture, or grease.

d. Do not remove protection or safety devices from fuzes until just before use.

e. Explosive ammunition or components containing explosives 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. Rounds prepared for firing but not fired will be returned to their original condition and packings and appropriately marked. Such rounds will be used first in subsequent firings in order that stocks of opened packings may be kept at a minimum.

g. Brass cartridge cases are easily dented and should be protected from hard knocks and blows. When removing the projectile of semifixed ammunition from or replacing it in the cartridge case, care must be taken to avoid damaging the lip of the case. Dented cartridge cases or cases with damaged lips may result in incomplete obturation, jamming in the chamber, and difficulty in extraction.

h. Each round to be loaded which contains a time or point-detonating fuze should be kept well out of the path of recoil of the gun. If the fuzes of rounds are accidentally hit by recoil, they are not to be fired under any circumstances but will be placed immediately in a segregated location and reported to the

local ordnance officer for examination and necessary action.

i. Blank ammunition with loose or broken cups will not be used or fired but will be reported to the ordnance officer for disposition.

j. Do not handle duds. Because their fuzes are armed, and hence extremely dangerous, duds will not be moved or turned but will be destroyed in place in accordance with TM 9–1900. Unlike other fuzes, duds containing VT fuzes may be considered safe for handling 24 hours after the firing of the projectile, but they should be handled with care since they contain an unignited powder train and booster charge.

164. Storage and Handling of VT Fuzes

a. Precautions applying to other packed ammunition also apply to VT fuzes. In addition, storage temperature limits should be held within —20° and +130° F. Storage outside these limits for any length of time will result in permanent damage. The direct rays of the sun on VT fuze containers may cause the temperature inside the container to exceed 130° F. and must be avoided.

b. VT fuzes must be protected against dampness. Although the fuzes are nearly waterproof, any exposure to dampness may increase the number of duds. Contact with rain or immersion in water will hasten deterioration. Particularly in tropical climates, the storage time of unpacked fuzes should be kept to a minimum. In other climates, fuzes can be safely used after 2 months storage outside of their packing containers but should be stored in the original sealed metal containers so far as practicable.

c. VT fuzes will withstand normal handling without danger of detonation or damage when in their original packing containers or when assembled to projectiles. However, care should be taken not to strike or drop fuzes or fuzed rounds as these actions may increase the number of duds. A drop of 4 feet in certain positions may cause a dud. Excessive rough handling will not decrease fuze safety but may increase the number of duds.

d. VT-fuzed ammunition may be safely transported short distances with normal care in handling. However, when such ammunition is to be transported considerable distances it may be advisable to remove the fuze from the shell and return the fuze to its original marked container. The supplementary charge and original fuze or closing plug (with gasket and spacer) should be reassembled to the shell, making certain that the supplementary charge is inserted properly (felt-pad end innermost, lifting strap outermost).

e. Fuzes and supplementary charges which have been removed from the shell will be packed in the containers from which VT fuzes have been removed. The containers should be properly marked and returned to ordnance personnel for disposition.

f. When rounds on which fuzes have been changed are returned to their containers, care must be taken to change markings on the containers and boxes to conform with the change in ammunition.

g. Rounds fuzed with VT fuzes must be specially padded when returned to their fiber containers. The U-shaped support which engages the wrench slots of time or impact fuzes will not fit the slots in VT fuzes and must, therefore, be omitted. The play that results is taken up by placing extra corrugated board pads under the base end of the projectile before closing the container.

165. Authorized Rounds

a. Ammunition authorized for use in the 75-mm howitzer M1A1 is listed in table III. Standard nomenclature, which completely identifies the ammunition, is used in the listing. *Only authorized rounds will be used in this weapon; unauthorized assembly and use of rounds, particularly HE, AT rounds, is extremely dangerous.*

b. Some high-explosive shell M48 are loaded to provide a deep fuze cavity so that these shell can be used with either VT fuzes or, upon insertion of a supplementary bursting charge of TNT, with other standard fuzes. Rounds with this shell are now shipped completely assembled with the supplementary charge and standard impact or time-and-impact fuze. Such rounds are marked "W/SUPPL CHG" on the shell. Early shipments of deep-cavity shell were assembled with or without supplementary charge, but without fuze, the fuze hole being closed by a nose plug. Such shell are marked "FOR VT FUZE."

c. Fuze, CP, M78 (T105), .025 second delay, w/booster, M25 (T1E1) (fig. 206), and fuze, CP, M78 (T105), nondelay, w/booster, M25 (T1E1) are authorized for use with high-explosive shell for the 75-mm howitzers These concrete-piercing fuzes, like the VT fuzes, are issued separately for assembly in the field.

d. For future manufacture of chemical shell M64, the M48A2 fuze with 0.05 second delay is authorized as standard and the M57 fuze is limited standard.

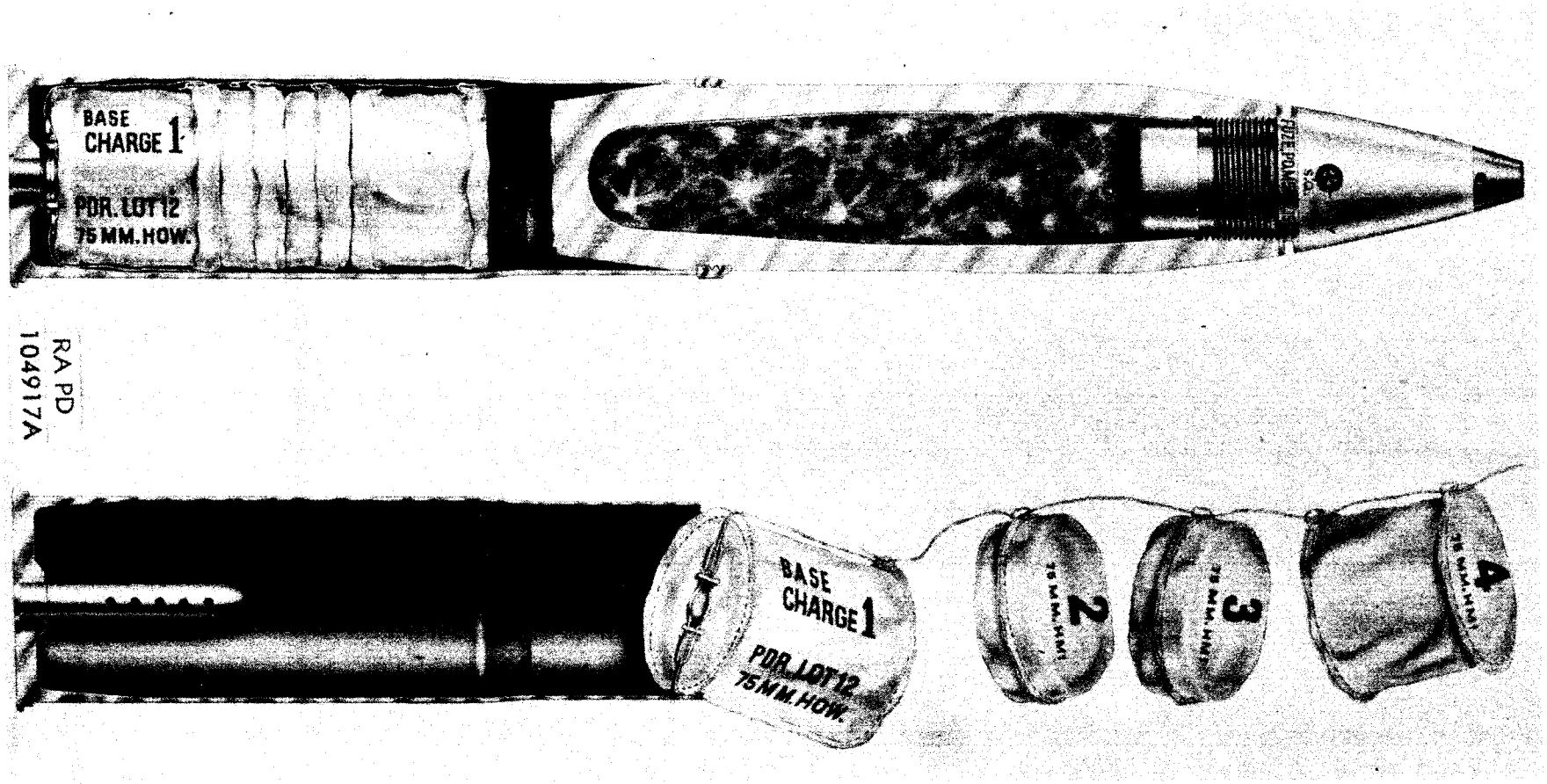


Figure 197. Semifixed round with HE shell M48 and PD fuze M51A4 (cartridge sectioned to show propelling charge).

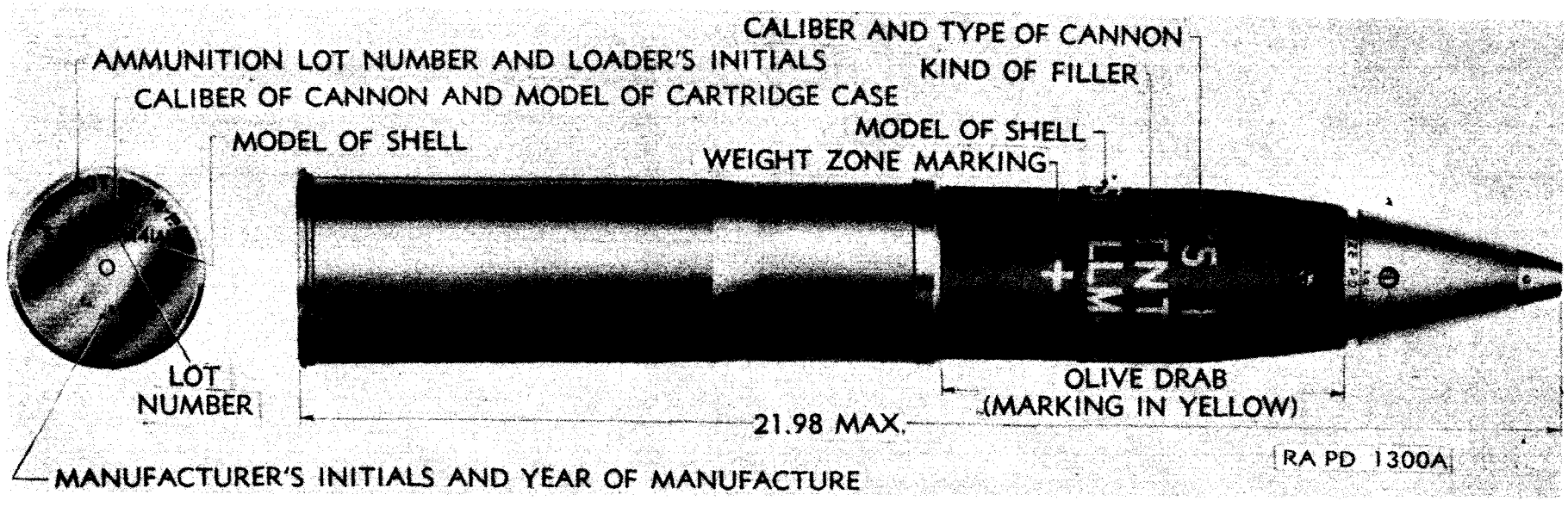


Figure 198. Semifixed round with HE shell M41A1 and PD fuze M48A2.

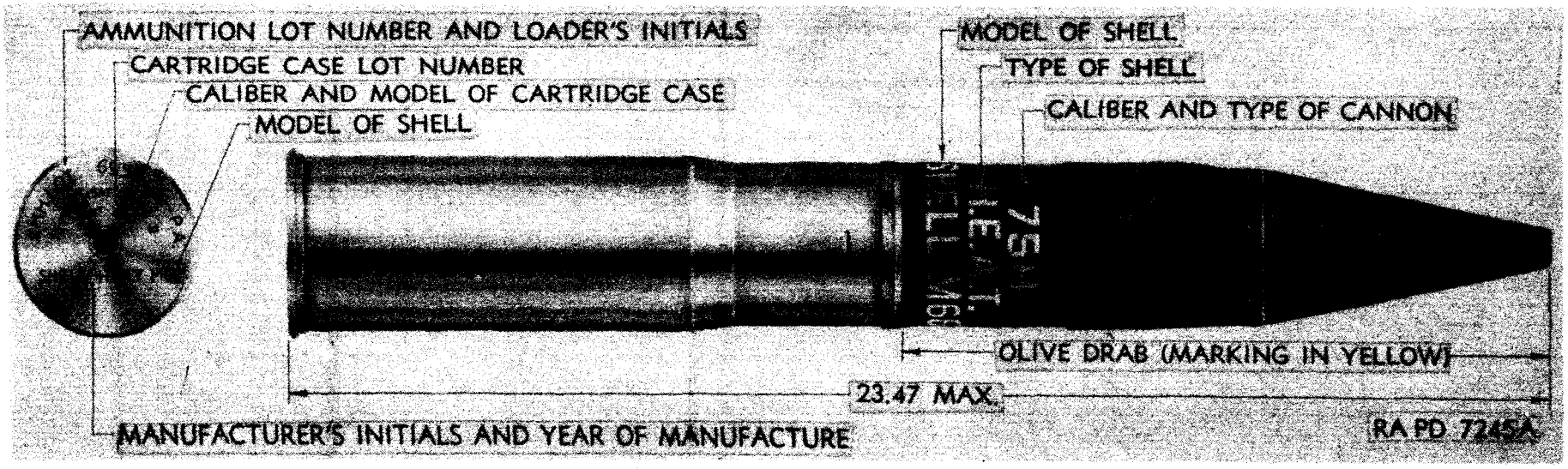


Figure 199. Fixed round with HE, AT shell M66.

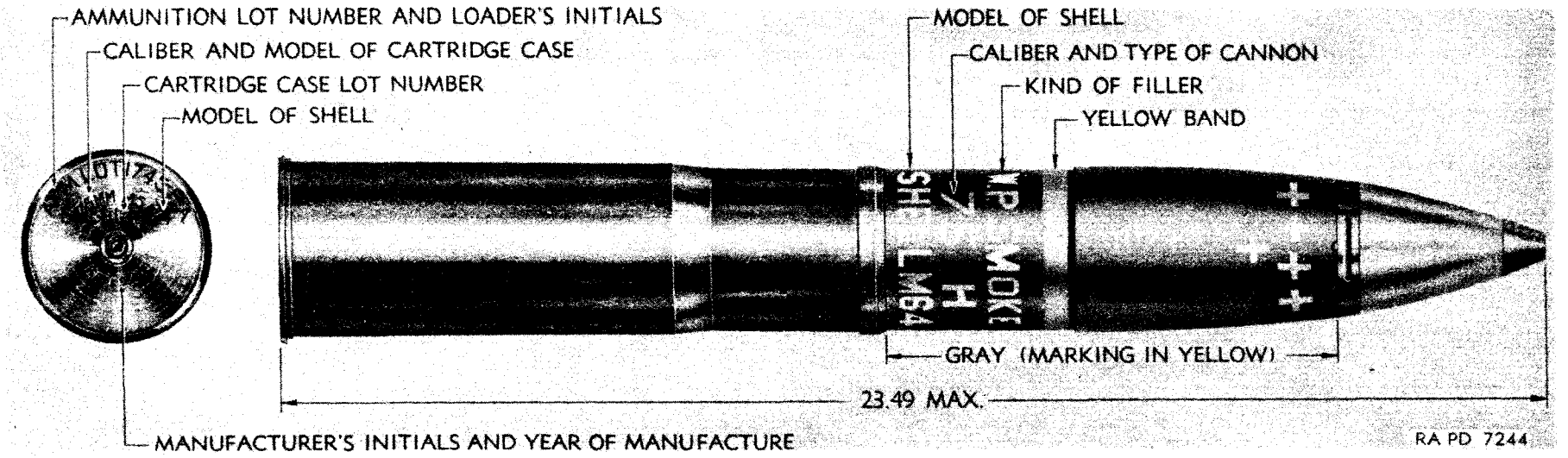


Figure 200. Semifixed round with WP shell M64 and PD fuze M57.

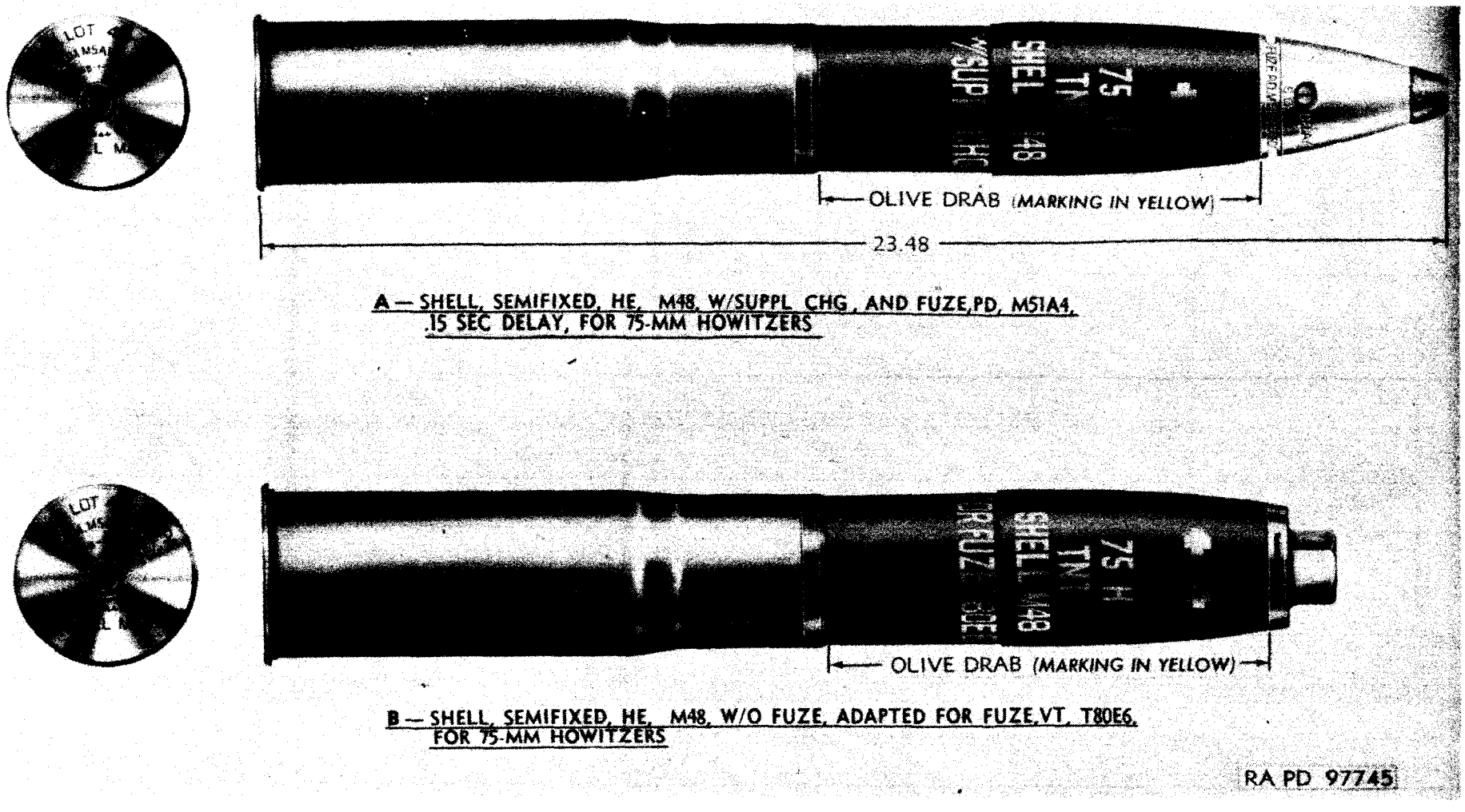


Figure 201. Deep-cavity rounds for 75-mm howitzers.

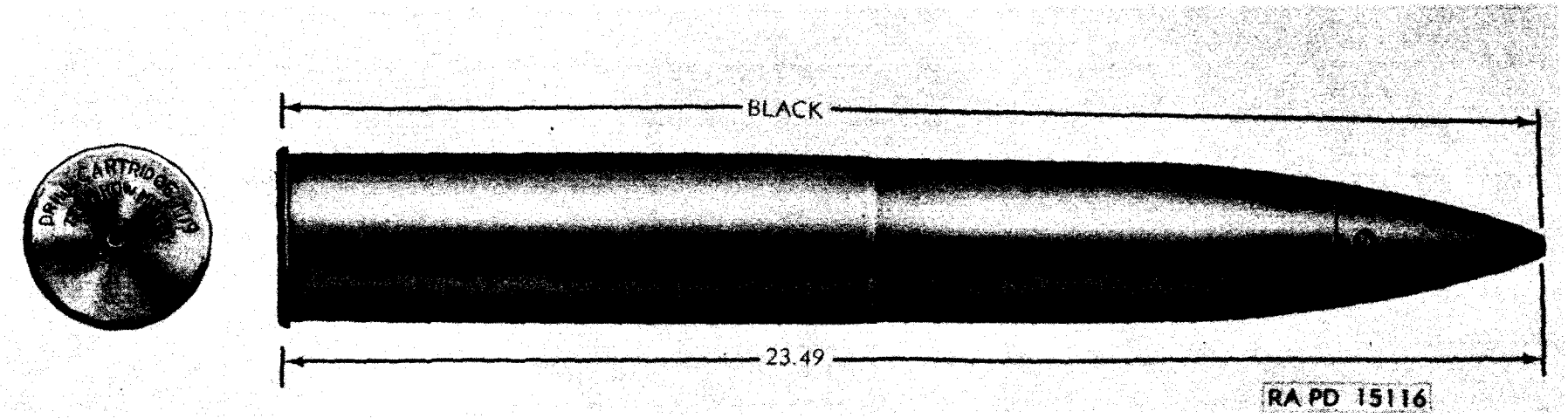


Figure 202. Drill cartridge M19 with dummy fuze M59.

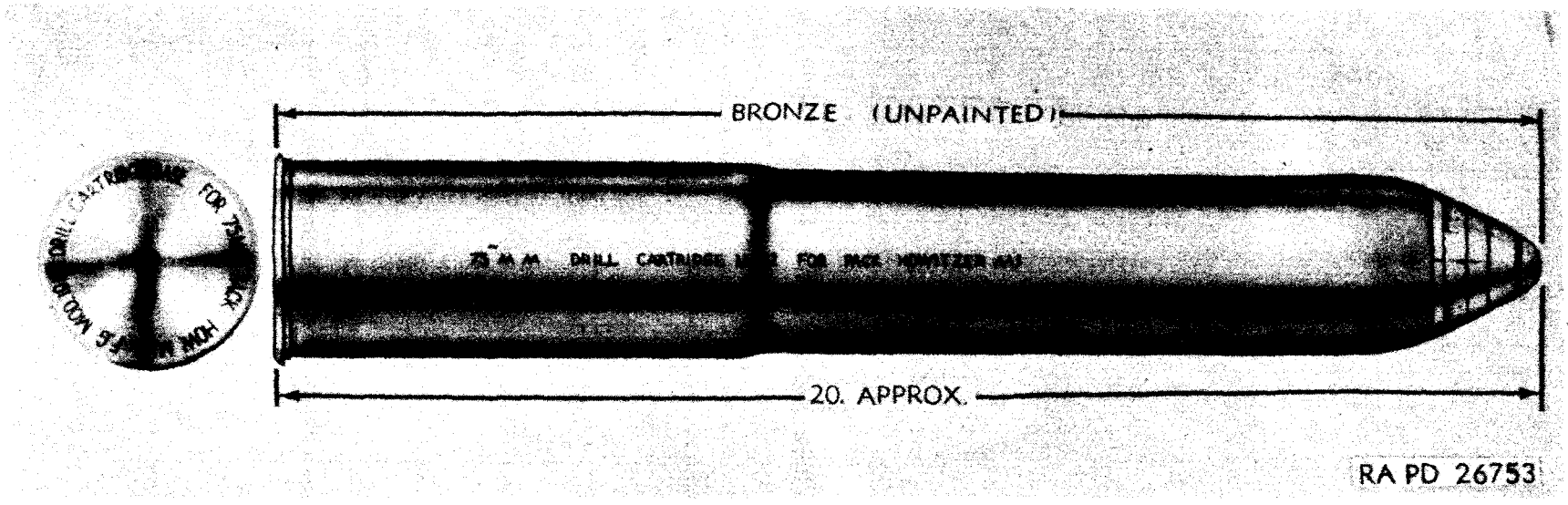


Figure 203. Drill cartridge M2A2 with inert 21-second combination fuze M1907M.

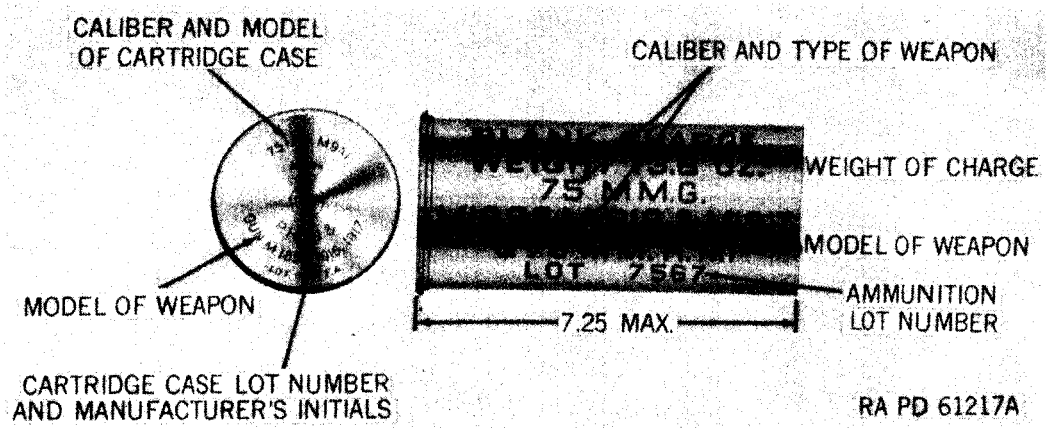


Figure 204. Blank ammunition (double pellet charge) for 75-mm howitzers.

Table III. Authorized Ammunition for 75-mm Howitzer M1A1

Standard Nomenclature	Complete Round		Projectile			Action of fuze
	Weight (lb.)	Length (in.)	Weight as fired (lb.)	Type of filler	Weight of filler (lb.)	
Service Ammunition						
SHELL, fixed, HE, AT, M66, for 75-mm howitzers[1]	16.26	23.47	13.27	Pentolite	1.00	Nondelay.
SHELL, semifixed, HE, M41A1, w/fuze, PD, M51A4 (M48A2), .15 sec delay, for 75-mm howitzers[9]	17.40	21.98	13.76	TNT	1.11	SQ or 0.15 sec delay.
SHELL, semifixed, HE, M48, w/fuze, PD, M51A4 (M48A2), .15 sec delay, for 75-mm howitzers[9]	18.34	23.50	14.70	TNT	1.49	SQ or 0.15 sec delay.
SHELL, semifixed, HE, M48, w/fuze, TSQ, M55A3 (M54), for 75-mm howitzers[9]	18.23	23.50	14.70	TNT	1.49	Time or SQ.
SHELL, semifixed, HE, M48, w/suppl chg and fuze, PD, M51A4 (M48A2), .15 sec delay, for 75-mm howitzers[8]	18.02	23.50	14.47[2]	TNT	1.303[3]	SQ or 0.15 sec delay.
SHELL, semifixed, HE, M48, w/suppl chg and fuze, TSQ, M55A3 (M54), for 75-mm howitzers[8]	18.02	23.50	14.47[2]	TNT[3]	1.303[3]	Time or SQ.
SHELL, semifixed, HE, M48, w/suppl chg, w/o fuze, for 75-mm howitzers[8]	16.26[5]	21.03[5]	14.47[4]	TNT[3]	1.303[3]	See footnote 8.
SHELL, semifixed, HE, M48, w/o fuze, for VT fuze, for 75-mm howitzers[8]	15.94[5]	21.03[5]	14.72[6]	TNT[7]	1.04[7]	VT; see footnote 6.
SHELL, semifixed, smoke, FS, M64, w/fuze, PD, M57, for 75-mm howitzers	19.05	23.50	15.41	FS	1.51	SQ.
SHELL, semifixed, smoke, WP, M64, w/fuze, PD, M57, for 75-mm howitzers	18.89	23.50	15.25	WP	1.35	SQ.

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Table III. Authorized Ammunition for 75-mm Howitzer M1A1—Continued

Standard Nomenclature	Complete Round		Projectile			Action of fuze
	Weight (lb.)	Length (in.)	Weight as fired (lb.)	Type of filler	Weight of filler (lb.)	
Blank Ammunition						
AMMUNITION, blank, double pellet charge, for 75-mm howitzers	3.07	7.25	—	—	—	—
AMMUNITION, blank, single pellet charge, for 75-mm howitzers	2.68	7.25	—	—	—	—
CARTRIDGE, blank, 10-gage, for 37-mm gun M6 and 75-mm guns and howitzers[10]	0.04	2.88	—	—	—	—
CARTRIDGE, training, M28, for 75-mm guns or howitzers[10]	—	23.49	—	—	—	Inert.
Drill Ammunition						
CARTRIDGE, drill, M19, w/fuze, dummy, M59, for 75-mm howitzers	18.25	23.49	—	—	—	Inert.
CARTRIDGE, drill, M2A2, w/fuze, combination, 21 sec, M1907M, inert, for 75-mm howitzers	19.20	20.00	—	—	—	Inert.

AT—antitank
HE—high explosive
PD—point detonating
sec—second
SQ—superquick
suppl—supplementary
TSQ—time and superquick

[1] The propelling charge is fixed; that is, not adjustable.
[2] As fired with fuze assembled as shipped.
[3] Includes supplementary charge assembly, weight 0.295 lb.
[4] With standard impact and time fuzes.
[5] As shipped, fitted with nose plug.
[6] With VT fuze.
[7] Does not include supplementary charge assembly, weight 0.295 lb.
[8] May be fired with impact, time, CP, or VT fuzes.
[9] CP fuze M78 and booster M25 may be assembled to these rounds.
[10] The cartridge, blank, 10-gage is intended for firing in the cartridge, training, M28, for 75-mm guns and howitzers.

166. Preparation for Firing

a. General. Rounds for the 75-mm howitzer M1A1 require preparation of shell, propelling charge, and fuze as described below, with the exception of the HE, AT round M66, which has a fixed (nonadjustable) propelling charge and single-action base fuze and is, therefore, ready for firing upon removing packing material.

Note. Upon removing a round from its fiber container, withdraw the U-shaped packing stop, when this stop is present, from the fuze wrench slots in the fuze. This stop is used with the packed projectile to prevent the fuze from touching the separating partitions in the center of the fiber container or from touching the ends of containers. Serious damage to the howitzer tube may result if this stop is not removed before firing.

b. Shell. (1) *Shell with assembled fuzes.* Rounds to be fired with their original fuzes require only the adjustment of fuzes as described in paragraph 167.

(2) *Shell with CP fuzes.* To prepare rounds for firing with CP fuzes (fig. 206), proceed as follows:

(*a*) Place round to be refuzed on its side. Protect the primer in the base of the cartridge case from being struck or damaged and the cartridge case from being dented.

(*b*) The booster setscrew, when present, must be loosened by means of a screw driver which fully fits the screw.

(*c*) Insert fuze wrench M16 (41–W–1496–115) (fig. 153) in the fuze slots and strike the wrench sharply in a counterclockwise direction to loosen the fuze from the shell, taking care to avoid striking any part of the fuze. Remove the fuze. If the booster comes out with the fuze, proceed to step (*e*) below.

(*d*) Remove the booster, using the booster end of the fuze wrench M16.

(*e*) Examine the fuze threads in the shell and the threads on the booster M25 and fuze M78 to insure that they are in good condition. Do not use components with damaged threads.

(*f*) Remove the safety pin from the booster M25 and screw the booster into the booster cavity of the shell. Tighten the booster firmly with the booster end of the fuze wrench. Boosters which are issued without safety pins should not be used.

(*g*) Screw the fuze M78 into the fuze cavity and tighten it securely. Make sure the fuze shoulder seats firmly against the nose of the shell. There should be no space between the fuze shoulder and the shell. Do not stake the fuze to the shell.

(*h*) Although the booster setscrew is not required for use with the M78 fuze and M25 booster, if originally present, it should be tightened sufficiently so that no part of the screw head projects above the ogival surface of the shell.

(*i*) If not fired, the round and the M78 fuze and M25 booster should be returned to their original container and packing.

(3) *Shell with deep-cavity and time-and-impact fuze to be prepared for VT fuze.* Deep-cavity shell issued with standard impact and time-and-impact fuzes are prepared for firing with VT fuzes as follows:

(*a*) Remove assembled fuze, using a fuze wrench and turning, with fuze up, in counterclockwise direction. (As the fuze is staked to the shell, it may be necessary to strike the handle of the wrench sharply to loosen it.)

Note. Do not remove the wax plug from the setscrew hole in the front of the shell if setscrew hole is present.

(*b*) Remove the supplementary charge by means of its cloth tape loop.

(*c*) Inspect the cavity for damage. Remove any loose material from the cavity. If the HE filler around the cavity appears to have been broken, reject the shell. If any HE is found adhering to the threaded portion of the shell throat, remove it with a pointed instrument made of wood or a nonferrous metal.

(*d*) Screw in the VT fuze by hand. If binding occurs, inspect the fuze cavity and threads of both fuze and shell. Reject whichever is at fault.

(*e*) Tighten the fuze to the shell with the special fuze wrench M18 (41–W–1496–135) (fig. 153) issued with boxes of VT fuzes. Use only such force as can be applied by hand to the fuze wrench handle. If the fuze cannot be tightened to form a good seat between the shell and fuze, reject the component at fault. *Do not hammer on the wrench or use an extension handle. Do not stake the fuze to the shell under any circumstances.*

(4) *Shell for VT fuze.* To prepare shell marked "FOR VT FUZES" for firing with such fuzes, proceed as follows:

(*a*) Remove the closing plug and gasket, and supplementary charge if one is present.

(*b*) Inspect the fuze cavity for damage as outlined in (3) (*e*), above.

(*c*) Assemble the fuze to the shell as outlined in (3) (*d*) and (*e*), above.

(5) *Shell with VT fuze to be prepared for time-and-impact fuze.* To prepare shell marked "FOR VT FUZE" for firing with time or impact fuze, proceed as follows:

(*a*) Remove the closing plug and gasket.

(*b*) Inspect fuze cavity for damage as outlined in (3) (*c*), above.

(*c*) Properly insert supplementary charge (feld-pad end innermost and listing strap outermost).

(*d*) Assemble the fuze to the shell.

c. Propelling Charge. Adjust the propelling charge for the charge to be fired as follows: Remove the projectile from the cartridge case, being careful not to damage the lip of the case, otherwise the round may jam in the chamber of the howitzer. Withdraw the increments from the cartridge case and remove and discard those increments numbered higher than the charge to be fired by cutting or breaking the twine between the designated charge and the higher numbered increments. Reassemble the remaining increments (from 1 up to and including the number of the charge to be fired) in the cartridge case in their original numerical order with the number of each increment uppermost. For example, when adjusting the four-section charge for charge 3, increment 4 will be removed and the remaining increments 1, 2, and 3 will be reassembled in the cartridge case. The round, so far as the propelling charge is concerned, is now ready for firing. When firing the full (charge 4) charge, no adjustment is required, the full charge as issued being used.

Caution: Under no conditions will the charge of the HE, AT round M66 be altered. Maximum penetration of armored targets is secured with the fixed charge furnished. Insertion of additional increments to increase the muzzle velocity will actually result in sharply reduced penetration due to changing the performance characteristics of the shaped charge in the projectile.

d. Fuzes. Fuzes M57, M62, M62A1, M91, CP M78, and VT M97, which by their nature are automatic or self-setting types, do not require preparation for firing. Other fuzes used with ammunition described in this section require adjustment of setting as described in paragraph 167.

