TM 9-767

WAR DEPARTMENT TECHNICAL MANUAL

40-TON
TANK TRANSPORTER
TRUCK-TRAILER M25

WAR DEPARTMENT *FEBRUARY 1944*

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TM 9-767, 40-Ton Tank Transporter Truck-trailer M25, is published for the information and guidance of all concerned.

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Chief of Staff.

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The Adjutant General.

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(For explanation of symbols, see FM 21-6.)

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Section I

INTRODUCTION

1. SCOPE.

a. This technical manual is published for the information and guidance of the using arm personnel charged with the operation and maintenance of this materiel.

b. In addition to a description of the 40-ton, Tank Transporter Truck-trailer M25, this manual contains technical information required for the identification, use, and care of materiel. The manual is divided into four parts. Part One, section I through section VIII, contains vehicle operating instructions. Part Two, section IX through section XXXIII, contains vehicle maintenance instructions for using arm personnel charged with the responsibility of doing tractor maintenance work within their jurisdiction. Part Three, section XXXIV through section XL, contains semitrailer maintenance instructions for using arm personnel. Part Four, section XLI, contains instructions for shipment, and temporary storage.

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

d. MWO and Major Unit Assembly Replacement Record.

(1) DESCRIPTION. Every vehicle is supplied with a copy of A.G.O. Form No. 478, which provides a means of keeping a record of each MWO (FSMWO) completed or major unit assembly replaced. This form includes spaces for the vehicle name and U. S. A. Registration Number, instructions for use, and information pertinent to the work accomplished. It is very important that the form be used as directed and that it remain with the vehicle until the vehicle is removed from service.

(2) INSTRUCTIONS FOR USE. Personnel performing modifications or major unit assembly replacements must record clearly on the form a description of the work completed and must initial the form in the columns provided. When each modification is completed, record the date, hours and/or mileage, and MWO number. When major unit assemblies, such as engines, transmissions, transfer cases, are replaced, record the date, hours and/or mileage and nomenclature of the unit assembly. Minor repairs and minor parts and accessory replacements need not be recorded.

(3) EARLY MODIFICATIONS. Upon receipt by a third or fourth echelon repair facility of a vehicle for modification or repair, maintenance personnel will record the MWO numbers of modifications applied prior to the date of the A.G.O. Form No. 478.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section II

DESCRIPTION AND TABULATED DATA

2. DESCRIPTION.

a. The 40-ton, Tank Transporter Truck-trailer M25 is designed for use in recovering a piece of damaged materiel and transporting it to a place where necessary repairs can be accomplished. The M25 unit consists of the tractor truck (M26) and semitrailer (M15), the semitrailer being coupled to the tractor by means of a fifth wheel on the tractor, which automatically locks the trailer to the tractor. Air brakes on the trailer wheels and lighting equipment on the trailer are connected to the tractor air and lighting systems by means of air hose and a jumper cable (carried on the trailer). The trailer air brakes and lights are controlled by the driver of the tractor. The trailer air brakes are automatically set in case the trailer is accidentally, or purposely, disconnected from the tractor.

b. The tractor truck M26 is a self-propelled motor vehicle, powered by a 6-cylinder internal-combustion gasoline engine. There are two front and eight rear dual wheels equipped with desert, or combat type, pneumatic tires. The rear wheels are driven by roller type chains operating on sprockets fastened to the wheel hubs. The power to drive the rear wheels is obtained from the engine, through the clutch, main and auxiliary transmissions, rear differential and jackshafts to the drive sprockets which are bolted to the jackshaft hubs. Roller chains on the jackshaft hub sprockets and on the wheel hub sprockets, drive the wheels. The tractor can be used as a recovery vehicle without the semitrailer, since it is equipped with a front mounting winch, a rear tandem winch, and a vertical lifting device. The cab is armor plated and has hinged armor plate covers for the windshield, radiator, doors, and cab windows. All of these armor plate covers are operated from inside the cab and have peep ports. A pintle hook is bolted to the rear end of the frame. Towing shackles are fastened to the front and rear of the frame. A drawbar and whiffletree are carried on the tractor, for recovery operations. Oxygen and acetylene tanks with equipment for welding or cuttings; vise, Pioneer, and maintenance tools are also carried on the tractor.

c. The semitrailer (M15) is designed to be pulled by the tractor truck (M26) and consists of a low drop frame having a low bed-type platform. Eight single wheels equipped with pneumatic tires are used to carry the semitrailer, which has a maximum pay load of 40 tons to be carried at a maximum speed of 26 miles per hour. The use of walking beams operating on trunnion shafts, allows any one wheel to pass over a 9-inch obstacle while all other wheels remain

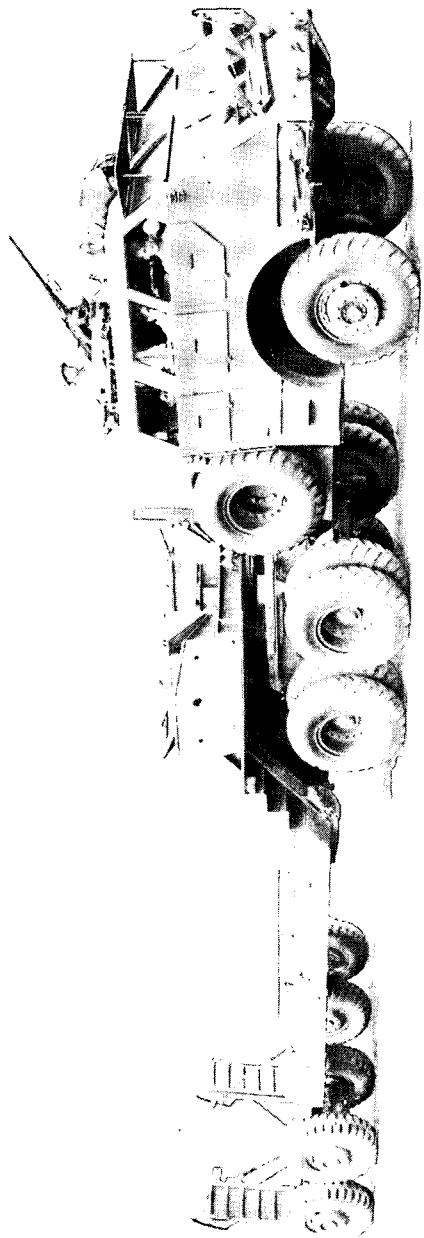

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Figure 1—Right Front Three-quarter View of 40-ton Tank Transporter Truck-Trailer M25

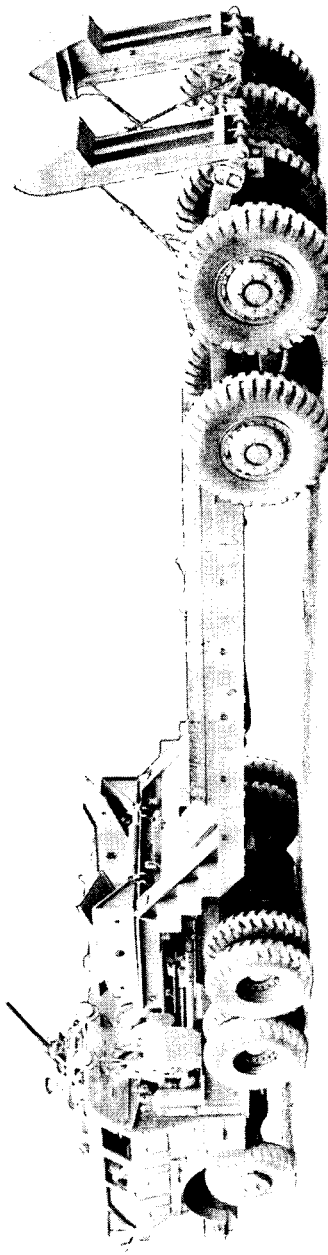

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Figure 2—Left Rear Three-quarter View of 40-ton Tank Transporter Truck-Trailer M25

DESCRIPTION AND TABULATED DATA

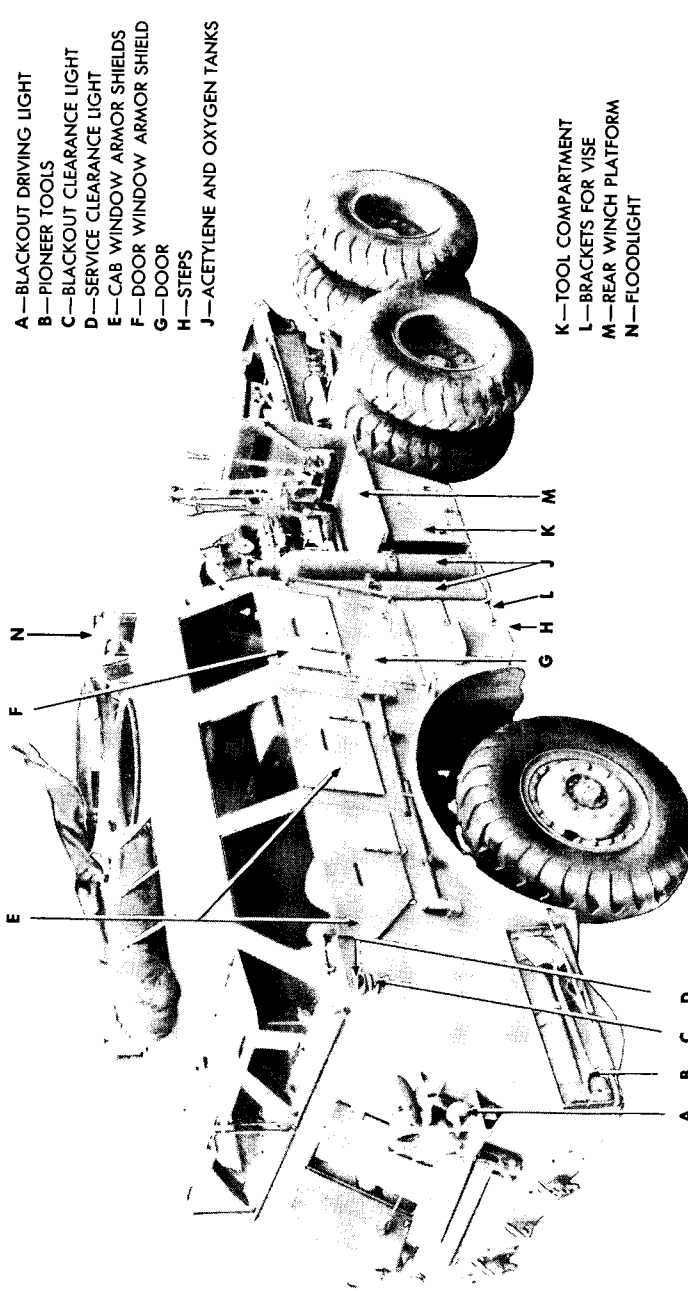

Figure 3—Left Front Three-quarter View of Tractor Truck M26 (Windows Open)

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Figure 4—Right Rear Three-quarter View of Tractor Truck M26 (Windows Closed)

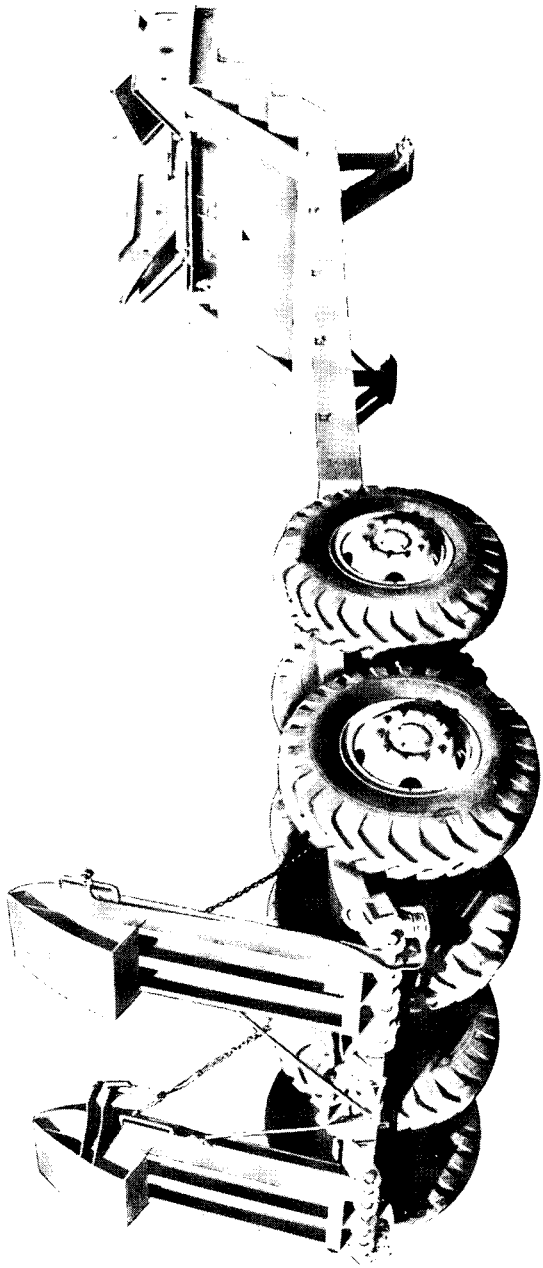

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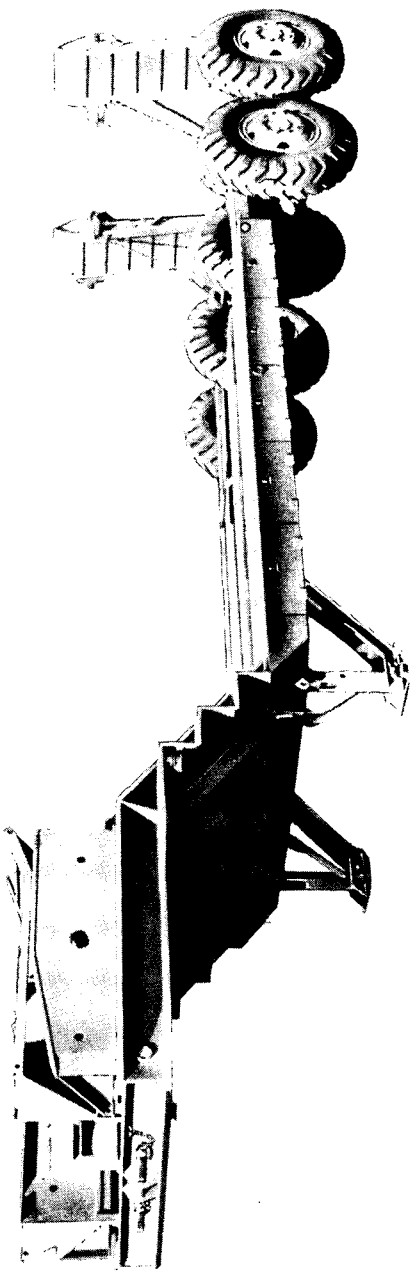
Figure 5—Right Rear Three-quarter View of Semitrailer M15

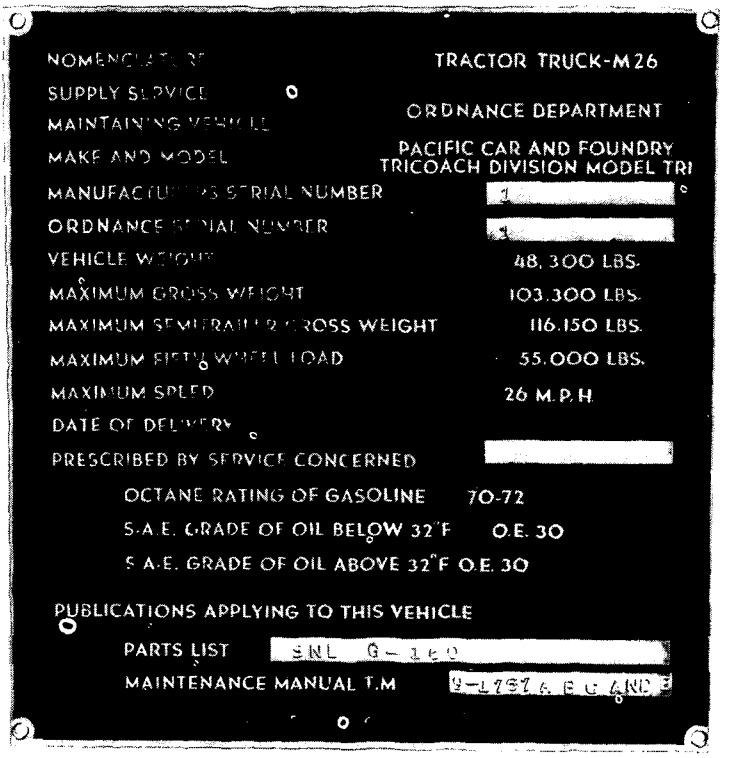


RA PD 57459

Figure 6—Left Front Three-quarter View of Semitrailer M15

DESCRIPTION AND TABULATED DATA

in contact with the ground. Brakes on the semitrailer wheels are actuated by compressed air supplied from the truck tractor, through removable hose which connect the semitrailer to the tractor. There are four clearance lights, two of which are on the right and left side at the rear cross member, and two are on the right and left front side at the steps. There are four blackout clearance lights which are located directly under the service clearance lights. Two auxiliary



RA PD 76487

Figure 7—Vehicle Data Plate

clearance lights are stowed on the left side. Two clips are provided to hold clearance lights in stowed position. A blackout taillight, service taillight and stop light, and service stop light, also, a blackout taillight and stop light are located on the rear cross member of the semitrailer and are operated by the same switches that operate the truck tractor clearance taillight and stop lights. Pioneer Tools, recovery equipment, hoist for changing tires and for maintenance work, and maintenance tools are carried on the trailer.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

3. DATA.

a. Tractor w/Trailer Specifications.

40-ton tank transporter truck-trailer model No.	M25
Semitrailer, model No.	M15
Tractor truck, model No.	M26
Tractor truck manufacturer	Pacific Car and Foundry Co.
Semitrailer manufacturer	Fruehauf Trailer Co.
Weight of tractor with semitrailer (gas, oil, water and all equipment)	103,300 lb

b. Tractor Specifications.

Curb weight of tractor	42,000 lb
Length, over-all of tractor (uncrated)	25 ft 4 in.
Width, over-all of tractor (uncrated)	10 ft 10 ¾ in.
Maximum fifth wheel load	55,000 lb
Height, over-all of tractor (uncrated)	11 ft 5 in.
Wheel size	24 in.
Tire size	14.00 x 24
Ply	20 or 12
Crew	7
Wheel base of tractor	14 ft 4 in.
Tread, front (center to center)	82 in.
Tread, rear (center to center)	98½ in.
Kind and grade of fuel	70-72 octane gasoline
Ground clearance	14 in.
Pintle or drawbar height, rear	41½ in.
Approach angle	35 degrees
Maximum speed (without towed load)	28 mph
Ground pressure	90 psi
Ground Contact Area:	
Each front tire	123 sq in.
Each rear tire	118 sq in.

Ground contact gross (zero penetration—75 pounds per square inch, tire pressure).

c. Performance. Speeds allowable, without front wheels driving:

Main Transmission Lever In	Auxiliary Transmission Lever In	Speed Obtained
first	first	1.5
first	second direct	2.5
first	third O.D.	3.8
second	first	5.1
second	second direct	6.5
second	third O.C.	8.1
third	first	8.6
third	second direct	12.0
third	third O.D.	16.0
fourth	first	21.0
fourth	second direct	26.0
fourth	third O.D.	28.0

(NOTE: *Speeds allowable, with front wheels driving, are the same as given above.)*

DESCRIPTION AND TABULATED DATA

Minimum turning radius (right) ..... 40 ft
(left) ..... 40 ft
Minimum turning circle diameter ..... 80 ft
Fording depth ..... 56 in.
Towing facilities (front) ..... two clevis hooks and tow bar
Towing facilities (rear) ..... two clevis hooks and pintle (quick release)
Maximum grade ascending ability 30%
Maximum allowable engine speed ..... 2,100 rpm

d. Tractor Capacities.

Transmission ..... 8½ qt
Transfer case ..... 12 qt
Front axle ..... 20 qt
Rear axle ..... 10 qt
Fuel (in two tanks) ..... 120 gal
Cooling system ..... 14 gal
Crankcase ..... 28 qt

e. Semitrailer Specifications.

Length, over-all (with permanent ramps in up position) ..... 38 ft 5 1/16 in.
Length, over-all (with permanent ramps in down position) ..... 44 ft 2 in.
Width, over-all ..... 12 ft 6 in.
Width, over-all (under-construction) ..... 10 ft 4 in.
Height, over-all ..... 8 ft 9 in.
Height at kingpin ..... 5 ft 7¾ in.
Ground clearance at lower decking ..... 2 ft 5⅛ in.
Height of lower deck ..... 3 ft 4½ in.
Height from lower deck to top deck ..... 3 ft 3 in.
Width of decking ..... 10 ft 4 in.
Wheel size ..... 24 x 10.00
Tire size ..... 14.00 x 24—20 ply
Tire types ..... both combat and desert types are used
Tread (center to center) ..... 10 ft 11 in.
Weight of semitrailer equipped ..... 36,100 lb
Maximum semitrailer gross weight ..... 55,000 lb
Minimum ground clearance (unloaded) ..... 13 in.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section III

DRIVING CONTROLS AND OPERATION

4. INSTRUMENTS AND CONTROLS.

a. Air Pressure Gage (AT, fig. 8). The air pressure gage is located at the left of the tachometer tell-tale lock on the instrument panel and registers the amount of air pressure in the two air reservoirs. The dial is graduated from zero to 150 in 10-pound divisions.

b. Low-pressure Indicator Buzzer. The low-pressure indicator buzzer is located on the front side of the dash and gives a buzzing sound whenever the air pressure is below a safe operating pressure. The buzzer is an electric vibrator operated by the air pressure in the air reservoirs through a low-pressure indicator.

c. Oil Pressure Gage (AH, fig. 8). The oil pressure gage is located on instrument panel to the left of ignition switches. This gage registers the pressure, in pounds per square inch, of the oil being circulated throughout the engine by the oil pump. The oil pressure gage does not indicate the amount of oil in the engine. The dial is graduated from zero to 120 in 10-pound divisions.

d. Oil Temperature Gage (F, fig. 8). The oil temperature gage is located on the instrument panel above the oil pressure gage. The temperature, in degrees Fahrenheit, of the engine oil is registered by this gage. The dial is graduated from 100°F to 320°F.

e. Water Temperature Gage (AR, fig. 8). The water temperature gage is located in the lower left corner of the instrument panel, and registers in degrees (Fahrenheit) the temperature of the coolant in the engine cooling system. The dial is graduated from 100°F to 220°F.

f. Fuel Gages (AV and J, fig. 8). There are two fuel gages, one in the upper right corner of the instrument panel for the right fuel tank, and the other in the opposite corner for the left fuel tank. The right fuel tank gage indicates how much fuel is in the right fuel tank and the left gage, how much fuel is in left fuel tank.

g. Tachometer (E, fig. 8). The tachometer is located in the center of the instrument panel and registers revolutions of the engine by hundreds; that is, the 5 indicates 500 revolutions per minute of the engine. The dial is graduated from 3 to 24, which indicates revolutions per minute of 300 to 2,400.

h. Speedometer (B, fig. 8). The speedometer is located at left center of the instrument panel and indicates the road speed of the

DRIVING CONTROLS AND OPERATION

tractor in miles per hour. The dial is graduated from zero to 60 and both trip mileage and total mileage are shown on the odometer.

i. Ammeter (C, fig. 8). The ammeter is located on the instrument panel just above the air pressure gage and indicates whether or not the generator current is charging the battery. The dial is graduated to show discharge (negative reading) on left side of dial and charge (positive reading) on right side of dial. The graduations are in amperes and read from zero to 100.

j. Brake Pedal (AF, fig. 8). The brake pedal is located in the floorboard immediately to the right of the steering column and controls the air-operated brakes on the rear wheels of the tractor. If semitrailer is attached to tractor with air hose connected, the semitrailer wheel brakes will also be applied.

k. Semitrailer Air Brake Hand Lever (AA, fig. 8). The semitrailer air brake hand lever is located in the center of the steering column beneath the steering wheel. This lever applies the wheel brakes on the semitrailer only.

l. Right Air Brake Hand Lever (Z, fig. 8). The right air brake hand lever is located on the right side of the steering column beneath the steering wheel. This control applies the brakes on the right rear wheels of the tractor and has no effect on semitrailer wheel brakes.

m. Left Air Brake Hand Lever (AJ, fig. 8). The left air brake hand lever is located on the left side of the steering column beneath the steering wheel. This control applies the brakes on the left rear wheels of the tractor and has no effect on semitrailer wheel brakes.

n. Propeller Shaft Brake Lever (AN, fig. 8). The propeller shaft brake lever is located at the left of the driver and is used to apply the brake, which is located on the propeller shaft at the front of the tractor rear differential carrier.

o. Clutch Pedal (AM, fig. 8). The clutch pedal is located in the floorboard to the left of the steering column and is used to disengage and engage the engine clutch in order to transmit power to the driving wheels.

p. Accelerator Pedal (AE, fig. 8). The accelerator pedal is located in the floorboard to the right of the brake pedal and is used to accelerate the engine revolutions per minute for increasing engine power for driving the vehicle or for operation of the winches.

q. Hand Throttle Lever (N, fig. 8). The hand throttle lever is located at the upper right front corner of the driving compartment on the side cover of the radiator and within reach of the driver's right hand. The lever is secured to a sector, and is used for setting the engine revolutions per minute at a definite rate for traveling over long distances, or for recovery operations.

r. Fuel Tank Change-over Valve (AD, fig. 8). The fuel tank change-over valve is located at the right of driver's seat just back of the front axle declutch lever. When fuel in one tank is exhausted, turning the valve lever permits fuel in opposite tank to be used.

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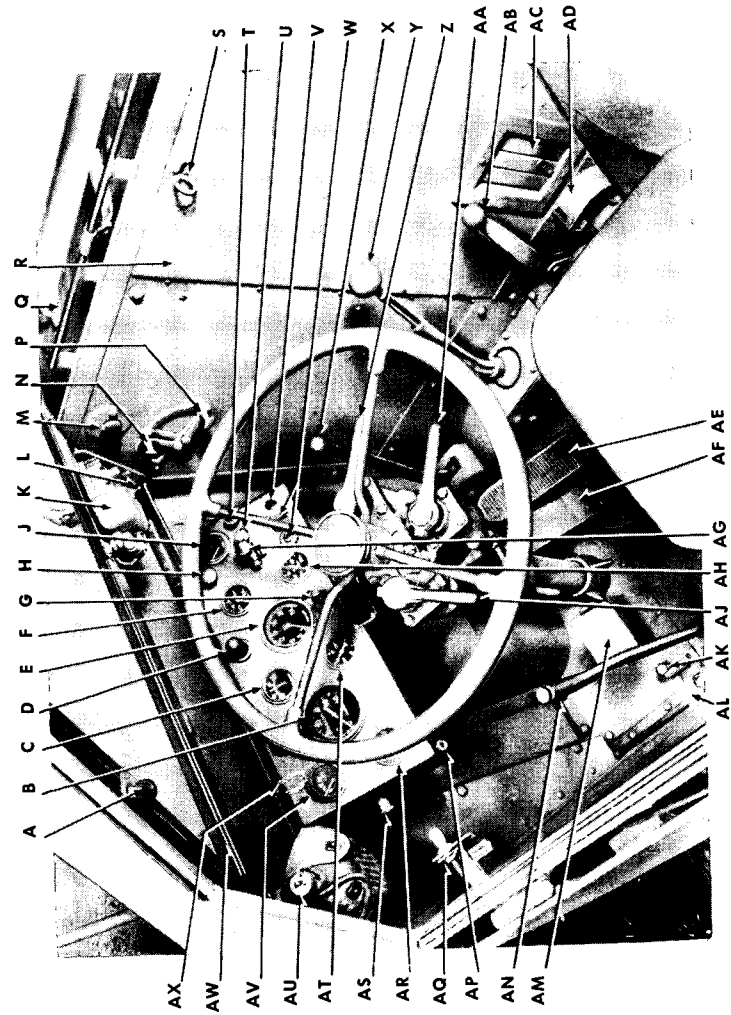


Figure 8—Instrument Panel and Driver's Controls

A—WINDSHIELD THUMB SCREW
B—SPEEDOMETER
C—AMMETER
D—INSTRUMENT PANEL LIGHT
E—TACHOMETER
F—OIL TEMPERATURE GAGE
G—TACHOMETER TELLTALE LOCK
H—FLOODLIGHT SWITCH
J—FUEL GAGE (RIGHT FUEL TANK)
K—WINDSHIELD WIPER
L—WINDSHIELD WIPER SWITCH
M—AIR HORN BUTTON
N—HAND THROTTLE LEVER
P—CHOKE LEVER
Q—RADIATOR FILLER CAP COVER
R—ENGINE COMPARTMENT SIDE COVER (DOOR)
S—TURNBUCKLE
T—SIREN LIGHT SWITCH
U—BLACKOUT DRIVING LIGHT SWITCH
V—STARTER SWITCH
W—IGNITION SWITCHES
X—AUXILIARY TRANSMISSION SHIFT LEVER
Y—MAIN TRANSMISSION SHIFT LEVER
Z—RIGHT AIR BRAKE HAND CONTROL
AA—TRAILER BRAKE HAND CONTROL
AB—FRONT AXLE DECLUTCH LEVER
AC—ENGINE VENTILATOR
AD—FUEL TANK CHANGE-OVER VALVE
AE—ACCELERATOR PEDAI
AF—BRAKE PEDAL
AG—LIGHT SWITCH
AH—OIL PRESSURE GAGE
AJ—LEFT AIR BRAKE HAND CONTROL
AK—HEADLIGHT DIMMER SWITCH
AL—WINDSHIELD RACK
AM—CLUTCH PEDAL
AN—HAND BRAKE LEVER
AP—SIREN SWITCH
AQ—WINDSHIELD RACK
AR—WATER TEMPERATURE GAGE
AS—INSTRUMENT PANEL LIGHT SWITCH
AT—AIR PRESSURE GAGE
AU—CANTEEN
AV—FUEL GAGE (LEFT FUEL TANK)
AW—WINDSHIELD
AX—CHAIN AND WING SCREW FOR INSTRUMENT PANEL

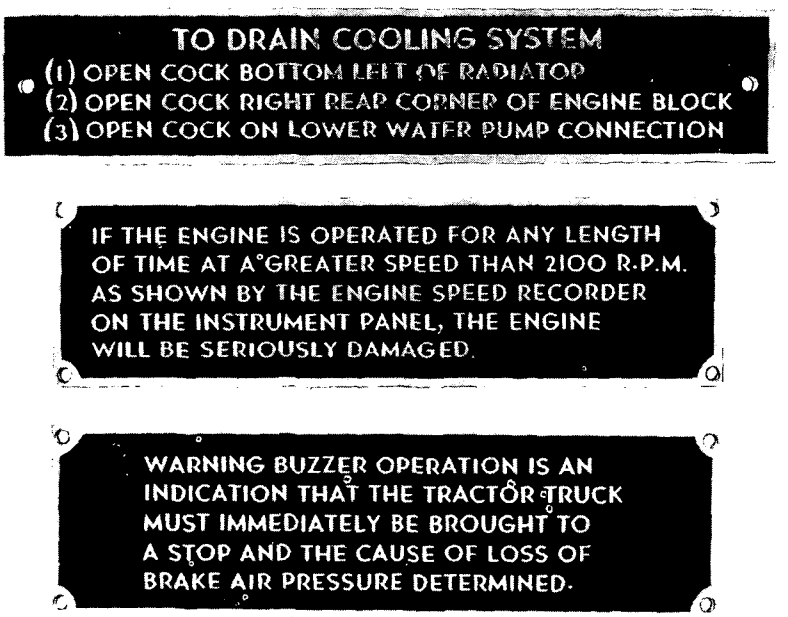
Legend for Figure 8—Instrument Panel and Driver's Controls RA PD 76921A

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

s. **Choke Lever** (P, fig. 8). The choke lever is located on the same sector as the hand throttle lever and is used to regulate the richness of the fuel mixture when starting a cold engine.

t. **Tachometer Tell-tale Lock** (G, fig. 8). The tachometer tell-tale lock is located at the left side of the oil pressure gage on the instrument panel and is used to reset the red hand of the tachometer, which stops at highest revolutions per minute at which engine has been operated.

u. **Ignition Switches** (W, fig. 8). There are two ignition switches located at the right lower corner of the instrument panel and to the



RA PD 76488

Figure 9—Instruction Plates in Cab

left of the starter switch. The engine has dual ignition (two spark plugs in each cylinder) and the right ignition switch controls the spark plugs on the right side of the engine, and the left ignition switch, the plugs on the left side of engine.

v. **Starter Switch** (V, fig. 8). The starter switch is a push type switch located at the right lower corner of the instrument panel and is the means of starting the engine.

w. **Light Switch** (AG, fig. 8). The light switch is a push-pull type switch located on the instrument panel above the two ignition switches and controls two service headlights, one service tail and

stop light, two service clearance lights, two blackout marker lights, one blackout tail and stop light, and two blackout clearance lights on the tractor. This switch also controls four service clearance lights, four blackout lights, one service tail and stop light, and one blackout tail and stop light on the semitrailer (fig. 10). The semitrailer wiring junction cable must be attached to the semitrailer and tractor and the blackout switch on the semitrailer must be on either blackout or standard light position.

x. **Floodlight Switch** (H, fig. 8). The floodlight switch is a push-pull switch located on the instrument panel between the oil temperature gage and right fuel gage. This switch is used to operate the two floodlights mounted on the outside rear end of cab. These floodlights have individual switches on them for singular operation.

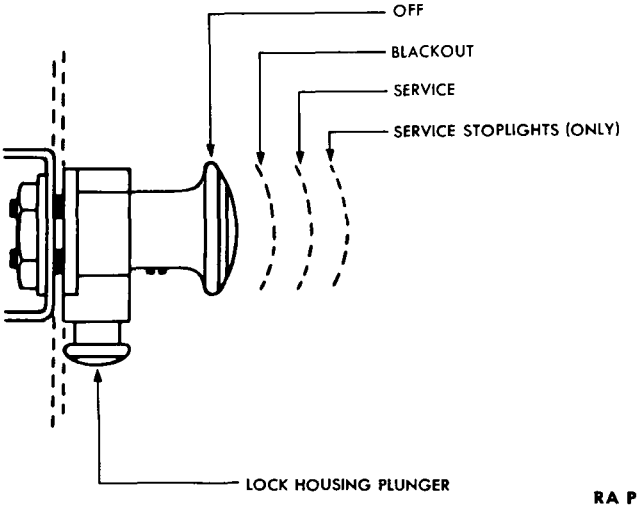


Figure 10—Operation of Tractor Light Switch

y. **Blackout Driving Light Switch** (U, fig. 8). The blackout driving light switch is a push-pull switch located at the right side of the main light switch on the instrument panel and controls the blackout driving light on the left front side of the tractor.

