TM9-1747

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORDNANCE MAINTENANCE

155-mm GUN MOTOR CARRIAGE M40

AND

8-IN. HOWITZER MOTOR CARRIAGE M43 HULL AND SUSPENSION

DEPARTMENT OF THE ARMY • OCTOBER 1947

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This manual supersedes so much of TB 9–1750K–2, 27 July 1944, TB ORD 41, 12 February 1944, and TB ORD 150, 15 June 1943, as pertains to the matériel described herein.

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United States Government Printing Office

Washington: 1947

DEPARTMENT OF THE ARMY
Washington 25, D. C., 21 October

TM 9–1747, Ordnance Maintenance: 155-mm Gun Motor Carriage M40 and 8-inch Howitzer Motor Carriage M43, Hull and Suspension, is published for the information and guidance of all concerned.

Information in this manual is effective as of 11 June 1947.

[AG 300.7 (8 Jan 47)]

BY ORDER OF THE SECRETARY OF THE ARMY:

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For explanation of distribution formula, see TM 38–405.

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This manual supersedes so much of TB 9–1750K–2, 27 July 1944, TB ORD 41, 12 February 1944, and TB ORD 150, 15 June 1943, as pertains to the matériel described herein.

CHAPTER 1
INTRODUCTION

1. Scope

a. These instructions are published for the information and guidance of personnel responsible for field and base maintenance on 155-mm gun motor carriage M40 and 8-inch howitzer motor carriage M43. They contain information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations. This manual does not contain information which is intended primarily for the using arm, since such information is available to ordnance maintenance personnel in the 100-series technical manuals or field manuals.

b. This manual contains a description of, and procedure for inspection and repair, and necessary disassembly and assembly of hull and track suspension group.

2. Forms, Records, and Reports

a. GENERAL. Forms, records, and reports are designed to serve necessary and useful purposes. Responsibility for the proper execution of these forms rests upon commanding officers of all units maintaining this equipment. It is emphasized, however, that forms, records, and reports are merely aids. They are not a substitute for thorough practical work, physical inspection, and active supervision.

b. AUTHORIZED FORMS. The forms, records, and reports generally applicable to units maintaining this equipment are listed below with brief explanations of each. No forms other than approved Department of the Army forms will be used. Pending availability of forms listed, old forms may be used. For a current and complete listing of all forms, see current FM 21–6 (Lists and Index of War Department Publications).

(1) *Department of the Army Lubrication Order.* War Department Lubrication Order 9–747 prescribes lubrication maintenance for this equipment. A lubrication order is issued with each vehicle and is to be carried with it at all times. Instructions contained therein are mandatory to all users of the equipment and supersede all conflicting lubrication instructions of prior date.

(2) *WD AGO Form 9–71 (Locator and Inventory Control Card).* Except when specified otherwise by the War Department, this form will be used as a bin tag, locator card, or inventory control card by all units authorized automotive spare parts.

(3) *WD AGO Form 9–72 (Ordnance Stock Record Card).* This form is prescribed for use by ordnance maintenance and depot companies.

(4) *WD AGO Form 9–74 (Motor Vehicle Operator's Permit).* This form will be issued by commanders to all operators of vehicles who are qualified to operate the particular vehicles noted on the permit.

(5) *WD AGO Form 9–76 (Request for Work Order).* This form will be used for requesting repairs, alterations, or other type of work within or between organizations and departments.

(6) *WD AGO Form 9–77 (Job Order Register).* This form will be used to keep a chronological record of work orders.

(7) *WD AGO Form 13–1 (Automotive Disability Report of Vehicles Disabled More Than 3 Days).* This form will be accomplished and submitted as directed in current Department of the Army instructions.

(8) *WD AGO Form 462 (Work Sheet for Full-Track and Tank-Like Wheeled Vehicles).* This form will be used for maintenance services and for all technical inspections of these vehicles.

(9) *WD AGO Form 461–5 (Limited Technical Inspection).* This form will be used for limited technical inspections to classify vehicles as to general over-all condition.

(10) *WD AGO Form 478 (Modification Work Order and Major Unit Assembly Replacement Record and Organization Equipment File).* This form will be kept in possession of second echelon personnel and will accompany vehicles upon transfer and evacuation to higher echelon. It will be a record of all modifications made and exchanges of major unit assemblies. Minor repairs, parts and accessory replacements will not be recorded. In the field, where no filing facilities are available, this form will be kept in a filing jacket.

(11) *WD AGO Form 811 (Work Request and Job Order).* This form will be used by organizational maintenance units when requesting repair by a higher echelon repair unit.

(12) *WD AGO Form 866 (Consolidation of Parts).* This form will be used by a maintenance company for the periodic report required by higher headquarters showing the parts and materials used and issued by the company for a given period.

(13) *WD AGO Form 867 (Status of Modification of Work Order).* This form provides a record of the status at any time of any modification work order being performed by a maintenance shop.

CHAPTER 2
DESCRIPTION AND DATA

3. Description

a. The 155-mm gun motor carriage M40 and the 8-inch howitzer motor carriage M43 are identical, the model designation depending entirely upon the weapon mounted in the vehicle. When designated as gun motor carriage M40, the vehicle carries the 155-mm gun, M1 or M1A1. When designated as gun motor carriage M43, the 8-inch howitzer, M1 or M2, is used. The weapons are mounted in the rear compartment and point forward when in traveling position.

b. This carriage is an improved version of the 155-mm gun motor carriage M12, based on major components of the medium tank M4A1. The motor carriage is of the armored, full-track laying type having horizontal volute spring suspension. The hull is divided into three compartments. The drivers' compartment is at the front, the engine compartment in the middle, and the fighting compartment at the rear. Universal-type ammunition racks for the 155-mm gun or 8-inch howitzer ammunition are installed in each vehicle. Seats are provided for a crew of eight men.

c. The M40 or M43 vehicle is powered by a 485-horsepower, 9-cylinder, radial gasoline engine, Ordnance Model No. R974–C4 (Continental) mounted in the center of the vehicle.

d. The vehicles are equipped with radio for intervehicle, and telephone for intravehicle communication (figs. 1 through 4).

e. The hull is constructed of armor plate and is divided into the fighting compartment at the rear, engine compartment in the center, and the driver's compartment at the front. The compartments are separated by bulkheads. With the exception of several removable sections, the sides, roof and floor are welded together to form a single box-like unit. The removable sections are provided to permit access to the interior of the hull for inspection, machinery replacement and personnel. The removable parts of the hull are: spade assembly which hold the carriage against the kickback when the gun is fired; tailgate and loading ramp assembly; spotlight; drivers' seats; oil cooler shutter assemblies; cupola hatch assemblies; spade winch and cable; exhaust and tail pipes; shell racks; and towing hooks and pintle assemblies.

f. The vehicle is propelled forward and backward by two individually driven tracks. The drive sprockets at the front end of the vehicle pull the tracks from the rear and lay them down in front of the advancing road wheels. The track and suspension system consists of the tracks, which the vehicle travels on; the suspension and road wheels, which carry the load of the vehicle and travel on the tracks; the track rear

idler, which is the turning point for the track and is the adjustment point for taking up slack in the track; and the support rollers, which support the upper half of the track.

4. Data (M40 and M43)

a. GENERAL.

Purpose	Gun carriage
Type	Full-track laying
Crew	8 men
Fighting weight:	
M40	83,000 lb.
M43	83,000 lb.
Length:	
M40	357 in.
M43	289 in.
Width, over-all	124 in.
Height, over-all	129¾ in.
Ground clearance	19¼ in.

b. ENGINE.

Manufacturer	Continental
Model	R975–C4
Type	Single-row, static-radial, air-cooled

c. SUSPENSION.

Type	Horizontal volute
Track shoe width	18¾ in.
Track pitch	6 in.
Ground contact area of both tracks	7,544 sq. in.
Number of blocks per track	87
Weight of track	4,042 lb.
Ground pressure (psi)	10.2

d. POWER TRAIN (1-PIECE DIFFERENTIAL).

Manufacturer	Iowa Transmission

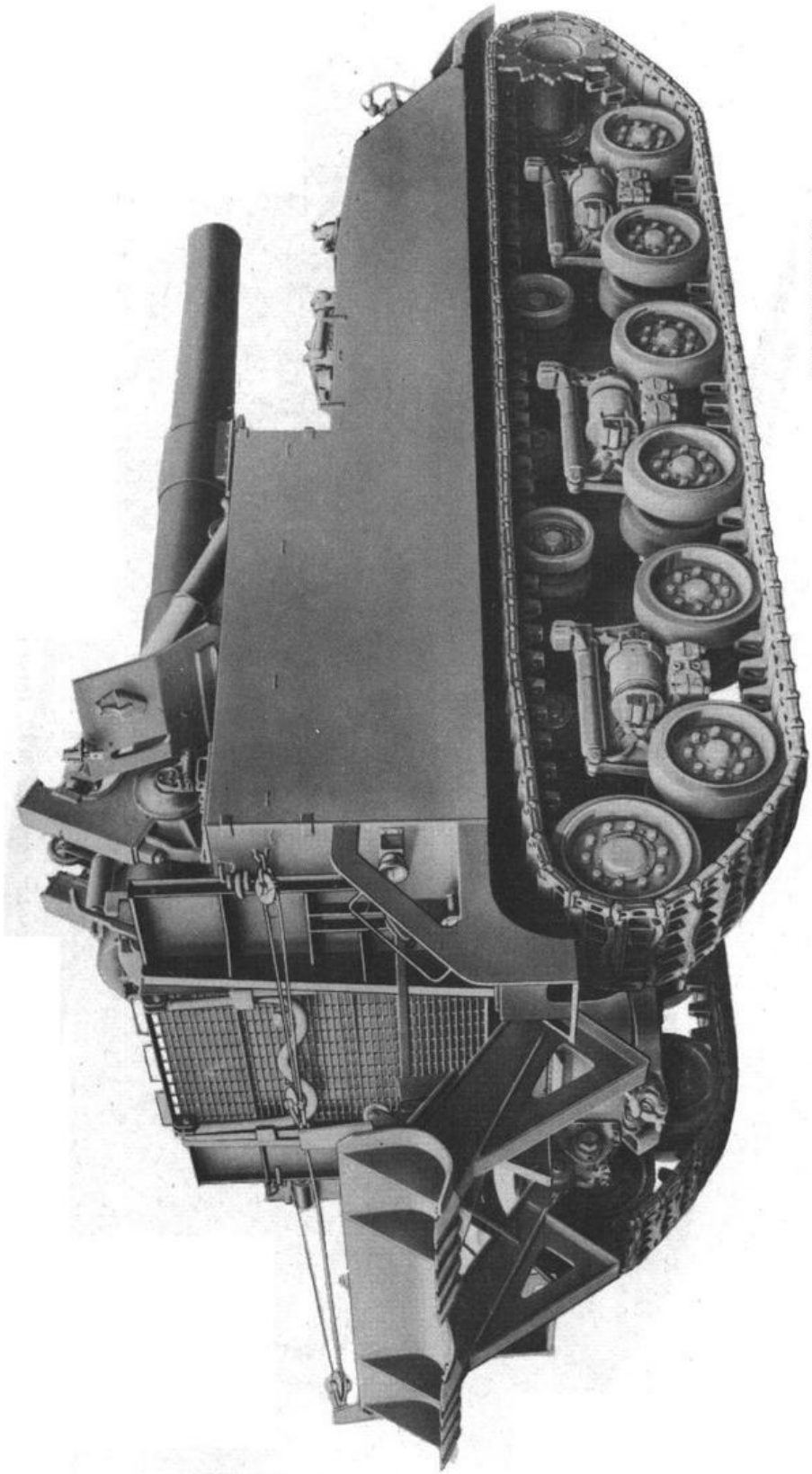

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Figure 1. 8-inch howitzer motor carriage M43, three-quarter rear view.

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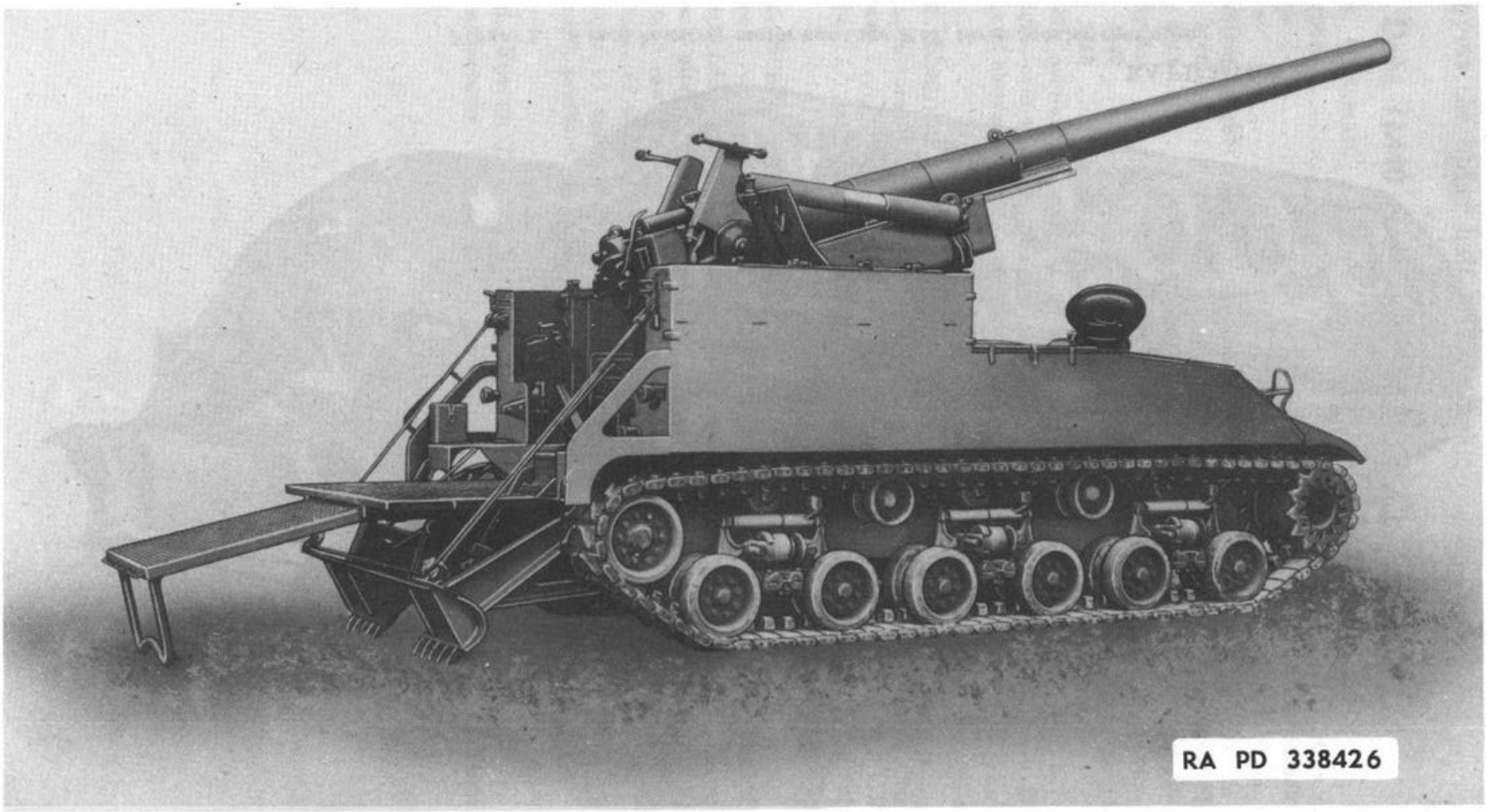

Figure 2. 155-mm gun motor carriage M40, three-quarter left rear firing position.

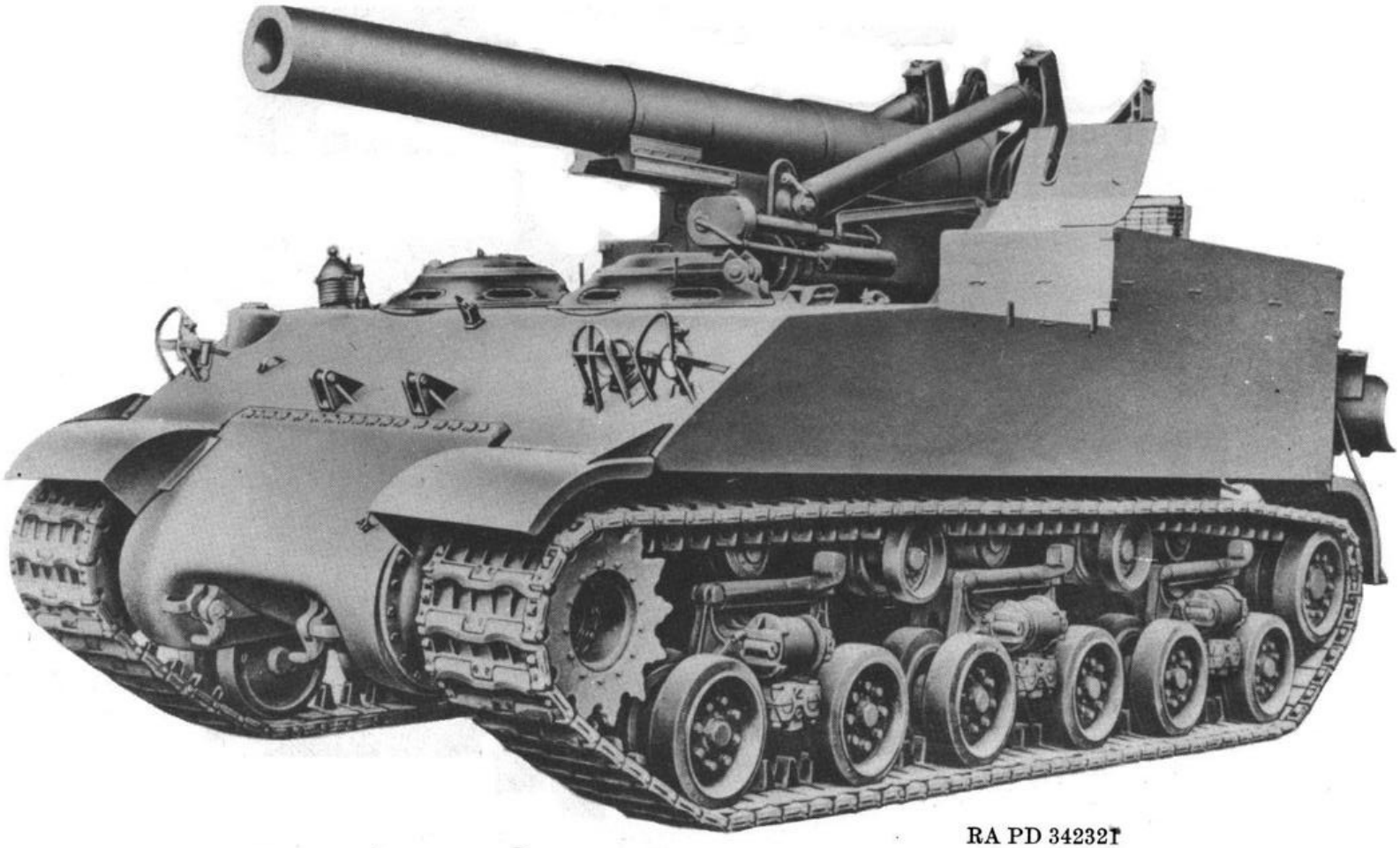

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Figure 3. 8-inch howitzer motor carriage M43, three-quarter left front traveling position.

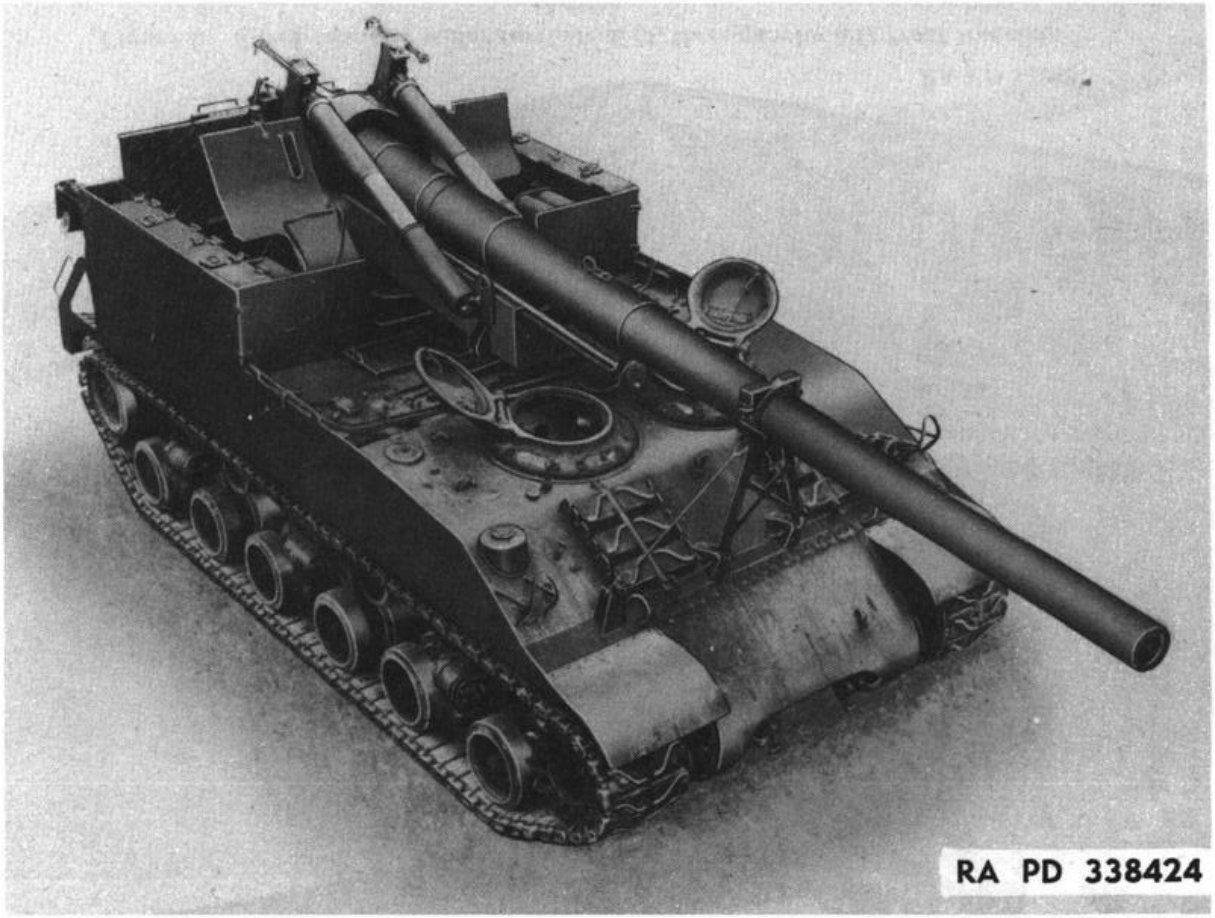


Figure 4. 155-mm gun motor carriage M40, three-quarter right front view.

CHAPTER 3
TOOLS

Section I. SPECIAL TOOLS

5. Purpose

a. The following list of special tools is an extract from ORD 6 SNL G–27, section I, 1 February 1946. It contains only those special tools necessary to perform the operations described in this manual. A complete list of special tools available for all maintenance operations on the 155-mm gun motor carriage M40 and 8-inch howitzer motor carriage M43 is contained in ORD 6 SNL G–27, section I, 1 February 1946.

b. The following list of special tools is for information only. It is not to be used as a basis for requisition.

6. List of Special Tools

Name	Federal Stock No.	Mfg. Tool No.	Maintenance Activity
Fixture, track connecting and link pulling R. H. and L. H. (Consisting of—	41–F–2997–86...	D78191.....	Field and base
1 Fixture, track connecting and link pulling, right hand.	41–F–2997–388..	.....	.....
1 Fixture, track connecting and link pulling, left hand).	41–F–2997–389..	.....	.....
Wrench, box (heavy duty), track adjusting, 3 in. hex, opening, length 44⅝ in.	41–W–640–400..	B248179..... MTM–M3–7	Field and base

41–T–3570–175 Tool Set, field maintenance Special; Supplemental (for vehicles having horizontal volute spring suspension).

41–T–3571–175 Tool Set, field and base maintenance Special; Supplemental (for vehicles having horizontal volute spring suspension).

41–T–3572–175 Tool Set, 5th Echelon, Special; Supplemental (for vehicles having horizontal volute spring suspension).

Name	Federal Stock No.	Mfg. Tool No.	Echelon
Adapter, volute spring, removing	41–A–30–650	B7079420	3–4–5
Bar, socket wrench extension, ¾ in. sq-drive., length 4⅝ in., w/⅞-in. hole for pin handle.	41–B–309–18		3–4–5
Block, riser, bogie wheel	41–B–1411–200	B7079422	3–4–5
Drift, S., round, straight, solid, 13/16 in. diam., 10 in. long.	41–D–1545–205	A7079723	3–4–5
Drift, S., round, straight, solid, 13/16 in. diam., 15 in. long.	41–D–1545–210	A7079724	3–4–5
Lock, riser, block, horizontal suspension.	41–L–1616	B7080204	3–4–5
Punch, track pin locking pin, removing, diam. ½ in., length 7 in.	41–P–3936	A7079725	3–4–5
Replacer, bearing cups, inner bogie and 13-in. idler wheels, inner and outer 10-i. . idler wheels.	41–R–2384–965	B7079419	3–4–5
Replacer, bearing cups, track rollers (inner and outer).	41–R–2385–350	B7079418	3–4–5
Wrench, pipe, chain, flat link, pipe capacity ⅝ to 4½ in., length 11⅞ in.	41–W–1781–100	B7079417	3–4–5
Wrench, socket, ¾ in. sq-drive., 12 point opng., 1¼ in.	41–W–3038–10	A7080150	3–4–5

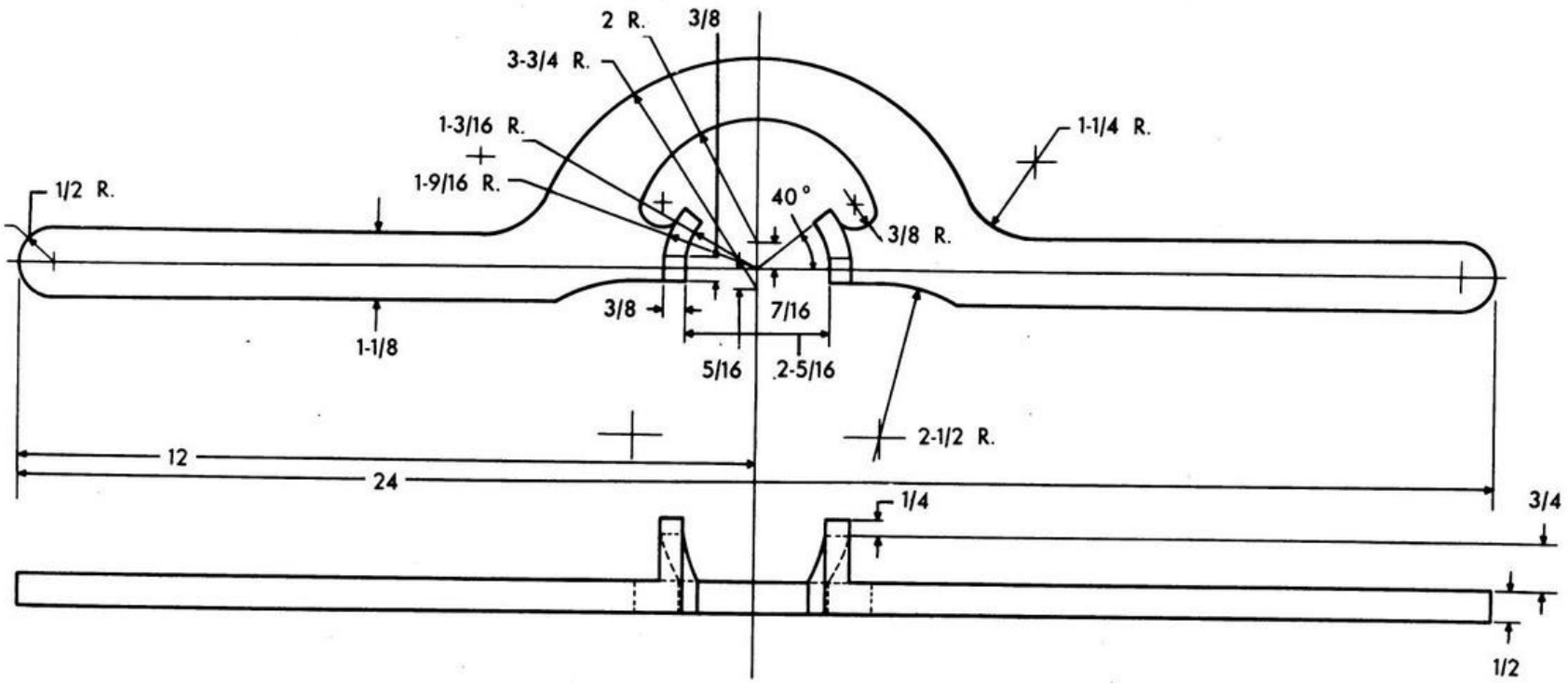
Section II. IMPROVISED TOOLS

7. Purpose

The improvised tool listed below and shown in figure 5 can easily be made up from material available at shops. It is used to unscrew the inner and outer locking rings on the shock absorbers during the disassembly of the shock absorber. It is also used to tighten the rings at time of assembly. The two built-up lugs must be finished to fit the slots in the locking ring (fig. 47).

8. List of Improvised Tools (fig. 5)

Name	*Figure reference*
Wrench, spanner (shock absorber locking rings)	5



RA PD 338452

Figure 5. Spanner wrench.

CHAPTER 4
REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

Section I. GENERAL

9. Scope

a. Chapter 4 contains information for the guidance of personnel performing major overhaul work on the 155-mm gun motor carriage M40 and 8-inch howitzer motor carriage M43. It gives an assembly line procedure for disassembly of the vehicle into its major components and assembly of the vehicle from its major components. The chapter also explains what constitutes a major component and indicates the points of connection between the major components.

b. Detailed instructions for the disassembly and assembly of the hull are given in chapter 5. Instructions for disassembly and assembly of gun or howitzer are given in TM 9–1350. Instructions for the disassembly and assembly of the remainder of the vehicle are given in detail in TM 9–747.

Section II. DISASSEMBLY OF VEHICLE INTO MAJOR COMPONENTS

10. Preliminary Instructions

a. REMOVE VEHICULAR EQUIPMENT. Remove and check all vehicular equipment listed in official On-vehicle Matériel List (if such equipment has not previously been removed before shipping to the facility) such as armament, fire control equipment, pioneer tools, vehicular tools, fire extinguishers, decontaminators, tarpaulins, camouflage net, spare parts, etc. Note any shortages and inspect for serviceability.