167. Fuzes

a. General. A fuze is a mechanical device used with a projectile to explode it at the time and under the circumstances desired.

b. Classification. Fuzes are classified according to their manner of action as "time" or "impact." Time fuzes are either automatic, self-acting types which function on approach to the target (variable time), or adjustable types which contain a graduated element in the form of a compressed black powder train or mechanism similar to clockwork to explode the shell a certain number of seconds after firing. Impact fuzes function when the projectile strikes a resistant object. Impact types are classified according to rapidity of action as superquick, nondelay, and delay. According to their location on the projectile, detonating fuzes are known as point-detonating (PD) or base-detonating (BD).

c. Boresafe and Nonboresafe. A boresafe (detonator-safe) fuze is one in which the explosive train is so interrupted that while

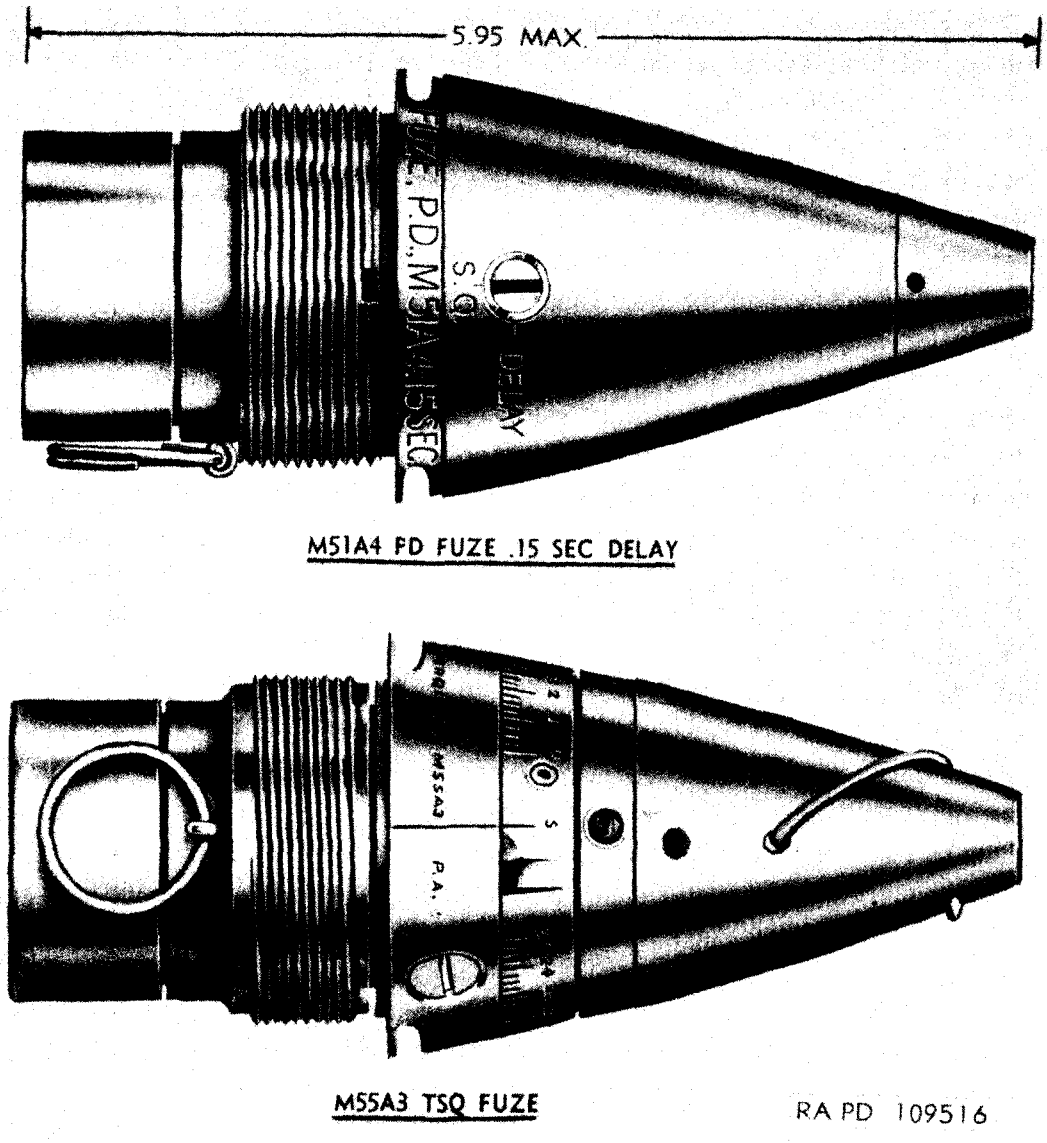


Figure 205. PD and SQ fuzes.

the projectile is still in the bore of the cannon, premature action of the bursting charge is prevented should any of the more sensitive elements, primer or detonator, malfunction. The fuzes are classified as follows:

Boresafe

Fuze, PD, M51A4 (M48A2)	w/booster, M25 (T1E1)
Fuze, PD, M54	Fuze, VT, M97 (T80E series)
Fuze, PD, M55A3 (M54)	Fuze, BD, M62
Fuze, PD, M57	Fuze, BD, M62A1
Fuze, CP, M78 (T105),	Fuze, BD, M91

Nonboresafe

None

Caution: Fuzes will not be disassembled. Any attempt to disassemble fuzes in the field is dangerous and is prohibited except under specific directions from the Chief of Ordnance.

d. Fuze M48A2 or M51A4. (1) *Description.* These fuzes, shown as issued fitted to the projectile in figures 198 and 201, are a combination superquick and delay type. Fuze M48A2 is manufactured with 0.05 second or with 0.15 second delay. The M51A4 (fig. 205) differs from the M48A2 by having a booster assembled to it and handled as a unit with the fuze. On the side of the fuze near the base is a slotted "setting sleeve" and two registration lines. One line is parallel to the axis of the fuze and marked SQ (superquick); the other at right angles thereto and marked DELAY. To set the fuze, the setting sleeve is turned with the screw driver end of fuze wrench M18, or a screw driver, so that the slot is alined with SQ or DELAY, whichever is required. The setting is made any time before firing, even in the dark, by noting the position of the slot parallel to the fuze axis for SQ and at right angles thereto for DELAY. It should be noted that, even though set superquick, this fuze will function with delay action should the superquick action fail to function.

(2) *Preparation for firing.* Prior to firing, it is only necessary to set the fuze as described above, and this only when delay action is required; since, as shipped, the fuze is set superquick.

e. TSQ Fuze M54 or M55A3. (1) *Description.* This type fuze, shown as issued assembled to the projectile in figure 197, is a combination time and superquick type. The M55A3 (fig. 205) differs from the M54 (fig. 197) by having a booster attached to it. A safety wire extends through the fuze to secure the time plunger during shipment. The fuze has two actions, time and superquick. The superquick action is always operative and will function on impact unless prior functioning has been caused by time action. Therefore, to set the fuze for superquick action, it is required that the time action be set either at safe (S) or for a time longer than expected time of flight. The time train ring is graduated for 25 seconds. To prevent extremely short time action, an internal safety feature prevents the time action from functioning, should the fuze be set for less than 0.4 second. As shipped, the fuze is set safe (S). The fuze is set for time by means of a fuze setter (par. 180 or 181).

(2) *Preparation for firing.* Prior to firing, with either superquick or time setting, the safety pull wire must be withdrawn from the fuze by pulling the lower end of the wire from the hole and sliding the wire off the end of the fuze. If superquick action is required, the graduated time ring can be left as shipped at safe (S) or set for a time greater than the expected time of

flight, using fuze setter M14 or M22 (par. 180 or 181).

Note. If the fuze is prepared for firing and is not used, it will be reset safe (S) and the safety pin replaced in its proper position before returning the round to its container.

f. PD Fuze M57. (1) *Description.* This fuze is a superquick type similar in appearance to fuze M48A2 or M51A4 except for the marking and the absence of the delay element assembly and setting sleeve.

(2) *Preparation for firing.* This fuze, being a single-action type, requires no setting or other special preparation for firing.

g. Fuze M62, M62A1, or M91. This fuze is assembled in the base of the antitank projectile (HE, AT, shell M66) and is known as a base-detonating (BD) fuze. It functions upon impact with nondelay action. Because of its location, the fuze is not visible. The M91 differs from the M62 and M62A1 by having a tracer in its base end. Shell containing M91 fuze (tracer) are identified by the addition of the letter T to the nomenclature (i.e., HE, AT–T).

h. CP Fuze M78 (T105). This concrete piercing fuze (fig. 206) consists of a solid, hardened steel nose plug with a detonator assembly in its base equipped to function with 0.025 second delay (for fire for effect), or with nondelay action (for spotting purposes), as marked on the individual fuze. To facilitate identification, the tip of the nondelay fuze is painted in white whereas the tip of the 0.025 second delay fuze is unpainted. Since these are single-action fuzes and there are no external safety devices, no preparation for firing is required.

i. VT Fuze M97 (T80E (series)). (1) *Description.* The VT fuze M97 is a proximity fuze without impact element, and is pro-

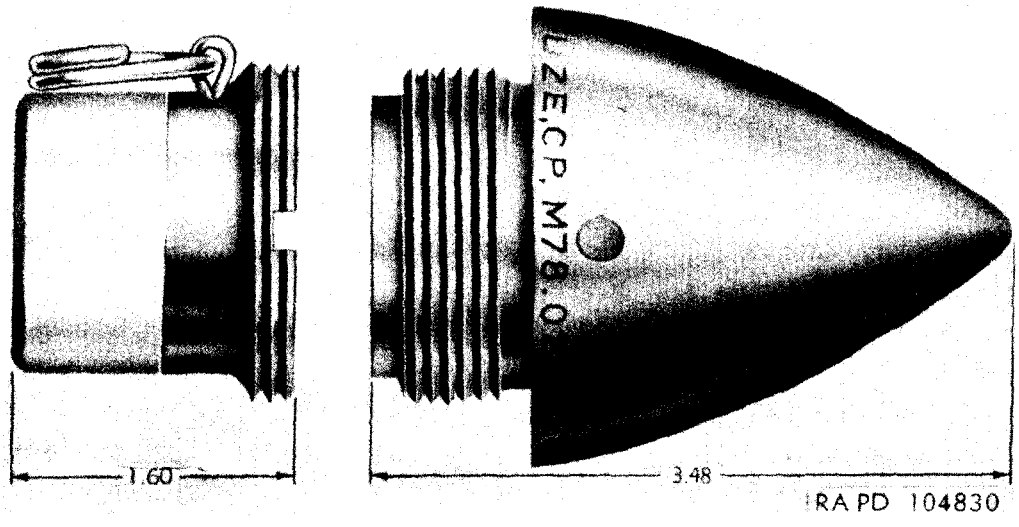


Figure 206. Fuze, CP, M78.

vided for use in terrestrial fire with deep-cavity high-explosive shell (without supplementary charge). It is essentially a self-powered radio transmitting and receiving unit. In flight, the armed fuze broadcasts radio waves. When any part of the radio wave front is reflected back from the target, it interacts with the transmitted wave. When the ripple or beat of this interaction reaches a predetermined intensity, it trips a switch which closes an electric circuit and initiates detonation of the fuze explosive train. Boresafety is provided by an arming switch which delays arming of the fuze for approximately 5 seconds. When armed, the fuze will function on close approach to any object capable of reflecting the transmitted waves.

(2) *Preparation for firing.* Since all functioning within the fuze is automatic, no adjustment in preparation for firing is required. It should be noted that the fuze will function properly at temperatures within 0° and 120° F., and should not be used outside these limits; also, if the fuzed round is loaded into the chamber of a hot gun and not fired before 30 seconds, the fuze probably will cause either an early burst or a dud.

j. Precautions to be Observed in Firing M48, M51, M55, and M57 Series Fuzes. If M48, M51, M55, and M57 series fuzes are fired during extremely heavy rainfall, premature functioning may occur which will result in an air burst. The rainfall necessary to cause such malfunctioning is comparable with the exceedingly heavy downpours commonly occurring during summer thundershowers. In the case of M48 and M51 series fuzes, occurrences of prematures may be prevented when firing under the conditions described above by setting the fuze for delay action, making the SQ action inoperative. The M55 and M57 fuzes cannot be remedied, however, since the SQ action is always operative.

168. Packing

Rounds for the 75-mm howitzer are packed in the individual fiber containers. Outer packing consists of two types—For shipment to areas where extraordinary protection against moisture is required, rounds in the fiber container are packed in a gasket-sealed metal container (fig. 173) ; for other areas, the standard packing consists of a wooden box holding two rounds, each in its individual fiber container. Weights vary somewhat, dependent upon the type and model of rounds. The two-round wooden box weighs approximately 59 pounds with a volume of 1.03 cubic feet; the metal container packing weighs approximately 36 pounds with a volume of 0.41 cubic feet.

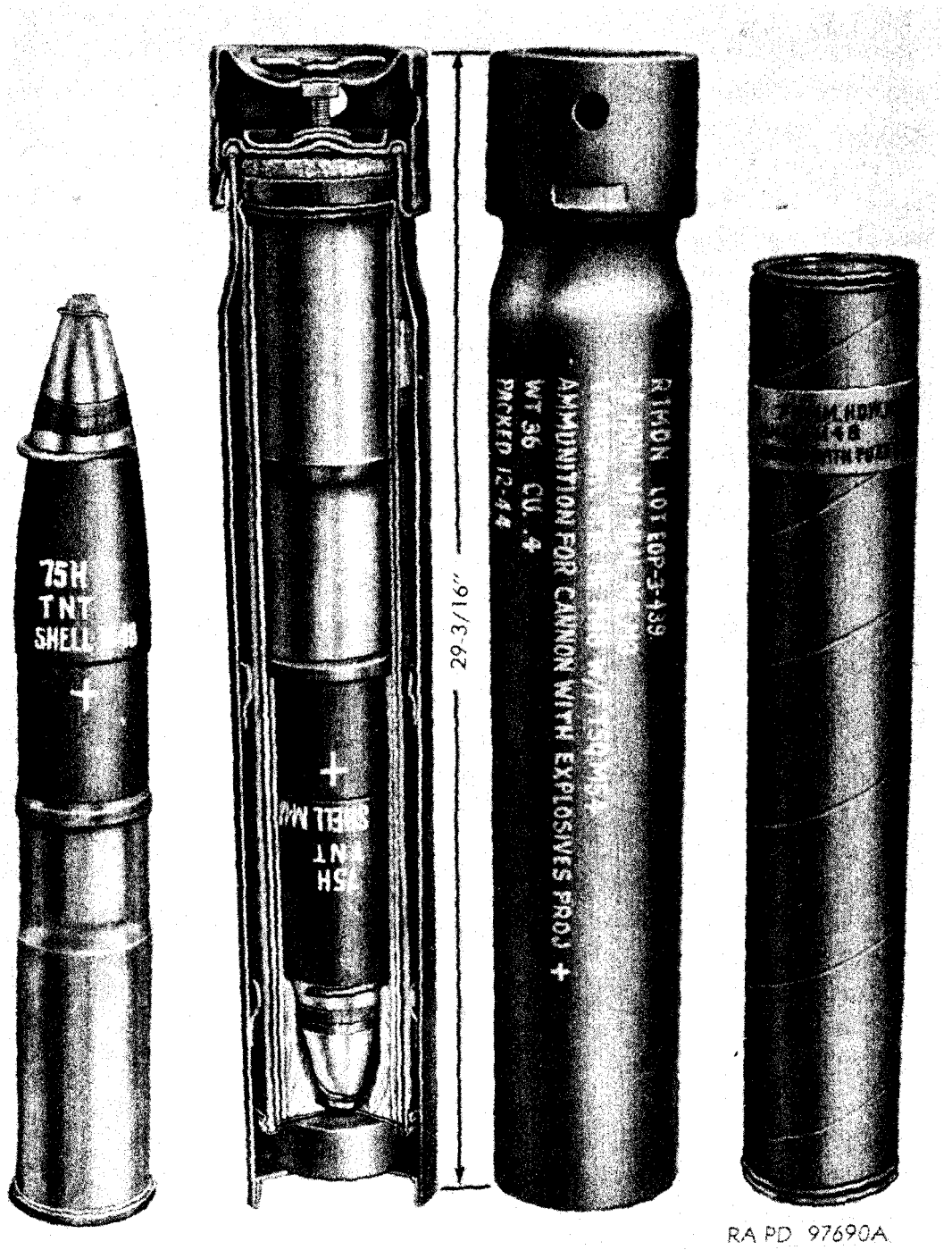


Figure 207. Metal container M173, for 75-mm howitzer ammunition.

169. Subcaliber Ammunition

a. General. Shell, fixed, TP, M92, w/fuze, PD, M74, for 37-mm subcaliber guns is standard for use in the 37-mm subcaliber gun for this howitzer. Shell, fixed, TP, M63 Mod 1, for 37-mm subcaliber guns is substitute standard. The rounds are issued in the form of fuzed rounds of fixed ammunition (fig. 208). Both pro-

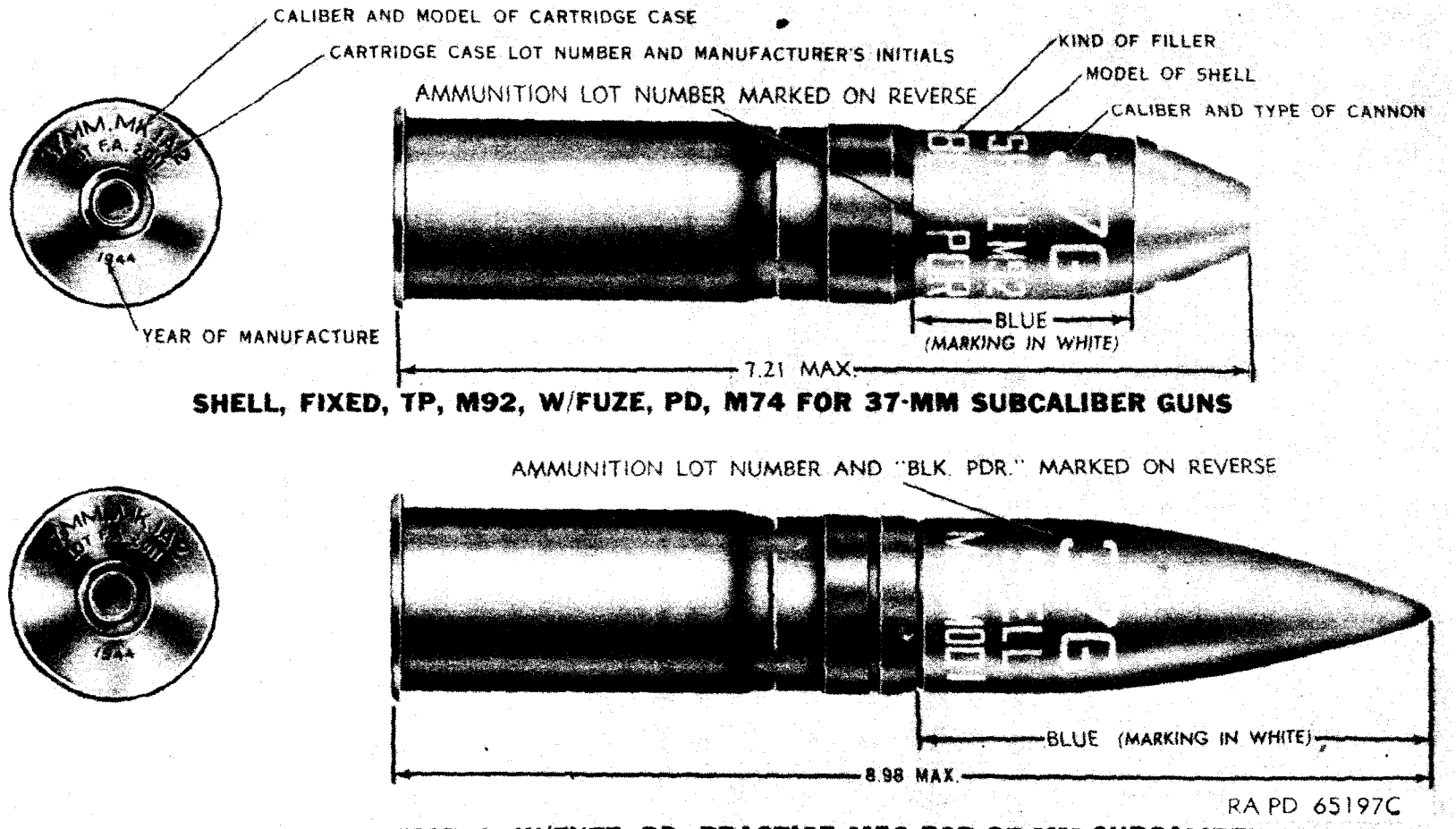


Figure 208. Ammunition for 37-mm subcaliber guns.

jectiles have a black powder charge which serves as a spotting charge, but the shell M92 is fitted with a point-detonating fuze whereas the M63 Mod 1 has a base-detonating fuze.

b. Packing. The M63 Mod 1 rounds are packed 10, 25, or 40 rounds per box. The M92 rounds are packed 40 per box. The 40-round box for the M63 Mod 1 round has a volume of 1.2 cubic feet and weighs, when loaded, about 76 pounds. The same packing for M92 rounds has a volume of 1.5 cubic feet and weighs approximately 93 pounds. Volume of the 25-round pack for M63 Mod 1 rounds is 1.3 cubic feet and weight is about 72 pounds, while corresponding data for the 10-round pack is 0.7 cubic foot and 46 pounds. Complete packing data are published in Department of the Army Supply Catalog pamphlet ORD 11 SNL R–1.

Section XXXII. SIGHTING AND FIRE CONTROL EQUIPMENT

170. General

This section contains information on the arrangement of the sighting and fire control equipment. It includes instructions for operation and maintenance of each item of on-carriage equipment. Instructions covering off-carriage equipment are not included in this manual, but a list of this equipment is contained in paragraph 6. The off-carriage equipment is covered in other technical manuals (app. II).

171. Arrangement and Use of Sighting Equipment

a. General. The sighting equipment furnished with the 75-mm pack howitzer M1A1 is the sightunit M28A1 or M29A1. The sightunit M28A1 includes the telescope mount M3A1 to which is fastened the panoramic telescope M1. The instrument light M13 is furnished to provide illumination for the mount and reticle. The sightunit M29A1 includes the telescope mount M3A1 to which is fastened the telescope adapter M9 and elbow telescope M62. The instrument light M46 is furnished for illuminating the mount and reticle. Telescope and mount cover M410 is furnished for protection of the sightunit. Each sightunit is used for direct and indirect fire.

b. Direct Fire. In direct fire the panoramic telescope M1 or elbow telescope M62 is used to track a visible target in azimuth and in elevation.

c. Indirect Fire. In indirect fire the panoramic telescope M1 or elbow telescope M62 with adapter M9 is used to lay the howitzer in azimuth on an invisible target by sighting on an aiming point. The telescope mount M3A1 is used for laying howitzer in elevation.

172. Maintenance of Sighting and Fire Control Equipment

a. General. Intervals for servicing sighting and fire control equipment will be found in the preventive maintenance schedules (pars. 91 and 92).

b. Care in Handling Sighting and Fire Control Equipment. (1) Sighting and fire control instruments are, in general, rugged and suited for the designed purpose. They will not, however, stand rough handling or abuse. Inaccuracy or malfunctioning will result from mistreatment.

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

(3) Stops are provided on instruments to limit the travel of the moving parts. Do not attempt to force the rotation of any knob beyond the stop limit.

(4) Keep the instrument as dry as possible. If an instrument is wet, dry it carefully before placing it in its carrying case.

(5) When not in use, keep the sightunit covered as a protection from dust and moisture. Place fuze setter in its carrying case.

(6) Any 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. The authorized tests and adjustments are those for which tools and parts have been provided. Adjustments other than those expressly authorized are not the responsibility of the using arm personnel.

(7) No painting of sighting or fire control equipment by the using personnel is permitted.

(8) When disengaging the azimuth mechanism, push the azimuth worm throwout level on the panoramic telescope or the azimuth micrometer knob on the adapter outward as far as it will go, to be sure that the internal worm and worm gear are completely disengaged. Do not allow the worm to drag over the worm gear teeth as this will result in unnecessary wear of parts.

(9) Do not point telescope directly at the sun unless a filter is used, as the heat of the focused rays may damage optical elements.

c. Optical Parts. (1) To obtain satisfactory vision, it is necessary that the exposed surfaces of the lenses and other parts be kept clean and dry. Corrosion and etching of the surface of the glass, which interfere with vision, can be prevented or greatly retarded by keeping the glass clean and dry.

(2) Under no circumstances should polishing liquids, pastes, or abrasives be used for polishing lenses and windows.

(3) For wiping optical parts, use only lens tissue paper especially intended for cleaning optical glass. Use of cleaning cloths is not permitted. To remove dust, brush the glass lightly with a

clean artist's camel's-hair brush and rap the brush against a hard body in order to knock out the small particles of dust that cling to the hairs. Repeat this operation until all dust is removed.

(4) Exercise particular care to keep optical parts free from oil and grease. Do not wipe lenses or windows with the fingers. To remove oil or grease from optical surfaces, apply liquid lens cleaning soap with a tuft of lens tissue paper and wipe gently with clean lens tissue paper. If this liquid is not available and the temperature of the surrounding air is above 32° F, breathe heavily on the glass and wipe off with clean lens tissue paper. Repeat this operation until clean.

(5) When temperatures are below 32° F, clean the glass by rubbing gently with dry lens tissue paper. To remove oil film, the instrument will be brought into a warm place and allowed to reach room temperature before applying lens cleaning liquid soap. Use of anticondensation chamber described in paragraph 65*d* is recommended. Heat from strongly concentrated sources should not be applied directly, as it may cause unequal expansion of parts resulting in damage to optical parts and inaccuracies of observation.

d. Batteries. (1) Batteries used in the instrument lights should be removed habitually whenever the lights are not in use. Chemical reaction set up in an exhausted battery will damage the battery case.

(2) The batteries for the instrument lights are contained in the case of the instrument light. To remove the batteries, unscrew the thumb nut on the cover (fig. 215), lift off the cover, and remove the batteries. When installing batteries, be sure they go back in the case in the same position as when removed. See that the cover is fully seated on the case and the thumb nut is drawn up tightly to insure contact with the battery terminals.

e. Preventive Maintenance. A schedule for maintenance of sighting and fire control equipment is included in the schedule for the howitzer matériel (pars. 91 and 92).

(1) To oil the felt washers on the telescope mount, apply one or two drops of oil; to oil the metal unpainted parts apply the oil with a lightly oiled cloth or rag.

(2) To clean the eyeshields, carefully use soap and warm water until clean. Rinse carefully and wipe dry.

(3) Lubricants for sighting and fire control instruments function also as rust-preventives. It is important that they be applied carefully and effectively. Extreme care should be taken not to apply lubricants excessively. Excessive lubrication of certain parts may be as damaging as the absence of any lubricant.

(4) Excessive lubricants should be wiped off to prevent the accumulation of dust and dirt.

173. Sightunit M28A1 or M29A1

a. The sightunits M28A1 and M29A1 consist of the items listed in paragraph 6*d*.

b. A description of each item and operating instructions are contained in separate paragraphs pertaining to the item (pars. 174 to 179).

c. Tests and adjustments of the sightunits as a whole are covered under boresighting instructions in paragraph 180.

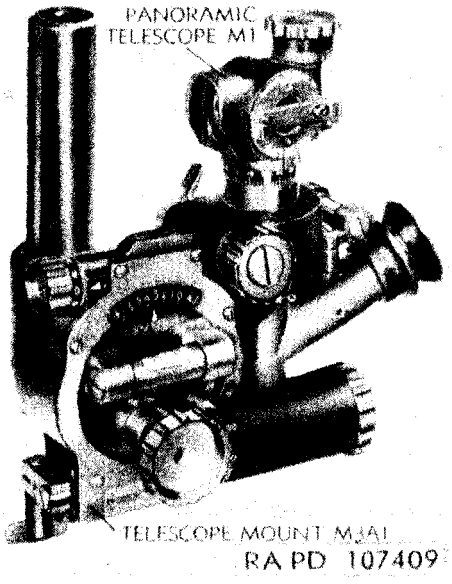


Figure 209. Sightunit M28A1—left front view.

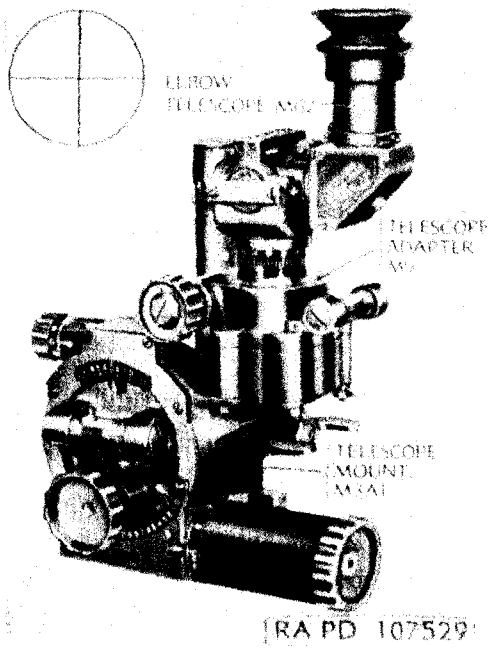


Figure 210. Sightunit M29A1—left rear view.

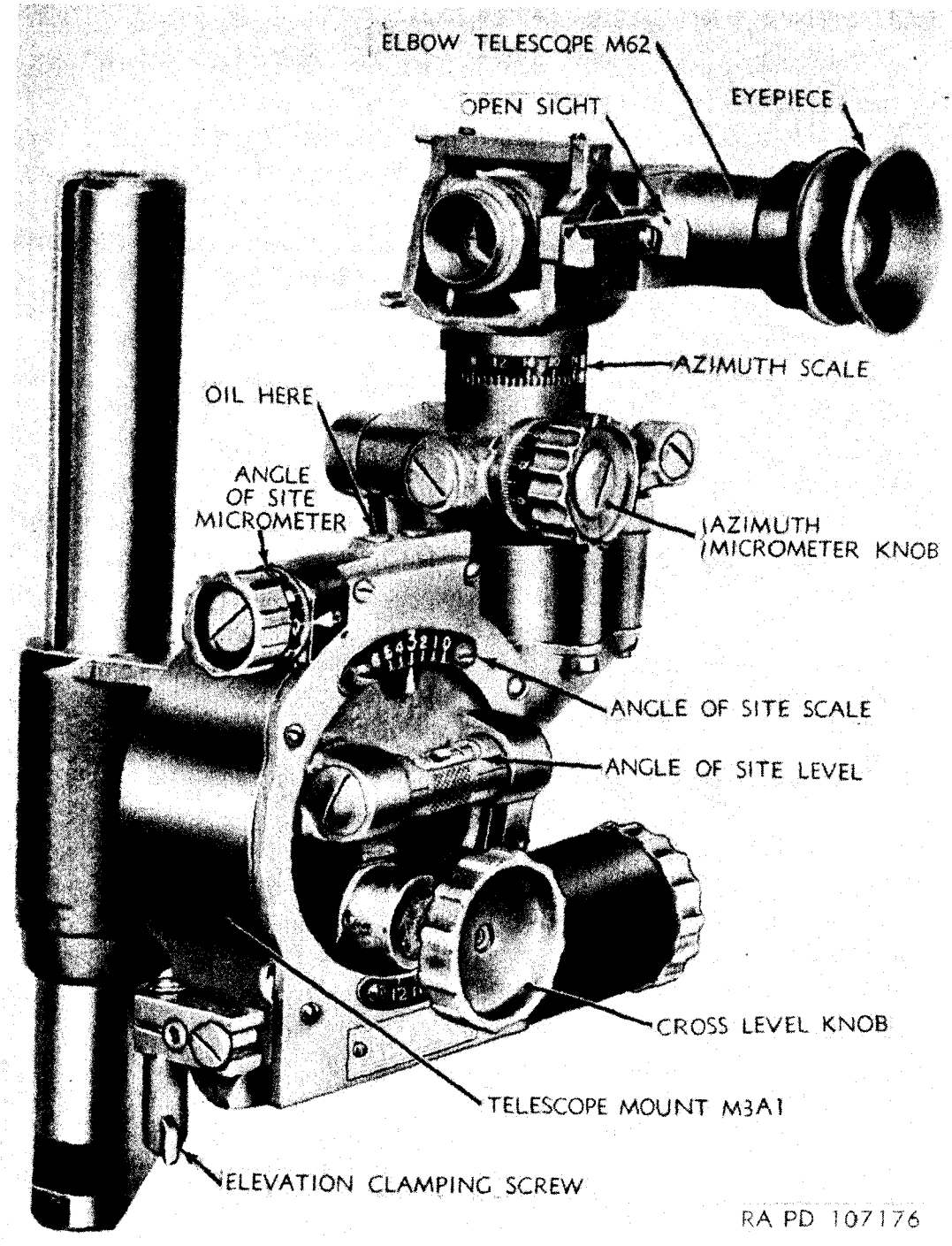


Figure 211. Sightunit M29A1—left front view (traveling position).

d. When not in use the sightunit should be covered with telescope and mount cover M410 (fig. 213).