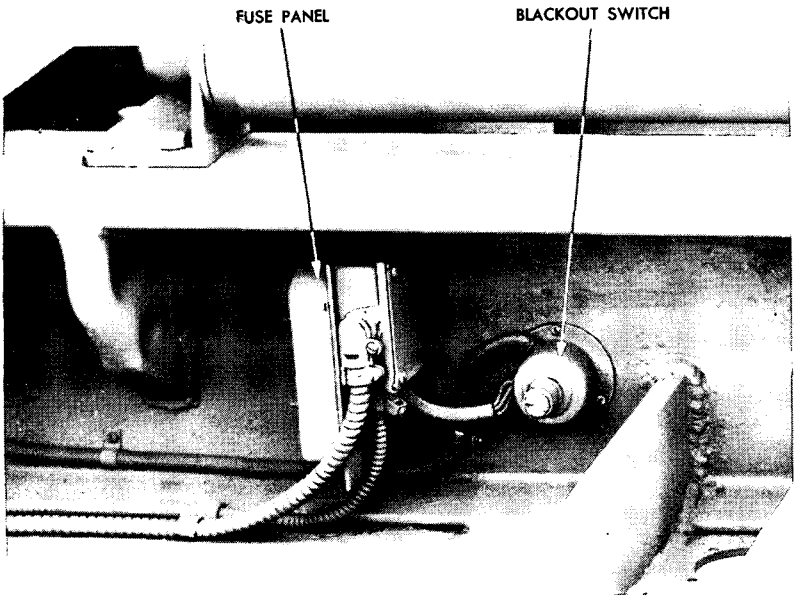
z. **Headlight Dimmer Switch** (AK, fig. 8). The headlight dimmer switch is a tilt switch located on the floor at the left of the clutch pedal, and operates the dim and bright beams of the two headlights when it is depressed.

aa. **Siren Switch** (AP, fig. 8). The siren switch is a push-button switch located at the lower left under side of the instrument panel and controls the siren which is mounted on the left front side of the cab.

ab. Siren Light Switch (T, fig. 8). The siren light switch is a push-pull switch located at the right side of the instrument panel, below the right fuel gage and controls the flashing siren light.

ac. Instrument Panel Light Switch (AS, fig. 8). The instrument panel light switch is a push-pull switch located on the left vertical side of the instrument panel and controls three instrument panel lights.

ad. Windshield Wiper Switches (L, fig. 8). The windshield wiper switches are lever switches located on both windshield wipers for controlling the operation of each windshield wiper.



RA PD 57460

Figure 11—Semitrailer Fuse Panel and Blackout Switch

ae. Main Transmission Shift Lever (Y, fig. 8). The main transmission shift lever is located in the driving compartment at the driver's right, and is used in conjunction with the clutch pedal when shifting gears in the main transmission.

af. Auxiliary Transmission Shift Lever (X, fig. 8). The auxiliary transmission shift lever is located in driving compartment to the right of the driver, and forward of the main transmission shift lever. It is used when shifting auxiliary transmission gears.

ag. Front Axle Declutch Lever (AB, fig. 8). The front axle declutch lever is located in the driving compartment at the driver's right and to the rear of the main transmission shift lever. It is used

to engage the front axle drive when additional traction and power are needed at the front wheels.

ah. Front Mounted Winch Power Take-off Lever (fig. 30). The front mounted winch power take-off control lever is located on the front side of the driver's seat and is used to operate the front winch. The principal use of the front winch is to assist the tractor in getting out of difficult terrain.

ai. Semitrailer Air Valves. There are two air valves on the rear of the tractor, just forward of the trailer air connections at the front of the tractor frame rear cross member. These valves must be turned on after the air hose are connected to the tractor and semitrailer.

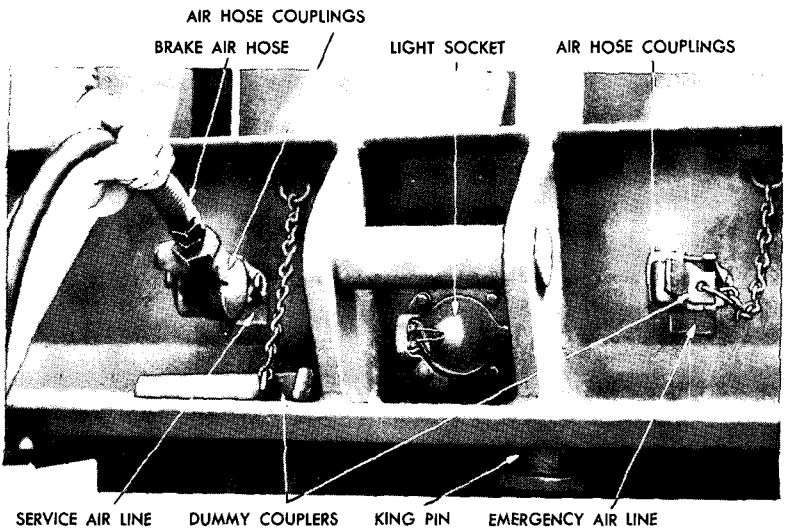


Figure 12—Semitrailer Light Socket and Air Hose Couplings

aj. Windshield Armor Plate Shield (fig. 3). There are two armor plate shields over the windshields at the front of cab which are used for protection of the crew during combat. These shields are hinged at the top to the cab and are held in their normal, open position by support rods secured on the exterior of the cab front end. The shields are secured to the support rods by a locking device which prevents the shields from being accidentally closed. Latch bolts are secured to the inner side of the shields and from these latch bolts is a chain which passes to the interior of the cab above the windshield. On the end of this chain is an eyelet. Peepholes are an integral part of the shields.

ak. Radiator Armor Plate Doors (fig. 3). There are two armor plate doors in the front of the cab and directly in front of the radiator core. These doors are hinged at their outer edge to the cab so that they open horizontally, and each door is connected by linkage to the radiator door and lever which is the left side of the commander's seat

inside the cab. These doors are used during combat to protect the radiator core, and are also used in extremely cold weather to assist in bringing the engine operation temperature to normal.

al. Door and Cab Window Armor Plate Shields (figs. 3 and 4).

(1) DESCRIPTION. There are drop-type armor plate shields at the top of each of the cab doors and six armor plate shields from the cab windows, two on the right, the left, and the rear of the cab. These shields are hinged at the bottom to the cab rear and side walls. Each shield has a peephole and a latch bolt.

Figure 13—Semitrailer Brake Release Valve

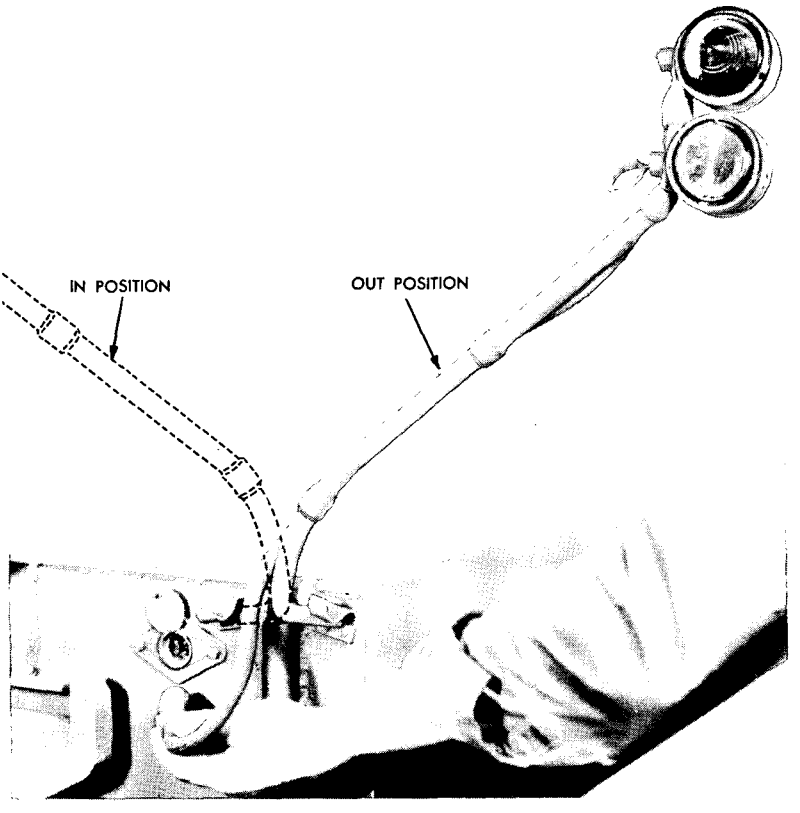
am. Semitrailer Blackout Switch (fig. 11). The semitrailer blackout switch is mounted at the rear of the trailer second cross member. When the jumper cable between the tractor and trailer is connected, the tractor driver can turn on either blackout or standard driving lights, depending upon the position the switch is in (blackout or standard).

an. Semitrailer and Tractor Light Sockets (fig. 12). A jumper cable light socket is mounted at the center of the front cross member

of the semitrailer for attachment of the semitrailer jumper cable to provide electrical current for the semitrailer. The tractor light socket is in the rear cross member of the frame.

ao. Semitrailer Jumper Cable (fig. 12). The semitrailer jumper cable connects the tractor and semitrailer light sockets to provide electrical current for the semitrailer.

ap. Semitrailer Air Connecting Hose (fig. 12). The two semitrailer air connecting hose connect the two air couplings mounted on



RA PD 57468

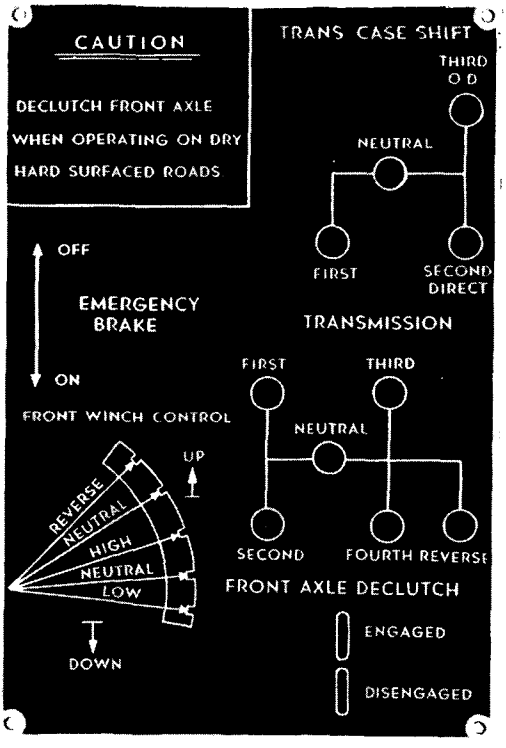
Figure 14—Semitrailer Auxiliary Clearance Lights

the front cross member of the semitrailer to the two air couplings mounted on the rear of the tractor frame. These air connecting hose connect the tractor air system to the semitrailer air system.

aq. Semitrailer Rocker Beam Shifting Device (figs. 24 and 27). The rear under-construction of the semitrailer may be narrowed to permit installation of the semitrailer on a flat car; to drive the semitrailer over a narrow bridge; or for passing through narrow tun-

nels. This under-construction width is controlled by the rocker beam shifting screw which is located between the rear tires on both the right and left sides of the semitrailer frame.

ar. Semitrailer Brake Release Valve (fig. 13). The semitrailer brake release valve is an air-operated valve located ahead of the front tire on the left side of the semitrailer. The purpose of this valve is to enable the tractor operator to release the semitrailer brakes in case the semitrailer air brake hand lever on the tractor fails to function,



RA PD 76489

Figure 15—Transmission, Front Axle, Front Winch and Parking (Emergency) Brake Control Instruction Plate

or if the semitrailer should need to be moved when the tractor is disconnected from the semitrailer. The semitrailer brakes are automatically set whenever the tractor is disconnected from the semitrailer.

as. Semitrailer Auxiliary Clearance Lights (fig. 14). There are two auxiliary clearance lights carried at the front of the semitrailer on the left-hand side. These lights are installed in holders on both sides of the semitrailer ahead of the front wheels. A jumper cable is attached to each light assembly for installing into the light socket adjacent to the holder.

at. Semitrailer Fifth Wheel Release Handle. The fifth wheel

release handle is located on the fifth wheel which is mounted on the rear of the tractor. The purpose of this handle is to enable the operator to release the coupler jaws that lock the tractor and semitrailer together.

5. USE OF INSTRUMENTS AND CONTROLS IN VEHICULAR OPERATION.

a. Before-operation Service. Perform the service in paragraph 25 before attempting to start the engine.

b. Starting Engine.

(1) Apply propeller shaft brake by pulling back on brake hand lever (fig. 8).

(2) Place auxiliary transmission and main transmission shifting levers in their neutral position (fig. 15).

(3) Make certain all rear tandem winch control levers are in their neutral position (fig 15). Be sure that front axle declutch lever is also in position (fig. 15).

(4) Move hand-throttle lever about one-third of the way forward (fig. 8). Then move the choke lever upward about three-quarters of the way. For conditions of extreme heat or cold see section V, paragraphs 20 and 21.

(5) Turn the two ignition switches to their "ON" position (fig. 8). NOTE: *At this point the low air pressure buzzer will start to sound if the air pressure gage reading is below 60 pounds.*

(6) Depress clutch pedal and hold it in depress position until after the engine has been started.

(7) Press starter button and release immediately when engine starts. If engine does not start after two or three trials, release starter button and investigate.

(8) After the engine has started, read the gages and instruments. The oil pressure should register not less than 40 pounds; and if it does, shut off the engine immediately and investigate. The air pressure gage should read not less than 60 pounds; however, if low pressure air indicator buzzer is sounding, wait a few moments for air pressure to build up to 60 pounds. If it does not, shut off the engine and investigate. The ammeter should read on the charge side; tachometer should register about 750 revolutions per minute; the water temperature gage show a gradual rise to 140°F to 160°F. The oil temperature gage must show a gradual rise to about 110°F to 130°F; the fuel gage should register at "F".

(9) Push choke lever down by slow movement until lever is all the way forward. NOTE: *If there is any uneven operation of the engine such as surging or irregular firing investigate the cause.* If air pressure gage does not register at least 60 pounds in about three minutes and low air pressure indicator buzzer ceases sounding, stop the engine and investigate the cause.

c. Operation of Vehicle. NOTE: *The controls to be moved, instruments and gages to be watched, are the same whether the tractor alone, or the tractor and semitrailer, are to be operated.*

(1) PLACING TRACTOR WITHOUT SEMITRAILER IN MOTION.

(a) Shifting to Higher Speeds. Push clutch pedal down and shift main and auxiliary transmission into first gear. Gearshift must be

made as smoothly and as quietly as possible, without throwing any unnecessary jerk on the driving mechanism when the clutch is engaged. Grasp propeller shaft hand-brake lever so as to release the catch, and then push the lever all the way forward. Depress accelerator pedal sufficiently to increase the engine's revolutions per minute (shown on tachometer) and to move the load. Release clutch pedal slowly while simultaneously depressing the accelerator pedal. This action prevents stalling the engine as the tractor starts to gather momentum. When tractor has gathered momentum and engine speed reaches 1,800 revolutions per minute on tachometer, release the accelerator pedal and depress the clutch pedal simultaneously. Then move the auxiliary shifting lever to second directly (fig. 15). Release clutch pedal slowly and depress accelerator pedal. Pick up further momentum of the tractor until the engine tachometer reads about 1,800 revolutions per minute. NOTE: *The tractor must gain momentum during gear shifting operation. The rear wheels must not be churning in sand or mud.* Momentum of the vehicle decides when gearshift must be made, not revolutions per minute of the engine. Repeat the procedure in preceding step until the highest gear ratio, that the engine can easily handle, is attained. The 12 forward speeds are shown in paragraph 3 and figure 15. The tractor will not move if the auxiliary transmission is not in mesh.

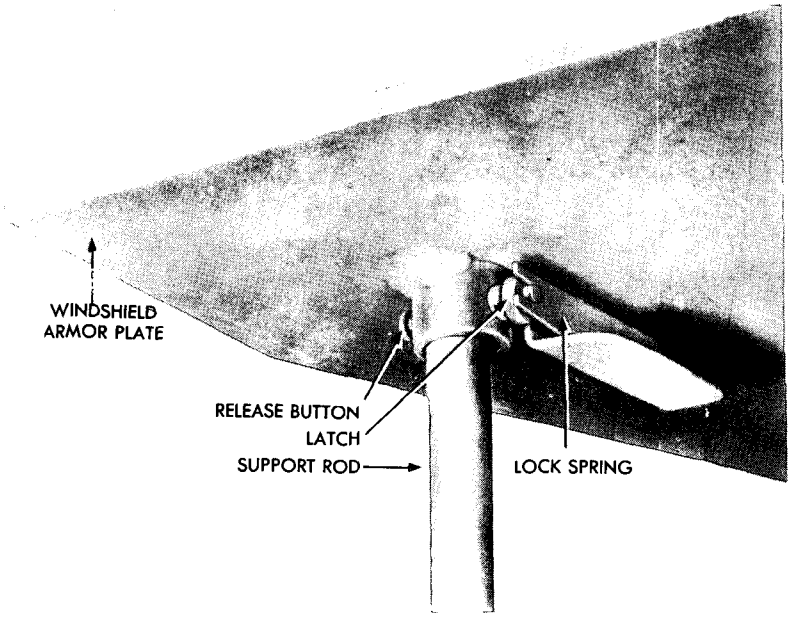
(b) Shifting to Lower Speeds (Double Clutching). Shift gears to a low speed before the engine begins to labor or the vehicle begins to lose momentum. Gears must be shifted to a lower ratio if the momentum of the vehicle is dropped to where the tachometer reads 1,300 revolutions per minute. Do not judge the necessity of a shift by the tachometer reading alone. The momentum must be of first importance. To reduce gear ratios use the double clutch method. Disengage the clutch by pressing the clutch pedal and simultaneously releasing the accelerator pedal. Move gearshift lever (fig. 15) to its neutral position, then engage clutch and press accelerator pedal at the same time. When the engine speed, and the desired gearshift speed, are about the same (synchronized), disengage the clutch and shift to the desired gear speed. Do not attempt to shift the transmission into gear until the gear speed has been synchronized with the engine revolutions per minute. Always engage the clutch and depress the accelerator pedal to attain the desired momentum of the vehicle.

(c) Driving Downhill. It is generally advisable to go downhill in the next lower gear than would be used to ascend the same hill. The engine governor is not effective in controlling the engine speed when the engine is used as a brake in descending the hill. The engine must not be allowed to over-speed (2,100 rpm) at this time. Use the air brakes to keep the vehicle under full control. CAUTION: *Never shift transmission gears to neutral, or disengage the clutch, and coast downhill. Also do not shut off the engine. Do not make excessive use of the brakes which might cause a loss of air pressure and mean complete loss of control of the vehicle.*

(d) Shifting into Reverse. The vehicle must be brought to a complete stop before any shift into reverse is attained. Disengage clutch and place main transmission gearshift lever in reverse (fig. 15). En-

gage clutch and simultaneously depress the accelerator to attain an engine speed that will prevent the engine from stalling. Shift auxiliary transmission to first, second direct, or third O.D. for whatever reverse speed will meet the condition.

(e) Front Axle Drive. To engage or disengage the front axle, it is necessary to move the front axle declutch lever into its "engaged" or "disengaged" position (fig. 15). Shifting of this lever will be facilitated by disengaging the engine clutch. The shifting may be made at any time; however, it is easier to shift the lever when the tractor is in motion. Do not attempt to engage the front axle if the rear wheels are spinning. Front axle drive should be used for off-the-road operation. Do not use the front axle drive when operating the vehicle on dry, hard-surfaced roads.



RA PD 77038

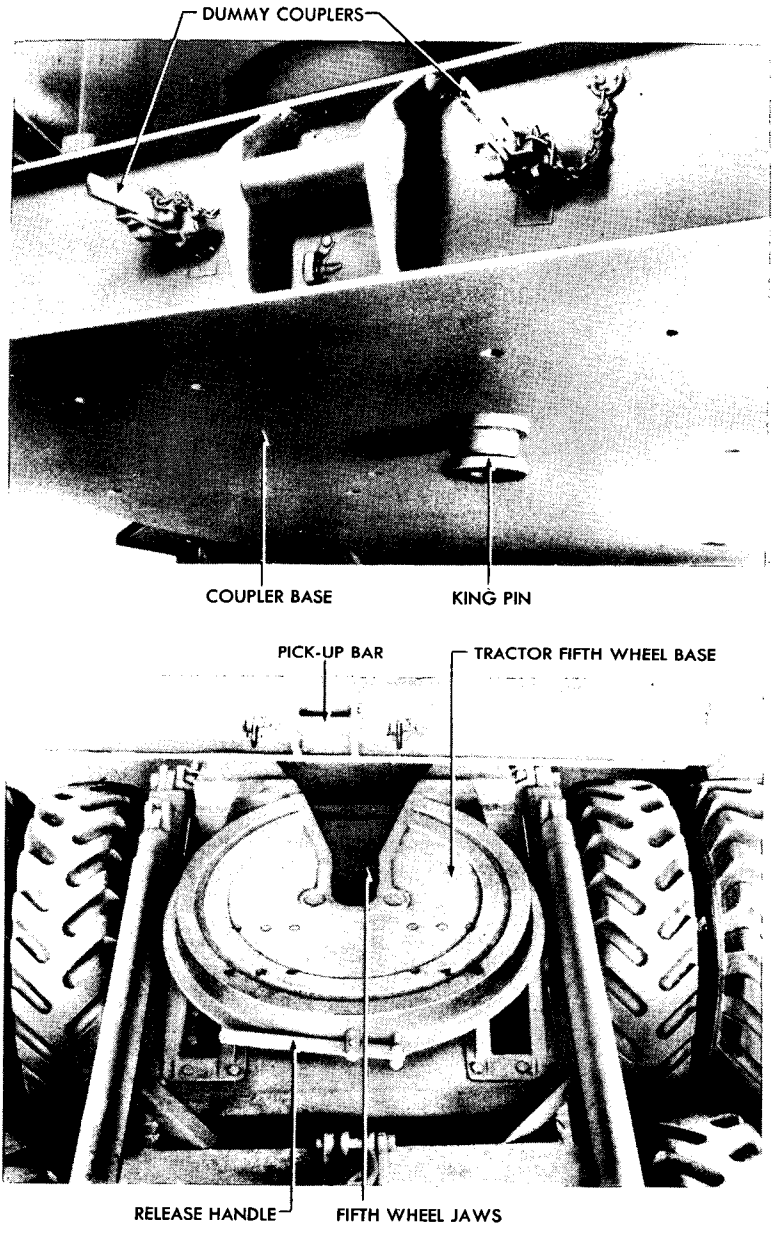
Figure 16—Windshield Armor Plate Latch

d. Driving in Combat Area.

(1) WINDSHIELD ARMOR PLATE SHIELDS.

(a) Close Shields from Inside Cab (fig. 16). In order to close the shields from inside the cab, it is necessary to remove the thumbscrew and retaining clips that hold the windshield assembly in place, then remove the windshield and place in the windshield racks in the driver's and commander's compartments. Secure the windshield in the racks with the thumbscrew and retaining clips which hold the windshield in the cab. Reach through the windshield opening in the

40-TON TANK TRANSPORTER TRUCK-TRAILER M25



RA PD 57469

Figure 17—Coupling Tractor to Semitrailer

cab, and press inward on the release button of the latch which holds the armor plate shield to the support rod, and lift the shield up, and off, the rod. Repeat procedure on opposite shield. Push rods up against the cab and allow the armor plate shields to slam shut, thereby latching the shield to the cab by means of the latch bolts.

(b) To Open Shields from Inside Cab. To unlatch the shields pull up on the latch pole. Then push the shield up. Push the support rod out and install shield on support rod, making sure the lock button is out. NOTE: *It is possible to close the shields with the windshield in its normal place in the front of the cab. If this is done, the shield can be unlatched by pulling on the eyelet at the end of the chain which is fastened to the shield latch bolt.*

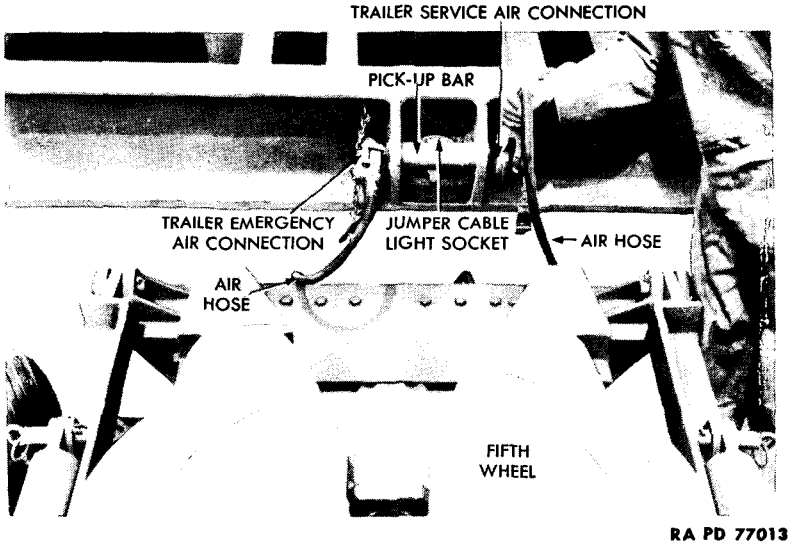


Figure 18—Attaching Air Lines to Semitrailer Before Coupling Tractor and Semitrailer

(c) Radiator Armor Plate Doors. Pulling backward on the radiator door lever, at left side of commander's seat, closes the radiator doors, and pushing the lever forward, opens the doors.

(d) Door and Cab Window Armor Plate Shields. Reach through the cab opening and pull the shield up, and slam it shut, so that the latch bolt holds the shield in place. To unlatch the shield pull downward on the latch bolt and push the shield outward and down.

e. Coupling Semitrailer to Tractor.

(1) ALINE TRACTOR WITH SEMITRAILER (fig. 17). Back the tractor slowly to the back end of the semitrailer and have an assistant stand at the semitrailer to guide the driving. Maneuver tractor so that the kingpin of the semitrailer is in line with the fifth wheel jaws; and

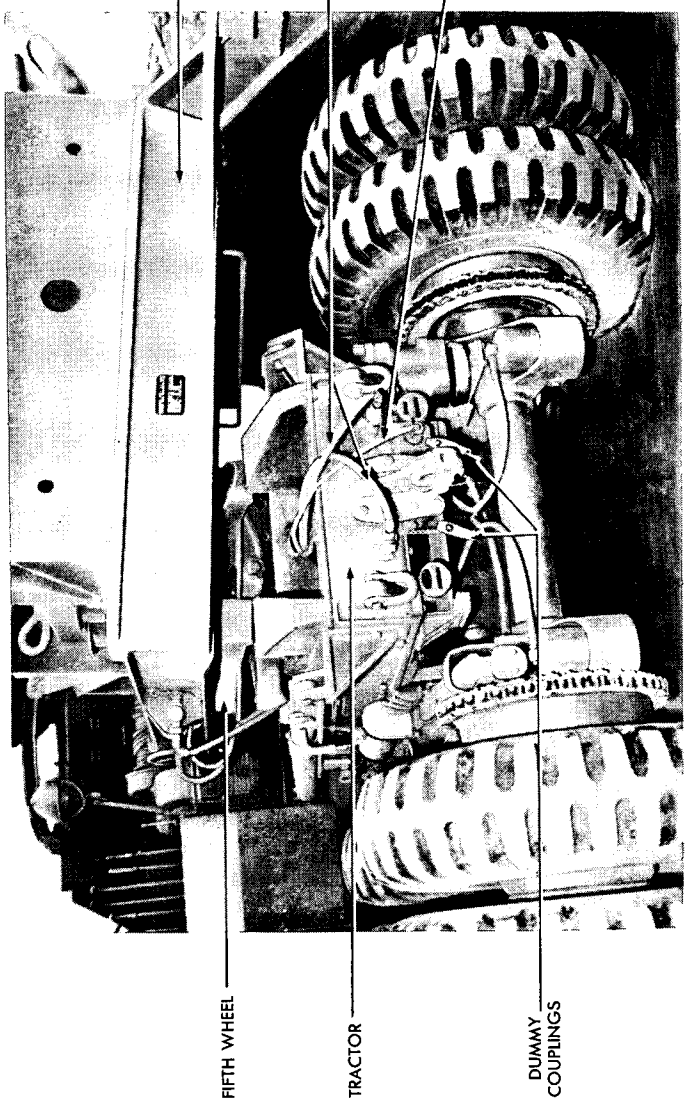
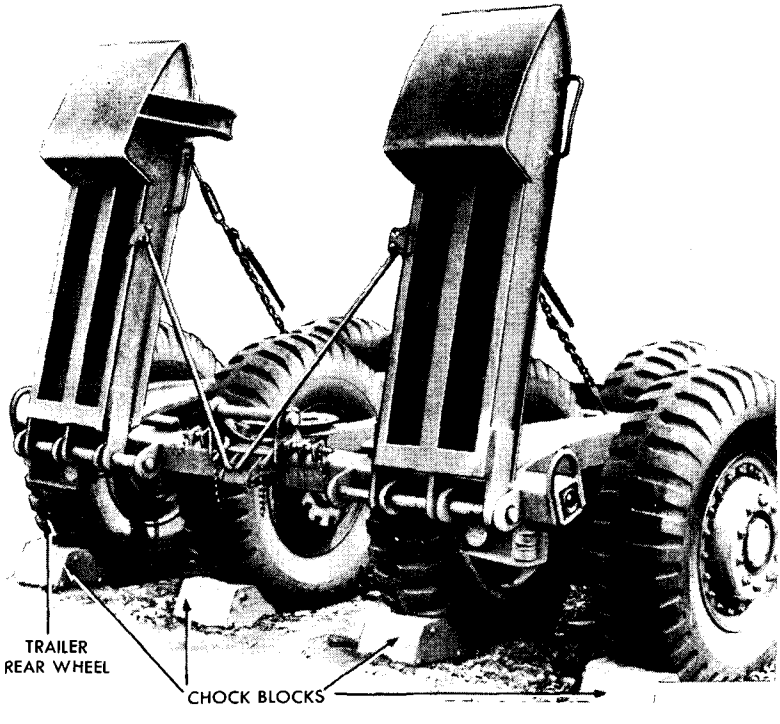


Figure 19—Attaching Air Hose to Tractor

just before the coupler base starts to ride onto the fifth wheel, stop the tractor.

(2) APPLY TRACTOR BRAKES AND BLOCK SEMITRAILER (figs. 18 and 19). Remove dummy couplings from the semitrailer air connection on the tractor and semitrailer and attach the air hose which is a part of the equipment of the semitrailer. Connect the emergency air connection on tractor to the service air connection on the semitrailer, and connect the service air connection of the tractor to the emergency air connection of the semitrailer. Turn the handle of the tractor air valves on by turning handle at side of tractor. These air valves are located at the front side of the rear cross member of the tractor



RA PD 77032

Figure 20—Blocking Rear Wheels of Semitrailer

chassis frame and are accessible through two handholes on the under side cross member. Remove chock blocks from the rear of the semitrailer decking and block the front and rear of the four rear wheels of the semitrailer (fig. 20). At the driver's seat in the tractor pull down on the semitrailer brake hand control in order to apply the semitrailer brakes. Turn off the two air valves at the rear cross member of the tractor chassis frame by pulling the handles, then disconnect and remove the air hose.

(3) ATTACH TRACTOR TO SEMITRAILER. Cover the fifth wheel and kingpin on the semitrailer with grease and back the tractor to the semitrailer until the kingpin is settled in the fifth wheel jaws. CAUTION: *The fifth wheel jaws must be locked firmly around the kingpin, therefore making certain that the release handle is inward toward the semitrailer with the release handle pin all the way in.* To test if the coupling is complete, start the tractor and try pulling the semitrailer ahead; and if the coupling has been correctly made, movement of the semitrailer will be extremely difficult. Attach jumper wiring

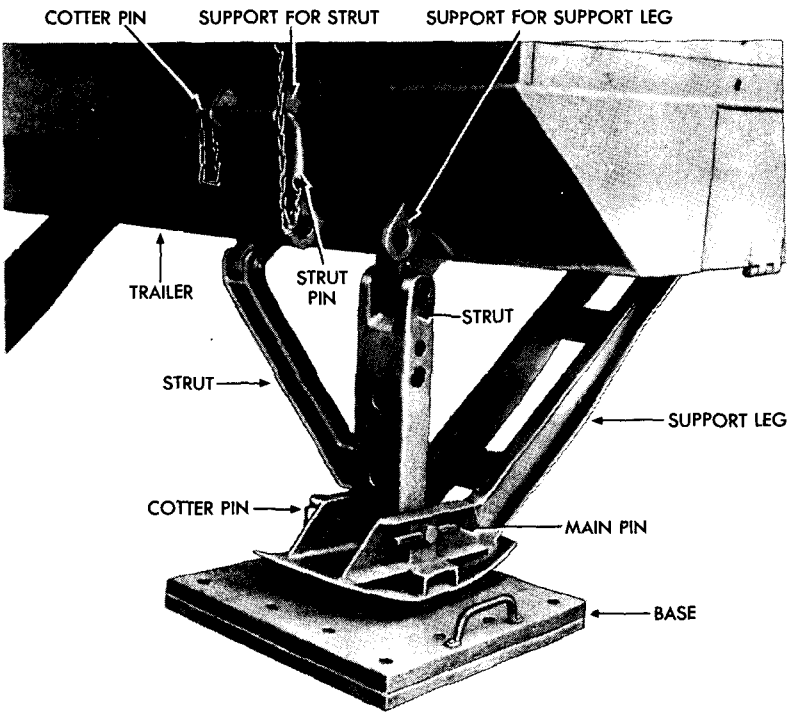


Figure 21—Semitrailer Support Legs in Down Position

cable which is part of the semitrailer equipment to the semitrailer wiring junction box (fig. 18) on the tractor and to the jumper cable light socket on the semitrailer. Then again attach the air hose as instructed above and for this final connection pass the air hose backward so that they are under the rail of the tractor.