Note. Mark all grilles, armor, and doors when removed with serial number and replace on original vehicle during assembly.

b. REMOVE LOOSE ITEMS FROM INTERIOR OF VEHICLE. Remove all trash, debris, and loose items found within the vehicle.

c. REMOVE GUN ASSEMBLY. Remove nuts holding shields to gun and remove shields. Removal and maintenance of gun or howitzer is a function of the artillery maintenance section. Automotive maintenance is not permitted to handle these units.

d. DRAIN OIL AND FUEL. Drain gasoline from fuel tanks on both sides of engine compartment. Drain oil from each of the following units: Oil tank in engine compartment, transmission, differential, and final drive. See TM 9–747 for detailed information.

e. REMOVE TRACKS (T66, STEEL TRACK). Refer to TM 9–747.

f. REMOVE TRACKS (T80, RUBBER TRACK). Using center guide socket wrench 41–W–3038–10 and extension bar 41–B–309–18, remove one center track guide between idler wheel and rear suspension assembly (fig. 6). Attach track connecting fixture 41–F–2997–389 (part of fixture 41–F–2997–86) to track as shown in figure 7 with the fixture hooks over the two pins exposed by the removal of the center guide. Loosen the two clamp screws in the idler wheel bracket (fig. 8). Turn the center spreader screw counterclockwise to spread the bracket until the spindle is free.

Caution: Excessive spreading will crack the bracket.

Place the adjusting wrench on the hexagon end of the idler shaft and turn the shaft to release the pressure on the idler shaft lock. Raise the spring at the end of the lock and slide the lock off the serrations on the idler shaft. Turn adjusting wrench (41–W–640–400) to loosen track tension. Remove wedge bolts and nuts from inside and outside track end connectors and drive end connectors from shoe pins (fig. 8). Release tension at connecting fixture, allowing track to separate. Remove connecting fixture. Pull the track forward over the support rollers and sprocket with a cable attached to a towing unit.

g. CLEAN EXTERIOR OF VEHICLE. Steam-clean and wash the exterior of the vehicle thoroughly.

h. DISCONNECT BATTERIES. Remove battery box covers and disconnect cables from batteries (TM 9–747).

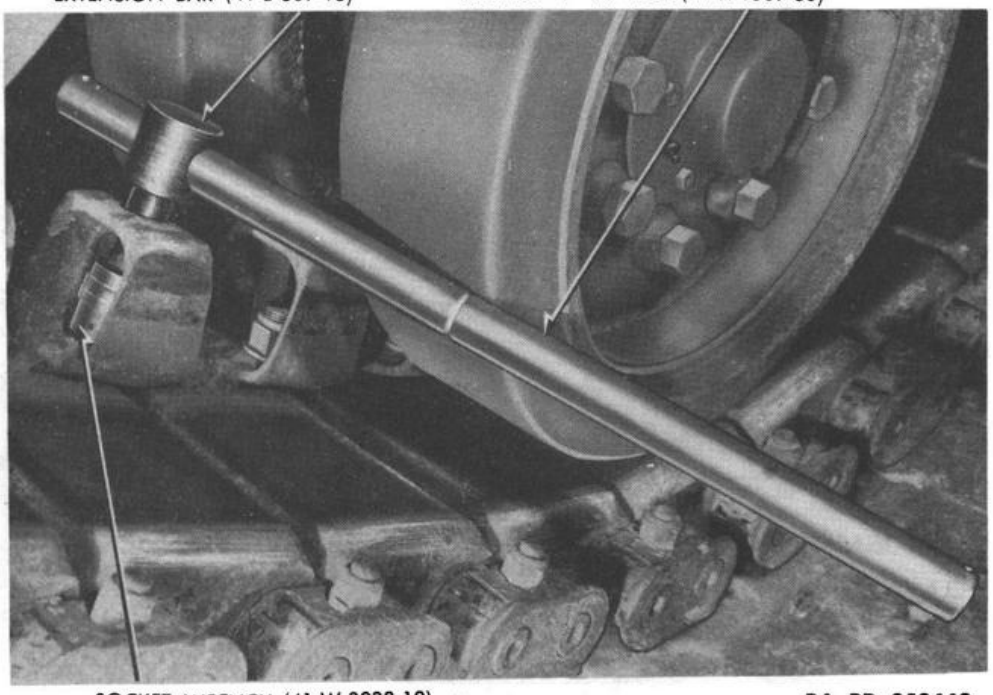


Figure 6. Removing center guide bolt and nut with special socket wrench and extension bar.

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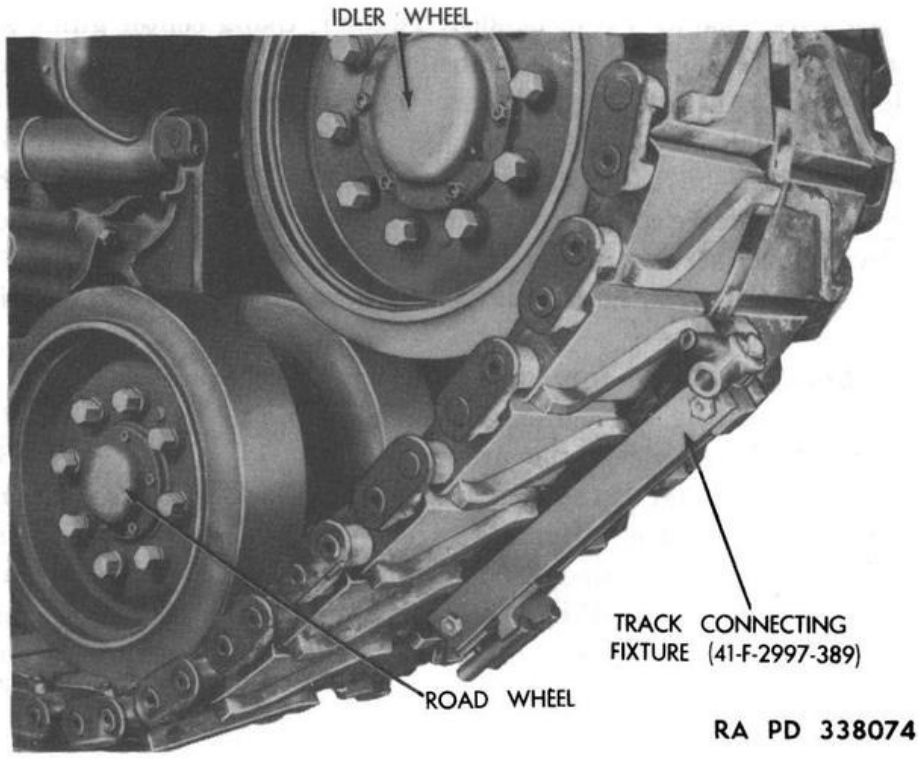

Figure 7. Track connecting fixture (41-F-2997-389)—installed.

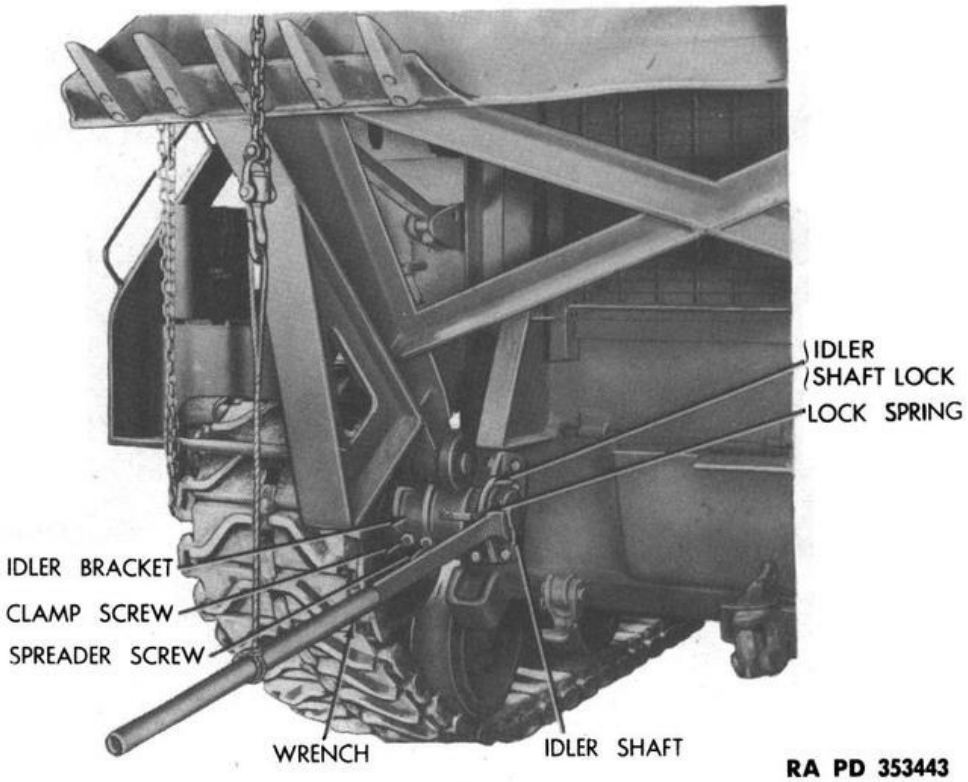

Figure 8. Adjusting track tension with wrench (41-W-640-400).

11. Disassembly

a. FIGHTING COMPARTMENT. (1) Remove spade, tailgate, and loading ramp from rear of carriage (par. 18).

(2) Remove stowage boxes, seats, shell racks, and air cleaners from fighting compartment (par. 18).

b. ENGINE COMPARTMENT (TM 9–747). (1) Remove engine compartment cover plate, top shroud, and two bottom plates from the engine compartment.

(2) Remove engine from the engine compartment.

(3) Remove engine shrouds from both sides of engine compartment.

(4) Disconnect oil line from reservoir and from top of engine oil cooler, and remove the line.

(5) Remove oil filter from rear bulkhead.

(6) Remove fire extinguisher pipes and horns from engine compartment.

(7) Remove oil reservoir from engine compartment.

(8) Remove fuel crossflow line and main fuel line from fuel tanks.

(9) Remove oil cooler guards and oil coolers from front bulkhead.

(10) Remove clutch throwout yoke, fuel tank shut-off linkage, and ventilator control rods from front bulkhead.

(11) Remove all electrical conduits from engine compartment.

(12) Remove left and right fuel tanks from engine compartment.

(13) Remove rubber engine mounts and primer lines from engine compartment.

c. DRIVER'S COMPARTMENT COMPONENTS. (1) Remove final drive and transmission assembly from hull (TM 9–747).

(2) Remove driver's and assistant driver's seats from drivers' compartment (par. 18).

(3) Remove batteries and steering brake linkage from drivers' compartment (TM 9–747).

(4) Remove battery box, master switch box, and regulator from drivers' compartment (TM 9–747).

(5) Remove blower, electrical conduits and junction box, and fire extinguisher system from drivers' compartment (TM 9–747).

d. SUSPENSION SYSTEMS (TM 9–747). (1) Remove idler wheels, idler shafts, and brackets.

(2) Remove dual support rollers and brackets.

(3) Remove single support rollers and brackets from hull.

(4) Place hull on a suitable stand.

(5) Remove shock absorbers from suspension assemblies.

(6) Remove suspension assemblies from hull.

Section III. ASSEMBLY OF VEHICLE FROM MAJOR COMPONENTS

12. Assembly

a. SUSPENSION SYSTEMS (TM 9–747). (1) Install suspension assemblies to hull.

(2) Install shock absorbers to suspension assemblies.

(3) Remove hull from stand.

(4) Install single support roller brackets and rollers.

(5) Install dual support roller brackets and rollers.

(6) Install idler wheel brackets, shafts, and idler wheels.

b. DRIVERS' COMPARTMENT (TM 9–747). (1) Install blower, electrical conduit and junction box, and fire extinguisher system in drivers' compartment.

(2) Install battery box, master switch box, and regulator in drivers' compartment.

(3) Install batteries and steering brake linkage in drivers' compartment.

(4) Install final drive and transmission assembly to hull.

c. ENGINE COMPARTMENT (TM 9–747). (1) Install rubber engine mount and primer lines in engine compartment.

(2) Install left and right fuel tanks in engine compartment.

(3) Install electrical conduit in engine compartment.

(4) Install clutch throwout yoke, fuel tank shut-off linkage, and ventilator control rods on front bulkhead.

(5) Install oil coolers and oil cooler guards on front bulkhead.

(6) Install fuel crossflow line and main fuel line to fuel tanks.

(7) Install oil reservoir in engine compartment.

(8) Install fire extinguisher pipes and horns in engine compartment.

(9) Install oil filter to rear bulkhead.

(10) Install oil lines and connect to oil reservoir and to engine oil cooler.

(11) Install lower engine shrouds on both sides of engine compartment.

(12) Install engine in engine compartment.

(13) Install top engine shroud, engine compartment cover plate, and bottom plates in engine compartment.

d. FIGHTING COMPARTMENT. (1) Install air cleaners, shell racks, stowage boxes, and seats in fighting compartment (par. 18).

(2) Install tailgate, ramp, and spade on rear of vehicle (par. 18).

e. TRACKS (T66 STEEL TRACK). Refer to TM 9–747.

f. TRACKS (T80 RUBBER-TRACK). Lay the tracks in front of the vehicle in alignment with the suspension wheels. Tow the vehicle over the tracks far enough so that the tracks may be connected at a point

between the idler wheel and rear suspension assembly. Block road wheels to keep vehicle from moving. Place the idler wheel in the extreme forward position and lock the shaft in the bracket to prevent breakage of the idler bracket. Using a towing unit, pull track over the sprocket, support rollers, and idler wheel. Attach track connecting fixture 41–F–2997–389 (part of fixture 41–F–2997–86) to track as shown in figure 7 with the fixture hooks over the two pins at the center of the track. Draw the track ends together and install the link connectors (fig. 38). Remove track connecting fixture. Install center guide and using socket wrench 41–W–3038–10, secure it to track as illustrated in figure 6.

g. BATTERIES. Connect cables to batteries and install battery box covers (TM 9–747).

h. GUN. Have gun installed by artillery maintenance.

i. TRACK TENSION. Refer to TM 9–747. When making adjustment the eccentric shafts should set in the lower arc or low position, to allow the track adjustment wrench (fig. 8) to be pulled up with a chain hoist or pushed up with a jack to tighten the track. Tracks must be adjusted to a sag of ½ inch to ¾ inch. This adjustment must be checked at a point midway between the second and third track support roller, counting from the front of the vehicle.

Note. Adjustment of track tension must be made after all equipment is installed.

13. Recording Installation of Major Units

Make proper entry on WD AGO Form No. 478, MWO and Major Unit Assembly Replacement Record, and attach to vehicle. Stamp name of shop and date of overhaul adjacent to vehicle nameplate.

14. Inspection After Assembly

Perform a technical inspection as prescribed in AR 850–15, using form WD AGO Form No. 462 as outlined in TM 9–747.

15. Final Road Test

a. After completing inspection after assembly (par. 14), subject the overhauled vehicle to a 50-mile minimum road test, at least 10 miles of which must be in high speed at full governor speed, if possible.

b. Test-operate the vehicle at various speeds. Check all functioning components thoroughly and pay particular attention to overheating. Correct any faulty operation.

c. Check vehicle thoroughly at intervals during road test for oil, grease, and fuel leaks.

d. Check for excessive vehicle drift in either direction when steering brakes are not applied.

e. Check tracks for proper alinement on suspension components.

CHAPTER 5
HULL

Section I. DESCRIPTION AND DATA

16. Description

a. The hull is constructed of armor plate. With the exception of several removable sections, the sides, roof, and floor are welded together to form a single unit. The removable sections are provided to permit access to the interior of the hull for inspection, machinery replacement and personnel. The removable pieces consist of a hinged and bolted cover assembly over the engine compartment; the shutter assembly and center tail pipe cover in the fighting compartment; the two doors over the drivers' seats in the drivers' compartment; and a small cover over the radio antenna. Openings in the floor include an escape door, two inspection plates under the engine compartment, and a cover plate over the oil reservoir drain plug.

b. The hull floor is reinforced by three angle iron strips. Mounting supports for the final drive and transmission assembly are located in the drivers' compartment. When installed, the final drive and transmission assembly forms the front end of the hull. Pockets for supporting the vertical fuel tanks are welded to the floor, side walls, and front bulkhead. The front engine supports are also welded to the floor and fuel tank pockets. The side walls are straight, meeting the floor at right angles. Drain valves located throughout the hull provide a means of draining any accumulated water, oil, or fuel.

c. The hull is divided into the fighting compartment at the rear, engine compartment in the center, the drivers' compartment at the front. Compartments are separated by bulkheads; the front bulkhead seals off the drivers' compartment from the engine compartment and reaches from side-to-side and from floor-to-roof. The rear bulkhead separates the fighting compartment from the engine compartment. Inside the drivers' compartment are boxes and brackets solidly welded to the floor and side walls for stowing periscope heads and prisms, hand grenades, binoculars, flashlights, and bulbs.

d. The drivers' seats are mounted in the front end of the hull. Both seats can be adjusted up and down and fore and aft. The assistant drivers' seat (right) is mounted on a tilting base. By pulling release lever, the seat tilts ahead and makes the escape door more accessible. Protective pads are provided on assistant driver's seat to prevent injury to personnel when climbing through escape hatch.

e. Stowage compartments are located on each side of the fighting compartment. Two shell racks are bolted to the front end of the fighting compartment. There are four loose stowage boxes which can be removed.

A compartment for tool stowage is provided under hinged covers which, when closed, serve as the subfloor. The center floor plate is removable to facilitate the removal of the exhaust tail pipes.

f. Roller and tailgate brackets, exhaust outlet, pintle bracket, and step and handrails are welded on the exterior of the hull. The gun traveling lock bracket, horn and headlight guards, and spare track link brackets are welded to the front of the hull. Lifting eyes are welded to the hull.

17. Data

Thickness of side wall (lower)	1 in.
Thickness of side wall (upper)	½ in.
Thickness of floor	½ in.
Thickness of roof	½ in.
Thickness of engine compartment cover	½ in.
Number of drivers' doors	2
Number of escape doors	1
Number of lifting eyes	4
Number of towing shackles	4
Number of pintles	1
Number of shutter assemblies	3
Number of floor cover plates	3
Number of drain plugs (fuel)	2
Number of drain valves (floor)	7

Section II. DISASSEMBLY OF HULL

18. Removal

a. GENERAL. The removal and installation of the following items are described in detail in this chapter, and enlarge upon instructions given in TM 9–747.

b. REMOVE SPADE ASSEMBLY. Be sure the tailgate is securely locked in traveling position with lock pins (fig. 11). Turn winch crank handle ratchet assembly and disengage locking pawl from gear while holding crank. Apply brake to prevent the drum from turning. Remove winch ratchet by turning release lever on housing and pulling out the ratchet assembly (fig. 9). Raise spade assembly high enough to permit raising locking links off anchor pins. Using the winch brake to control the spade, lower the spade to the floor as shown in figure 10. Remove spade anchor link lock pins. Pull all of the cable from the winch drum and loosen the U-bolts which secure the cable to the drum. Pull cable from the drum and out of the sheaves on spade and hull. Loosen the U-bolt which secures the cable to U-bracket on spade plate, and remove cable. Remove cotter pins from spade anchor pins (fig. 10) which anchor the spade to the idler wheel brackets on the rear corners of hull. Attach a hoist to the spade to support its weight, tap the pins out of idler brackets, and note the number of shims used on each side. Lower the spade assembly to the floor. Replace winch ratchet to prevent loss.

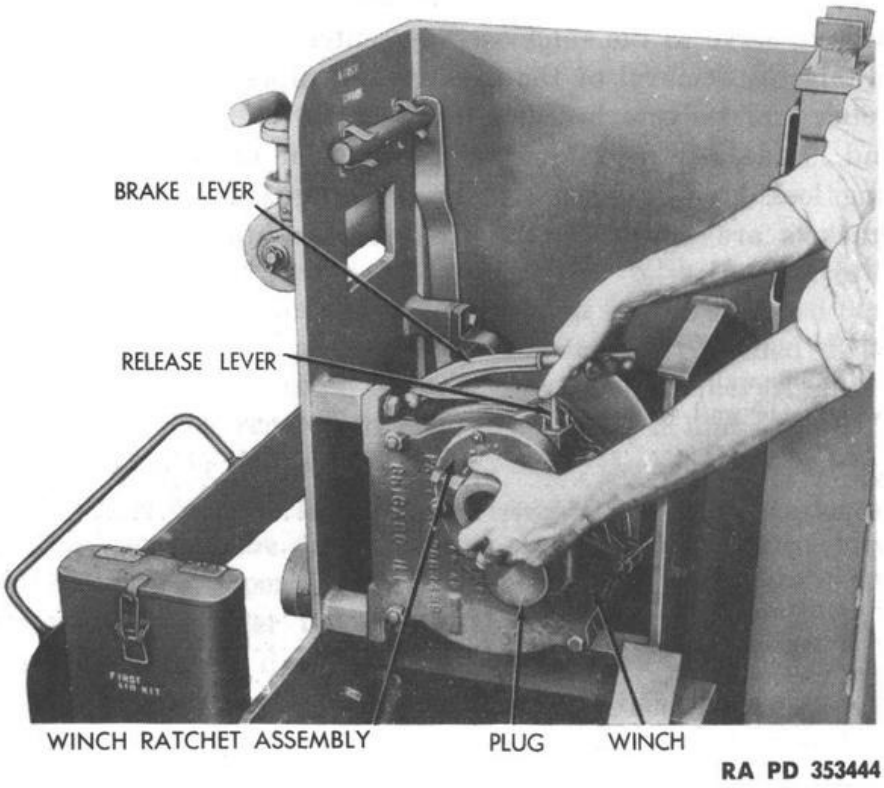

Figure 9. Removing winch crank ratchet assembly.

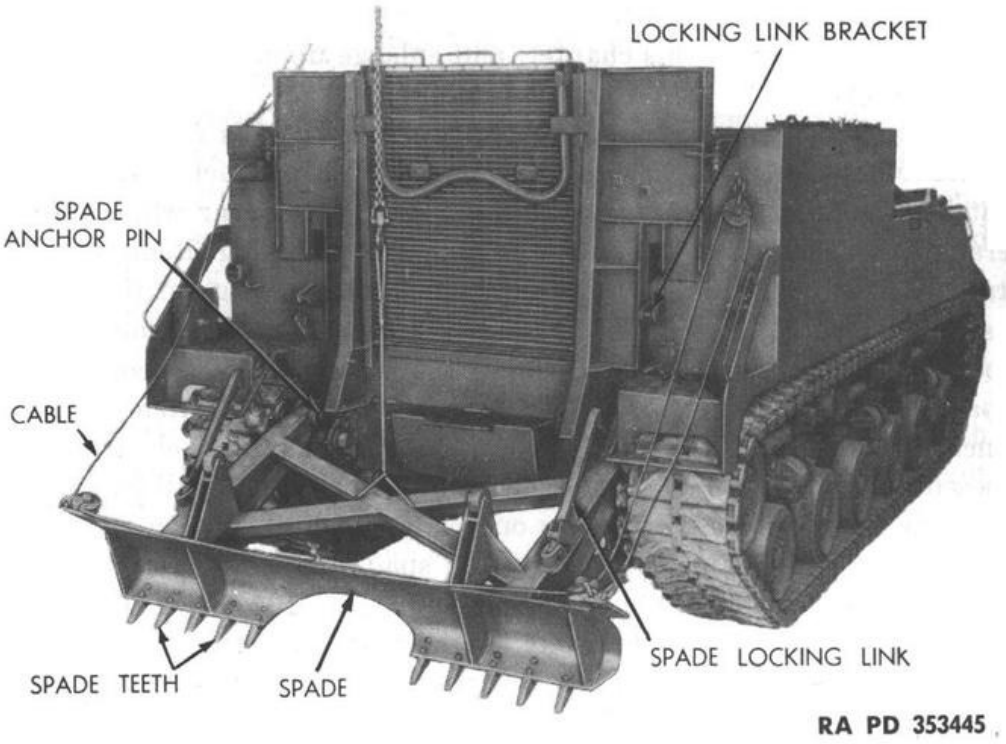

Figure 10. Removing spade assembly.

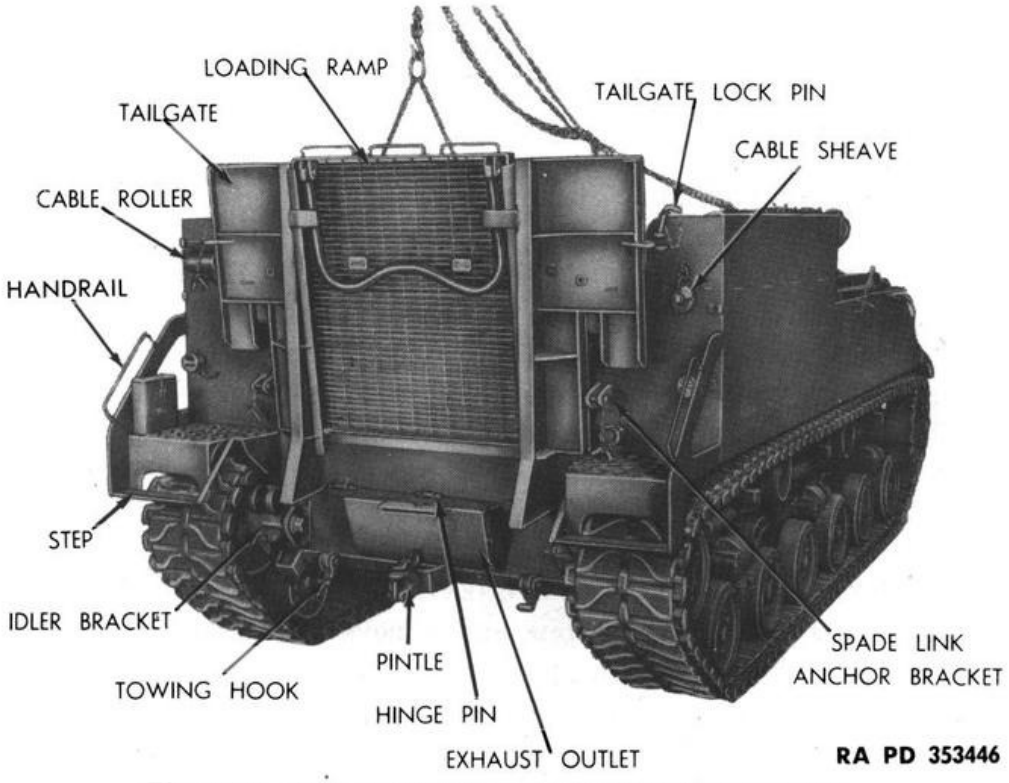

Figure 11. Removing tailgate and loading ramp assembly.

c. Remove Tailgate and Loading Ramp Assembly. Install a sling cable, and support the weight of the tailgate and loading ramp with a hoist; then tap out tailgate hinge pins which secure the tailgate to the hull floor (fig. 11). Pull tailgate lock pins out of hull brackets and lugs on each side of tailgate. Lift tailgate and loading ramp assembly from hull and lower the assembly to the floor. Remove the sling.

d. Remove Spotlight and/or Control Handle. Disconnect spotlight extension socket from outlet on inside of hull. Pull out lockpin above handle knob shaft, and slide handle from shaft. Pull spotlight shaft out of housing and mounting boss. Remove protector cap from retainer and install cap on mounting boss. On inside of hull, remove screws in housing base. Tighten wing nut on housing base and unscrew housing from mounting boss.

e. Remove Drivers' Seats. Take out bolts which secure the driver's and assistant driver's seats to the seat-mounting bases. Remove tilting base of assistant driver's seat by removing cap screws which secure it to the floor.

f. Remove Oil Cooler Shutter Assemblies (Fig. 12). From inside of the drivers' compartment, remove cap screws which fasten the two shutter assemblies to the front bulkhead behind the driver's and assistant driver's seats, and lift the shutter assemblies from the vehicle.

g. Remove Gun Traveling Lock (Fig. 13). Remove nuts from the U-bolts which anchor the gun lock brace rods to brackets on either side of the front of hull. Replace U-bolts after releasing the brace rods to

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prevent loss. Attach a sling cable and hoist to saddle, release saddle catch lock, and raise saddle to vertical position with the hoist. Take cotter pins out of gun traveling lock hinge pins and remove flat washers. Tap pins out of the saddle and hinge brackets, and lift gun traveling lock assembly from hull.

h. Remove Cupola Hatch Assemblies (Fig. 21). Remove the 10 oval-head bolts which secure each of the cupola hatch assemblies to the hull. Attach the sling cable to the door hinge tube and lift the assembly from the top of hull and lower it to the floor.

i. Remove Spade Winch (Fig. 9). Attach sling cable and hoist to winch to support weight; remove cap screws which secure the spade winch assembly to the bosses on the rear wall in the fighting compartment. Lower the assembly to the floor and remove the sling.

j. Remove Cable Roller and Sheave from Hull (Fig. 11). Pull cotter pin out of cable roller pin, and remove flat washer. Hold roller with one hand and pull pin with washer out of roller and brackets, separating it from the hull. Remove cotter pin and flat washer from sheave pin. Pull pin out of sheave and yoke, and remove sheave from the yoke.

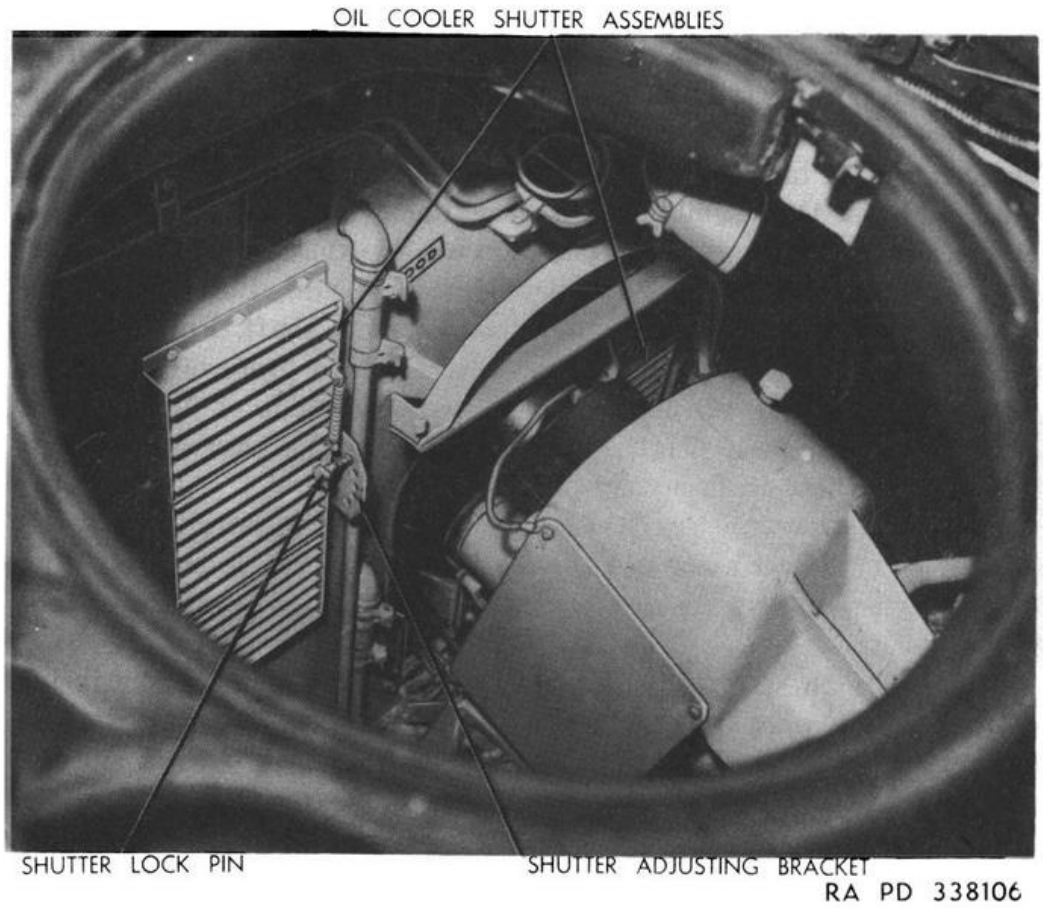


Figure 12. Oil cooler shutter assemblies.

k. Remove Exhaust and Tail Pipes (Fig. 14). Take out the screws which secure the center floor plate in the fighting compartment. Remove cap screws securing tail pipe flanges to exhaust outlet, take off rear and center tail pipe clamps. From a position in the engine compartment, remove clamps securing flexible exhaust pipes to tail pipes, and remove exhaust pipes. Free front end of tail pipes by removing clamps, pull the pipes from inside of tunnel out toward rear, and remove from vehicle.