174. Telescope Mount M3A1

a. The body of the mount (figs. 209 to 212) must be raised to the top of the support and clamped there for normal operation and must be lowered to rest on the lug near the lower end of the

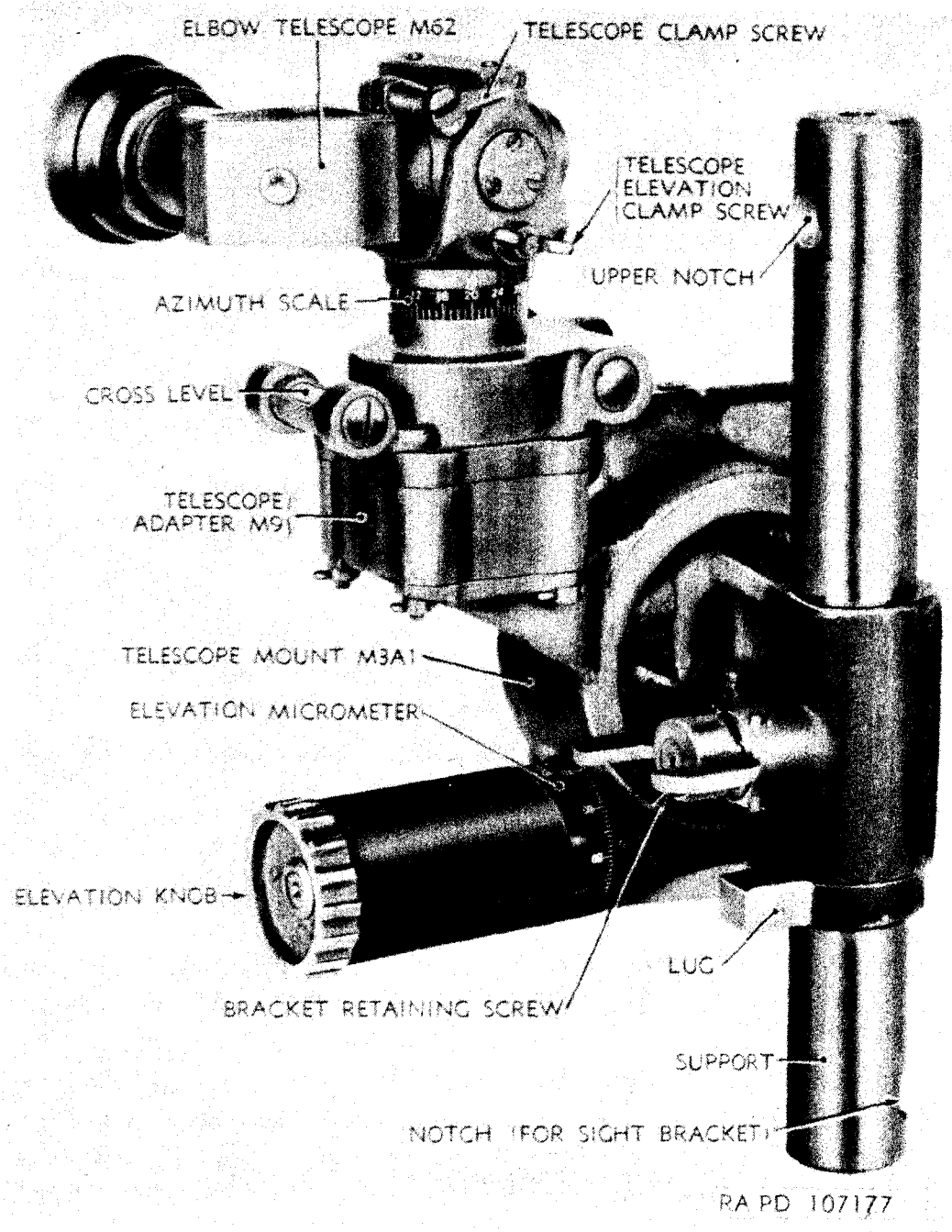


Figure 212. Sightunit M29A1—right rear view (traveling position).

support and clamped there for better stability while traveling (figs. 211 and 212). The support fits the sight bracket on the left-hand side of the cradle and is locked in place by a spring-loaded shaft. The sight bracket contains a spring-loaded plunger and a stop screw by which the mount is positioned in azimuth.

b. The elevation knob (figs. 209 and 212) operates the elevation scale and micrometer and moves the angle of site level and the telescope through the indicated elevation angle. A clamping screw (fig. 211) secures the knob against accidental movement. The

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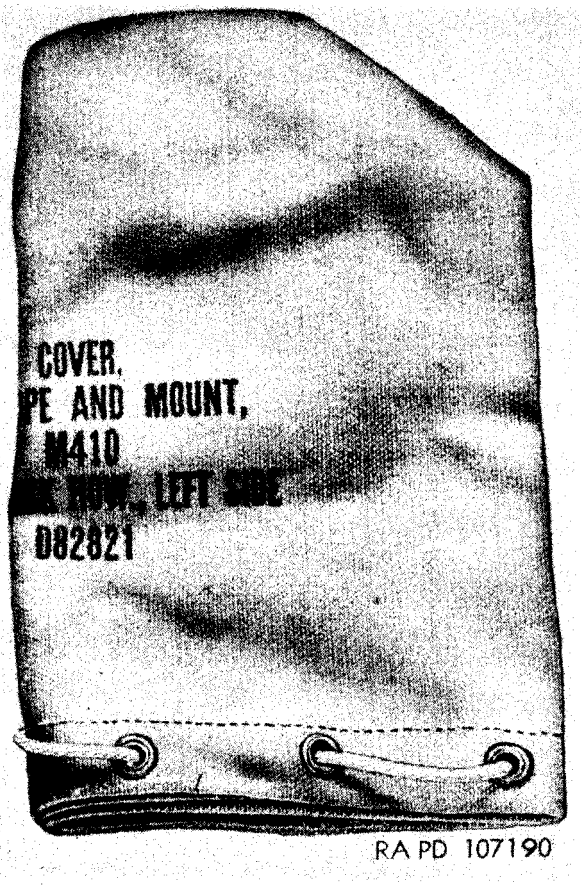


Figure 213. Telescope and mount cover M410.

elevation scale is graduated from 0 to 1,200 mils at 100-mil intervals, and the micrometer is graduated from 0 to 100 mils at 1-mil intervals.

c. The angle of site micrometer knob operates the angle of site level and the angle of site scale and micrometer. It does not move the telescope. The angle of site scale (fig. 209) is graduated in 100-mil intervals from 0 to 600 mils, 300 mils being the normal setting. The angle of site micrometer is graduated in 1-mil intervals from 0 to 100.

d. When the howitzer is used for indirect fire, it is laid in elevation by turning the elevating handwheel until the bubble in the angle of site level vial is centered. The howitzer elevation is then equal to sum of the angle of site setting and elevation setting.

e. When the howitzer is used for direct fire, it is aimed in elevation by turning the elevating handwheel until the horizontal cross line of the telescope reticle is on the target. The telescope elevation must be set to normal and kept there during direct fire. Elevation corresponding to the range of the target must be set on the elevation scale and micrometer in order to introduce the neces-

sary superelevation. Angle of site setting on the telescope mount is immaterial.

f. The cross level, operated by the cross level knob (figs. 209, 210, and 211), indicates when the mount is leveled transversely. Keep the mount continuously cross leveled during all sighting operations to compensate for any cant of the trunnions, and thereby insure accurate laying of the howitzer in azimuth at any elevation.

g. Each level vial is protected by a rotatable cover which is kept closed when the telescope mount is not in operation.

175. Panoramic Telescope M1

a. The panoramic telescope M1 (fig. 214) is a 3-power telescope with a field of view of 12°, 12 minutes. The telescope is of the fixed focus type designed for normal eyesight and for ranges ordinarily encountered. The eyepiece is rotatable about the vertical axis of the telescope to eliminate interference of the observer's head when backsighting, without effect on deflection indications or the line of sighting.

b. The reticle contains vertical and horizontal cross lines which intersect at the center of the field of view. The point of intersection of both lines is used to aline the howitzer in azimuth and elevation for direct fire. The vertical cross line is used to aline the howitzer in azimuth for indirect fire.

c. The elevation knob raises or lowers the telescope line of sight. It is operated during indirect fire to bring the aiming point into the field of view. During direct fire, however, it must be kept at "normal" position by matching the coarse and fine index graduations with the corresponding zero marks.

d. The azimuth knob moves the telescope line of sight in azimuth. The azimuth worm throwout lever disengages the azimuth knob to permit a more rapid motion over large angles. The azimuth scale is graduated in 100-mil intervals and is numbered from 0 to 32 in two consecutive semicircles. Micrometer indications (1-mil intervals) supplement the indications on the azimuth scale. Zero reading indicates the line of sighting to be directly forward or directly backward.

e. Open sights at the top of the panoramic telescope permit rapid approximate aiming.

176. Elbow Telescope M62 and Adapter M9

a. The elbow telescope M62 used with adapter M9 (figs. 210 to 212) serves the same purpose and has the same reticle pattern as panoramic telescope M1.

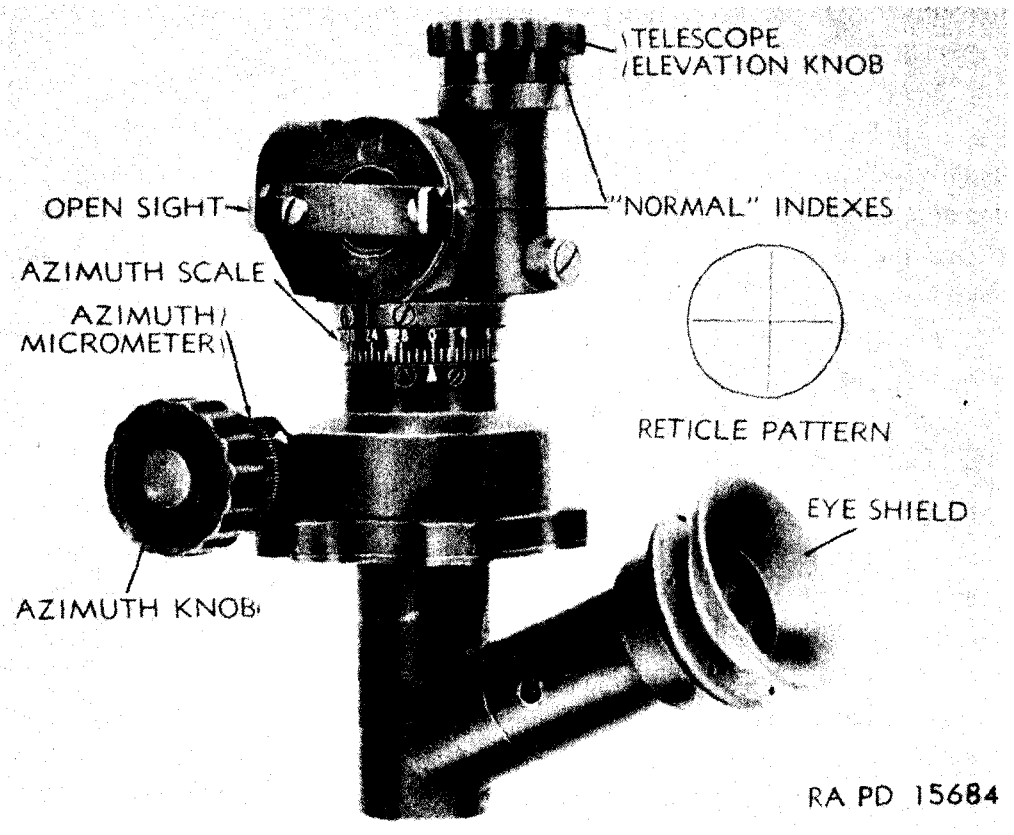


Figure 214. Panoramic telescope M1.

b. The elbow telescope M62 is a 3-power telescope with a field of view of 12°, 12 minutes. The telescope is of the fixed focus type. The eyepiece is rotatable about the horizontal axis of the telescope and is kept clamped in position by the telescope clamp screw (fig. 212). The telescope should be used with the eyepiece arm horizontal in order to maintain correct reticle position.

c. The elevation clamp screw (fig. 212) when loosened allows limited rotation in elevation of the elbow telescope so that the aiming point may be brought into the field of view if necessary during indirect fire. Matching lines (fig. 210) indicate the normal position for direct fire. The lines are kept matched throughout direct fire operations by tightening the elevation clamp screw.

d. The azimuth scale and micrometer are graduated in the same manner as for the panoramic telescope (par. 175*d*) and are operated in the same manner with the exception of the throwout device. For rapid traversing, push the azimuth micrometer knob outward to disengage the worm.

e. Open sights are provided to facilitate picking up the target or aiming point.

177. Instrument Light M13 or M46

a. The instrument light M13 (fig. 215) is a self-contained lighting device which is provided with a case clamp and associated eyebolt and thumb nut for securing it to the telescope mount. A 3-volt electric lamp contained in a lead wire body furnishes the reticle illumination. A lamp bracket which is screwed to the lead wire body clamps on the telescope over the reticle window and is secured in position by an eyebolt and thumb nut. To replace the lamp, unscrew the lamp bracket from the lead wire body and unscrew the lamp from its socket. A hand light also is provided for illuminating the azimuth scale, micrometer, level vials, and for general use around the instrument. To replace the lamp in the hand light, unscrew the cap from the body and then unscrew the lamp from its socket. Power for the lamps is supplied by two flashlight batteries contained in the battery case. For access to the batteries see paragraph 172*d*. The electric power is turned on and off by a toggle switch on the cover.

b. The instrument light M46 is identical to the instrument light M13 with the exception of the lamp bracket which has a dovetail formed base to engage a band on the telescope.

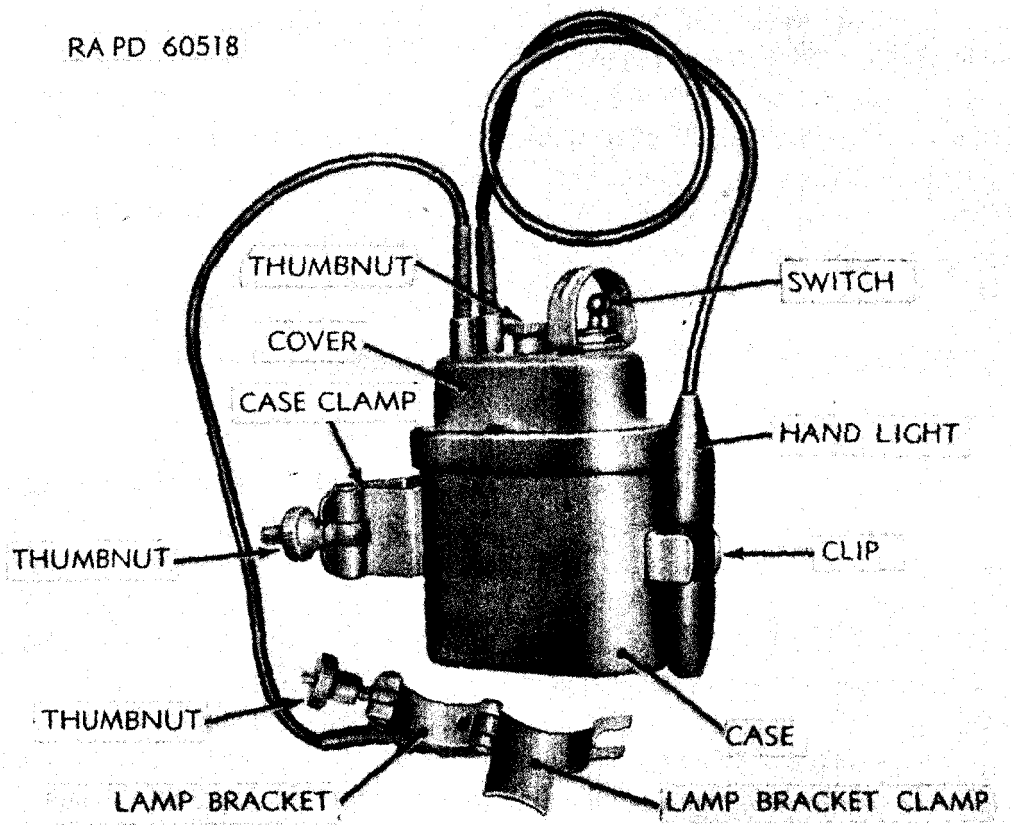


Figure 215. Instrument light M13.

178. Installation of Sightunit on Howitzer

Remove the telescope and mount as a unit from the chest and insert the support of the mount in the sight bracket on the left side of the cradle. Turn the sight retaining shaft knob of the sight bracket to clear the lower end of the support. Allow the knob to return by its spring action to the locked position after the bracket is seated. Make certain that the projecting lug at the rear engages properly and is held to the extreme right by the spring and plunger. Clamp the mount in its upper position with the bracket retaining screw in the upper notch of the support. Uncover the level vials and release the elevation clamping screw. Attach the instrument light if necessary.

179. Tests and Adjustments on Sightunits

a. Backlash. The worm gears should be tested periodically for backlash. Backlash in the cross leveling mechanism of the telescope mount can be felt as a freedom or shake of the telescope adapter or panoramic telescope. Backlash in the micrometer mechanism can be detected by operating the mechanism first in one direction and then in the opposite direction, returning both times to the same micrometer setting. If the telescope or level vial which is operated by the mechanism does not return to the same aiming point or level position, it is an indication of backlash in the mechanism. The effect of small amounts of backlash may be eliminated by habitually making the last movement always in the same direction. If an appreciable degree of backlash exists in the sighting and laying equipment, report to ordnance maintenance personnel.

b. Adjustment. Adjustment of the sightunits is outlined in the boresighting procedure (par. 180).

180. Boresighting

a. General. This paragraph contains instructions for testing and adjusting the alinement of the sighting equipment with the bore of the howitzer.

b. Selection of Aiming Point. The aiming point for boresighting may be a sharply defined distant point 1,500 yards or more from the howitzer or a testing target (fig. 216) placed at a minimum distance of 50 yards from the muzzle of the howitzer.

c. Improvised Testing Target. If a testing target is not available, construct one of cardboard or some other suitable material. The dimensions shown in figure 216 are for use with the panoramic telescope M1. For use with the elbow telescope M62, increase

the vertical offset dimensions from 9.607 inches to 10.567 inches. Measure the distances as accurately as possible. Mark the top of the target TOP, to avoid accidentally positioning the target in an inverted position, and label the aiming points.

Note. The targets for use with the different telescopes are not interchangeable and care must be taken that the correct target is used.

d. Preliminary Operations. (1) *Level and cross-level the howitzer.* Place a gunner's quadrant transversely on the breechblock and cross-level the howitzer and carriage by jacking up the axle near one wheel until the quadrant indicates level. Set the howitzer at zero elevation, using the gunner's quadrant to indicate zero.

(2) *Test telescope mount cross-level and angle of site level bubbles.* (*a*) Level and cross-level the telescope mount using the angle of site and cross-level bubbles to indicate level. Angle of site scale should indicate *3* (300 mils).

(b) Aline the vertical line on the reticle of the telescope with a plumb line as follows:

1. Aline the vertical line on the reticle of the panoramic or elbow telescope with a plumb line held in front of the howitzer. Sight through the panoramic telescope and rotate the line of sight of the panoramic telescope in a vertical plane by turning the telescope elevation knob (fig. 214). Sight through the elbow telescope if it is used in place of the panoramic telescope and rotate the line of sight of the elbow telescope in a vertical plane by loosening the telescope elevation clamp screw (fig. 212) and moving the telescope on its horizontal axis. Rotate the telescopes in a vertical plane throughout their limits of travel. If the vertical line on the reticle does not remain in coincidence with a plumb line held in front of the telescopes, turn the cross-level knob (fig. 211) and repeat the tests until the verticle line on the reticle remains in coincidence with the plumb line. Note whether the position of the cross-level bubble is centered with the allowable limit of one scale division on the vial. If the cross-level bubble is not within the allowable limit, notify ordnance personnel. If the position of the cross-level bubble is within limits, note its position.

2. Turn the telescope 1,600 mils to the left. Aline the vertical line on the panoramic or elbow telescope with a plumb line. Rotate the telescopes in a vertical plane through their limits of travel as in *1*, above. If the vertical line on the reticle does not remain in coincidence with the plumb line, turn the elevation knob (fig. 212) and repeat the test until the vertical line on the reticle remains in coincidence with the plumb line. Note whether the position of the angle of site bubble is centered in the vial. If the bubble is not centered, turn the angle of site micrometer knob (fig. 211) to center the bubble.

3. With the telescope referred 1,600 mils to the left and alined with a plumb line as in *2*, above, turn the cross-level knob (fig. 211) through the extent of its travel. If the intersection of the cross lines on the telescope reticle does not remain in coincidence with the plumb line, the azimuth compensating mechanism of the telescope mount requires adjustment by ordnance personnel.

(3) *Adjust telescope mount scales and micrometers to zero or normal.* (*a*) If the angle of site scale (fig. 211) does not indicate *3*, loosen the clamping screw in each end of the scale, shift the scale to indicate *3*, and tighten the clamping screws.

(*b*) If the angle of site micrometer does not indicate zero, loosen the slotted nut in the angle of site knob, while preventing the knob from turning; shift the micrometer to indicate zero, and tighten the slotted nut.

(*c*) If the elevation scale does not indicate zero, loosen the clamping screw in each end of the scale, shift the scale to indicate zero, and tighten the screws.

(*d*) If the elevation micrometer (fig. 212) does not indicate zero, loosen the three clamping screws in the elevation knob, while preventing the knob from turning; shift the micrometer until it indicates zero, and tighten the clamping screws.

e. Insert Bore Sights in Howitzer. Insert the breech bore sight 41–S–3636–160 (fig. 153) in the chamber of the tube. Attach the muzzle bore sight 41–S–3645–200 (fig. 153), stretching the cord tightly across the score marks on the muzzle, and secure the cord in place with the strap. Boresighting may be done without the issue bore sights by removing the firing lock and sighting through the firing pinhole in the breechblock bushing or sighting through an empty cartridge case with the primer removed and using improvised cross hairs at the muzzle.

f. Aline Bore on Testing Target. If a testing target (fig. 216) is used, place the testing target at least 50 yards from the muzzle. With the howitzer at *zero elevation*, sight through the breech bore sight and *shift the target* so that the intersection of the cross hairs on the muzzle bore sight is on the bore aiming point. When this alinement has been obtained, do not move the howitzer or target until the boresighting operation has been completed.

g. Aline Bore on Distant Aiming Point. If a distant aiming point is used, sight through the breech bore sight and *elevate and traverse the howitzer* so that the intersection of the cross hairs on the muzzle bore sight is on the distant aiming point. Elevating the howitzer also will elevate the telescope and mount. Do not move knobs on the telescope mount.

h. Aline Panoramic Telescope with Aiming Point. Aline the panoramic telescope by turning the elevation and azimuth knobs (fig. 214) on the telescope so that the intersection of the cross lines on the reticle are on the telescope aiming point on the testing target or are on the distant aiming point. When this alinement has been obtained, do not move the telescope until the scales and micrometers have been adjusted (*i* below).

i. Adjust Panoramic Telescope Scales and Micrometers. (1) If the azimuth scale does not indicate zero, loosen the four headless screws which secure the two halves of the clamping ring and turn the scale so that it indicates zero. Tighten the screws.

(2) If the azimuth micrometer does not indicate zero, loosen the slotted nut in the azimuth knob, while preventing the knob from turning; shift the micrometer to indicate zero, and tighten the slotted nut.

(3) If the elevation micrometer does not indicate zero when the telescope is alined with a *testing target or distant aiming point,* loosen the three screws in the knob, while preventing the knob from turning; shift the micrometer to indicate zero, and tighten the three screws. Be careful not to pull the knob out when making this adjustment as the stop rings under the knob may become disengaged.

(4) Adjustment of the coarse elevation index near the open sight will not be made by the using arm personnel but will be made by ordnance personnel if necessary.

j. Aline Elbow Telescope with Aiming Point. (1) Aline the elbow telescope in azimuth by turning the azimuth micrometer knob on the telescope adapter (fig. 211) so that the vertical line on the reticle is on the aiming point on the testing target or is in on the distant aiming point.

(2) Aline the telescope in elevation by loosening the telescope elevation clamp screw (fig. 212) and shifting the telescope in elevation so that the horizontal line on the reticle is on the aiming point on the testing target or is on the distant aiming point. Tighten the clamp screw.

k. Adjust Elbow Telescope Adapter Azimuth Scale and Azimuth Micrometer. (1) If the azimuth scale does not indicate zero, loosen the four headless screws which secure the two halves of the clamping ring and turn the scale so that it indicates zero. Tighten the screws.

(2) If the azimuth micrometer does not indicate zero, loosen the slotted nut in the azimuth micrometer knob (fig. 211), while preventing the knob from turning; shift the micrometer to indicate zero, and tighten the slotted nut.

(3) Adjustment of the elevation zero index near the open sight

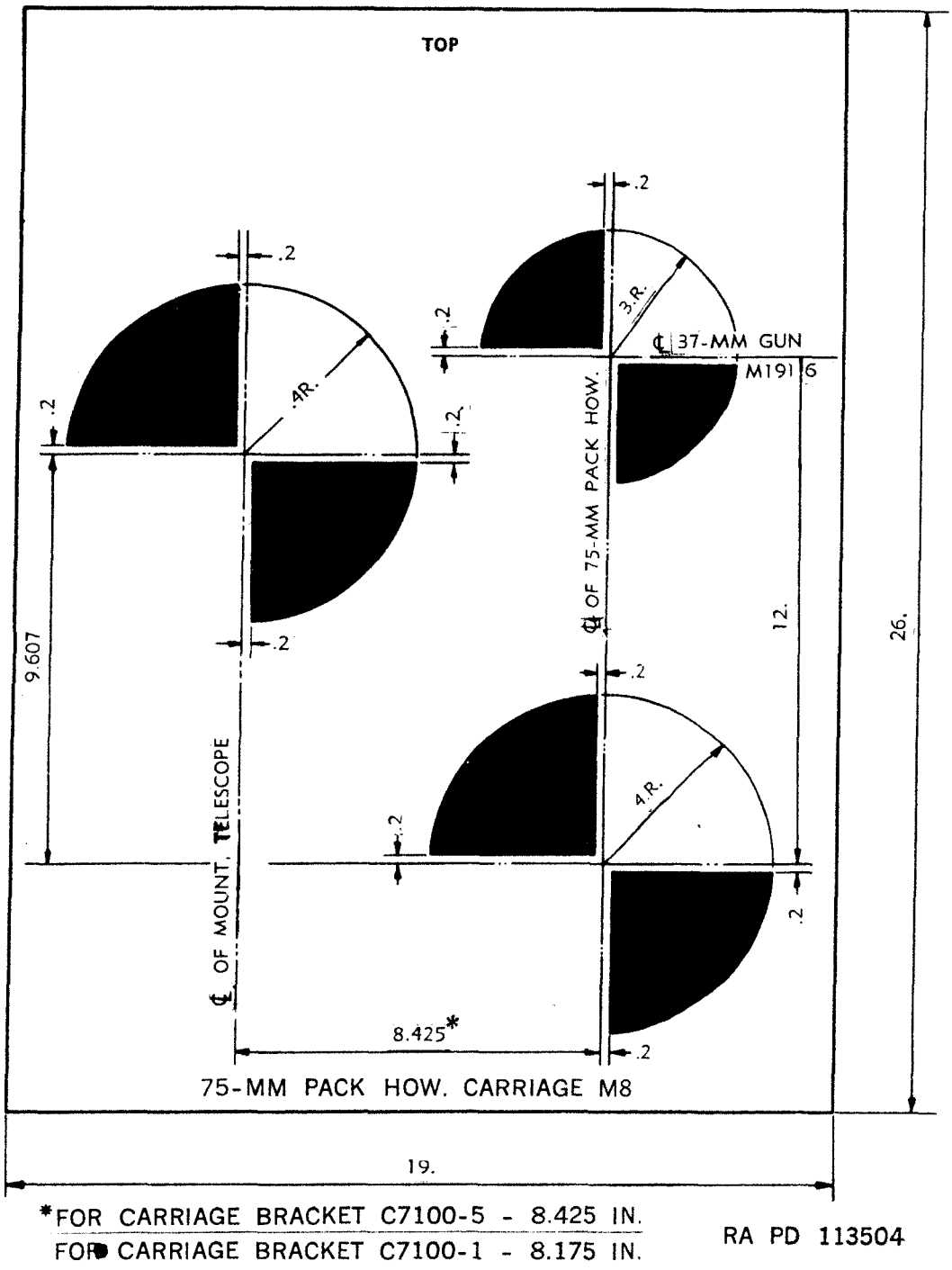


Figure 216. Testing target for 75-mm pack howitzer M1A1 on carriage M8.

will not be made by the using arm personnel but will be made by ordnance personnel if necessary.

l. Aline bore of 37-mm Subcaliber Gun with Aiming Point. Insert the breech and muzzle bore sights (fig. 256) into the subcaliber gun. With the howitzer bore alined on a distant aiming point or the testing target, aline the bore of the subcaliber gun on the distant aiming point or on its aiming point on the testing target (fig. 216). Adjust the subcaliber gun in deflection and elevation as described in paragraph 212*b* (5) and illustrated in figures 257 and 258.

181. Fuze Setter M22

a. Description. (1) The fuze setter M22 (fig. 217) is a hand-operated dialed instrument for setting the mechanical time fuzes. A time scale and corrector scale with corresponding indexes record the fuze number corresponding to the firing table figure for the desired time of flight of the projectile. (Fuze numbers or fuze seconds are angular measurements and are not directly proportional to the time of flight.) The setting is locked with two wing screws so that any number of fuzes may be set, even in darkness, until a new setting is required. The fuze setter is contoured to fit over the point of the fuze after the fuze safety pin has been removed.

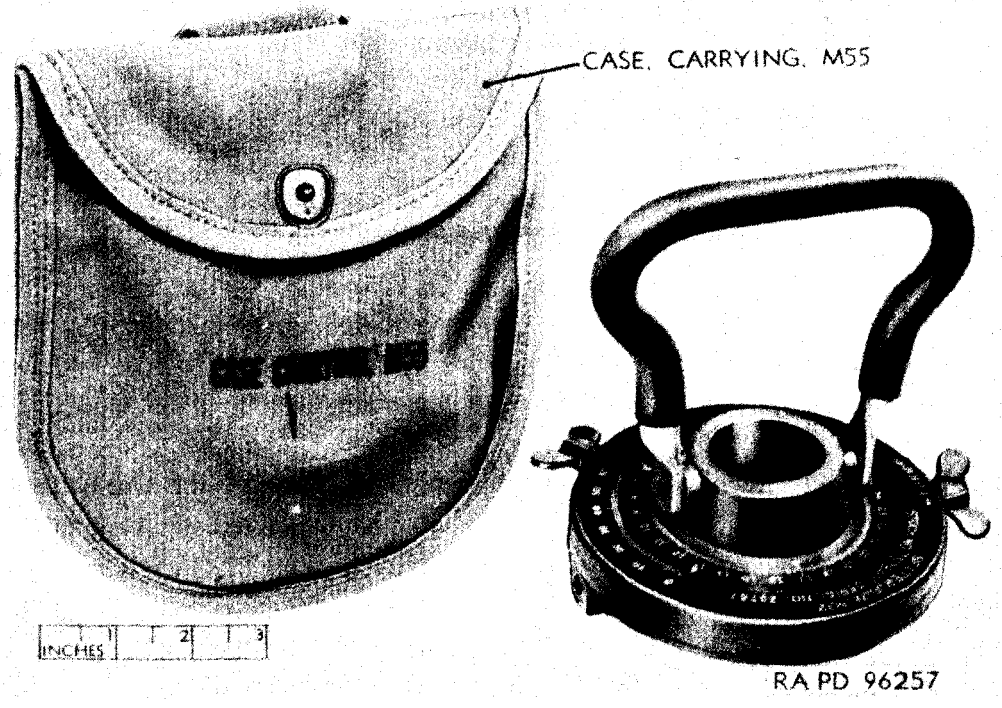


Figure 217. Fuze setter M22 and carrying case M66.

(2) The time scale is graduated in 0.1-second intervals from 0 to 25 and indicates the desired fuze setting plus or minus the corrector setting. The letter S on the scale indicates the SAFE setting for the fuze when the corrector scale is set at 30 (normal).

(3) The graduations on the corrector scale are called points. The scale is graduated in 1-point (0.1-seconds) intervals from 0 to 60 points with 30 as normal. The graduations represent corrections in time from 0 to 3 seconds either side of normal for increasing or decreasing the time of burst from the time indicated on the time scale.

(4) To insure accuracy in setting scales, look squarely at the graduations and indexes.

(5) The wing screws which lock the time scale and correction scale settings are marked T and C respectively (fig. 217). Tighten the C screw and loosen the T screw when setting time values; then, turn the handle until the time scale index alines with the desired graduation; tighten the T screw. To set the corrector value, loosen the C screw and turn the corrector scale until its index alines with the desired graduation; tighten the C screw.

(6) The handle which was used to set time values is used also to turn the fuze setter when setting fuzes.

(7) The carrying case M66 (fig. 217) is provided for the fuze setter M22.

b. To Set a Fuze. (1) Place the fuze setter M22, with the scales set to the desired values, over the point of the fuze. Press down firmly on the fuze setter and at the same time rotate the fuze setter clockwise until the lug engages the fuze ring. Continue rotation until the pawl seats in the fuze body. The setting is complete when further rotation becomes impossible.

(2) If it is desired to reset a fuze to the SAFE position, set the time scale to S and the corrector scale to the normal setting of 30 and proceed as above.

Caution: Before setting a fuze with the fuze setter M22, make sure that the T and C screws are tight to prevent any slipping of the scale indexes when the handle of the fuze setter is rotated. When setting fuzes, always rotate the fuze setter in a clockwise direction. When removing the fuze setter from the fuze, lift it straight off without rotating it to prevent disturbing the setting of the fuze.

c. Tests and Adjustments. Test the fuze setter M22 on a dummy, inert fuze, or a live fuze for correct setting of the fuze and for smooth operation. Set the corrector scale to normal setting of 30 and set in same value on the time scale. Cut the fuze. The time setting of fuze should agree with the setting of the fuze setter time scale. If the settings do not agree, repeat the operation with

a different time value to make sure there was no slippage. Note engagement with fuze and any tendency to stick or bind. If the fuze setter fails to operate properly, turn it in for repairs by ordnance maintenance personnel. No adjustments by the using personnel are permitted.

Caution: Where a live fuze is used, the precautions normally observed in handling ammunition must be followed.
Remove the safety wire or cotter pin carefully for the test. After the test has been made, return the fuze setting to the S or SAFE setting and replace the safety wire or cotter pin. When checking the accuracy of the fuze setter by cutting trial fuzes, no fuze should be cut more than twice. The fuze from a dud must never be used. Further precautions are described in TM 9–1900.

182. Fuze Setter M14

a. Description. The fuze setter M14 (fig. 218) is a flat handled wrench having a circular tapered hole at one end to fit the fuze and a key which protrudes through the hole to engage the slot in the fuze.

b. To Set a Fuze. When using fuze setter M14, remove the safety pin from the fuze and position the fuze setter on the fuze so that the key engages the slot in the fuze. Turn the fuze setter clockwise (increasing direction) until the index mark on the fuze alines with the required time setting on the fuze scale.

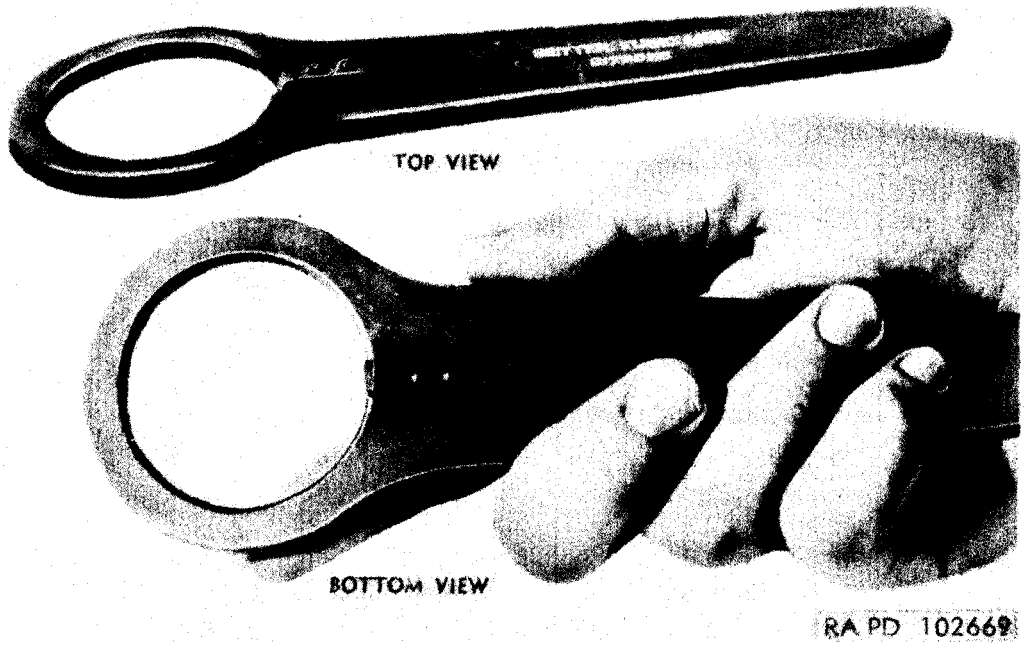


Figure 218. Fuze setter M14.

Section XXXIII. SUBCALIBER EQUIPMENT

183. General

a. Purpose. Subcaliber equipment, which is used for training purposes only and is not taken into the theater of operations, consists either of the interior type 37-mm subcaliber gun M12 or of the exterior type 37-mm gun matériel M1916, 37-mm subcaliber mount M5, and equipment. Subcaliber equipment is used to provide practice in laying and firing the 75-mm howitzer matériel. The use of small bore ammunition prevents wear on the regular piece during practice and is less costly. The actual handling, loading, and range obtained are different.

b. Description. Two types of subcaliber equipment are available for use with the 75-mm howitzer—the interior type and the exterior type. The former is inserted into the bore of the howitzer; the latter is mounted over the howitzer; both are described below.