(4) RAISE SEMITRAILER SUPPORTS AND TRAIL SKIDS (fig. 22). There are two semitrailer support legs and the procedure for raising them is the same. Remove base from under support legs and stow base on semitrailer, then remove cotter pin from main pin at base of strut and remove main pin. Remove gravity pin from mounting bracket

DRIVING CONTROLS AND OPERTAION

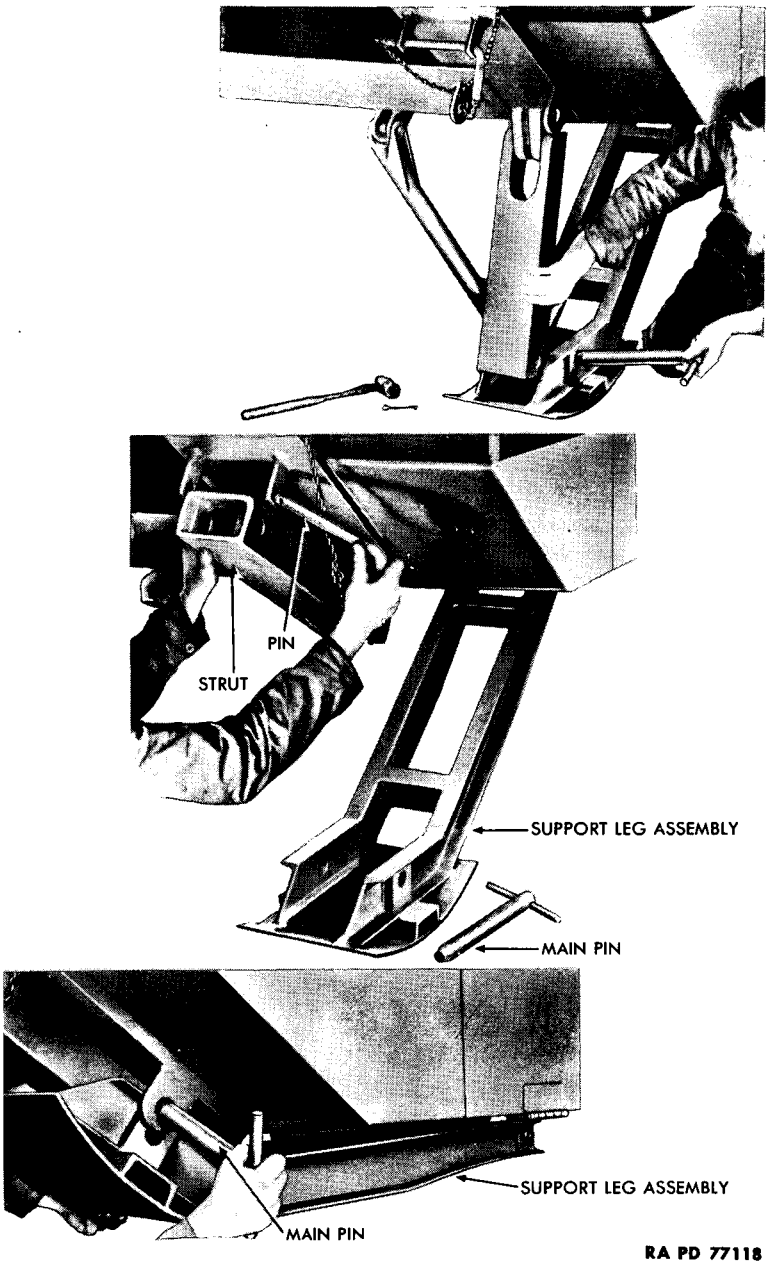
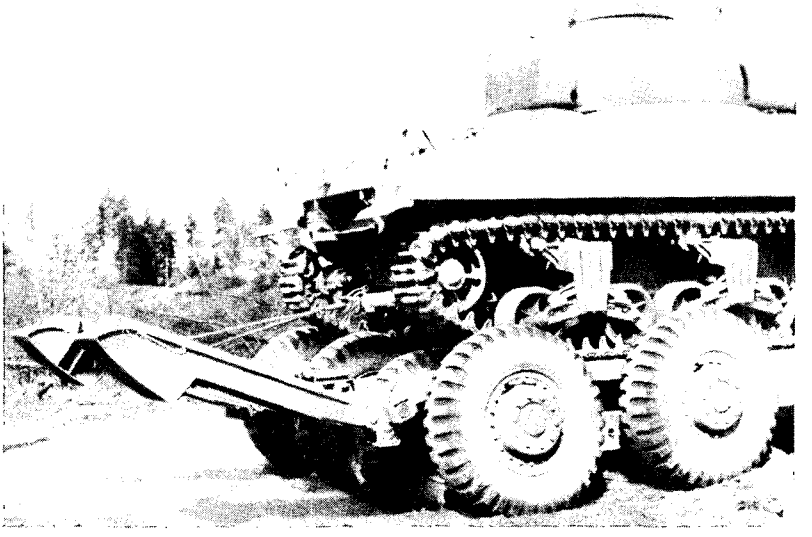


Figure 22—Raising Supports

welded to main frame member. Raise strut to its carrying position in the mounting bracket and lock strut into desired bracket with gravity pin and cotter pin. Raise support leg assembly to its carrying position and lock it with main pin and cotter pin. Remove chock blocks semitrailer rear wheels and stow in rear compartment of semitrailer. Raise trail skids by hand or by attaching skids to tank being loaded. The latter method raises the skids along with the tank (fig. 23).

f. Placing Tractor with Semitrailer in Motion. NOTE: *Make certain that the semitrailer jumper cable between the semitrailer light socket and the tractor light socket is connected. Also, that the blackout switch on the semitrailer is turned to either the blackout or standard light position by the use of a small screwdriver.* The



RA PD 76926

Figure 23—Lifting Trail Skids During Loading of Semitrailer

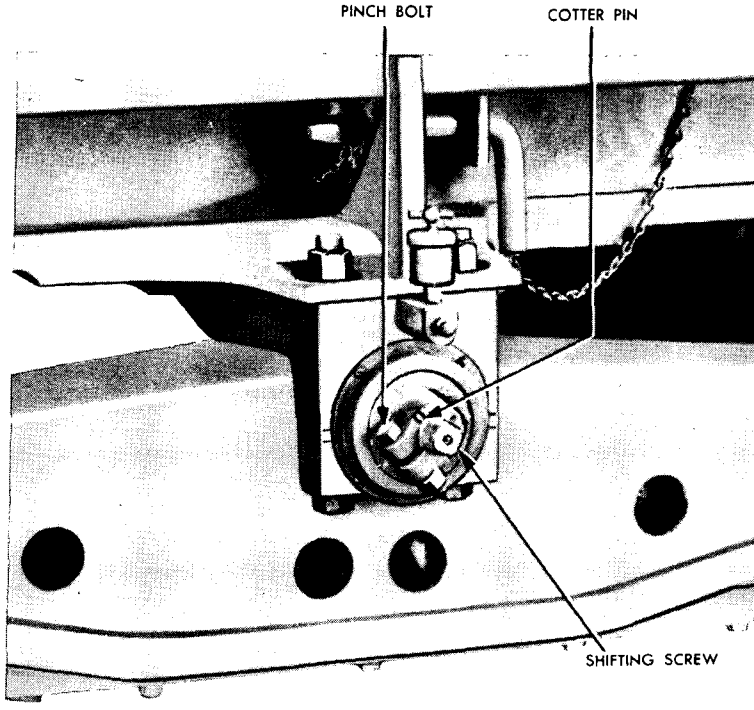
blackout switch has no "OFF" position. It must be turned to use the blackout or standard light. The light switch on the instrument panel of the tractor operates the semitrailer blackout lights simultaneously with the tractor blackout lights. When the semitrailer blackout switch is turned to the drive light position, both the tractor and semitrailer drive lights are operated simultaneously. The semitrailer blackout switch must be turned to the driving light position in order that the stop lights of both the tractor and semitrailer will be operated when the brakes are applied.

(1) SEMITRAILER AUXILIARY CLEARANCE LIGHTS (fig. 14). There are two auxiliary clearance lights carried at the front of the semitrailer on the left-hand side. These lights are installed in holders on both sides of the semitrailer at the front wheels. The jumper cable

DRIVING CONTROLS AND OPERATION

is attached to each light assembly for installing into the light socket adjacent to the holder. The lights are adjustable to two positions "IN" and "OUT." They are held in position by spring clips.

(2) DRIVING. The procedure of driving the tractor and semitrailer is the same as driving the tractor alone. The over-all length must be kept in mind, as well as the weight, and whether the semitrailer is loaded or not.



RA PD 57463

Figure 24—Shifting Screw

(3) TURNING. When turning corners allow for the fact that the semitrailer wheels turn inside the turning radius of the tractor. This fact is due to the tank transporter unit being hinged in the middle.

(4) BACKING. When backing the tractor with semitrailer, the tractor should be turned in the opposite direction to the direction that is desired for the semitrailer. When stopping, if the terrain permits, the tractor brakes and semitrailer brakes must be applied simultaneously by means of the brake pedal on the tractor. The semitrailer brakes must not be used for stopping. When bringing the tractor with semitrailer to a stop, keep the tires just short of the skidding point.

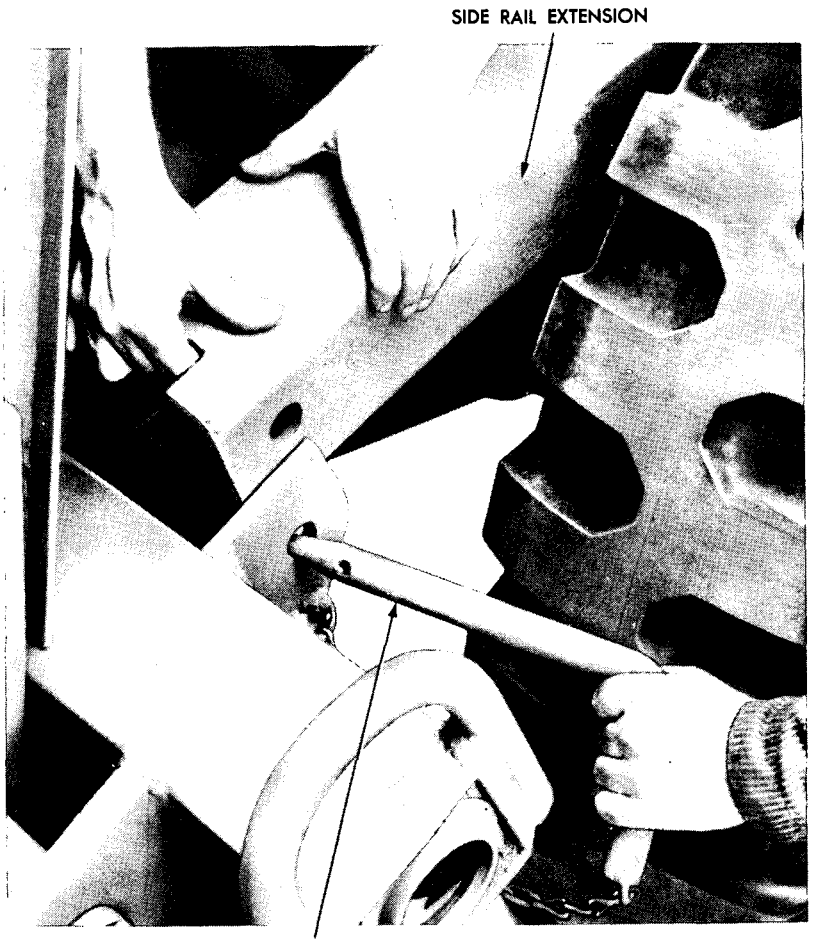


Figure 25—Side Rail Extension

(5) PARKING. When the tractor with semitrailer is to be parked, do not set the air brakes and depend upon them to hold the vehicle, place chock blocks at the front and rear of the semitrailer rear wheels.

(6) SEMITRAILER ROCKER BEAM SHIFTING DEVICE. To narrow the rear underconstruction of the semitrailer proceed as follows:

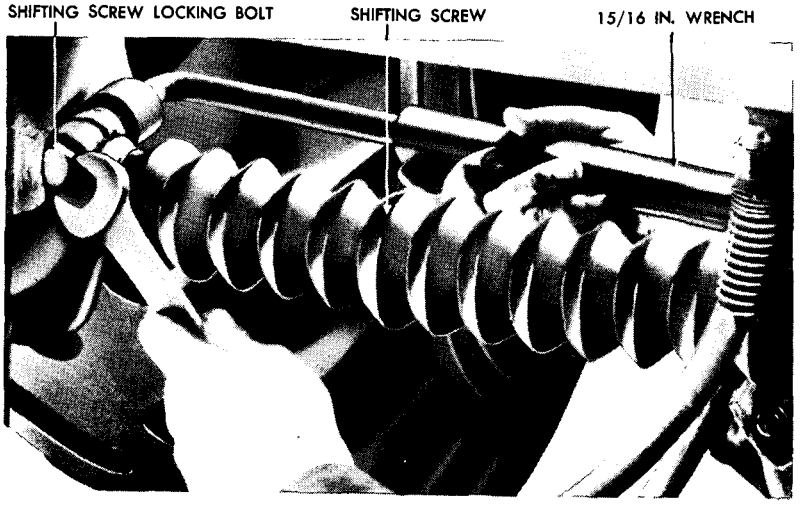
(a) Remove Side Rails. Remove side rail extensions, then pull out two pins holding side rail extension to side rail and lift the side rail out of loading brackets (figs. 24 and 25).

(b) Raise Frame. Remove jack pad from deck of semitrailer and place it directly under the frame at the rear. Remove jack

DRIVING CONTROLS AND OPERATION

pedestal from right-hand tool compartment of semitrailer and remove 30-ton hydraulic jack from the top decking. Place the jack on the jack pedestal and raise the frame from one to two inches.

(c) *Adjust Shifting Screw.* Loosen pinch bolt at shifting bracket. Place rocker beam shifting wrench on rocker beam shifting screw (fig. 27). Turn shifting screw counterclockwise to move the underconstruction in, and counterclockwise to move it out. The underconstruction may be moved in 13 inches on each side, thereby reducing the over-all width from 12 feet 6 inches to 10 feet 4 inches. If it is necessary to drive the unit under reduced width, be sure that the width has not been reduced to less than 10 feet 6 inches, otherwise the tires will rub on the side of the frame.



RA PD 57465

Figure 26—Shifting Screw Locking Bolt

(7) TIGHTEN LOCKING BOLT. After the underconstruction has been moved to the desired "IN" position, tighten the locking pinch bolt at the shift screw bracket (fig. 26). CAUTION: *When shifting the underconstruction to the full "OUT" position, turn the shift screw in a counterclockwise direction until stop is reached. Then give the wrench a half turn in the opposite direction. It is very important that the shifting screw lock bolt (fig. 26) be kept tight at all times except when the adjustment is being made.*

(8) Remove jack pedestal and hydraulic jack. Stow them on semitrailer.

g. Stopping the Vehicle.

(1) Remove foot from accelerator pedal and depress brake pedal. This will apply the brakes of the tractor and the semitrailer. When-

ever the terrain permits, the tractor brakes and the semitrailer brakes must be applied simultaneously by means of the brake pedal. The semitrailer brakes alone must not be used for stopping.

(2) Disengage clutch when the vehicle speed has been reduced to the engine idling speed, which is about 600 revolutions per minute on the tachometer.

(3) Move main transmission and auxiliary transmission shift levers to neutral.

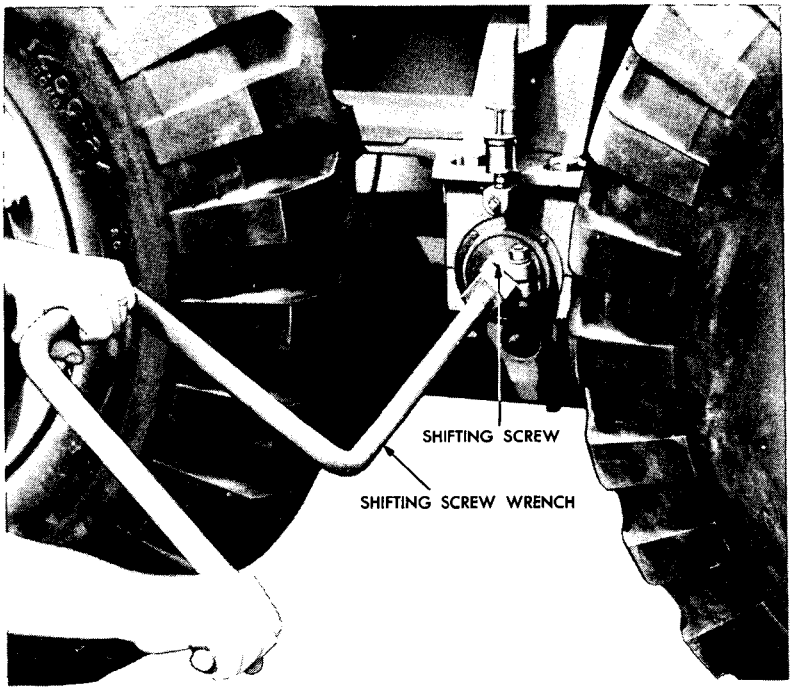


Figure 27—Turning Shifting Screw

(4) After vehicle has come to a complete stop, pull propeller shaft brake lever back. This lever must not be used to stop the vehicle except in an extreme emergency and do not depend entirely upon the parking brake to hold the vehicle if on a grade or if heavily loaded. Block wheels of vehicle with the chock blocks which are carried in the rear compartment of the semitrailer. Do not set air brake hand controls for parking the vehicle because the compressed air will gradually leak out, and after a period of time the brakes will release. If an extreme emergency forces the use of the parking brake for stopping the vehicle, use it with as much care as possible.

DRIVING CONTROLS AND OPERATION

(5) USING BRAKES ON RIGHT OR LEFT SIDE. The control lever for the right side brakes is on the right side of the steering column, and the control lever for the left side brakes is on the left side of the column. These controls operate the brakes on the tractor only, and the choice of right or left side brakes will prove useful under the following conditions:

(a) When front wheels of tractor are in deep sand, snow, mud, or ice, application of one brake will cause short pivot toward the side on which the brake is applied.

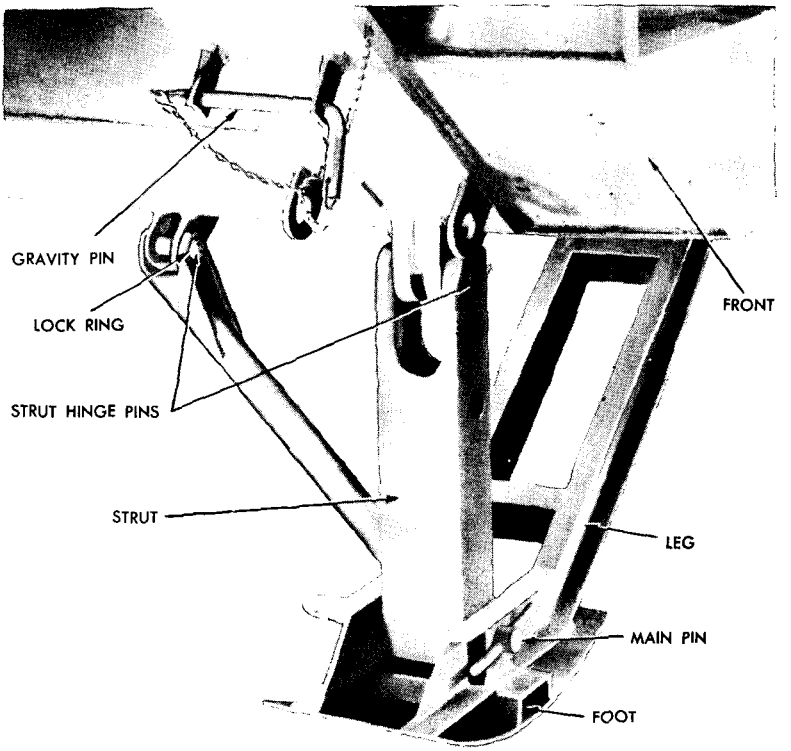


Figure 28—Semitrailer Supports

(b) When on ice or on soft terrain, application of the right or left brakes or alternate application of each will prevent skidding.

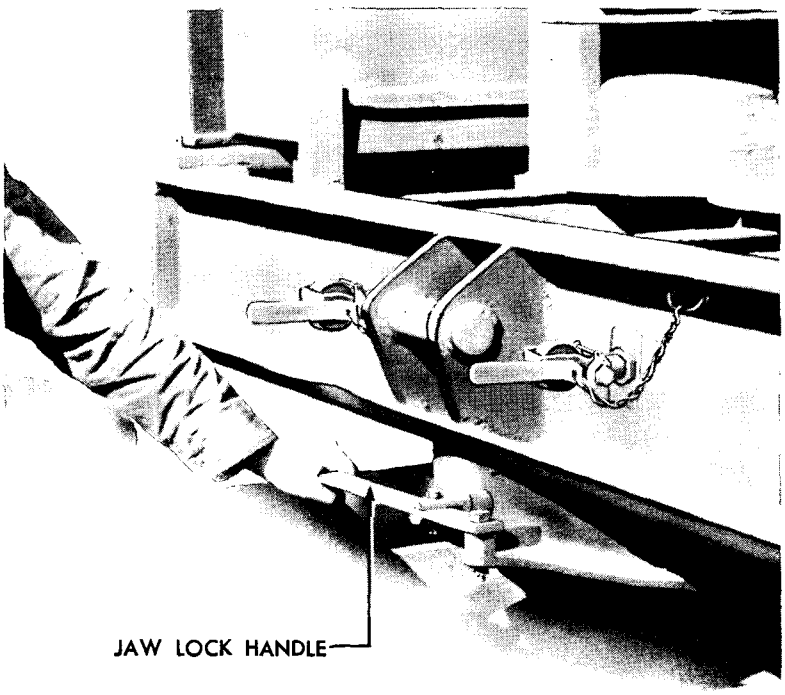
(c) When on snow or muddy terrain, where the wheels, on either side, may spin and bury themselves in the snow or mud, application of the brake on the buried side will help move the tractor.

h. Uncoupling Semitrailer from Tractor (figs. 28 and 29).

(1) SET BRAKES. Set the semitrailer brakes by pulling semitrailer air brake control lever downward, then remove four chock blocks

from rear of semitrailer top decking and place the blocks at the front and the rear of the semitrailer rear wheels.

(2) SHUT OFF AIR PRESSURE AND REMOVE AIR HOSE. Close the two air shut-off valves at the rear cross member of the tractor frame. Uncouple two air hose (emergency and service) from semitrailer air connection and tractor air connections, and stow air hose on trailer. CAUTION: *Do not allow ends of air hose to drag on the ground, as dirt will get into the air hose, and when they are used again, the emergency air relay valve and other parts will be injured.*



RA PD 57473

Figure 29—Uncoupling Tractor from Semitrailer

(3) DISCONNECT LIGHTS. Remove jumper light cable from tractor and semitrailer, and stow cable in equipment stowage compartment at right front end of semitrailer.

(4) INSTALL DUMMY COUPLING. Place four dummy couplings on the air connections of the semitrailer and tractor.

(5) LOWER SUPPORT LEGS. Grasp leg assembly firmly in the left hand and at the same time place the left shoulder under the support leg. *Remove* cotter pin from main pin and remove main pin. Then lower the support leg assembly to the ground. Hold the support

strut in the left hand and *remove* cotter pin from gravity pin, then remove gravity pin. Lower strut so that holes in it line up with the holes in the support leg. Then install main pin and cotter pin.

(6) SEPARATE TRACTOR FROM SEMITRAILER. Start the engine and pull the jaw lock handle (on the fifth wheel of the tractor) out and hold it in this position. Shift transmissions into low and drive the tractor forward slowly until the semitrailer becomes disengaged from the tractor. It may be necessary to rock the semitrailer back and forth in order to uncouple the semitrailer and tractor. This is due to the fact that the tractor and semitrailer were as far apart as possible without actually being disengaged when the tractor with semitrailer was stopped. The semitrailer kingpin binds in the jaws of the fifth wheel under this condition and rocking action is necessary in order to free the kingpin.

(7) SEMITRAILER BRAKE RELEASE VALVE (fig. 13). The semitrailer brakes were automatically set when it was uncoupled from the tractor. If the semitrailer is to be moved, release the brakes and push on the valve button and hold it in until the air escapes.

i. Stopping the Engine. Make certain all control levers are in their "OFF" or neutral position. Pull propeller shaft brake lever back. Turn ignition switches off.

6. TOWING THE VEHICLE.

a. Towing to Start Tractor. The towing facilities on the tractor consist of a pintle, four shackles, a bracket, whiffletree, and drawbar. A pintle and two shackles are secured to the rear end of the frame. A bracket (for a shackle or a sheave) and two shackles are secured to the front of the tractor.

b. Towing a Disabled Tractor. A disabled tractor can be towed by lifting the front, or rear, and clear of the ground by using the tow bar and whiffletree, which are carried on the tractor, or the tractor can be loaded on the semitrailer of another recovery unit.

c. Towing a Disabled Trailer. A disabled trailer can be picked up at the trailer pick-up bar and towed.

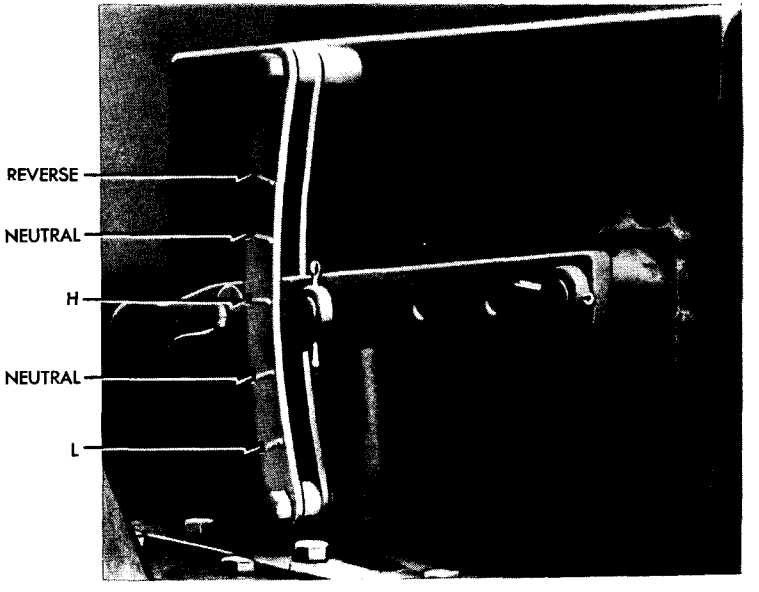
40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section IV

AUXILIARY EQUIPMENT, CONTROLS AND OPERATION

7. PRELIMINARY INSTRUCTIONS.

a. Perform Before-operation Service in section VI before making use of any auxiliary equipment.



RA PD 76484

Figure 30—Front Mounted Winch Power Take-off Control Handle

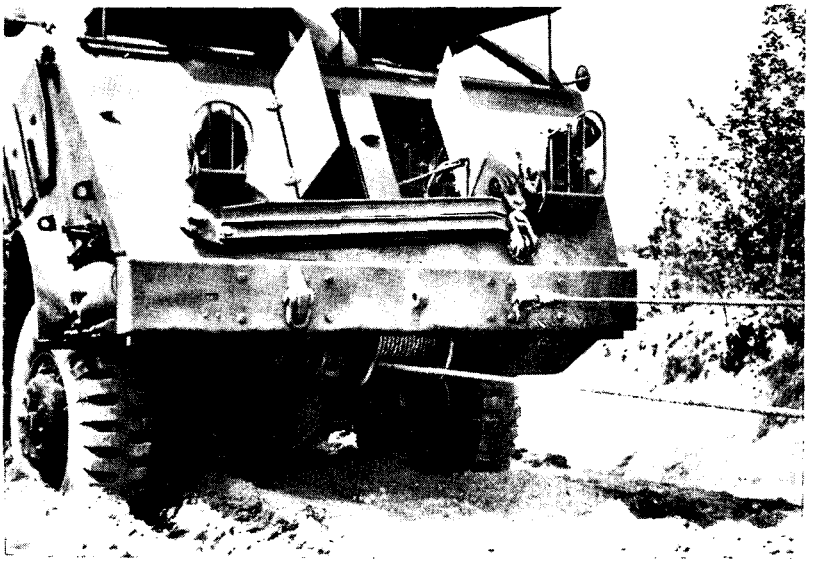
AUXILIARY EQUIPMENT, CONTROLS AND OPERATION

8. FRONT MOUNTED WINCH.

a. Description (fig. 30). The front mounted winch power take-off control handle is located on the front of the driver's seat. This lever engages, and disengages, the side mounted power take-off on the left side of the auxiliary transmission to provide power for the front mounted winch to pay out, or draw in, the cable on the front mounted winch drum.

b. Operation.

(1) PRELIMINARY INSTRUCTIONS (fig. 31). The front mounted winch is operated by the driver of the truck tractor from his seat in



RA PD 76929

Figure 31—Using Front Winch to Assist Tractor in Pulling Out of Bad Traction Conditions

the cab. The primary purpose of the front winch is to help the tractor and semitrailer to get through terrain where the traction is poor, or conditions are such as to make power applied to the wheels of the tractor partially, or totally, ineffective. Recovery operations can also be performed by the use of the front winch.

(2) SHIFTING GEARS. Disengage clutch, then shift auxiliary transmission to neutral, shift main transmission into first, shift front winch control lever into reverse, engage clutch and accelerate engine to a desirable speed.

(3) ATTACH CABLE. Unspool the cable, keeping it taut at all times to prevent any unwinding and slacking off of the coils of cable, on the drum. After the cable has been withdrawn to the desired length,

disengage clutch and move front winch control lever to neutral. When cable has been securely fastened to an anchor of vehicle being recovered, disengage clutch and shift front winch control lever to low. Shift main transmission to low, depress accelerator pedal and engage clutch. As the cable becomes tight, ease the load on the cable by disengaging and engaging clutch. Increase engine revolutions per minute if an even pull is necessary.

(4) POWER ON UNDERDRIVE. Gearing of the front mounted winch is designed so that with front winch control lever in low and drum approximately half full of cable, the retrieved speed approaches that of the tractor with the auxiliary transmission in "FIRST", this shift giving an underdrive of the main transmission shift. Because of this underdrive, it is possible to obtain added pull by using the driving (rear) wheels of the tractor. To accomplish this, see next step.

(5) USING REAR WHEELS OF TRACTOR AND FRONT WINCH SIMULTANEOUSLY FOR RETRIEVING A TRACTOR FROM A SPOT WHERE TRACTION IS POOR. Disengage clutch, shift auxiliary transmission into first (an underdrive when main transmission is in second). Engage and disengage clutch and pick up both the cable load and traction loads (rear wheels) simultaneously. CAUTION: *Do not attempt to run the front mounted winch after the cable has been fully spooled as the end of the cable may become fouled on a part of the tractor and cause serious damage.*

(6) SPEEDS. Different speeds may be obtained on the front mounted winch by selecting different gears in the main transmission.

9. TANDEM WINCHES.

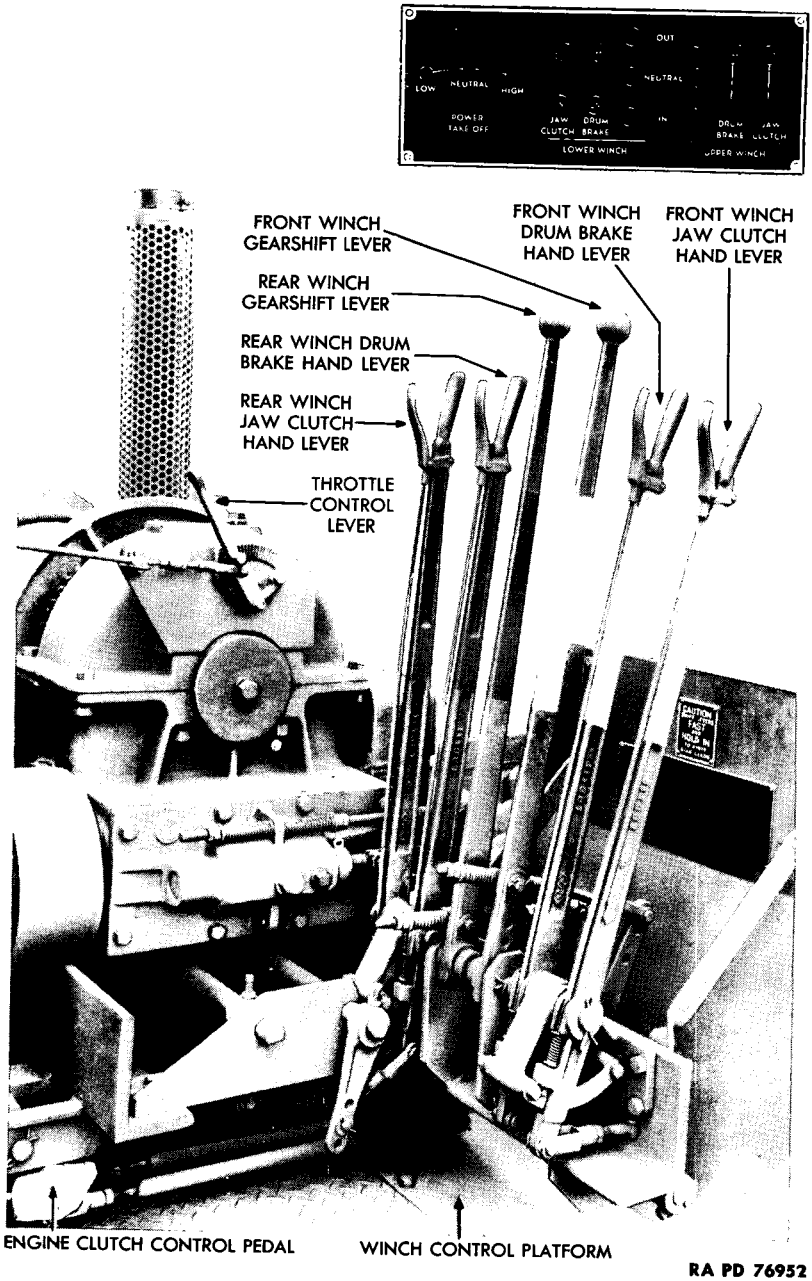
a. Description.

(1) FRONT WINCH HAND CLUTCH LEVER. The front winch hand clutch lever is mounted on the tandem winch at the platform (fig. 32). This lever engages and disengages the front winch drum to the drum shaft in order to provide power for the drum to pay out or draw in the cable on the front winch drum.

(2) FRONT WINCH HAND DRUM BRAKE LEVER. The front winch hand drum brake lever is mounted on tandem winch at the platform. This lever controls the drum brake on the front winch drum and is used when pulling the cable off the front drum by hand, or when the jaw clutch is disengaged.

(3) FRONT WINCH GEARSHIFT HAND LEVER (fig. 32). The front winch gear shifting lever is located on tandem winch at the platform and controls the movement (paying out or drawing in) of the cable on the front winch drum. There are three positions for this lever as shown in instruction plate. The speed at which the cable is being played out, or drawn in, is controlled by the power take-off control lever.

(4) POWER TAKE-OFF CONTROL LEVER (fig. 33). The power take-off control lever is located at the tandem winch operator's left hand as he stands on tandem winch platform and faces the rear of the tractor. This lever controls the speed at which the cable (on either



RA PD 76952

Figure 32—Winch Control Platform and Controls

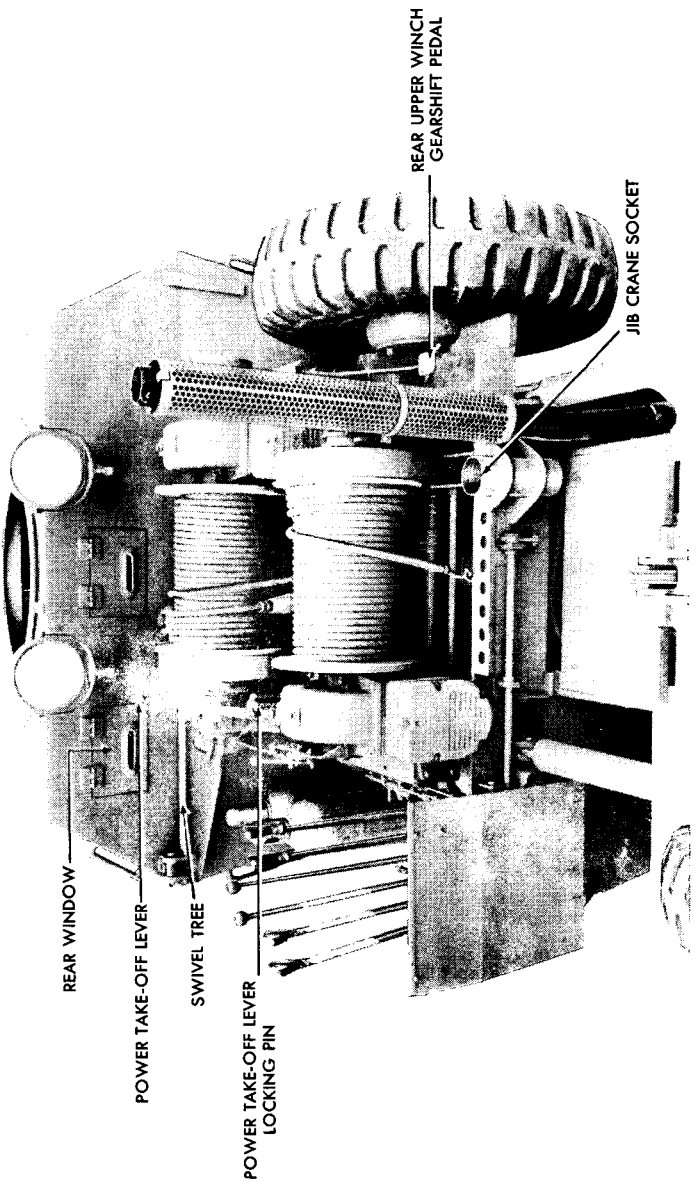
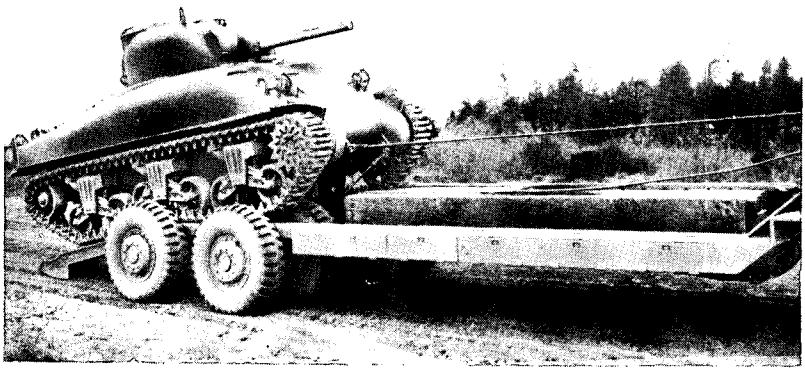


Figure 33—Top Rear View of Rear Winch

front or rear winch of tandem winches) is played out, or drawn in. This lever has three positions, high, low, or neutral.