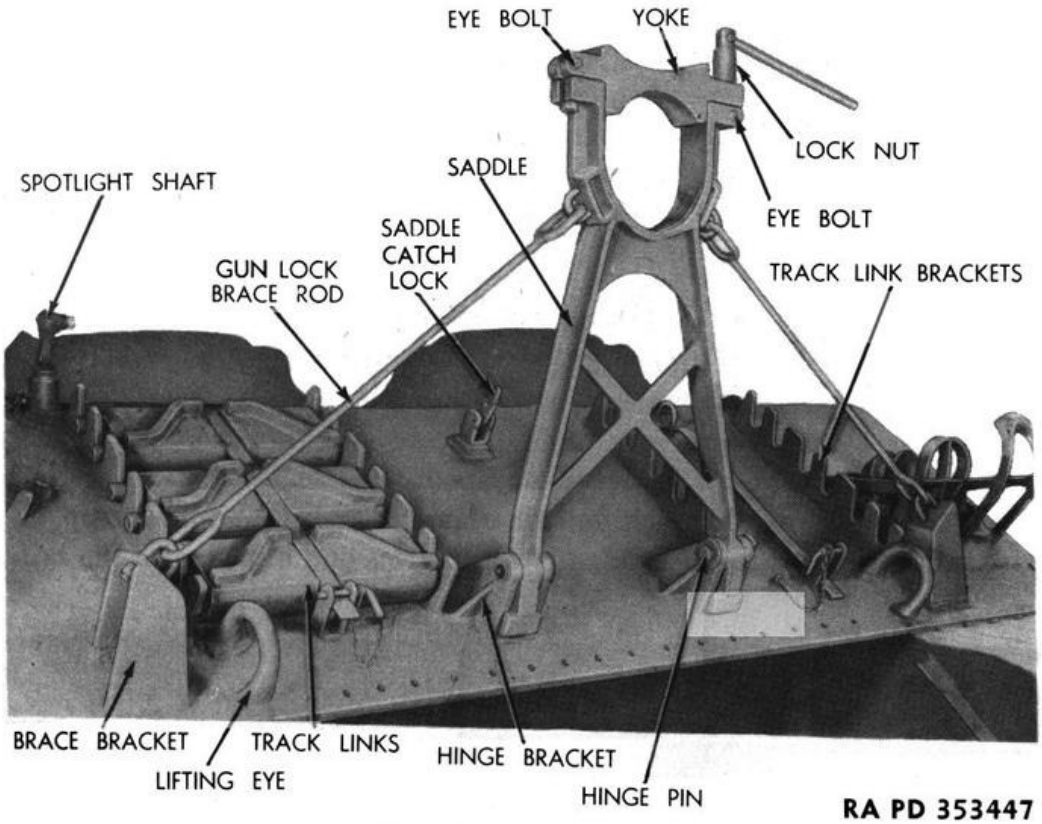


Figure 13. Gun barrel traveling lock.

l. Remove Shell Racks (Fig. 15). Pull up on the pin which locks the shell retainer cover to the shell racks (not shown in figure 15). Pull the top of the shell retainer away from the shell rack, then lift retainer from rack. Remove the cap screw which secures the rack to rear bulkhead. Take out the screws which secure the rack to the floor. Lift cover on the rear stowage compartment on side of hull and remove the two screws from inside the compartment which secure the rack to the stowage compartment. Install a hook in rear top fastening bracket, attach a hoist, and lift shell rack from fighting compartment.

m. Remove Towing Hooks and Pintle Assembly (Fig. 11). Pull either of the hairpin retainer pins out of towing hook pins. Tap the pins out of hooks and brackets and remove the hook. Remove cotter pin and slot head nut which secure the pintle assembly to pintle bracket and remove pintle.

Section III. OVERHAUL OF SUBASSEMBLIES

19. General

Clean the following subassemblies with steam or dry cleaning solvent. Care must be taken not to immerse any of the rubber parts in dry cleaning solvent; merely wipe them with a cloth soaked in solvent, then dry them immediately with a dry cloth. When grease has hardened on metal parts soak in solvent until grease can be removed. Remove rust, if present, with wipe off type (phosphoric acid type) rust remover metal conditioner. Lenses of prisms must be cleaned with a camel's hair brush or lens tissue. As each assembly is completely assembled after overhauling, paint the assembly with the paint prescribed for this vehicle. TM 9–2851 outlines the preparation and application of various paints, lacquers, and enamels.

20. Spade and Locking Link Assembly

a. Inspection and Repair (Fig. 16). Inspect spade assembly for cracked or broken welds and repair if present (fig. 16). Check anchor pin holes in spade arms to see that they are not worn enough to cause looseness or excessive play between spade arm and anchor pin. New anchor pins have 2.000-inch outside diameter. See that roller supports are solidly welded to the spade plate and arms and alined with the rails

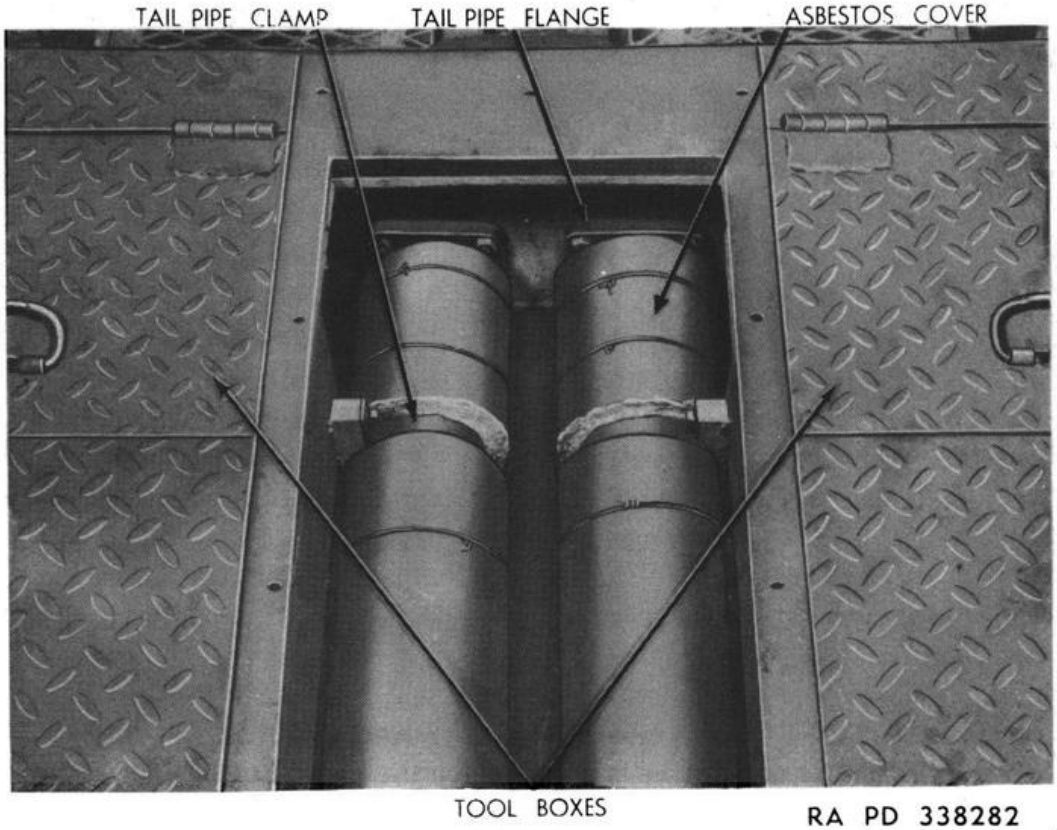


Figure 14. Tail pipes.

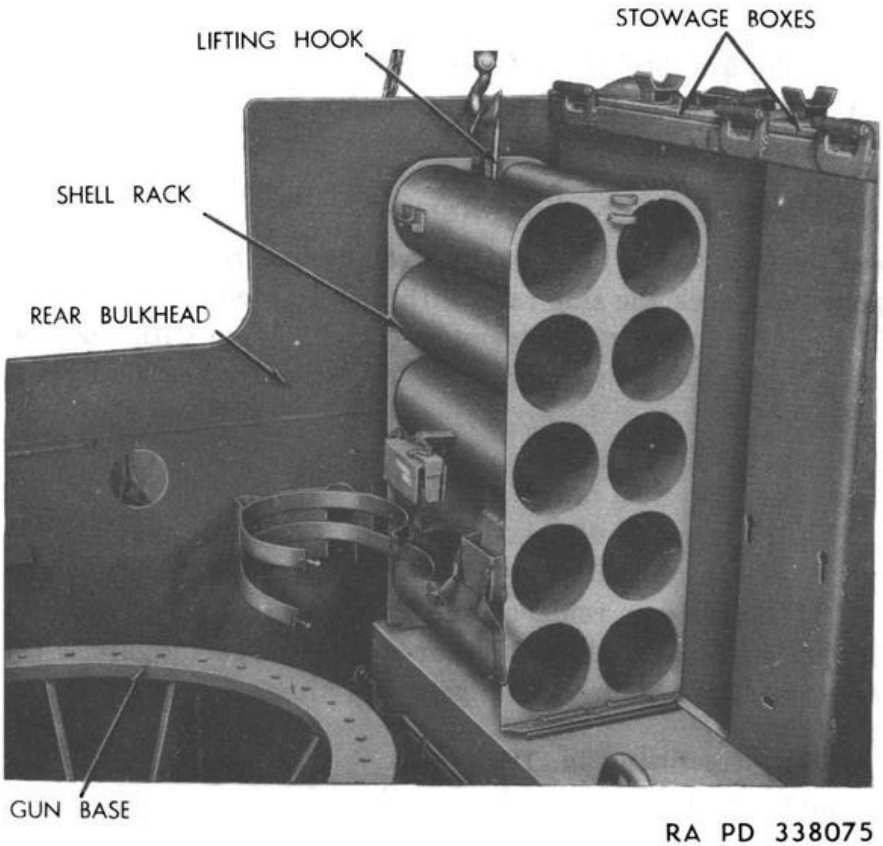


Figure 15. Removing shell racks.

on the tailgate when the tailgate is raised or lowered. Lubricate the rollers. If rollers do not rotate freely after lubrication, oil roller pins and remove bind on sides of roller by spreading the roller support. Remove rollers by removing cotter pin and flat washer then remove roller pin from roller and supports. Check roller and pin for wear. Hole in new roller is 0.505 inch. Replace pin if grooved, and roller if the hole is badly worn. Spade arms and spade braces must be free from distortion to prevent binding in idler bracket. Straighten spade by heating the distorted area and bending the section to its original shape. In an emergency, badly damaged sections can be removed and new pieces welded in place. If the lower edge of the spade plate is bent or rolled, heat edge and straighten. Badly worn nuts and bolts in the lower edge of spade plate must be replaced with new bolts and nuts. Replace any broken spade teeth. Straighten spade arms, roller supports, and ribs if they are twisted, using jacks, beams, and/or sledge hammer. To insure the proper engagement of the hook end of the spade locking link over the anchor pin, it may be necessary to build up metal on the hook, and then grind it to conform to the dimensions given in the insert, figure 16. Cable sheaves must turn freely. Check sheave grooves for wear, and grind off the sharp edges which might damage cable. If sheaves have worn so that cable has a tendency to jump out of grooves, replace sheaves. If sheaves do not rotate freely, spread yokes.

Replace badly worn sheave pins. New pins measure 0.998 inch in diameter. Replace broken or frayed cables.

b. ASSEMBLY (FIG. 16). Assemble rollers, sheaves, and spade locking links on spade, using new pins if necessary, and lock with cotter pins.

21. Tailgate and Loading Ramp

Inspect loading ramp (fig. 17) and straighten or reweld bent or loosened components. Check the side rails with a straightedge as shown in figure 18. The supporting leg should make a right angle with the ramp. See that ramp leg anchor brackets and hand bar grips are solidly welded to rear of ramp and that the leg anchor bolts are tight and in good condition. Ramp section must slide in and out of tailgate freely without binding. See that the tailgate lock pin lugs on the sides of tailgate aline with the lugs on hull when the ramp is raised in traveling position. Correct by straightening or rewelding. Repair cracked or broken hinges. If hinges are replaced, care must be taken to see that they are properly alined with each other so that when tailgate is raised in traveling position, hinges on tailgate will aline with hinges on the hull.

22. Pintle Assembly (fig. 19)

Disassemble pintle by removing the release lever pin which secures the release lever in the housing. Lift out release lever and release lever spring. Inspect all parts for wear and cracks. Check tension of release lever spring; it must hold release lever in locked position. A new spring will have a free length of 3¼ inches. Replace badly worn parts with serviceable parts or whenever possible replace defective pintle assembly.

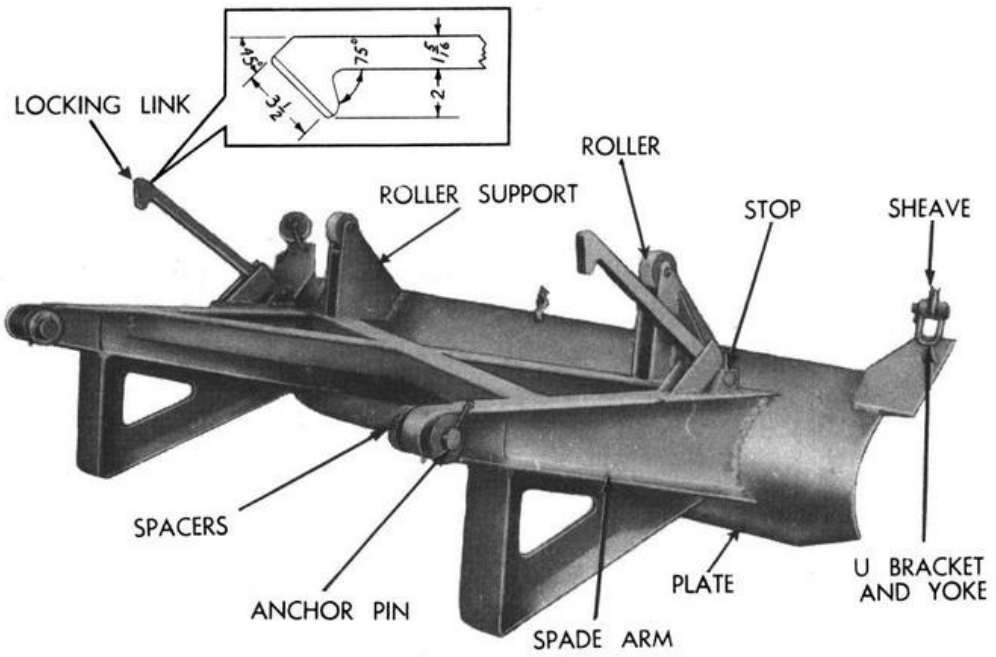


Figure 16. Spade and locking link assembly RA PD 338250

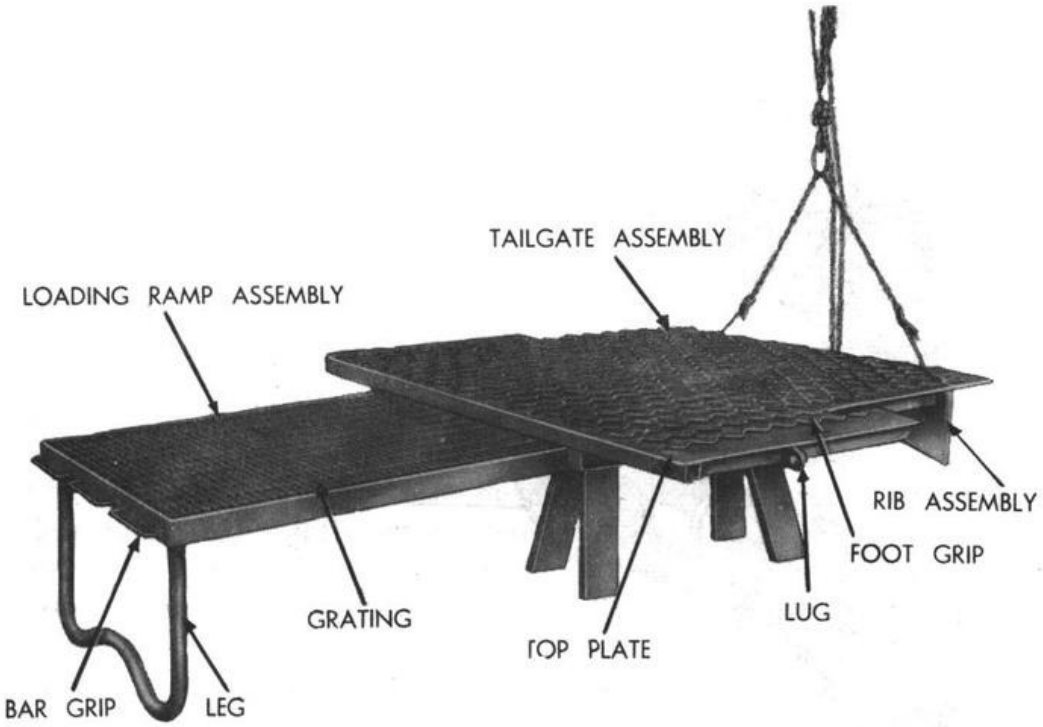


Figure 17. Tailgate and loading ramp assembly RA PD 338251

Figure 18. Checking loading ramp with straight edges RA PD 338372

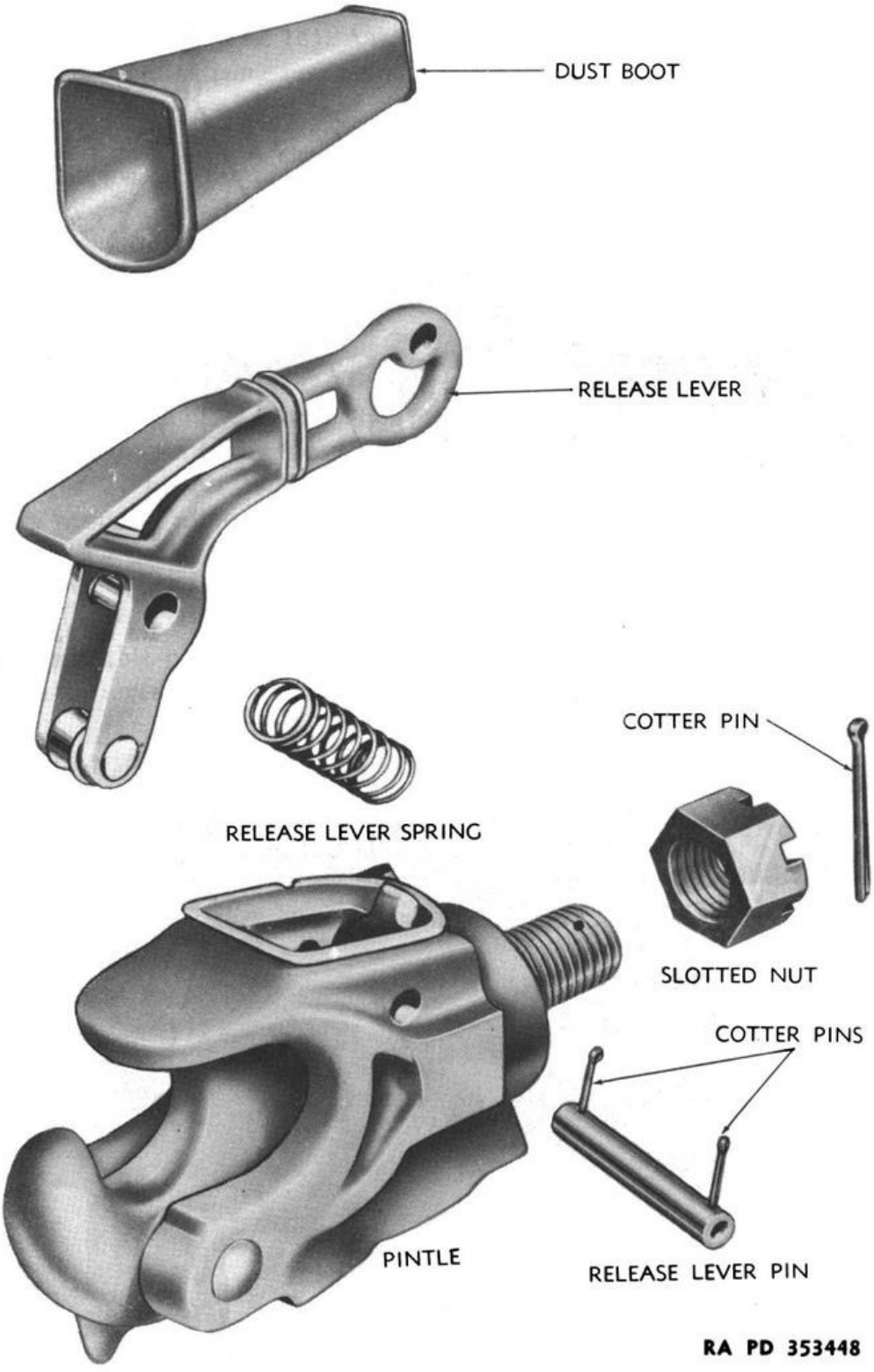


Figure 19. Pintle assembly—disassembled

Install the release lever spring in the pintle housing. Position the release lever, with dust boot installed, over spring in housing and install straight pin. Lock the pin with two cotter pins.

23. Periscope Holders

Check the periscope holder for dents and burred trunnions. Note whether periscope may be readily installed or removed from the holder. Remove dents or burs which cause binding on the holder or trunnions. See that the locking device is working properly. The repairing, adjusting, and rebuilding of the periscope is described in TM 9–1608.

24. Doors and Cover Plates

a. Escape Door in Floor of Drivers' Compartment (Fig. 20). Check to see that escape door opens when release lever is lifted. The door must seal tightly when closed to prevent water or mud from entering the vehicle. If door is buckled, straighten and check operation until a snug fit is obtained. Lubricate the latch so that it operates freely. If latch binds or sticks when released, scrape rust or foreign matter from door and door seat.

b. Cover Plates. The cover plates must be cleaned thoroughly to rid them of grease or foreign matter. Straighten cover plates if bent, and file off any sealing edge burs until a good fit is insured when the cover plate is fastened to bottom of hull.

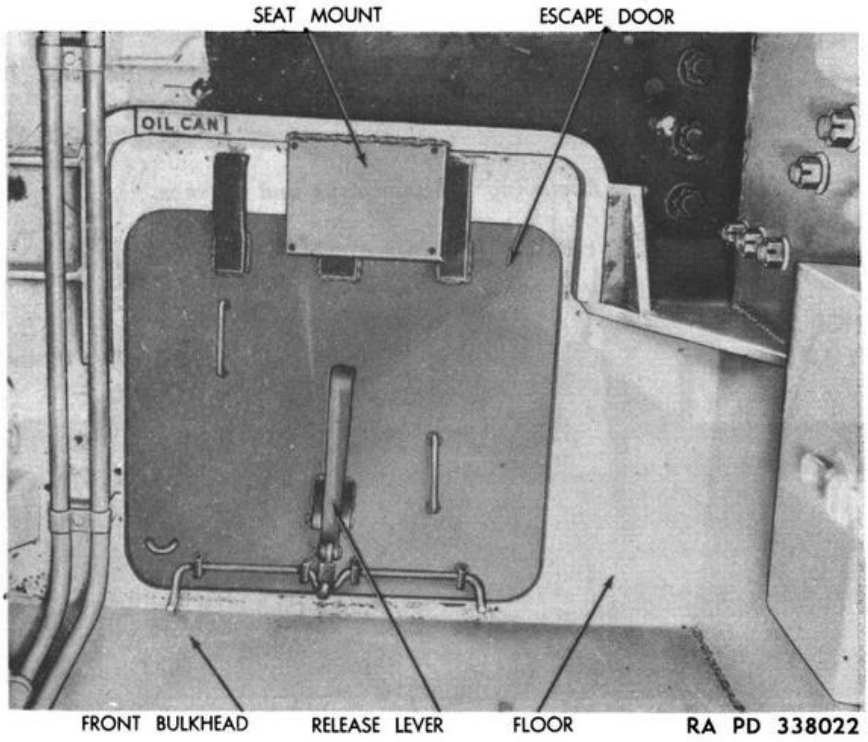


Figure 20. Escape door installed—top view

25. Driver and Assistant Driver's Cupola Assemblies

a. DISASSEMBLY. (1) *Remove cupola door assembly from base* (fig. 21). Hold cupola door in an approximate vertical position with a hoist (fig. 21). Remove two torsion spring retaining caps held by screws to the hinges, and slide torsion springs from inside of hinge tube. After torsion springs have been removed the door can be lowered. To facilitate removal of hinge tube, remove the paint on outside of tube with emery cloth and coat with a film of oil.

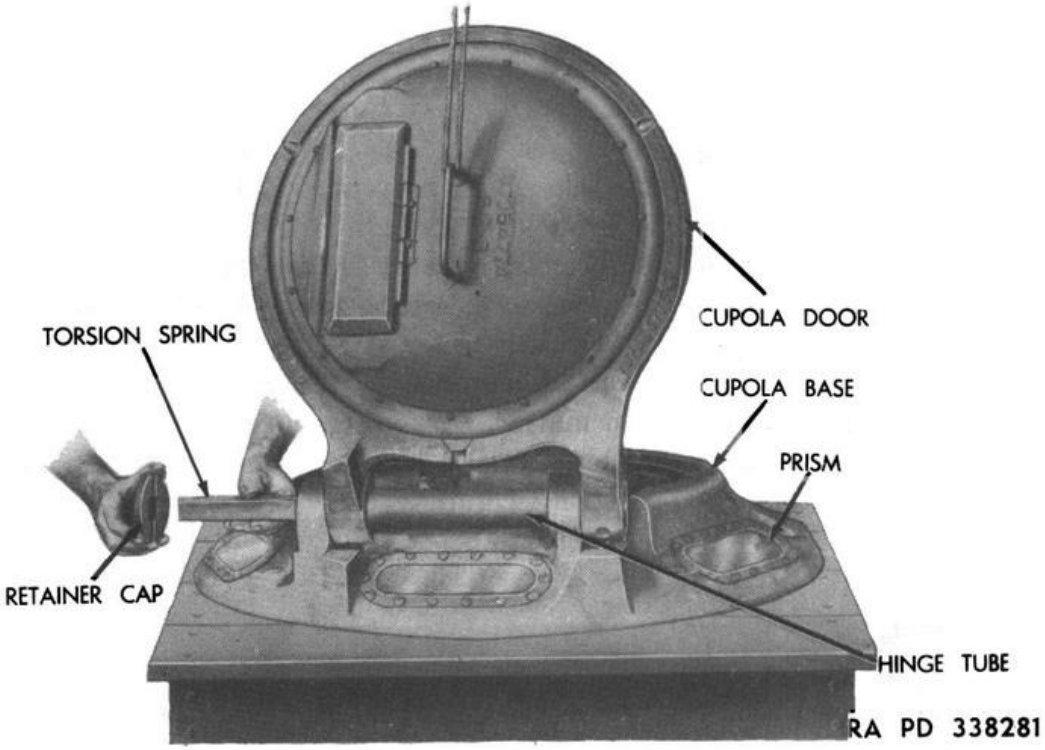


Figure 21. Removing retainer caps and springs.

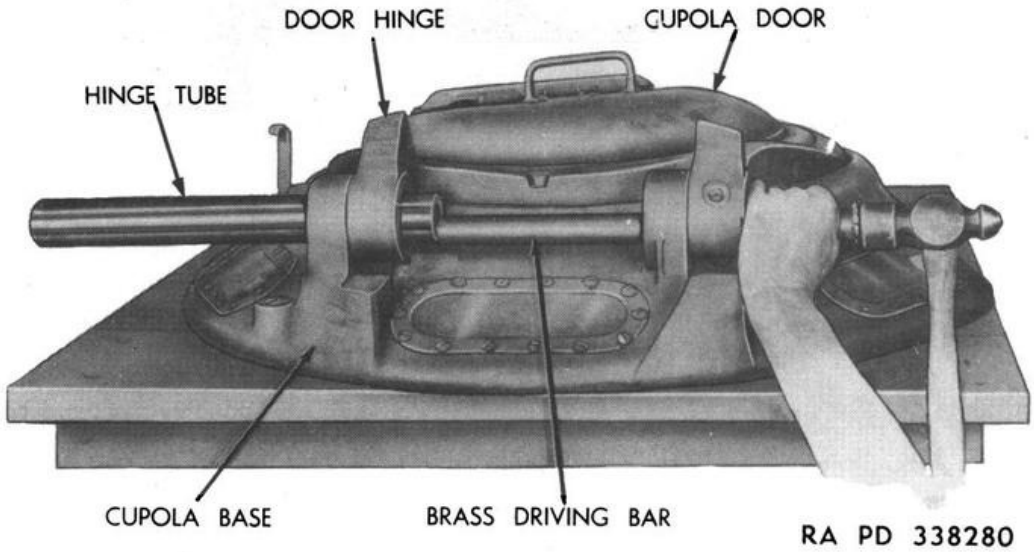


Figure 22. Removing cupola door hinge tube.

Caution: To prevent hinge bushings from sliding out of door hinge with tube, tap the hinge tube out of door ring hinge through cupola base hinge, using a brass bar and hammer (fig. 22).
Remove door assembly from base.

(2) *Remove prisms from cupola base* (fig. 24). From inside of cupola base, cut wire locking the prism screws. Remove the two outside screws, then the middle screw. Pull wedge and prisms out of opening in base.

(3) *Separate cupola door assembly* (fig. 23). Remove sealing cover attached to door race plate, and remove ball race access cap attached to cupola door ring. Maneuver the balls toward the access cap recess and remove balls. Separate the cupola door race plate from door ring.