184. Description and Functioning of Interior Type Subcaliber Equipment

a. The 37-mm subcaliber gun M12 (fig. 219) consists of an alloy steel tube having an enlarged portion near the chamber end, which acts as a rear adapter to center the gun in the chamber of the 75-mm howitzer, and a combination front adapter and gas

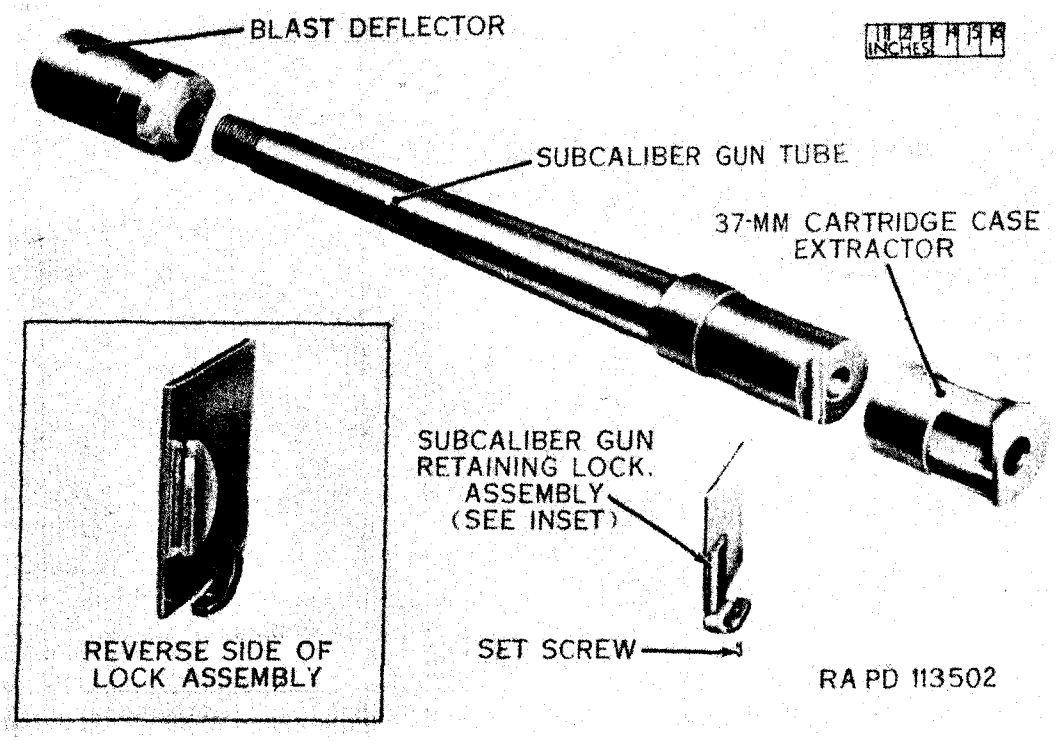


Figure 219. 37-mm subcaliber gun M12.

deflector screwed to the muzzle end of the tube. The tube is secured longitudinally by a lock which fits in a transverse keyway at the rear of the subcaliber tube and fastened to the lower left side of the breech ring by means of a setscrew passing through a clamp. A sliding cylindrical sleeve, which encases the rear end of the tube, completes the subcaliber gun. The rear end of the sleeve which is partly cut away is counterbored for the rim of a 37-mm cartridge and forms an extractor for the cartridge case. The tube is 29.11 inches, or 20 calibers, long. The bore is rifled with a uniform right-hand turn (1 turn in 25 calibers).

b. Percussion is obtained by operation of the firing mechanism of the howitzer, which actuates its firing pin causing it to strike the primer of the 37-mm cartridge.

185. Installation and Removal of 37-mm Subcaliber Gun M12

a. Installation. Oil the bore of the 75-mm howitzer lightly before installing the subcaliber gun. Assemble deflector on the muzzle of the gun and slide the subcaliber extractor over the chamber end. Open the breech and insert the subcaliber gun in the chamber part way. Engage the lock, with smooth side to the rear, in the groove in the rear of the tube so that it fits snugly. Guide the subcaliber gun in until the lock lays against the breech face. Secure the lock to the breech ring with the setscrew. Operate the breech mechanism several times to test the action of the subcaliber extractor.

b. Removal. Open the breech of the howitzer. Loosen the screw on the clamp of the lock and pry the lock rearward to a point where it can be pulled out of the vertical keyway of the subcaliber tube. Remove the lock leftward from the breech recess of the howitzer. With hook or suitable tool inserted in keyway, draw the subcaliber tube and extractor rearward from the chamber of the howitzer. Remove the extractor from the subcaliber tube. The deflector is not to be removed from muzzle of the tube except to replace damaged part.

186. Operation of 37-mm Subcaliber Gun M12

a. Loading. (1) With the subcaliber gun installed and secured to the howitzer, open the breech of the howitzer. This will draw the extractor of the subcaliber gun to the rear by engagement of its rim with the lip of the howitzer extractor.

(2) Insert a 37-mm practice round into the counterbored hole of the subcaliber extractor and position it in the chamber of the subcaliber tube. Using a wooden rammer, push the shell and extractor forward and close the breech of the howitzer.

b. Firing. To fire the subcaliber gun, operate the firing mech-

anism of the howitzer (par. 19). In case of failure to fire, attempt to fire the round twice more; wait 60 seconds, clear other personnel from the vicinity of the breech, and extract the complete round. If indent is normal, segregate the round for the inspection of the local ordnance officer. If the indent is light or missing, then replace the firing lock as outlined for the howitzer in paragraph 94*d*.

c. Extracting. Open the howitzer breech. This will pull the subcaliber extractor to the rear by action of the howitzer extractor. At the end of the rearward movement, the left side of the subcaliber extractor strikes the forward face of the lock, but the 37-mm shell case continues to move rearward by its own momentum. Complete ejection is not accomplished, but the case is moved back sufficiently to be conveniently removed by hand. Use gloves, if available, as the case may be hot. In case of failure to extract, follow the instructions given for the 75-mm howitzer (par. 95).

d. Unloading. In case the complete round is not to be fired, extract the complete round by slowly opening the breech. If the cartridge case becomes separated from the projectile or if the breechblock cannot be opened, notify ordnance maintenance personnel.

Caution: Do not attempt to remove a stuck projectile by ramming it back from the muzzle end of the tube.

187. Care and Preservation of 37-mm Subcaliber Gun M12

a. Cleaning Instructions. The subcaliber equipment should be cleaned in the same manner as the corresponding parts of the howitzer as outlined in paragraphs 84 and 85 and in the lubrication order (fig. 156). After firing, be sure to clean the 75-mm howitzer tube and chamber as well as the subcaliber gun.

b. Lubrication Instructions. (1) Lubrication instructions which are contained in LO 9–319 (fig. 156) also apply to the corresponding parts of the subcaliber gun.

(2) Each time the subcaliber gun tube is removed from the howitzer, remove the extractor from the subcaliber tube, clean the sliding surfaces carefully, and oil the parts by applying a sufficient, but not excessive, quantity of oil, distributing it evenly over all surfaces.

(3) Care and preservation under unusual conditions are the same as for the howitzer (sec. XII).

188. Sighting Equipment for 37-mm Subcaliber Gun M12

The sighting equipment issued for the 75-mm howitzer and carriage is used also for the subcaliber gun.

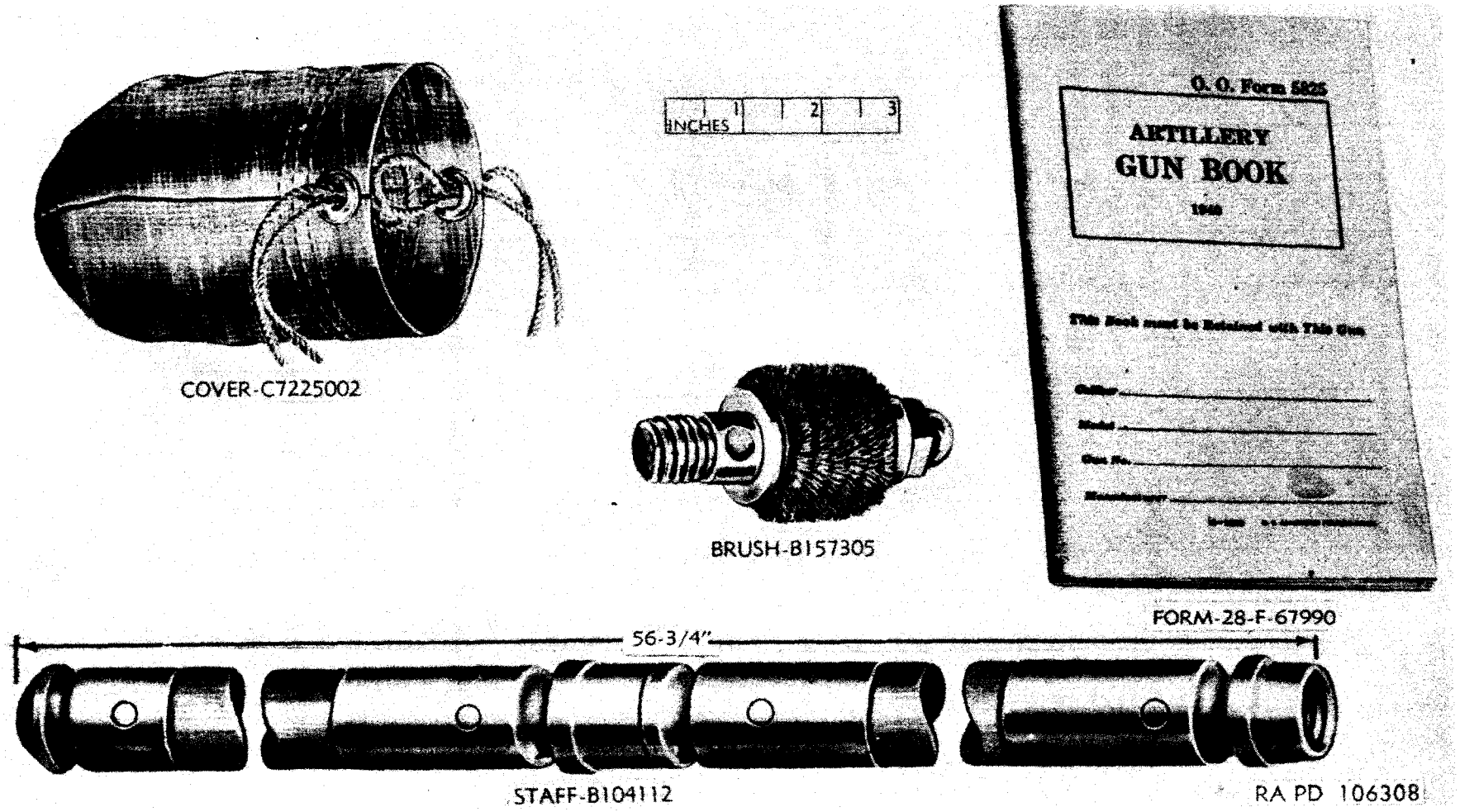


Figure 220. Special equipment for 37-mm subcaliber gun M12.

189. Ammunition for 37-mm Subcaliber Gun M12

Subcaliber ammunition authorized for use with this gun is covered in paragraph 169.

190. Subcaliber Gun Equipment

The following special equipment (fig. 220) is provided for use with the subcaliber gun. All tools and equipment for the 37-mm gun M12 are listed in Department of the Army Supply Catalog pamphlet ORD 7 SNL C–33, section 15, which is the authority for requisitioning replacements. No spare parts are authorized for this subcaliber gun.

1 BRUSH, bore, 37-mm, M8 (B157305)
1 COVER, bore brush, 37-mm, M530 (C7225002)
1 COVER, gun book, M539 (C7228906)
1 FORM, Govt., War Dept., Artillery Gun Book, O.O. 5825 (blank) (28–F–67990)
1 STAFF, cleaning (B104112)

191. General Characteristics of Exterior Type Subcaliber Equipment

a. Exterior type subcaliber equipment consists of the 37-mm gun M1916, the 37-mm gun recoil mechanism M1916, the 37-mm subcaliber mount M5, and organizational spare parts and equipment. The gun and mount are mounted on the 75-mm howitzer (fig. 221) in place of the howitzer top sleigh. The 37-mm subcaliber gun may be replaced by the caliber .22–.30 rifle adapter M17 and either the caliber .22 rifle M2 (fig. 222) or caliber .30 rifle M1903A3 (fig. 223) with the stocks removed. Tabulated data for 37-mm subcaliber equipment is listed in paragraph 6.

b. The 37-mm gun M1916 (fig. 224) is a single-shot, hand-loaded weapon with a manually-operated eccentric-screw (Nordenfeld) type of breechblock.

c. The 37-mm gun recoil mechanism M1916 (fig. 224) is of the hydrospring type. It consists of the recoil mechanism, counterrecoil mechanism, and counterrecoil buffer, all encased in a cradle over which the gun slides during recoil and counterrecoil. The recoil mechanism controls the force created by firing and retards the rearward movement of the gun in a gradual manner. The counterrecoil mechanism returns the gun into battery in order that it may be fired again. The counterrecoil buffer functions at the

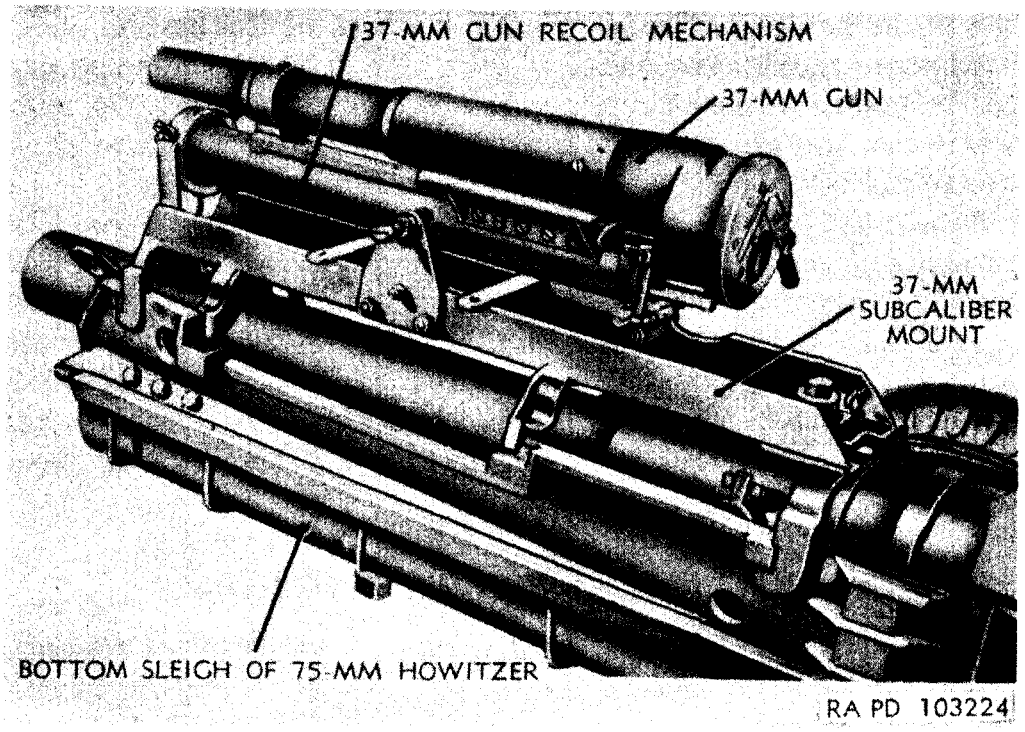


Figure 221. Exterior type 37-mm subcaliber equipment mounted on 75-mm howitzer.

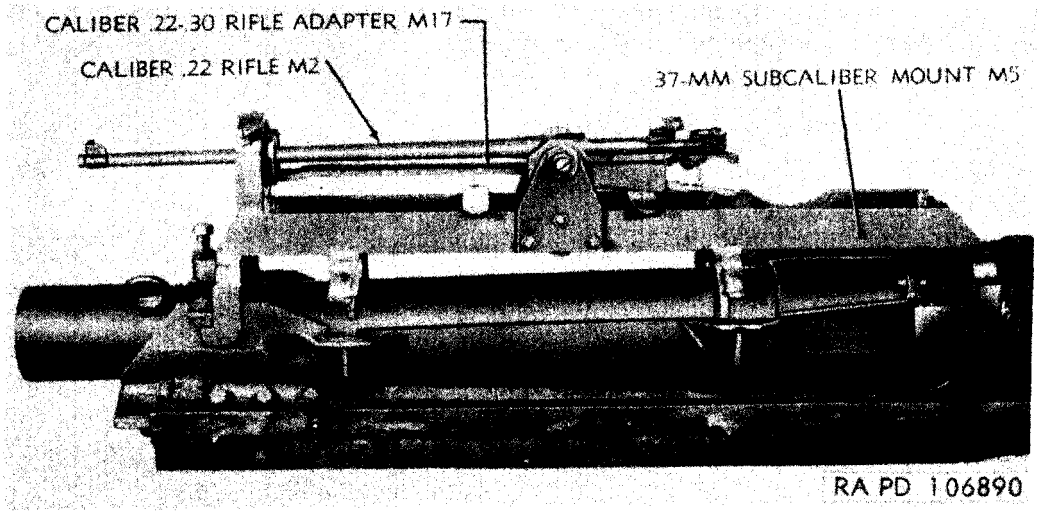


Figure 222. Caliber .22 subcaliber equipment mounted on 75-mm howitzer.

end of counterrecoil by slowing down and stopping the counterrecoil action without injury to the system.

d. The 37-mm subcaliber mount M5 (fig. 224) is composed of a number of steel angles and plates welded into a frame. The frame is retained upon the howitzer by four hooks formed to slide under the lugs of the howitzer bottom sleigh. At the rear of the frame is a cam which moves the frame forward to engage the hooks and lock it in position. At the front, a screw is provided for the purpose of raising the front end of the frame until

the hooks are in full contact with the lugs of the bottom sleigh. Trunnion brackets are bolted to each side of the frame to support the trunnions of the 37-mm gun cradle or rifle adapter. The collar welded on the upright pieces at the front of the frame encircles the recoil cylinder of the 37-mm gun cradle or the front end of rifle adapter. Three adjusting screws are provided in the collar to hold the cradle or adapter in position and to facilitate adjustment for boresighting the 37-mm gun with that of the howitzer.

e. The caliber .22–.30 rifle adapter M17 (fig. 225), which is used with either the caliber .22 rifle M2 or caliber .30 rifle M1903A3 instead of the 37-mm gun M1916, consists of a steel plate with trunnions at the rear end and a collar which encircles the barrel of the rifle at the front end.

192. Service Upon Receipt of 37-mm Gun Matériel

a. Upon receipt of matériel, it is the responsibility of the officer in charge to ascertain whether it is complete and in sound operating condition. A record will be made of any missing parts and of any malfunctions, and any such conditions will be corrected as quickly as possible.

b. Attention will be given to small and minor parts as these are more likely to become lost and may seriously affect the proper functioning of the matériel.

c. The matériel will be cleaned and prepared for service in accordance with instructions given in paragraph 198. The matériel will be lubricated in accordance with paragraph 197.

d. If the subcaliber gun has been treated with corrosion pre-

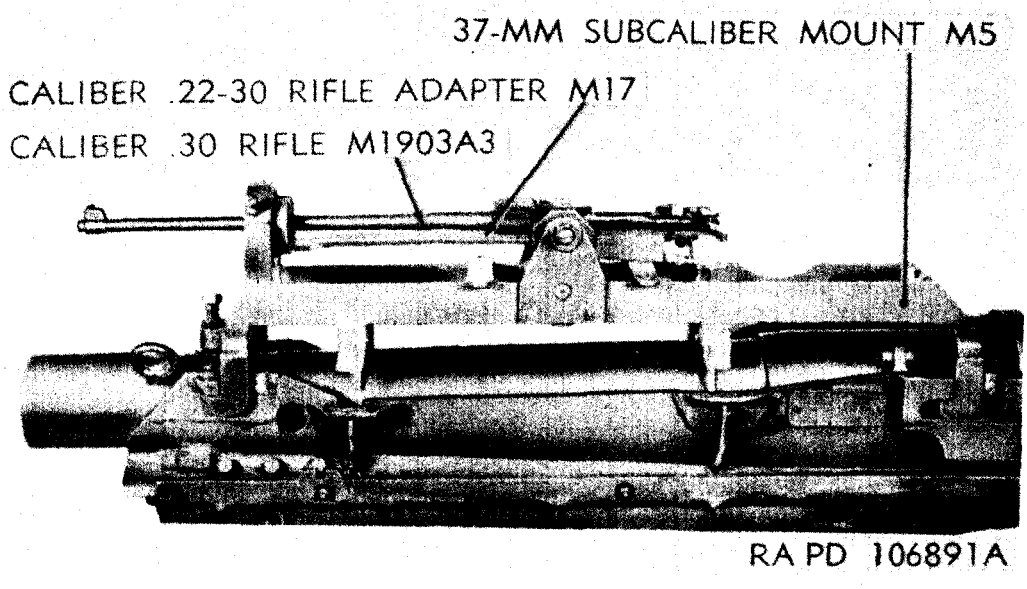


Figure 223. Caliber .30 subcaliber equipment mounted on 75-mm howitzer.

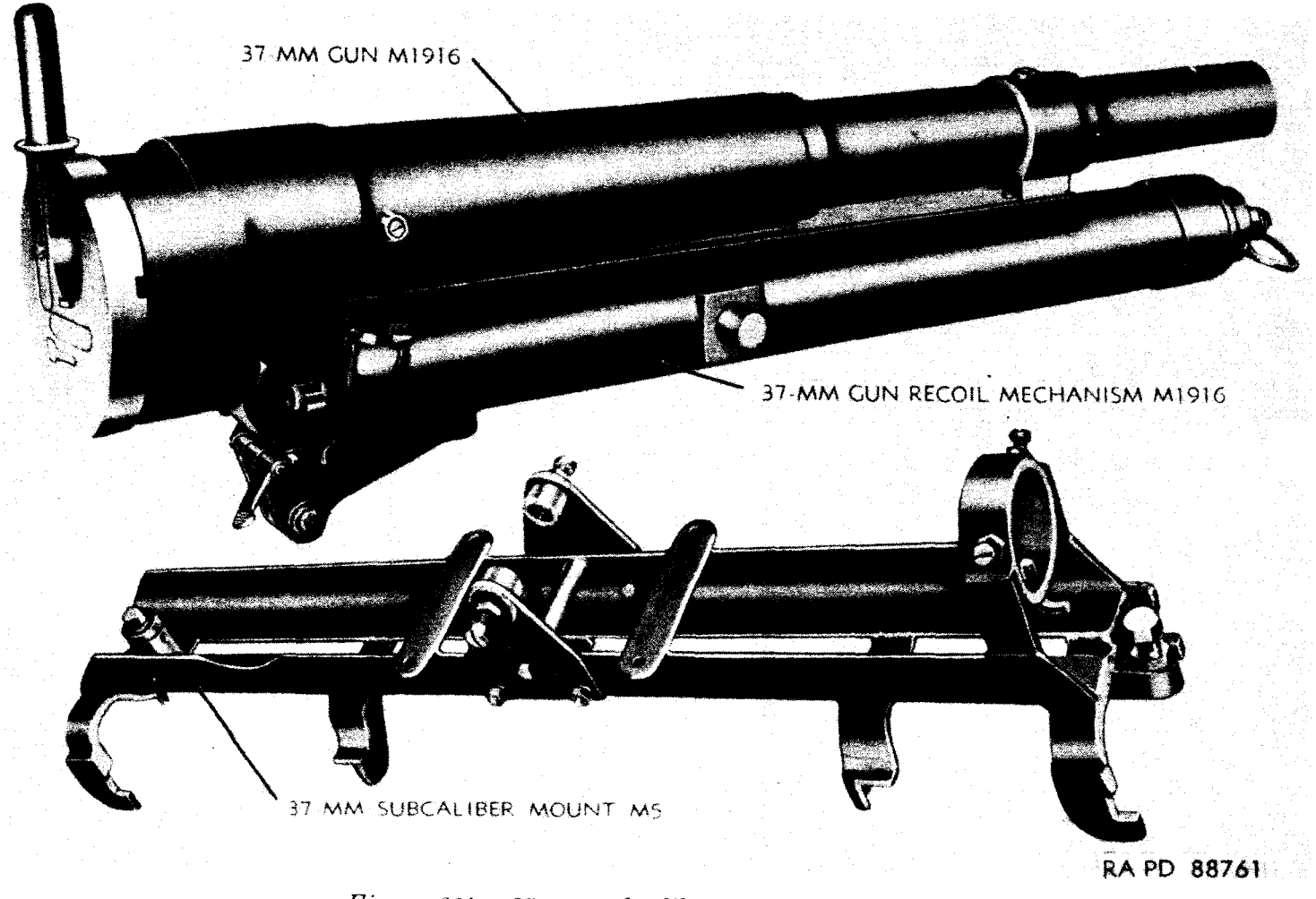
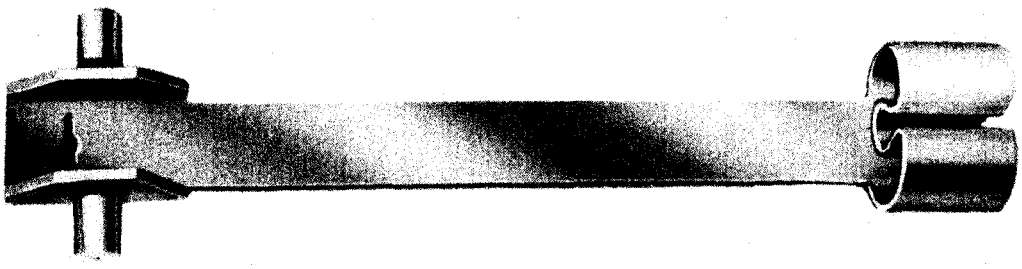


Figure 224. 37-mm subcaliber gun and mount M5.



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Figure 225. Caliber .22–.30 rifle adapter M17 (used with mount M5).

ventive compound, the compound must be removed as outlined in the applicable portions of paragraph 9.

e. Open and close the breech. Action should be smooth and positive.

Note. The piece must be cocked in order to allow the breechblock to return to the open position.

f. Exercise the recoil mechanism by manually retracting the gun and then allowing it to return to battery position. Repeat several times to see that the counterrecoil action is smooth.

g. Examine the gun and mount for general appearance. If the paint has deteriorated or become damaged leaving exposed portions of bare metal, the matériel should be repainted.

h. Check the data in the Artillery Gun Book (O.O. Form 5825) and make sure that this record has been kept up to date and that all entries have been properly made (par. 2).

193. Controls for 37-mm Gun Matériel

a. The breechblock lever (fig. 227) is a short round handle with the lower half machined to fit into a slide. It is used to open and close the breechblock. Moving the lever to the left causes the breechblock to rotate, thus carrying the eccentric opening in the breechblock to a position in line with the bore (fig. 227). When the lever is moved to the right, the breechblock closes the breech (fig. 229) placing the firing pin in line with the percussion cap in the base of the cartridge case, and at the same time it releases the safety bolt.

b. The firing mechanism actuating striker (fig. 227), which is provided with a cocking handle (fig. 226), is located in a housing mounted on the left rear end of the recoil mechanism. It is cocked manually before the first shot but is automatically recocked thereafter by action of the recoil mechanism.

c. The trigger crank lever (fig. 230) is located at the lower rear

right hand side of the recoil mechanism. The 37-mm gun is fired by means of this lever.

194. Installation of Exterior Type Subcaliber Gun on Howitzer

a. To install the 37-mm subcaliber mount on the howitzer, first remove the top sleigh from the howitzer (par.15).

b. Place the 37-mm subcaliber mount on top of the howitzer in place of the top sleigh, guiding the hooks of the frame under the lugs of the bottom sleigh. Turn the locking cam clockwise 90°, moving the frame into the full locked position. With the adjusting screw, raise the frame at the front until the hooks of the frame bear on the lugs of the bottom sleigh. Remove the left trunnion bracket from the frame and place it on the corresponding trunnion of the 37-mm gun cradle.

c. Lift the 37-mm gun and cradle into position on the mount, guiding the recoil cylinder through the collar at the front of the frame and the other trunnion into its bracket. Bolt the loose trunnion bracket in place. Center the recoil cylinder in the collar by the three adjusting screws. In making adjustment, no strain should be exerted on the screws. Tighten the adjusting screws in the trunnion, centering the cradle in the frame.

d. When using the caliber .22–.30 matériel in place of 37-mm gun, install the subcaliber mount as directed in *b* above; next, insert the rifle in the rifle adapter. This is accomplished by removing the rifle guard, inserting the rifle barrel into the collar of the adapter, and lowering the front end of the rifle receiver into the slot provided in the adapter. Replace the rifle guard. Remove the left trunnion bracket from the frame and place it on the corresponding trunnion of the rifle adapter. Lift the adapter and rifle into position on the mount, guiding the front end of the adapter through the collar at the front of the frame and the other trunnion into its bracket. Bolt the loose trunnion bracket in place.

195. Removal of Exterior Type Subcaliber Gun from Howitzer

a. To remove the 37-mm gun, loosen the adjusting screws in the collar which hold the recoil cylinder. Remove the left trunnion bracket. Move the cradle and recoil mechanism to the left, freeing it from the right trunnion, and then slide it to the rear until the recoil cylinder is free from the collar. Lift the 37-mm gun off the mount.

b. To remove the caliber .22 or .30 rifle from the adapter, loosen the adjusting screws in the collar. Remove the left trunnion bracket. Move the rifle and adapter to the left, freeing it from the right trunnion, and then slide it to the rear until the rifle is free from the collar. Lift the rifle off the mount.

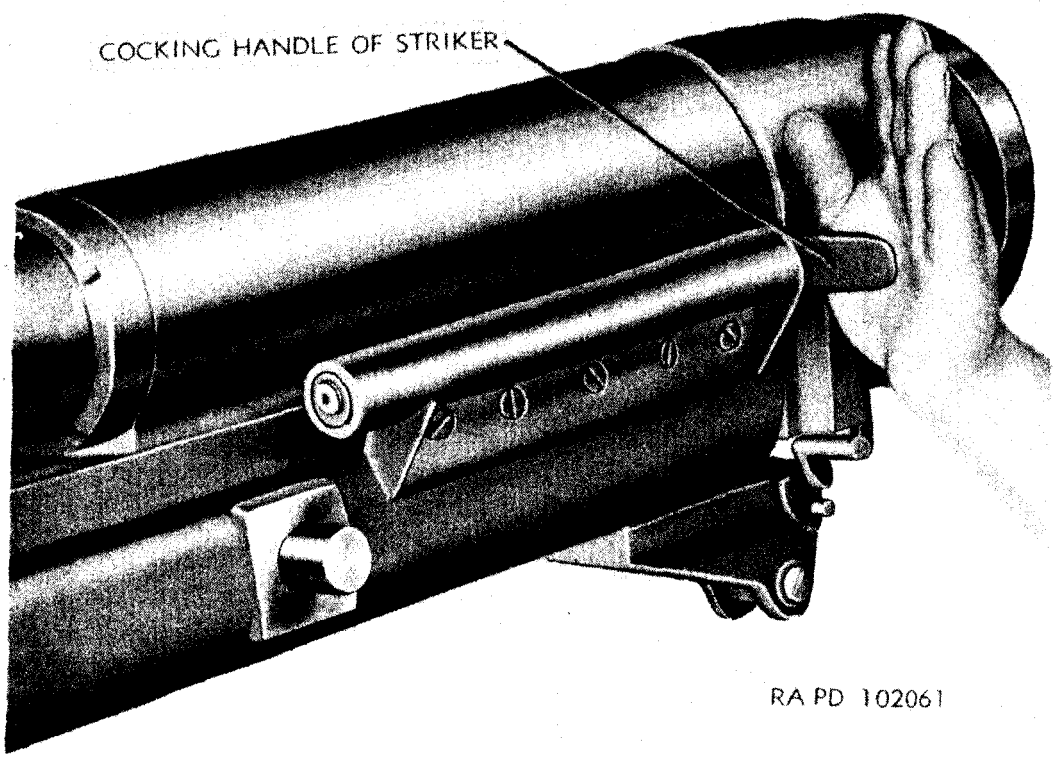


Figure 226. Cocking 37-mm gun M1916.

c. To remove the subcaliber mount, turn the locking cam counterclockwise 90°. This moves the mount to the rear and unlocks the lugs, disconnecting it from the bottom sleigh.

d. When the equipment is dismounted, assemble trunnion bracket and all screws, washers, and nuts on the mount to prevent items from being lost.

e. Place the top sleigh on the bottom sleigh, locking it in place by means of the locking cam.

196. Operation of Exterior Type Subcaliber Gun

a. Cocking. (1) The normal position for operating the 37-mm gun is from the right side.

(2) First cock the gun (if not already automatically recocked) by placing the palm on the cocking handle (fig. 226) and pushing it forward until it latches.

b. Loading. (1) Open the breech (fig. 227). The breech cannot be opened unless the firing mechanism is in the cocked position.

(2) Place round in breech opening (fig. 228) and push it forward as far as allowed by the extractor. Move the breechblock lever down to the right until the breech is fully closed (fig. 229). The gun is now ready to fire.

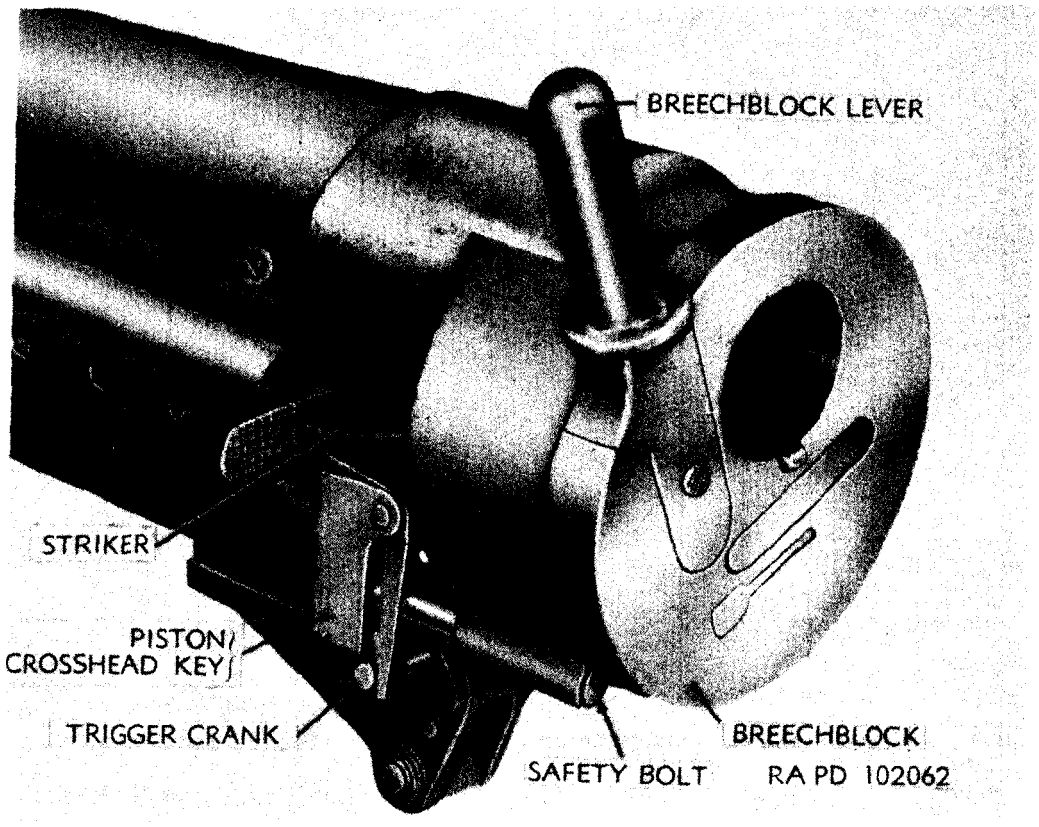


Figure 227. 37-mm gun M1916 with breech open.