(5) POWER TAKE-OFF LEVER LOCKING PIN (fig. 33). The power take-off lever locking pin is off lever and is used to lock the power take-off lever in its neutral position in order that the power take-off cannot be accidentally engaged. This pin must always be inserted whenever the tandem winch (front or rear) is not in operation.

(6) REAR WINCH JAW CLUTCH HAND LEVER (fig. 32). The rear winch jaw clutch hand lever is located at the tandem winch platform and this lever performs the same function for the rear of the tandem winches as the front winch jaw clutch hand lever.



RA PD 76928

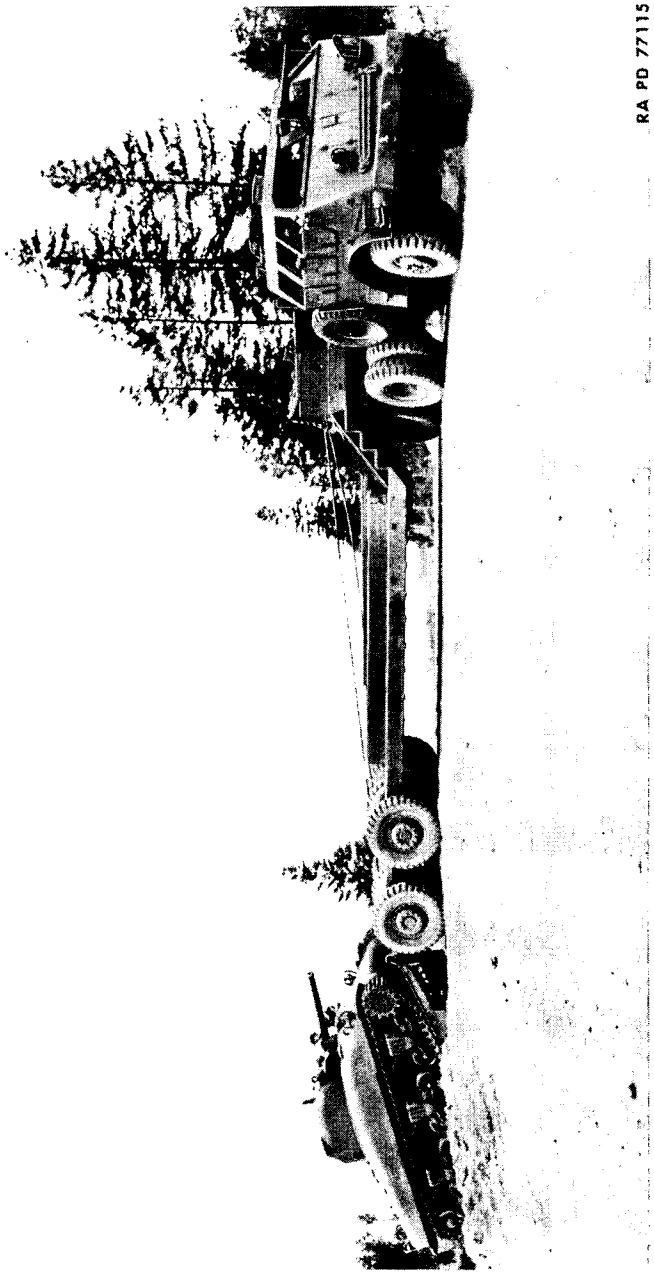
Figure 34—Using Front and Rear Tandem Winches in Unloading Recovered Tank

(7) REAR WINCH DRUM BRAKE HAND LEVER (fig. 32). The rear winch drum brake hand lever is located at the tandem winch platform and this lever performs the same function for the rear of the tandem winches as the front winch drum brake hand lever.

(8) REAR WINCH GEARSHIFT HAND LEVER (fig. 32). The rear winch gearshift hand lever is located at the tandem winch platform, and this lever performs the same function for the rear of the tandem winches as the front winch gearshift hand lever.

(9) ENGINE CLUTCH CONTROL PEDAL (fig. 32). Engine clutch control pedal is located at the tandem winch platform just above the floor. This pedal is used to engage and disengage the engine clutch when shifting the power take-off lever.

(10) THROTTLE CONTROL LEVER (fig. 32). The throttle control lever is located at the left end of the rear winch and controls the revolutions per minute of the engine and, consequently, the revolu-



RA PD 77115

Figure 35—Recovering Tank and Pulling It Onto Semitrailer with Rear Winch

tions per minute of the power take-off. The accelerator pedal and hand throttle lever at the driver's seat in the cab perform the same function.

(11) ROPE DRUM (fig. 33). The rope drum is on the right end of the front winch drum shaft and is used for any lifting operation requiring a small length of fiber rope. The rope drum pedal is located on the right side of the tandem winch and engages the rope drum for drawing in only.

b. Operation.

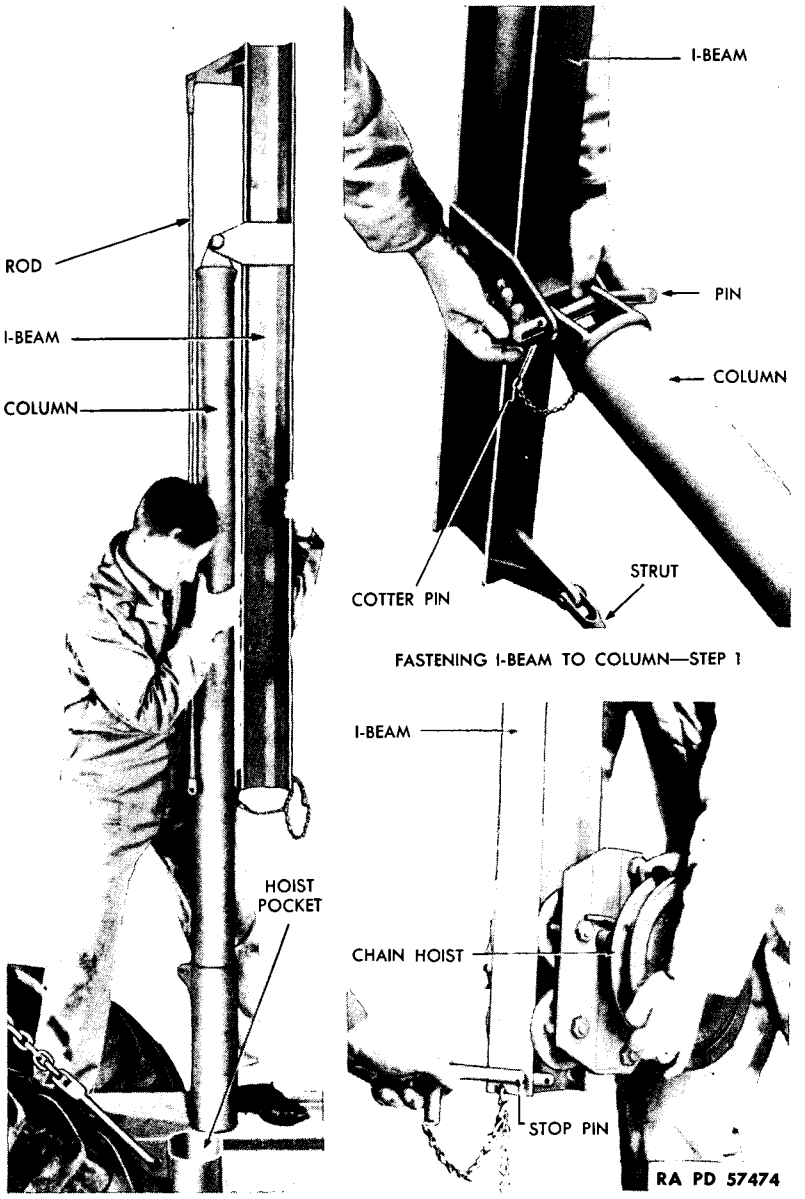
(1) PRELIMINARY INSTRUCTIONS. The front and rear winches can be operated individually or together, and if the nature and position of the equipment being recovered requires it; the vertical lifting device can be used with the tandem winches.

(2) MAIN TRANSMISSION. From driver's seat disengage engine clutch and shift main transmission into low, leaving auxiliary transmission in neutral. Start engine, then engage clutch.

(3) WINCH CONTROLS. From tandem winch platform remove power take-off lever pin. Disengage engine clutch, and shift power take-off control lever into "LOW" gear (fig. 32). Shift winch gearshift hand lever in "OUT" (paying out) (fig. 32) position and slowly engage engine clutch, at the same time opening the throttle control lever to maintain engine speed. Shift jaw clutch hand lever to "OUT" position (fig. 32). Winch speeds may be changed by shifting gears in the main transmission (auxiliary transmission cannot be used) and by shifting gears in power take-off by means of the power take-off control lever. NOTE: *The engine clutch control pedal must not be released quickly when engaging the clutch, and the winch operator must not operate the winches with the foot on the pedal.* Shifting of gearshift levers and jaw clutch hand levers must be done rapidly and the levers must be held in to avoid gear clash.

(4) TO UNWIND CABLE FROM DRUM BY HAND. Release winch jaw clutch hand lever thereby freeing the winch drum. Grasp clevis end of cable and pull cable off drum by hand. The speed of unreeling will depend on the amount of pull. To prevent cable from paying out too rapidly and becoming kinked, an application of the winch drum brake hand lever may be made. NOTE: *The reverse gear "IN" must be shifted with the engine clutch disengaged.* Do not operate the tandem winch with the main transmission in high gear. Install power take-off lever pin whenever the power take-off lever is shifted into neutral and winches are not being used.

(5) PAYING OUT CABLE UNDER LOAD. When paying out a cable which is under load, place gearshift hand lever in its "IN" position, which will place the drum in its drawing-in position (reverse), thereby causing the cable to pay out under a brake. Do not depend upon the use of the drum brake hand lever to snub a cable that is paying out under a load. The drum brake must be applied simultaneously with the disengagement of the engine clutch and released simultaneously with the engaging of the engine clutch.



INSTALLING HOIST COLUMN IN HOIST POCKET—STEP 2

FASTENING I-BEAM TO COLUMN—STEP 1

PLACING CHAIN HOIST ON I-BEAM—STEP 3

RA PD 57474

Figure 36—Erecting Crane and Hoist

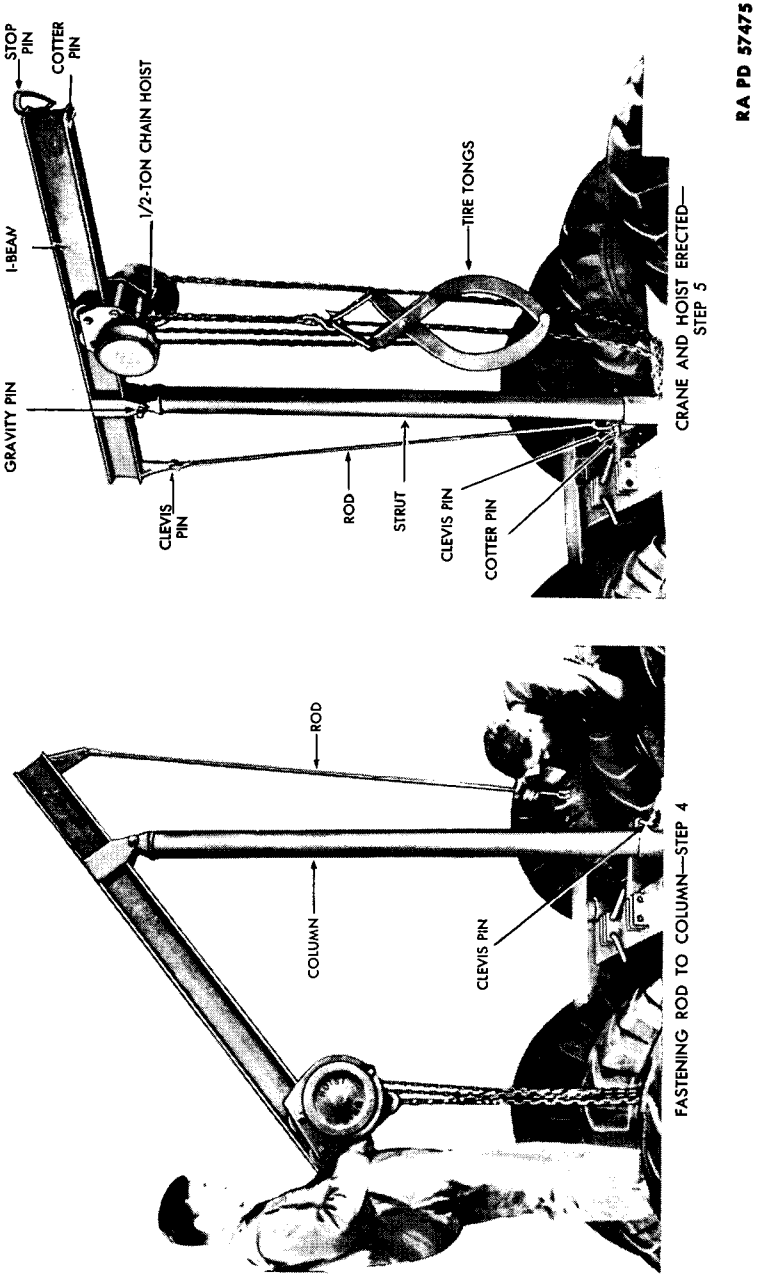


Figure 37—Erecting Crane and Hoist

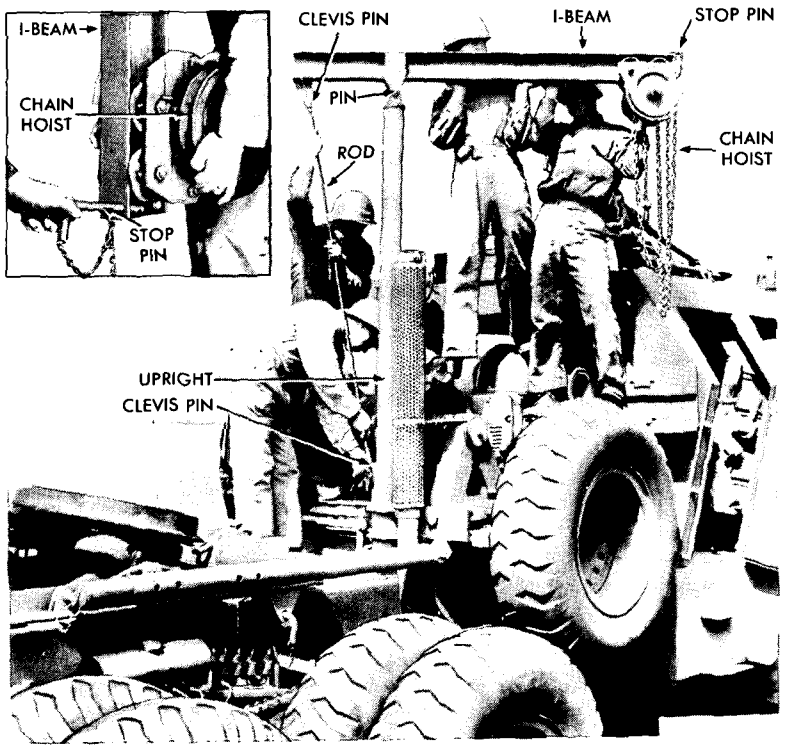


Figure 38—Locking Crane and Hoist I-beam in Place

(6) ROPE DRUM PEDAL (fig. 33). Depress the rope drum pedal for drawing in only. The operator of the tandem winch must not interfere with the use of the rope drum pedal by operating the front winch gearshift hand lever because the front winch drum and the rope drum can be operated by this gearshift hand lever. The rope drum pedal is for an operator who is on the right side of the vehicle and who is using the rope drum when the tandem front winch is not in use.

10. CRANE AND HOIST.

a. Description. The crane and hoist assembly is stowed on the lower decking of the semitrailer in a knocked-down condition and consists of four components which are crane I-beam, trolley hoist, crane vertical strut and tire tongs. Crane sockets or pockets are welded in place on the semitrailer. There are four pockets or sockets on the semitrailer, two being on the top decking ahead of the semitrailer drop and two at the rear of the semitrailer between the front and rear wheels. The socket for the tractor is near the right rear

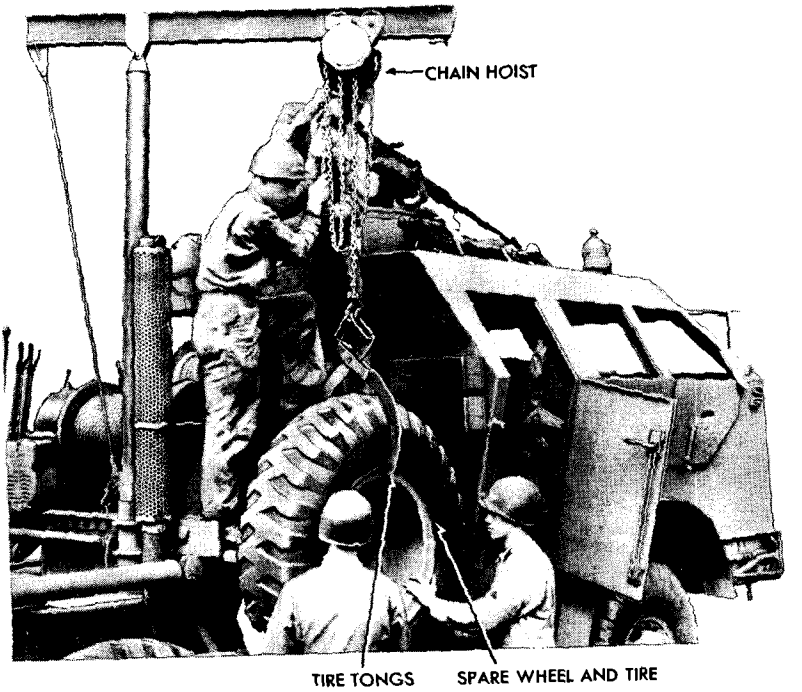
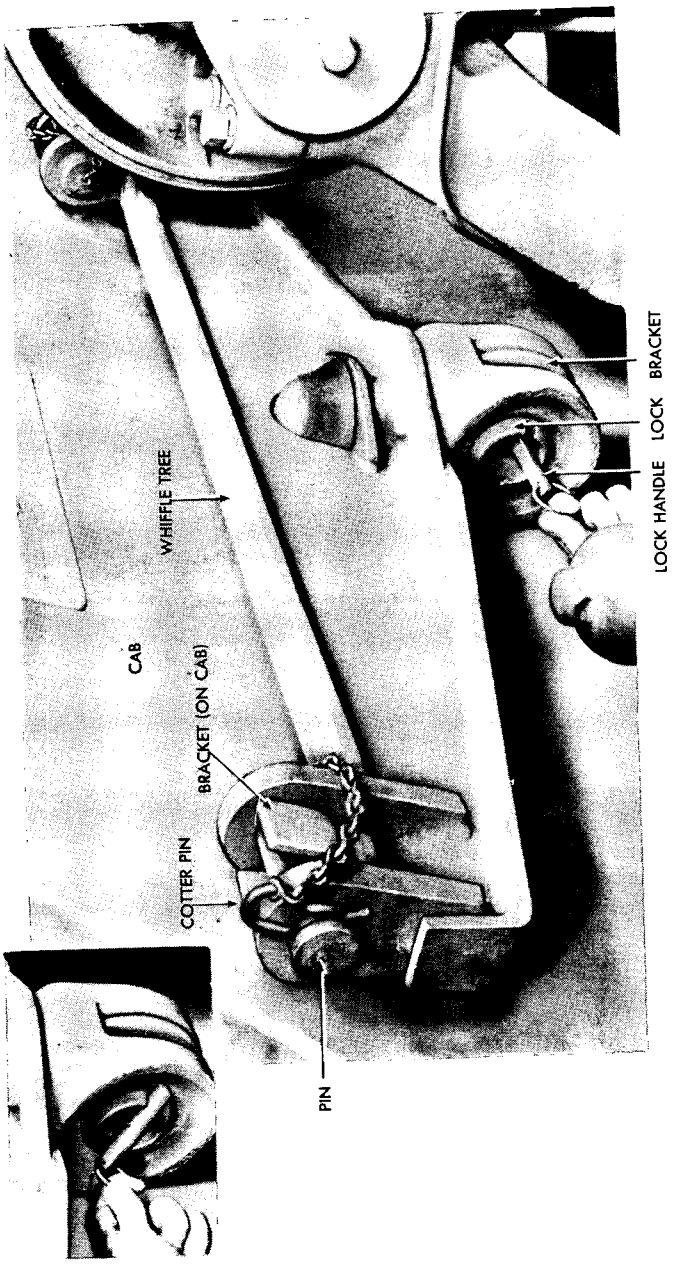


Figure 39—Removing Spare Wheel and Tire

corner of the tandem winch frame. The primary purpose of the crane and hoist is for changing the inner wheels and tires of the semitrailer or for removing the spare wheel and tire which is carried on the tractor truck at the right side of the tandem winch. The crane and hoist can also be used for removing and installing major components of the semitrailer or tractor under construction. The capacity of the crane and hoist is ½ ton.

b. Erection. Place I-beam section on its end and fasten vertical strut to I-beam crane by using gravity pin (step 1, fig. 36). Place the assembly just completed in any hoist pocket (step 2, fig. 36) so that the erection can be completed and remove cotter pin from stop pin and pull stop pin from end of I-beam (step 3, fig. 36). Place the chain hoist on the lower flange of the I-beam and install the stop pin in the I-beam. Secure stop pin by installing cotter pin. Lift the end of the I-beam until it is approximately level, then install rod assembly or base of vertical strut and secure rod with clevis pin and cotter pin (step 4, fig. 37). Recheck erection procedure, making certain cotter pins are in the two clevis pins and stop pin. Make sure also that gravity pin which holds I-beam to vertical strut is properly secured (step 5, fig. 37).



RA PD 77035

Figure 40—Removing Whiffletree

AUXILIARY EQUIPMENT, CONTROLS AND OPERATION

c. Operation.

(1) PRELIMINARY INSTRUCTIONS. If the crane and hoist is to be moved from one socket to another, the moving can be more easily accomplished by removing the cotter pin, a stop pin and chain hoist, also cotter pin and clevis pin that hold rod to base of vertical strut. Then install crane and hoist in socket where work is to be done and install chain hoist and rod as instructed above.

(2) REMOVE SPARE WHEEL AND TIRE ASSEMBLY (fig. 39). Attach tire tongs to chain hoist and place tongs on wheel. Tighten chain of chain hoist. Remove nuts which hold spare wheel on spare wheel

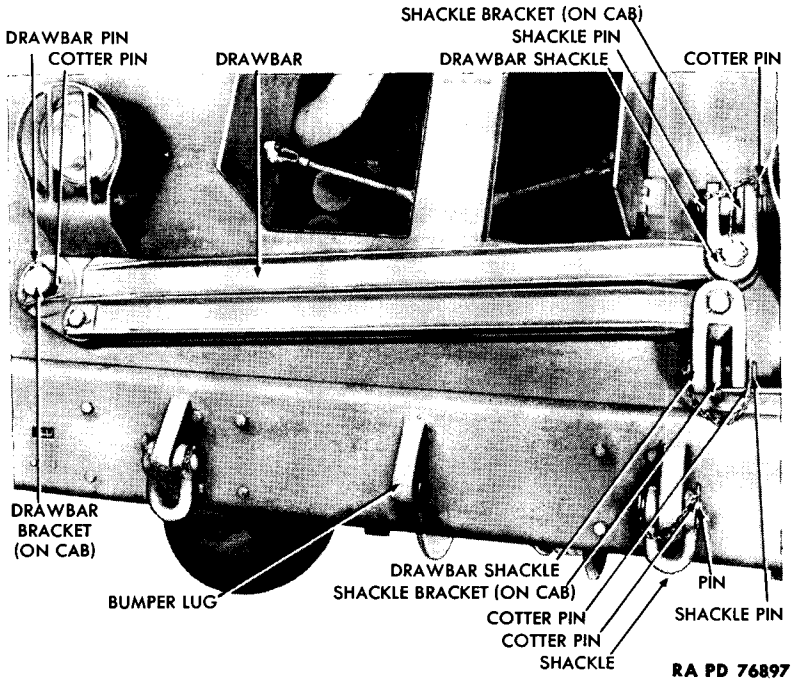


Figure 41—Removing Drawbar

carrier and lift wheel and tire assembly off carrier by means of chain hoist. Lower wheel and tire to the ground. NOTE: *Exercise care in removing the spare wheel and tire assembly, because it weighs over 500 pounds.*

d. Removal. Pull chain hoist outward and to the extreme end of the I-beam. Hold I-beam crane and have an assistant remove cotter pin and clevis pin from rod (step 4, fig. 37). Lower the I-beam slowly, then remove cotter from stop pin; and while holding the chain hoist to prevent its falling, pull stop pin out of I-beam (step 2, fig. 36). Lift the strut and I-beam assembly from the hoist socket

(step 2, fig. 36). Remove the gravity pin which holds strut to I-beam (step 1, fig. 36) and separate the two assemblies. Install gravity pin in end of strut, then install clevis pin in hole in strut base and secure with cotter pin. Install stop pin in hole in I-beam and secure it with cotter pin. Place the three components in their proper stowage compartments on the decking of the semitrailer.

11. WHIFFLETREE, DRAWBAR, AND SHACKLES.

a. Whiffletree.

(1) DESCRIPTION. The whiffletree is carried on the exterior wall at the back of the cab and can be reached by standing on the winch platform at the left side of the semitrailer truck. The whiffletree is

RA PD 76930

Figure 42—Towing a Tank by Using Tow Bar at Pintle Hook (Vertical Lifting Device Used to Recover and Bring Tank Up to Tractor)

used for towing purposes and can be used with or without the drawbar. The whiffletree is secured to the cab by a removable lock, the handle of which prevents it from being jarred out of its bracket.

(2) REMOVAL. Lift lock handle and turn end of handle inward and into the lock, then pull the lock out of the whiffletree and whiffletree bracket. Remove cotter pin from the pins which are at each end of the whiffletree and then pull the pins out of whiffletree bracket. Lift whiffletree out of its bracket and off cab.

b. Darwbar.

(1) DESCRIPTION. The drawbar is carried on the front of the cab above the front bumper and is used for towing purposes with or without the whiffletree. The drawbar is secured to the front of the cab by the drawbar pin and cotter pins that hold the drawbar shackles.

(2) REMOVAL. Remove cotter pin that holds drawbar pin and pull drawbar pin out of the drawbar. Then remove two cotter pins that hold the drawbar shackles to the cab and lift the drawbar off the cab.

c. Shackles.

(1) DESCRIPTION. There are three shackles attached to brackets on the front bumper by means of shackle pins and cotter pins. There are two shackles secured to brackets on the rear end of the chassis frame by means of shackle pins and cotter pins. These

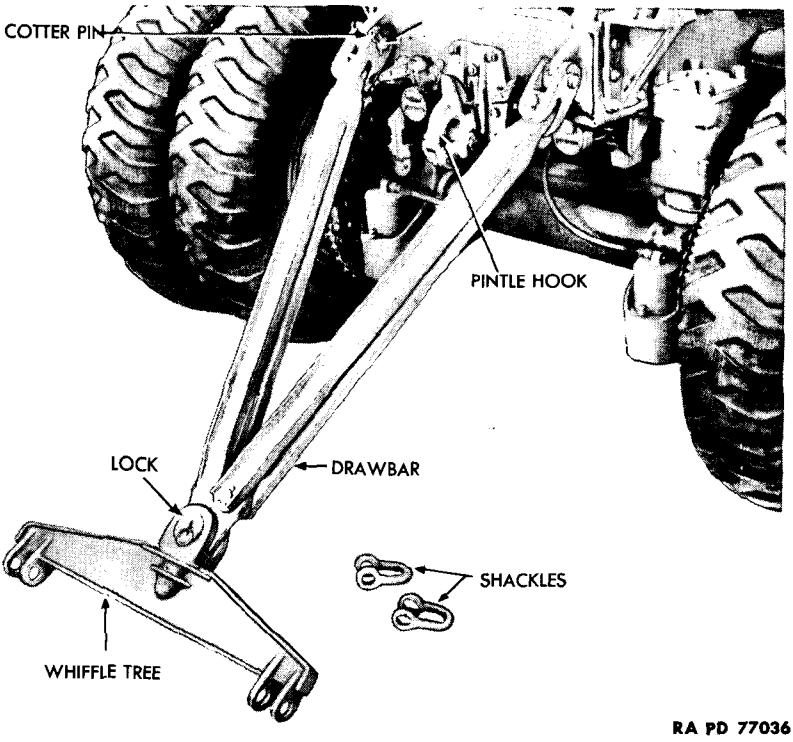


Figure 43—Drawbar and Whiffletree Attached to Rear of Tractor

shackles are used for towing purposes and after the shackles are removed, the drawbar or whiffletree, or both, can be attached to the brackets.

(2) REMOVAL. Pull cotter pins out of shackle pins then pull shackle pins out of shackles and brackets and lift off the shackles.

d. Operation. The drawbar can be attached to the front or the rear of the tractor by removing the shackles and attaching the drawbar by means of shackle or drawbar pins and cotter pins. The whiffletree can be used at the front or rear of the tractor in the

same manner as the drawbar or it can be attached to the end of the drawbar. Use the whiffletree lock to attach the whiffletree. A lug on the front bumper (fig. 41) can be used for attaching whiffletree to drawbar or a cable.

12. VERTICAL LIFTING DEVICE.

a. Description. A vertical lifting device consists of two telescopic side supports and an "A" frame having a sheave mounted on the top of the "A" frame. The vertical lifting device is carried on the rear of the tractor frame in a locked-down position. The vertical lifting device is used principally for the recovery of equipment which is on a lower plane than the tractor, thereby requiring the

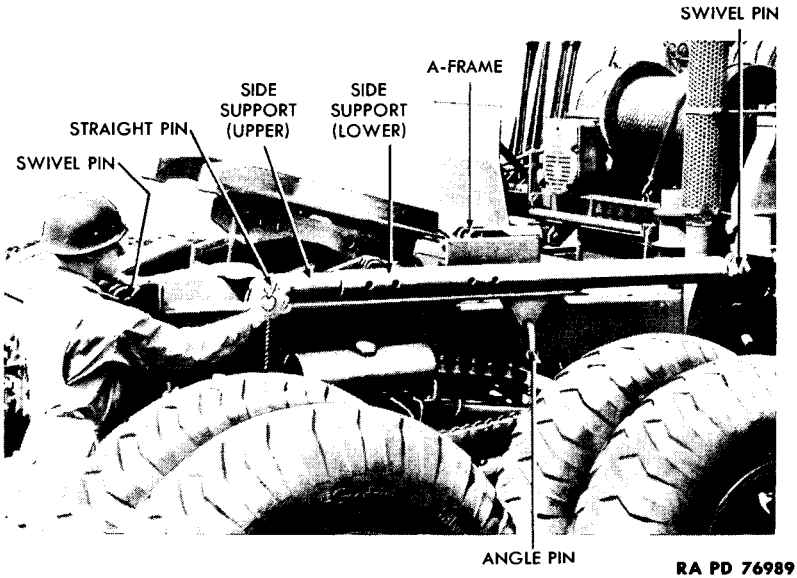
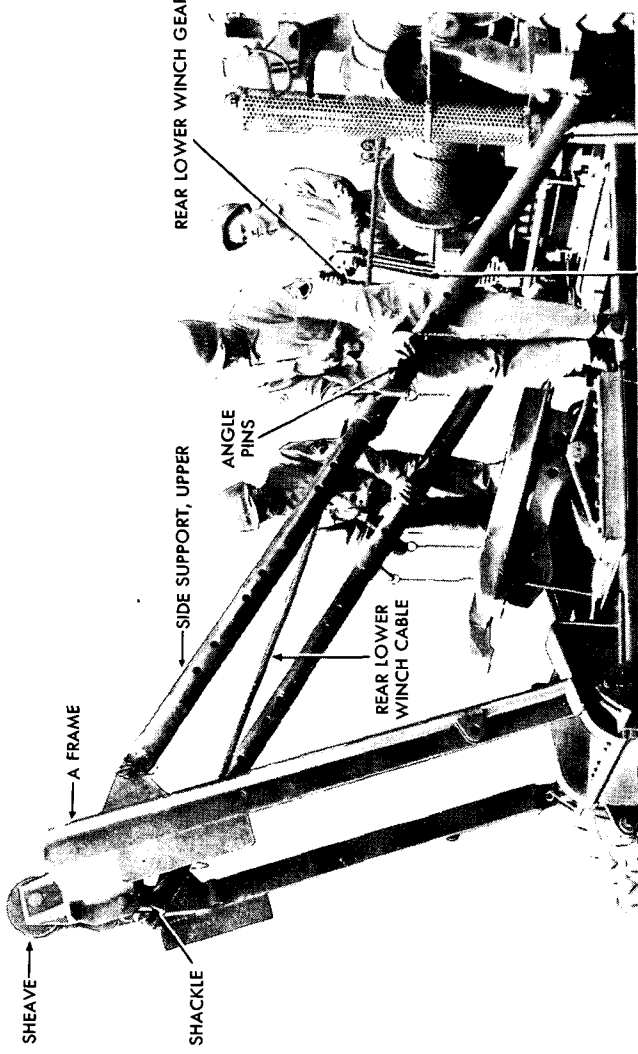


Figure 44—Unlocking Vertical Lifting Device

vertical lift rather than a pull. The vertical lifting device is also used to raise a tandem winch cable to a height that assists in preventing the cable from getting tangled in other equipment or getting in the way of recovery operation. The vertical lifting device has three main positions (fig. 46) which consist of vertical 18 degrees forward and 18 degrees back of vertical, and there are two additional positions between the 18 degrees back of center and the vertical position.

b. Erection.