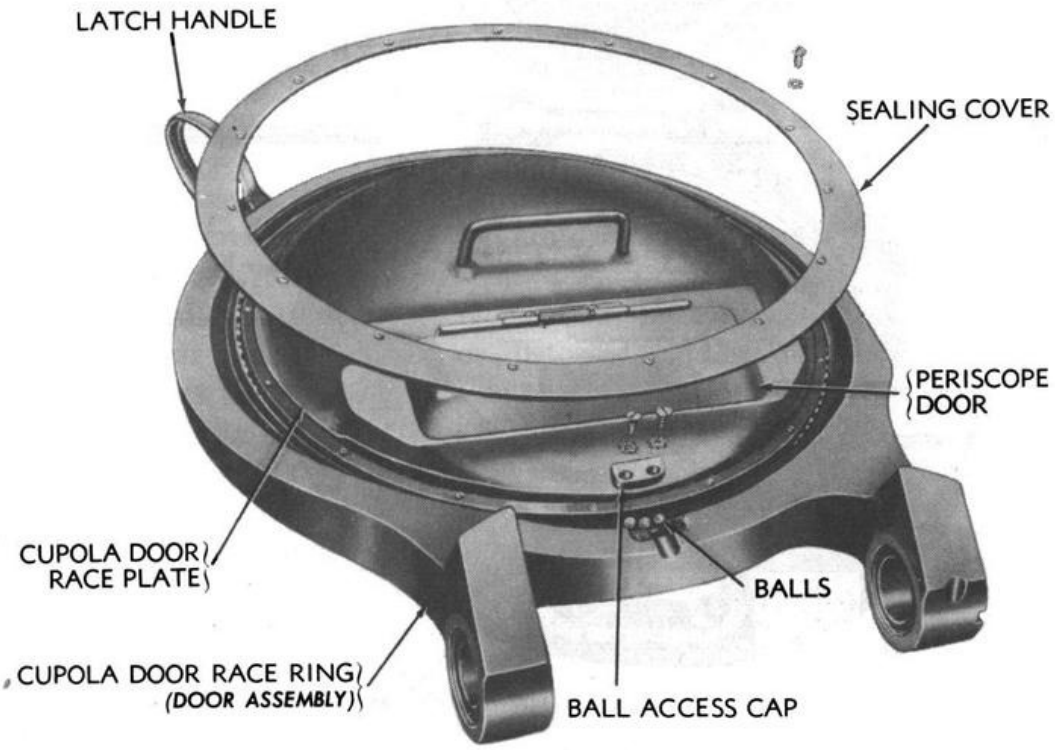
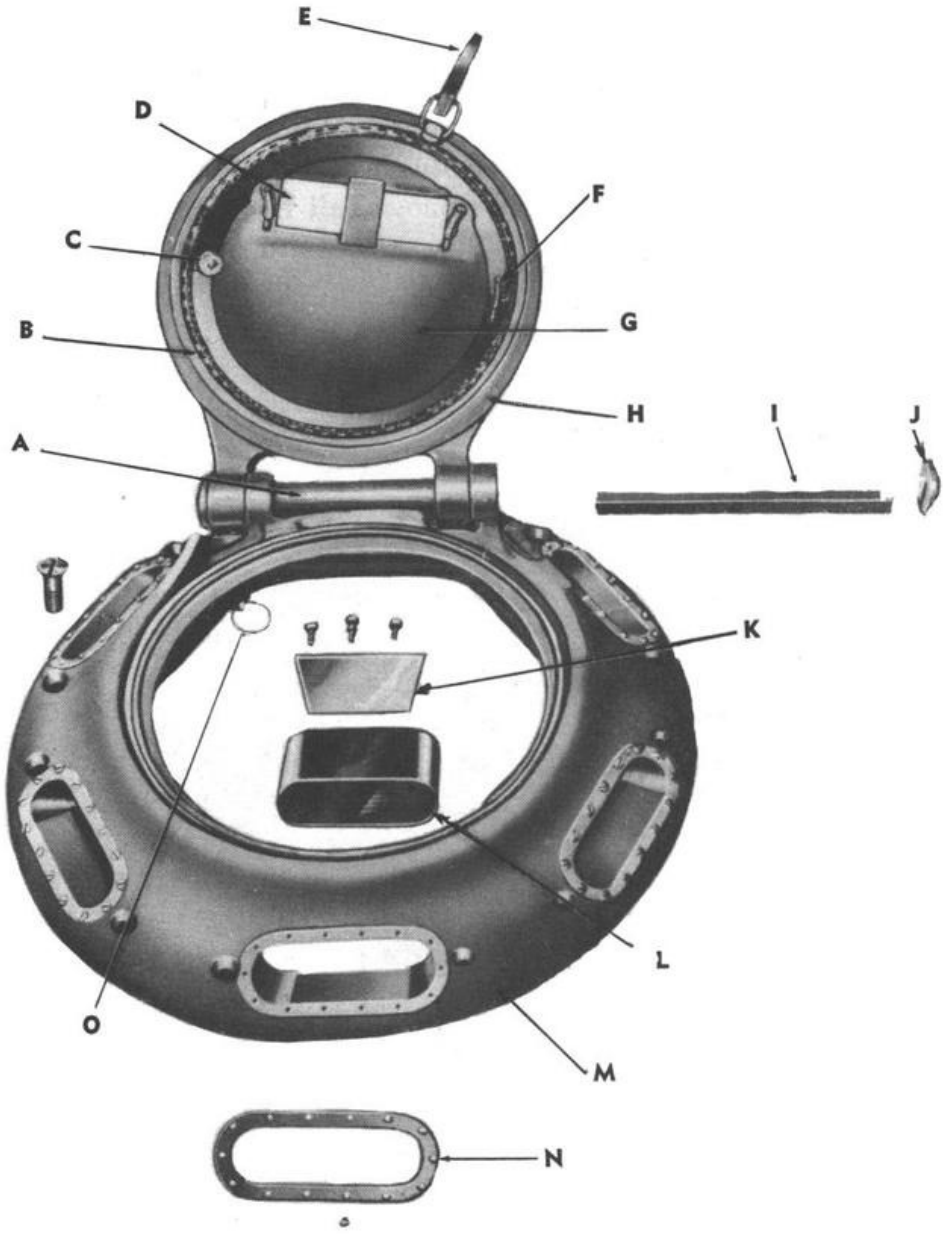


Figure 23. Method of disassembling cupola door. RA PD 353449

b. Inspection and Repair. (1) *Cupola door assembly.* If door race plate or door ring is warped, cracked, or distorted and races have deep rust pits, replace cupola assembly. Replace all balls which are pitted by rust. The outside diameter of the large balls is 0.5000 inch and the outside diameter of small balls is 0.4375 inch. If periscope door on race plate is damaged beyond repair, replace with new door. Tighten loose screws on azimuth pointer. Tighten azimuth scale by lightly tapping drive screws on the scale. Check the condition of the threads on the cupola race lock knob. Measure the outside diameter of the door hinge bushing; the manufactured outside diameter is 2.500 inches. Measure inside diameter of hinge bushing; the manufactured inside diameter is 1.752 inches. The



A — HINGE TUBE
B — AZIMUTH SCALE
C — CUPOLA RACE LOCK KNOB
D — PERISCOPE RECESS FILLER
E — LATCHING HANDLE
F — AZIMUTH SCALE POINTER
G — CUPOLA DOOR RACE PLATE
H — CUPOLA DOOR RACE RING
I — TORSION SPRINGS
J — RETAINER CAP
K — PRISM WEDGE
L — DIRECT VISION PRISM
M — CUPOLA BODY
N — PRISM BEZEL
O — HOLD-OPEN LOCK

RA PD 353450

Figure 24. Cupola door—disassembled.

outside diameter of hinge tube is 1.747 inches. If door fails to close and lock properly due to excessive wear on hinge bushings and tube, replace either bushings or tube or both. Replace broken torsion springs. Lubricate periscope levers in door race plate and see that they operate freely. Replace if damaged. If rubber seal on race plate is damaged, replace.

(2) *Cupola base* (fig. 24). Check the spring in door hold-open lock assembly. To disassemble the lock, unscrew the lock case from the cupola base. Remove ring and drive out dowel pin, permitting the plunger and spring to be removed. If spring, plunger, or case is broken or damaged beyond repair, replace with new lock assembly. Insert spring and plunger in the lock case and secure with dowel pin. Install ring in lock case. Screw lock assembly in cupola base. Cement new or torn crash pads and door seal on cupola base with nonvulcanizing rubber cement.

26. Gun Barrel Traveling Lock and Rod Assemblies (fig. 13)

Inspect traveling gun lock saddle for cracks, wear, and stripped or burred threads. Repair cracks by welding. Run tap through yoke lock nut to clean threads and remove burs on the threads of yoke clamping eye bolts with a thread file. If threads are damaged beyond repair, replace with new or serviceable bolts. Remove worn or damaged leather liners in gun saddle yoke and top yoke, and rivet new liners in place. Straighten or replace twisted or distorted saddles. The saddle hinge pins must not be so badly worn as to allow the gun tube to slap from side-to-side when traveling. The outside diameter of the pins as manufactured is 1.248-0.002 inches. Build up worn holes in saddle by welding and refinish hole to 1.250+0.002 inches. Remove the brace rod U-bolts and separate brace rods from gun saddle. Straighten the brace rods if bent and check to see that eyes at each end of rods are solidly welded. New rods are approximately 36⅛ inches from center-to-center of eyes.

27. Air Outlet Shutter Assemblies

a. Disassembly (Fig. 25). (1) *Separate shutter frames and remove levers.* Remove bolts which secure the shutter and grille frames together. Remove hairpin retainer, unhook lever spring from lever, and lever shaft mounting bracket. Disconnect actuating lever from shutter link by removing pin. Slide lever assembly out of mounting brackets.

(2) *Remove deflectors.* Cut shutter frame at the two narrow corners on the same side of frame and cut the two tie rods with a hacksaw or cutting torch. Separate the side which has been cut from the rest of the frame. Deflectors and deflector actuating strip can now be removed.

Note. As there may be a variation in the length of the deflectors, remove and lay them on a bench in the order of their assembly in the frame to facilitate reassembly in the same position.

b. Inspection and Repair. The frames must be straight and square. Employ heat when straightening badly distorted sections. See that the

grille is square and flat, and fits the grille opening properly. The deflectors must be flat so that when closed they will shut off the passage of air. Restore bent deflectors to their original shape. Pivot rods must be straight and tightly crimped in place in the deflectors and the small cranks which actuate the deflectors must be secure. Straighten the deflector actuating strip, lever and link if bent.

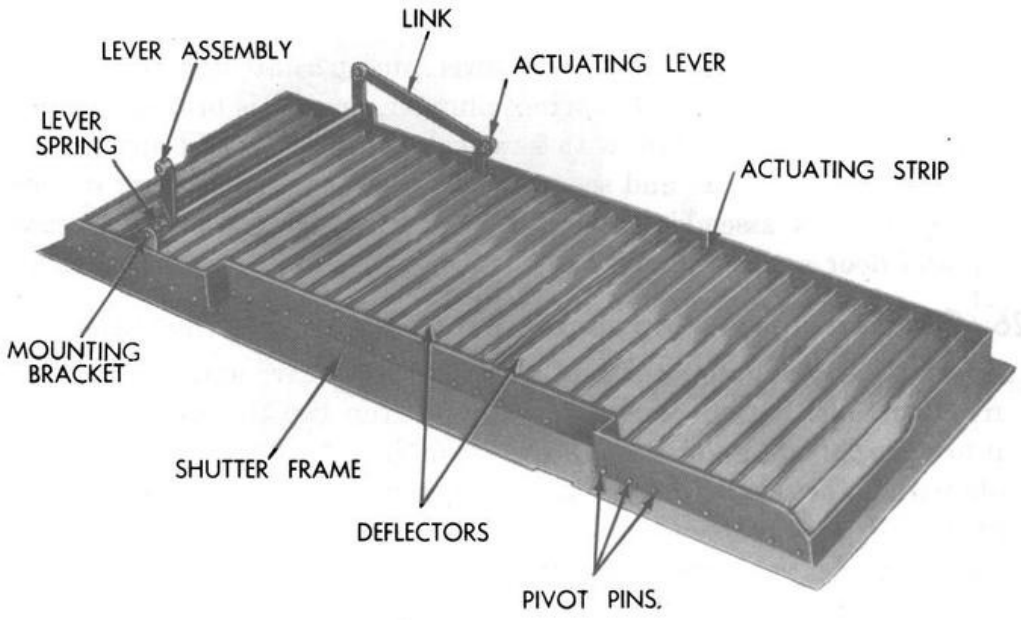


Figure 25. Air outlet shutter assemblies. RA PD 338252

c. ASSEMBLY. (1) *Install deflectors.* Lay the shutter frame flat on a work bench. Starting at either end, insert deflector pivot rods in holes on one side of the shutter frame in their original position in the assembly.

(2) *Install deflectors actuating strip.* Position shutter actuating strip along inside of frame, taking care that the lever attached to the strip lies at the end of the frame nearest the lever assembly mounting brackets. Insert the small cranks of the deflectors in the holes in the strip.

(3) *Install side of frame.* Carefully raise the frame with deflectors installed to a vertical position to prevent deflectors from sliding out of frame and strip. Position the opposite side of the frame, which was cut out, in place over the deflectors. Starting at either end, insert the deflector pivot rods in the holes in the frame. Weld the frame at the corners allowing a little end play between the frame and each deflector to prevent it from binding. Weld the two tie rods across middle section of the frame to stiffen the sides.

(4) *Install lever assembly.* Slide the spring over one end of lever shaft, place the flat washer spacer over the opposite end of shaft; then install the lever cross shaft assembly in the mounting brackets on the

deflector frame. Lock the shaft in place with a hairpin retainer. Hook one end of spring over lever and the other end over mounting bracket. Connect the deflector actuating lever link to cross shaft lever with its pin, and lock in place with a cotter pin. Oil the deflector pivot pins, levers and actuating strip. Operate lever and see that deflectors open and close easily; make any minor adjustment. The deflectors should be held in open position by the spring. Install grille frame over the shutter frame and secure with bolts.

28. Spade Winch Assembly

a. DISASSEMBLY. (1) *Remove winch ratchet and plug from housing.* Turn release lever shaft on the side of winch housing, and pull the winch ratchet assembly and plug, from the side of housing (fig. 9).

(2) *Dismantle winch assembly* (fig. 26). Remove the socket-head screw which secures the center shaft to the winch housing. Remove three cap screws, and two nuts which secure the winch housing to the gear reduction plate, and lift winch housing and winch gear from the winch assembly. Remove cotter pin and tap out brake band pin separating the brake band from the brake lever. Lift the reduction gear plate and brake drum assembly from shaft and bolts. Slide brake band and brake lever from bolts. Remove nuts securing long bolts in winch support. Tap bolts out of winch support. Remove socket-head screw securing shaft in winch support, and slide shaft and flat spacer from winch support.

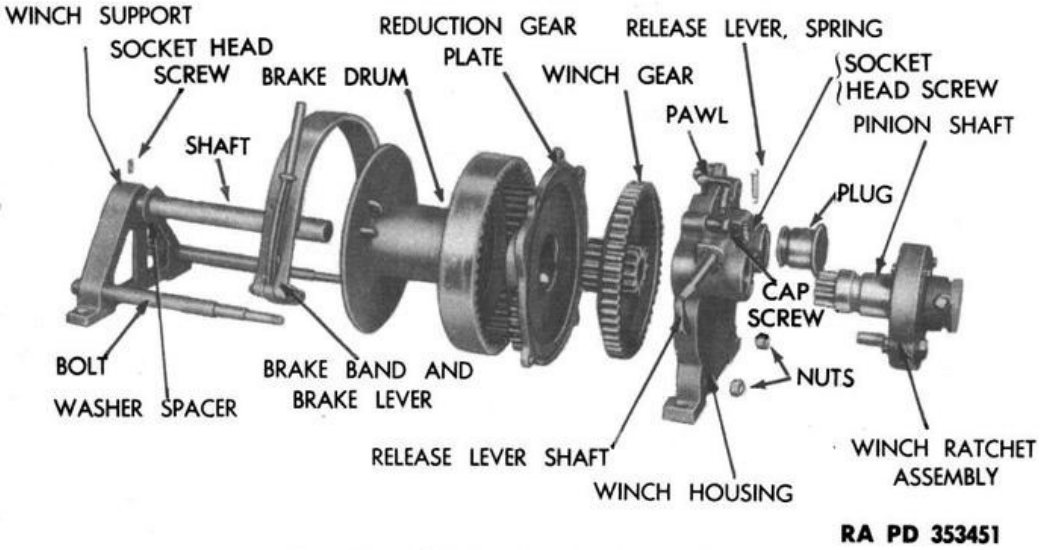


Figure 26. Spade winch—disassembled.

(3) *Disassemble winch ratchet* (fig. 27). Remove the handle lock-screw. Remove the bolts securing the cover to housing. Separate the cover from the housing, remove the ratchet pawl and pawl spring from inside of housing, and slide housing from pinion shaft. Remove two

socket-head screws from the pinion shaft, both from the same hole. Install spanner wrench, and remove the screw securing the crank housing, ratchet gear and pinion shaft together.

b. Inspection and Repair. Inspect winch housing, reduction gear plate, brake drum, and winch support for cracks, damage, or distortion. Replace ratchet gear when it has broken or badly worn teeth. The brake and winch drum must be solidly welded to each other. See that the winch shaft is straight, and the lock screw threads on the shaft are in a serviceable condition. The bushings in this assembly receive but little wear, and should not be replaced unless cracked or broken. Inspect the ratchet pawl and spring on the drum housing. The spring must have enough tension to hold the pawl in the ratchet and to lock the winch drum in any position. Examine the brake lining. When glazed or worn nearly to the rivets, a new lining should be riveted on the band. A scored drum will damage the lining and should be refinished by reducing the outside diameter only enough to clean up the surface.

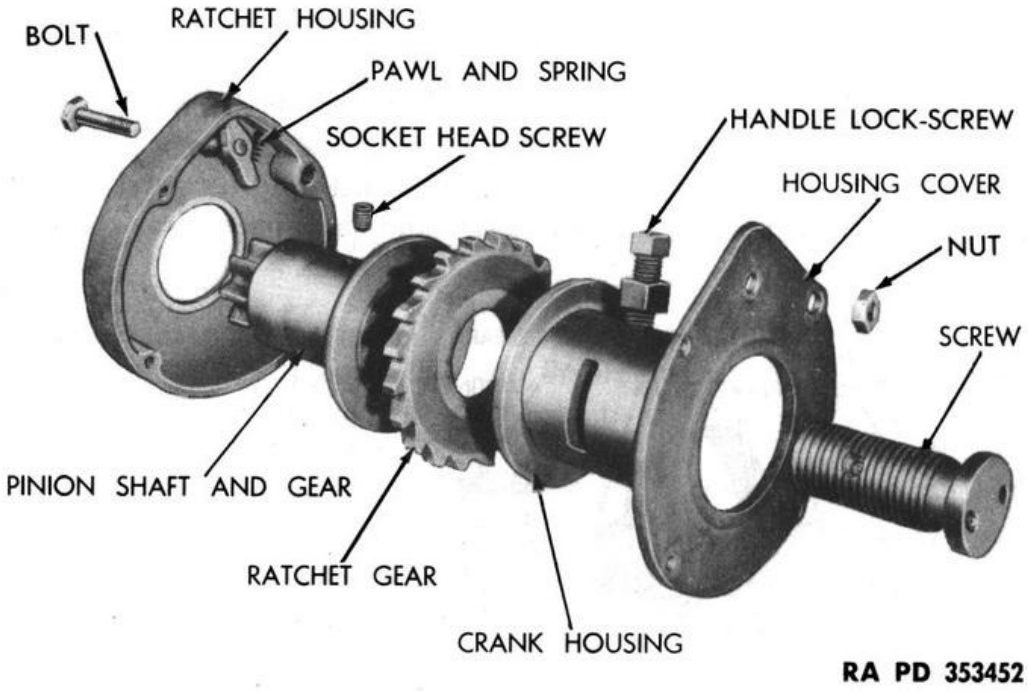


Figure 27. Winch ratchet—disassembled.

c. Assembly. (1) *Assemble winch ratchet assembly* (fig. 27). Install the large screw in the crank housing and tighten with a spanner wrench. Position the ratchet gear over the screw with the engaging surfaces of gear teeth facing counterclockwise when viewing the assembly from the crank end. Insert the screw in the pinion shaft and tighten shaft on screw. The flange of the crank housing and pinion shaft must clamp the ratchet gear tightly to prevent it from turning. The locking hole in

the screw should line up with the set screw hole in the pinion shaft. Install the socket head screw in the tapped hole in pinion shaft until it enters the locking hole in the large screw and then securely tighten. Drive the second set screw down to bear against the head of the first screw. If a new large center screw must be used, assemble the parts tightly as before; then, using the set screw hole in the pinion shaft as a guide, drill a ¼-inch diameter by ⅛-inch deep hole in the screw (care must be exercised to avoid damaging the threads in the shaft), and install the two set screws to lock the screw in position. Slide ratchet housing over the pinion end of the ratchet gear assembly, install pawl and spring in ratchet housing, and bolt the housing cover on the ratchet housing. Install handle lock-screw.

(2) *Assemble the brake drum on shaft* (fig. 26). Insert the winch shaft in the winch support, aline the holes in the shaft and support, and secure the shaft in place with a socket head screw. Insert the two long bolts in the holes at bottom of the winch support and secure with nuts and lock washers. Slide the flat washer spacer over the winch shaft and follow with the brake drum.

(3) *Install brake band, reduction gear place, winch gear, and winch housing* (fig. 26). Place winch assembly in upright position facing the extended end of shaft, slide the brake band on the right bolt, and brake lever over the left bolt. Connect the brake band to the brake lever with pin and lock with cotter pin. Position the reduction gear plate with gear facing toward inside of drum and over long bolts in winch support. Install winch gear on shaft and mesh small integral gear with reduction gear. Slide winch housing with pawl installed over shaft and two winch support bolts. Secure the winch housing to the gear reduction plate with three cap screws. Install nuts on the end of the two winch support bolts and tighten securely. Install socket head screw through winch housing and into the center shaft. Turn the release lever on housing and install the plug and the winch ratchet assembly. Release the lever; then the plug and ratchet assembly will be locked in place in the winch housing.

29. Seats (fig. 28)

a. GENERAL. The driver and assistant driver's seats are identical in construction though mounted on different bases. The driver's seat is mounted on fixed base and the assistant driver's seat is mounted in a tilting base which moves forward to permit access to the escape door. Two bumper pads are provided on the back of the movable seat and seat base.

b. DISASSEMBLY. (1) *Remove seats, cushions, and pads.* Remove the pad from the seat. Remove bolts securing the seat to the upper seat bracket. Remove seat and fibre strips. Pull release levers positioning the seat in its highest position and releasing the two tension springs.

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Remove the bumper pads from behind the seat and tilting base of the assistant driver's seat.

(2) *Disassemble levers, seat bracket, and base.* Remove cotter pin from the lower pin in the seat base and press out the pin or drive the pin out with a brass drift. Unhook the two small tension springs from seat release lever. Press out top pin and pull the release lever from the seat bracket. Press middle pin from seat bracket releasing the top end of front seat lever. Press lower pin from seat bracket and remove rear lever section of the seat. Remove the tension spring anchor pin in seat base and release the two long tension springs. Unhook the two short springs from the spring anchor in seat bracket, and remove the release lever tension springs. Separate front lever, seat bracket, and base. Press the lower pin from the tilting base, unhook locking spring, and remove tilting base release lever. Take out upper pin and remove top section of tilting base.

c. Inspection and Repair. Inspect all the components of the seat assemblies for bent, broken, or worn parts. Note particularly the wear on release lever teeth and pins, and the condition of springs, etc. Replace broken or weak springs with new or serviceable springs. Build up worn teeth of release lever by welding, and file to shape. Remove burs from points where binding may occur. Parts which are badly damaged must be replaced with new or serviceable parts.

d. Assembly. (1) *Assemble tilting base.* Install tilting base release lever in tilting base and press in the lower pin. Hook locking spring to

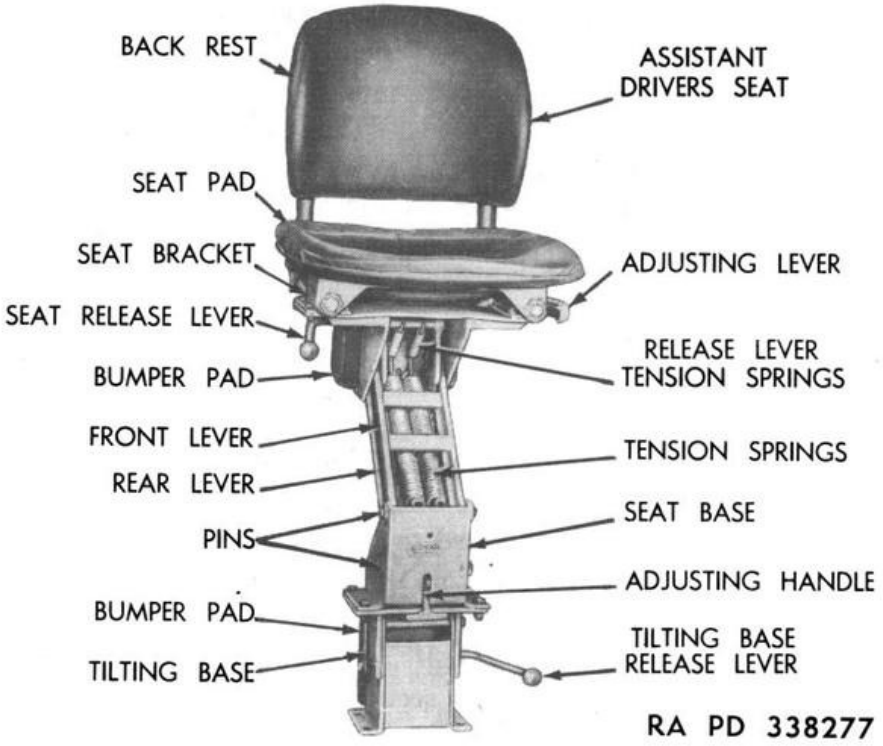

Figure 28. Assistant driver's seat.

pin and release lever. Position top of tilting base on lower section of base and insert pin. Lock both pins with cotter pins.

(2) *Assemble seat base, levers, and bracket.* Install rear seat lever section in seat base and seat bracket; aline with the lower hole in base and the bottom hole in seat bracket, and insert pins. Insert spring anchor in seat bracket, and hook the two long tension springs to anchor. Position the front lever in base, aline the holes, and insert pin through base, front lever, and the two long tension springs. Aline the holes in the seat bracket with those in the front lever and insert center pin. Press seat bracket down toward the base until release lever assembly can be positioned, and install the top pin through seat bracket and release lever assembly. Install short release lever springs from release lever to spring anchor. Position the two fiber strips on seat bracket; place seat on strips and secure with bolts. Fasten bumper pads to back of assistant driver's seat and to tilting base. Lubricate fibre strips with engine oil so that seat will slide fore and aft freely.

e. GUN CREW SEATS (FIG. 29). Inspect the six gun crew seats for torn pads, broken springs, and bent or broken frames. Straighten or replace broken or torn parts with serviceable parts. See that mounting lugs and safety belt loops are solid. Weld loose lugs. Check adjusting lever assembly for correct operation. The springs on each side of seats must have enough tension to automatically fold seat when it is not being occupied.

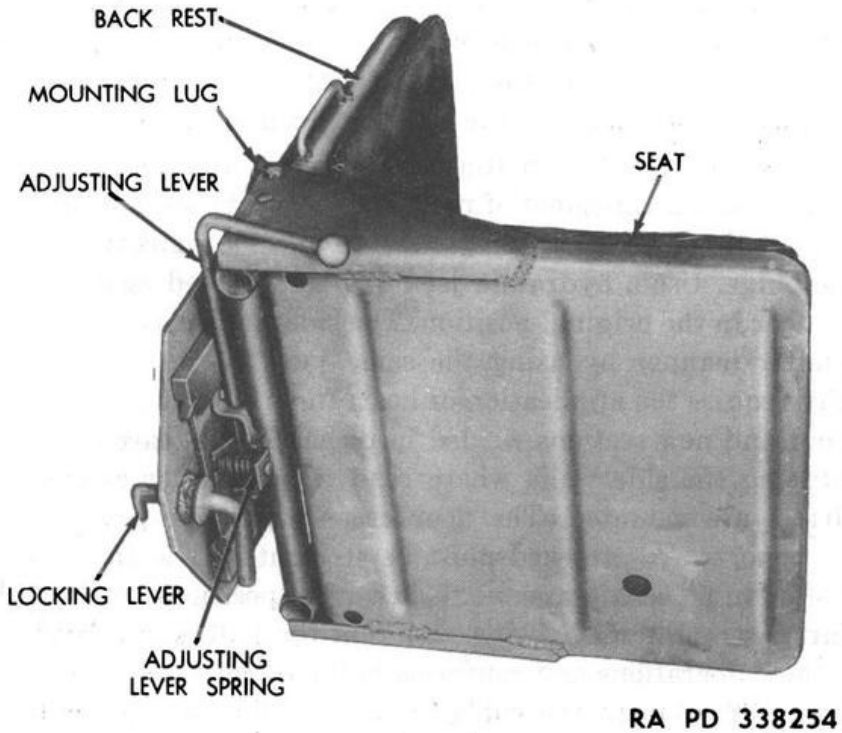

Figure 29. Gunner's seat—bottom view.

30. Shell Racks

Inspect shell racks to see that racks are in good condition, and free from dents, cracks, or broken welds (fig. 15). Weld any cracked welds or loose mounting brackets and straighten dents. The shell retainer must be straight and free from cracks. Install retainer on shell rack and see that it fastens securely to prevent shells from sliding out of racks during travel.

31. Inspection and Repair of Hull

a. GENERAL. The hull must be cleaned inside and out with steam or dry cleaning solvent to remove dirt, grease, and foreign matter. Scrape accumulated dirt from the corners. Clean all items in the hull thoroughly prior to inspection and repair. The alinement of the hull, as covered by the following procedures, consists of checking all surfaces of the hull on which the operating units are mounted and correcting distortion of those surfaces.

b. PLACE HULL ON STANDS. With hull stripped of all operating units, support the hull at each corner with stands of equal height on a level floor. If the floor is not level, shim stands until tops are level when checked with a straightedge and spirit level.

c. CHECK ALINEMENT OF HULL. When the hull has sustained an impact, such as might be caused by an accident or direct hit from shell fire, the side walls and floor plate will be distorted and welded joints cracked or broken. Check side walls and floor with a straightedge to determine where the distortion is centered. The dimensions necessary for checking the alinement of the hull are given in figures 30, 31, and 32.

d. STRAIGHTEN HULL AND REPAIR WELDS. If the floor is sufficiently bulged to cause misalinement of mounting brackets, support a steel beam across the ceiling of the hull projecting to the side walls if possible, just over the bulge. Use a hydraulic jack 41-J-118 braced against the beam to force floor in the original position. The side walls may be straightened in a similar manner by using the same jack. Large deep bulges will generally require the application of heat. In an emergency, sections may be cut out and new sections welded in place. Special care is required in straightening the side walls where road wheels, roller assemblies, and final drives are mounted. The floor areas where the power train and engine supports are attached must be straightened so that these units when bolted in place will assume their correct positions. Weld all broken joints after straightening, being sure that the hull is in a level position during these operations and conforms to the dimensions given in figures 30, 31, and 32. Cement the rubber crash-padding which has been torn loose from the hull or replace when badly damaged. To repair holes in the hull made by shell fire, refer to TM 9-2852 for welding procedure.