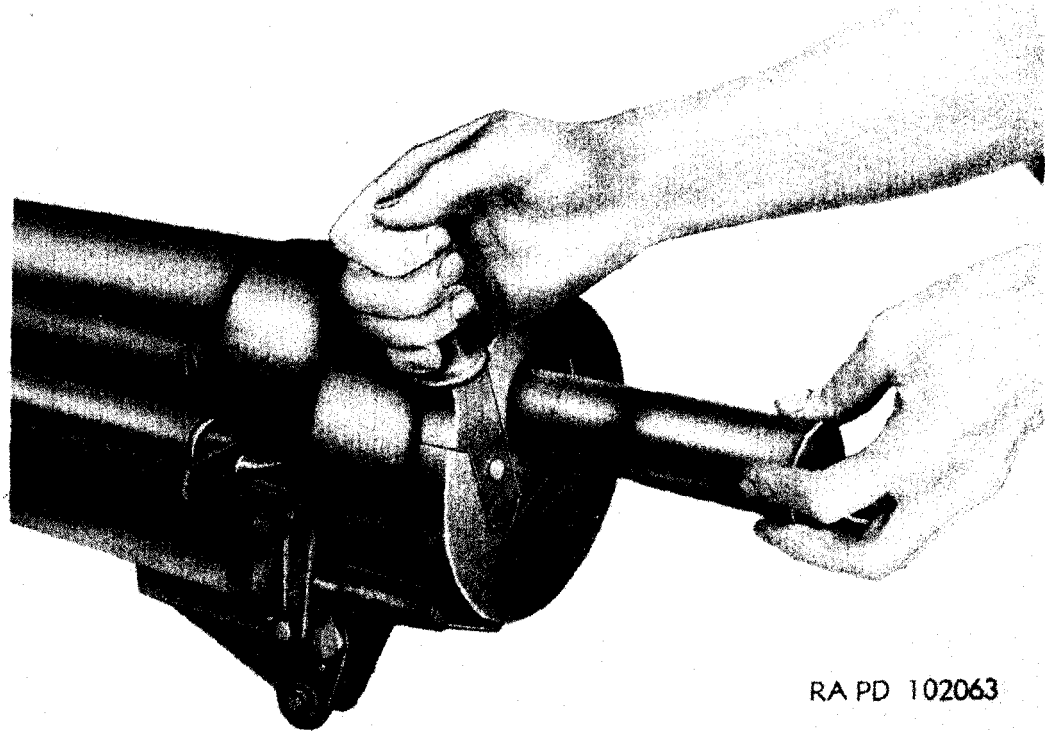


Figure 228. Loading exterior type 37-mm subcaliber gun.

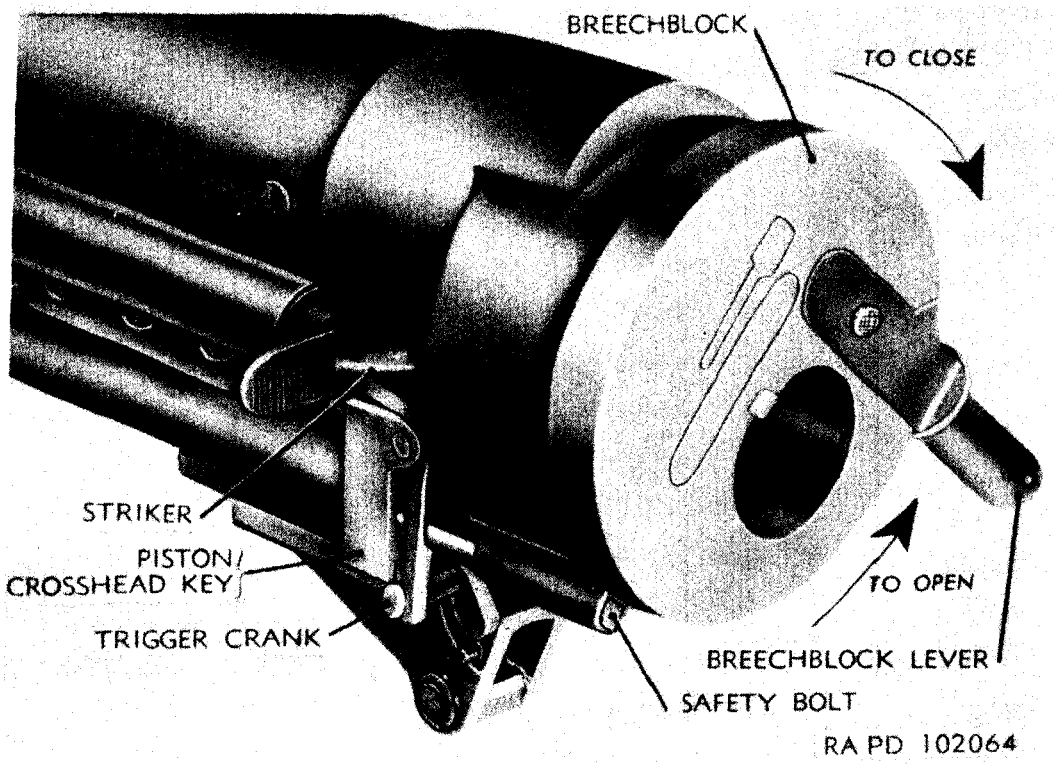


Figure 229. Exterior type 37-mm subcaliber gun with breech closed.

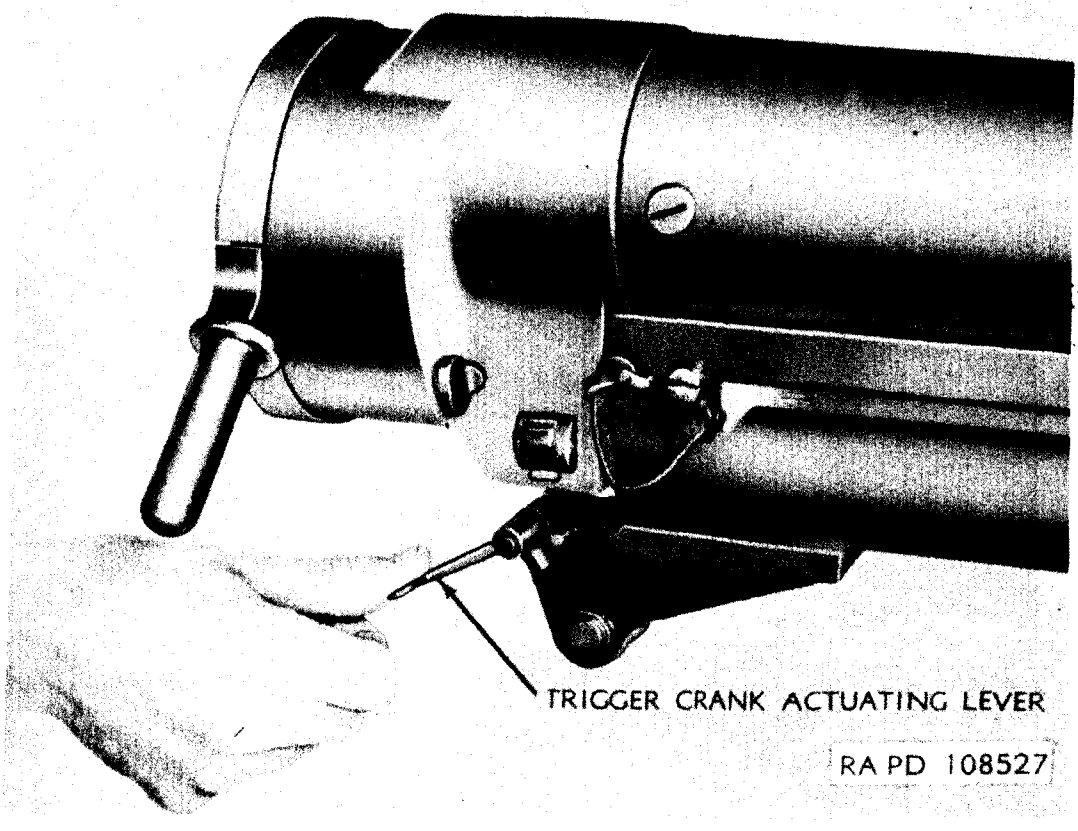


Figure 230. Firing exterior type 37-mm subcaliber gun.

c. Firing. (1) Firing is accomplished by pressing the trigger crank lever (fig. 230) and then releasing it promptly.

(2) In case of failure to fire, recock, relay, and make two more attempts to fire. If failure continues, wait 60 seconds, clear other personnel from the vicinity of the breech, and extract the complete round. If indent is normal, segregate the round for the inspection of the local ordnance officer. If the indent is light or missing, see paragraph 199*d* for correction of the malfunction.

(3) Be sure to follow the maintenance instructions for before, during, and after firing (par. 198).

d. Extracting. Opening the breech actuates the extractor which ejects the cartridge case from the chamber. If the cartridge case is not ejected, see paragraph 199*e* for correction of the malfunction.

e. Unloading. A complete round normally is fired in preference to being unloaded. However, if the round is to be unloaded, open the breech slowly and remove the round. If the cartridge case and projectile become separated and the projectile sticks in the bore, notify ordnance maintenance personnel for its removal.

Caution: Do not attempt to ram the shell back from the muzzle end of the tube.

197. Lubrication of 37-mm Gun Matériel

a. The 37-mm gun matériel has very few oilholes or special fittings, yet it requires regular oiling of certain bearings. The fol-

Lubrication Guide—37-mm Gun Matériel M1916

PART	*METHOD*	*REMARKS*
Bore	Swab with bore brush. Dry and apply oil with jute burlap.	Clean and lubricate in the same manner as the 75-mm howitzer (pars. 84 and 85).
Breechblock	Apply oil to threads	Weekly. Unscrew breechblock (par. 204).
Firing pin	Drops at contact surfaces	Weekly. While breechblock is dismounted (par. 204)
Extractor and extractor pin.	Drops at contact surfaces	Weekly. While breechblock is dismounted (par. 204).
Safety bolt	Drops at ends of bracket	Weekly. While breechblock is dismounted (par. 206).
Striker rod	Drops at ends of bracket	Weekly. While breechblock is dismounted (par. 208).
Sear	Drops at bearing surface	Weekly. While breechblock is dismounted (par. 206).
Piston cross head key	Drops at contact surfaces	At assembly of striker assembly (par. 207).
Striker spring	Slush	At assembly of striker assembly (par. 209).
Gun slides and piston cross head.	Cover bearing surfaces	At installation of gun (par. 207).
Trigger crank	One drop at each end of bearing.	Weekly (par. 206).

lowing lubrication guide indicates where lubrication is necessary, amount and frequency required, and the method of application required in active service. Use preservative lubricating oil (medium) at temperatures above 0° F. and preservative lubricating oil (special) below 0° F.

b. Service intervals specified in above chart are for normal operating conditions and continuous use of the matériel. Reduce these intervals under extreme climatic conditions such as excessively high or low temperatures, continued operation in sandy or dusty areas, immersion in water, or exposure to moisture. Any one of these conditions may quickly destroy the protective qualities of the lubricant and require servicing in order to prevent malfunctioning or damage to matériel.

c. The general instructions in paragraph 81 for cleaning and lubricating the 75-mm howitzer will be followed for the subcaliber equipment.

198. Preventive Maintenance Schedules for the 37-mm Gun Matériel

a. For general preventive maintenance service see section XVII.

b. The following instructions are designed to insure proper functioning of the 37-mm matériel at all times.

ITEM	*PREVENTIVE MAINTENANCE*	*INSTRUCTIONS*
Before firing		
Gun, recoil mechanism, and mount as a unit.	General inspection	Note appearance of weapon. Check to see that spare parts set is complete, that mount is securely fastened to primary weapon, and that both weapons are properly boresighted (par. 212). Try ejection with empty shell case.
Gun barrel	Inspect, clean, and dry	Wipe the bore dry with clean, dry burlap or wiping cloth. Examine the threads in the breech recess for burs and rough surfaces. The chamber and bore should be free from pits and rust. Remove the piston cross head key (par. 201*c*) and slide the gun back to insure that the jacket shoe and recoil ways are free from burs.
Piston cross head key	Inspect, clean, and lubricate.	If the sear, sear spring, or sear plunger (fig. 245) becomes worn, entire key should be replaced.

ITEM	PREVENTIVE MAINTENANCE	INSTRUCTIONS
Before firing—Continued		
Breechblock	Inspect and check for proper functioning.	Rotate the breechblock from right to left and back several times, noting whether there is any stiffness or binding. Remove the breechblock from the breech ring (par. 204*b*) and examine the threads on both for burs and rough surfaces. Inspect the firing pin hole in the face of the breechblock, depress the rocker plunger, and note how far the firing pin protrudes. With the rocker plunger fully depressed, the firing pin should protrude approximately 1/8 inch. Remove the firing mechanism (par. 208*b*). Examine the parts for rust and burred surfaces. The free length of firing pin spring is 25/32 inch. Test the tension of the breechblock lever latch spring. Replace all worn parts with new ones or with parts that are declared usable by ordnance personnel.
Recoil mechanism	Check for leaks and proper functioning.	Remove the gun from the recoil mechanism (par. 201*c*) and examine the front and rear cradle caps for oil leaks and for leaks at the piston rod packing washer. Check the quantity of oil in recoil mechanism. Perform a retraction test (par. 209*d*).
Striker and trigger mechanisms.	Inspect and check for proper functioning.	Test the tension of the striker spring and sear plunger spring. Test the action of the trigger crank and trigger crank lever. The trigger crank plunger should have tension enough to hold the trigger crank in place. Examine the sear and sear notch for burs or worn surfaces.
During firing		
Gun barrel	Examine bore for powder fouling.	Clean with bore brush if necessary.
Recoil mechanism	Check for proper functioning.	The length of recoil should be measured for the first few rounds and then at regular intervals.

ITEM	PREVENTIVE MAINTENANCE	INSTRUCTIONS
After firing		
Gun barrel	Clean and lubricate	See paragraph 201*e*.
Breechblock and striker and trigger mechanisms.	Clean and lubricate	Disassemble, clean, and relubricate.
Recoil mechanism	General inspection	Examine for worn, loose, or broken parts.

199. Malfunctions and Corrections for 37-mm Gun Matériel

a. Incomplete return to battery is evident when the firing mechanism does not cock, or the cocking is not sufficient to fire the next round. This may be caused by weakened counterrecoil springs, scored or scratched jacket shoe guides, a dented recoil cylinder, or by an excess of oil in the recoil mechanism caused by the expansion of the oil from continued firing. In the latter case, a little oil may be let out of the recoil mechanism by unscrewing the drain plug located on the rear right side of the cradle. If it is thought that the condition of the guides is causing the difficulty, the gun should be dismounted and the guides examined for traces of scratches, fouling, etc. These may be remedied by use of crocus cloth, followed by a thorough cleaning and oiling. Test the operation of the gun in the slides before replacing the piston cross head key.

b. Sudden return to battery with a jarring impact is caused by incomplete buffing at the end of counterrecoil; that is, insufficient oil in the recoil mechanism. Ordinarly, addition of a little oil will remedy this condition. To do this, remove the filling plug at the front of the cradle and inject sufficient oil, using recoil oil gun 41–G–1362–15 (figs. 232 and 251).

c. Trigger crank lever jamming, which prevents depression sufficient to operate the firing mechanism, can usually be attributed to incomplete closure of the breech, which causes the safety bolt to lock the sear. The cartridge case should be examined for damaged rim or other defects tending to prevent its insertion into the chamber. Another round may be tried. If the round is not the cause of the difficulty, examine the chamber for dirt or fouling and the trigger mechanism for broken parts and for foreign matter which may have become caught in the mechanism. Broken or damaged parts should be replaced.

d. Failure to fire is caused by a defective primer, a weakened striker spring, a worn or broken firing pin (fig. 240), or dirt in the firing pin recess. If two percussions are frequently necessary

to produce discharge, the striker spring has either become weakened and should be replaced, or it is so clogged with dirt and hardened grease that it cannot function properly. Correct the deficiency. If no defect can be found in the firing mechanism, load with a new round. Segregate the old round with the defective primer for the inspection of the local ordnance officer.

e. Defective extraction may occur when the cartridge case tends to stick in the chamber either because the chamber is burred or fouled with powder or because the extractor is damaged or broken. A poor cartridge case may stick in the chamber because of expansion, in which case the hand extractor 41–E–52080 (fig. 231) should be used to complete extraction. Careful use of crocus cloth will correct sticking caused by burs in the chamber. If the extractor is broken or damaged, it should be replaced.

f. Failure of the breech to open may be caused by the firing pin being stuck in the primer, or the gun may be uncocked. The former may be caused by a burred rocker, which can be corrected by careful use of crocus cloth. The gun may be uncocked because the cannoneer failed to release the trigger crank lever promptly when firing, because of a worn or broken sear, a defective sear plunger and spring, or a worn or broken shoulder on striker rod.

200. Spares Parts and Accessories

a. The spare parts and accessories for the 37-mm gun M1916 are listed in the Army Supply Catalog pamphlet ORD 7 SNL C–33, section 13, which is the authority for requisitioning. There are no spare parts or accessories issued for the 37-mm subcaliber mount M5. Special tools and equipment for the exterior type 37-mm subcaliber gun are shown in figure 231.

b. Recoil oil gun (41–G–1362–15) (fig. 232) will be issued for use in filling the recoil mechanism of the 37-mm M1916 in lieu of oil gun 15–18–83, which is no longer being produced.

c. The oil gun 41–G–1362–15 is not adapted for the recoil mechanism M1916 because the nozzle of the gun is one-half inch in diameter with standard thread, whereas the end cap of the recoil mechanism is adapted for a metric-threaded nozzle of 12-mm diameter. To use this substitute oil gun, an adapter, two gaskets, plug, and link must be manufactured locally as shown in figures 233 and 234. The adapter must be assembled to the recoil mechanism and cap whenever it becomes necessary to replace the oil gun 15–18–83 with the gun 41–G–1362–15.

201. Barrel and Breech Ring Assembly of 37-mm Gun

a. The barrel of the 37-mm subcaliber gun M1916 is formed in one piece and includes a 37-mm bore and a tapered chamber at

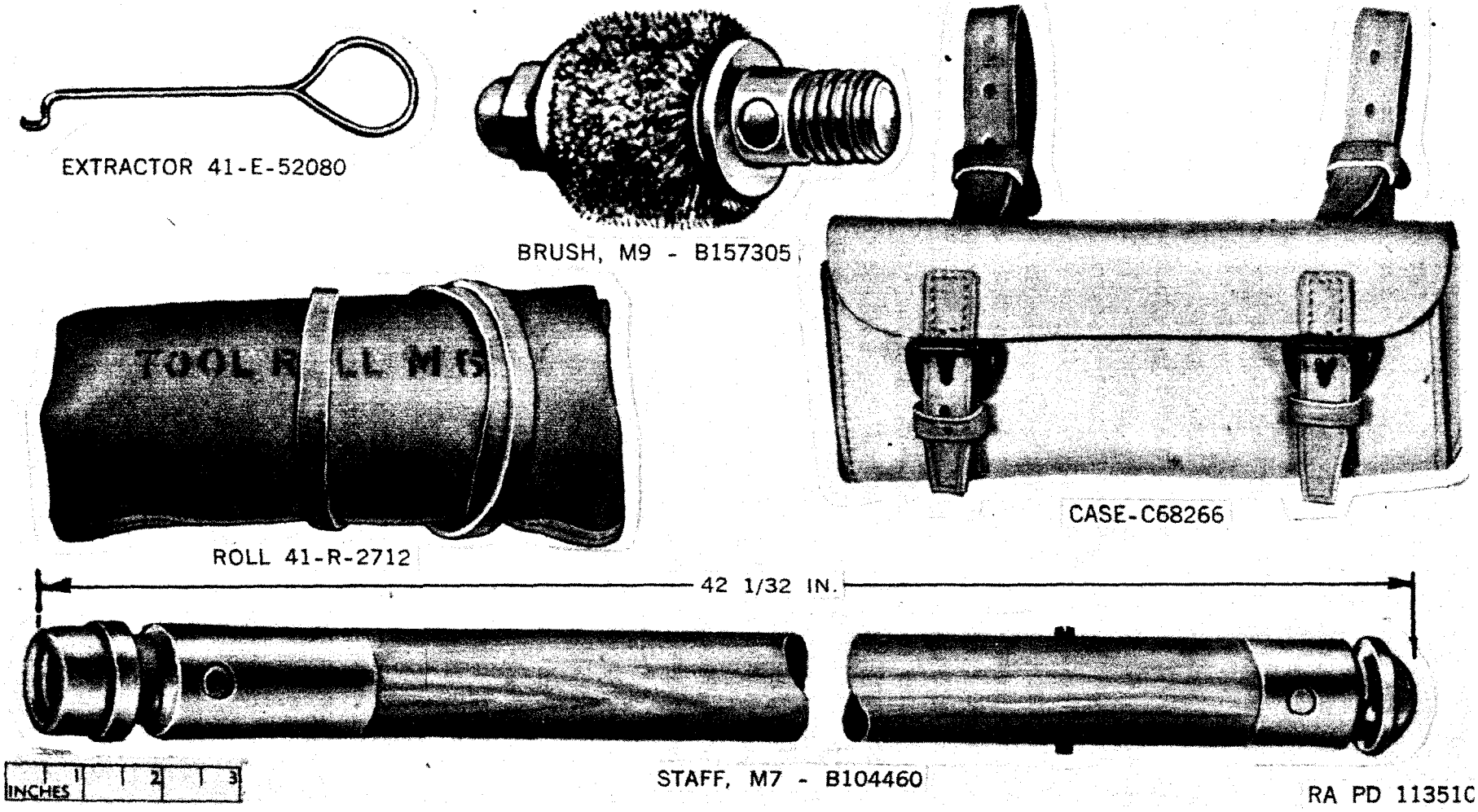


Figure 231. Special tools and equipment for 37-mm gun M1916.

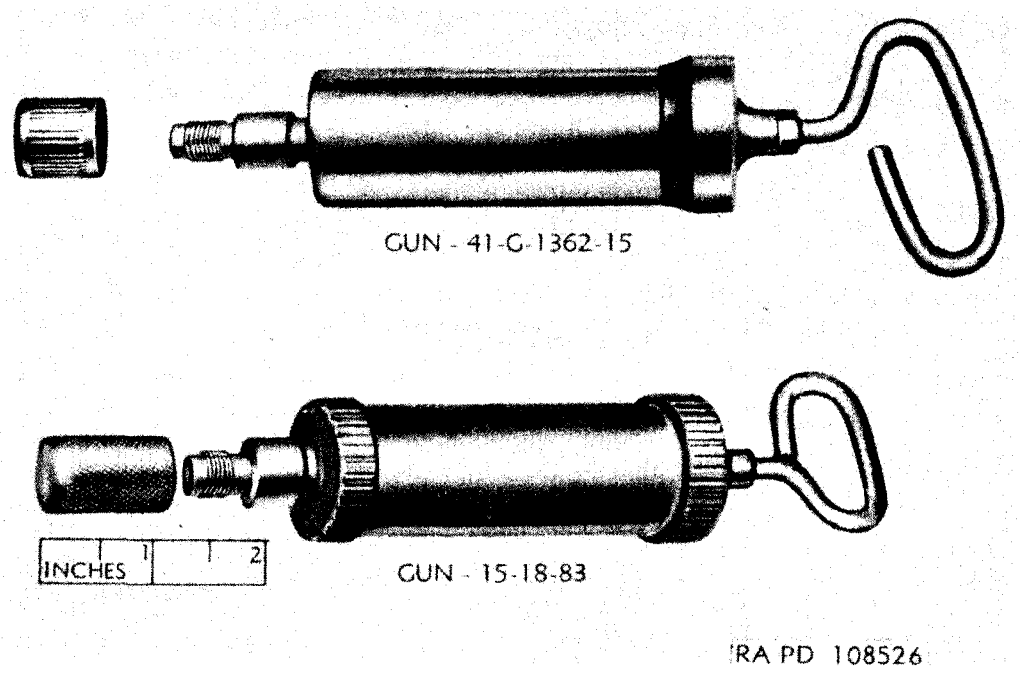


Figure 232. Recoil oil guns.

the breech end to receive the ammunition. The bore is rifled from chamber to muzzle with a uniform left-hand twist. The breech end of the barrel is provided with a continuous thread for attaching the breech ring. The face of the barrel at the breech end is recessed on the right side of the bore in order to form a clearance surface for an extractor (fig. 243), which ejects the fired cartridge

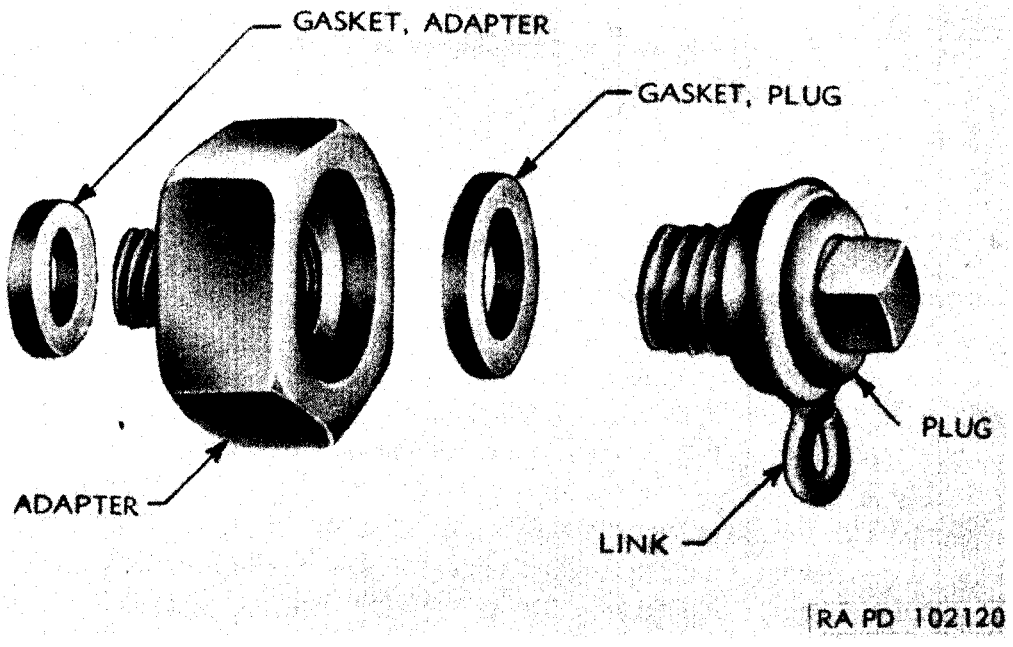


Figure 233. Exploded view of adapter and components.

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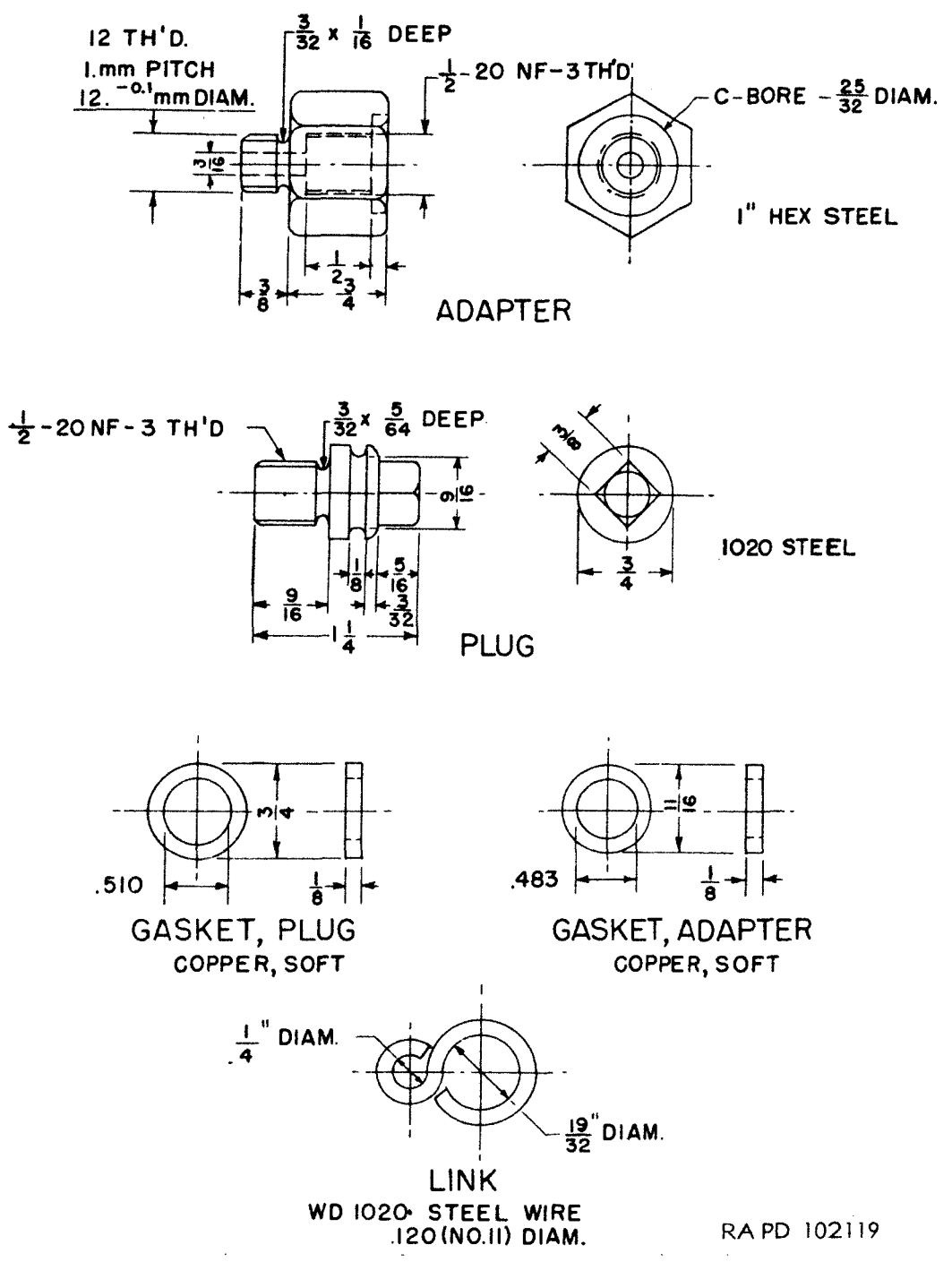


Figure 234. Adapter and components.

case. The barrel is fitted with a jacket, jacket shoe, clip, a plate connecting the jacket and clip and locking nuts (fig. 235). These provide a means for the gun to travel in the slides of the recoil mechanism cradle during recoil and counterrecoil.

b. The breech ring anchors the recoil mechanism which is below the gun barrel. The piston cross head, which is attached to the rear of the recoil piston, fits into an opening in the lower front end of the breech ring and lines up with two square openings,

one on each side of the breech ring. It is then locked in position by the piston cross head key. On the lower left hand side of the breech ring is a bracket which houses the safety bolt (fig. 235). This bolt is a safety device which prevents firing of the gun when the breechblock is not fully closed.

c. In order to remove the gun from the recoil mechanism, first uncock the firing mechanism. This is accomplished by pressing down on the trigger crank lever with the right thumb while applying pressure against the cocking handle with the left hand, thus preventing too fast a movement of the striker. Remove the piston cross head key by pressing up its latch (fig. 236) and pushing it out to the left. Carefully draw the gun back off the cradle of the recoil mechanism by grasping the muzzle with one hand and the breech with the other (fig. 237).

d. To install the gun on the recoil mechanism, first see that the gun slides are thoroughly cleaned and lubricated. Insert the gun from the rear, carefully maintaining alinement to avoid jamming the gun slides. Push the piston cross head key in place with the trigger crank lying in front of the long arm of the sear. See that the safety bolt properly engages the descending arm of the sear

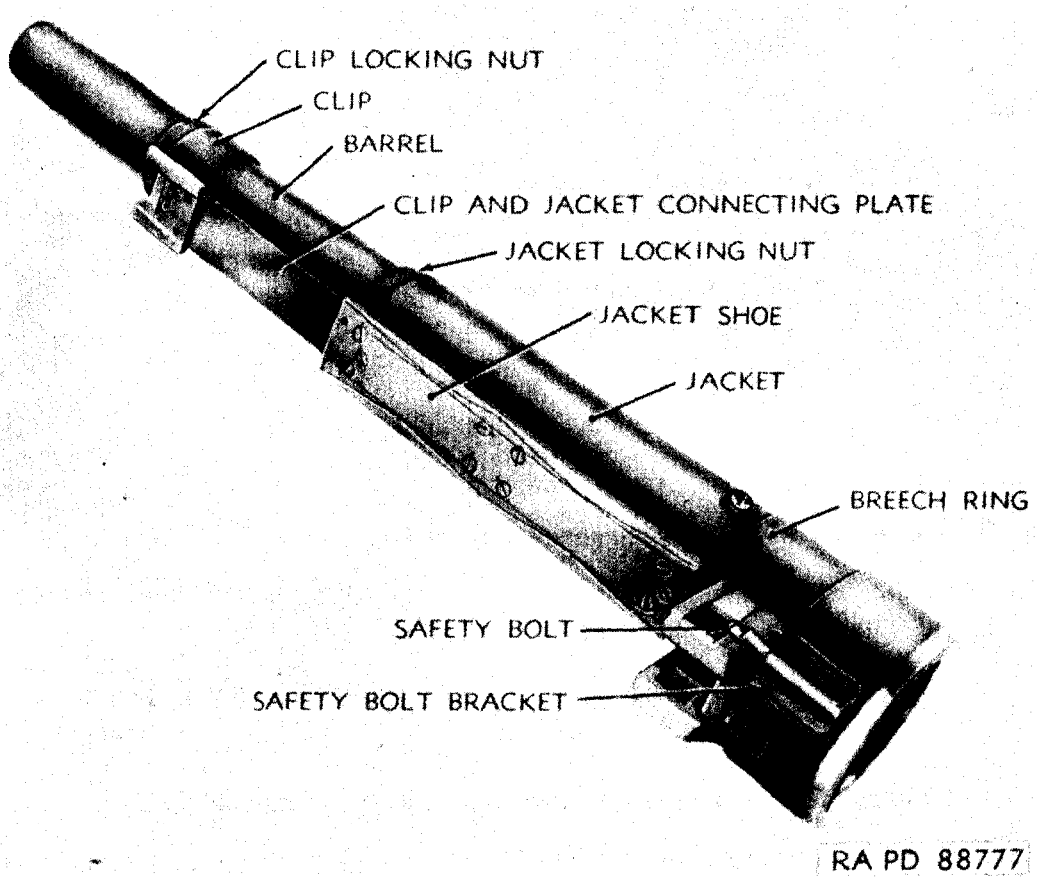


Figure 235. Barrel and breech ring assembly of 37-mm gun M1916.

before the key is pushed fully home. Failure to have the safety bolt in the proper position will prevent the cross head key from being fully pushed in, and an attempt to force it will cause damage to the sear.

e. In order to properly maintain the barrel and breech ring, it is required that they be cleaned thoroughly as prescribed for the howitzer (par. 84) and oiled in accordance with the lubrication guide (par. 79). The accuracy life of the tube depends upon the care given it, the number of rounds fired, and the rate of fire. See tabulated data (par. 6) for data on subcaliber equipment.