(1) PRELIMINARY INSTRUCTIONS. The vertical lifting device can be erected either by hand or by the following method: Back the tractor up to a tall object such as a tree and attach a rope to the



RA PD 76991

Figure 45—Locking Vertical Lifting Device in Position

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

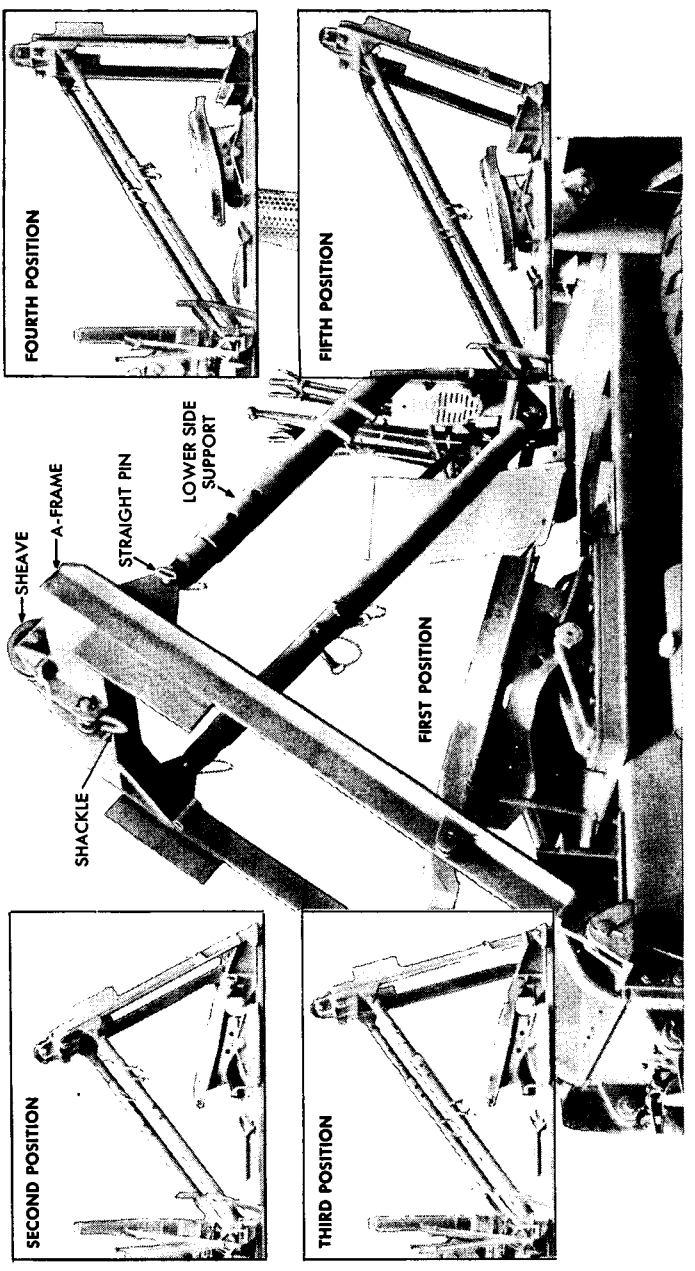


Figure 46—Vertical Lifting Device Illustrating the Five Possible Positions

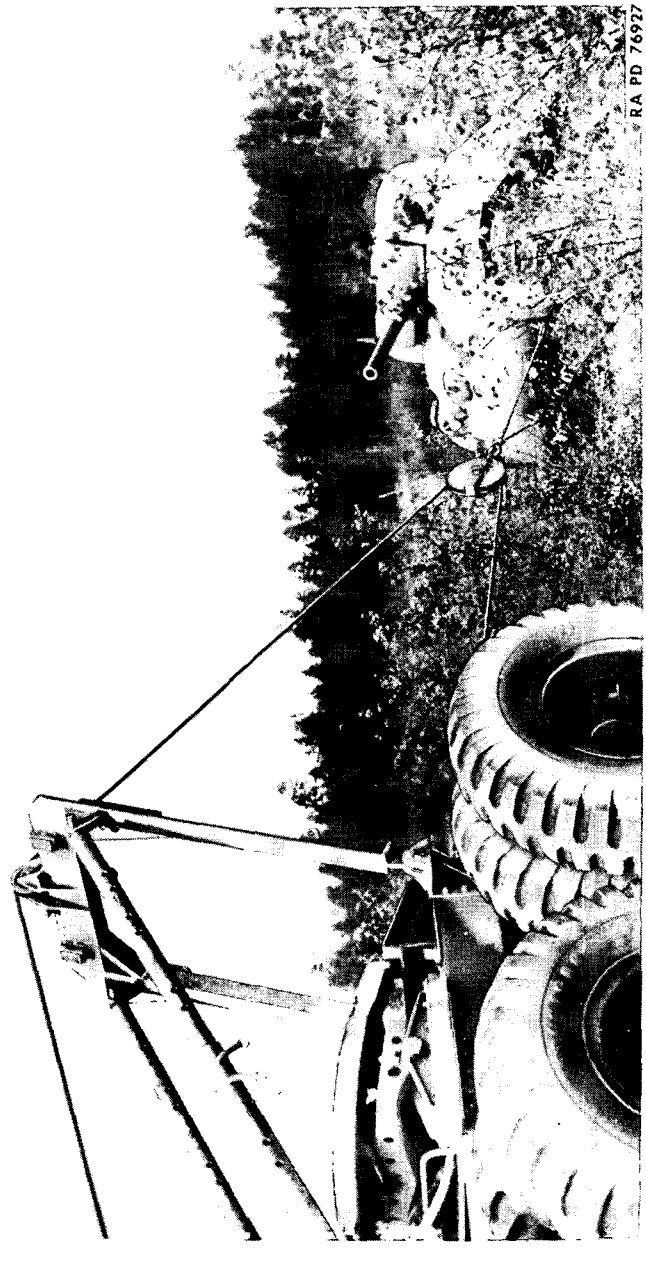
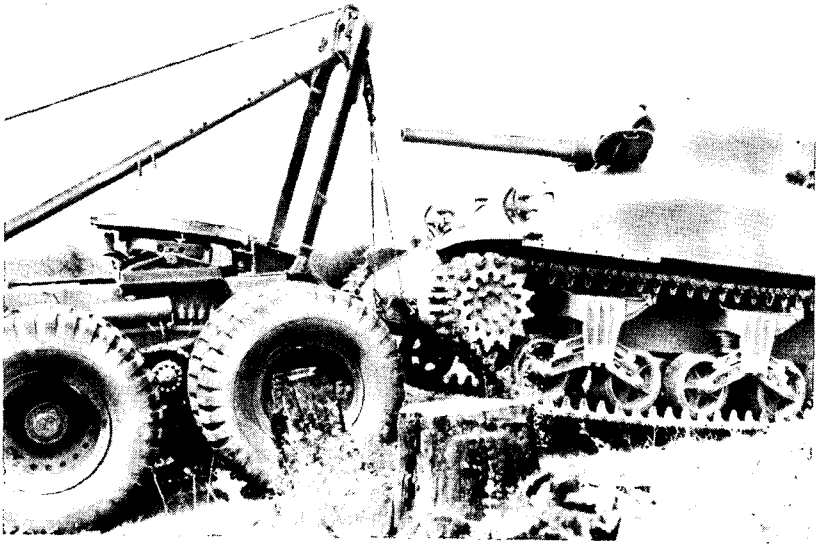


Figure 47—Recovery of Tank, Using Vertical Lifting Devices and Tandem Front Winch

tree and the sheave of the vertical lifting device. Then start the tractor and drive it away from the tree until the lifting device is in the desired position. It is easier, whenever conditions permit, to erect the device by backing the tractor up to the tree and using it to raise the "A" frame.

(2) UNLOCKING. Remove cotter pins from straight pins which are on both sides of the tractor and which hold the top of the telescopic side supports to the frame, then pull out the straight pins (fig. 44). Remove cotter pins and angle pins which are on both sides of the tractor and in the bracket of the "A" frame.

(3) RAISING AND LOCKING. Raise the "A" frame to whatever position is desired and insert in the frame two straight pins and four angle pins with cotter pins (fig. 46). There are two spare angle



RA PD 76931

Figure 48—Raising and Towing Tank by Using Vertical Lifting Device

pins located on the "A" frame (fig. 46) and these, as well as the angle pins which are in the "A" frame (fig. 44), must be used.

c. Operation. There are numerous ways in which the vertical lifting device can be used, examples of which are shown in figures 47 and 48.

13. FLOODLIGHTS, BLINKER AND SPOTLIGHT, AND TROUBLE LAMP.

a. Floodlight.

(1) DESCRIPTION. There are two floodlights secured in brackets which are, in turn, secured to the rear of the cab. These floodlights are mounted so that they can be turned up, or down, and to the

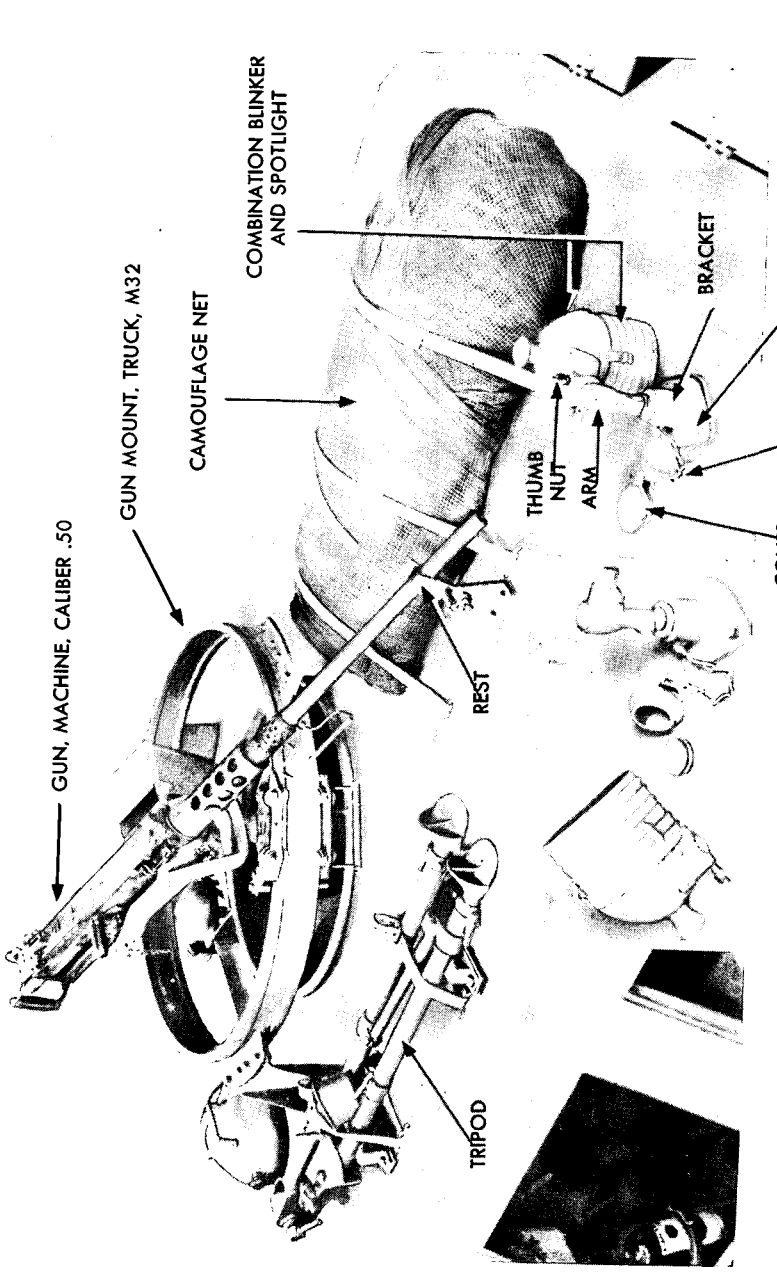


Figure 49—Top View of Cab Roof

right, or left. These lights are for use in field operations and are operated from a switch on the instrument panel (fig. 14). An individual switch is located on each floodlight which permits each light to be turned on, or off, at the light itself.

(2) OPERATION. Pull out the switch in the instrument panel to turn on the floodlight, and push the switch button in, to turn off the floodlight. Turn the individual switch on the floodlight up to turn on, and press down to turn off.

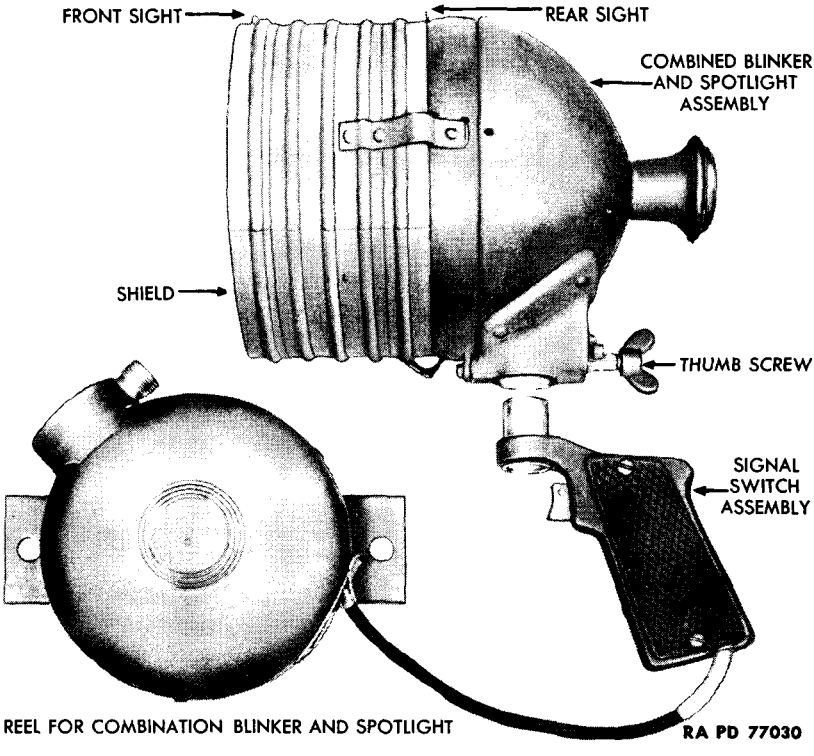


Figure 50—Combination Blinker and Spotlight Units

b. Combination Blinker and Spotlight.

(1) DESCRIPTION. The combination blinker and spotlight is located on the right front corner of the exterior of the roof. The combination blinker and spotlight assembly consists of a spotlight having a removable hood attached to the front end. The spotlight is attached to an arm which passes through the roof of the cab and into the interior above the commander's seat. On the end of the arm is a handle and switch so that the light can be operated from inside the cab. The light can be turned to the right or the left, and up or down. A reel and signal switch is attached to the inside of the cab roof, just inside the right door, and the combination blinker and

spotlight can be removed from the roof, and attached to this signal switch.

(2) REMOVAL.

(a) Preliminary Instructions. To remove the blinker and spotlight from the roof of the cab and use it with the signal switch and reel for signaling, use procedure in steps *(b)*, *(d)*, and *(e)* which follow.

(b) Remove Light. Unscrew thumb nut which holds blinker and spotlight to the arm and lift the light off the arm.

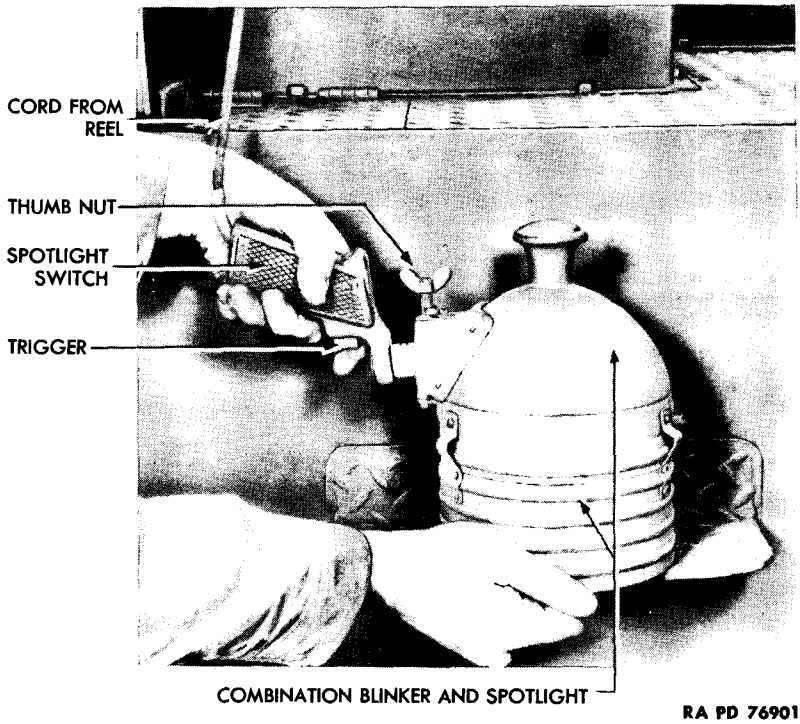


Figure 51—Attaching Combination Blinker and Spotlight

(c) Remove Signal Switch. The signal switch and wire reel is located inside the roof on the left side of the cab. Pull down on the clamp and remove switch, which is attached to the electric cord on the reel.

(d) Install Light on Switch. Install combination blinker and spotlight on the signal switch (fig. 51) and tighten the thumb nut. Unreel the electric cord from the reel by walking away from the vehicle. If a spotlight is desired, remove the hood from the combination blinker and spotlight by twisting hood slightly and pulling off from the dowels. If a hooded light is desired, leave the hood on.

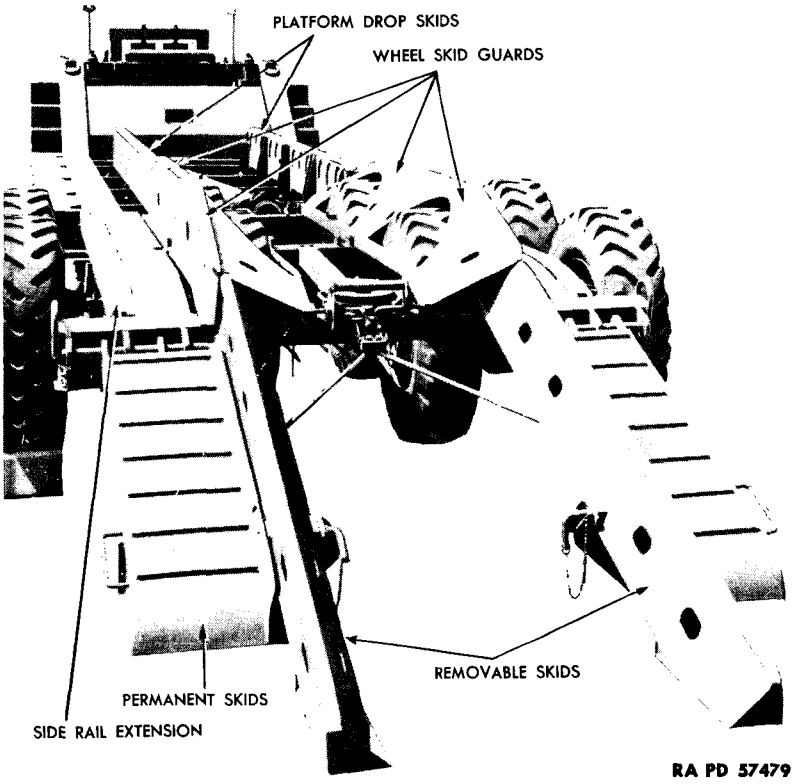


Figure 52—Skids

(e) Install Cover. A metal cover is attached to the spotlight bracket which is at the exterior right front corner of the cab roof and this cover is used whenever the arm has been removed from the roof. Place the cover on top of the bracket so as to cover the hole caused by the removal of the arm.

(3) OPERATION. The combination blinker and spotlight can be operated when in its usual position on the cab roof by turning the handle and moving the switch to "ON" or "OFF" position. The signal light when attached to the signal switch can be operated by pressing on the trigger of the signal switch.

c. Trouble light.

(1) DESCRIPTION. The tractor has a tool box just to the rear of the left door (fig. 3). One of the items in this box is a trouble light with 50 feet of cord. An electric socket which is a part of the electrical system is secured to the front side of this tool box.

(2) OPERATION. Insert connector on trouble light cord into electric socket and turn slightly to secure.

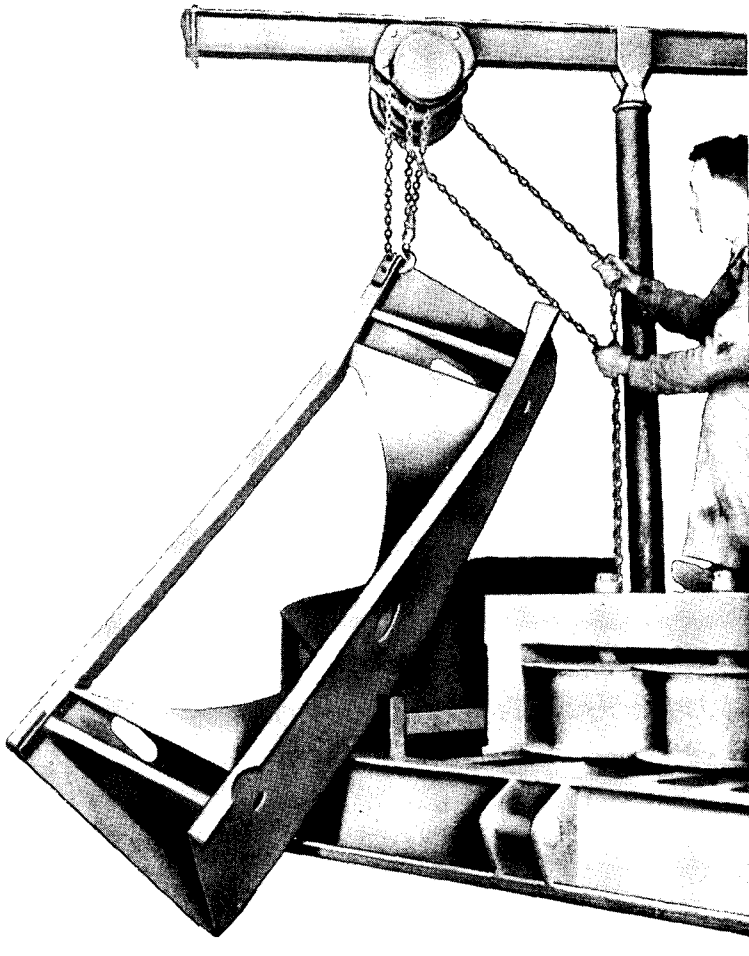


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Figure 53—Removing Wheel Guard from Stowage Position

14. AIRPLANE RECOGNITION PANEL SET.

a. Description. An airplane recognition set is secured to the rear end of the left ammunition chest, inside the cab. This panel set is held by fabric straps and consists of two cases and two panels. The panels are painted with fluorescent paint and are to be used as a signaling device to friendly aircraft to prevent bombing. Loosen fabric straps and remove panels from case, then lay the panels on the ground in such a manner that they will give the order of the day to friendly aircraft, thereby preventing action by the aircraft.

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15. SEMITRAILER REMOVABLE SKIDS.

a. Description. The vehicle is equipped with two removable skids, right and left. These removable skids are attached to the permanent skid and rear cross member by pins and brackets. The purpose of the removable skids is to permit the loading of disabled tanks. When the removable skids are not in use they are stowed in right and left side tool compartments.

b. Installation (fig. 52).

(1) Pull cotter key from pin attached to chain at rear of permanent skid, then remove pin.

(2) Remove skids from tool compartment. Insert one cant bar through hole at rear and another cant bar through hole at front.

(3) With one man at each end of cant bar, carry skid to rear of semitrailer.

(4) Lay front end of skid on semitrailer rear cross member, shove skid under hold-down angle. Lay rear end of skid in position next to permanent skid. Install pin, securing pin with cotter key.

c. Removal (fig. 53).

(1) Pull cotter key from pin, which holds removable skid to permanent skid.

(2) With the use of two cant bars inserted through holes at front and rear of removable skid, lift the skid out of its working position. Carry skid to its stowage position.

16. SEMITRAILER WHEEL SKID GUARDS.

a. Description. Vehicle is equipped with four wheel skid guards. Wheel skid guards are installed over front and rear inner wheel assemblies to protect the tires when loading disabled tanks. The skid guards are built in four removable sections and straddle the three rear cross members of the semitrailer. When not in use, the skid guards are stowed on the top decking at the front of the trailer.

b. Installation.

(1) Remove nut and locking device holding skid guards in their stowage position.

(2) Erect crane and hoist. Place crane in hoist pocket adjacent to wheel skid guard on top decking. Couple hoist to wheel skid guards and lower to ground (fig. 53).

(3) Place cant bar through hole at front and rear end of wheel skid guards. With a man at each end of cant bar, carry wheel skid guards to their mounting position over wheels. Place guards in position so that the holes in mounting brackets are in alinement with holes in wheel skid guards. Insert pins through mounting brackets and wheel skid guards; install cotter key in pins.

c. Removal.

(1) Remove cotter keys from pins holding wheel guards in mounting brackets.

(2) Place cant bar through holes at front and rear ends of wheel skid guards and lift assembly out. Carry assembly to front of semitrailer. Using the crane, hoist assembly to its position for stowage, securing it to top decking with nut and clamping device.

17. SEMITRAILER PLATFORM DROP SKIDS.

a. Description. Platform skids are installed on lower decking. They are fastened to semitrailer cross member with pins and cotter keys. A series of holes is provided in semitrailer cross members to permit shifting of platform drop skids to accommodate loading of wide and narrow track tanks. The skids are so constructed that they can be anchored down on platform to make up part of semitrailer decking. When placed in a vertical position they serve as a skid for loading of disabled tanks. Holes are provided at both ends to accom-

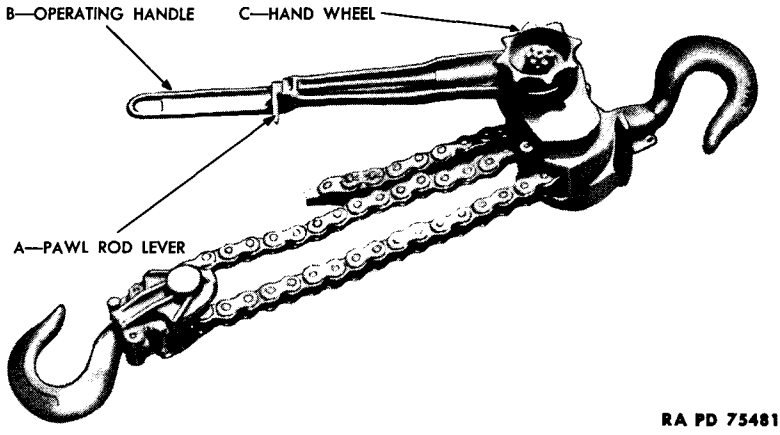

Figure 54—Semitrailer Hand Ratchet Chain Fall

modate cant bars. All pins and cotter keys holding skids are welded to chain adjacent to pinhole.

b. Adjustment. Remove all cotter keys from pins holding drop skids to semitrailer cross member; drive out pins. Place crowbar under skids and shift them to the desired position. Insert pins and cotter keys.

c. Removal. Remove all cotter keys from pins holding platform drop skid to semitrailer cross members, drive out pins and lift assembly off semitrailer.

d. Replacement.

(1) Platform drop skids are identical in construction and are interchangeable from right to left side; replacement procedure for either is identical.

(2) Place platform drop skids in position on semitrailer. Place mounting bracket hole in alinement with holes in semitrailer cross member. Install pins and cotter keys.

18. SEMITRAILER HAND RATCHET CHAIN FALL.

a. Description and Data (fig. 54). The hand ratchet chain fall is stowed in right side compartment. It is designed for either pulling or lifting and has a three-ton capacity tested at 50 percent overload. The chain fall is operated by means of short strokes of the ratchet handle. The load is supported on self-actuating brakes.

b. Hoisting or Pulling Load.

(1) Make certain the load is suspended inside of hook and not on the point of the hook. NOTE: *If the ratchet chain fall is excessively overloaded, the hook will act as a safety valve and slowly open. This provides warning of overload and permits operator to ease off or deposit load without injury to hoist mechanism or to those who may be standing by.*

(2) Turn pawl rod lever "A" (fig. 54) so that marking "UP" is visible and the lever seat is in handle slot. Operate chain fall handle "B" with a pumping motion.

c. Lowering or Slacking Off on Load. Turn pawl rod lever "A" so that marking "ON" is visible and lever seats in handle slot. Operate handle "B" with a pump action. If the lower hook is raised to the point where it jams against the housing, or if the hoist is subject to excessive overloading, the load brake may freeze. If this occurs, the brake can be released by setting the pawl rod lever "A" to the "ON" position, tapping handle "B" with a hammer and lowering with the handle. NOTE: *The pumping action in hoisting or lowering should be with effort applied on the downward movement of the handle and with the upward movement free. The opposite action is obtained by reversing the movement of the handle.*

d. Operation Without Load (fig. 54). Turn the pawl rod "A" to the neutral position. Turn handle wheel "G" to raise or lower the empty hook to the desired position. NOTE: *Use handwheel instead of the handle when operating without load.*

Section V

OPERATION UNDER UNUSUAL CONDITIONS

19. DECONTAMINATION.

a. Decontamination is covered in an Armored Force Field Manual (FM 17-59).

20. EXTREME COLD.

a. Subzero Temperatures. Efficient operation of this vehicle at subzero temperatures presents a number of problems that demand special precautions and extra servicing from both operation and maintenance personnel. These problems are discussed in this paragraph.

b. Fuel for Low Temperatures. Use the winter grade of motor fuel procured under U.S. Army Specifications 2-103, latest revision, to reduce cold-weather starting difficulties.

c. Storage and Handling of Fuel. Condensation of moisture in the air causes water to accumulate in tanks, drums, and containers. At low temperatures, this water will form ice crystals that clog fuel lines and carburetor jets unless the following precautions are used:

(1) Strain the fuel through a chamois skin or any other type of strainer that will prevent the passage of water.

(2) CAUTION: *Gasoline flowing over a surface generates static electricity that will result in a spark unless means are provided to ground the electricity. A metallic contact between the container and the tank will be provided to assure an effective ground.*

(3) Keep tank full, if possible. The more fuel there is in the tank the smaller the volume of air from which moisture can be condensed.

(4) Be sure that all containers are thoroughly clean and free from rust before storing fuel in them.

(5) If possible, allow the fuel to settle after filling or moving a container before filling the vehicle tank from it.

(6) Keep all closures of containers tight to prevent snow, ice, dirt and other foreign matter from entering.

d. Preparation and Lubrication for Continued Operation Below 0°F. The instructions contained in this subparagraph apply only when temperatures below 0°F prevail.

(1) SPECIAL WINTERIZATION KIT. Some of these vehicles will be equipped with special winterization kits. Complete instructions for use accompany the kits.

(2) TRANSMISSIONS AND TRANSFER CASE (WITH OR WITHOUT WINTERIZATION EQUIPMENT). For operation below 0°F, use OE, SAE 30. When temperatures below zero are immediately anticipated, and if transmissions or transfer case do not already contain OE, SAE 30, drain immediately after use and while lubricant is still warm. Refill to proper level with OE, SAE 30.

(3) UNIVERSAL JOINTS. Lubricate with GO No. 00 (with or without winterization equipment).

(4) CLUTCH THROWOUT BEARING. Lubricate with GO No. 00 (with or without winterization equipment).

e. Preparation of Engine not Equipped with Cold Weather Kit. Several methods of keeping crankcase oil fluid for proper lubrication are:

(1) Keep the vehicle in a heated enclosure when it is not being operated.

(2) Drain crankcase oil while it is hot and store in a warm place, or heat oil before installing.

(3) Cover the engine with a tarpaulin. About three hours before engine is to be started, place fire pots under the tarpaulin. A Van Prag, Primus type, or other type blowtorch and ordinary kerosene lanterns may be used.

(4) Dilute the crankcase oil. Crankcase oils may be diluted with gasoline or Diesel fuel according to their availability, with preference given to gasoline.

(a) Fill engine crankcase to the "FULL" mark with the grade of engine oil prescribed for use at temperatures from +32°F to 0°F. Add 1½ quarts of gasoline for each 5 quarts of crankcase oil capacity. EXAMPLE: Crankcase with capacity of 28 quarts will require 8½ quarts of gasoline as an oil diluent.

(b) Run the engine 5 to 10 minutes to mix the lubricant and diluent thoroughly.

(c) Stop the engine and note that the level of the diluted oil is above the normal "FULL" mark on the oil gage. This level should be marked on the gage for future reference.

(d) The presence of a large percentage of light diluent will increase oil consumption and, for that reason, the oil level should be checked frequently. Use the grade of engine oil prescribed for use between +32°F to 0°F to maintain the oil level to manufacturer's "FULL" mark on the gage during operation.

(e) If the vehicle is operated 4 hours or more at operating temperatures, redilution will be necessary if it is anticipated that the vehicle will be left standing unprotected for 5 hours or more. This can be accomplished by adding engine oil prescribed for use between +32°F to 0°F to the manufacturer's "FULL" mark; then adding gasoline to the dilution mark on the gage described in step *(c)* above.

f. Protection of Cooling Systems (With or Without Winterization Kit). Ethylene Glycol is the only compound prescribed for use

as an antifreeze compound in vehicle radiators. See antifreeze chart in paragraph 95 e.

g. Electrical Systems (With or Without Winterization Kit).

(1) GENERATOR AND CRANKING MOTOR.

(a) Check the brushes, commutators, and bearings. See that the commutators are clean. The large surges of current which occur when starting a cold motor require good contact between brushes and commutators.

(b) Be sure that no heavy grease or dirt has been left on the cranking motor throwout mechanism. Heavy grease or dirt may keep the gears from being meshed, or cause them to remain in mesh after the engine starts running. The latter will ruin the cranking motor and necessitate repair.

(2) WIRING. Check and clean all connections, especially the battery terminals. Care should be taken that no short circuits are present.

(3) COIL. Check coil for proper functioning.

(4) DISTRIBUTOR. Clean thoroughly, and clean or replace points. Check the points frequently. Slightly pitted points can prevent engine from starting in cold weather.

(5) SPARK PLUGS. Clean, test, and replace spark plugs, if necessary. If it is difficult to make engine fire, reduce the gap to 0.013 inch to 0.015 inch. This will make ignition more effective at the reduced voltages likely to prevail.

(6) TIMING. Check carefully. Care should be taken that the spark is not unduly advanced or retarded.

(7) BATTERIES. The efficiency of batteries decreases sharply with decreasing temperatures, and becomes practically nil at −40°F. Do not try to start the engine with the battery, when it has been chilled to temperatures below −30°F, until battery has been heated. See that the battery is always fully charged, with the hydrometer reading between 1.275 and 1.300. A fully charged battery will not freeze at temperatures likely to be encountered even in arctic climates, but a fully discharged battery will freeze and rupture at 5°F. Do not add water to batteries when they have been exposed to sub-zero temperatures unless the battery is to be charged immediately afterward. If water is added and the battery not put on charge, the layer of water will stay at the top and freeze before it gets a chance to mix with the acid.

(8) LIGHTS. Inspect the lights carefully. Check for short circuits and presence of moisture around sockets.

(9) ICE ON ELECTRICAL EQUIPMENT. Before every start, see that the spark plugs, wiring, or other electrical equipment are free from ice.

h. Fuel System.

(1) A full choke is necessary to secure the air-fuel ratio required for cold weather starting. Check the butterfly valve to see that it closes all the way and otherwise functions properly.