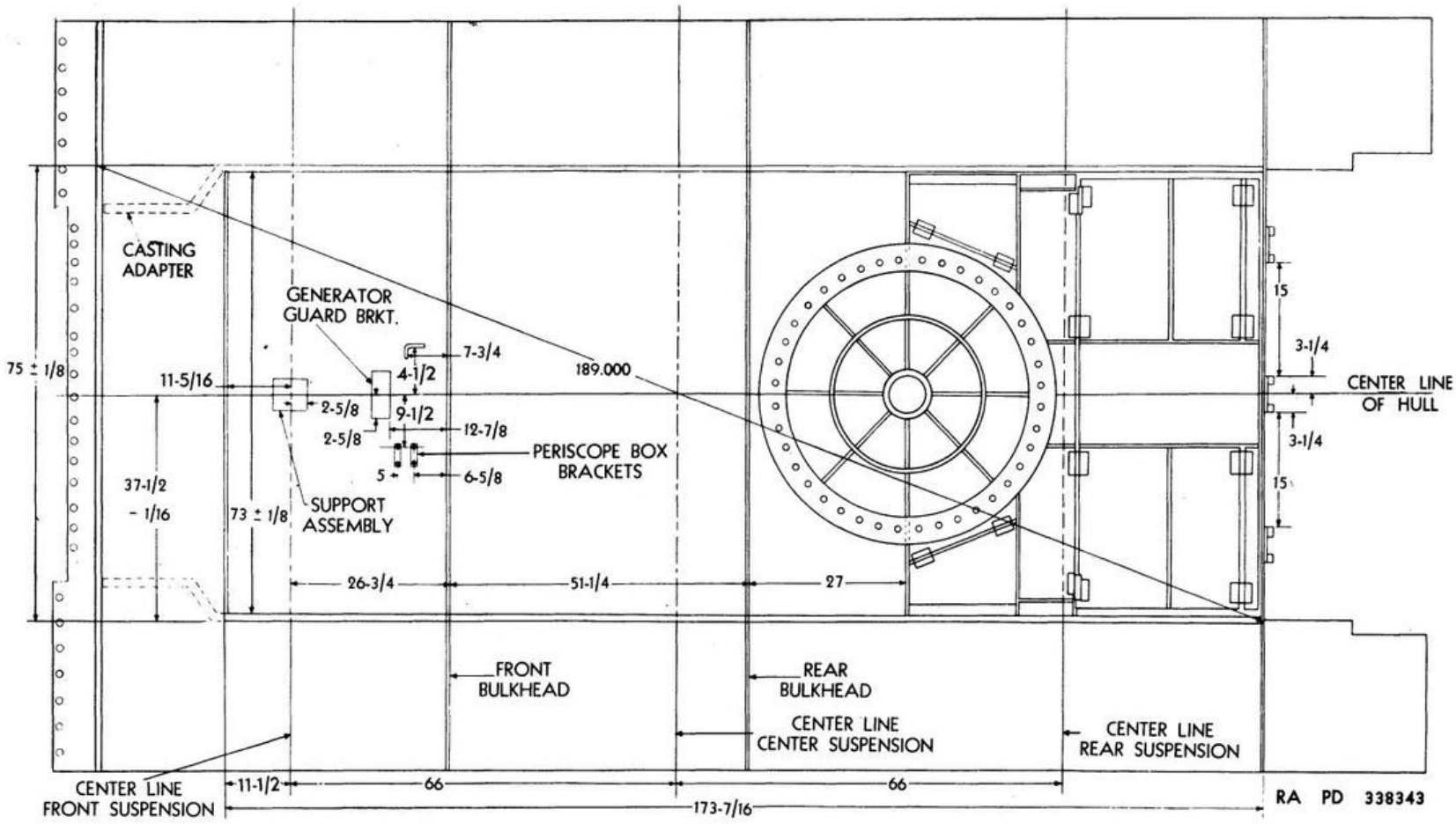

Figure 30. Hull—top view.

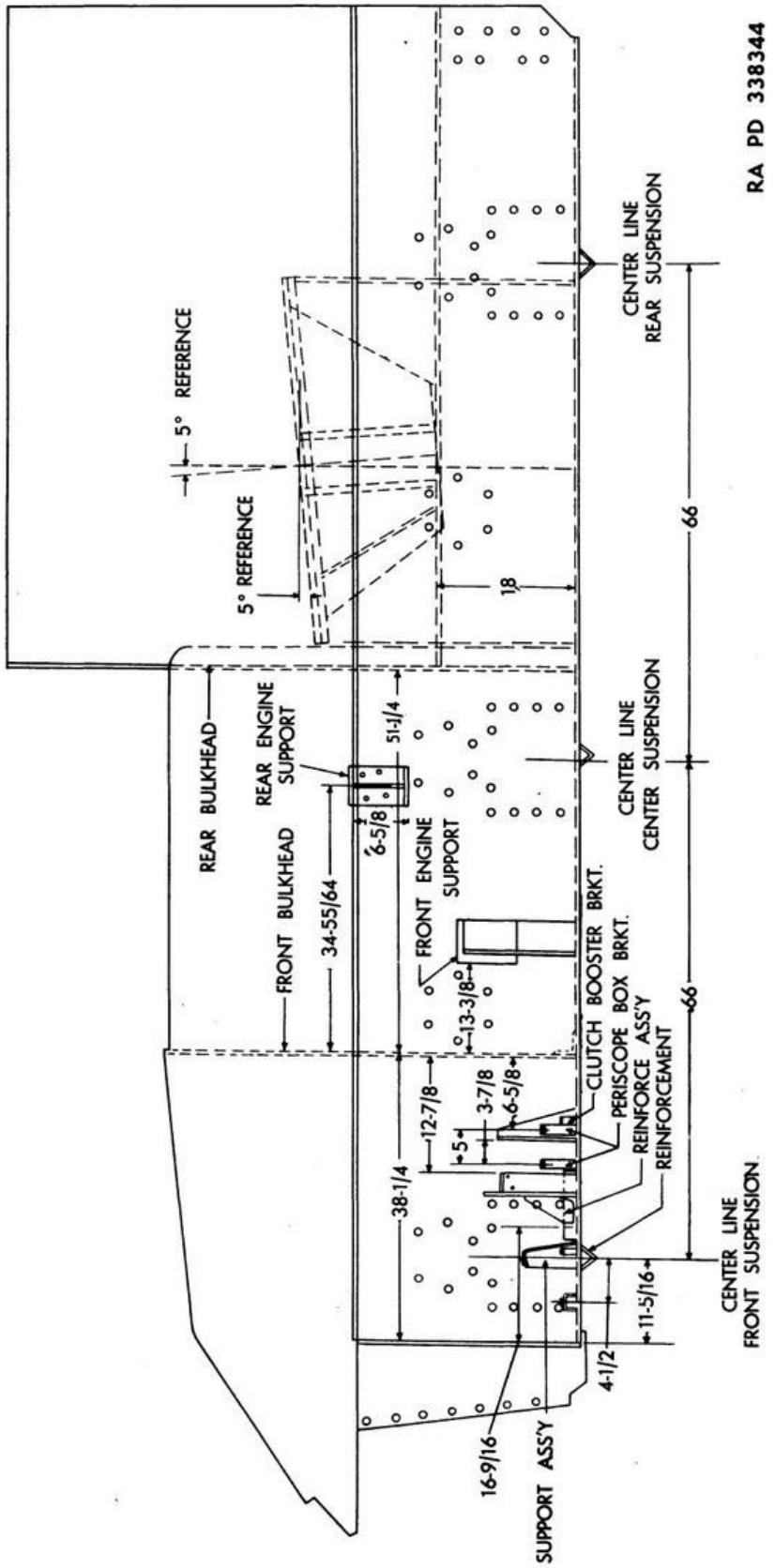

Figure 31. Hull—side view.

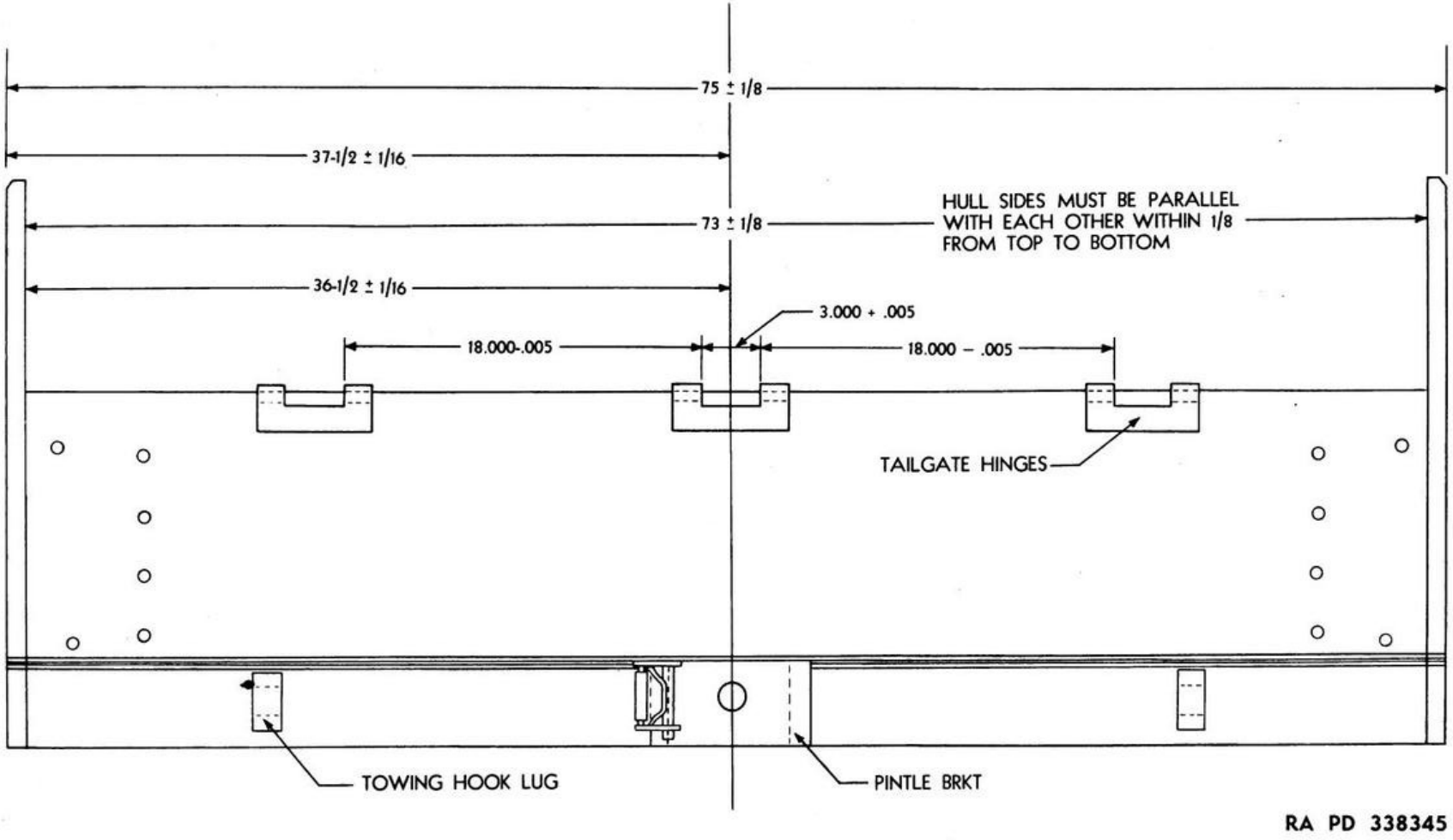

Figure 32. Hull—rear view

32. Miscellaneous Items on Hull

a. BRACKETS AND SUPPORTS. Inspect gun traveling lock saddle base brackets and brace rod brackets to see that they are solidly welded to the hull (fig. 13). Check to see that the gun breech anchor braces in fighting compartment are solidly anchored to hull, and that the threads of braces and eyes are in good condition. Check operation of gun traveling saddle catch lock. If spring is broken, replace with new spring.

b. MUD GUARDS AND MOUNTING BRACKETS. Straighten bent mud guards and weld holes or cracks when necessary. If mud guards are damaged beyond repair, replace. Check strap loops throughout the hull and repair if damaged. See that tarpaulin bows and mounting brackets are in good condition; repair if defective. Tap out all holes having burred threads. Boxes, fire extinguisher mounting brackets, and mounting bosses must be solidly welded in place. Inspect condition of asbestos lining of tunnel of fighting compartment; if damaged, replace.

c. DRAIN VALVES. Check the drain valves in the floors of all compartments for obvious damage, such as broken springs, cages, or valves. If valves are damaged, remove and repair as follows:

(1) *Remove drain valves from floor.* Hold valve in closed position by blocking it under the floor. From top side, compress coil spring until taper pin attaching the knob to valve stem is in the clear. Tap taper pin out of knob and stem by tapping on the small end of pin. Remove knob and spring, then remove blocks below releasing the valve; withdraw the valve.

(2) *Reseat valves.* Wash and check all parts. Springs, taper pin, knob, extension rod, and valve are replaceable. If the assembly is damaged beyond repair, replace the whole assembly. Reseat valves which fail to seat properly by applying valve grinding compound to valve, and grinding it in a valve seat in the same manner as grinding the valves in a gasoline engine.

(3) *Install drain valve.* Clean valve and valve seat after valve has been properly seated. Insert the valve in the cage from below, holding it in the closed position with a block. From above, locate the valve spring and knob over the stem, and force down the knob to compress the spring and aline the holes in knob and stem. Insert a taper pin through the holes and tap the pin lightly in place. Release the knob and remove block from under the valve. Lubricate the valve stem with engine oil. Test the valve for leaks.

d. ENGINE COVER. Inspect the air outlet grilles for damage. Repair broken grilles. Replace the canvas covers if torn. Straighten and reweld bent or broken lifting handles. Open and close the grilles and note whether they bind upon the sides of the opening or upon each other. Binding will result if the covers are bent; check with a straightedge. Use a hydraulic press to remove any distortion in cover plate. Check the air ventilator shutter assembly hold-down clamps to see that threads

of studs are in good condition and that clamps are straight. Cut off damaged or broken studs and weld new ones in place. Inspect all strap loops and fixtures for mounting pioneer tools, shovels, crow bars, etc., and repair or replace.

e. Oil Cooler Shutter Assemblies (Fig. 12). Inspect the shutter assemblies to see that the deflectors are in good condition. Straighten any of the deflectors which are bent or bind on sides of frames. Check to see that actuating cranks on deflectors are solidly fastened to each deflector and that pivot rods are tightly crimped. Straighten frame if it hinders the operation of deflectors. Check the shutter spring and lock pin to see that they are in good condition.

f. Tool and Stowage Boxes (Figs. 33 and 34). Check tool and stowage boxes for dents, holes, broken hinges, and latches. Straighten dents in boxes and covers, weld holes or cracks if necessary, and repair or replace unserviceable hinges and latches.

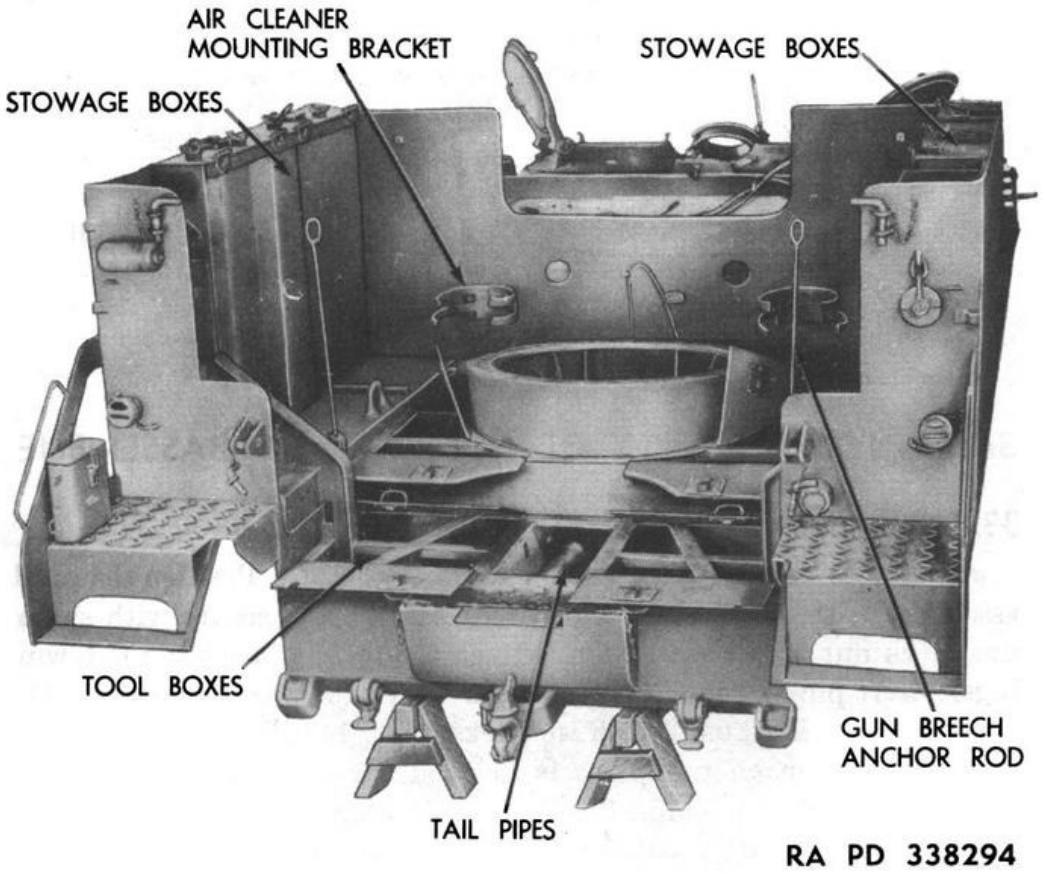

Figure 33. Tool, ration and stowage boxes.

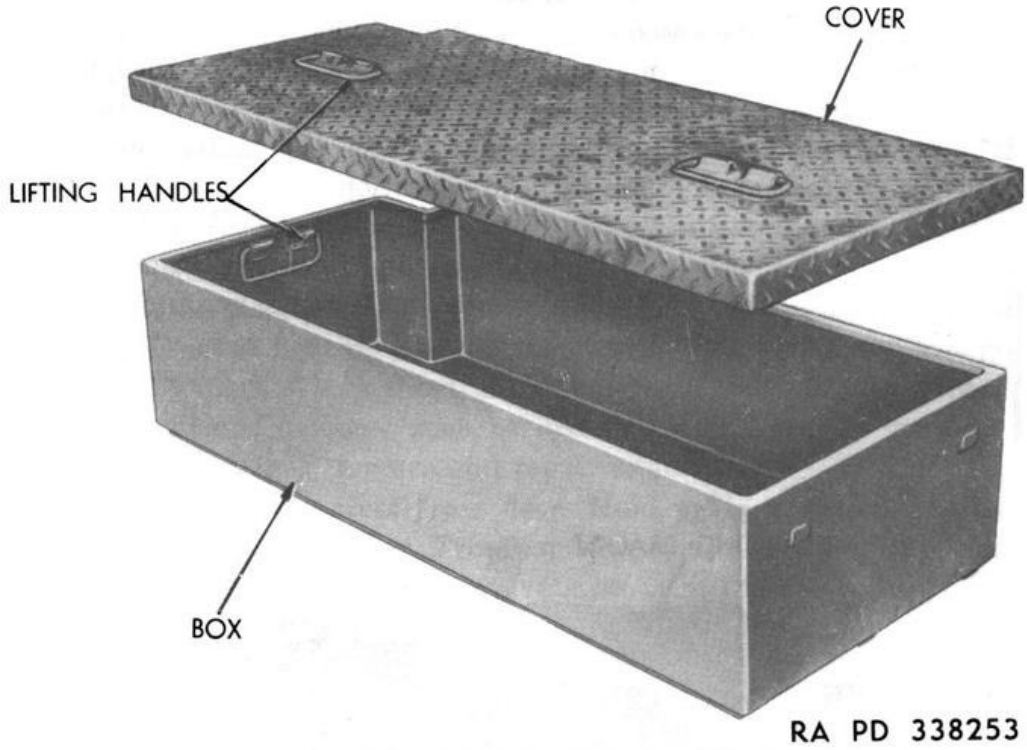

Figure 34. Stowage box.

Section IV. ASSEMBLY OF HULL FROM SUBASSEMBLIES

33. Assembly

a. INSTALL TOWING HOOKS AND PINTLE ASSEMBLY. Position the pintle assembly in the pintle bracket on rear of hull and secure with slotted nut. Lock nut with a cotter pin. Attach the towing hooks to the towing lugs. Insert pins through lugs and lock with hairpin retainers (fig. 11).

b. INSTALL EXHAUST AND TAIL PIPES (FIG. 14). Be sure that the asbestos insulation on tail pipes is in good condition. Insert tail pipes in tunnel of fighting compartment from the rear. Connect flanges of tail pipes to exhaust outlet with screws. Secure each tail pipe in tunnel with three clamps. From inside of engine compartment, install flexible exhaust pipes to tail pipes and secure with clamps. Position center floor plate over pipes and secure with screws.

c. INSTALL SHEAVE AND CABLE ROLLER ON HULL (FIG. 11). Position cable sheave in yoke on rear of hull and insert sheave pin. Slide flat

washer over pin and lock with a cotter pin. Slide a flat washer over cable roller pin. Hold roller between roller brackets on left rear end of hull and insert a pin through brackets and roller. Place a washer over pin and secure pin with a cotter pin.

d. INSTALL SPADE WINCH (FIG. 35). Attach a sling cable to the spade winch and hoist it in position on rear of hull. Install cap screws which secure winch assembly to bosses on rear wall of fighting compartment and tighten securely. Remove hoist and sling.

e. INSTALL LOADING RAMP AND TAILGATE (FIG. 11). Fasten sling cable to rear end of tailgate and loading ramp assembly and attach a hoist. Raise the assembly to a vertical position on rear end of hull, aline hinges of tailgate with those on hull, and tap in hinge pins. Aline lugs on each side of tailgate with the brackets on each side of hull and install tailgate lock pins.

f. INSTALL SPADE ASSEMBLY (FIG. 10). Position spade assembly behind hull. Lift spade arms with hoist and aline the anchor pin holes in the arms with those of the lugs on the idler bracket. Install and aline necessary number of shims to reduce side play between spade arms and idler bracket lugs and insert spade anchor pins. Lock the pins with cotter pins; then remove hoist and sling. Secure winch cable to anchoring eye on the right corner of the spade. Thread loose end of cable through sheave on right rear of hull, then back through sheave on the right corner of spade, through sheave on left corner of spade, and over roller

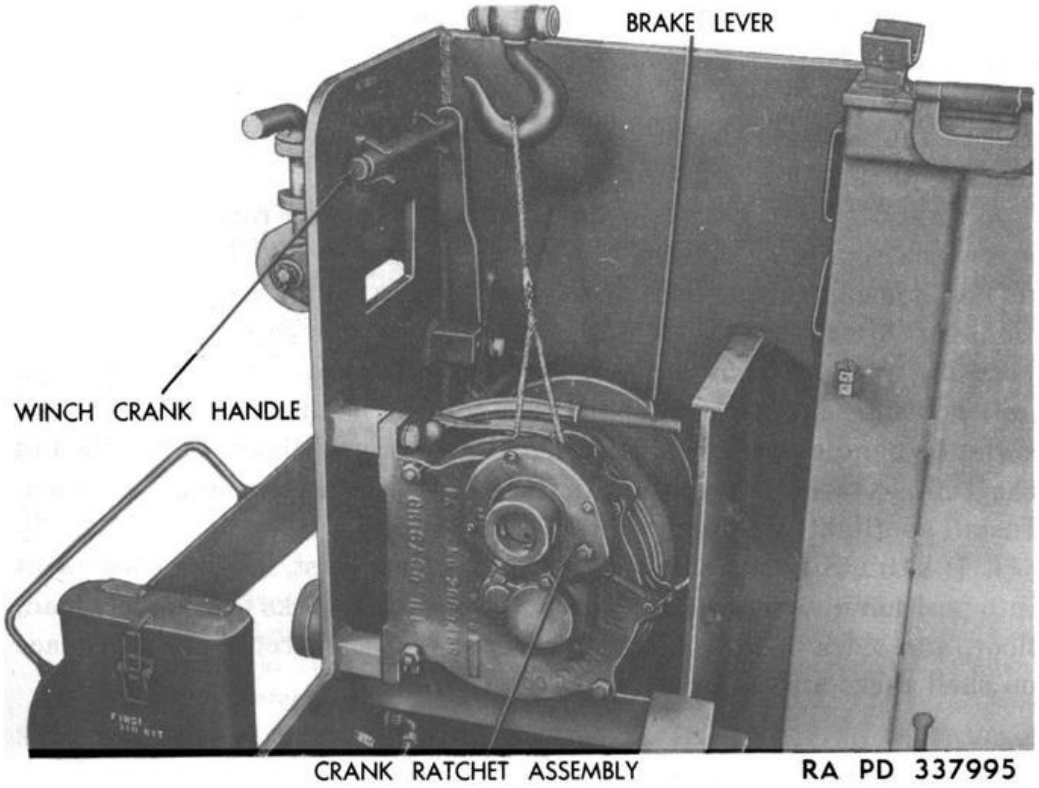

Figure 35. Installing spade winch.

on left rear of hull. Secure end of cable to winch brake drum with U-bolts. Install winch crank handle and wind cable onto drum; continue to wind cable until the spade assembly is raised to traveling position. Be sure the locking links are hooked over the locking link bracket pins, or that winch is locked with pawl before removing crank to prevent spade from dropping accidentally. Insert spade locking link bracket lock pins to prevent the links from unhooking.

g. INSTALL CUPOLA HATCH ASSEMBLY. Attach sling cable and hoist to the cupola assembly and lift the assembly into position over driver's or assistant driver's seats. Coat hull and cupola base with joint sealing compound. Lower the assembly onto hull, alining the holes at the same time so that door hinge will be in position as shown in figure 4. Secure base to hull with oval-head bolts.

h. INSTALL GUN BARREL TRAVELING LOCK (FIG. 13). Attach a sling cable and hoist to the lock saddle and raise the saddle into position on hull. Support weight of saddle and aline mounting holes in saddle hinges with holes in saddle hinge brackets on the hull. Insert hinge pins. Place flat washers over the pins and lock with cotter pins. Fasten gun lock brace rods to saddle and brackets on hull with U-bolts. Lower the saddle and secure with saddle catch lock. Remove hoist and sling.

i. INSTALL OIL COOLER SHUTTER ASSEMBLIES (FIG. 12). Install oil cooler shutters in position on bulkhead behind driver's and assistant driver's seats. Secure the shutters to bulkhead with cap screws at top and bottom.

j. INSTALL DRIVER'S SEATS. Locate driver's seat on mounting base and secure with bolts, nuts, and lock washers. Secure the tilting base of assistant driver's seat to the floor with cap screws and lock washers. Install the assistant driver's seat on the tilting base and secure it with bolts, nuts, and lock washers.

k. INSTALL SPOTLIGHT AND/OR CONTROL HANDLE. From inside of hull, screw the spotlight housing in the mounting boss and loosen the wing nut on housing. Aline holes and install screws in housing and base and tighten. On the outside of hull, remove protector cap from mounting boss and replace on retainer. Insert spotlight shaft in mounting boss and housing. On inside of hull hold control handle lock pin out and slide the handle on end of shaft. Turn handle until holes in handle and shaft aline, then release lock pin, being sure it seats in locked position. Install spotlight wire connector in outlet socket.

l. INSTALL SHELL RACKS (FIG. 15). Using a hoist, lift the shell racks into position in fighting compartment. Secure the racks to rear bulkhead, floor, and sides of hull with cap screws. Lift shell retainers into place on shell racks and secure with locking pin.

CHAPTER 6
TRACKS AND SUSPENSION

Section I. DESCRIPTION AND DATA

34. Description

The suspension system (fig. 36) includes the horizontal volute springs and shock absorbers, single and double track support rollers, rear idler wheels, track drive sprockets and hubs, and the steel and rubber tracks used with this type of suspension system. The track drive sprockets are bolted to the hubs which are attached to the track drive sprocket shafts at the front. The intermediate upper section of each track is supported by fire rollers mounted on brackets bolted to the side of the hull. The vehicle is supported on six suspension assemblies which are bolted to the hull. Two large volute springs, placed horizontally at the top of each suspension, are held in place by the hinged spring seats at the upper end of each suspension arm which is pivoted on the suspension bracket in rubber bushings. The road wheels, mounted on shafts at the lower end of each arm, roll on the upper surface of the section of track which is in contact with the ground. As the track follows the contour of the ground and the road wheels are raised, the upper end of the suspension arm moves in, compressing the volute springs and moves out as the road wheel is lowered into a depression. The spring action is controlled by a heavy-duty telescopic-type hydraulic shock absorber connected across the top of each pair of suspension arms. The track is guided as it passes over the idler wheel by center guide lugs. On the steel tracks these lugs are cast integral with the steel links. On the rubber type tracks they are separate parts bolted across the link pins at the center, acting as a connector. The steel track and rubber track are interchangeable but only like tracks made up entirely of the same links must be used on both sides of the vehicle. The proper track tension is maintained by adjusting the position of the rear idler wheel which is mounted on an eccentric shaft in the bracket at the rear of the hull.

35. Data

Volute springs	12
Number of active coils (each)	5
Normal free height	14 in.
Assembled height (approximate)	10 in.
Maximum diameter	8 in.
Shock absorbers	6
Type	Hydraulic telescopic
Length of travel	3¼ in.
Fluid capacity (each)	63 plus or minus ½ oz.