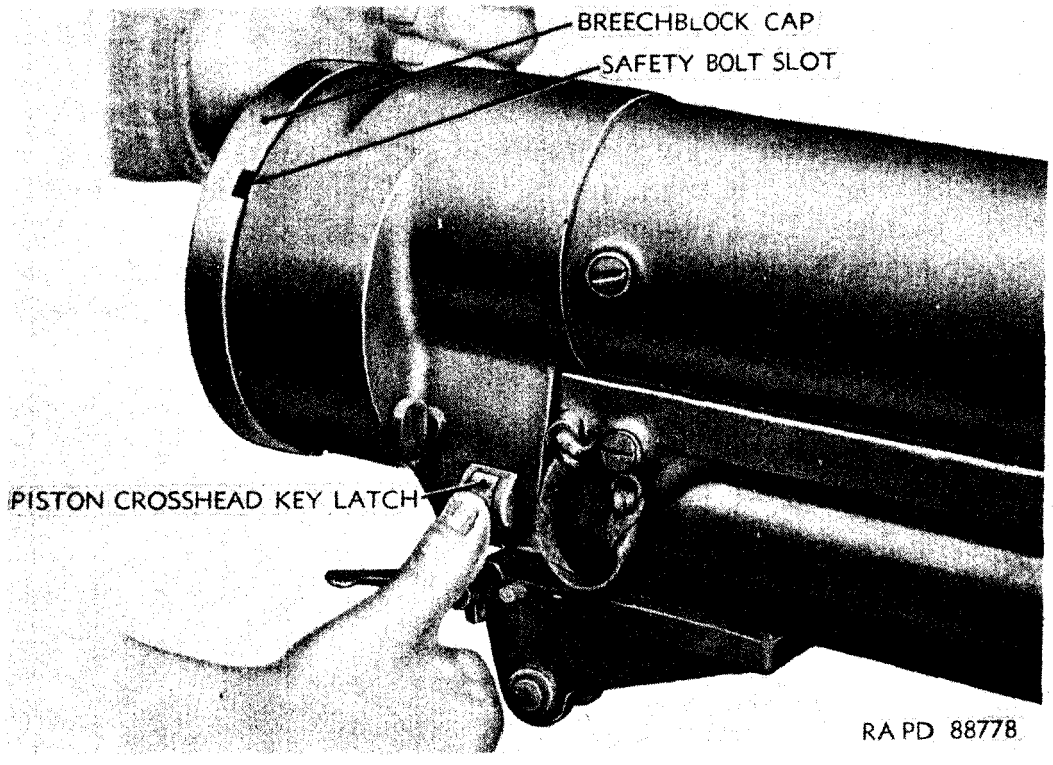


Figure 236. Removal of piston cross head key.

202. Breech Mechanism of 37-MM Gun (fig. 242)

The breech mechanism consists of a breechblock, breechblock lever, firing mechanism, extractor, extractor retaining pin, safety bolt, and piston cross head key. Each of these parts or mechanisms are covered in a separate paragraph.

203. Breechblock Lever—37-mm Subcaliber Gun M1916

a. The breechblock lever (fig. 238) is used to open and close the breech. It fits into a slide in the breechblock and is retained by a latch (fig. 240).

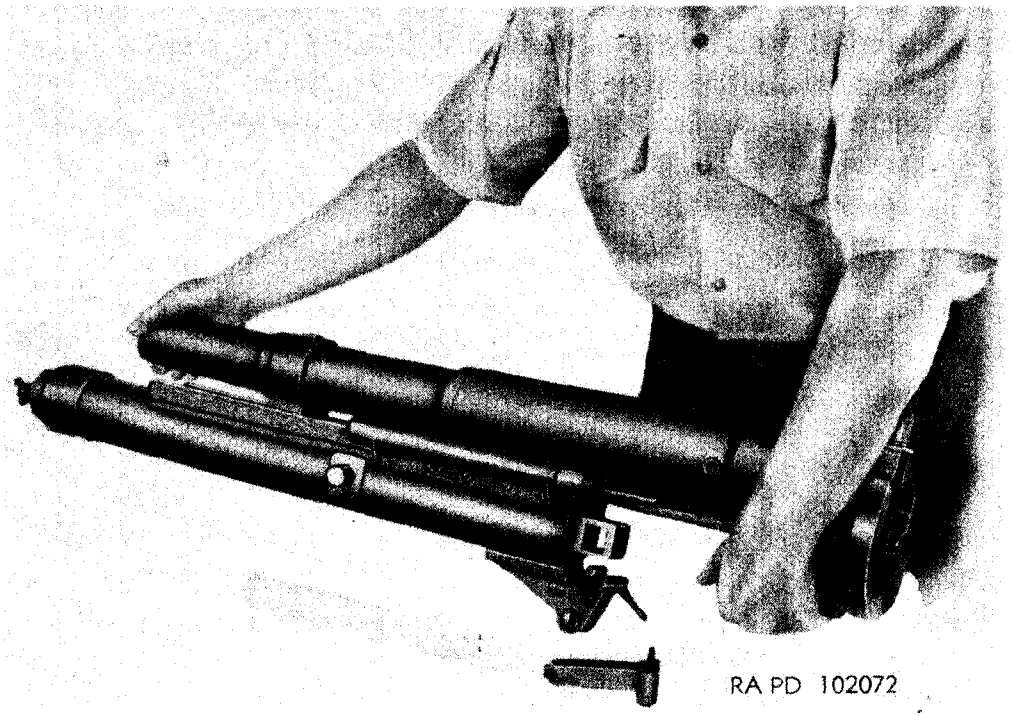


Figure 237. Removal of 37-mm gun from recoil mechanism.

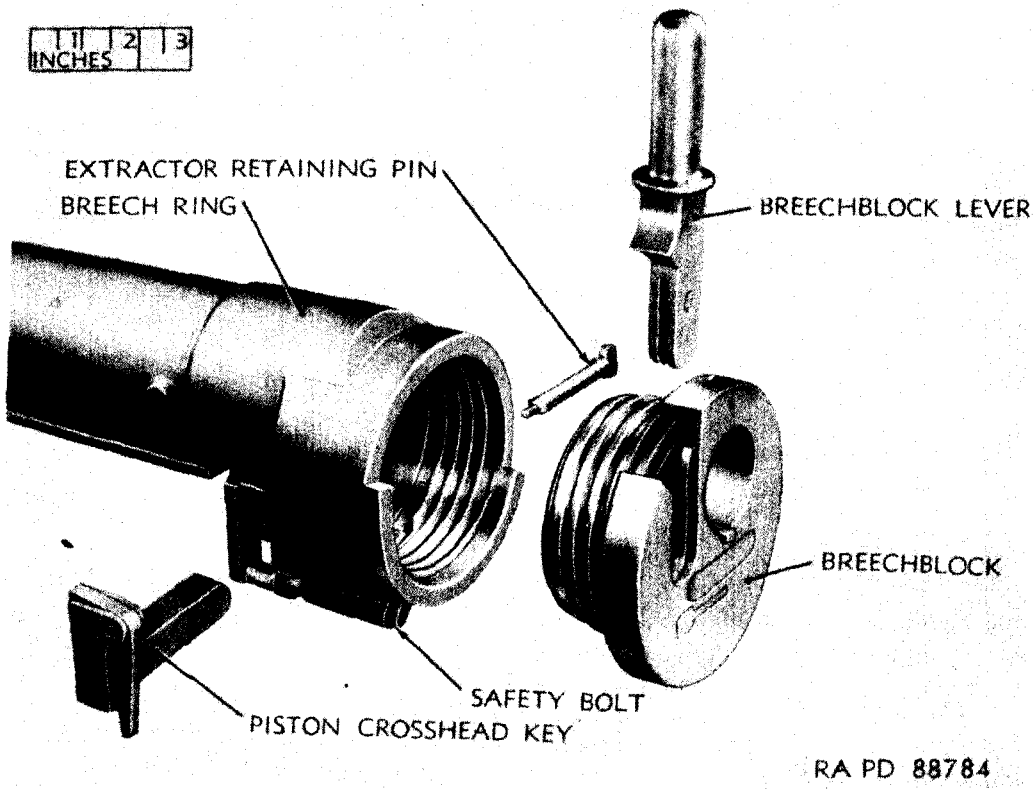


Figure 238. Breech mechanism of 37-mm subcaliber gun M1916.

b. In order to remove the lever, grasp the handle with the fingers of the right hand, press the release pin cap with the thumb, and slide the lever out (fig. 239).

c. To assemble the breechblock lever to the breechblock, insert the lever in the breechblock slide and push it down until it latches.

204. Breechblock—37-mm Subcaliber Gun M1916

a. The breechblock (fig. 240) screws into the breech ring, the axis of the breech recess being below the axis of the breechblock bore when the breech is closed. During the first part of the move-

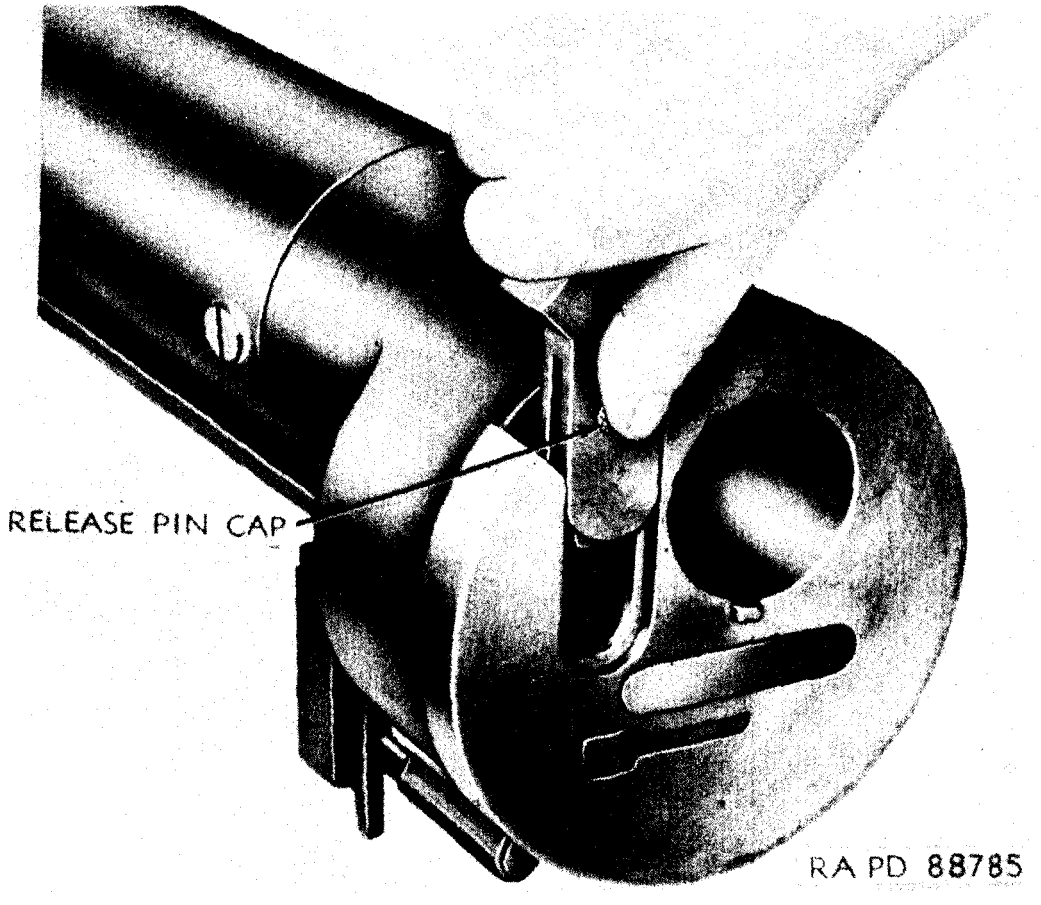


Figure 239. Removal of breechblock lever.

ment which closes the breech, a ramp (fig. 240) on the front of the breechblock pushes the cartridge case in flush with the face of the breechblock. When the breech is fully closed, the firing pin of the firing mechanism (which is housed in the breechblock) is in line with the percussion cap in the base of the cartridge case, and at the same time the safety bolt is released.

b. To remove the breechblock, first remove the breechblock lever; then take out the extractor pin by pressing the extractor

pin latch toward the breech with the left forefinger (fig. 241) and pulling it out to the right with the right hand. The extractor will then drop down until its heel clears the extractor cam. Unscrew the breechblock to the left, grasping it firmly in the right hand and supporting it with the left (fig. 242).

c. To install the breechblock, first see that the breech recess, extractor, and breechblock threads are thoroughly cleaned and oiled; then set the extractor in its seat but do not insert the extractor retaining pin; next screw the breechblock onto the breech ring (fig. 242). (If the gun is mounted on the recoil mechanism, it is necessary to cock the gun before installing the breechblock.) Raise the extractor by pushing upward on its heel from under the breechblock and insert the extractor pin from the right until the latch springs out at the left and secures the pin.

d. The breechblock should be thoroughly cleaned, rinsed, dried, inspected, and oiled, before installing.

205. Extractor—37-mm Subcaliber Gun M1916

a. The extractor (fig. 243) ejects the fired cartridge case. It fits into a seat in the breech ring and, when the breech is closed, rests against a recess cut in the face of the gun barrel at the breech end. The extractor is held in position by the extractor retaining pin.

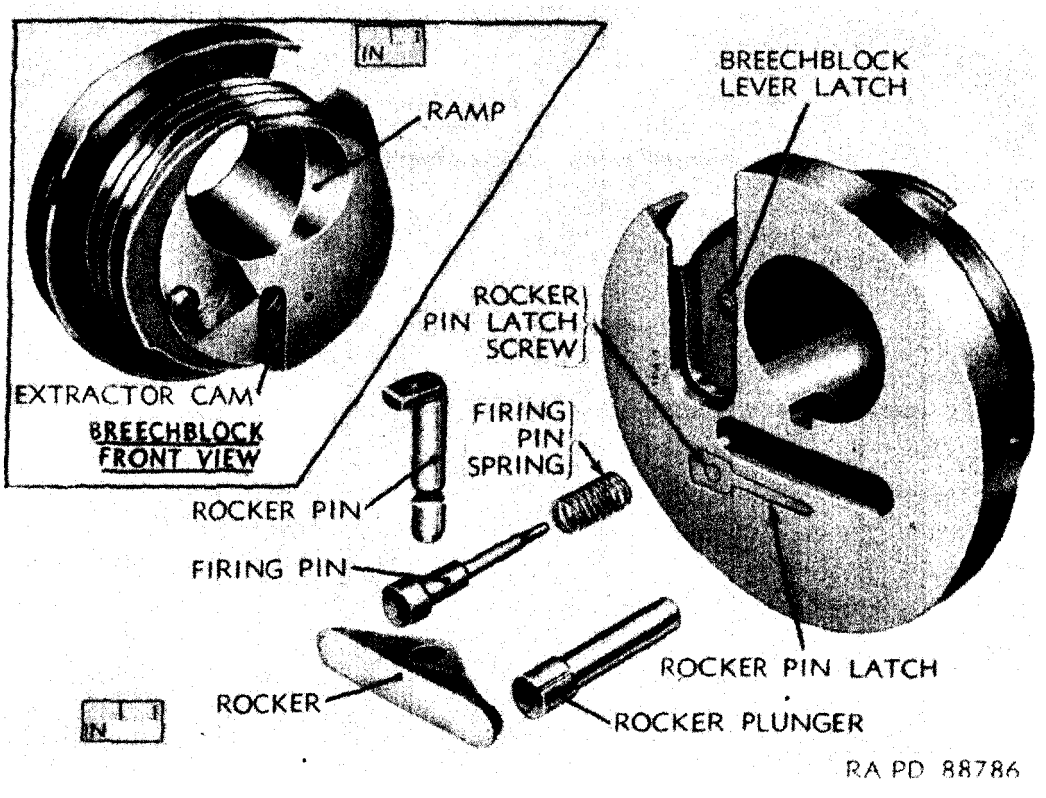


Figure 240. Breechblock—exploded view.

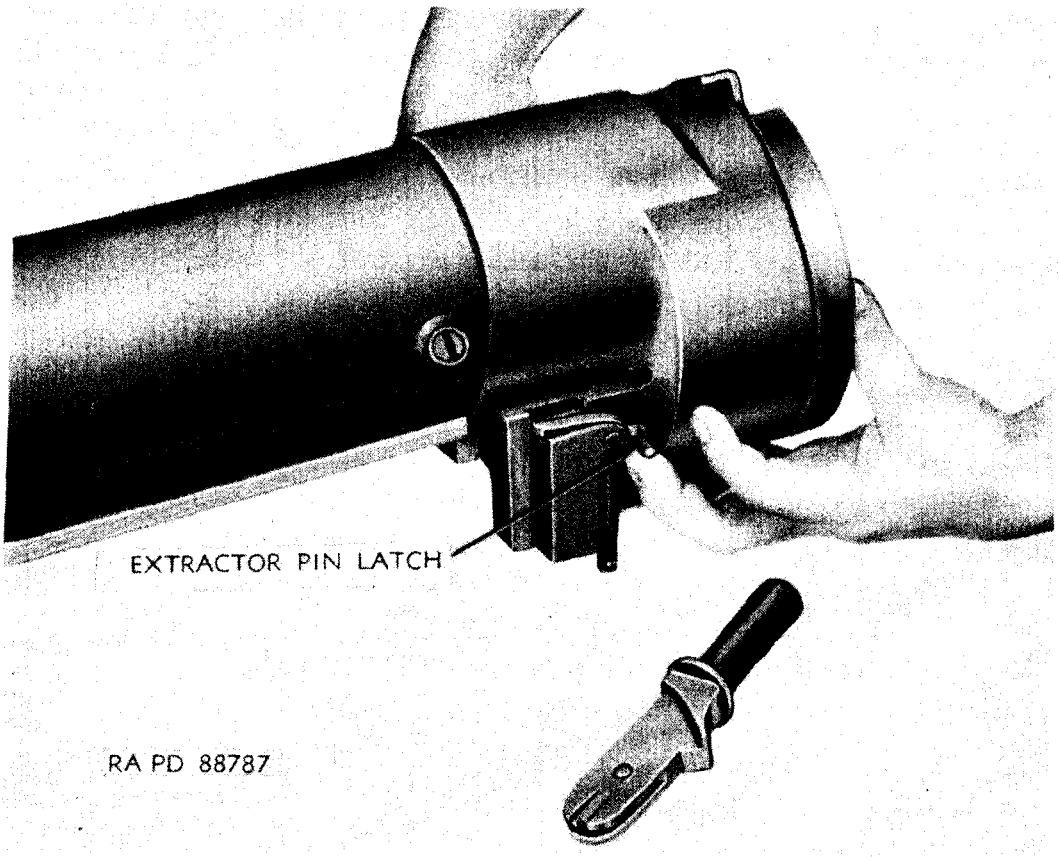


Figure 241. Removal of extractor retaining pin.

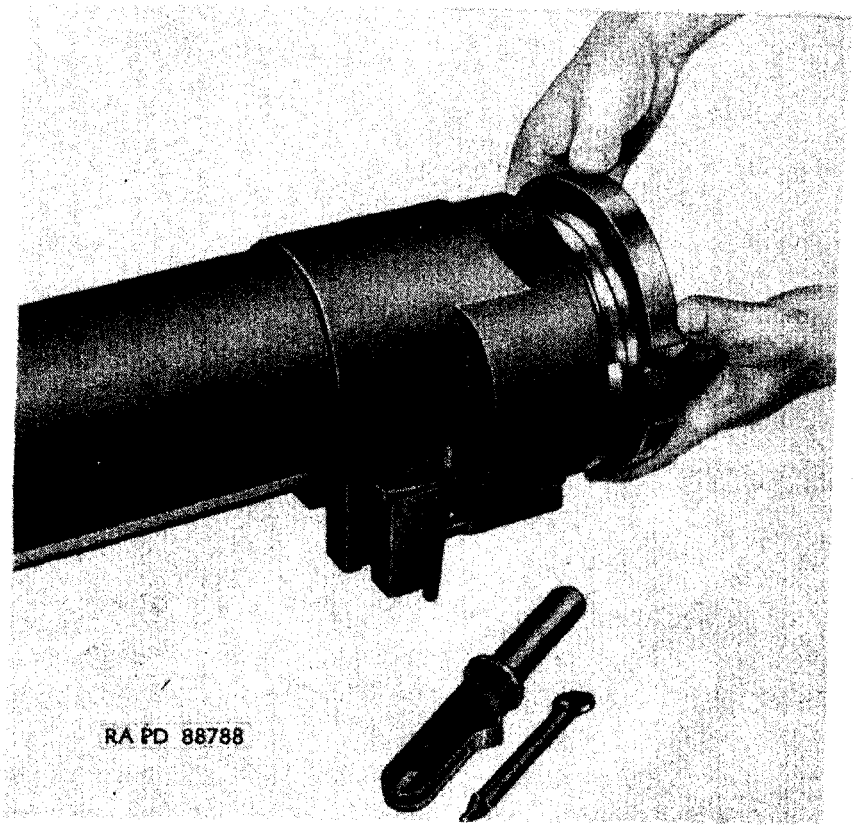


Figure 242. Removal of breechblock.

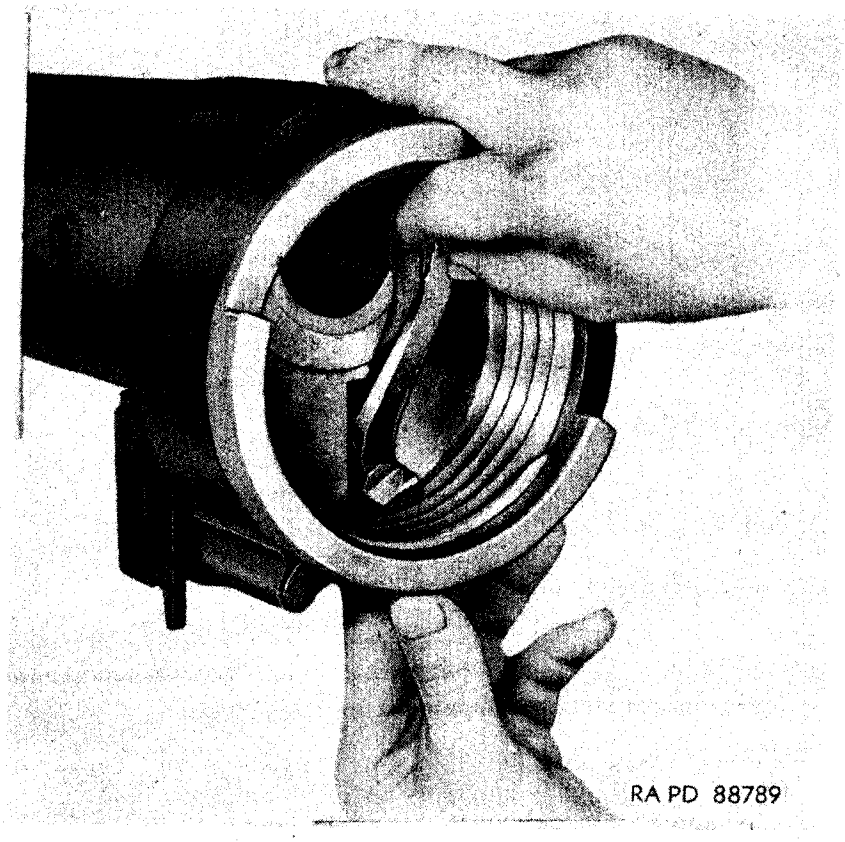


Figure 243. Removal of extractor.

b. To remove the extractor, remove the breechblock as directed in *b* above. Withdraw the extractor by inserting the left forefinger in the mortise in the base of the breech ring, slightly raising the extractor and grasping it with thumb and index finger of the right hand (fig. 243).

c. To install the extractor, follow directions during installation of the breechblock (par. 204*c*).

206. Safety Bolt—37-mm Subcaliber Gun M1916

a. The safety bolt (fig. 238) prevents firing of the gun when the breech is not completely closed. It is housed in a bracket at the lower left side of the breech ring and is held in position by locking the sear on the piston cross head key. When the breech is completely closed, operation of the trigger crank lever forces the sear back while the rear of the safety bolt enters the slot in the breechblock cap (fig. 236). If the breech is not fully closed, the rear of the safety bolt will strike the shoulder of the breechblock cap, thus preventing the sear from moving rearward and thereby preventing firing.

b. To remove the safety bolt, dismount the breechblock and remove the piston cross head key. The safety bolt then may be

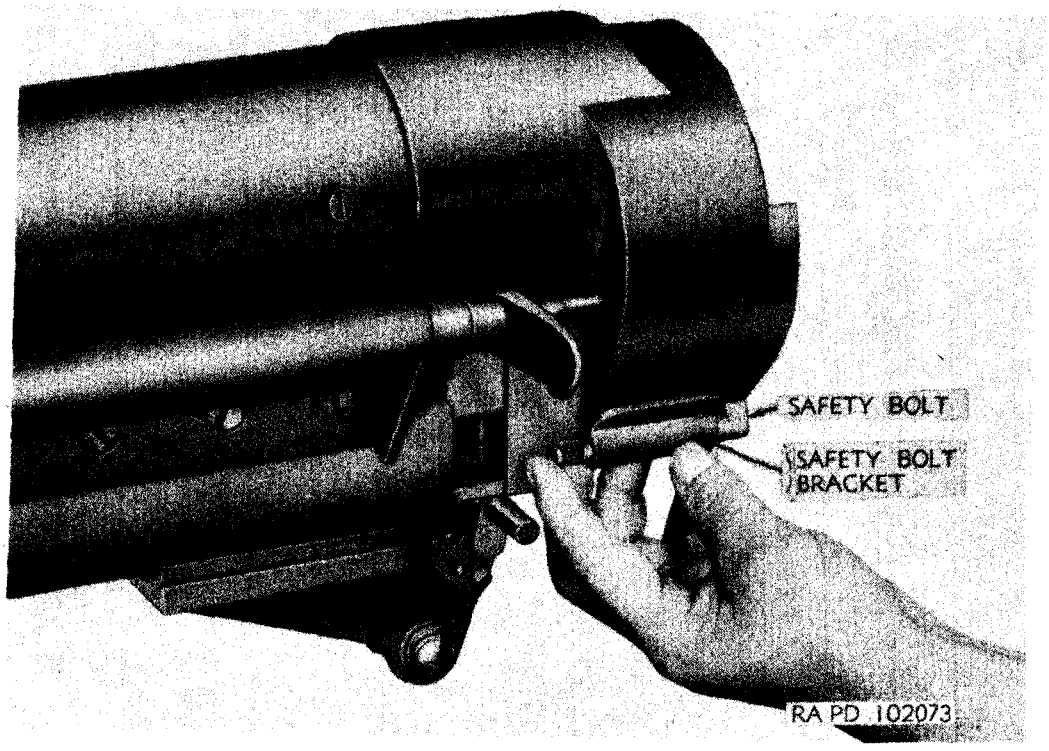


Figure 244. Removal of safety bolt.

pushed out of its retaining bracket towards the rear as indicated in figure 244. If the bolt is stuck, the use of a brass drift and mallet may be necessary.

c. To install the safety bolt, insert it from the rear and push it forward until the end is flush with the rear end of the safety bolt bracket.

207. Piston Cross Head Key—37-mm Subcaliber Gun M1916

a. The piston cross head key (fig. 238) has two functions—namely, it locks the recoil piston to the gun, thereby enabling operation of the recoil mechanism; and it also controls firing by means of the sear, which is a component of it.

b. To remove and install the piston cross head key, follow directions in paragraph 201*c* and *d*.

c. In order for the piston cross head key to function properly, it is important that the contact surfaces be kept clean and properly lubricated at all times. If the sear, sear spring, or sear plunger (fig. 245) becomes worn, the entire key should be replaced.

208. Firing Mechanism—37-mm Subcaliber Gun M1916

a. The firing mechanism, which is housed in the breechblock, consists of the firing pin, firing pin spring, rocker, rocker pin, rocker pin latch and screw, and rocker plunger (fig. 240). When

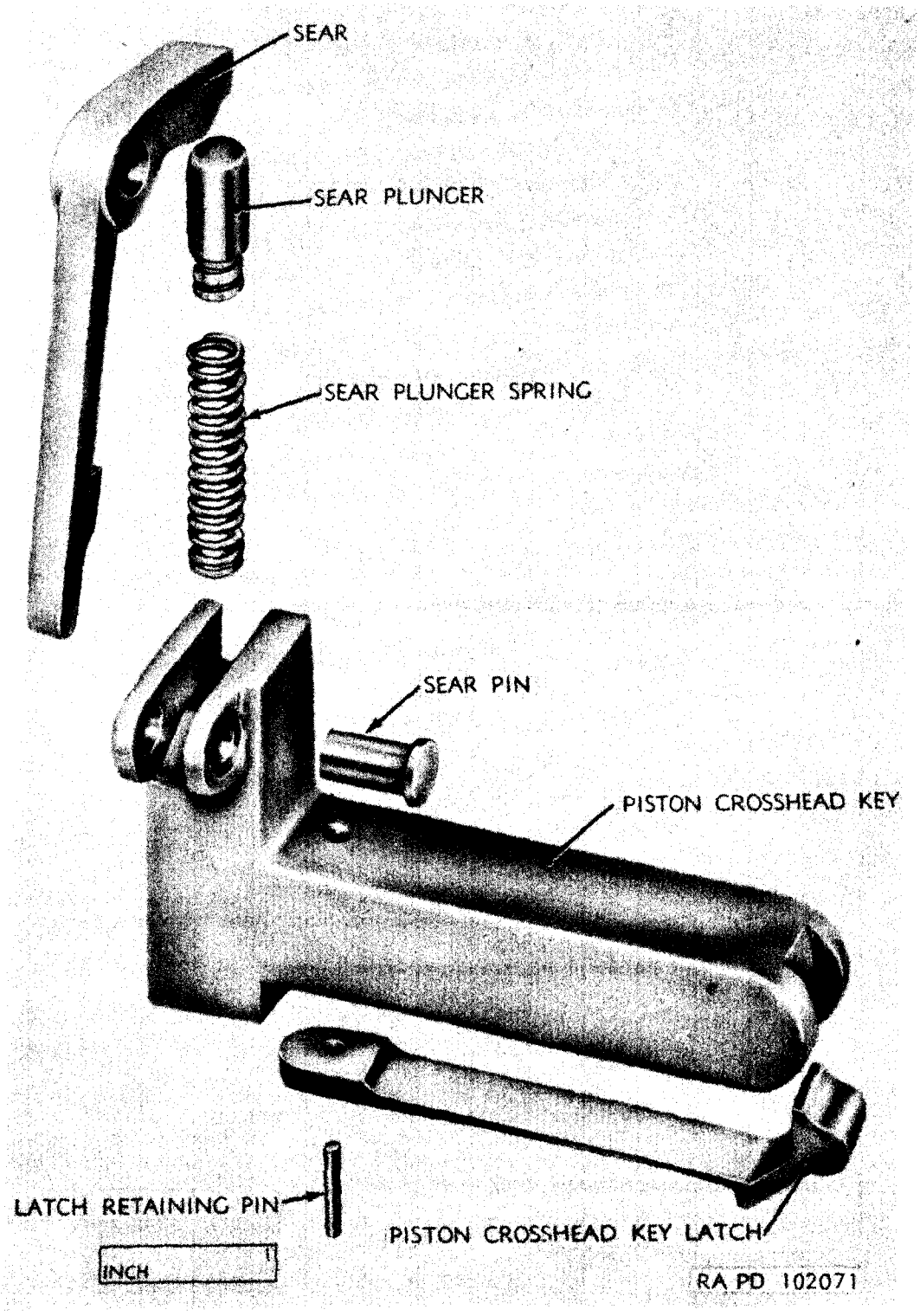


Figure 245. Piston cross head key—exploded view.

the gun is fired, the striker rod forces the rocker pin to the rear causing the rocker to bear down on the firing pin which strikes the percussion cap, thus firing the gun.

b. To remove the firing mechanism, the gun should be cocked

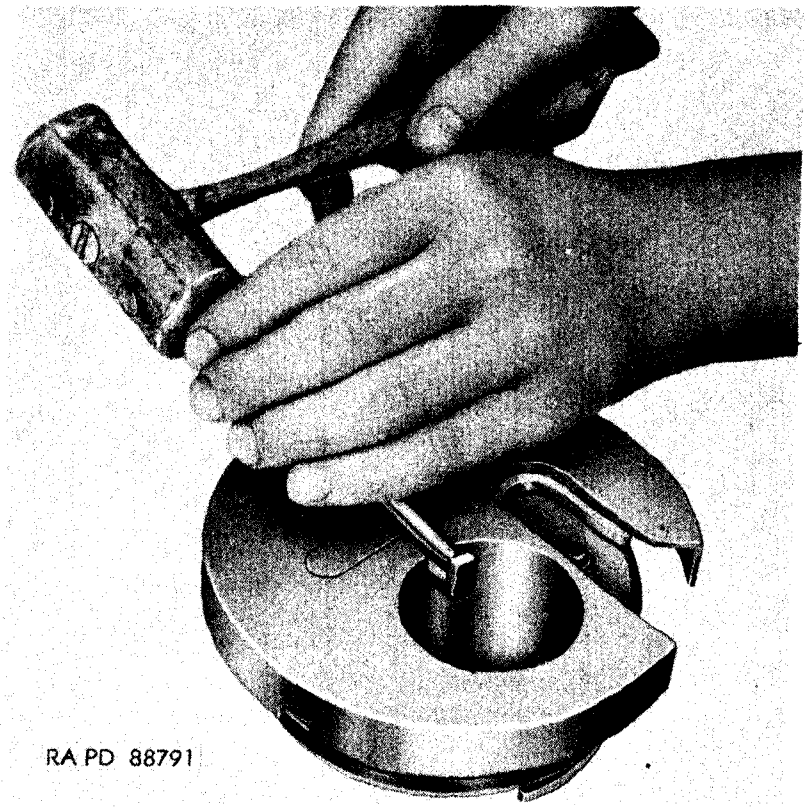


Figure 246. Removal of rocker pin.