(2) Carburetors, which give no appreciable trouble at normal temperatures, may not operate satisfactorily at low temperatures. A fuel pump, which will deliver enough gasoline at normal starting speeds of 500 revolutions per minute, may have leaky valves or a diaphragm which will prevent it from delivering a sufficient quantity of fuel. At the reduced temperature this will not produce sufficient vapor to fire when turning 30 to 60 revolutions per minute.

(3) Remove and clean sediment bulb, strainers, etc., daily. Also drain fuel tank pump daily to remove water and dirt.

(4) At temperatures below zero degree F, do not use oil in air cleaners. The oil will congeal and prevent easy flow of air. At temperatures below zero degree F, wash screens in dry-cleaning solvent, dry and replace. Ice and frost formations on the air cleaner screens may cause an abnormally high intake vacuum in the carburetor air horn hose, resulting in collapse.

i. The oil filter on this vehicle requires no special attention in extremely cold weather, because the heavy oil bypasses the filter and continues to circulate without passing through the filter as long as the oil is cold.

j. Chassis.

(1) Brake bands, particularly on new vehicles, have a tendency to bind when they are very cold. Always have a blowtorch handy to warm up these parts if they bind prior to moving, or attempting to move, the vehicle. Parking the vehicle with the brake released will eliminate most of the binding. Precaution must be taken, under these circumstances, to block the wheels or otherwise prevent movement of the vehicle.

(2) Inspect the vehicle frequently. Shock resistance of metals, or resistance against breaking, is greatly reduced at extremely low temperatures. Operation of vehicles on hard, frozen ground causes strain and jolting which will result in screws breaking or nuts jarring loose.

21. EXTREME HEAT.

a. When operating the vehicle in high temperatures, give particular attention to the operation and efficiency of the cooling system. Watch the water temperature gage, and if temperatures rise beyond 200°F, stop the engine and investigate. Watch the oil temperature gage; and if temperature rises beyond 300°F, stop the engine and investigate.

22. SANDY OR DESERT TERRAIN.

a. When operating in sandy or desert country, frequent inspection of the cooling, air, and lubrication systems must be made. Inspect radiator, fan and belts frequently and clean out any sand and grit which has accumulated in the openings of the radiator core, on the fan blades, fan belts, and pulleys. Use compressed air from the air system for cleaning. Clean the oil filter and air filters every four hours. Wrap cloth or rags around oil filler and air filter openings.

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23. DEEP MUD, SNOW, AND ICE.

a. The vehicle should be inspected and cleaned frequently, when operating in deep mud, snow, or on ice. Do not allow mud, snow, or ice to cake on the wheels, slack adjusters, steering knuckles and steering arms. Do not allow ice or mud to gather on the air system safety valve, oil filler or air filter openings. Inspect and clean radiator core, removing mud, snow and ice from fan and fan belts. Keep electrical connections free from mud, snow, and ice.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section VI

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICES

24. PURPOSE.

a. To ensure mechanical efficiency it is necessary that these vehicles be systematically inspected at intervals each day they are operated and weekly, so defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. The services set forth in this section are those performed by driver or crew, before operation, during operation, at halt, and after operation or weekly.

b. Driver preventive maintenance services are listed on the back of "Driver's Trip Ticket and Preventive Maintenance Service Record" W.D. Form No. 48 to cover vehicles of all types and models. Items peculiar to specific vehicles but not listed on W.D. Form No. 48 are covered in manual procedures under the items with which they are related. Certain items listed on the form that do not pertain to the vehicles involved are eliminated from the procedures as written into the manual. Every organization must thoroughly school each driver in performing the maintenance procedures set forth in manuals whether they are listed specifically on W.D. Form No. 48 or not.

c. The items listed on W.D. Form No. 48 that apply to these vehicles are expanded in this manual to provide specific procedures for accomplishment of the inspections and services. These services are arranged to facilitate inspection and conserve the time of the driver and are not necessarily in the same numerical order as shown on W.D. Form No. 48. The item numbers, however, are identical with those shown on that form.

d. The general inspection of each item applies also to any supporting member or connection, and generally includes a check to see whether or not the item is in good condition, correctly assembled, secure, or excessively worn.

e. The inspection for "good condition" is usually an external visual inspection to determine whether or not the unit is damaged beyond safe or serviceable limits. The term "good condition" is explained further by the following terms: not bent or twisted, not chafed or burned, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut.

f. The inspection of a unit to see that it is "correctly assembled" is usually an external visual inspection to see whether or not it is in its normal assembled position in the vehicle.

g. The inspection of a unit to determine if it is "secure" is usually an external visual examination, a hand-feel, or a pry-bar check for looseness. Such an inspection should include any brackets, lock washers, lock nuts, locking wires, or cotter pins used in assembly.

h. "Excessively worn" will be understood to mean worn close to, or beyond, serviceable limits, and likely to result in a failure if not replaced before the next scheduled inspection.

i. Any defects or unsatisfactory operating characteristics beyond the scope of first echelon to correct must be reported at the earliest opportunity to the designated individual in authority.

25. BEFORE-OPERATION SERVICE.

a. This inspection schedule is designed primarily as a check to see that the vehicles have not been tampered with, or sabotaged since the After-operation Service was performed. Various combat conditions may have rendered the vehicles unsafe for operation and it is the duty of the driver to determine whether or not the vehicles are in condition to carry out any mission to which they may be assigned. This operation will not be entirely omitted, even in extreme tactical situations.

b. Procedures. Before-operation Service consists of inspecting items listed below according to the procedure described, and correcting or reporting any deficiencies. Upon completion of the service, results should be reported promptly to the designated individual in authority.

(1) ITEM 1, TAMPERING AND DAMAGE. Look for any injury to truck and semitrailer, and their accessories and special equipment, caused by tampering or sabotage, collision, falling debris, or shell fire since parking. Look within engine compartment for evidence of these conditions, and for loose or damaged engine accessories or drive belts, loose fuel, oil, coolant or air lines, or disconnected control linkage. If wet, dry ignition parts.

(2) ITEM 2, FIRE EXTINGUISHERS. Be sure both extinguishers are full, nozzles clean and mountings secure.

(3) ITEM 3, FUEL, OIL, AND WATER. Check supply of fuel, oil, and coolant and add as necessary to bring to proper levels. NOTE: *Any appreciable drop in levels since After-operation Service should be investigated, and cause corrected or reported. During freezing weather, when antifreeze solution is in use, if any appreciable addition of water is needed, antifreeze value should be tested by 2nd echelon and added if necessary. Be sure spare fuel, oil, and water cans are full and securely mounted.*

(4) ITEM 4, ACCESSORIES AND DRIVES. Examine units such as carburetor, air compressor, oil coolers, generator and regulator, cranking motor, oil filters, fan, water pump, and air cleaners, for looseness,

damage, or leaks. Be sure drive belt is in good condition and adjusted to have approximately ½ inch finger pressure deflection.

(5) ITEM 5, AIR BRAKE TANKS. Examine truck and semitrailer, air brake reservoir tanks, air lines, and connections for looseness or damage. Listen for air leaks. Drain water from tanks and close drain cocks. Be sure truck to semitrailer air couplings are securely connected, or if not in use, that they are closed and properly supported.

(6) ITEM 6, LEAKS, GENERAL. Look on ground under vehicle for evidence of fuel, oil, water, or gear oil leaks. Trace leaks to their source and correct or report them.

(7) ITEM 7, ENGINE WARM-UP. Start engine, noting any tendency toward difficult starting. Observe action of cranking motor, particularly if it has adequate cranking speed, and engages and disengages without unusual noise when in operation. Set the hand throttle so engine runs at fast idle, and during warm-up proceed with following Before-operation Services. NOTE: *If oil pressure is not evident in 30 seconds, stop engine and investigate.*

(8) ITEM 8, CHOKE. When starting engine, check operation of choke. As engine warms up, reset choke as required for engine to run smoothly and to prevent over-choking and oil dilution.

(9) ITEM 9, INSTRUMENTS.

(a) Oil Pressure Gage. Gage should register 60 to 80 pounds pressure for normal operation. Forty pounds pressure is normal at idle or low speed. CAUTION: *Never operate engine when oil pressure has dropped below 40 pounds.*

(b) Ammeter. Ammeter should show high charge for short period after starting until generator restores to battery current used in starting, then slight positive reading, above 10 miles per hour with lights and accessories off.

(c) Temperature Gages. Coolant and engine oil temperatures should rise gradually during warm-up period to normal operating range. Normal coolant operating temperature is 140°F to 160°F, engine oil 110°F to 130°F. NOTE: *Do not move vehicle until coolant has reached 135°F.*

(d) Air Pressure Gage. Gage should register 90 to 100 pounds. Low pressure indicator buzzer operates from zero to 60 pounds plus, or minus, eight pounds. CAUTION: *Do not attempt to move vehicle while buzzer is sounding.*

(e) Tachometer. Regular pointer should register actual engine revolutions per minute at any time engine is running. Red pointer indicates, and remains at highest engine revolutions per minute attained, and should not exceed specified maximum.

(f) Fuel Gage. Gage should register approximate amount of fuel in tanks. Ordinarily tanks will have been filled after operation when gage reads "FULL."

(10) ITEM 10, HORN AND WINDSHIELD WIPERS. If tactical situation permits, test horn for proper operation and tone. Test wipers to see that they operate, and observe whether or not blades contact

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICES

glass evenly, and if arms travel through a full stroke. Inspect for damage.

(11) ITEM 11, GLASS AND REAR VIEW MIRRORS. Clean all glass and inspect for damage. Aim rear vision mirror properly and see that it is secure.

(12) ITEM 12, LAMPS (LIGHTS) AND REFLECTORS. Clean all truck and semitrailer lights and warning reflectors, and examine them for looseness or damage. If tactical situation permits, open and close all switches and observe if lamps respond properly, include stop and blackout lamps.

(13) ITEM 13, WHEEL AND FLANGE NUTS. Inspect all truck and semitrailer wheel rim, mounting, and axle flange nuts to see that they are present and secure.

(14) ITEM 14, TIRES. Be sure all truck and semitrailer tires are properly inflated to 90 pound (maximum) cool. Remove objects lodged in treads, carcasses, or between duals, and inspect for damage.

(15) ITEM 15, SPRINGS OR WALKING BEAM AND SUSPENSIONS. Inspect truck springs and semitrailer walking beam for looseness or damage. Look for excessive spring sag, and broken or shifted leaves. See that spring rebound clips are present and secure. Examine truck spring, semitrailer walking beam, and axle suspensions to be sure they are secure and not damaged. Include semitrailer air brake cylinder carriers and walking beam bracket assemblies.

(16) ITEM 16, STEERING LINKAGE. Inspect steering gear case and steering hydraulic booster system for excessive leaks. See that all steering units and connecting linkage are in good condition and secure.

(17) ITEM 17, FENDERS AND BUMPERS. Inspect front fenders and bumper for looseness or damage.

(18) ITEM 18, TOWING CONNECTIONS. Inspect all towing devices to see that they are in good condition and securely mounted. Pay particular attention to pintle drawbar and retraction spring. See that fifth wheel mechanism operates properly, and if connected to semitrailer, is securely locked.

(19) ITEM 19, BODY, LOAD, AND TARPAULINS. Inspect truck cab for looseness or damage. See that doors and armored port covers operate properly and latch securely in open or closed position. See that any load carried is secure and properly distributed, and that tarpaulins or camouflage nets are in good condition and properly stowed. Inspect semitrailer for damage or loose attachments, and if loaded, be sure tank is in correct position, properly blocked, and secured.

(20) ITEM 20, DECONTAMINATORS. Make sure the two decontaminators are fully charged and securely mounted.

(21) ITEM 21, TOOLS AND EQUIPMENT. Be sure all items of both truck and semitrailer "ON VEHICLE" tools, and standard and special equipment are present, serviceable, and properly stowed, or mounted.

(22) ITEM 22, ENGINE OPERATION. Before vehicle is put in motion, be sure engine has reached minimum operating temperature (135°F) and idles smoothly. Accelerate and decelerate, and listen for any unusual vibration or noise. Note any unsatisfactory operating characteristics or excessive exhaust smoke.

(23) ITEM 23, DRIVER'S PERMIT AND FORM 26. Driver must have his operator's permit on his person. Check to see that Standard Accident Report Form No. 26, MWO Major Unit Assembly Replacement Record, W.D. A.G.O. Form No. 478, vehicle manuals, and Lubrication Guide are present in vehicle, legible, and properly stowed.

(24) ITEM 25, DURING-OPERATION CHECK. The During-operation Service and observation on both truck and semitrailer start immediately the vehicles are put in motion as follows:

26. DURING-OPERATION SERVICE.

a. While truck and semitrailer are in motion listen for any unusual noise such as rattles, knocks, squeals, or hums that may indicate trouble. Be on alert for indications of trouble in truck cooling system and smoke from any part of vehicle. Watch for overheated components such as generator, brakes or clutch, and for vapor from fuel leaks, exhaust gas, or other signs of trouble. Any time brakes are used, gears shifted, or vehicles turned, consider this a test and note any unusual or unsatisfactory performance. Watch truck instruments constantly. Notice promptly any unusual instrument indications that may signify possible trouble in system to which instrument applies.

b. Procedures. During-operation Service consists of observing items listed below according to the procedures following each item, and investigating any indications of serious trouble. Notice minor deficiencies to be corrected or reported at earliest opportunity, usually next scheduled halt.

(1) ITEM 27, FOOT AND HAND BRAKES. Test truck and semitrailer brake application valves for proper operation. Foot- and hand-applied air brakes should stop vehicle effectively with normal pressure or leverage, and without pull to one side. Test semitrailer brake separately (if connected) for effective operation. Test both right and left separate truck brake by application of respective valves. Foot-pedal roller-to-plunger clearance should be maintained at 0.030 inch. Hand-operated parking brake should hold truck on reasonable incline leaving about ⅓ reserve lever travel. CAUTION: *When parking on incline with semitrailer attached, always use chock blocks under tires.*

(2) ITEM 28, CLUTCH. Clutch should not grab, chatter, or squeal during engagement, or slip when fully engaged under load. Pedal should have at least ½-inch free travel before meeting resistance.

(3) ITEM 29, TRANSMISSIONS. Gears should shift smoothly, operate quietly, and not creep out of mesh during operation.

(4) ITEM 30, TRANSFER. Transfer unit, declutching mechanism, and power take-off gears should shift smoothly, operate without unusual noise, and not creep out of mesh during operation.

(5) ITEM 31, ENGINE AND CONTROLS. Driver must be on the alert for deficiencies in engine performance, such as lack of usual power, misfiring or stalling, unusual noise or vibrations, indications of overheating or excessive exhaust smoke. Observe if engine responds to all controls, and if controls are excessively loose or binding.

(6) ITEM 32, INSTRUMENTS. Observe the readings of all instruments frequently during operation for indication of normal functioning of systems to which they pertain.

(a) Oil Pressure Gage. Gage must register 60 to 80 pounds at running speeds, and never less than 40 pounds at slow speed.

(b) Ammeter. During operation with all lamps and accessories turned off, ammeter should indicate a positive (+) charge at operating speed, or with fully charged battery and regulator unit cut-in it may register zero. Investigate or report excessive negative (−) readings.

(c) Temperature Gages. Normal operating temperature, 140°F to 160°F for coolant. Oil temperature range is 110°F to 130°F.

(d) Air Pressure Gage. Operating pressure 90 to 100 pounds. Warning buzzer should sound at, from zero to 60 pounds plus, or minus, eight pounds.

(e) Tachometer. See that tachometer indicates engine revolutions per minute and operates without unusual fluctuation or noise.

(f) Fuel Gage. Gage should continue to register approximate amount of fuel in tanks.

(g) Speedometer. Speed indicator should register vehicle miles per hour, and odometer should register accumulating mileage.

(7) ITEM 33, STEERING GEAR. Note any indication of looseness or binding, pull to one side, wandering, shimmy, wheel tramp, or unusual noise. Note if hydraulic steering booster functions properly to assist in steering truck.

(8) ITEM 34, RUNNING GEAR. Be on the alert, both at truck and semitrailer, for any unusual operating characteristics or noise from wheels, axles, chain drives, or suspension units, that might indicate looseness, damaged, or underinflated tires.

(9) ITEM 35, BODY AND SEMITRAILER. Note any noise or abnormal condition, both on truck and semitrailer, that might indicate shifting of body or load, loose top, tarpaulins or curtains, loose or damaged doors, port covers, hardware, vehicle load, special semitrailer equipment, or mounted body attachments.

27. AT-HALT SERVICE.

a. At-halt Services may be regarded as minimum maintenance procedures and should be performed under all tactical conditions, even though more extensive maintenance services must be slighted, or omitted altogether.

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b. Procedures. At-halt Service consists of investigating any deficiencies noted during operation, inspecting items listed below according to the procedure following the items, and correcting any deficiencies found. Deficiencies not corrected should be reported promptly to the designated individual in authority.

(1) ITEM 38, FUEL, OIL, AND WATER. Check the fuel, engine oil, and coolant supply to see that it is adequate to operate the vehicle to the next stop. Remove radiator pressure cap cautiously. Do not remove entirely until steam has escaped. When refueling, use safety precautions for grounding static electricity. Gas tank filler-cap vent must be open, radiator pressure-cap valve must be free, and caps must be replaced securely. Leave sufficient space in fuel tank and radiator for expansion. If engine is hot, fill radiator slowly while engine is running at a fast idle.

(2) ITEM 39, TEMPERATURES: HUBS, BRAKE DRUMS, TRANSFER, TRANSMISSIONS, AND AXLES. Place hand cautiously on each truck and semitrailer wheel hub and brake drum to see if it is abnormally hot. Inspect truck transfer case, transmissions, and axle housings for overheating and excessive lubricant leaks.

(3) ITEM 40, AXLE AND TRANSFER VENTS. Wipe clean and inspect vents for damage or clogging. Vents must be kept open.

(4) ITEM 41, PROPELLER SHAFTS. Inspect vehicle and winch propeller shafts and universal joints and center bearings for looseness, damage, or excessive oil leaks. Remove any foreign matter wound around shafts or joints.

(5) ITEM 42, SPRINGS AND SUSPENSIONS. Inspect front springs and rear axle tandem unit to see if they are in good condition and securely assembled and mounted. See if chain drive tension is satisfactory. Examine all suspensions for looseness and damage. See that trunnion oil tubes, hose, and cups, and chain-oil tanks and lines are secure and not damaged, and that chain-oiler operates. Chain deflection from horizontal, of left front and right rear should be two inches, and of right front and left rear, five inches. Report if adjustment by higher echelon is required. Examine semitrailer walking beam and axle suspensions for looseness or damage, and see that front suspension to fifth wheel (if connected) is secure.

(6) ITEM 43, STEERING LINKAGE. Examine all steering control mechanism, arms, and joints for looseness and damage. Be sure booster is securely mounted and connected, and not leaking excessively. Investigate any unusual condition noted during operation.

(7) ITEM 44, WHEEL AND FLANGE NUTS. See that both truck and semitrailer wheel rim, mounting, and flange nuts are present and secure.

(8) ITEM 45, TIRES. Inspect all truck and semitrailer tires for underinflation and damage. Remove objects lodged in treads, carcasses, and from between duals.

(9) ITEM 46, LEAKS—GENERAL. Look around engine and on ground beneath the vehicle for excessive fuel. oil, or coolant leaks. Trace any leaks to source and correct or report them.

(10) ITEM 47, ACCESSORIES AND BELTS. Examine all accessible units for looseness or damage. Be sure drive belts are in good condition, and adjusted to allow ½-inch free travel at tip of fan blades.

(11) ITEM 48, AIR CLEANERS. If dusty or sandy conditions have been encountered, remove oil reservoirs from both carburetor air cleaners and examine for excessive dirt. Examine crankcase breather filter for excessive dirt, clean and service as necessary. Be sure air cleaners and ducts are in good condition and all connections secure.

(12) ITEM 49, FENDERS AND BUMPER. Inspect front mudguards and bumper for looseness or damage.

(13) ITEM 50, TOWING CONNECTIONS. Inspect all towing connections for looseness or damage. Be sure locking devices are secure.

(14) ITEM 51, BODY, LOAD, AND TARPAULINS. Examine all items on both truck and semitrailer for looseness or damage. Load must be properly distributed and secure. If semitrailer tire skid guards are not in place, be sure tracks of loaded tank are not scuffing semitrailer tires. Tarpaulins should be properly lashed when in use.

(15) ITEM 52, GLASS. Clean truck windshield and mirrors, and both truck and semitrailer lights, and warning reflector glass, and inspect for looseness or damage.

28. AFTER-OPERATION AND WEEKLY SERVICE.

a. After-operation Service is particularly important because at this time the driver inspects his vehicles to detect any deficiencies that may have developed and corrects those he is permitted to handle. He should report promptly the results of his inspection to the designated individual in authority. If this schedule is performed thoroughly, the vehicles should be ready to roll again on a moment's notice. The Before-operation Service, with a few exceptions, is then necessary only to ascertain whether or not the vehicles are in the same condition in which they were left upon completion of the After-operation Service. The After-operation Service should never be entirely omitted even in extreme tactical situations, but may be reduced to the bare fundamental services outlined for the At-halt Service, if necessary.

b. Procedures. When performing the After-operation Service the driver must remember, and consider, any irregularities noticed during the day in the Before-operation, During-operation, and At-halt Services. The After-operation Service consists of inspecting and servicing the following items. Those items of the After-operation Service that are marked by an asterisk (*) require additional weekly services, and the procedures for which are indicated in subparagraph *(b)* of each applicable item.

(1) ITEM 55, ENGINE OPERATION. Test engine for satisfactory performances and smooth idle. Accelerate and decelerate engine and note any tendency to miss or backfire. Listen for any unusual noise or vibration that may indicate worn or inadequately lubricated parts, loose mountings, incorrect fuel mixture, or faulty ignition. Note any unusual exhaust smoke. Investigate and correct, or report, any deficiencies noted during operation.

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(2) ITEM 56, INSTRUMENTS. Check all pertinent instruments to be sure they are operating properly and continue to register or indicate correct performance of the units to which they apply. Inspect them for looseness or damage. Stop engine.

(3) ITEM 54, FUEL, OIL, AND WATER. Fill fuel tanks. (See if fuel gage indicates full.) Check crankcase oil and coolant supply and add as necessary to bring to correct level. NOTE: *Do not overfill fuel tanks or radiator. Allow room for expansion.* In freezing weather, if it is necessary to add any appreciable amount of coolant, have anti-freeze value checked and add sufficient quantity of solution to protect cooling system against freezing. Be careful in removing pressure radiator cap. Do not entirely remove until steam has escaped, and do not add coolant while engine is hot. Fill all spare fuel, oil, and water cans, if supply has been used.

(4) ITEM 57, HORN AND WINDSHIELD WIPERS. Examine horn to see that it is securely mounted and that there are no leaks in air lines. If tactical situation permits, test horns for proper operation and tone. Inspect windshield wiper arms and blades to see that they operate through full stroke and make proper contact with windshield glass.

(5) ITEM 58, GLASS AND REAR VISION MIRRORS. Clean all glass on truck and semitrailer and inspect for looseness or damage.

(6) ITEM 59, LAMPS, (LIGHTS) AND REFLECTORS. Inspect all units on truck and semitrailer for looseness or damage. If tactical situation permits, test all lamp switches for correct operation and see that all lamps respond properly.

(7) ITEM 60, FIRE EXTINGUISHERS. Examine extinguishers for looseness or damage, and see that nozzles are clean. If extinguishers have been used, report them for refill or replacement.

(8) ITEM 61, DECONTAMINATORS. Inspect for looseness or damage and full charge; if used, report for refill or exchange.

(9) ITEM 62, *BATTERIES.

(a) Inspect both batteries to see if they are clean, secure, and not leaking. Safety-fill vent caps should be fingertight.

(b) Weekly. Clean all dirt from top of batteries. If terminal connections or posts are corroded, clean them thoroughly, and apply fresh, thin coating of grease. Tighten terminal bolts if loose. Check electrolyte level and, if necessary, add distilled or clean water to bottom of filler well when cap is off safety-fill vent. Battery should be secure, and not bulging or leaking electrolyte; carrier should be secure, clean, free of corrosion, and well painted. Tighten loose mountings cautiously.

(10) ITEM 63, ACCESSORIES AND BELTS. Look at all accessories such as carburetor, generator, generator regulator, cranking motor, air compressor, fan and shroud, and water pump for looseness, damage, or leaks. Fan belt's tension must be adjusted so that there is ½-inch free travel of fan, measured at the tip of blade. Investigate and correct, or report, any deficiencies of accessory units or drive belt noted during operation.

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(11) ITEM 64, ELECTRICAL WIRING. Inspect all ignition wiring for looseness or damage. Wipe off excessive grease or moisture. Also examine all accessible low voltage wiring and connections, on both truck and semitrailer, for looseness or damage, and be sure wiring is supported so as not to chafe against other vehicle parts.

(12) ITEM 65, AIR CLEANERS AND BREATHER CAPS. Inspect both carburetor air cleaners and crankcase breather cap for looseness or damage. Examine oil in reservoirs for correct level and excessive dirt. Add oil to bead level. When operating in sandy or dusty conditions, clean and service as often as necessary.

(13) ITEM 66, *FUEL FILTERS.

(a) Examine filter for looseness, damage, and leaks.

(b) Weekly. Remove sediment bowl plug and drain off accumulated dirt and water. If draining indicates excessive dirt, remove element, and clean as outlined in paragraph 89. Clean fuel pump strainer. NOTE: *If excessive fuel contamination is evident, report for cleaning of fuel tank by higher echelon.*

(14) ITEM 67, ENGINE CONTROLS. Examine all controls for damage, excessive wear and adequate lubrication.

(15) ITEM 68, *TIRES.

(a) Examine both truck and semitrailer tires, including spares, for damage and excessive wear. Remove objects lodged in treads and carcasses and from between duals. Check for low pressures, proper position of valve stems, and presence of valve caps. Inflate to correct pressure, 90 pounds (maximum) cold.

(b) Weekly. Replace badly worn or otherwise unserviceable truck and semitrailer tires. Serviceable tires which show abnormal wear should be rotated to other wheel positions. Apparent mechanical defects causing such wear should be reported for attention by higher echelon.

(16) ITEM 69, SPRINGS AND SUSPENSIONS. Inspect truck front springs and rear tandem unit for looseness and damage. Look for abnormal front spring sag, shifted leaves, and loose or missing rebound clips. See that rear tandem unit stabilizer beams and wear blocks, axle beams, leaf springs and guide plates, radius rods and axle trunnions, are in good condition, correctly assembled, and secure. Examine semitrailer walking beams and axle assemblies including brake cylinder carrier, oil spring case caps, and beam mounting brackets for looseness and damage. Be sure walking-beam shifting adjusting screw is in proper position and securely locked. See that drive chains are in good condition, adjusted properly, and that lubricant tanks are secure, not leaking and filled with oil. Oil tubes should be clear and cocks closed after operation.

(17) ITEM 70, STEERING LINKAGE. Inspect gear case and hydraulic booster system for excessive leaks. Examine all linkage and joints for looseness, damage, and excessive wear. Investigate any unusual condition noticed during operation.

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(18) ITEM 71, PROPELLER SHAFTS AND CENTER BEARINGS. Inspect all drive shafts and universal joints for looseness, damage, and excessive lubricant leaks. See that companion flange and center bearing nuts are tight.

(19) ITEM 72, *AXLE AND TRANSFER VENTS.

(a) Examine all vents to see that they are present, clean, secure, and not damaged.

(b) Weekly. Remove all accessible vents and clean out oil passages.

(20) ITEM 73, LEAKS—GENERAL. Look in engine compartment and under vehicle for fuel, oil, coolant, gear oil, or hydraulic oil leaks. Also look at brake drums and axle flanges for excessive oil seepage. Trace any leaks to their source and correct or report them.

(21) ITEM 74, GEAR OIL LEVELS. After units have cooled, check lubricant levels in differentials, transmission, and transfer case. Correct cold levels are from lower edge of filler hole to ½ inch below.

(22) ITEM 75, *AIR BRAKE TANKS.

(a) Inspect all tanks on both truck and semitrailer for looseness and damage. See that all connections are tight, and that air lines are properly supported so as not to chafe on other vehicle parts. Drain water from all tanks and close drain cocks.

(b) Weekly. Have assistant operate all brake control valves and listen for air leaks. Tighten tank mountings and all connections where leaks are heard. Clean oil from all truck and semitrailer air line rubber hose. Press release valve button on semitrailer to be sure it operates.

(23) ITEM 76, FENDERS AND BUMPER. Inspect truck front mudguards and bumper for looseness and damage.

(24) ITEM 77, *TOWING CONNECTIONS.

(a) Inspect truck rear pintle and both truck and semitrailer towing shackles for looseness, damage, and excessive wear. Examine fifth wheel on truck, and kingpin on semitrailer, for wear or damage, and see that latching mechanism operates properly and locks securely.

(b) Weekly. Tighten all towing device mounting and assembly nuts securely. Test fifth-wheel connecting and locking mechanism for proper operation. Examine pintle hook spring and drawbar for damage.

(25) ITEM 78, BODY, LOAD, AND TARPAULINS. Examine truck body carefully for damaged or loose parts. See that doors and port covers fit, operate properly, and latch securely. Any load carried must be properly distributed and securely stowed. Tarpaulins or camouflage nets and gun covers should be in good condition and securely mounted or stowed. Inspect semitrailer frame and platform front supports and ramps for damage or loose attachments. If semitrailer is loaded, see that wheel skid guards are in place or that tank tracks do not scuff semitrailer tires.

(26) ITEM 79, *ARMOR AND WINCHES.

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(a) Inspect all cab armor plate for damage or loose assembly, and mounting nuts or screws. Examine all winch assemblies for looseness, damage, and excessive oil leaks at gear housing. Be sure winch control mechanisms operate freely and function properly and that drive chains are in good condition, adequately lubricated and adjusted according to instructions in paragraph 201.

(b) Weekly. Check winch gear case levels, fill gear cases and lubricate winch jaw clutches and drive chains according to Lubrication Guide. Test winch drag brakes. They should retard drum spinning when unwinding cable. To test all winch automatic brakes, place truck at top of steep grade and pull another vehicle upgrade. Throw out engine clutch; if towed vehicle starts to back down, brake should be adjusted. Start lowering towed vehicle downgrade; throw out engine clutch; if towed vehicle drifts more than one or two inches, brake should be adjusted. While winch cables are unwound, inspect them for damage. Clean entire length with thin oil or dry-cleaning solvent and as cables are rewound tightly and evenly, apply a coating of engine oil.

(27) ITEM 81, GUN MOUNT. Inspect caliber .50 gun mount for looseness or damage. Test traversing, elevating, and lock mechanism for proper operation.

(28) ITEM 82, *TIGHTEN.

(a) Tighten any truck or semitrailer external assembly, or mounting nuts or screws, where inspection has indicated the necessity.

(b) Weekly. Tighten all truck and semitrailer wheel rims, mounting and axle flange nuts or cap screws; spring U-bolts, shackles, and rebound clips; tandem unit and semitrailer walking beam, and axle assembly, mountings; universal joint companion flanges; engine mountings, transfer case mountings, steering arms, towing connections, or any other mounting or assembly nuts or screws that inspection indicates as necessary on a weekly, or mileage basis.

(29) ITEM 83, *LUBRICATE AS NEEDED.

(a) Lubricate truck and semitrailer items such as shackles, hinges, and latches, control linkage, frictional joints or clevises, and any point where inspection indicates the necessity, according to Lubrication Guide instructions.

(b) Weekly. Lubricate all points on truck and semitrailer indicated on Lubrication Guides (figs. 55, 56, and 63) as needing attention on a weekly, or mileage basis.

(30) ITEM 84, *CLEAN ENGINE AND VEHICLES.

(a) Clean dirt and grease from inside cab, engine compartment, and exterior of engine. Wipe off excess dirt and grease from entire exterior of both truck and semitrailer.

(b) Weekly. Wash truck and semitrailer when possible. If not possible, wipe off thoroughly. Inspect paint or camouflage pattern for rust or bright spots which might cause reflections. See that all vehicle markings (unless covered for tactical reasons) are legible. CAUTION: *When vehicles are driven into water for washing, care*

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must be taken to see that water or dirt does not get into wheel bearings, gear cases or brakes, or on electrical units or wiring.

(31) ITEM 85, *TOOLS AND EQUIPMENT.

(a) Check both truck and semitrailer tool and equipment on vehicle stowage lists (pars. 31 and 32, figs. 66 to 82), to be sure all items are present. See that they are in good condition and properly mounted or stowed.

(b) Weekly. Clean all tools and equipment of rust, dirt, or excessive grease. Apply preservatives where necessary and possible. See that tools with cutting edges are sharp and properly protected, and that all items are properly and securely mounted or stowed.

Section VII

LUBRICATION

29. LUBRICATION GUIDE.

a. War Department Lubrication Guides Nos. 138 and 138A (figs. 55, 56, and 63) prescribe lubrication maintenance for the 40-ton tank transporter trailer-truck.

b. A Lubrication Guide is placed on or is issued with each vehicle and is to be carried with it at all times. In the event the vehicle is received without a Guide, the using arm shall immediately requisition a replacement from the Commanding Officer, Fort Wayne Ordnance Depot, Detroit 32, Mich.

c. Lubrication instructions on the Guide are binding on all echelons of maintenance and there shall be no deviations from these instructions.

d. Service intervals specified on the Guide are for normal operation conditions. Reduce these intervals under extreme conditions such as excessively high or low temperatures, prolonged periods of high speed, continued operation in sand or dust, immersion in water, or exposure to moisture, any one of which may quickly destroy the protective qualities of the lubricant and require servicing in order to prevent malfunctioning or damage to the materiel.

e. Lubricants are prescribed in the "Key" in accordance with three temperature ranges: above +32°F, +32°F to 0°F, and below 0°F. Determine the time to change grades of lubricants by maintaining a close check on operation of the vehicle during the approach to change-over periods. Be particularly observant when starting the engine. Sluggish starting is an indication of thickened lubricants and the signal to change to grades prescribed for the next lower temperature range. Ordinarily it will be necessary to change grades of lubricants *only when air temperatures are consistently in the next higher or lower range,* unless malfunctioning occurs sooner due to lubricants being too thin or too heavy.

30. DETAILED LUBRICATION INSTRUCTIONS.

a. Lubrication Equipment. Each piece of materiel is supplied with lubrication equipment adequate to maintain the materiel. Be sure to clean this equipment both before and after use. Operate lubricating guns carefully and in such manner as to insure a proper distribution of the lubricant.