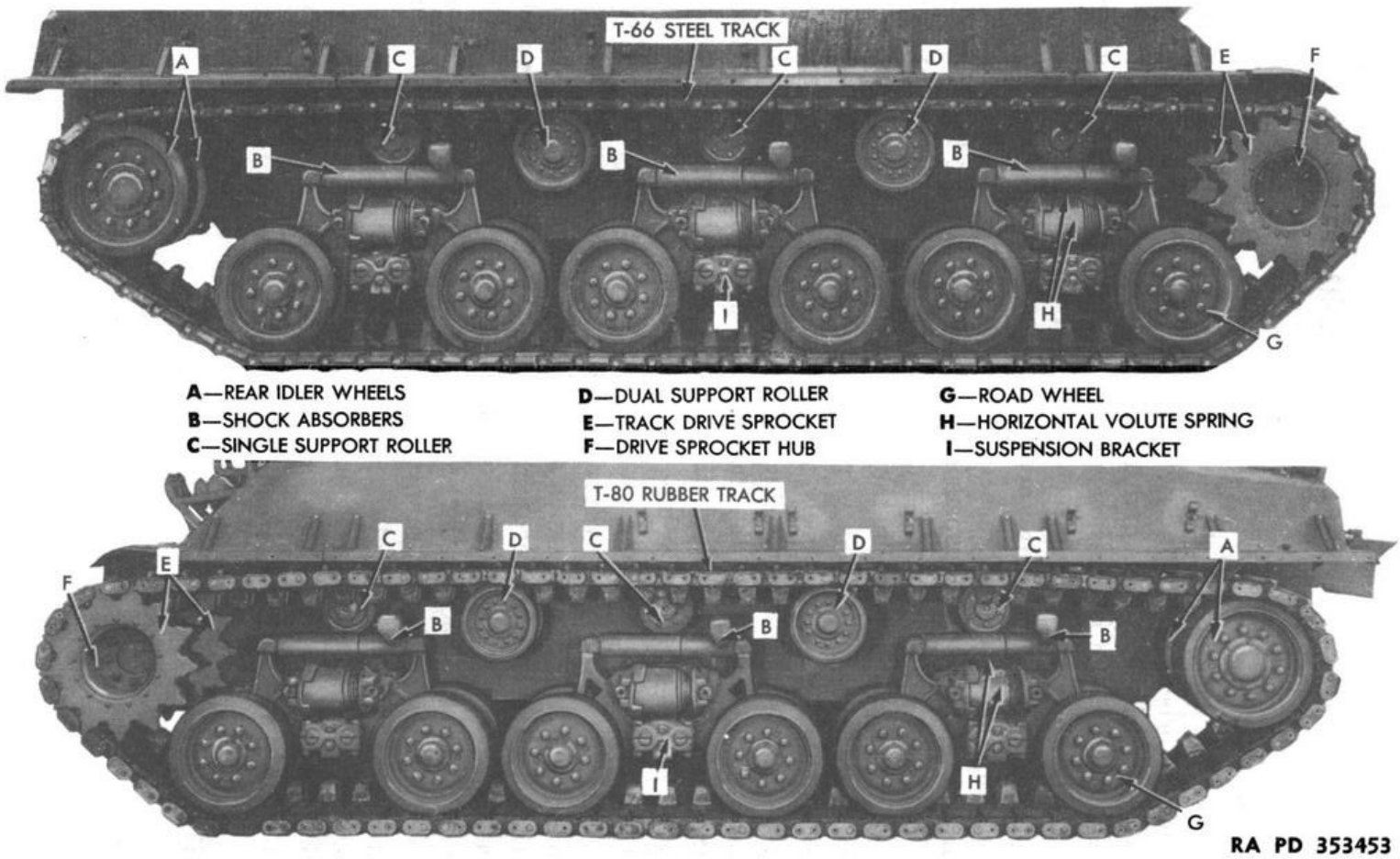

Figure 36. Tracks and suspension system.

Road wheels	24
Tread diameter	20½ in.
Single track support rollers	8
Tread diameter	13½ in.
Track rear idler wheels	4
Tread diameter	22 in.
T–66 steel tracks (used on some carriages)	2
Type	T–66
Shoes per track	87
Track pitch	6 in.
Shoe assembly angle	¼ deg.
Type of center guide	Cast integral with track shoe
Type of grouser	Cast integral with track shoe
Width of track	23 in.
T–80 rubber track (used on some carriages)	2
Type	T–80
Links per track	79
Track pitch	6 in.
Link assembly angle	7 deg.
Type of center guide	removable
Type of grouser	welded
Center guides and caps per track	87
End connectors and wedges per track	174
Width of track	23 in.

Section II. TRACKS

36. T–66 Steel Tracks

a. DESCRIPTION. The track is held in position by center guide lugs cast integral with each track link of the shoe assembly (fig. 37). These lugs keep the track in line as they pass between the dual road wheels, idler wheels and support rollers. Track links are male and female hinge type; two male hinges mating with the two female hinges of the next link (fig. 37). Each link pin is held in place by four lockpins with flat tapered sides which engage depressions machined in the link pins. The link pin holes contain bushing tubes and hollow rubber bushings, which are bonded to the inside walls of the tubes. Each tube has two keys which engage individual keyways milled in the track link pin.

b. INSPECTION. Clean tracks before inspection with steam and dry cleaning solvent. Tracks are considered serviceable if the grouser is more than ¼ inch in height (for overseas use) or ⅛ inch (for domestic use). If part of the chevron is broken off, the track is still serviceable if 75 percent of the chevron is in good condition. Inspect steel block for cracks, and replace if cracks are over ½ inch long. Backplates of track must not be dished more than $\frac{1}{16}$ inch.

c. TRACK LINK REMOVAL. Position vehicle on level ground with track link to be removed between the drive sprocket and front road wheel. Remove rear fender and release track tension by shifting position of

idler wheel shaft at the idler wheel bracket (par. 10). Drive the four track link lock pins (A, fig. 38) out of the adjacent track links, using punch 41–P–3936. Use a 10-inch drift 41–D–1545–205 and start link pin (B, fig. 38). Position track connecting fixture 41–F–2997–388 and adjust it to release strain on link pin (C, fig. 38). Use 15-inch drift 41–D–1545–210 and drive link pin out. Remove track connecting fixture. Use above method to remove the link pin which attaches the defective track link to end of the track. After serviceable track link is connected to end of track, use connecting fixture 41–F–2997–388 to draw ends together and aline holes in track links. Install link pin in track link and aline flat spots on link pin with lock pin holes. Then secure pin by tightly installing the four taper lock pins in the track link.

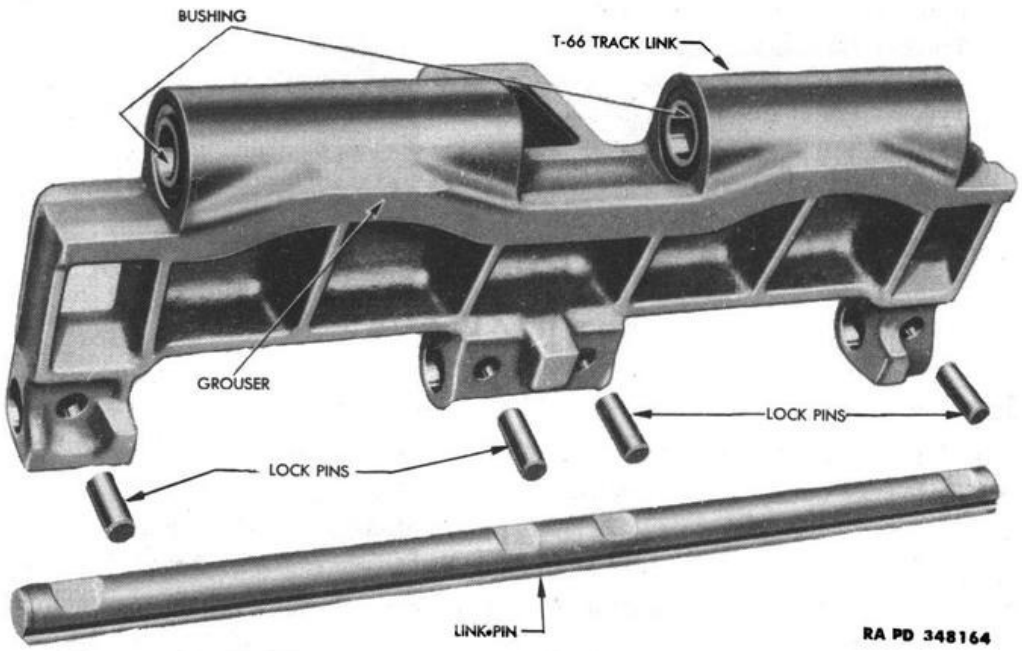

Figure 37. Steel track link.

Caution: Do not use engine hand crank or starter to draw ends of track together, as this may cause the engine crank shaft to be sprung out of line.

d. Track Installation. Disconnect track between drive sprocket and front road wheel (*d* above). Connect new track to lower section of old track, with new track laid on the ground ahead of vehicle. Tow vehicle ahead until front road wheel is on the fifth track link from the end of the new track. Disconnect old track from new track at rear of vehicle. Lift end of new track over idler wheel and install tow cable. Pull track forward over idler wheel and support rollers with tow cable attached to towing vehicle. Connect the track (*d* above). Adjust track tension (par. 12 *i*).

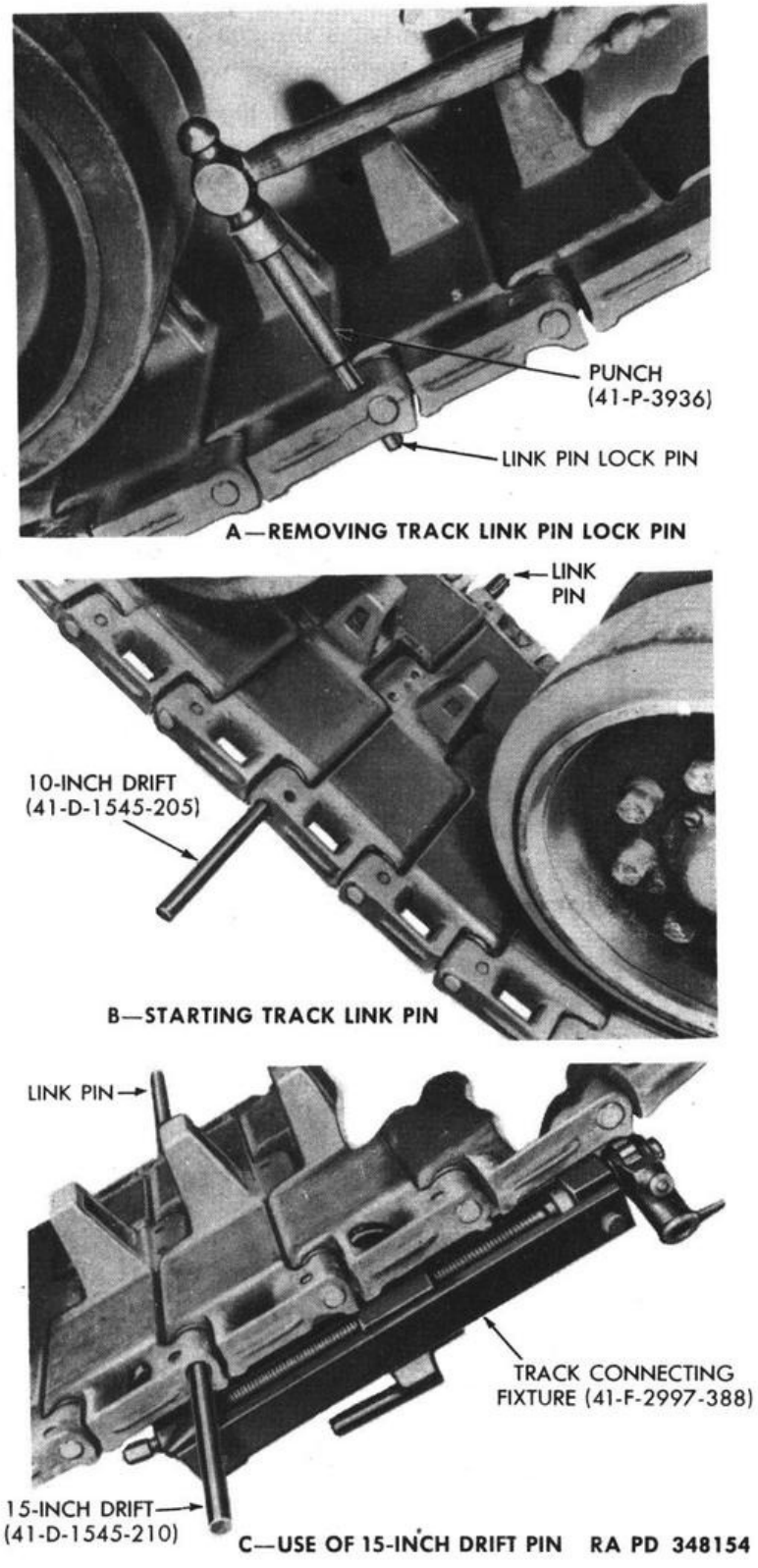

Figure 38. Removal of link from steel track T–66.

37. T–80 Rubber Tracks

a. DESCRIPTION. The T–80 rubber track has rubber on the surface of that side of the link which contacts the road wheels and idlers. The opposite side of the link has a steel grouser welded to the back which provides traction. Each track link (fig. 39) is connected to the adjacent link (fig. 40) by means of two end connectors and a detachable center guide. The end connector wedge (fig. 39) engages the flat surface of the adjacent link pins and prevents the link pins from turning as the track operates. These link pins are not removable. The rubber, which surrounds the link pin, absorbs the torque during operation of the track.

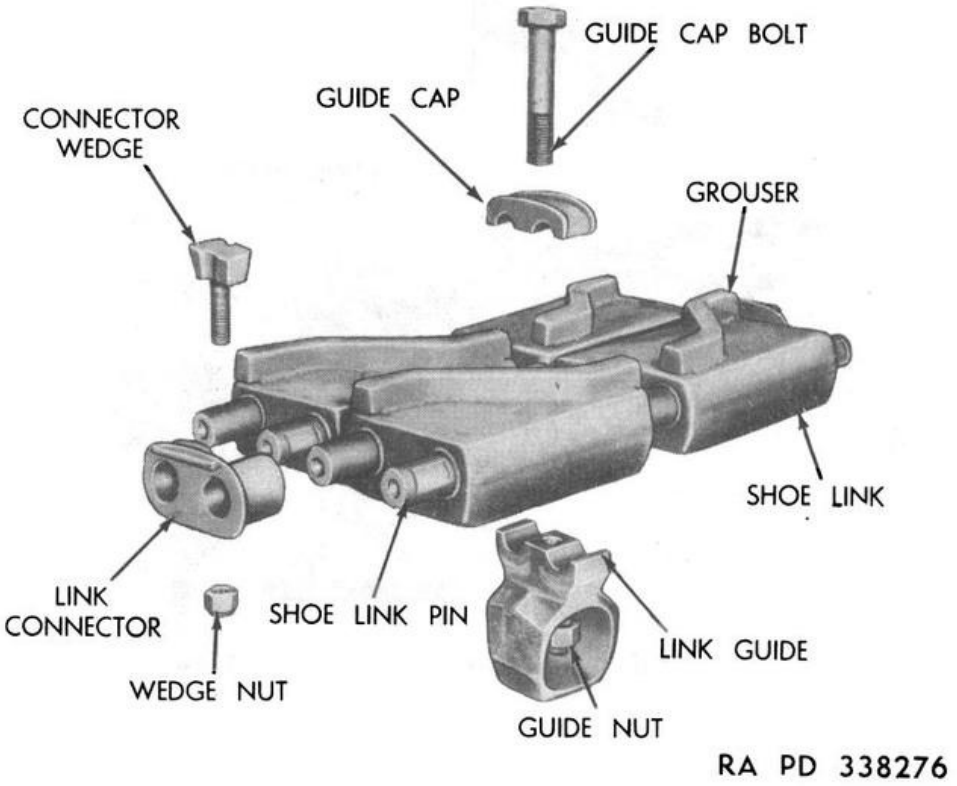

Figure 39. Two links of T–80 track—exploded.

b. INSPECTION. Tracks are considered serviceable if grouser chevrons are more than $\frac{7}{8}$ inch in height (for overseas service) or $\frac{1}{2}$ inch in height (for domestic service). Clean tracks before inspection. Inspect the tracks for cracks, damaged rubber bushings which allow link pins to be loose and cracked or worn connectors. Replace damaged or worn links and links that have dropped out of line. Tighten wedge nuts to 80 foot-pound torque. Replace connectors that are worn more than $\frac{3}{16}$ inch.

c. TRACK SEPARATION. Position vehicle on level ground with link to be removed between the drive sprocket and the front road wheel. Remove the two end connector wedges from the inner and outer connector

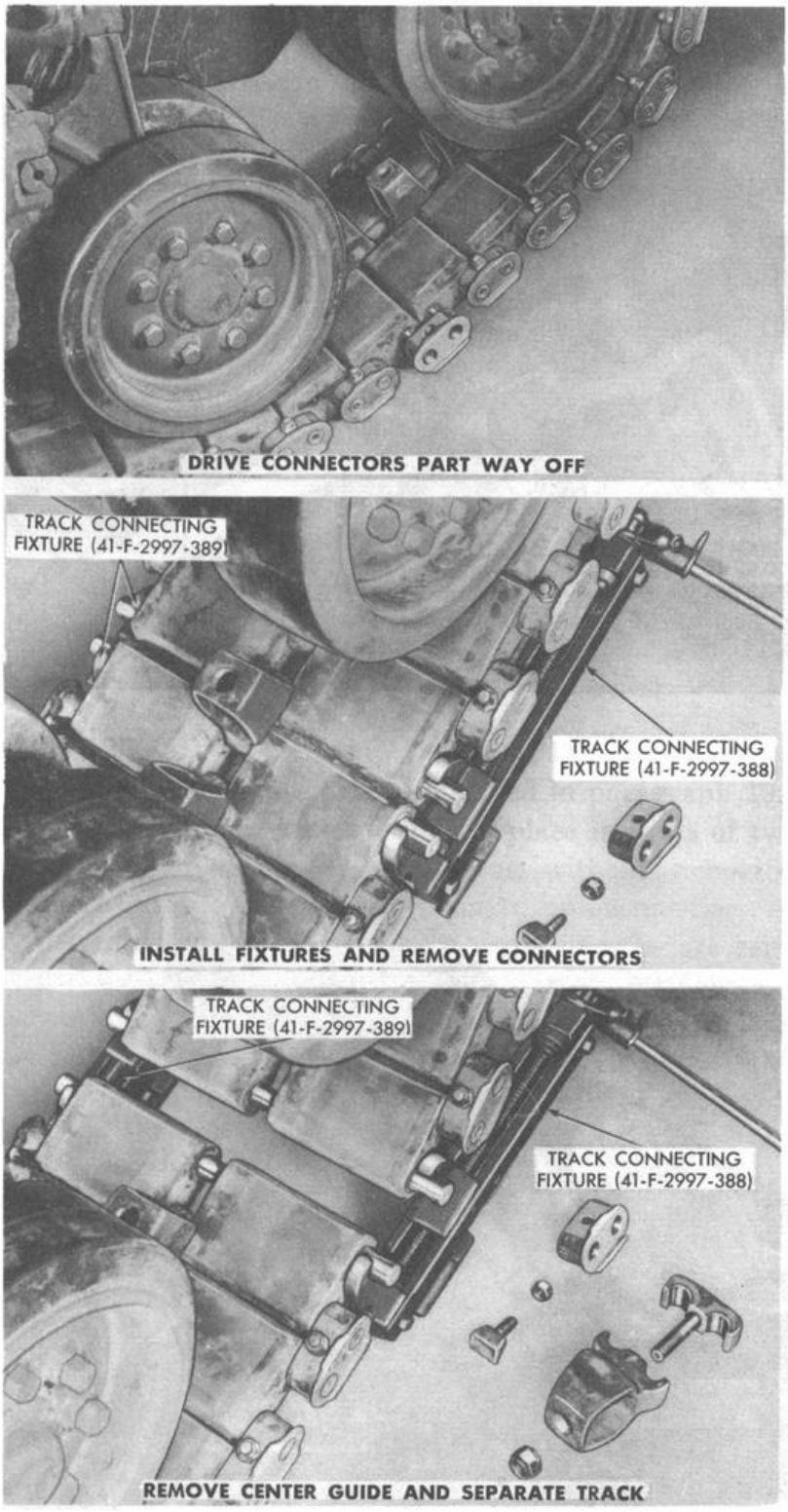

Figure 40. Separation of T–80 track.

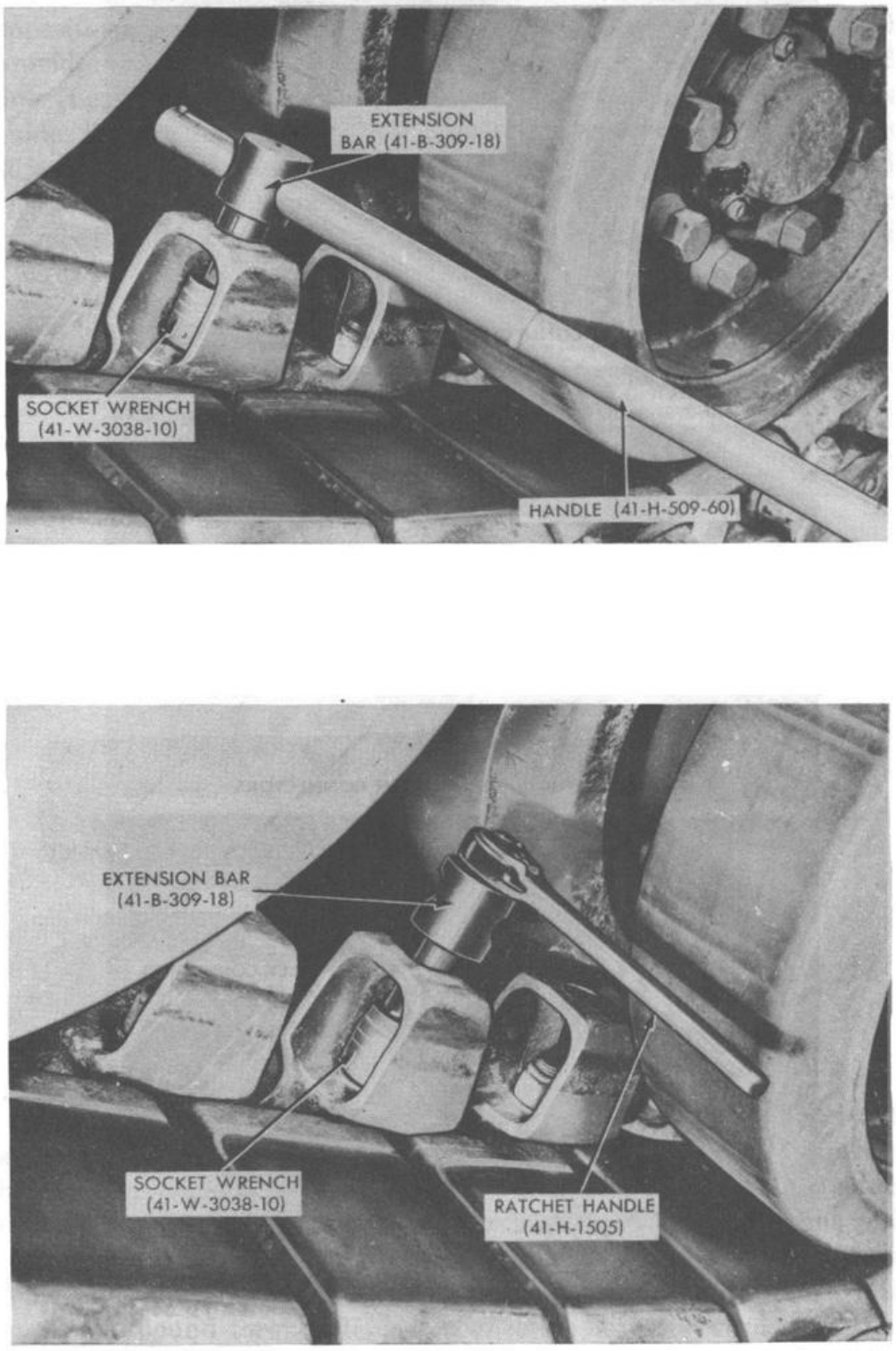

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Figure 41. Removal of center guide.

of the link to be removed. Drive both end connectors part way off the link pins to accommodate the jaws of the track connecting fixture (fig. 40). Install and adjust track connecting fixture 41–F–2997–388 to remove tension on end connectors. Drive both end connectors off the pins. Loosen and remove center guide nut and remove the guide.

d. Track Link Removal. Proceed as in *c* above only install the track connecting fixture across two end connectors on the inner side and two on the out side, and remove two center guides (fig. 41). Lift off the defective link leaving the two track connecting fixtures in place until serviceable link is installed.

e. Track Link Installation. With track connecting fixtures in position as in *d* above place the serviceable link and secure by tightly installing the two center guides. Slide the four end connectors on the pins as far as possible. Remove the outer track connecting fixture, drive the two connectors to position and secure by tightly installing the connector wedges and nuts. Remove inner fixture, drive the two inner connectors to position and secure by installing the two connector wedges and nuts. Adjust track tension (par. 12 *i*).

38. Inspection

a. T–80 Track. Clean all parts as outlined in paragraph 19. If track shoes are damaged or are unserviceable, replace in units of two. If impracticable, perform minor reconditioning without removing tracks from vehicle. Replace badly worn or damaged link connectors. Allowable wear on driving surfaces of track link connectors before replacement ranges from $\frac{1}{16}$ to $\frac{1}{8}$ inch in depth. Wear on track link connectors must be held below the minimum tolerance except in cases of badly worn tracks with limited life (for domestic use) where it would not be practical to replace connectors. In no case should wear be allowed to exceed the maximum wear tolerance, as wearing surfaces worn over $\frac{1}{8}$-inch

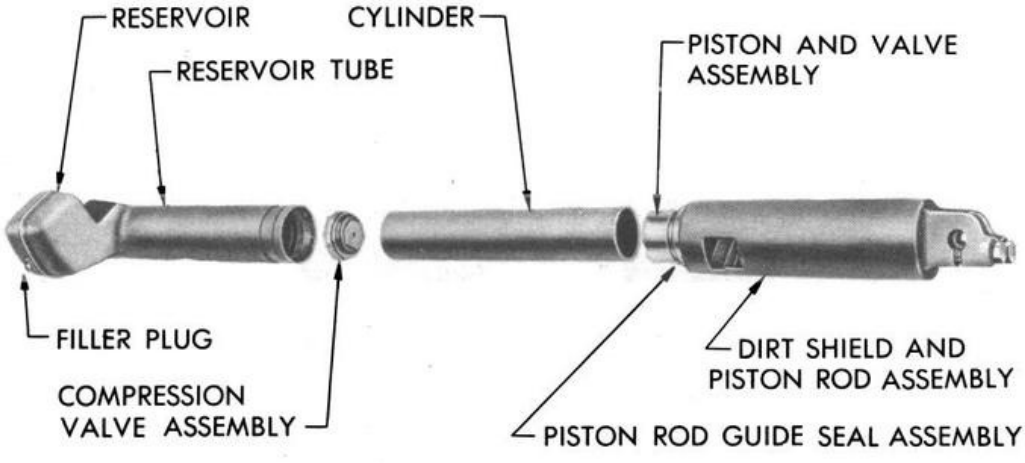

Figure 42. Disassembling shock absorber.

cannot be reclaimed. In above case replace connectors with used connectors having approximately the same wear as those removed. If wedge bolts are unserviceable due to jammed ends or damaged threads and replacements are critically short, they may be reclaimed by tip-grinding and chasing the threads. Replace center guides that are badly worn or damaged. The minimum thickness of center guide at tire contact point is $\frac{5}{16}$ inch.

b. T–66 TRACK. Tracks are considered serviceable if the grouser is more than $\frac{1}{4}$ inch in height (for overseas use) or $\frac{1}{8}$ inch in height (for domestic use). If part of the grouser is broken off, the track is still serviceable, if the 75 percent of the grouser is in good condition. Inspect steel blocks for cracks, and replace if cracks are over $\frac{1}{2}$ inch long. Back plates of steel tracks must not be dished more than $\frac{1}{16}$ inch.

Section III. SHOCK ABSORBERS

39. Disassembly

a. REMOVE PISTON ASSEMBLY AND CYLINDER (FIG. 42). Clean the shock absorber thoroughly before disassembling. Stand the shock absorber vertically and clamp the reservoir end forging in a vise. Bend the metal tabs away from the windows in the dirt shield and extend the shock absorber to its fullest extent, using a hoist and cable as illustrated (fig. 43). Remove the set screw that holds the outer locking ring in the reservoir tube (fig. 43). Exercising care to avoid damage to the

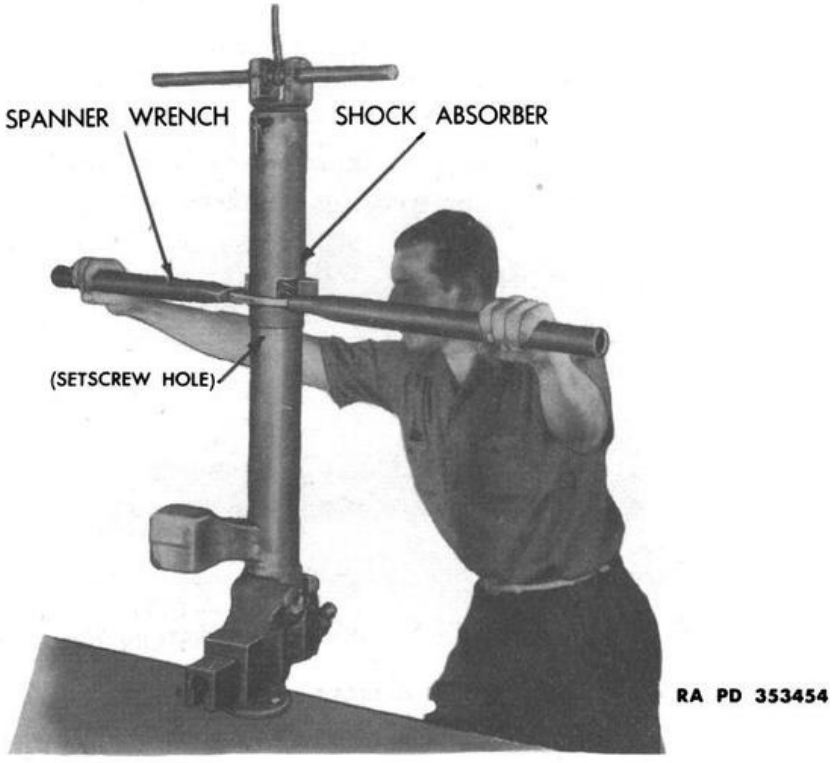

Figure. 43. Removing outer locking ring.

seal, insert a spanner wrench through the window in the dirt shield and unscrew the outer locking ring (fig. 43). Carefully separate the reservoir tube gasket from the gasket support washer to avoid any damage to the gasket, and raise both the gasket and support washer to provide clearance for a spanner wrench. Exercising care to avoid damaging the seal, insert a spanner wrench through the window in the dirt shield second time and unscrew the inner locking ring. Pull the piston and cylinder assembly out of the reservoir tube. Remove the reservoir tube from the vise, and pour out the fluid.

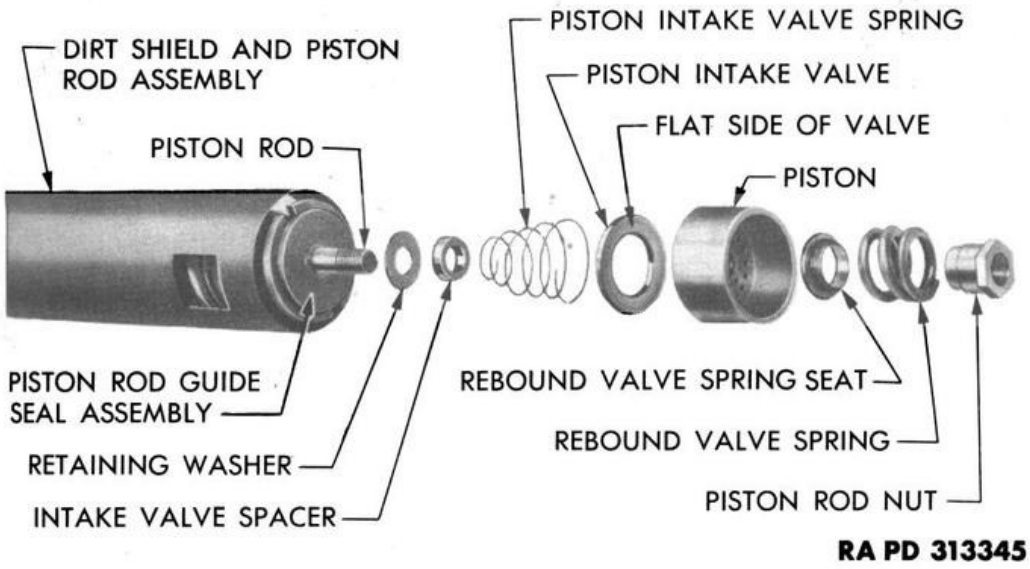

Figure 44. Disassembling piston and piston valves on piston rod.