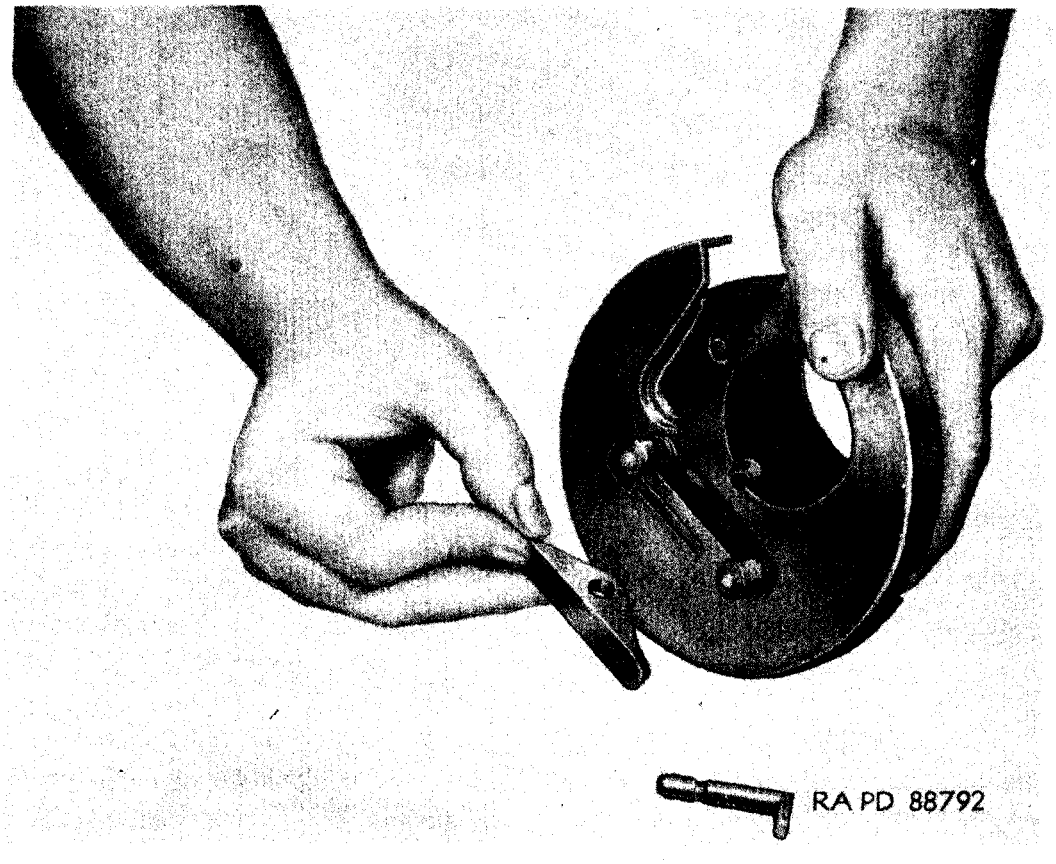


Figure 247. Removal of firing mechanism.

or the breechblock dismounted. Remove the rocker pin by placing a small brass drift against the projecting head and, with light taps, drive the pin out of the breechblock (fig. 246). The rocker is then free and, when removed, exposes the firing pin, firing pin spring, and plunger (fig. 247), all of which then may be taken out.

c. To install the firing mechanism, first clean and lubricate all parts; then insert the rocker plunger, firing pin spring, and firing pin into the breechblock. Place the rocker over the firing pin and plunger and press down in its seat until the rocker pin can be

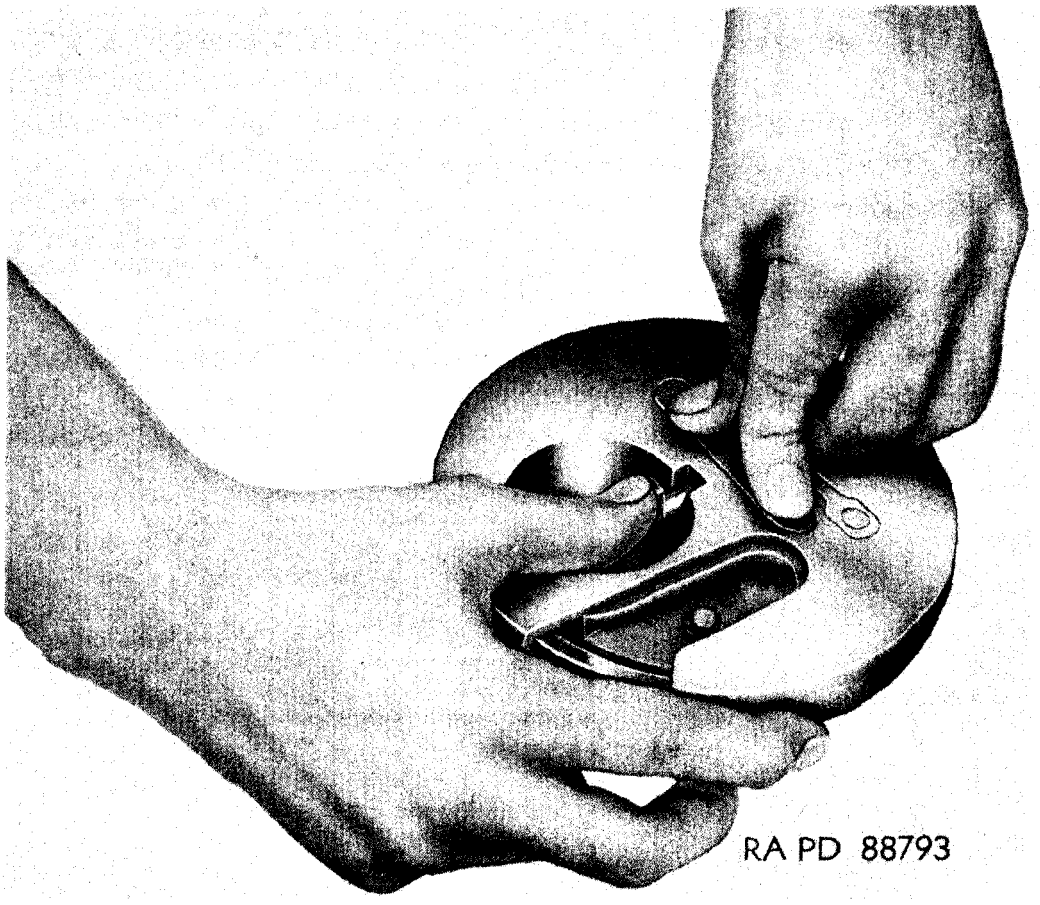


Figure 248. Installation of firing mechanism.

started through (fig. 248). Push the pin home, making sure that the rocker pin latch springs into the groove of the rocker pin.

209. Recoil Mechanism of 37-mm Gun Matériel

a. The recoil mechanism (figs. 249 and 250), which is of the hydrospring type, controls the force created by firing and checks the movement of the gun in a gradual manner. The counterrecoil mechanism returns the gun to battery so that it may be fired again.

The counterrecoil buffer, which is of the dash pot type, slows down and stops the counterrecoil action, thus preventing injury to the system.

b. Recoil mechanism adjustment by the using arm is prohibited. All maladjustments should be reported to ordnance personnel. Refilling of the mechanism, however, is permitted. An empty recoil mechanism requires 2¾ pints of oil or 21 oil gun fills. The filling procedure is as follows:

(1) Raise rear end of recoil mechanism higher than front end (fig. 251) and remove the filling plug from the front end of the cradle.

(2) In order to fill the recoil oil gun 41–G–1362–15 with adapter (figs. 232 and 233), first unscrew the nozzle of the oil gun and pull the plunger back. Using the recoil oil (special), pour the oil carefully into the gun in order to prevent the formation of air bubbles. Screw on the nozzle and, holding the gun with nozzle end up, push on the handle to purge the gun of any air bubbles.

(3) Screw the oil gun into the filling hole.

(4) Remove the drain plug in the right side of the cradle.

(5) Push the plunger of the oil gun in slowly, at the same time watching for the escape of oil from the drain hole (fig. 251). When the oil runs out free of air bubbles, the recoil mechanism is full.

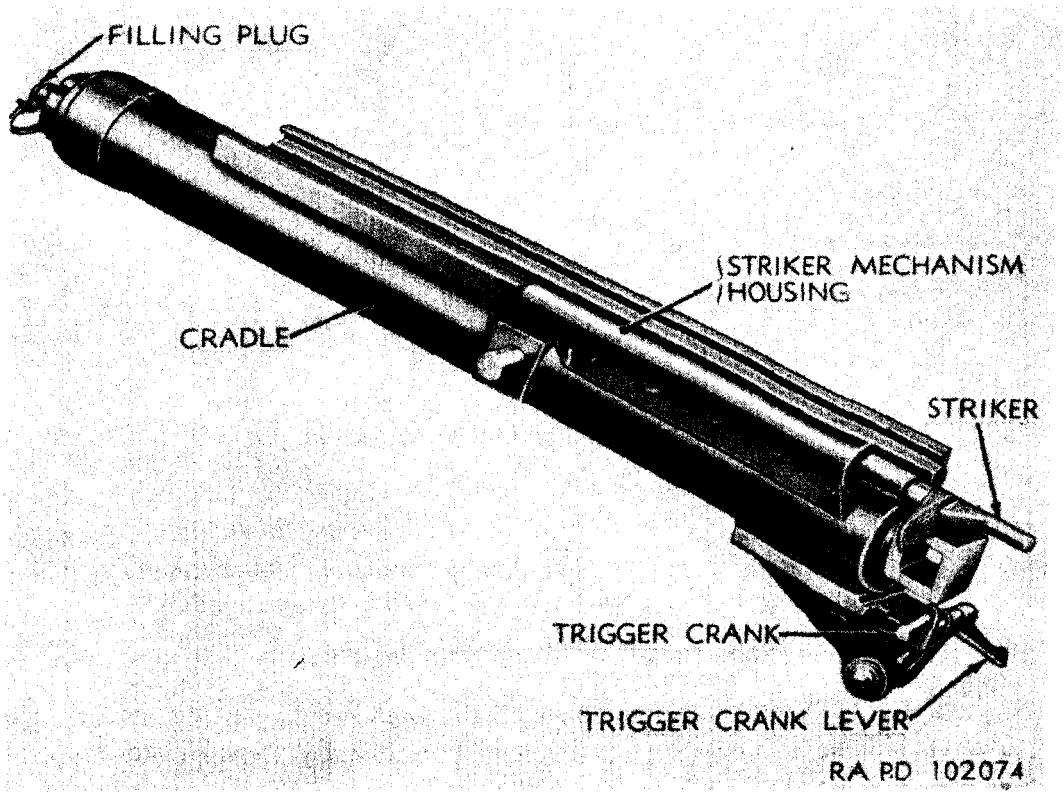


Figure 249. Recoil mechanism—left view.

(6) Remove the oil gun. Before replacing the filling and drain plugs let about 2 teaspoonfuls of oil escape. Screw the two plugs in tightly.

c. The proper functioning of the recoil mechanism will be checked by a retraction test. A simple test is performed by manually retracting the gun, locking it with a block of wood from 7 to 10 inches long, and then pulling out the block with a cord or wire (fig. 252). The gun should return to battery quickly but without shock.

d. If it becomes necessary to replace the piston cross head locking screw, the procedure is as follows:

(1) Retract the gun manually, blocking it with a piece of wood, and remove the screw (fig. 253).

(2) Insert a new screw and remove the wooden block.

e. The trigger mechanism, which together with the striker actuates the firing mechanism of the gun, is located at the lower rear end of the recoil mechanism. The trigger mechanism will be kept free from dust and foreign matter and, after use, all parts will be carefully wiped dry and a drop of oil put on the striker bearings and trigger bearings.

f. The function of the striker mechanism, which is encased in a housing fixed to the rear left side of the recoil mechanism, is to

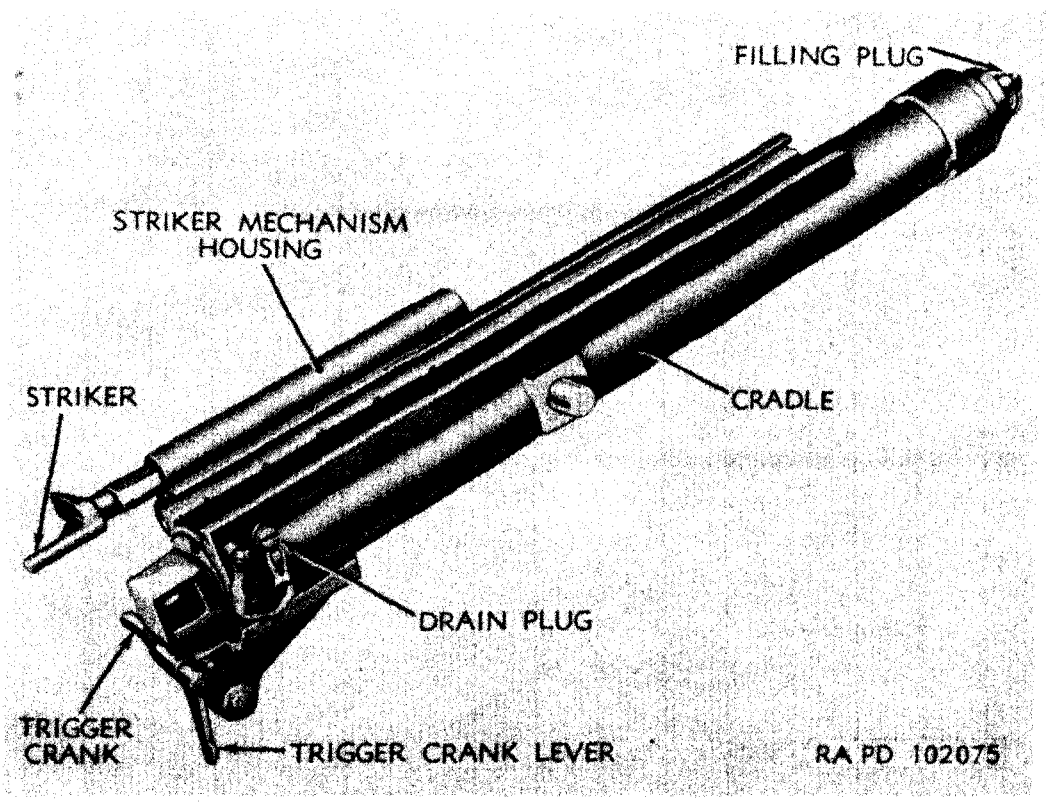


Figure 250. Recoil mechanism—right view.

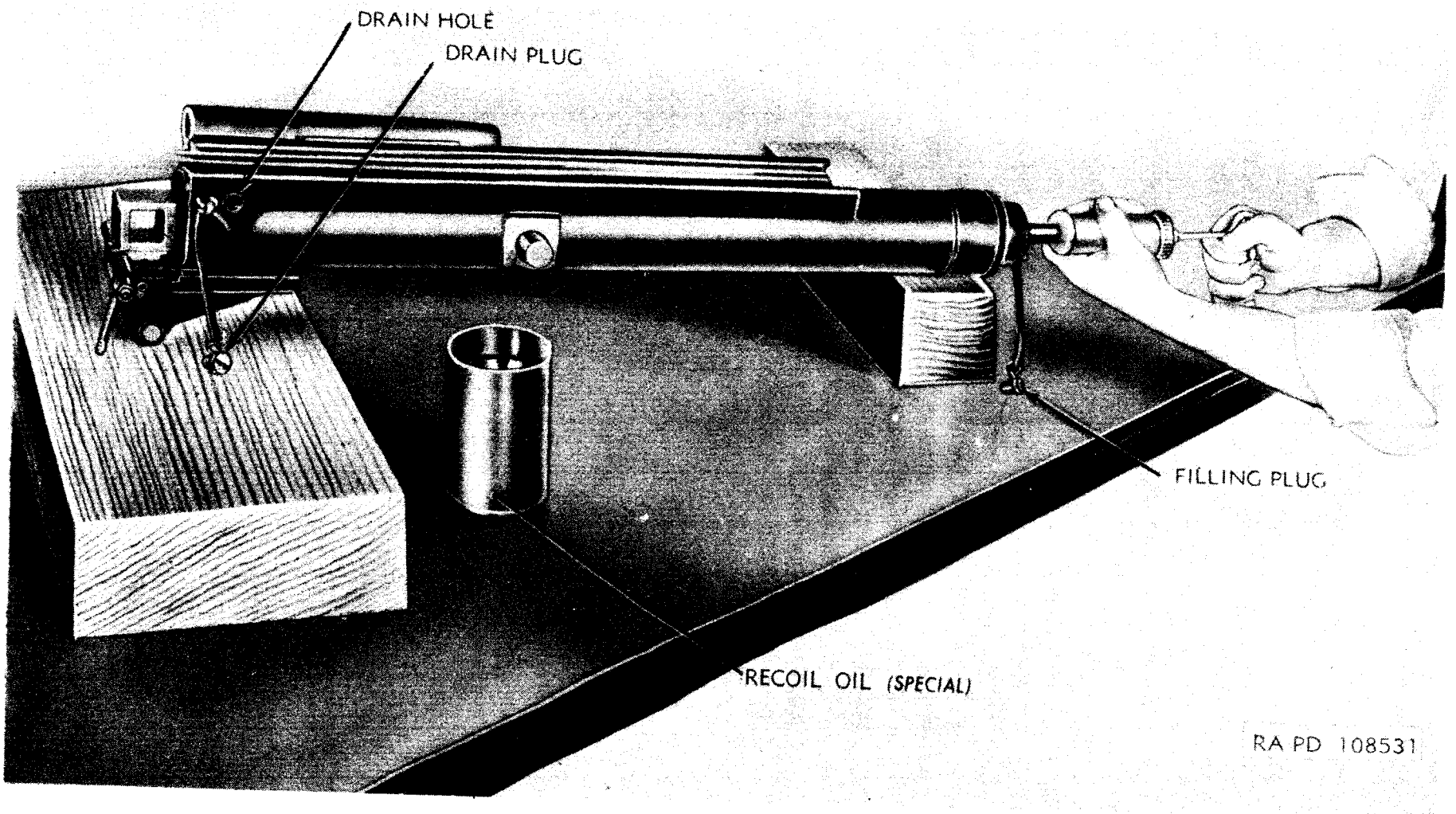


Figure 251. Filling recoil mechanism.

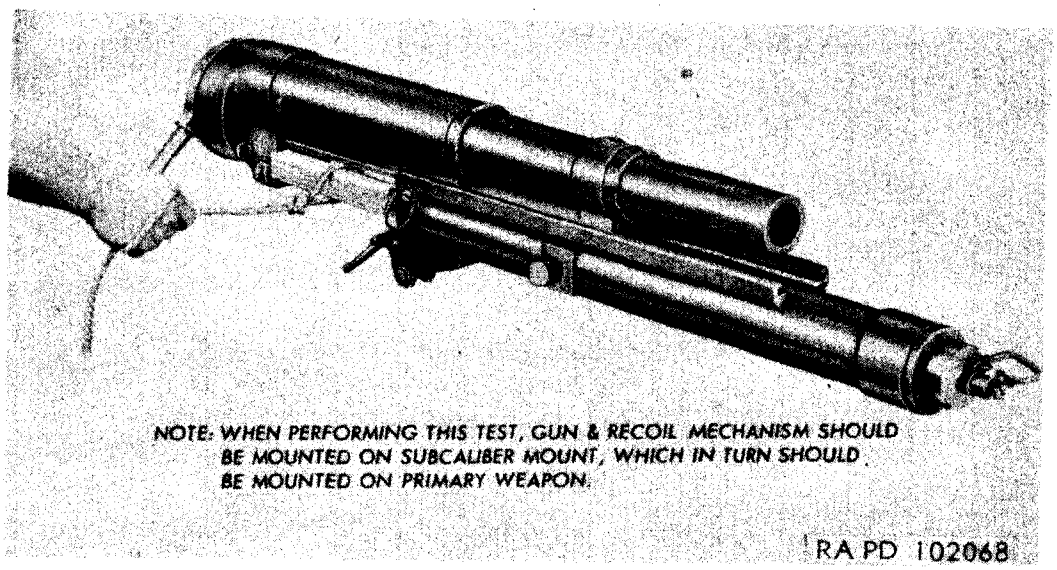


Figure 252. Retraction test for 37-mm gun M1916.

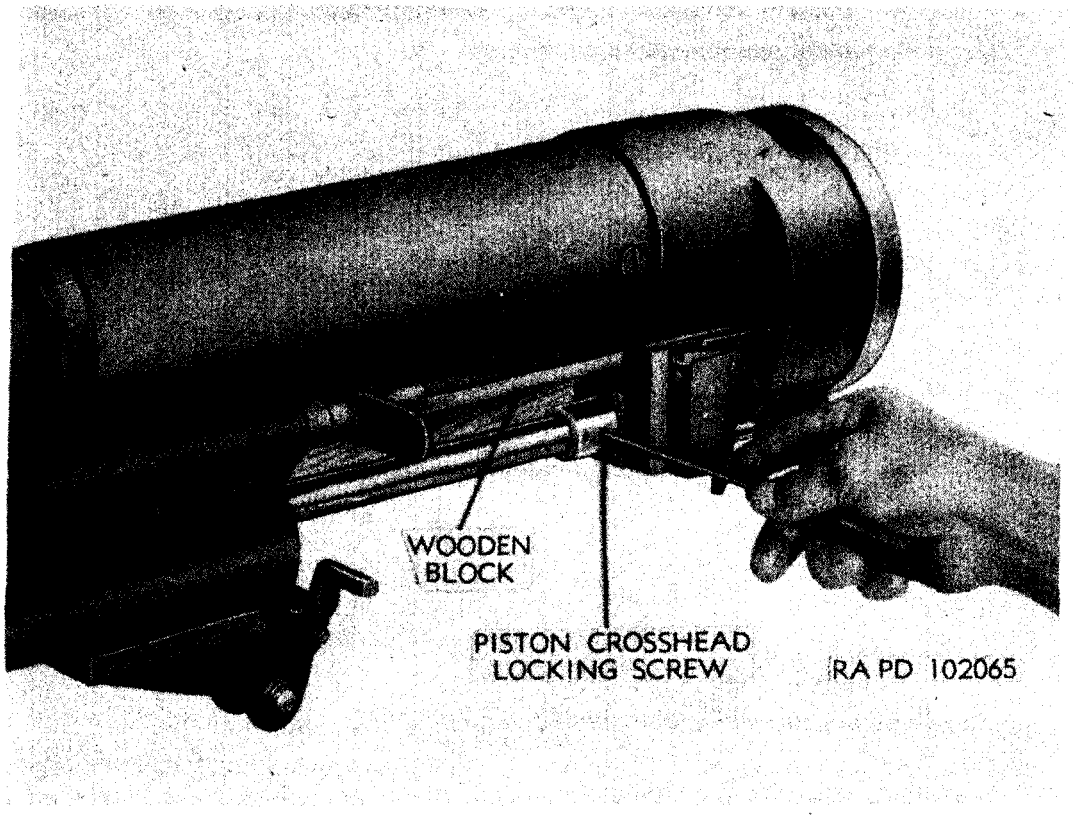


Figure 253. Removal of piston cross head locking screw.

cock the weapon as well as to actuate the firing mechanism by means of the striker.

g. To disassemble the striker mechanism, first remove the piston cross head key. Draw the gun back about 12 inches and push the striker to its extreme forward position so that the head of the striker rod nut setscrew clears the keyway in the striker housing.

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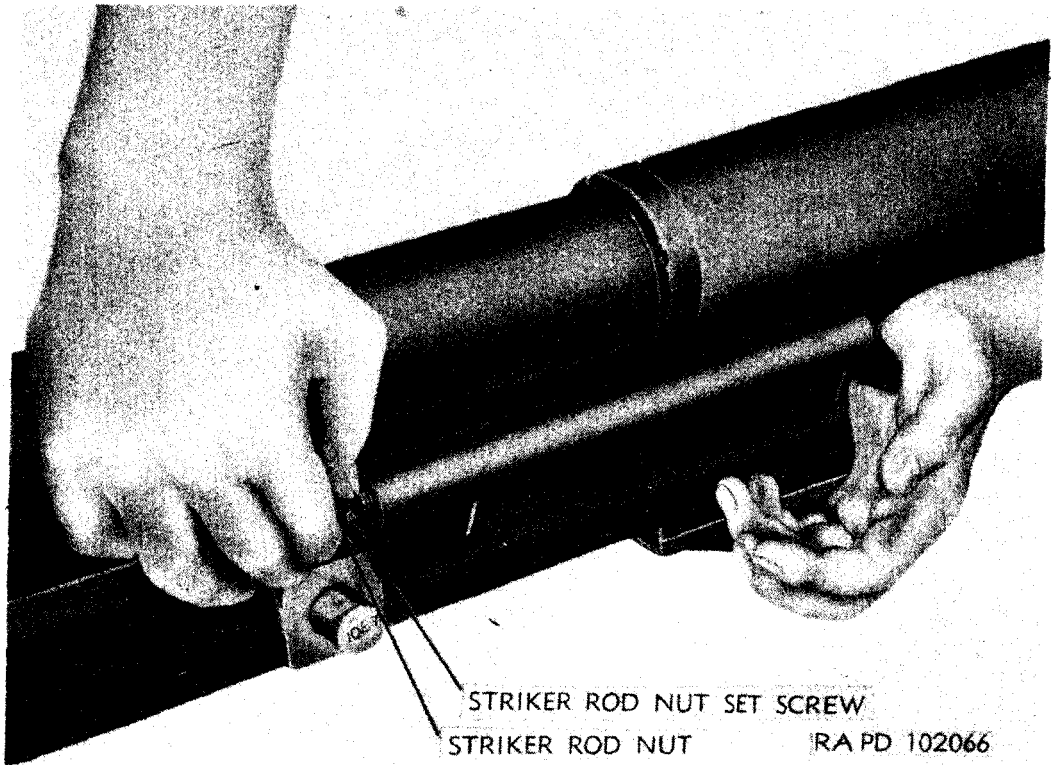


Figure 254. Removal of striker rod nut.

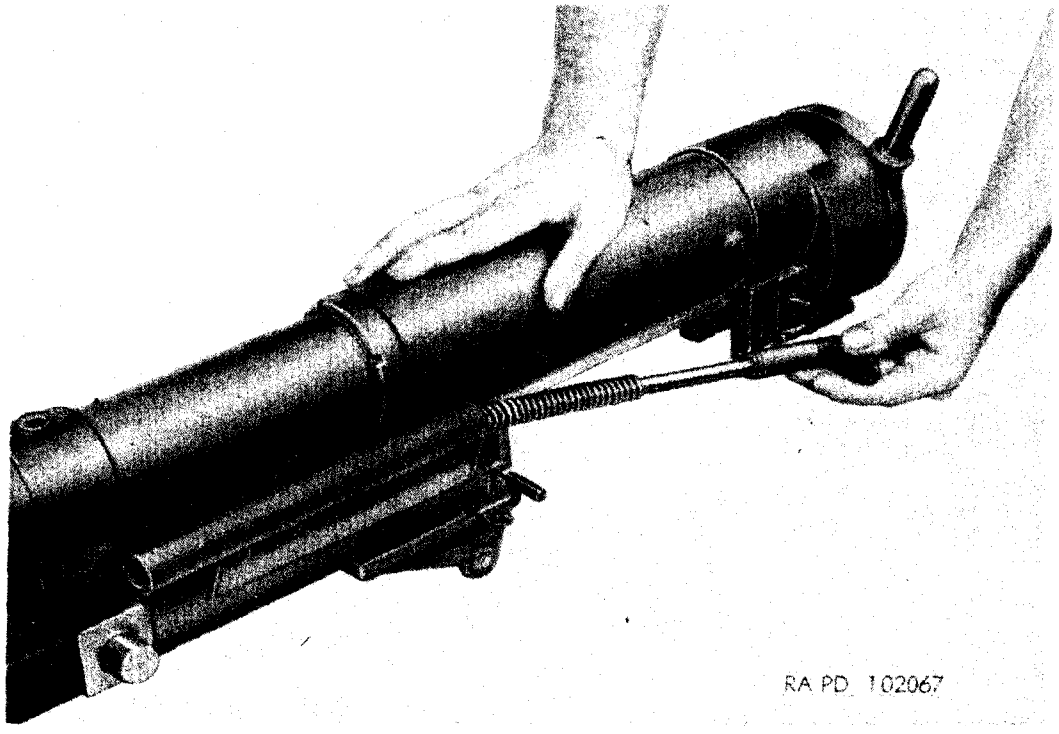


Figure 255. Removal of striker mechanism.

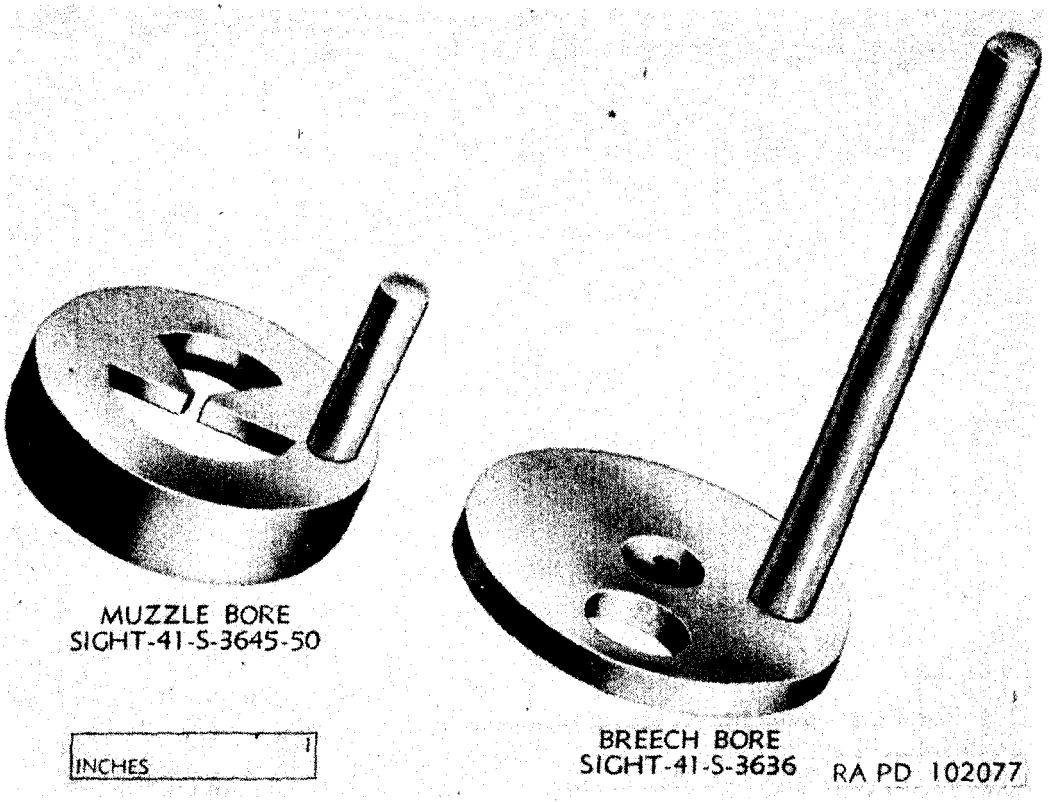


Figure 256. Bore sights for 37-mm gun M1916.

Keeping the striker in the forward position, unscrew the striker rod nut (fig. 254). Release the pressure on the cocking handle of the striker rod and remove the rod and striker spring (fig. 255).

h. To assemble the striker mechanism, first clean all parts. Check the free height of striker spring. It should be 6.81 inches long. If it is as much as 0.5 inch less than this, replace it with a new spring; then thoroughly slush the striker spring and striker rod with oil (par. 197*a*). Place the striker spring over the rod and insert both in the striker housing. Push the striker to the extreme forward position, place the striker nut over the end of the rod, and turn the nut until its front edge is about flush with the front end of the striker rod, taking care that the striker rod nut setscrew comes opposite its keyway in the striker housing. The stroke of the striker rod may be adjusted by loosening or tightening the striker rod nut a few turns. The setscrew in the striker rod nut should not be disturbed during assembly or disassembly of the striker mechanism. If it is, however, it should be set so that it does not strike the bottom of the keyway in the striker housing.

210. Ammunition

Ammunition issued for use with the 37-mm gun matériel M1916 is covered in section XXXI. Ammunition for the subcaliber rifles is covered in TM 9–270 and TM 9–280.

211. Sighting Equipment

The only sighting equipment issued with the 37-mm gun M1916 are the breech and muzzle bore sights (fig. 256), which are used for boresighting. For additional sighting and fire control requirements, use the equipment issued with the primary weapon.

212. Boresighting

a. As the 37-mm gun is to be laid with the regular sighting and laying mechanism of the primary weapon, the bores of the two weapons must be parallel. Boresighting is the method by which this is accomplished. It is essential that both the subcaliber gun and the primary weapon be boresighted before firing is

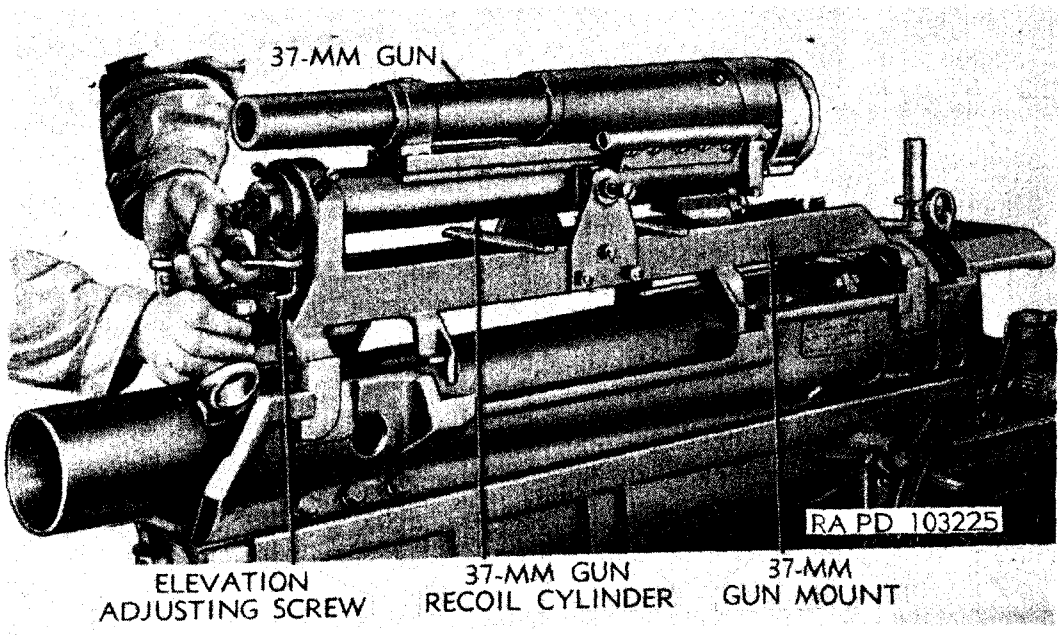


Figure 257. Adjusting elevation of 37-mm gun.

commenced and the alinement checked frequently during firing. Boresighting may be performed as described in paragraph 180*l*, using a testing target or distant aiming point, or as described in *b*, below, using an aiming post as a testing target.

b. The procedure necessary to bring the axis of the bore of the subcaliber gun parallel to that of the primary weapon is as follows:

(1) Insert the breech and muzzle bore sights in the subcaliber gun and the primary weapon.

(2) Make a testing target by wrapping two pieces of black tape of equal width around the aiming post with the bottom edges

of each exactly 12 inches apart. By the use of the aiming post as a testing target, it will not be necessary to level the primary weapon, as the post can be canted to conform to the angle of the primary weapon. Thus, the vertical line of the bore of the primary weapon will be parallel to the aiming post. The testing target then should be placed about 50 yards in front of the primary weapon. The more distant the target, the less the error produced by inaccuracies in constructing the target.

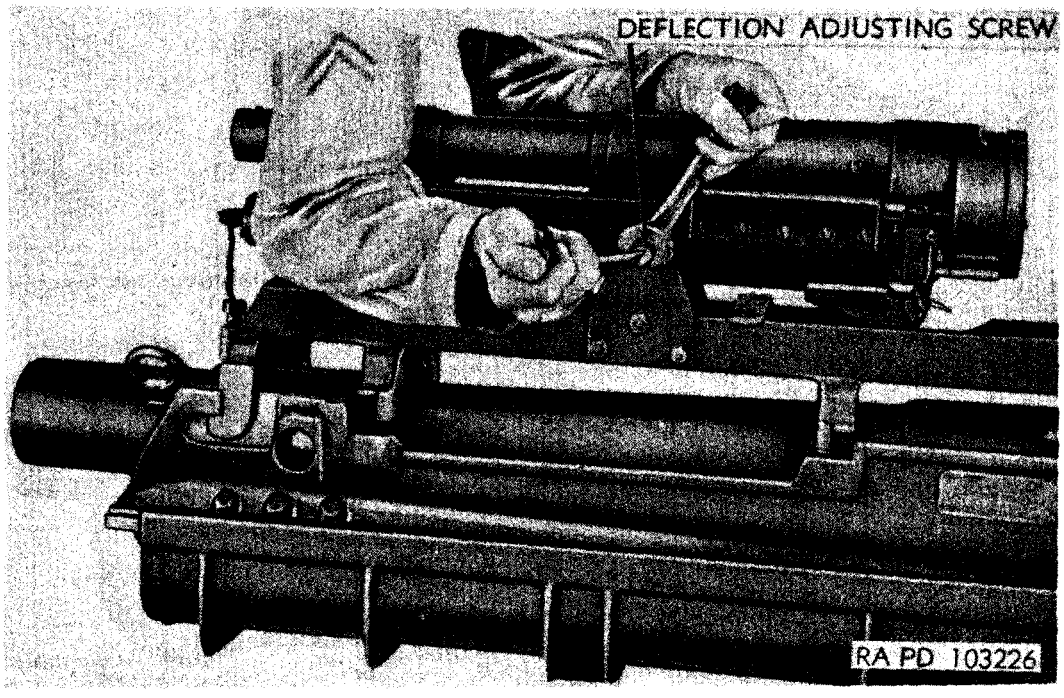


Figure 258. Adjusting deflection of 37-mm gun.