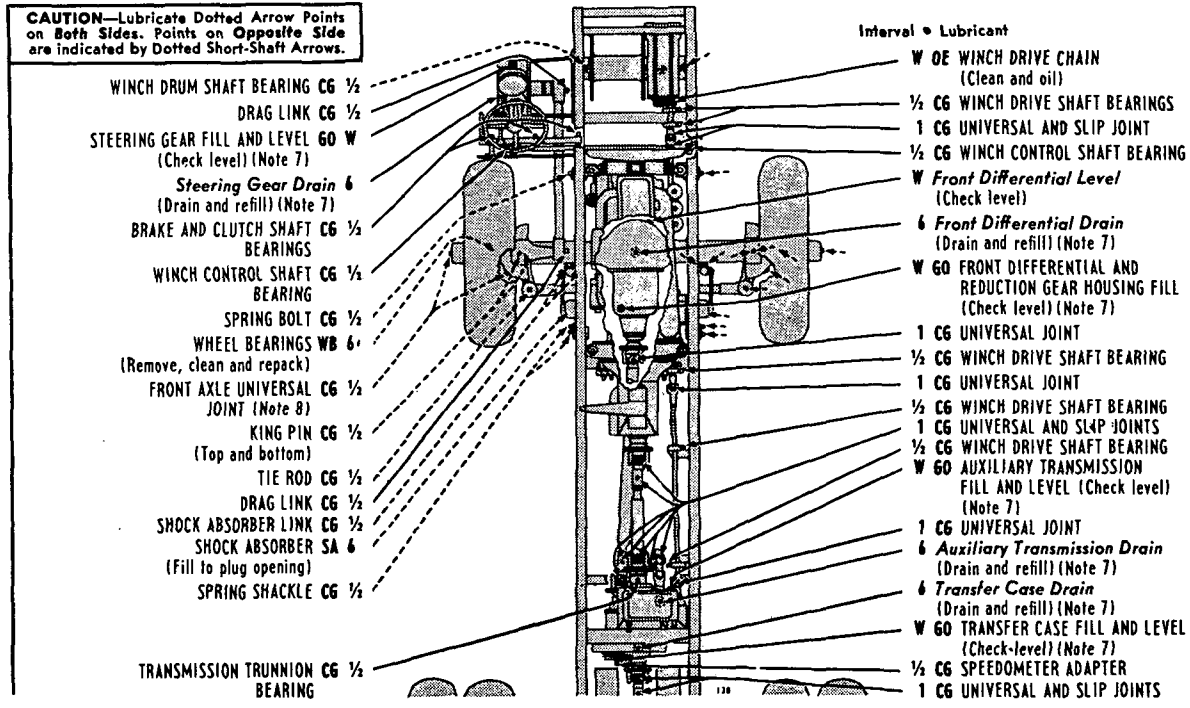
b. Points of Application.

(1) Red circles surrounding lubrication fittings, grease cups, oilers and oil holes make them readily identifiable on the vehicle Wipe clean such lubricators and the surrounding surface before lubr cant is applied.

MANUFACTURER'S SERIAL NUMBER located in front of cab above driver.

Lubricant • Interval

CAUTION—Lubricate Dotted Arrow Points on **Both Sides**. Points on **Opposite Side** are indicated by Dotted Short-Shaft Arrows.



WINCH DRUM SHAFT BEARING CG ½
DRAG LINK CG ½
STEERING GEAR FILL AND LEVEL GO W
(Check level) (Note 7)
Steering Gear Drain 6
(Drain and refill) (Note 7)
BRAKE AND CLUTCH SHAFT CG ½
BEARINGS
WINCH CONTROL SHAFT CG ½
BEARING
SPRING BOLT CG ½
WHEEL BEARINGS WB 6
(Remove, clean and repack)
FRONT AXLE UNIVERSAL CG ½
JOINT (Note 8)
KING PIN CG ½
(Top and bottom)
TIE ROD CG ½
DRAG LINK CG ½
SHOCK ABSORBER LINK CG ½
SHOCK ABSORBER SA 6
(Fill to plug opening)
SPRING SHACKLE CG ½
TRANSMISSION TRUNNION CG ½
BEARING

Interval • Lubricant

W OE WINCH DRIVE CHAIN
(Clean and oil)
½ CG WINCH DRIVE SHAFT BEARINGS
1 CG UNIVERSAL AND SLIP JOINT
½ CG WINCH CONTROL SHAFT BEARING
W *Front Differential Level*
(Check level)
6 *Front Differential Drain*
(Drain and refill) (Note 7)
W GO FRONT DIFFERENTIAL AND
REDUCTION GEAR HOUSING FILL
(Check level) (Note 7)
1 CG UNIVERSAL JOINT
½ CG WINCH DRIVE SHAFT BEARING
1 CG UNIVERSAL JOINT
½ CG WINCH DRIVE SHAFT BEARING
1 CG UNIVERSAL AND SLIP JOINTS
½ CG WINCH DRIVE SHAFT BEARING
W GO AUXILIARY TRANSMISSION
FILL AND LEVEL (Check level)
(Note 7)
1 CG UNIVERSAL JOINT
6 *Auxiliary Transmission Drain*
(Drain and refill) (Note 7)
6 *Transfer Case Drain*
(Drain and refill) (Note 7)
W GO TRANSFER CASE FILL AND LEVEL
(Check level) (Note 7)
½ CG SPEEDOMETER ADAPTER
1 CG UNIVERSAL AND SLIP JOINTS

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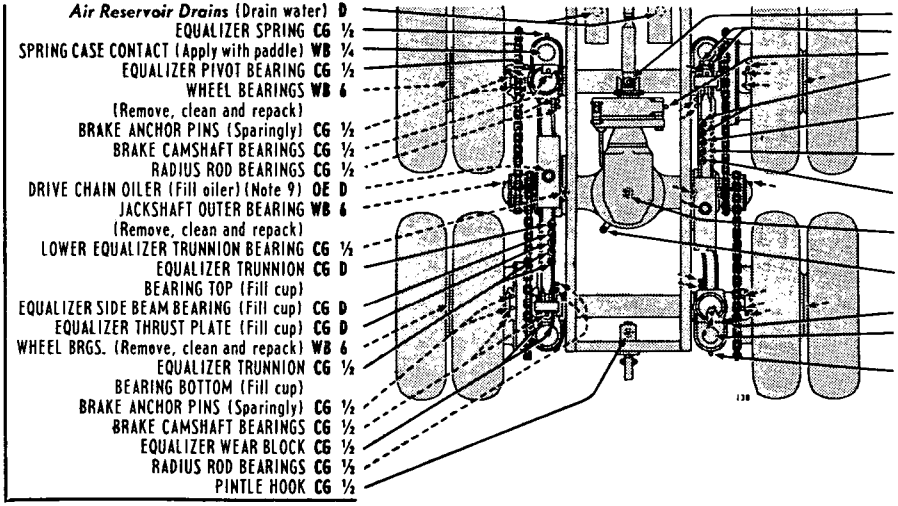

— KEY —

INTERVALS
D—DAILY
W—WEEKLY
¼—250 MILES
½—500 MILES
1—1,000 MILES
6—6,000 MILES

TABLE OF CAPACITIES AND LUBRICANTS TO BE USED

UNIT	CAPACITY (Approx.)	LOWEST EXPECTED AIR TEMPERATURE		
		+32°F. and above	+32°F. to 0°F.	Below 0°F.
Auxiliary Transmission	7½ qt.	GO SAE 90	GO SAE 80	GO Grade 75
Transfer Case	3½ qt.			
Differential (Front)	32 qt.			
Differential (Rear)	8 qt.			
Steering Gear	8½ qt.			

— KEY —

LUBRICANTS
OE—OIL, engine Except crankcase SAE 30 (above +32°F.) SAE 10 (+32°F. to 0°F.) PL (below 0°F.)
GO—LUBRICANT, gear, universal (See Table)
CG—GREASE, general purpose No. 1 (above +32°F.) No. 0 (below +32°F.)
WB—GREASE, general purpose, No. 2
SA—FLUID, shock-absorber, heavy
PL—OIL, lubricating, preservative, light

See Fig. 56 for lubrication of FIFTH WHEEL, WINCHES AND CAB POINTS, and Fig. 63 for TRAILER.

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Figure 55—Lubrication Guide, Tractor Truck M26—Chassis Points

MANUFACTURER'S SERIAL NUMBER located in front of cab above driver.

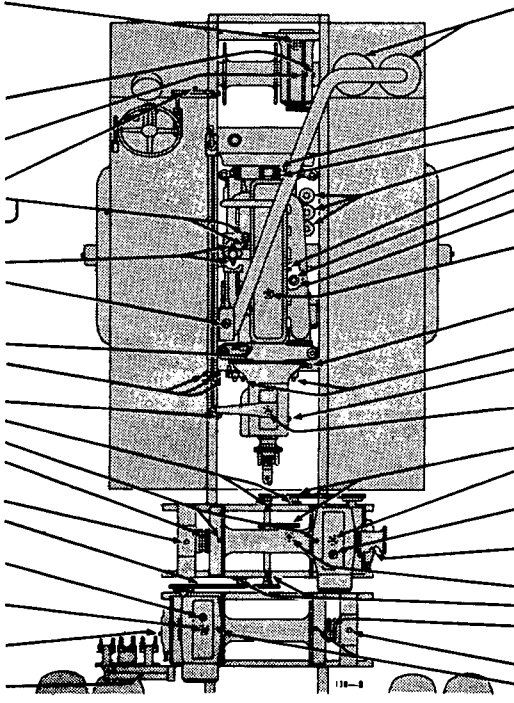
Lubricant • Interval

Winch Gear Case Drain 6
(Drain and refill) (Note 7)

Serviced From Cab

Winch Gear Case Level W
(Check level)
WINCH GEAR CASE FILL GO W
(Check level) (Note 7)
THROTTLE BELLCRANK CG ½
DISTRIBUTOR (Note 11) OE 1
DISTRIBUTOR SHAFT OE ½
(6 to 8 drops)
THROTTLE LINKAGE OE ½
HYDRAULIC STEERING OH W
SYSTEM FILL AND LEVEL
(Check level) (Note 10)
TACHOMETER ADAPTER CG ½
GEAR SHIFT RODS GUIDE CG ½

GEAR SHIFT SHAFT BEARING CG ½
WINCH SPROCKET BEARINGS CG ½
WINCH DRUM BEARINGS CG ½
WINCH JAW CLUTCH OE W
(Clean and oil)
WINCH DRUM SHAFT BEARING CG ½
WINCH DRIVE CHAIN OE W
(Clean and oil)
WINCH GEAR CASE FILL GO W
(Check level) (Note 7)
Winch Gear Case Drain 6
(Drain and refill) (Note 7)
Winch Gear Case Level W
(Check level)
WINCH BRAKE SHAFT CG ½



Interval • Lubricant

D OE AIR CLEANERS
(Check level) (Note 4)

Serviced From Cab

½ CG ENGINE SUPPORT BEARING
½ WP WATER PUMP
1 *Oil Filters* (Note 6)
D *Crankcase Level* (Check level)
D OE CRANKCASE FILL (See Table) (Note 5)
D OE CRANKCASE BREATHER
AIR CLEANER (Check level) (Note 4)
1 *Crankcase Drain*
(Drain and refill) (Note 5)

½ CG CLUTCH THROWOUT BEARING
(Sparingly)
½ CG CLUTCH THROWOUT SHAFT
W GO TRANSMISSION FILL AND LEVEL
(Check level) (Note 7)
6 *Transmission Drain*
(Drain and refill) (Note 7)
W OE WINCH DRIVE CHAINS (Clean and oil)
6 *Winch Gear Case Drain*
(Drain and refill) (Note 7)
W GO WINCH GEAR CASE FILL
(Check level) (Note 7)
W *Winch Gear Case Level*
(Check level)
½ CG WINCH DRIVE SHAFT BEARING
½ CG WINCH SPROCKET BEARINGS
W OE WINCH JAW CLUTCH
(Clean and oil)
½ CG WINCH DRUM SHAFT BEARING
½ CG WINCH DRUM BEARINGS

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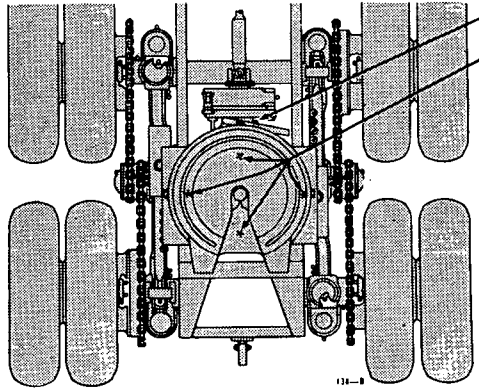
KEY

LUBRICANTS
OE—OIL, engine Except crankcase SAE 30 (above +32°F.) SAE 10 (+32°F. to 0°F.) PL (below 0°F.)
GO—LUBRICANT, gear, universal (See Table)
CG—GREASE, general purpose No. 1 (above +32°F.) No. 0 (below +32°F.)
WP—GREASE, water pump
OH—OIL, hydraulic
PL—OIL, lubricating, preservative, light



KEY

INTERVALS
D—DAILY
W—WEEKLY
½—500 MILES
1—1,000 MILES
6—6,000 MILES
CHECK DAILY Air Cleaner Crankcase

See Fig. 55 for lubrication of CHASSIS POINTS and Fig. 63 for TRAILER.

TABLE OF CAPACITIES AND LUBRICANTS TO BE USED

UNIT	CAPACITY (Approx.)	LOWEST EXPECTED AIR TEMPERATURE		
		+32°F. and above	+32°F. to 0°F.	Below 0°F.
Crankcase	28 qt.	**OE** SAE 30	**OE** SAE 30	Refer to OFSB 6-11
Transmission	8½ qt.	**GO** SAE 90	**GO** SAE 80	**GO** Grade 75
Winch Gear Case (each)	4 qt.			
Hydraulic Steering System	10 qt.	**OH**	**OH**	**OH**

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Figure 56—Lubrication Guide, Tractor Truck M26—Fifth Wheel Winches and Uses in Cab

(2) Where relief valves are provided, apply new lubricant until the old lubricant is forced from the vent. Exceptions are specified in notes on the Lubrication Guide.

c. Lubrication Notes on Truck Tractor Individual Units and Parts. The following instructions supplement those notes on the Lubrication Guide (figs. 55 and 56) which pertain to lubrication and service of individual units and parts of the truck tractor.

(1) FITTINGS. Clean fittings before applying lubricant. Lubricate until new lubricant is forced from the bearing, unless otherwise specified. CAUTION: *Lubricate chassis points after washing vehicle.*

(2) INTERVALS. Intervals indicated are for normal service. For extreme conditions of speed, heat, water, sand, mud, snow, rough roads, dust, etc., reduce intervals by ⅓ or ½, or more if conditions warrant.

(3) CLEANING. Use SOLVENT, dry-cleaning, or OIL, fuel, Diesel, to wash or clean all parts. Use of gasoline for this purpose is prohibited. Dry all parts thoroughly before relubrication.

(4) AIR CLEANERS. Daily check level and refill engine air cleaner oil cup to bead level with used crankcase oil or OIL, engine, SAE 30 above +32°F and SAE 10 +32°F to 0°F. Below 0°F, remove oil and operate dry. Every 1,000 miles, daily under extremely dusty conditions, remove and wash all parts. Daily check level and refill crankcase breather air cleaner to level mark with used crankcase oil or OIL, engine, SAE 30 above +32°F and SAE 10 +32°F to 0°F. Below 0°F remove oil and operate dry. When changing crankcase oil, remove cleaner and wash all parts.

(5) CRANKCASE. Drain only when engine is hot. Refill to "FULL" mark on gage. Run engine a few minutes and recheck oil level. CAUTION: *Be sure pressure gage indicates oil is circulating.*

(6) OIL FILTERS. Drain sediment every 1,000 miles. Drain filter every 6,000 miles, or more often if filter becomes clogged. Clean inside and renew element. Run engine a few minutes, recheck crankcase level, add OIL, engine, to "FULL" mark on gage (SAE 30 above +32°F; SAE 10 +32°F to 0°F; below 0°F refer to OFSB 6-11).

(7) GEAR CASES. Weekly, check level with truck on level ground and, if necessary, add lubricant to within ½ inch of plug level when cold, or to plug level, when hot. Drain and refill at intervals indicated on Guide. Drain only after operation.

(8) STEERING UNIVERSAL JOINT. Remove plug to center of wheel hub and insert fitting. Remove level plug in rear of joint and fill through fitting to level of plug hole. Replace plugs.

(9) DRIVE CHAIN OILER. Keep tank filled with used crankcase oil or OIL, engine, SAE 30 above +32°F; SAE 10 +32°F to 0°F; OIL, lubricating, preservative, light, below 0°F. Below 0°F drain, clean, and refill. Adjust pet cocks to feed oil sparingly.

(10) HYDRAULIC STEERING SYSTEM. Check level of hydraulic oil weekly and replenish if necessary. Twice a year, drain and flush reservoir with OIL, hydraulic, to remove sediment and moisture. Refill with OIL, hydraulic.

LUBRICATION

(11) DISTRIBUTOR. Every 1,000 miles, wipe distributor breaker cam lightly with GREASE, general purpose, No. 1 above +32°F and No. 0 below +32°F and lubricate breaker arm pivot and wick under rotor with one to two drops of OIL, engine, SAE 30 above +32°F; SAE 10 +32°F to 0°F; OIL, lubricating, preservative, light, below 0°F.

(12) WHEEL BEARINGS. Remove bearing cone assemblies from hub and wash spindle and inside of hub. Inspect bearing races and replace if necessary. Wet the spindle and inside of hub and hub cap with GREASE, general purpose, No. 2, to a maximum thickness of $\frac{1}{16}$ inch only to retard rust. Wash bearing cones and grease seals. Inspect and replace if necessary. Lubricate bearings with GREASE, general purpose, No. 2, with a packer or by hand, kneading lubricant into all spaces in the bearing. Use extreme care to protect bearings from dirt and immediately reassemble and replace wheel. The lubricant in the bearings is sufficient to provide lubrication until the next service period. Do not fill hub or hub cap. Any excess might result in leakage into the brake drum.

(13) OILCAN POINTS. Every 500 miles, lubricate winch control shafts, levers, clevises and latches, gearshift rod clevises, clutch and parking brake linkage, etc., with OIL, engine, SAE 30, above +32°F; SAE 10 +32°F to 0°F; OIL, lubricating, preservative, light, below 0°F.

(14) POINTS REQUIRING NO LUBRICATION SERVICE. The brake cylinders, radius rod ball socket joints, and air compressor do not require lubrication.

(15) POINTS TO BE SERVICED AND/OR LUBRICATED BY ORDNANCE MAINTENANCE PERSONNEL.

(a) Speedometer and Tachometer Cables. Once a year, dismount cables, disassemble and coat shaft with GREASE, graphited, light.

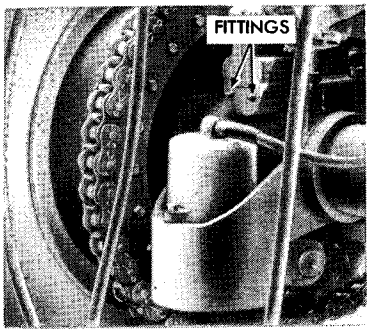
(b) Cranking Motor and Generator. Once a year, the cranking motor and generator will be disassembled for inspection and cleaning of all parts. The Bendix drive will be cleaned with SOLVENT, dry-cleaning, and coated with OIL, lubricating, preservative, special. CAUTION: *Never clean the armature and field coils of either cranking motor or generator with SOLVENT, dry-cleaning, or any grease dissolving material. Such products are liable to damage insulation.* Replace all parts showing excessive wear. Coat bearings with OIL, engine, SAE 30 above +32°F; SAE 10 +32°F to 0°F; OIL, lubricating, preservative, light, before reassembly.

d. Lubrication Notes for Semitrailer M15. The following notes supplement those on the Lubrication Guide shown in figure 63, which pertain to lubrication and service of individual units and parts of the semitrailer.

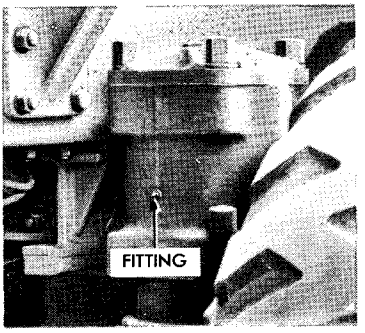
(1) FITTINGS. Clean before applying lubricant. Lubricate until new lubricant is forced from the bearings, unless otherwise specified. CAUTION: *Lubricate chassis points after washing semitrailer.*

(2) INTERVALS. Intervals indicated are for normal service. For extreme conditions of speed, heat, water, sand, mud, snow, rough

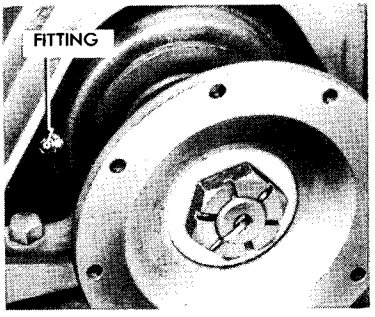
40-TON TANK TRANSPORTER TRUCK-TRAILER M25



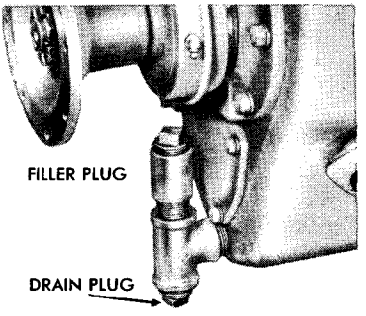
SPRING CASE—CG
Two fittings, one on each spring case.



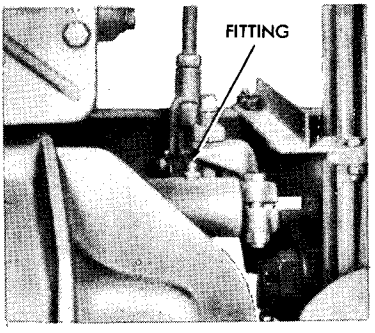
WEAR STABILIZER BLOCK—CG
Four fittings, two on each block.



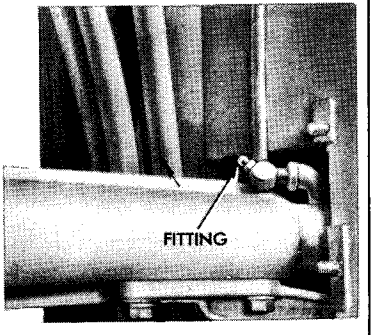
AUXILIARY TRANSMISSION MOUNTING—CG
One lubrication fitting on trunnion.



AUXILIARY TRANSMISSION AND TRANSFER CASE
Keep filled to filler plug. Refill capacity 12 quarts.



TRANSMISSION SHIFTING SHAFT—CG
One fitting at left end of remote control housing.



CLUTCH RELEASE BEARING—CG
One fitting at left end of clutch throwout shaft.

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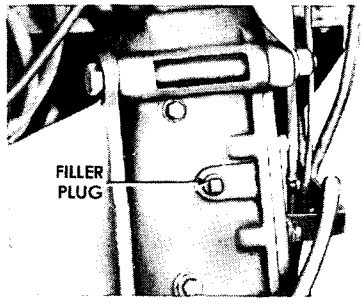
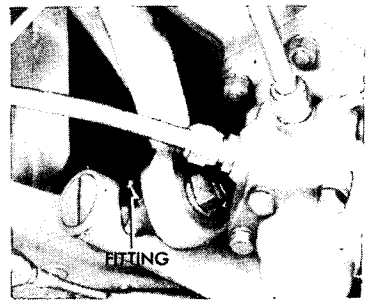
Figure 57—Tractor Truck Localized Lubrication View—A

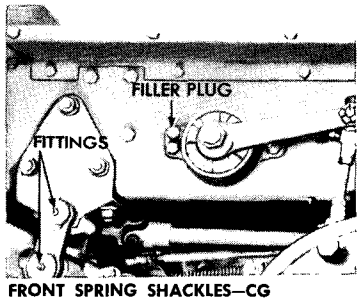
LUBRICATION



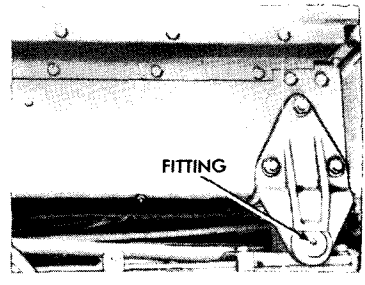
STEERING GEAR—GO
Keep steering gear housing filled to level of plug.



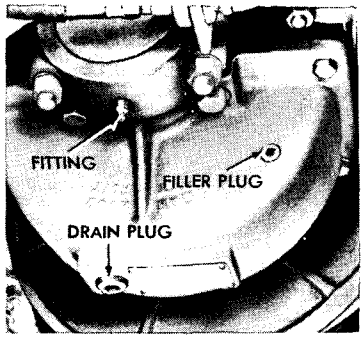
DRAG LINK—CG
Two fittings, one at each end of drag link.



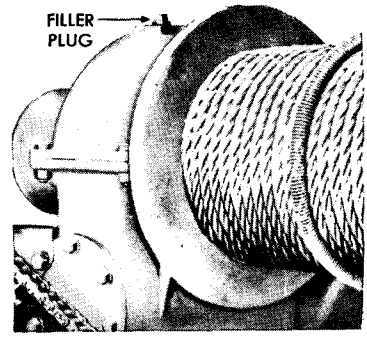
FRONT SPRING SHACKLES—CG
SHOCK ABSORBERS—SA
Four fittings on shackles. Two fittings and two filler plugs on shock absorbers.



FRONT SPRING BRACKET PINS—CG
One fitting on each front spring bracket pin.



FRONT MOUNTED WINCH—GO, CG
One fitting on each bearing cap (CG). Keep case filled to level of filler plug (GO).

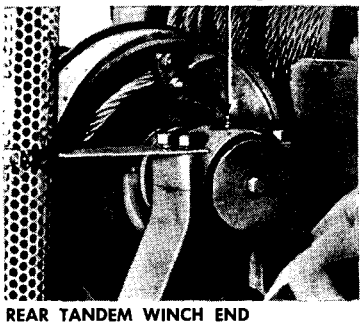


TANDEM WINCH—GO
Keep case on front mounted tandem winch filled to level of filler plug.

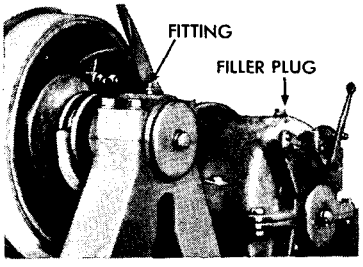
RA PD 77120

Figure 58—Tractor Truck Localized Lubrication View—B

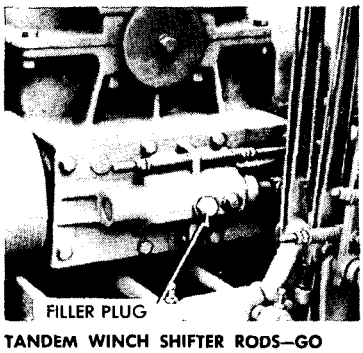
40-TON TANK TRANSPORTER TRUCK-TRAILER M25



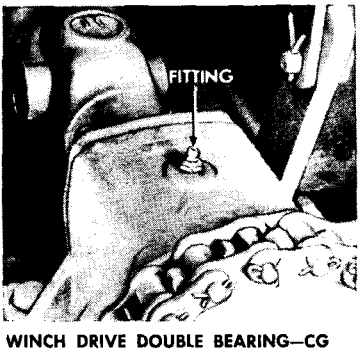
REAR TANDEM WINCH END BEARING SLEEVE—CG
One fitting at right end of rear winch.



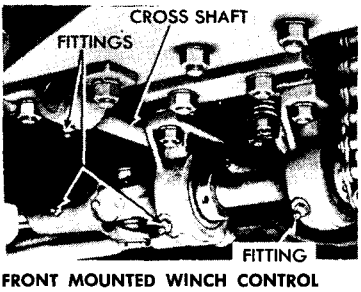
REAR TANDEM WINCH GEAR CASE—GO
FRONT WINCH END BEARING SLEEVE—CG
One fitting at left end of front winch (CG).
Filler plug at right end of rear winch (GO).



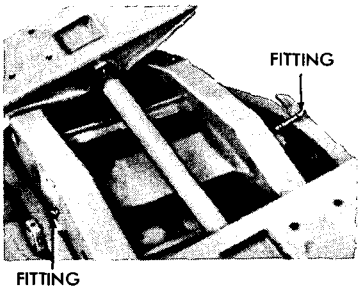
TANDEM WINCH SHIFTER RODS—GO
Keep shifter cover filled to level of filler plug.



WINCH DRIVE DOUBLE BEARING—CG
One fitting.



FRONT MOUNTED WINCH CONTROL CROSS SHAFT AND DRIVE SHAFT—CG
Two fittings on cross shaft (one at each end). One fitting on each universal joint yoke. One fitting on each drive shaft bearing housing.



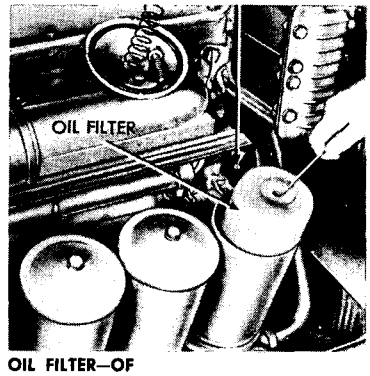
FIFTH WHEEL—CG
Five fittings, one at each end of both shafts and one at jaw locking handle.

RA PD 77117

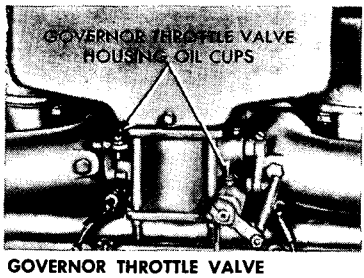
Figure 59—Tractor Truck Localized Lubrication View—C

LUBRICATION

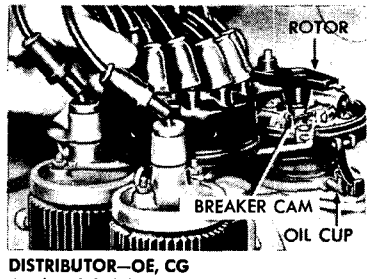
CRANKCASE AND BREATHER—OE
Keep oil level at "F" mark on gage. Clean breather screen and keep body filled to breather oil level. Refill capacity 28 quarts.



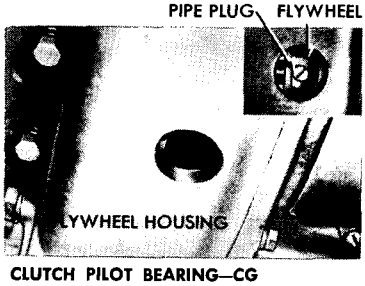
OIL FILTER—OF
WATER PUMP—WP
Replace oil filter element. Apply lubricant through one fitting on water pump.



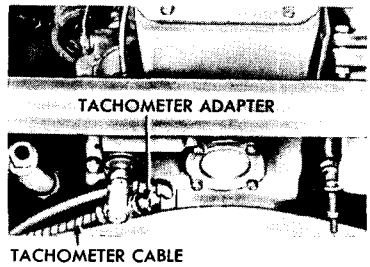
GOVERNOR THROTTLE VALVE HOUSING—OE
Three oil cups, one at front, two at rear.



DISTRIBUTOR—OE, CG
Apply CG lightly on breaker cam. Fill oil cup with OE. Remove rotor and drop OE on felt in end of shaft.



CLUTCH PILOT BEARING—CG
Remove pipe plug and install lubrication fitting in its place. Apply grease gun on fitting and turn handle of gun two or three times.

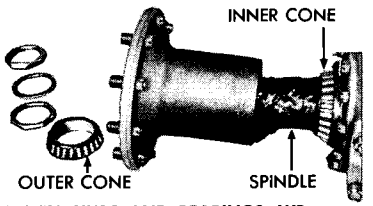


TACHOMETER ADAPTER AND CABLE—CG
Tachometer adapter has one fitting. Remove tachometer cable and coat with graphite grease, then reinstall cable.

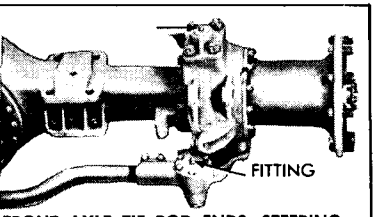
RA PD 76479

Figure 60—Tractor Truck Localized Lubrication View—D

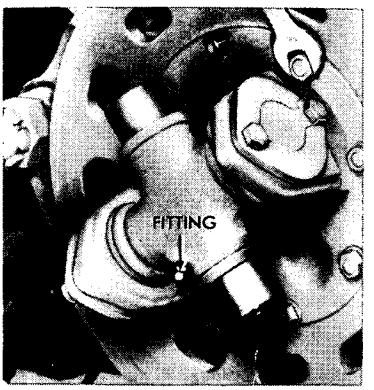
40-TON TANK TRANSPORTER TRUCK-TRAILER M25



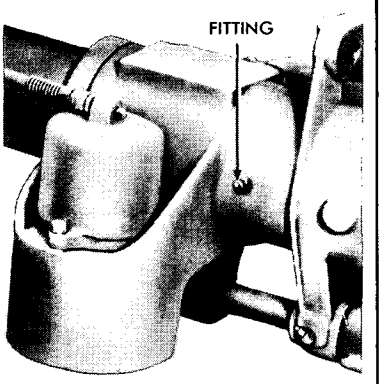
WHEEL HUBS AND BEARINGS—WB
Remove front hubs and bearing, clean all parts and repack bearings and spindle. Remove rear jackshaft hubs and repack bearings and jackshaft hub.



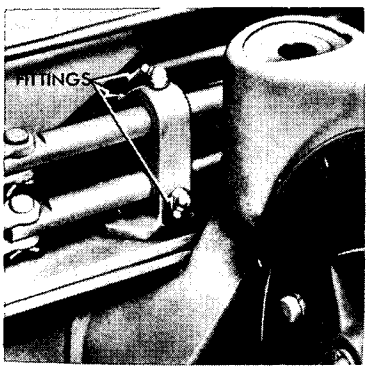
FRONT AXLE TIE ROD ENDS, STEERING KNUCKLES—CG
Two fittings, one on each end of tie rod, and two fittings, one on each steering knuckle.



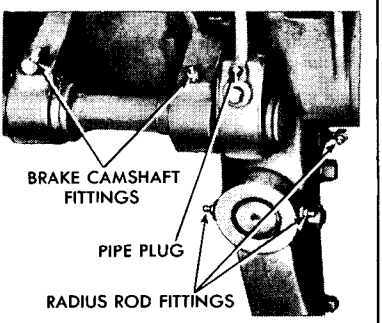
UNIVERSAL JOINT CROSS—CG
One fitting each universal joint.



REAR CARRIER AXLE—CG
Two fittings, one at each end of axle.



TRANSMISSION SHIFTING RODS—CG
Three fittings at rod bracket.

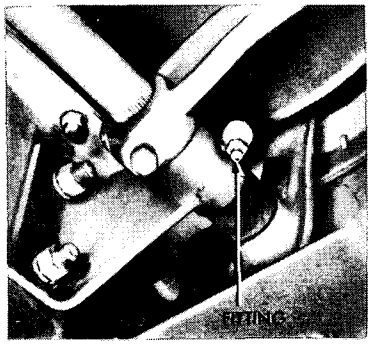


BRAKE CAMSHAFT SLACK ADJUSTER AND RADIUS ROD—CG
Sixteen fittings on brake camshaft (two at each rear wheel). Four pipe plugs (one at each slack adjuster). Twelve fittings on radius rod (three on each rod)

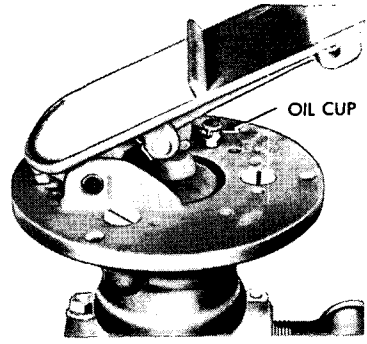
RA PD 76480

Figure 61—Tractor Truck Localized Lubrication View—E

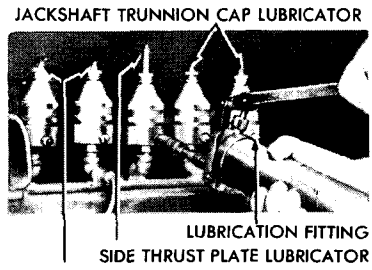
LUBRICATION



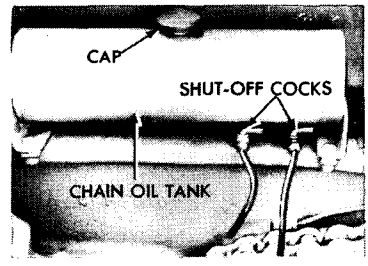
CLUTCH AND HAND BRAKE CROSS SHAFT—CG
Two fittings (one on each end of shaft).