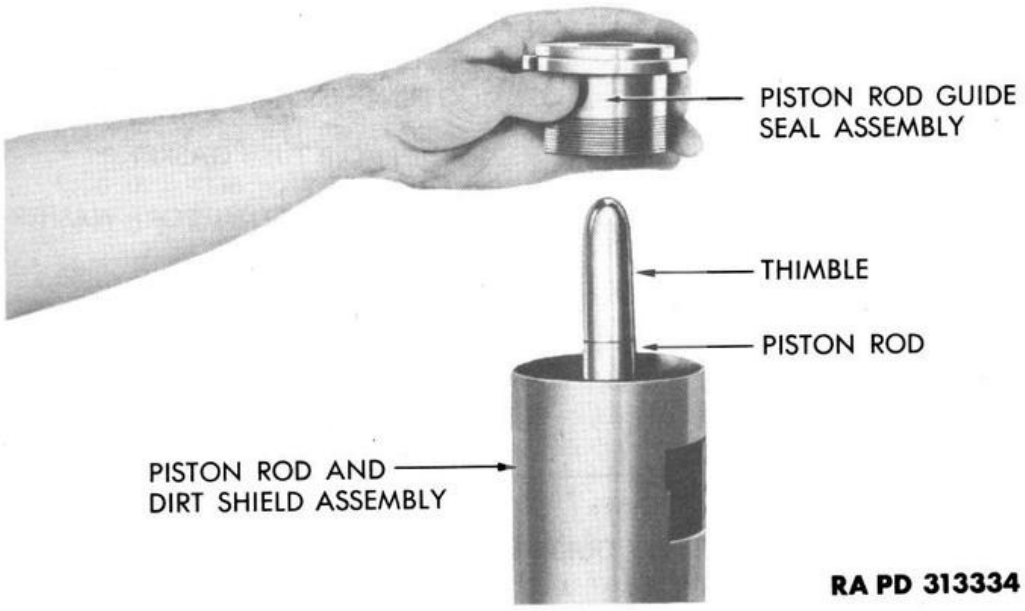

Figure 45. Removing guide and seal assembly.

b. Remove Cylinder and Compression Valve (Fig. 42). Pull the cylinder out of the dirt shield until the piston rod guide and seal assembly is exposed. Push a small pin through one of the holes in the compression valve body to lift the intake valve off its seat, and drain the fluid from the cylinder. Carefully tap against the shoulder of the piston rod guide and seal with a brass drift and hammer.

Caution: Do not clamp the cylinder in a vise. When the piston rod guide and seal has been removed, insert a piece of hardwood through the cylinder, and tap the compression valve out of the opposite end of the cylinder.

Note. Exercise care so that the interior of the cylinder does not become damaged.

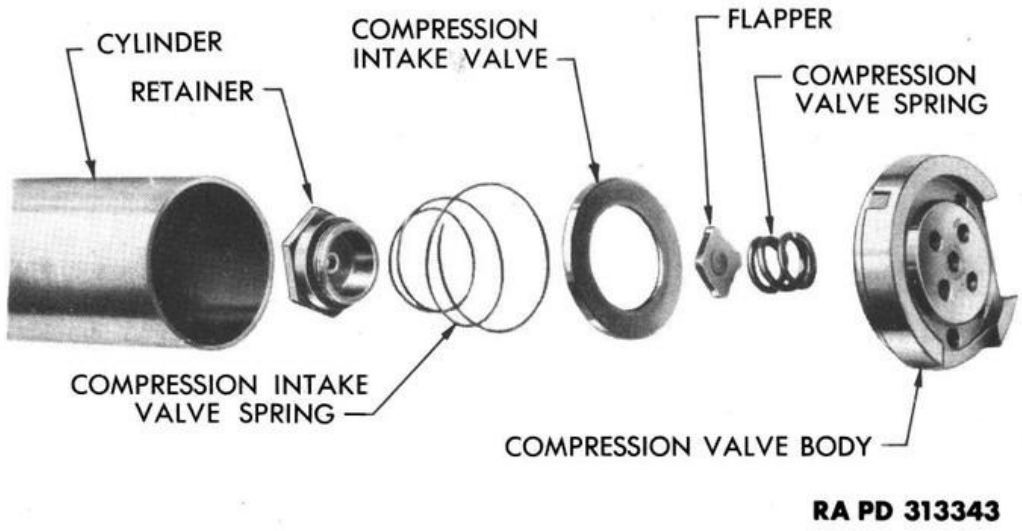

Figure 46. Disassembling compression valve.

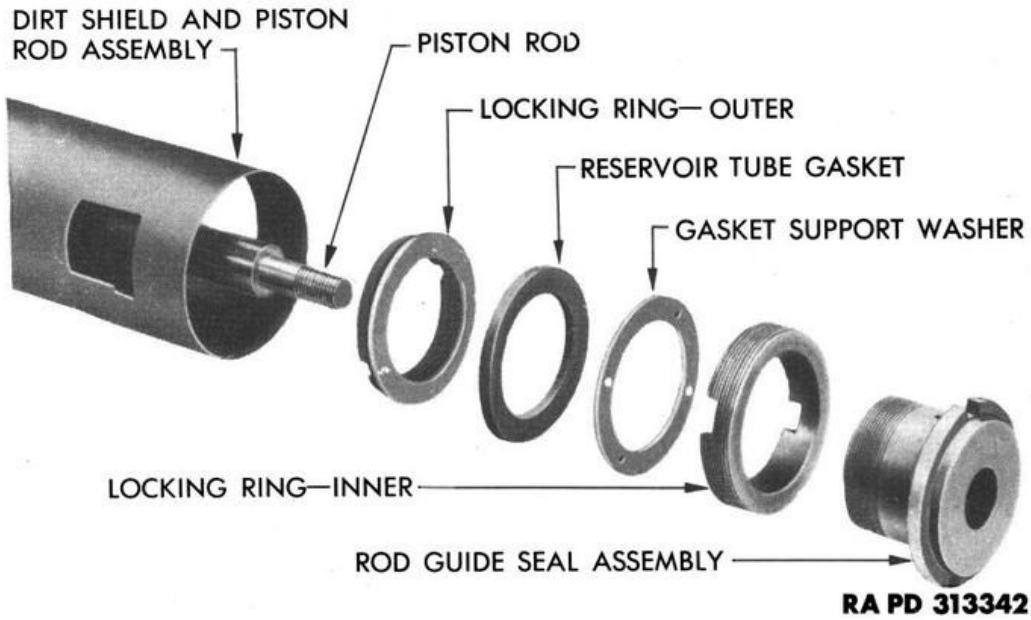

Figure 47. Installing piston rod guide seal and locking rings.

c. DISASSEMBLE PISTON AND PISTON VALVE ASSEMBLY (FIG. 44). Clamp the forged end of the piston rod and dirt shield assembly in a vise with the piston up. Remove the nut that holds the piston on the piston rod. Remove the rebound valve spring, spring seat, piston, intake valve, intake valve spring, spacer, and retaining washer.

d. REMOVE PISTON ROD GUIDE AND SEAL ASSEMBLY (Fig. 45). Place the seal protector thimble on the end of the piston rod. Hold the thimble firmly in position and slide the guide and seal assembly off the piston rod. Remove the thimble. Remove the piston rod and dirt shield assembly from the vise, and let the inner and outer locking rings, gasket support washer, and gasket fall out.

c. DISASSEMBLE COMPRESSION VALVE ASSEMBLY (FIG. 46). Clamp the valve body in a vise having copper jaw protectors. Unscrew the retainer from the body. Remove the intake valve spring, flapper, intake valve, and compression valve spring.

40. Cleaning, Inspection, and Repair (figs. 42 and 44)

Remove the filler plug in the reservoir, flush the reservoir and reservoir tube, and blow out with air. If the piston rod guide and seal assembly is scored on the bearing surface, or if there was evidence of leakage prior to disassembly, replace the piston rod guide and seal assembly, and the piston rod and dirt shield assembly. Inspect the piston rod nut and spring seat. If the spring seat does not fit snugly around the nut, replace the spring seat and nut. Inspect all parts, especially valve seats. If there is any evidence of pitting, scores, or wear, install new parts. Run a $\frac{5}{8}$-18 die on the threads of the piston rod and a tap through the piston rod nut before assembly. Remove all metal cuttings.

41. Assembly

a. INSTALL ROD GUIDE AND SEAL ASSEMBLY ON PISTON ROD (FIGS. 45 AND 47). Clamp the dust shield and piston rod assembly in a vertical position in a vise with the open end up. Slide the outer locking ring on the piston rod with the spanner wrench slots down. Install a new reservoir tube gasket. Install the gasket support washer with the locating nubs up. Install the inner locking ring with the spanner slots down.

Note. Insert a length of ½-inch brass rod through the windows of the dirt shield to prevent the piston rod guide and seal assembly from sliding down into the dirt shield. Place the seal protector thimble on the piston rod. Slide the guide and seal assembly on the rod with the threaded end down (fig. 45). Remove the thimble.

b. ASSEMBLE PISTON AND PISTON VALVES ON PISTON ROD (FIG. 44). Install the retaining washer, intake valve spacer, and intake valve spring on the piston rod. Install the intake valve with the flat side up and the piston with the cup side up. Install the rebound valve spring seat with its largest diameter toward the piston. Install the rebound valve

spring and piston rod nut. Be sure the intake valve spring is properly entered in the intake valve, and that the intake valve is centered over the spacer. Be sure that the nut enters the spring seat properly and is tightened securely. With the brass rod inserted through the dirt shield windows, slide the cylinder over the piston (fig. 41). Place a flat plate over the end of the cylinder. Drive the cylinder down and force the guide and seal assembly squarely in the end of the cylinder and against the flange of the guide and seat assembly.

c. Assemble and Install Compression Valve Assembly (Figs. 46 and 48). Clamp the compression valve body between copper vise jaws with threaded side up. Position the compression valve spring in the threaded side of the valve body. Lay the flapper on top of the spring coils. Place the intake valve on the valve body with the flat surface against the body. Position the intake valve spring on the intake valve. Screw the retainer in the valve body. Be sure the retainer enters the intake valve, then tighten securely. Aline the scribe line in one of the milled slots of the piston rod guide and seal assembly with the scribe line in the milled slot in the compression valve body. Pour 32 ounces of new light shock absorber fluid in the cylinder. With the piston rod guide resting on the brass rod through the windows of the dirt shield, tap the compression valve assembly in the end of the cylinder. NOTE: *Be sure the scribe marks are alined.* Remove all chips or foreign matter which may have lodged in the valve or on the tube. Remove the brass rod.

d. Install Piston Assembly and Cylinder in Reservoir Tube (Figs. 41, 42, and 47). Clamp the reservoir tube end forging in a vise with the

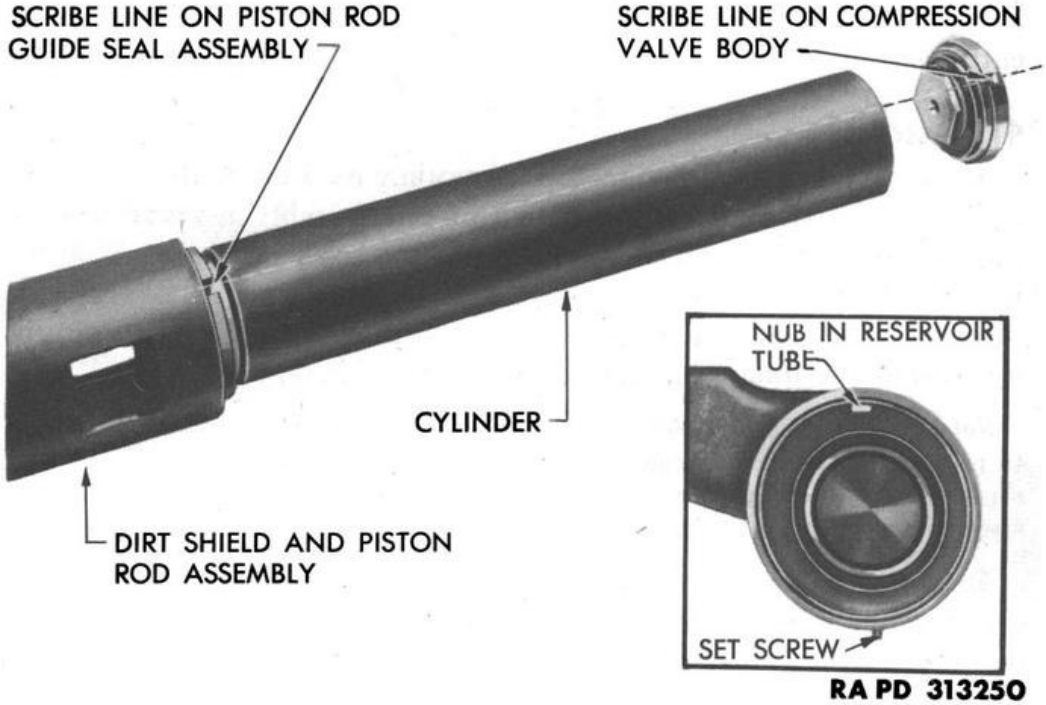

Figure 48. Scribe line on rod guide seal assembly and compression valve body.

tube in vertical position (fig. 42). Install the filler plug in the reservoir using a new gasket. Pour 32 ounces of light shock absorber fluid in the reservoir tube. Slide the cylinder in the reservoir tube so that the nub in the tube enters the scribe-marked milled slot in the "rod guide and seal assembly" (fig. 48). Screw the inner locking ring down tight on the piston rod guide with the spanner wrench (figs. 45 and 43), being careful not to damage the seal. Position the support washer on the locking ring with the nubs located in the spanner slots of the inner locking ring. Press the reservoir tube gasket down on the support washer. Screw the outer locking ring in place and tighten securely, being careful not to damage the seal. Install and tighten the set screw (figs. 48 and 43). Push the dirt shield tube down over the reservoir tube until the windows are opposite the reservoir tube and bend the metal tabs over the dirt shield windows. If the metal tabs have been broken off, they must be welded back in position before assembling the shock absorber.

e. INSTALLATION. Position the shock absorber on the arms with the reservoir filler plug to the outside. Drive pins in position, install, and tighten the clamp screws.

Section IV. SUSPENSION

42. Road Wheel and Hub

a. DISASSEMBLY (FIGS. 49 AND 50). Remove the 10 mounting screws and washers which secure each road wheel to the hub and remove the two road wheels. Remove the five cap screws which secure the hub cap to the hub and remove the cap. Remove cap gasket. Straighten taps on lock washer which locks the bearing outer nut and unscrew the nut. Remove the lock washer and remove the bearing adjusting nut. Remove thrust washer. Slide hub and outer bearing from the road wheel shaft. Remove inner bearing and grease seal from shaft. Repeat the above operation to remove the second road wheel and hub assembly.

b. BEARING INSPECTION. Inspect external surfaces of bearing cones, races, and cups for rust spots, spalled areas, or cracked races. Using a light, a magnifier, and a sharp awl, or similar tool, inspect surfaces for fractures. Rotating the bearing while holding it in the hands is not an accurate check for its running qualities, although this test will indicate the presence of dirt or foreign matter. If dirt is present, rewash bearing, lubricate, and check again. Segregate and discard bearings having either of the races cracked, or having a bluish cast caused by heating.

Note. Discoloration of bearings is not always an indication that harm has been done. They may become discolored by use of extreme pressure lubricants, and such bearings should not be confused with those discolored through excessive heat. Bearings must rotate smoothly in all positions to be serviceable. For new bearing sizes refer to paragraph 47.

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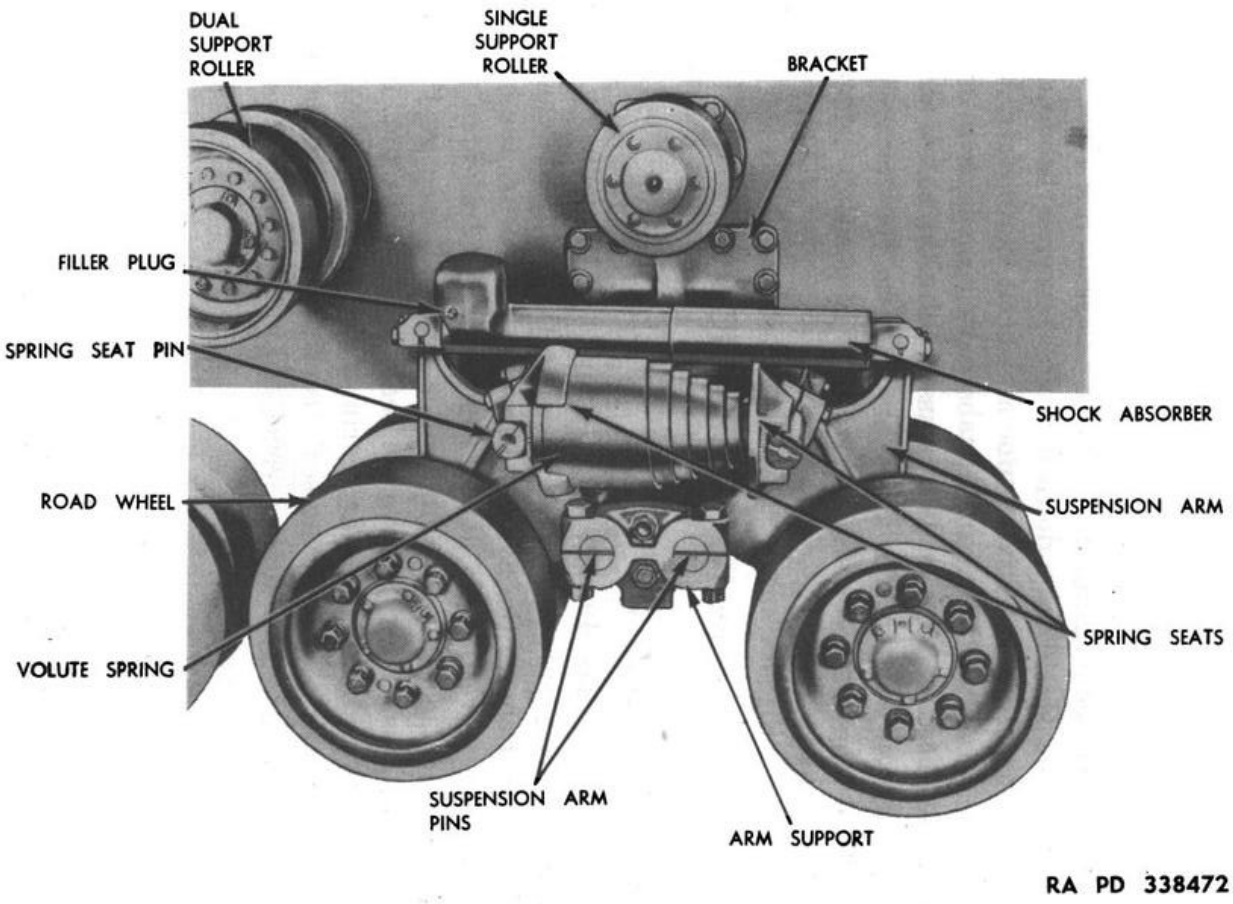

Figure 49. Road wheel suspension assembly.

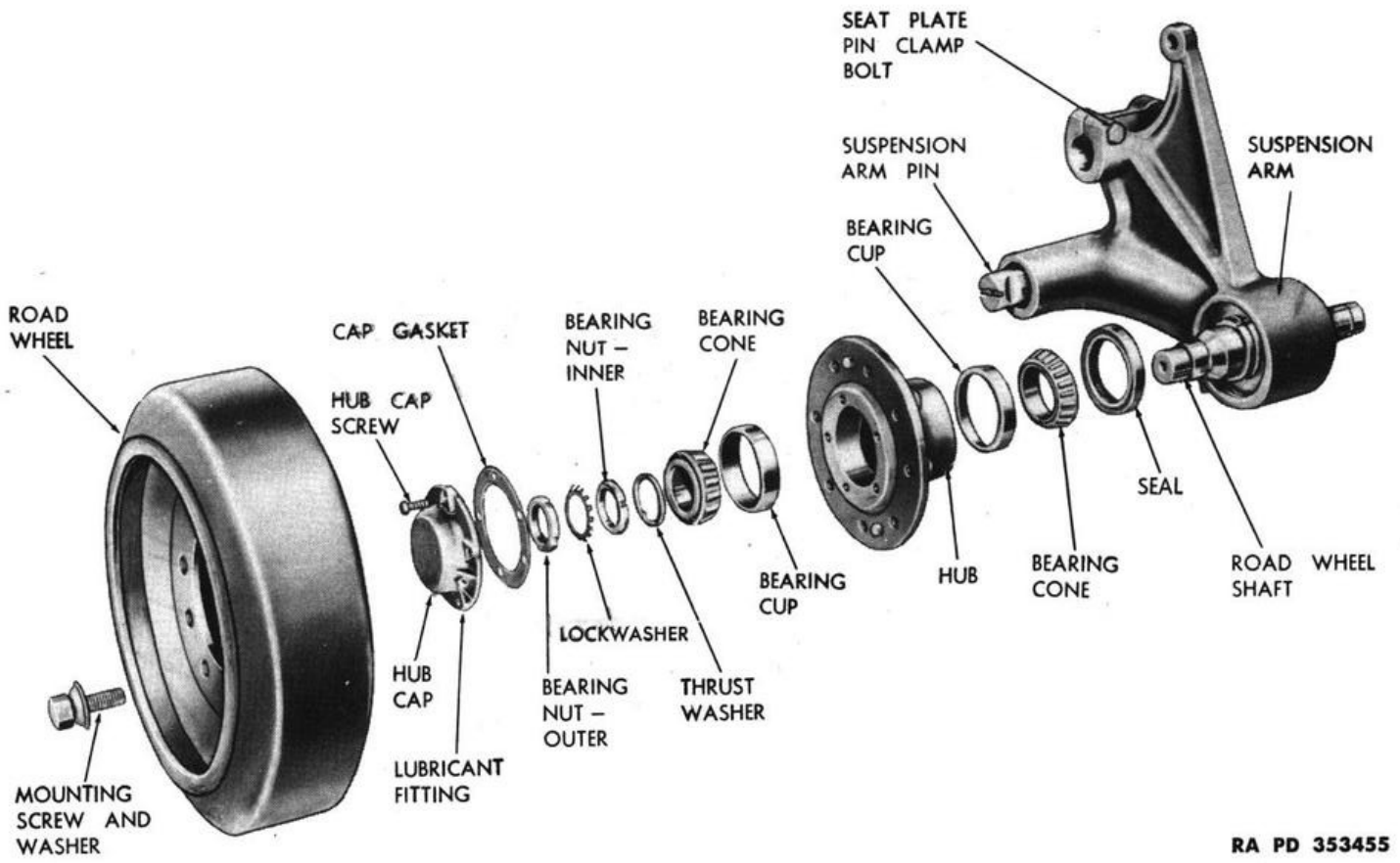

Figure 50. Road wheel and suspension arm—disassembled.

c. HUB INSPECTION. Examine the hub for cracks and for distortion of flange. Inspect all tapped holes for stripped or crossed threads. All damaged threads must be "cleaned up" with the proper tap or die. If oil seals are removed from hub, always install new seals. Inspect hub bore bearing surfaces and if galled or gouged, replace hub. For new hub bore diameters refer to paragraph 47.

d. ROAD WHEEL INSPECTION. Wheel rims which are not severely damaged, cracked, or out-of-round are serviceable. Wheel tires are serviceable provided they meet the following conditions and specifications: Tires must be free from deep cuts, grooves, stock separations, or other damage likely to cause early failure. Refer to paragraph 47 and figure 51 for new tire size and wear limits. Tires with present side wall contour which do not have rubber along one or both sides gouged out due to the cutting action of the track link connectors or guides are considered serviceable. If tire has gouges across surface or if diameter is reduced more than 25 percent, it is unserviceable.

43. Suspension Arm Assembly (figs 49 and 50)

a. For removal and disassembly of road wheel and suspension arm assembly refer to TM 9–747.

b. If the suspension arm is cracked or twisted, replace. Check road wheel shaft for damage or distortion. If suspension arm pin, which is

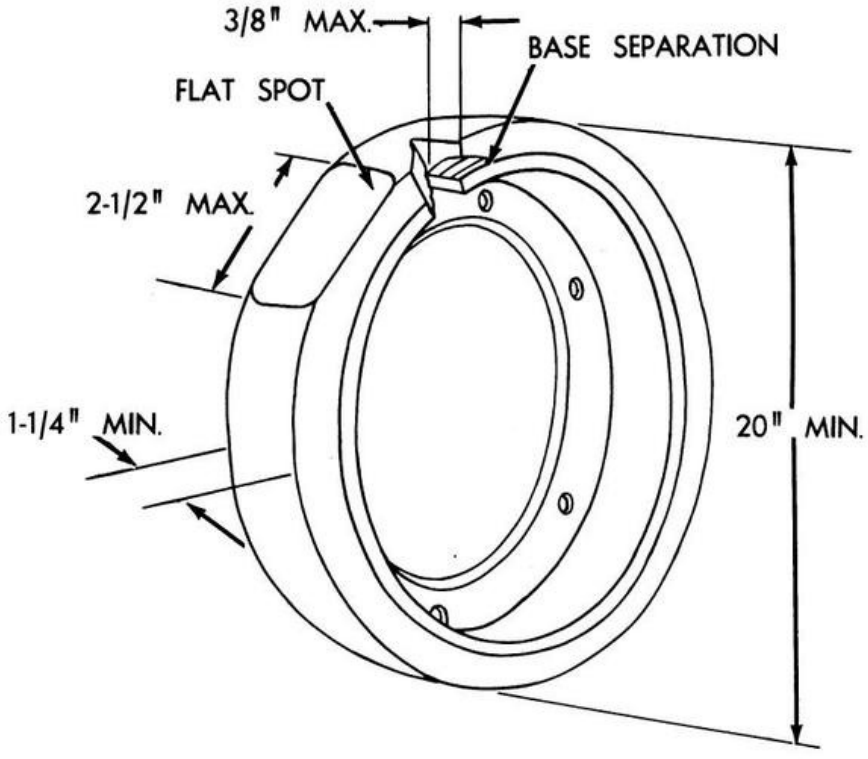

Figure 51. Maximum wear of road wheel tire.

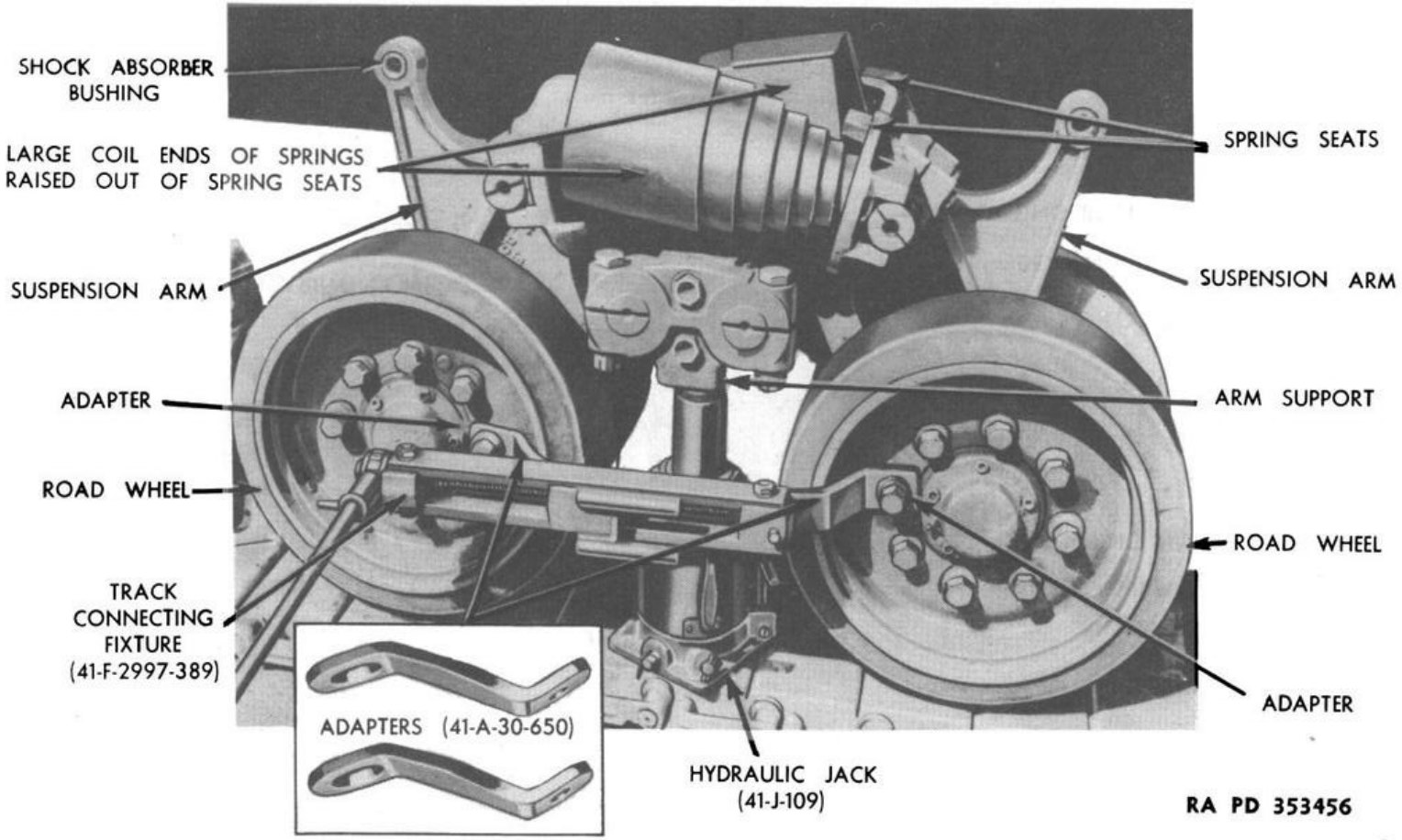

Figure 52. Removing or installing volute springs.