(3) Using the bore sights of the primary weapon, line up the bottom edge of the lower tape on the target with the bore of the primary weapon.

(4) Using the bore sights of the subcaliber gun, sight on the bottom edge of the upper tape on the target, making whatever adjustments are necessary to bring the 37-mm gun in line.

(5) All the adjustments of the 37-mm gun on the testing target are made by the adjusting screws in the collar of the subcaliber mount that encircles the recoil cylinder (fig. 257) and those in the trunnion bearing brackets (fig. 258). When tightening the screws, care must be taken not to place a strain upon the recoil cylinder as it may become distorted and so prevent the subcaliber gun from returning fully to battery. After the bore of the 37-mm gun is properly alined, fit the jam nuts up tight by tightening them intermittently instead of tightening one at a time.

APPENDIX I

SHIPMENT AND STORAGE

1. Domestic Shipment and Limited Storage

a. General. The howitzer and carriage will be shipped and stored in the traveling position. Preparation of the matériel will be the same for domestic shipment and limited storage (periods up to 90 days). All precautions must be taken to prevent corrosion of matériel and deterioration of rubber during storage.

b. Materials Required. Materials required for preparation for shipment and limited storage specified throughout this section are in addition to those listed in paragraph 83.

BARRIER, wrapping paper (QM issue)
COMPOUND, rust preventive, heavy
COMPOUND, rust preventive, light
COMPOUND, rust preventive, thin film
TAPE, adhesive, nonhygroscopic, od
WRAPPING, greaseproof

c. Cleaning. Before storage or shipment, the howitzer and carriage must be thoroughly cleaned as described in paragraphs 84 and 85.

d. Lubrication. Matériel must be completely lubricated before rail shipment or limited storage in accordance with the applicable lubrication order.

e. Painting. All painted metal surfaces that have become pitted or rusted must be cleaned with aluminum oxide abrasive cloth or crocus cloth and repainted where necessary (par. 90).

f. Application of Preservatives. Preservatives must be applied immediately after cleaning and drying, as a rust stain will form if matériel is handled between operations. Rust preventive compound must be heated for proper consistency before application. For methods of heating and application of rust preventive compounds, see TM 9–850.

(1) *Howitzer bore.* Swab the howitzer bore thoroughly using a suitable cleaning staff and clean cloths soaked in heated rust preventive compound (light).

(2) *Breech mechanism.* Partial disassembly of the breech mechanism must be accomplished where possible and parts dipped, sprayed, or brushed with rust preventive compound (light). After assembly of the breech, apply a coating of rust preventive compound (light) to exterior portions.

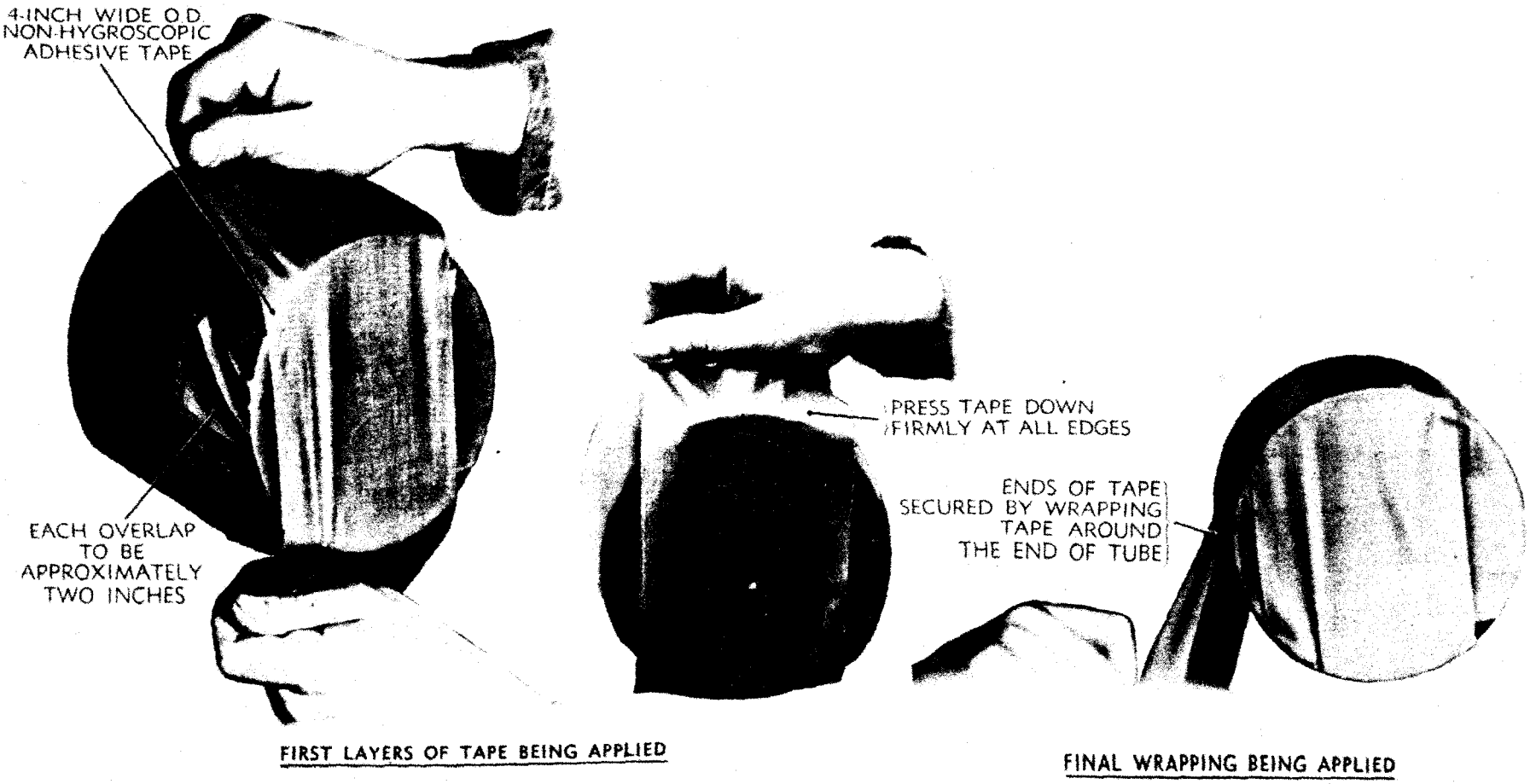


Figure 259. Method of sealing muzzle.

(3) *Exterior unpainted surfaces.* (*a*) Use rust preventive compound (thin film) on exterior unpainted surfaces that are not highly finished, machined, or operating, and from which the preservative need not be completely removed before operation. This compound may be applied by brushing or spraying without heating or solvent dilution.

(*b*) Use rust preventive compound (heavy) on exterior unpainted operating surfaces from which preservatives *must be completely removed* before matériel is placed in operation.

g. Sealing. (1) *Howitzer muzzle.* Seal muzzle with nonhygroscopic adhesive tape (fig. 259). If this tape is not available, use canvas or burlap impregnated with rust preventive compound (thin film) and tie or strap in place.

(2) *Breech.* Seal breech with two layers of greaseproof wrapping and overwrap with one layer of wrapping paper barrier. Secure by wrapping with nonhygroscopic adhesive tape. Spray over tape with rust preventive compound (thin film).

h. Covers. Install all covers provided with the matériel and securely fasten.

i. Gun Book. (1) During transfer or shipment, the gun book must be kept in a waterproof envelope securely fastened to the cannon with nonhygroscopic adhesive tape.

(2) Under one of the wrappings of tape, one end of a small tab will be inserted, reading, "Gun book here."

j. Tires. (1) Remove all stones or other foreign objects from the tire treads.

(2) Rubber equipment must be kept free from oils, greases, and preservatives.

k. Storage. (1) *General.* When the matériel is out of use, it may be placed in a limited storage status for periods not to exceed 90 days.

Note. Storage of matériel for periods in excess of 90 days normally will be handled by ordnance personnel only.

(2) *Preservation.* Preservation of matériel must be accomplished as directed in *f*, above.

(3) *Inspections.* (*a*) Before placing matériel in storage, a systematic inspection must be made, and all missing or broken parts must be replaced or repaired. If repairs cannot be made prior to placing matériel in storage, a tag must be attached to the matériel specifying the repairs needed and a written report of these items must be made to the officer in charge of the matériel.

(*b*) A visual inspection must be made weekly to determine general condition. If corrosion is found on any part, remove the rust spots and clean and treat with the prescribed preservative.

(*c*) All tires must be cleaned, inspected, and properly inflated. Tires requiring repairing or retreading must be replaced with serviceable tires. Matériel must not be stored on floors, cinders, or other surfaces which are soaked with oil or grease. Any oil, grease, gasoline, or solvent which comes in contact with tires under any circumstances must be washed off immediately.

(4) *Preferred storage.* The preferred type of storage for this matériel is in closed, dry warehouses or sheds. Where it is found necessary to store matériel in the open, cover with tarpaulins (see SB 9–47, Protection of Ordnance Matériel in Open Storage).

l. Removal from storage. (1) Remove all seals and tape and preservatives as outlined in paragraph 9.

(2) Repair and/or replace all items tagged in accordance with paragraph 1*k*, above.

2. Loading Rules and Blocking Requirements for Rail Shipment

a. General. Matériel to be loaded and blocked on railroad cars for rail shipment will be prepared in accordance with instructions given in paragraph 1 above. All loading and blocking instructions as specified herein are minimum. Additional blocking as required may be added at the discretion of the officer in charge.

b. Inspection. Railroad cars must be inspected to see that they are suitable to carry loads safely to destinations. Floors must be sound and all loose nails or other projections, not an integral part of the car, should be removed. Nails, bolts, etc., necessary in car construction, when loose, should be made tight rather than removed.

c. Ramps. Permanent ramps should be used for loading the matériel, but when such ramps are not available, they may be improvised from rail ties and other available lumber.

d. Handling. (1) Cars loaded in accordance with specifications given herein must not be handled in hump switching.

(2) Cars must not be cut off while in motion and must be coupled carefully to avoid all unnecessary shocks.

(3) Cars must be placed in yards or on sidings so that they will be subjected to as little handling as possible. Separate track or tracks, when available, must be designated at terminals, classification, or receiving yards for such cars, and cars must be coupled at all times during such holding and hand brakes set.

e. Clearing Limits. The height and width of load must be within the clearance limits of the railroads over which it is to be moved. Army and railroad officials must check all clearances prior to each move.

f. Maximum Load Weights. To determine the permissible

weight of load, the following will govern, except where load weight limit has been reduced by the car owner. Subtract the light weight of the car, which is stenciled on each side of the car as "Lt. Wt." from the total weight of the car and load. An example is as follows:

	Pounds
Capacity of car	100,000
Total weight of car and load	169,000
Light weight of car (to be subtracted)	37,000
Permissible weight of load	132,000

g. Brake Wheel Clearance (fig. 260, A). Load will clear the brake wheel as much as possible, but must not be less than 4 inches below nor less than 6 inches above in back and on both sides of the brake wheel. Brake wheel clearance will be increased as much as is consistent with proper location of load.

h. Distribution of Load. Matériel must be so placed on the car that there will not be more weight on one side of the car than on the other. One truck of the carrying car must not carry more than one-half of the load weight.

Note. When loading railroad cars, matériel will be so loaded as to require a minimum number of cars. To accomplish this, various types of matériel may be loaded on the same car provided all have the same destination.

i. Tire Pressure. For shipment by rail, the tire pressure will be increased 10 pounds per square inch above normal.

j. Type of Car. Flat or drop-end gondola cars may be used.

k. Brakes. After loading the matériel, set the hand brakes.

l. Blocking. All blocking pieces will be of sound straight-grained wood. All item reference letters given below refer to the details and locations in figure 260.

(1) *Pattern 3, item B* (four required). Place one pattern 3 at the front and one at the rear of each wheel. The 45° portion of the block will be placed against the tire. Nail the heel of the pattern to the car floor with three fortypenny cement-coated nails, and that portion of the pattern under the wheel will be toenailed to the car floor with two fortypenny cement-coated nails before applying pattern 2.

(2) *Pattern 2, item C* (four required). Place two patterns 2 on each side of the carriage against the outside face of each tire. Nail the bottom pattern to the car floor with four thirty-penny cement-coated nails and the top pattern to the pattern below with four thirtypenny cement-coated nails.

(3) *Pattern 7, item D* (two required). Place one pattern 7 under axle at each side to partially relieve weight from the tires. Cut patterns accurately to height equal to the distance between car floor and axle plus one-quarter of an inch. Each pattern will be nailed to the car floor with four fortypenny cement-coated

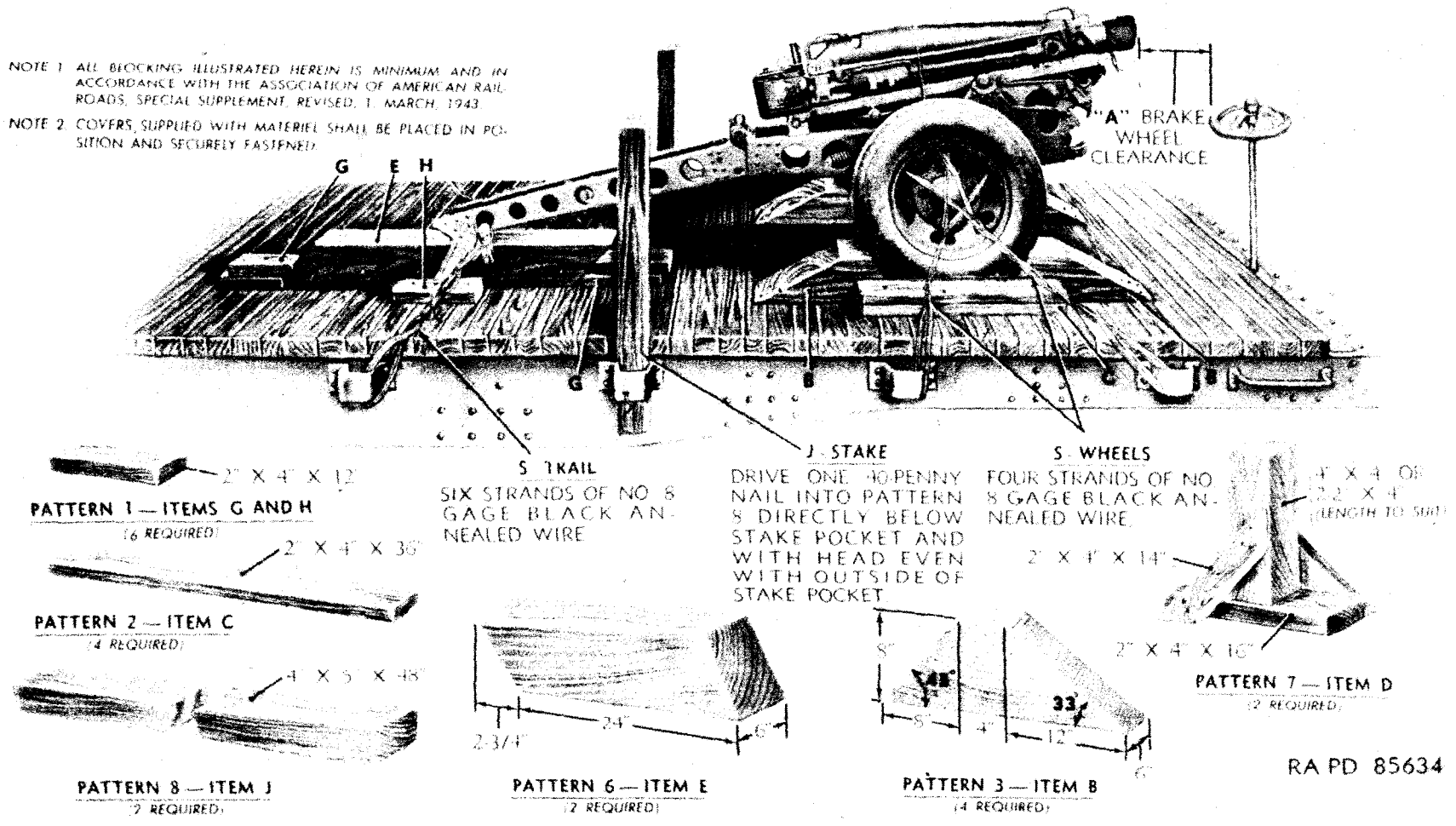


Figure 260. Method of blocking 75-mm (pack) howitzer carriage M8 on railroad car.

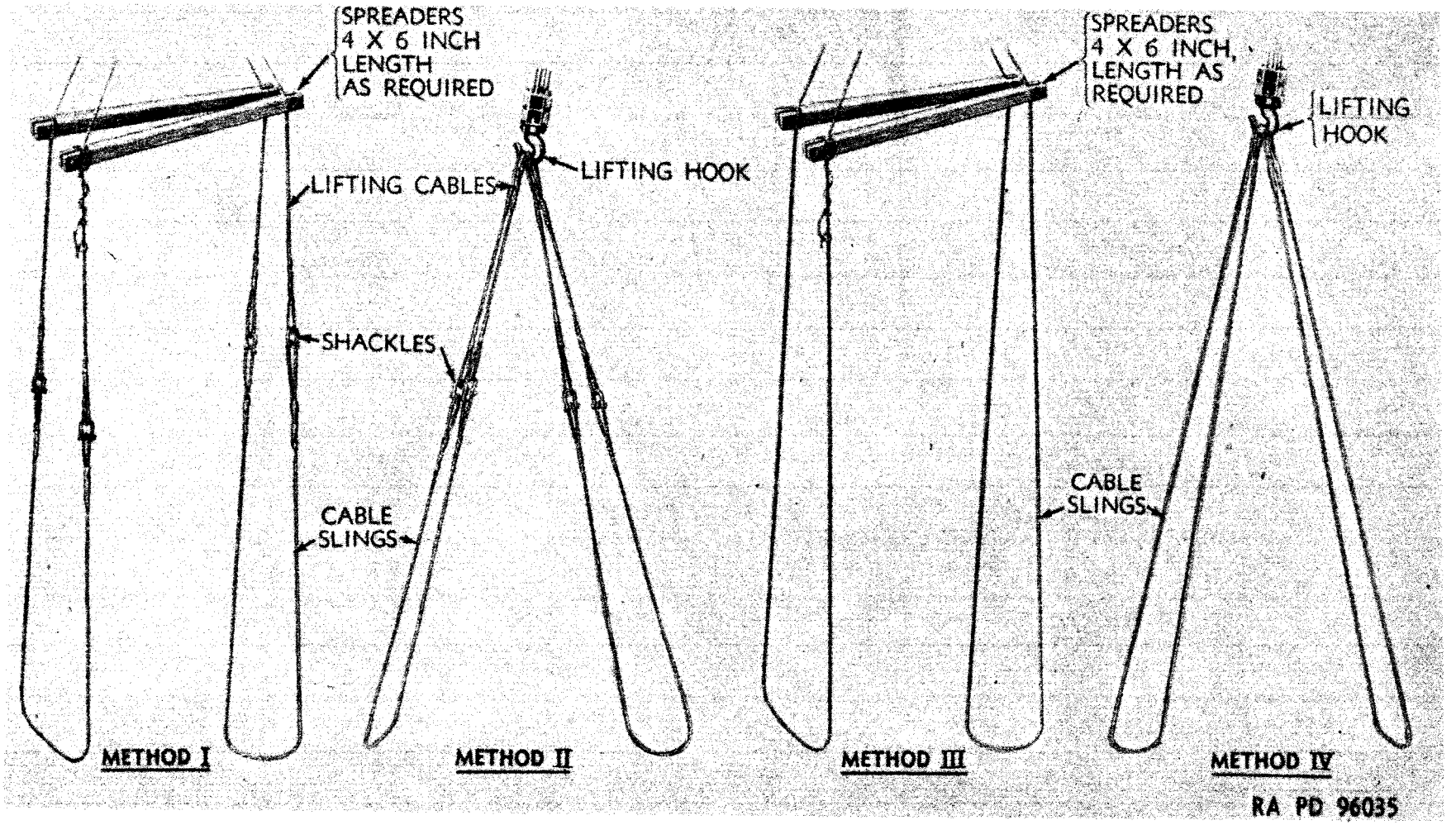


Figure 261. Slinging methods used in hoisting artillery matériel.

nails.

Caution: Do not place pattern under traversing mechanism on the axle.

(4) *Pattern 6, item E* (two required). Block the trail of the carriage by placing one pattern 6 to the front and one to the rear of the spade. Each pattern will be toenailed to the car floor with four fortypenny cement-coated nails.

(5) *Pattern 1, item G* (four required). Place two patterns 1 (G) to the front and to the rear of pattern 6. Nail the lower piece to the car floor using four thirtypenny cement-coated nails, and nail the top piece to the one below with four thirtypenny cement-coated nails.

(6) *Pattern 1, item H* (two required). Locate one pattern 1 (H) against each side of spade and nail to the car floor, using four thirtypenny cement-coated nails in each pattern.

(7) *Pattern 8, item J* (two required). Locate in stake pocket of car, one-third the distance from the end of trail to the center of the wheels. Drive one fortypenny cement-coated nail into pattern 8 directly below stake pocket. Clinch head over outside of the stake pocket.

(8) *Strapping, item S.* (*a*) *Wheels.* Secure each wheel by passing wire consisting of six strands of No. 8 gage, black annealed, through two openings in the wheels, and securing at the stake pockets of the car as close as possible to the pockets. Twist-tie with rod or bolt to remove slack. Openings in the wheels through which wire passes will be approximately the same distance from the car floor.

(*b*) *Trail.* Secure the trail of the carriage by passing wire consisting of six strands of No. 8 gage, black annealed, through openings in the trails and securing at the stake pockets of the car. Twist-tie with rod or bolt to remove slack.

3. Methods of Slinging 75-mm (Pack) Howitzer M1A1 and Carriage M8

a. General. (1) These instructions prescribe procedures, methods, and practices to be followed when the matériel is hoisted and describe the proper attachment points for slings to permit the matériel to be hoisted in its normal position.

(2) Covers supplied with matériel will be installed and securely fastened.

(3) If operations embrace deep water fording, matériel will be prepared in accordance with TM 9–2853, Preparation of Ordnance Matériel for Deep Water Fording.

(4) For methods in stevedoring, see TM 55–310, Stevedoring.

b. Sling Methods (fig. 261).

Note. Due to varying conditions encountered in the field, any of the following procedures may be used, where applicable.

(1) *Method I.* Method I employs the following materials:

(*a*) Cable slings (heavy enough to support matériel).

(*b*) Shackles (placed between lifting cables and slings).

(*c*) Lifting cables.

(*d*) Lifting hook.

(*e*) Cargo runners.

(*f*) Spreaders (4 in. x 6 in., length as required) are used between cables to obtain a better balance and to provide clearance between slings and matériel to prevent damage when matériel is hoisted. Spreaders consist of two pieces of oak or other hardwood with open ends, as shown in figure 261, and are positioned on the cables leading from the lifting hook at a point which will provide clearance between slings and matériel. Slings are placed around matériel at the proper points of balance and attached to the shackles on the lifting cables.

(2) *Method II.* Special care must be exercised, when this method is used, to see that proper clearance for fire control brackets, gears, and operating surfaces is maintained when matériel is hoisted clear of ground. Method II employs the following materials:

(*a*) Cable slings (heavy enough to support matériel).

(*b*) Shackles (placed between lifting cables and slings).

(*c*) Lifting cables.

(*d*) Lifting hook.

(*e*) Cargo runners.

(3) *Method III.* Method III employs the following materials:

(*a*) Cable slings (heavy enough to support matériel).

(*b*) Lifting hook.

(*c*) Cargo runners.

(*d*) Spreaders (4 in. x 6 in., length as required).

(4) *Method IV.* Exercise the same care as required for Method II. Method IV employs the following materials:

(*a*) Cable slings (heavy enough to support matériel).

(*b*) Lifting hook.

(*c*) Cargo runners.

c. Cautions during Hoisting of Matériel. (1) Before attempting to hoist matériel, an examination of hoisting cables must be made to determine their condition. If strands of cable are broken at any point, a new cable must be substituted. Kinked cables which will not straighten out without damage will not be used.

(2) Under no circumstances must matériel be hoisted when it is found that all weight is balanced on one sling (other sling

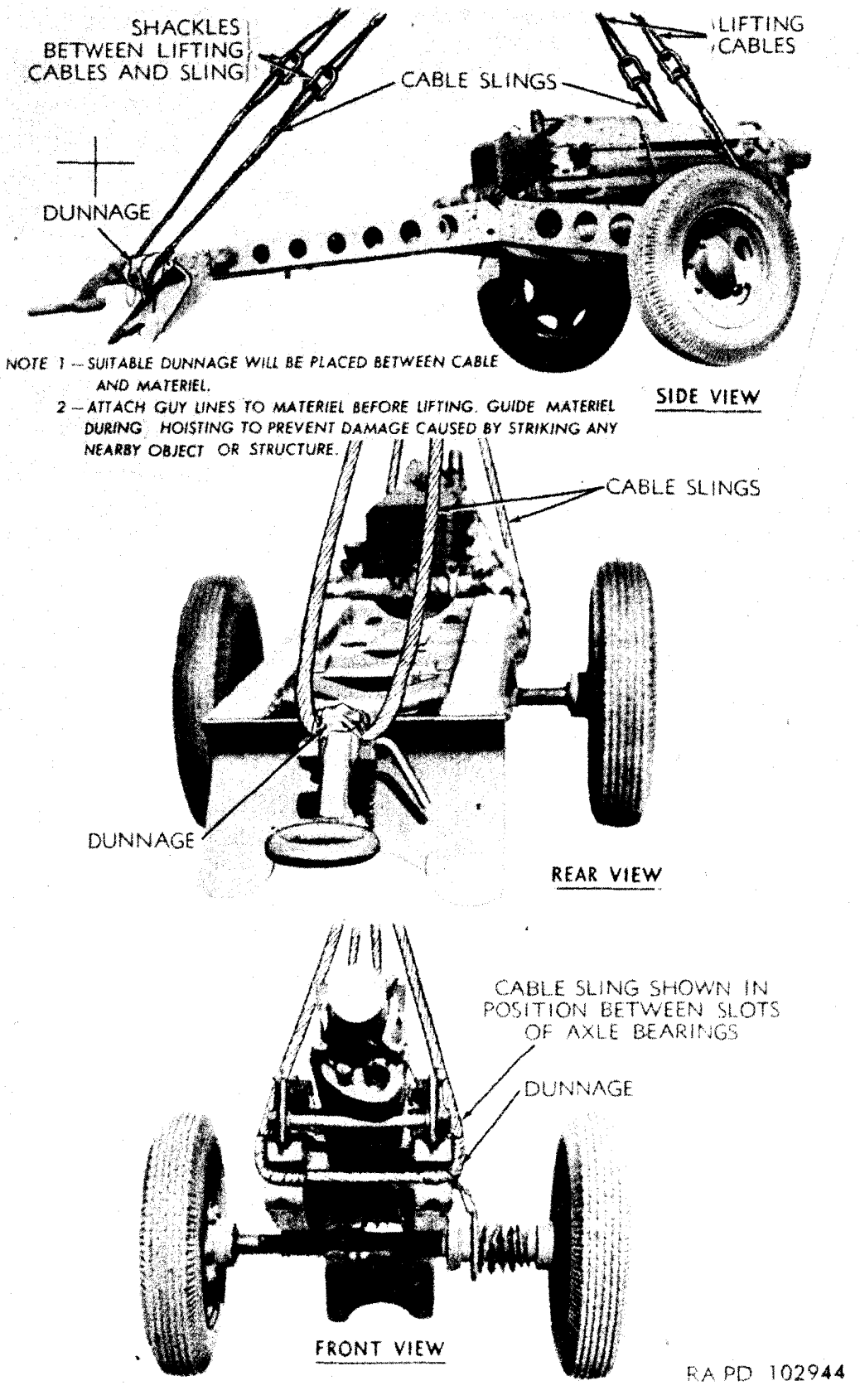


Figure 262. Slinging the 75-mm pack howitzer M1A1 and carriage M8.

being loose). Matériel must be lowered to the ground and slings placed in the proper position.

(3) Do not place slings around howitzer tubes for hoisting purposes.

(4) All damageable instruments such as fire control equipment, howitzer sights, etc., must be removed from matériel and securely stowed. *It is imperative that all stowage boxes, tires, or other loose equipment be securely strapped to matériel prior to movement.*

(5) If the underside of matériel has sharp edges at the points where slings are placed, insert dunnage consisting of wood blocks, sacking, clean cloth, or similar material between the slings and matériel in order to prevent cable strands from cutting or slipping.

(6) Attach guy lines to matériel before lifting. Guide matériel during hoisting to prevent damage caused by striking any nearby object or structure.

d. Slinging the 75-mm Pack Howitzer M1A1 and Carriage M8 (figs. 261 and 262). (1) Place drawbar in traveling position and lock.

(2) Position one cable sling between slots of axle bearings.

(3) Position other sling between drawbar and end of trail.

(4) Locate dunnage as described in *c*(5) above.

(5) Attach guy lines (*c*(6) above) and hoist matérial slowly, observing proper balance (*c*(2) above).

APPENDIX II

REFERENCES

1. Publications Index.

The following publications indexes should be consulted frequently for latest changes or revisions of references given in this section and for new publications relating to matériel covered in this manual.

a. Ordnance Supply Catalog Index ..... ORD 2
b. Ordnance Major Items and Combinations, and Pertinent Publications ..... SB 9–1
c. List and index of Department of the Army Publications ..... FM 21–6
d. List of War Department Films, Film Strips and Recognition Film Slides ..... FM 21–7
e. Military Training Aids ..... FM 21–8

2. Standard Nomenclature Lists

a. Ammunition.

Ammunition, Blank, for Pack, Light and Medium Field, Tank, and Antitank Artillery ..... ORD 11 SNL R–5
Ammunition, Fixed and Semifixed, including Subcaliber, for Pack, Light and Medium Field, Aircraft, Tank, and Antitank Artillery, including Complete Round Data ..... ORD 11 SNL R–1
Ammunition Instruction Material for Pack, Light and Medium Field, Aircraft, Tank, and Antitank Artillery.. ORD 11 SNL R–6

b. Cleaning, Preserving, and Repair.

Cleaners, preservatives, lubricants, recoil fluids, special oils, and related maintenance materials ..... ORD 3 SNL K–1

c. Howitzer and Subcaliber Matériel.

Gun, 37-mm, M1916..... ORD (*) SNL C–33, Sec. 13
Gun, Subcaliber, 37-mm M12 ..... ORD (*) SNL C–33, Sec. 15

*See ORD 1, Introduction and Index, for published pamphlets of the Ordnance section of the Department of the Army Supply Catalog.

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Howitzer, Pack, 75-mm, M1A1;
Carriage, Howitzer (Pack),
75-mm, M5 ..... ORD (*) SNL C–20
Mount, Subcaliber,
37-mm, M5 ..... ORD (*) SNL C–33, Sec. 3

d. Sighting and Fire Control Equipment.

Binocular, M13 ..... ORD (*) SNL F–210
Circle, aiming, M1 ..... ORD (*) SNL F–160
Compass, M2 ..... ORD (*) SNL F–219
Finder, range, M7 ..... ORD (*) SNL F–254
Light, aiming post and
Light, instrument ..... ORD (*) SNL F–205
Mount, telescope, M3; Telescope,
panoramic, M1 ..... ORD (*) SNL F–106
Mount, telescope, M16A1; Quadrant, range, M3A1C; Telescope,
elbow, M5 ..... ORD (*) SNL F–169
Quadrant, gunner's, M1 ..... ORD (*) SNL F–140
Setter, fuze, M14 and M15 ..... ORD (*) SNL F–245
Setter, fuze, M22 ..... ORD (*) SNL F–293
Telescope, B.C., M65 ..... ORD (*) SNL F–259
Telescope, elbow, M62 ..... ORD (*) SNL F–262
Watches, pocket, wrist, and stop .... ORD (*) SNL F–36

3. Explanatory Publications

a. Ammunition.

Ammunition, General ..... TM 9–1900
Ammunition Inspection Guide ..... TM 9–1904
Artillery Ammunition ..... TM 9–1901
Ballistic Data, Performance of Ammunition .... TM 9–1907
Firing Table ..... FT 75–I–4
Qualifications in Arms and Ammunition
Training Allowances ..... AR 775–10
Range Regulations for Firing Ammunition
for Training and Target Practice ..... AR 750–10

b. Chemical Warfare.

Decontamination ..... TM 3–220
Defense Against Chemical Attack ..... FM 21–40
Military Chemistry and Chemical Agents ..... TM 3–215

c. Maintenance and Repair.

Basic Maintenance Manual ..... TM 38–650
Cleaning, Preserving, Sealing, and Related
Materials Issued for Ordnance Matériel ..... TM 9–850

*See ORD 1, Introduction and Index, for published pamphlets of the Ordnance section of the Department of the Army Supply Catalog.

Instruction Guide, Instrument Repairman ....TM 9–2602
Maintenance and Care of Hand Tools .....TM 9–867
Maintenance and Care of Pneumatic Tires and Rubber Treads .....TM 31–200
Painting Instructions for Field Use .....TM 9–2851
Preparation of Ordnance Matériel for Deep Water Fording .....TM 9–2853

d. Miscellaneous.

Camouflage, Basic Principles .....FM 5–20
Camouflage of Field Artillery .....FM 5–20D
Dictionary of United States Army Terms .....TM 20–205
Evaluation of Erosion and Damage in Cannon Bores .....TB 9–1860–2
Explosives and Demolitions .....FM 5–25
Field Artillery Gunnery .....FM 6–40
Pack Artillery .....FM 6–110
Standard Artillery and Fire Control Matériel..TM 9–2300
Technical Training of Parachutists .....TM 71–220
The Firing Battery .....FM 6–140

e. Sighting Equipment.

Auxiliary Fire Control Instruments (Field Glasses, Eyeglasses, Telescopes, and Watches) .....TM 9–575
Field Artillery Fire Control Instruments .....TM 6–220
Fuze Setters for Field Artillery .....TM 9–1590
12-Inch Graphical Firing Tables .....TM 9–524
Graphical Firing Tables .....TM 9–526

f. Storage and Shipment.

Army Marking Directive .....TM 38–414
Instruction Guide, Ordnance Packaging and Shipping (Posts, Camps, and Stations)..TM 9–2854
Preparation of Ordnance Matériel for Deep Water Fording .....TM 9–2853
Preparation of Unboxed Ordnance Matériel for Shipment .....SB 9–4
Protection of Ordnance Matériel in Open Storage .....SB 9–47

g. Training Films and Film Strips.

75-mm pack howitzer M1A1, and Carriages M1 and M8:
Description and Characteristics .....FS 6–46
Disassembly and Loading on Pack Animals for Transport .....FS 6–37
In C–47 Airplane .....FS 7–81
In CG–4A Glider .....FS 31–1
Mechanical Functioning .....FS 6–47

Principles of Operation ..... TF 9–1124
Sighting and Laying Equipment—
Tests and Adjustments ..... FS 6–40

4. Forms and Tables

Artillery Gun Book ..... O.O. Form 5825
Firing Tables ..... (See sec. XXXI)
Unsatisfactory Equipment Report ..... WD AGO Form 468

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