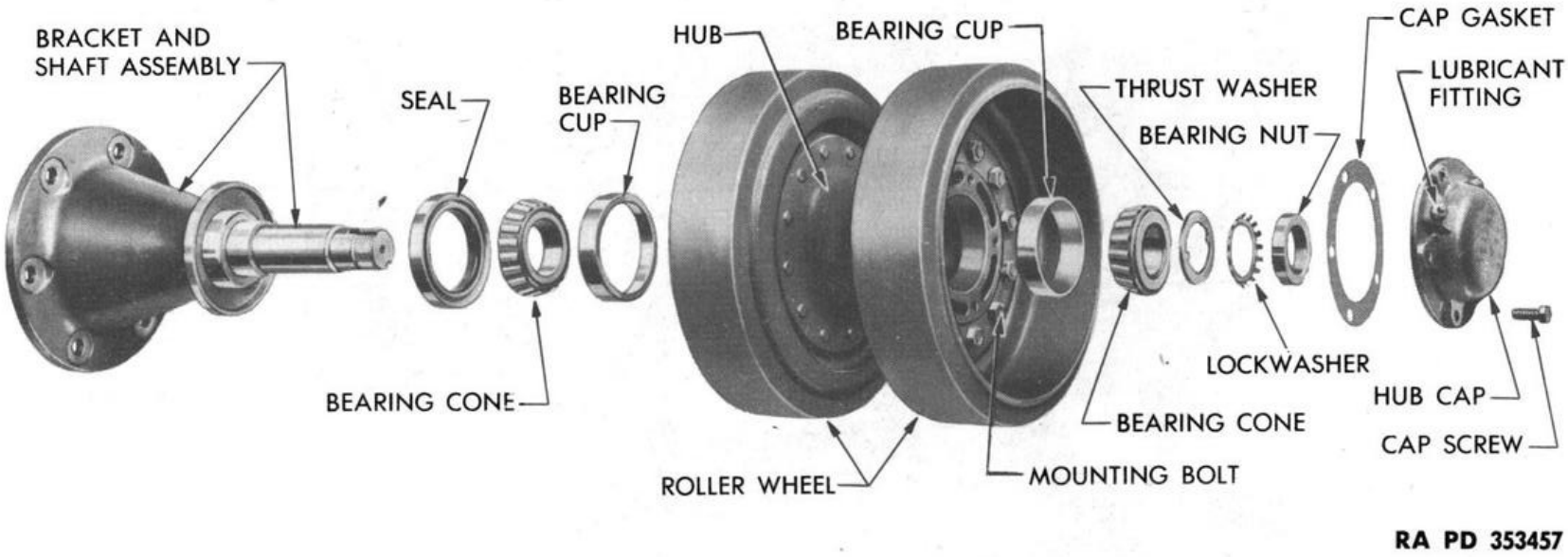

Figure 53. Dual support roller—disassembled.

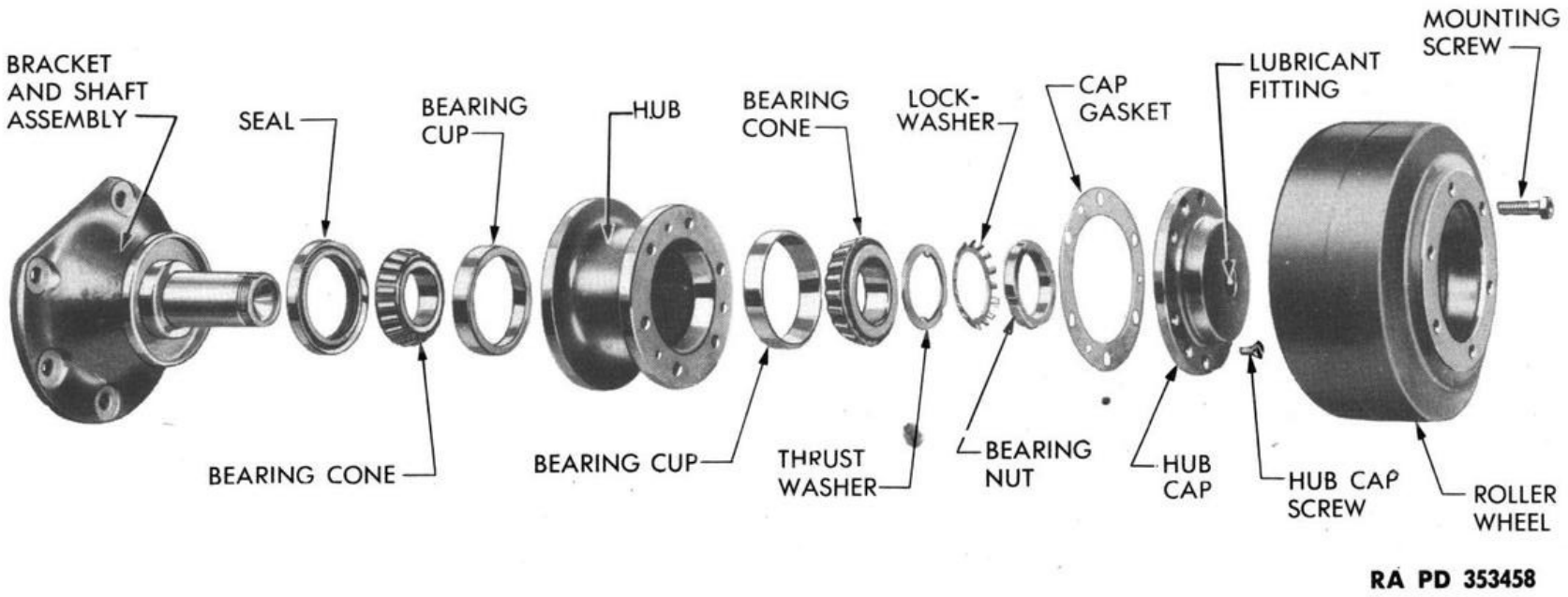

Figure 54. Single support roller—disassembled.

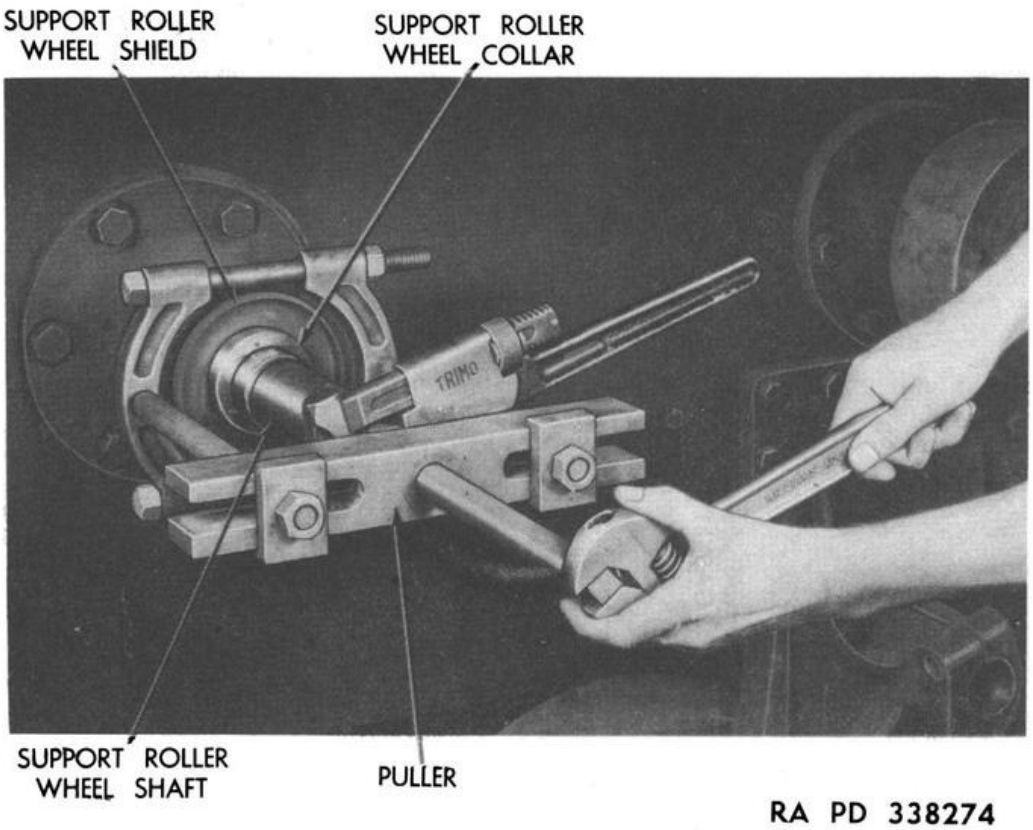

Figure 55. Dual support roller shield and collar removed, using puller (41–P–2905–60).

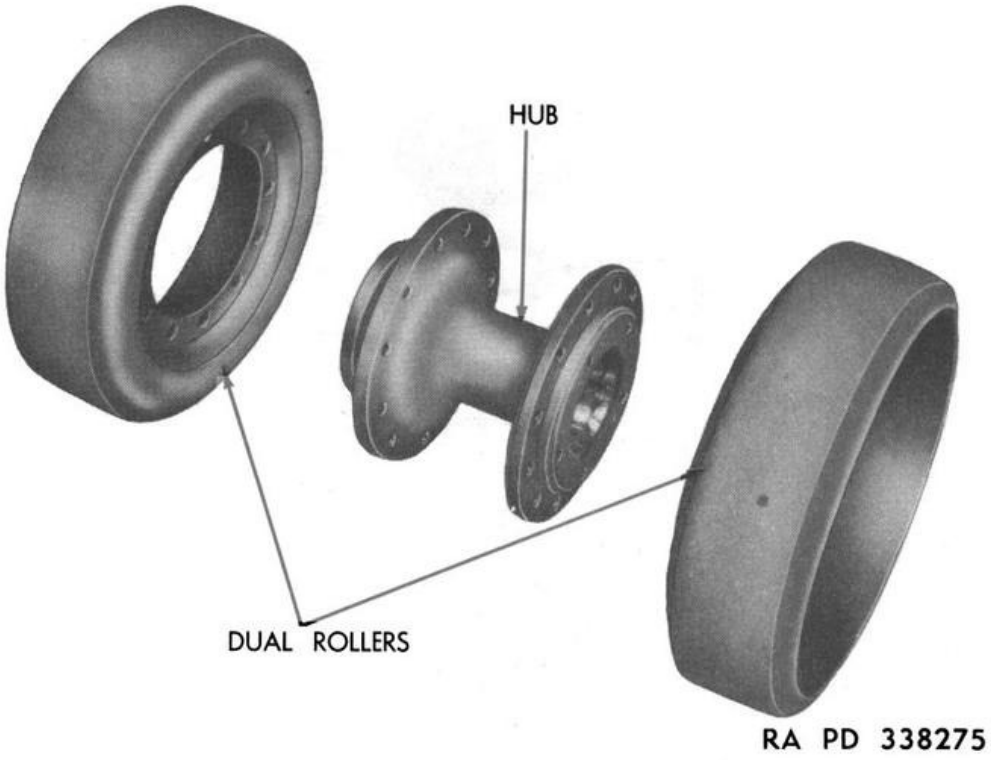

Figure 56. Dual support rollers and hub.

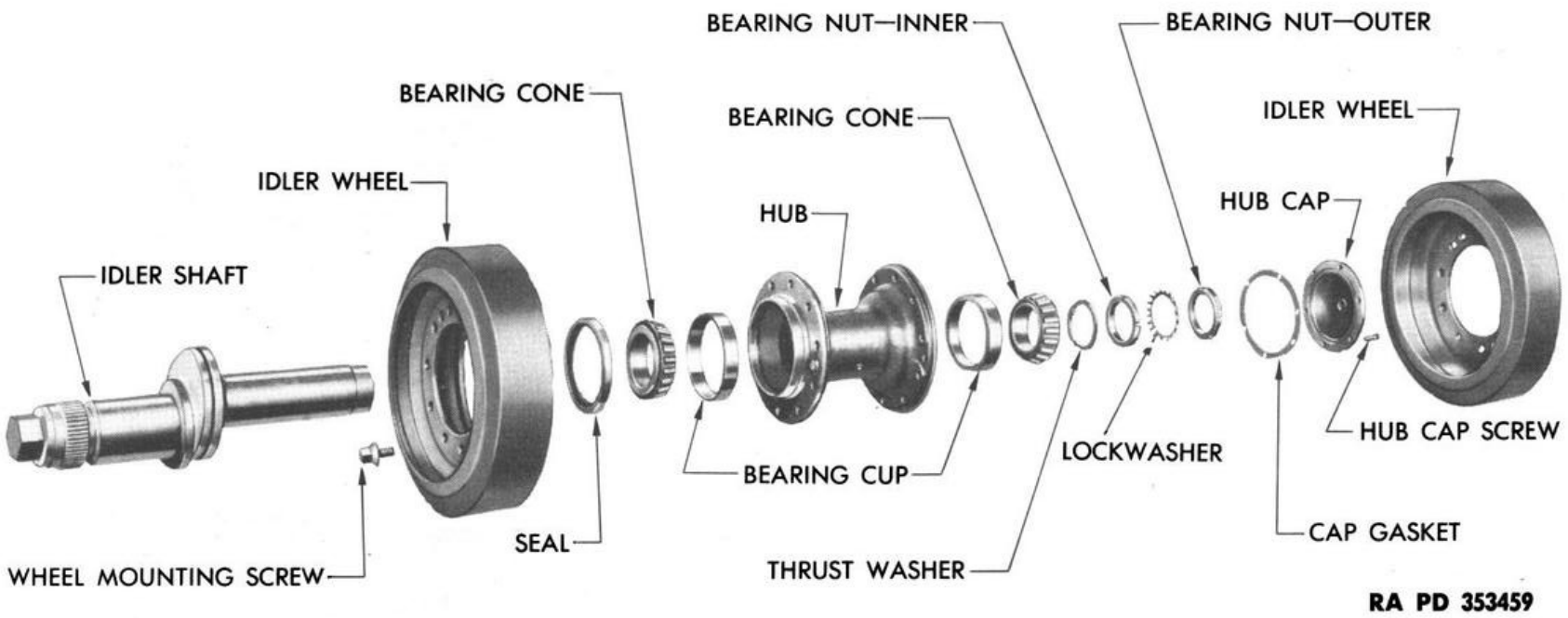

Figure 57. Track idler—disassembled.

set in a rubber bushing, or road wheel shaft is damaged, bent, or loose in the arm, replace arm assembly. Refer to paragraph 47 for new shaft sizes and wear limits. Inspect shock absorber bushing (fig. 52) and if damaged or worn, replace. Chase threads in seat plate pin clamp with the proper tap or die.

44. Suspension Bracket and Volute Spring (fig. 49)

a. For removal and disassembly of suspension bracket and volute spring refer to TM 9–747.

b. If suspension bracket is cracked or twisted, replace bracket. Suspension bracket must be square with the hull. Replace volute springs if cracked or broken (fig. 52). Inspect spring seat casting and replace if cracked or broken. Spring seat pins and wear plates (fig. 36) must be smooth and if worn beyond the dimensions given in paragraph 47 *b*, they must be replaced (fig. 52).

45. Track Support Roller Assemblies (figs. 53 and 54)

a. For removal and disassembly of track support roller assemblies refer to TM 9–747.

b. Inspect roller wheel brackets for cracks, particularly around bolt holes. Replace cracked or broken brackets. Inspect support roller wheel shafts for damage or distortion. Remove scores and burs on machined surfaces and keyways. If distorted, replace shaft. Refer to paragraph

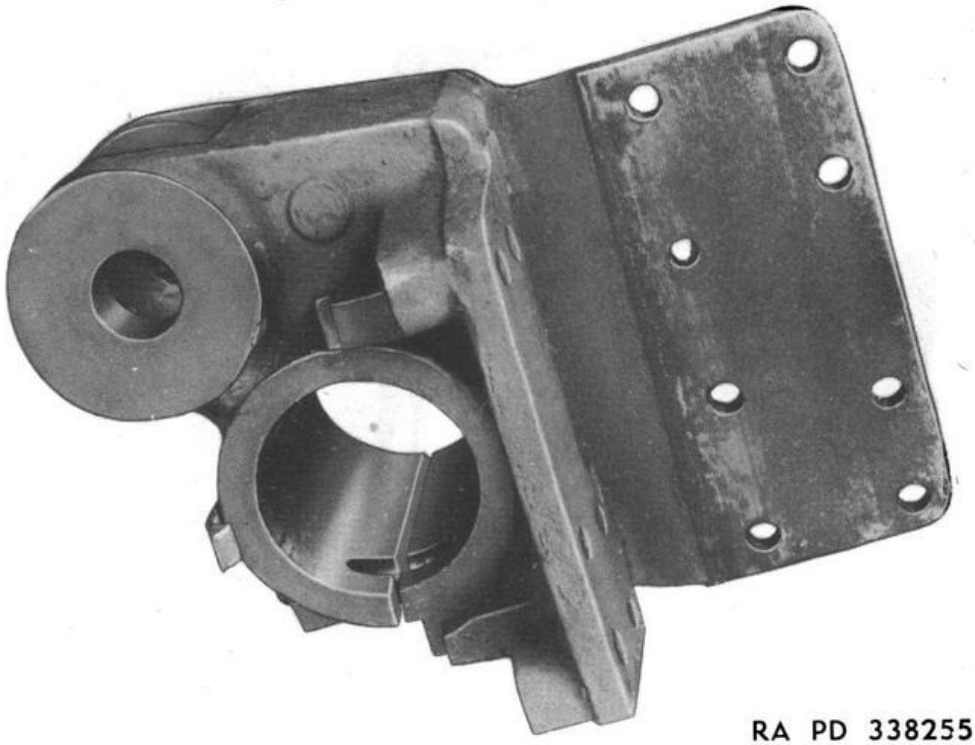

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Figure 58. Idler wheel bracket.

49 for new shaft sizes. Clean up shaft threads with a suitable die. Inspect shield and collar for cracks and scores. If the collar or shield is damaged by a worn oil seal, use puller 41–P–2905–60 and remove shield and collar as shown in figure 55. Refer to paragraph 49 for new collar and shield sizes. Refer to paragraph 42 for repair of hub, bearings, cups, seals, and wheels, and to paragraph 47 for sizes and wear limits.

46. Idler Assembly (figs. 57 and 58)

a. For removal and disassembly of idler assembly refer to TM 9–747.

b. If idler bracket is cracked or twisted, replace bracket. Check idler shaft for damage or distortion, and if damaged or bent, replace shaft. Refer to paragraph 48 for new shaft sizes. Remove all scores or burs which are found on machined surfaces. Inspect shield and collar for cracks or scores. If scored, hone smooth. If cracked or worn beyond the sizes given in paragraph 48, replace. If collar and shield must be removed, refer to paragraph 43. Shield and collar must be press fit on shaft. Pin must be press fit in shield and shaft. Refer to paragraph 48 for new pin sizes.

c. Refer to paragraph 42 and figure 57 for wheel and hub disassembly, inspection, and assembly.

CHAPTER 7
SERVICEABILITY STANDARDS

47 Suspension Assembly

a. SUSPENSION ARM.

Point of measurement	Dimensions of new parts, inches	Wear limit
Shock absorber bushing bore	1.8740 +0.0020 −0.0010	1.8760
Shock absorber bushing (OD)	1.8800 −0.0050	1.8750
Shock absorber bushing (ID)	0.9950 +0.0020	1.0000
Shock absorber bushing fit in arm (0.0010-in. loose to 0.0080-in tight)		
Road wheel shaft bore	3.4940 +0.0020	3.4960
Road wheel shaft (OD)	3.5000—0.0010	3.4990
Road wheel shaft pressed in suspension arm (0.0040 —to 0.0070-in. tight)		

b. VOLUTE SPRING ASSEMBLY.

Free height of spring (normal)	14 in.	
Free height of spring (maximum)	14½ in.	
Load to compress spring to 8 inches	11,500 lb.	10,500 lb.
Spring seat pin diameter	2.233 −0.002	2.193
Spring seat wear plate (thickness)	½ in.	0.4687

c. ROAD WHEEL AND HUB.

Inner bearing cup hub diameter	4.6230 +0.0010	4.6240
Outer bearing cup hub diameter	4.2480 +0.0010	4.2490
Inner cup (OD)	4.6250 +0.0010 −0.0000	4.6260
Inner bearing (ID)	2.8125 +0.0005 −0.0000	2.8125
Outer cup (OD)	4.2500 +0.0010 −0.0000	4.2510
Outer bearing (ID)	2.1250 +0.0005 −0.0000	2.1250
Outer bearing cup pressed in hub (0.001 = to 0.003-in. tight)		
Outer bearing fit on shaft (0.0002 = to 0.0012-in. loose)		
Inner bearing cup pressed in hub (0.0010 = to 0.0030-in. tight)		
Inner bearing pressed on shaft (0.0002 = to 0.0012-in. loose)		
Tire (OD) (new)	20½ in.	½ in.
Tire tread width (new)	6¼ in.	1¼ in.
Maximum flat spot wear		2½ in.
Maximum base separation		⅜ in.

d. ROAD WHEEL SHAFT.

Point of measurement	Dimensions of new parts, inches	Wear limit
Inner bearing diameter	2.8123 −0.0005	2.8118
Outer bearing diameter	2.1248 −0.0005	2.1243
Oil seal diameter	3.066 −0.001	3.065
Keyway (width)	0.312	0.313
Keyway (depth)	0.156	0.156

e. SHOCK ABSORBERS.

Pin diameter	0.992 −0.002	0.985
Pin length	4.000	4.000
Pin fit in bushing (0.0030 = to 0.0070-in. loose).		

48. Idler Assembly

a. IDLER SHAFT.

Inner bearing diameter	4.3748 −0.0010	4.3738
Outer bearing diameter	3.9998 −0.0010	3.9988
Inner bearing (ID)	4.3750 +0.0010	4.3760
Outer bearing (ID)	4.0000 +0.0010	4.0010
Inner bearing fit on shaft (0.0002 = to 0.0022-in. loose).		
Outer bearing fit on shaft (0.0002 = to 0.0012-in. loose).		
Shield (ID)	6.0050 +0.005	6.0100
Shield flange (ID)	8.6250 +0.010	8.6260
Collar (ID)	5.9950 +0.002	5.9952
Collar (OD)	6.6250 −0.002	6.6248
Shield pin diameter	0.3100 +0.0020	0.3100
Shield pin (expanded dia)	0.3260 +0.0040	0.3260
Shield pin length	1.0000	1.0000
Keyway (width)	0.375	0.3760
Keyway (depth)	0.156	0.156

b. IDLER WHEEL AND HUB.

Oil seal hub (ID)	7.9980 +0.0040	8.0060
Inner bearing cup hub (ID)	7.4970 +0.0020	7.4970
Inner bearing cup (OD)	7.5000 +0.0010	7.5000
Outer bearing cup hub (ID)	7.1220 +0.0020	7.1220
Outer bearing cup (OD)	7.1250 +0.0010	7.1250
Inner bearing cup pressed in hub (0.0010 = to 0.0040 in. tight).		
Outer bearing cup pressed in hub (0.0010 = to 0.0040-in. tight).		
Tire (OD) (new)	22 in.	½ in.
Tire tread width (new)	6¼ in.	1¼ in.
Maximum flat spot wear		2½ in.
Maximum base separation		⅜ in.

c. IDLER BRACKET.

Spade arm anchor pin bore	2.000 +0.005	2.0090

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49. Support Rollers

a. Dual Wheel and Hub.

Point of measurement	Dimensions of new parts, inches	Wear limit
Inner bearing cup hub (ID)	4.4365 −0.0010	4.4355
Outer bearing cup hub (ID)	3.6708 −0.0010	3.6698
Outer bearing cup (OD)	3.6718 +0.0010	3.6718
Inner bearing cup (OD)	4.4375 +0.0010	4.4375
Inner bearing cup pressed in hub (0.0010 = to 0.0030 in. tight).		
Outer bearing cup pressed in hub (0.0010 = to 0.0030 in. tight).		
Tire (OD) (new)	13½ in.	
Minimum wear (OD)		¼ in.
Tire tread width (new)	3¾ in.	
Minimum tread width		2⅜ in.

b. Dual Roller Shaft.

Collar and shield diameter	2.503 −0.001	2.502
Inner bearing diameter	2.3620 −0.0005	2.3615
Inner bearing (ID)	2.3622 +0.0005	2.3627
Outer bearing diameter	1.8123 −0.0005	1.8118
Outer bearing (ID)	1.8125 +0.0005	1.8130
Shield pin diameter	0.3100 +0.0020	
Shield pin (expanded dia.)	0.3260 +0.0040	0.3300
Shield pin length	1.0000	1.0000
Keyway width	0.3120	0.3130
Keyway depth	0.1250	0.1250
Inner bearing pressed on shaft (0.0002 = to 0.0012-in. loose).		
Outer bearing pressed on shaft (0.0002 = to 0.0012-in. loose).		

c. Single Wheel and Hub.

Bearing cup hub (ID)	4.4355 +0.0010	4.4365
Bearing cup (OD)	4.4375 +0.0010	4.4385
Bearing cups pressed in hubs (0.0010 = to 0.0030-in. tight).		
Tire (OD) (new)	10 in.	
Minimum wear (OD)		¼ in.
Tire tread width (new)	4¾ in.	
Minimum tread width		3⅜ in.

d. Single Roller Shaft.

Collar and shield diameter	2.503 −0.001	2.502
Collar (ID)	2.500 +0.001	2.501
Shield (ID)	2.505 +0.005	2.510
Shield pin diameter	0.310 +0.002	
Shield flange (ID)	5.375 +0.010	5.385
Shield pin (expanded dia.)	0.326 +0.004	0.330
Shield pin length	1.000	1.000
Bearing diameter	2.3620 −0.0005	2.3615
Bearing (ID)	2.3622 +0.0005	2.3627

Point of measurement	Dimensions of new parts, inches	Wear limit
Bearings pressed on shaft (0.0002= to 0.0012-in. loose).		
Keyway width	0.321	0.322
Keyway depth	0.125	0.125

50. T–80 Track

a. TRACK SHOE.

Link pin diameter	1.2490 to 1.2470	1.2430
Link pin slots must be flat and parallel within 1 degree.		
Minimum grouser height for overseas use (removal point)	⅞ in.	
Minimum grouser height for domestic use (removal point)	½ in.	

b. LINK CONNECTORS.

Link connector (driving surface)	0.1250 in.	0.1250
Link pin bore	1.2500+0.0035	1.2535
Connectors pressed on link pin (0.0065= to 0.0110-in. loose).		

c. CENTER GUIDES.

Minimum thickness of center guide at tire contact point	0.3125 in.	0.250

51. T–66 Track

Link pin diameter	1.064 +0.000 −0.001	1.059
Minimum grouser height for overseas use (removal point)	¼ in.	
Minimum grouser height for domestic use (removal point)	⅛ in.	

APPENDIX
REFERENCES

1. Publications Indexes

The following publications indexes should be consulted frequently for latest changes or revisions of reference given in this section and for new publications relating to matériel covered in this manual:

Ordnance Supply Index.....WD Cat ORD 2
Ordnance Major Items and Combinations and Pertinent Publications.....SB 9–1
List and Index of War Department Publications.....FM 21–6
List of War Department Films, Film Strips, and Recognition Film Slides..FM 21–7

2. Standard Nomenclature Lists

a. ARMAMENT.

Carriage, Motor, 155-mm Gun M40 and Carriage, Motor, 8-inch Howitzer M43 .....SNL G–232
Gun, 155-mm, M1 or M1A1.....SNL D–24
Howitzer, 8-in, M1 .....SNL D–29

b. MAINTENANCE.

Antifriction bearings and related items.....WD Cat ORD 5
SNL H–12
Cleaning, preserving, and lubrication materials; recoil fluids, special oils, and miscellaneous related items.....WD Cat ORD 3
SNL K–1
Elements, oil filter .....WD Cat ORD 5
SNL K–4
General tools and supplies, ordnance base automotive maintenance company .....SNL N–327
Lubricating equipment, accessories, and related dispensers.....WD Cat ORD 5
SNL K–3
Oil seals .....SNL H–13
Soldering, brazing, and welding materials, gases, and related items..WD Cat ORD 3
SNL K–2
Standard hardware .....WD Cat ORD 5
SNL H–1
Tool-sets (common) specialists' and organizational.....WD Cat ORD 6
SNL G–27 (Section 2)
Tool-sets (special), automotive and semiautomotive.....WD Cat ORD 6
SNL G–27 (Section 1)
Tools and supplies for ordnance base armament maintenance battalion .....SNL N–315
Tools and supplies for ordnance base automotive maintenance battalion .....SNL N–325

3. Explanatory Publications

a. FUNDAMENTAL PRINCIPLES.

Automotive electricity .....TM 10–580
Basic maintenance manual.....TM 38–650

Driver's manual ..... TM 21-305
Driver selection, training, and supervision, half-track, and full track vehicles ..... TM 21-301
Electrical fundamentals ..... TM 1-455
Fuels and carburetion ..... TM 10-550
Military motor vehicles ..... AR 850-15
Motor vehicle inspections and preventive maintenance services ..... TM 37-2810
Ordnance service in the field ..... FM 9-5
Precautions in handling gasoline ..... AR 850-20
Welding: theory and application ..... TM 9-2852

b. MAINTENANCE AND REPAIR.

Cleaning, preserving, sealing, lubricating, and related items issued for ordnance matériel ..... TM 9-850
Maintenance and care of pneumatic tires and rubber treads ..... TM 31-200
155-mm Gun Motor Carriage T83 (M40) and 8-inch Howitzer Motor Carriage T89 (M43) ..... TM 9-747
Disassembly, cleaning, inspection, overhaul and assembly of the 155-mm gun and the 8-inch howitzer ..... TM 9-1350
Ordnance maintenance: Auxiliary generator (Homelite Model HRUH-28) for medium tanks M4 and modifications ..... TM 9-1731K
Ordnance maintenance: Accessories for Wright R975-EC2 engines for medium tanks M3 and M4 (Scintilla magnetos) ..... TM 9-1750D
Ordnance maintenance: Carburetors (Stromberg) ..... TM 9-1826B
Ordnance maintenance: Electrical equipment (Auto-Lite) ..... TM 9-1825B
Ordnance maintenance: Electrical equipment (Delco-Remy) ..... TM 9-1825A
Ordnance maintenance: Fire extinguishers ..... TM 9-1799
Ordnance maintenance: Fuel pumps ..... TM 9-1828A
Ordnance maintenance: Ordnance engine model R975-C4 (Continental) .. TM 9-1725
Ordnance maintenance: Power train unit, 1-piece differential case, for medium tanks M3 and M4 and modifications, and related gun motor carriages ..... TM 9-1750B
Ordnance maintenance: Speedometers, tachometers, and recorders ..... TM 9-1829A

c. PROTECTION OF MATÉRIEL.

Camouflage ..... FM 5-20
Decontamination ..... TM 3-220
Decontamination of armored force vehicles ..... FM 17-59
Defense against chemical attack ..... FM 21-40
Explosives and demolitions ..... FM 5-25
Military chemistry and chemical agents ..... TM 3-215

d. STORAGE AND SHIPMENT.

Ordnance company, depot ..... FM 9-25
Ordnance packaging and shipping ..... TM 9-2854
Ordnance storage and shipment chart—group G—major items ..... OSSC-G
Preparation of unboxed ordnance materiel for shipment ..... SB 9-4
Registration of motor vehicles ..... AR 850-10
Rules governing the loading of mechanized and motorized army equipment, also major caliber guns, for the United States Army and Navy, on open top equipment published by Operations and Maintenance Department of Association of American Railroads.
Storage of motor vehicle equipment ..... AR 850-18

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