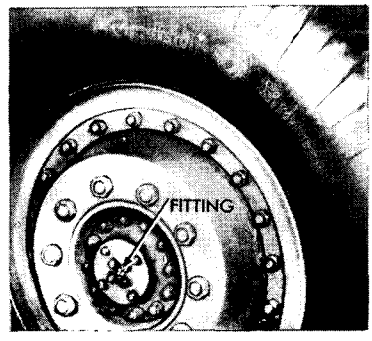
AIR BRAKE FOOT VALVE—OE
One oil cup, under brake pedal.



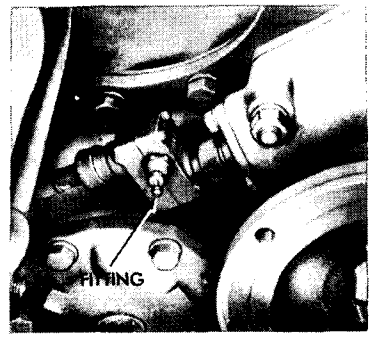
JACKSHAFT TRUNNION AND SIDE THRUST PLATE—CG
10 fittings (5 on each side of chassis). Fill cup until plunger is all the way up.



DRIVE CHAIN—OE
Two chain oil tanks, one on each side of chassis. Keep filled.



WHEELS—WB
Six fittings, one on each wheel.

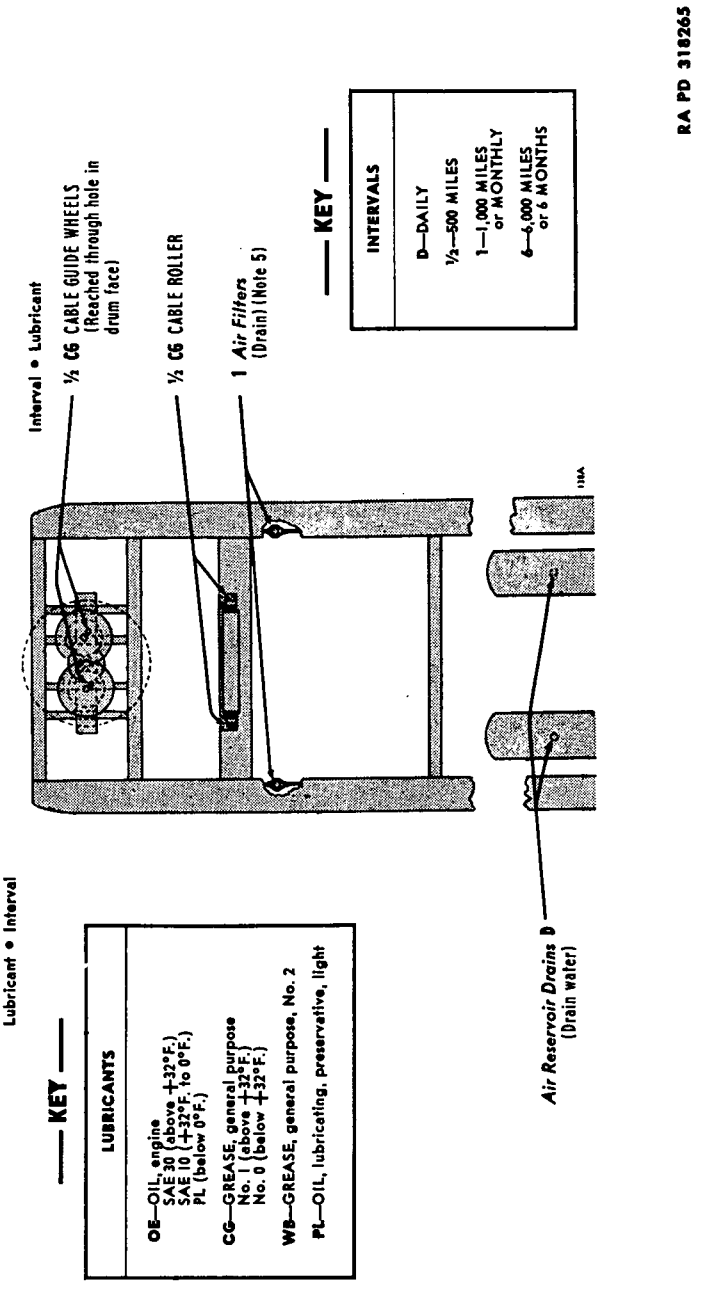


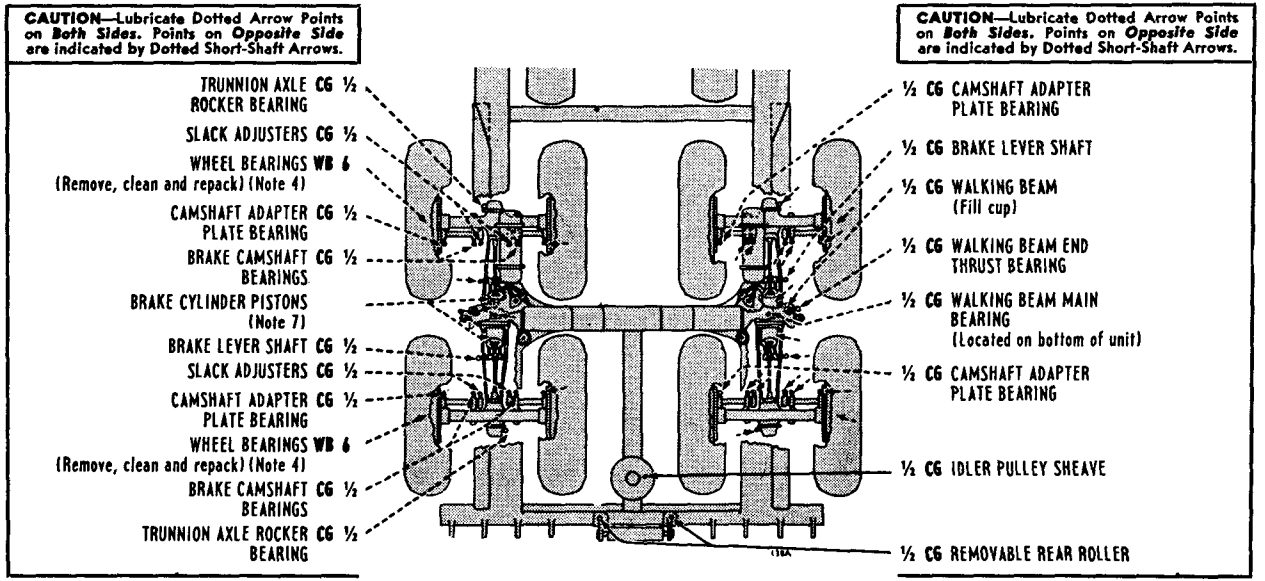
SPEEDOMETER DRIVE—CG
One fitting.

RA PD 77119

Figure 62—Tractor Truck Localized Lubrication View—F

40-TON TANK TRANSPORTER TRUCK-TRAILER M25





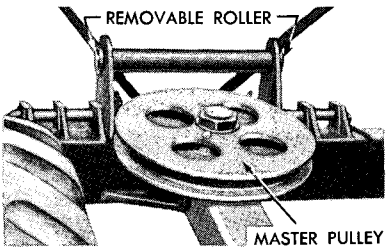
See Fig. 56 for lubrication of FIFTH WHEEL, WINCHES and CAB POINTS, and Fig. 55 for CHASSIS POINTS.

8-26-43
Supersedes all previous instructions.

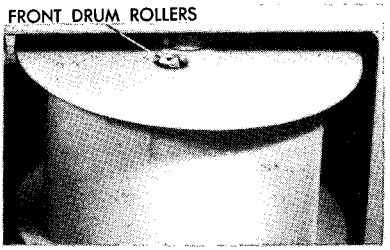
RA PD 318265B

Figure 63—Lubrication Guide—Trailer M15

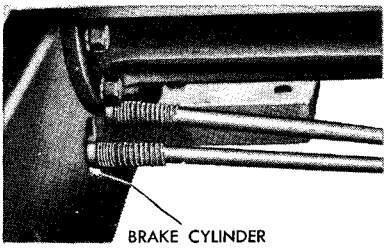
40-TON TANK TRANSPORTER TRUCK-TRAILER M25



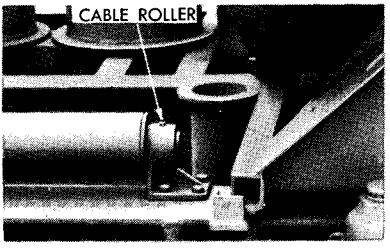
REMOVABLE ROLLER AND MASTER PULLEY—CG
Pressure gun. Use grease sparingly. (One fitting on master pulley. Two fittings on removable roller.)



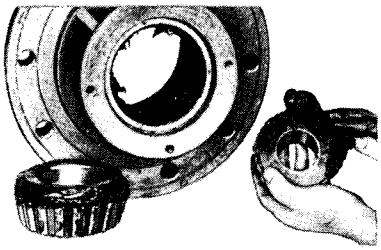
FRONT DRUM ROLLERS—CG
Pressure gun. Use grease sparingly. (Two fittings.)



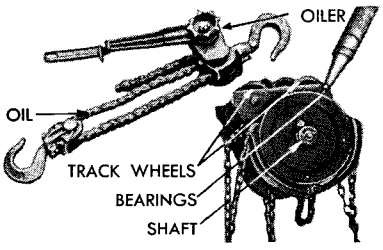
BRAKE CYLINDER—OE
Remove brake air lines which enter brake cylinders at rocker beam. Using long spout oil can, put 1 oz. of oil into each cylinder. (Four cylinders).



CABLE ROLLER—CG
Pressure gun. Apply grease through fitting until new grease shows on outer end of mounting bracket. (Two fittings.)



WHEEL BEARINGS AND HUB—WB
Clean bearing and hub in solvent. Dry thoroughly, Hand pack bearing, forcing grease into bearing at big end of rollers until grease comes out between cage and rollers. Coat the space in hub between inner and outer cup with ¼" layer of lubricant. (Eight bearings.)

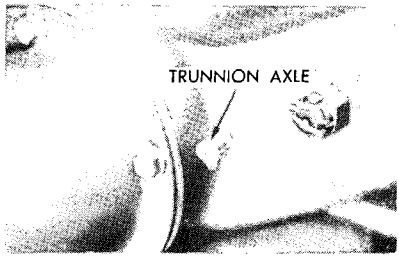


HAND RATCHET CHAIN FALL—OE
Periodically. Oil holes are provided with valve oilers. Chain should be kept clean and lubricated with oil. CAUTION: Do not oil disc hub, friction disc, ratchet disc or ratchet.
TROLLEY HOIST—CG
Alemite fittings, pressure gun, unit is equipped with seven alemite fittings, use grease sparingly.

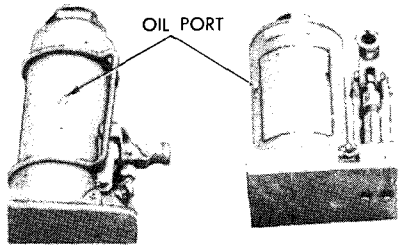
RA PD 57484

Figure 64—Semitrailer Localized Lubrication View—A

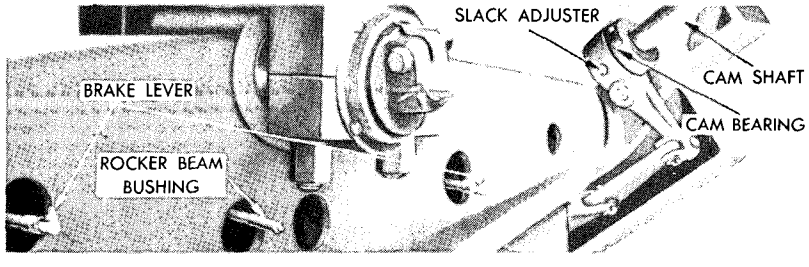
LUBRICATION



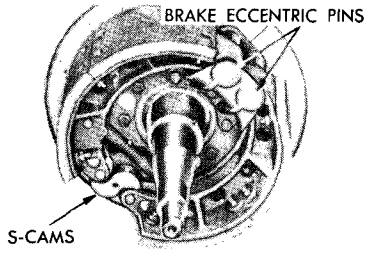
TRUNNION AXLE BUSHING—CG
Clean fittings with wiping cloth. Apply lubricant through fittings until new grease shows at inner side. (Four fittings.)



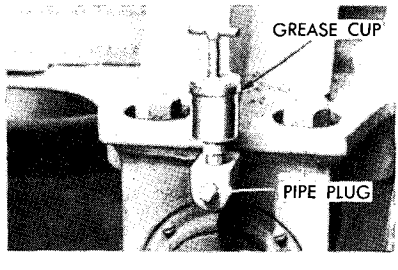
HYDRAULIC JACKS—OH
Check oil level periodically. With jack in upright position, remove filler screw slowly. Oil level should be even with filler hole. Use oil, hydraulic. (Three each.)



ROCKER BEAM BUSHING, BRAKE LEVER, CAM, SLACK ADJUSTER AND BEARING—CG
Pressure Gun. Clean fittings with wiping cloth. Apply lubricant through fitting until new grease shows. NOTE: When lubricating cam use grease sparingly. (Two fittings in bushings, four on levers, eight on cams, slack adjuster and bearings.)



BRAKE ECCENTRIC PINS AND S-CAM—WB AND OE
Place several drops of oil around frame eccentric pins, using oil can. Do not allow oil to flow on brake lining. (Sixteen points). Work grease around top and bottom surface with finger. These points are lubricated only when wheel is removed. (Eight points.)



SHIFTING SCREW—CG
Keep cup filled. Turn pressure handle several turns in clockwise direction prior to shifting rocker beam. Do not use grease cup for initial greasing, remove pipe plug, install fitting and use pressure gun. (Two points.)

RA PD 57483

Figure 65—Semitrailer Localized Lubrication View—B

roads, dust, etc., reduce interval by ⅓ or ½, or more if conditions warrant.

(3) CLEANING. Use SOLVENT, dry-cleaning, or OIL, fuel, Diesel, to clean or wash all parts. Use of gasoline is prohibited for this purpose. Dry all parts thoroughly before relubrication.

(4) WHEEL BEARINGS. While wheel is removed, coat brake anchor pins lightly with No. 1 GREASE, general purpose, above +32°F and No. 0 below +32°F. Remove bearing cone assemblies from hub and wash spindle and inside of hub. Inspect bearing races and replace if necessary. Wet the spindle and inside of hub and hub cap with GREASE, general purpose, No. 2 to a maximum thickness of ⅛ inch only to retard rust. Wash bearing cones and grease seals. Inspect and replace if necessary. Lubricate bearings with GREASE, general purpose, No. 2 with a packer or by hand, kneading lubricant into all spaces in the bearing. Carefully protect bearings from dirt and immediately reassemble and replace wheel. The lubricant in the bearings is sufficient to provide lubrication until the next service period. Do not fill hub or hub cap. Excess lubrication might leak into the brake drum.

(5) AIR FILTERS. Every 1,000 miles, remove plug and drain moisture. Every 6,000 miles, remove filter element and wash.

(6) OILCAN POINTS. Every 1,000 miles, lubricate all brake connecting rod ends and yokes and any other frictional points with OIL, engine, SAE 30 above +32°F; SAE 10 +32°F to 0°F; OIL, lubricating, preservative, light, below 0°F.

(7) POINTS TO BE SERVICED AND/OR LUBRICATED BY ORDNANCE MAINTENANCE PERSONNEL.

(a) Brake Cylinder Pistons. Every 6 months or when the trunnion unit is disassembled for inspection, repair or overhaul, the brake cylinders will be removed and the brake cylinder pistons lubricated. To perform this service, proceed as follows:

1. Remove plate bolted on bottom of trunnion arm.
2. Disconnect brake cylinder piston rod from brake lever.
3. Remove brake cylinder support bolt and lift from brake lever.
4. Disconnect air line to brake cylinder and inject ¾ ounce of OIL, hydraulic, into cylinder through air line inlet opening.
5. Connect air line to cylinder and reassemble cylinder in trunnion arm.

e. Reports and Records. If lubrication instructions are closely followed, proper lubricants used, and satisfactory results are not obtained, a report will be made to the ordnance officer responsible for the materiel. A complete record of seasonal changes of lubricants may be kept in the Duty Roster (W.D., A.G.O. Form No. 6).

Section VIII

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

31. VEHICLE TOOLS AND EQUIPMENT.

a. Purpose. The lists in paragraphs 31 and 32 are for information only and are not to be used as a basis for requisition.

b. Truck Tractor Tools.

Item	Number Carried	Where Carried
BAG, tool	1	Cab tool box
BAR, wheel nut wrench	1	Cab tool box
CHUCK, air, tire inflating hose	1	Cab tool box
COUPLER, swivel	1	Cab tool box
EXTENSION, wrench (for radius rod, steering gear and jackshaft wrenches)	1	Cab tool box
FILE, hand, smooth, 8-in. (41-F-1571)	1	Tool box
FILE, A.S., three-sq., sm, 6-in. (41-F-1028)	1	Tool box
GAGE, pressure	1	Tool box
GUN, lubr., press, hand type	1	Cab tool box
HAMMER, machs, ball peen, 8-oz (41-H-521)	1	Cab tool box
HAMMER, machs, ball peen, 32-oz (41-H-527)	1	Cab tool box
HOSE, tire inflating, 50 ft long	1	Cab tool box
JACK, hydraulic, 20 ton (w/two levers)	1	Cab tool box
PLIERS, comb, slip-joint, 8-in. (41-P-1652)	5	Cab tool box
PLIERS, side-cutt., fl-nose, 8-in. (41-P-1977)	1	Cab tool box
SCREWDRIVER, 3-in. blade (41-S-1101)	1	Cab tool box
SCREWDRIVER, 6-in. blade (41-S-1104)	1	Cab tool box
SCREWDRIVER, 10-in. blade (41-S-1108)	1	Cab tool box
SCREWDRIVER, 12-in. blade (41-S-1110)	1	
TOOL-SET (chain repair)	1	Cab tool box
WRENCH, box, 7/8-in. hex.	1	Cab tool box
WRENCH, box, 15/16-in.	1	Cab tool box
WRENCH, engrs, 3/8- and 7/16-in. (41-W-991)	1	Cab tool box
WRENCH, engrs, 1/2- and 9/16-in. (41-W-1002-40)	1	Cab tool box
WRENCH, engrs, 9/16- and 3/4-in. (41-W-1005-10)	1	Cab tool box
WRENCH, engrs, 5/8- and 3/4-in. (41-W-1008)	1	Cab tool box

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

RA PD 76953

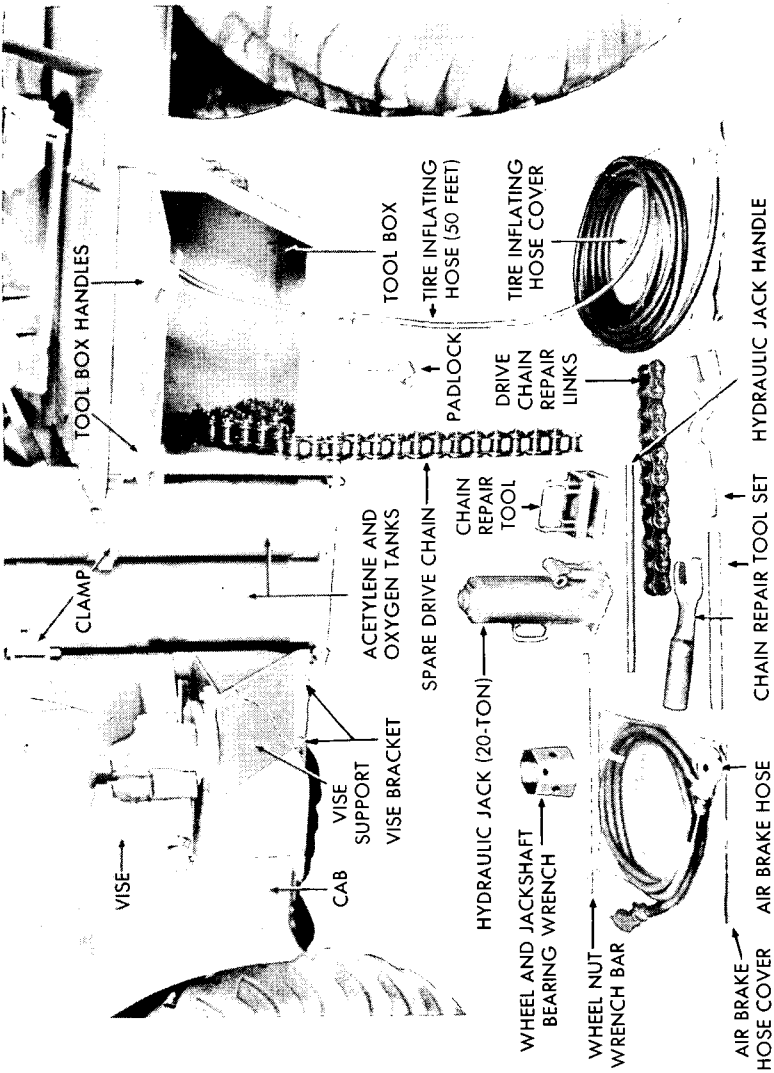


Figure 66—Stowage in Left Side Tool Box and on Left Side of Tractor

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

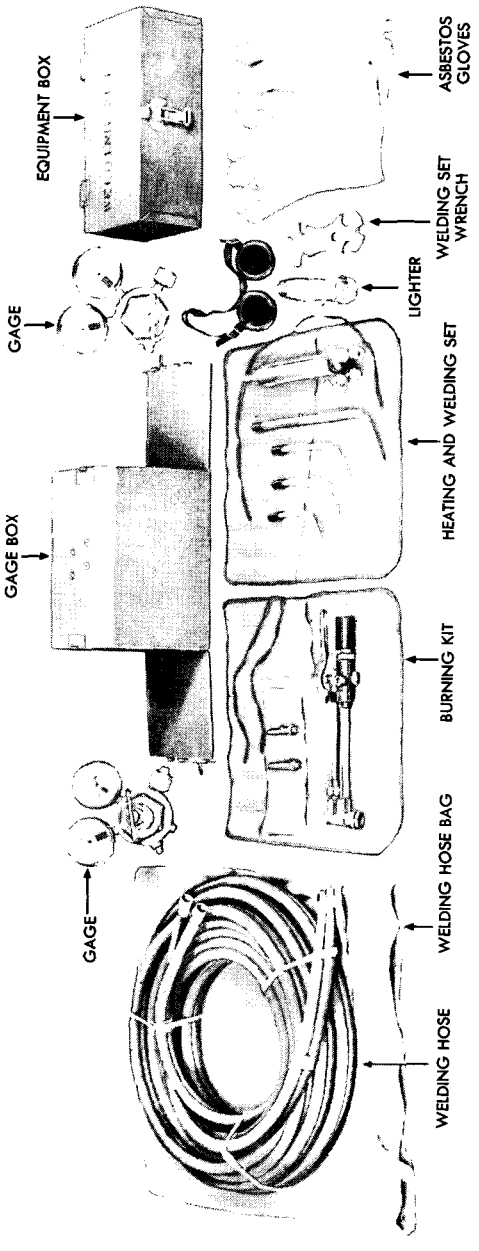


Figure 67—Welding Equipment

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

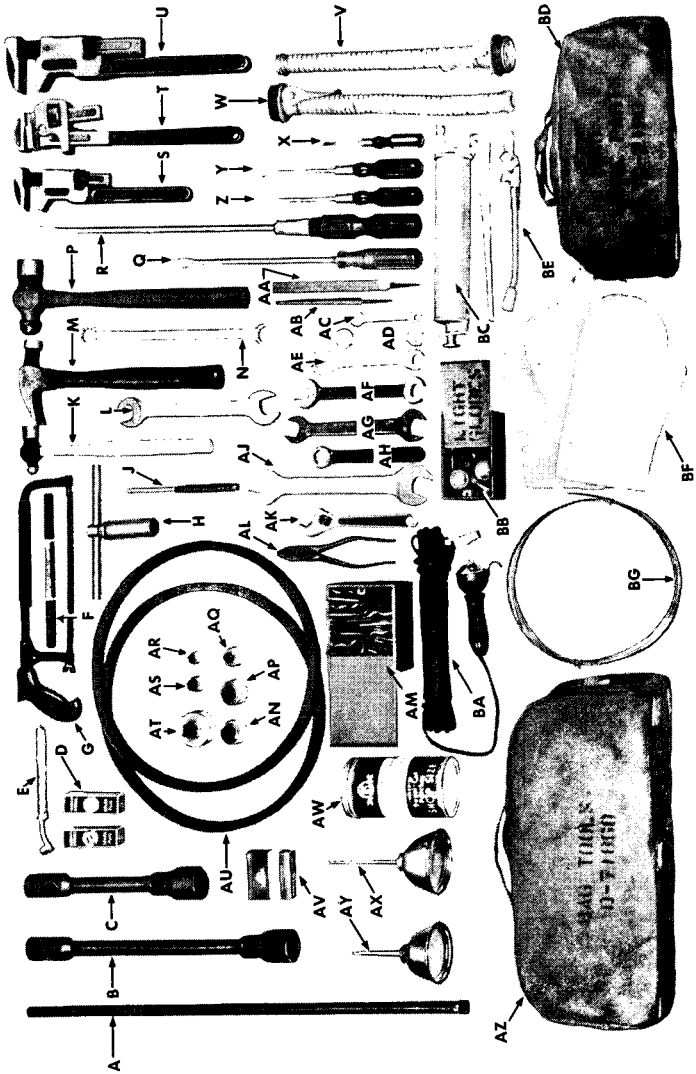


Figure 68—Tools and Spare Parts

A—BAR, WHEEL NUT WRENCH
B—WRENCH, WHEEL NUT, LONG
C—WRENCH, WHEEL NUT
D—PLUG, SPARK, 18-MM
E—GAGE, PRESSURE, BALLOON TIRE
F—BLADE, HACKSAW (41-B-1163-20)
G—FRAME, HACKSAW (41-F-3390)
H—WRENCH, SPARK PLUG, w/HANDLE
J—PUNCH, 3/8-IN.
K—HAMMER, MACHINIST'S, BALL PEEN, 8 OZ (41-H-521)
L—WRENCH, ENGRS, DBLE-HD, 31/32- x 1 1/16-IN. (41-W-1023-10)
M—HAMMER, CLAW, 20 OZ (41-H-198)
N—WRENCH, BOX, DBLE-HD, 15/16- x 1-IN. (41-W-608)
P—HAMMER, MACHINIST'S, BALL PEEN, 32 OZ (41-H-527)
Q—SCREWDRIVER, COMMON, 12-IN. BLADE (41-S-1110)
R—SCREWDRIVER, HEAVY DUTY, 18-IN. BLADE
S—WRENCH, ADJUSTABLE, SCREW, 12-IN. (41-W-2343)
T—WRENCH, PIPE, ADJUSTABLE, 18-IN. (41-W-1664)
U—WRENCH, ADJUSTABLE, SCREW, 18-IN. (41-W-2345)
V—SPOUT, OIL CAN
W—SPOUT, OIL CAN
X—SCREWDRIVER, COMMON, 3-IN. BLADE (41-S-1101)
Y—SCREWDRIVER, COMMON, 6-IN. BLADE (41-S-1104)
Z—SCREWDRIVER, COMMON, 10-IN. BLADE (41-S-1108)
AA—FILE, HAND SMOOTH, 8-IN. (41-F-1028)
AB—FILE, 3-SQUARE, SMOOTH, 6-IN. (41-F-1571)
AC—WRENCH, ENGRS, DBLE-HD, 3/8- x 7/16-IN. (41-W-991)
AD—WRENCH, ENGRS, DBLE-HD, 1/2- x 9/16-IN. (41-W-1002-40)
AE—WRENCH, ENGRS, DBLE-HD, 5/8- x 3/4-IN. (41-W-1008)
AF—WRENCH, ENGRS, DBLE-HD, 7/8- x 15/16-IN. (41-W-1019)
AG—WRENCH, ENGRS, DBLE-HD, 15/16- x 1-IN. (41-W-1021)
AH—WRENCH, BOX, SINGLE END, 15/16-IN.
AJ—WRENCH, ENGRS, DBLE-HD, 1- x 1 1/8-IN. (41-W-1024)
AK—WRENCH, ADJUSTABLE, CRESCENT TYPE, 8-IN. (41-W-486)
AL—PLIERS, SIDE CUTTING, 8-IN. (41-P-1977)
AM—PIN, COTTER, ASSORTED (IN BOX)
AN—PLUG, FRONT AXLE
AP—PLUG, TRANSFER CASE
AQ—PLUG, FRONT WINCH
AR—PLUG, TRANSMISSION
AS—PLUG, ENGINE
AT—PLUG, REAR AXLE
AU—BELT, FAN
AV—TAPE, FRICTION
AW—KIT, TIRE REPAIR
AX—OILER, STRAIGHT SPOOL, 6-IN. SPOUT
AY—OILER, STRAIGHT SPOOL, 4-IN. SPOUT
AZ—BAG, TOOL
BA—LIGHT, INSPECTION
BB—LAMP—SET
BC—GUN, LBR, PRES, 15 OZ CAP.
BD—BAG, SPARE PARTS
BE—EXTENSION, ALEMITE, AND SWIVEL JOINT, 7-IN.
BF—MITTENS, ASBESTOS
BG—WIRE, IRON, SOFT, 14 GA, 16 FT. ROLL

RA PD 77049D

Legend for Figure 68—Tools and Spare Parts

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

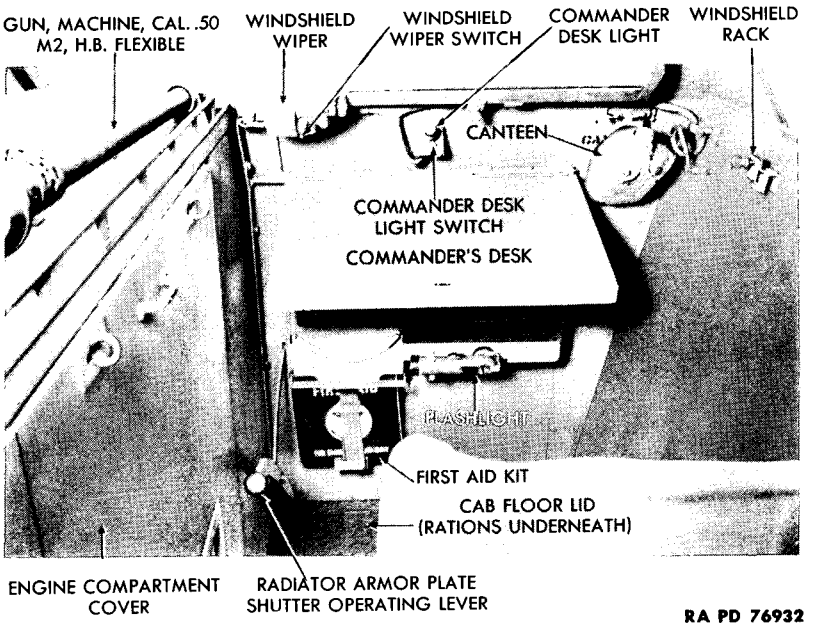


Figure 69—Stowage Inside Cab at Commander's Desk

Item	Number Carried	Where Carried
WRENCH, engrs, 7/8- and 15/16-in. (41-W-1019)	1	Cab tool box
WRENCH, engrs, 31/32- and 1 1/16-in. (41-W-1023-10)	1	Cab tool box
WRENCH, engrs, 1- and 1 1/8-in. (41-W-1024)	1	Cab tool box
WRENCH, pipe, adj., 18-in. (41-W-1664)	1	Tool box
WRENCH, plug, 3/8-in., hex.	1	
WRENCH, plug, 9/16-in., hex. (41-W-878)	1	
WRENCH, plug, 5/8-in., hex.	1	
WRENCH, plug, 3/4-in., hex. (41-W-877)	1	
WRENCH, plug, 1-in., hex.	1	
WRENCH, radius rod adjusting	1	Cab tool box
WRENCH, rim nut	1	Cab tool box
WRENCH, adj., screw, 12-in. (41-W-2343)	1	Cab tool box
WRENCH, adj., screw, 18-in. (41-W-2345)	1	Tool box
WRENCH, spark plug, w/handle	1	Cab tool box
WRENCH, safety screw, 1/8-in. hex. (41-W-2450)	1	Cab tool box

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

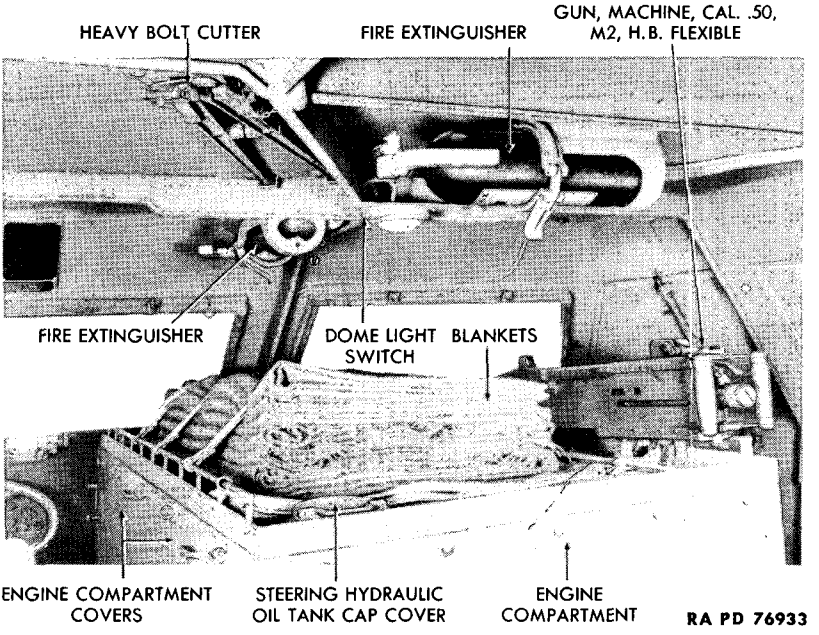


Figure 70—Stowage Inside Cab on Engine Compartment and Cab Roof

Item	Number Carried	Where Carried
WRENCH, safety screw, 1/4-in. hex. (41-W-2454)	1	Cab tool box
WRENCH, steering gear	1	Cab tool box
WRENCH, wheel and jackshaft bearing	1	Cab tool box
WRENCH, wheel nut, long	1	Cab tool box
c. Trailer Tools.		
BAR, cant	2	Right side compartment
BLOCK, chock	4	Rear compartment lower decking
BOARD, ground	2	Rear compartment lower decking
CRANE AND HOIST, assembly	1	Right side compartment
CRANK, rocker beam adjusting	1	Right side compartment
JACK, hydraulic, 20-ton (w/lever)	2	Top decking

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

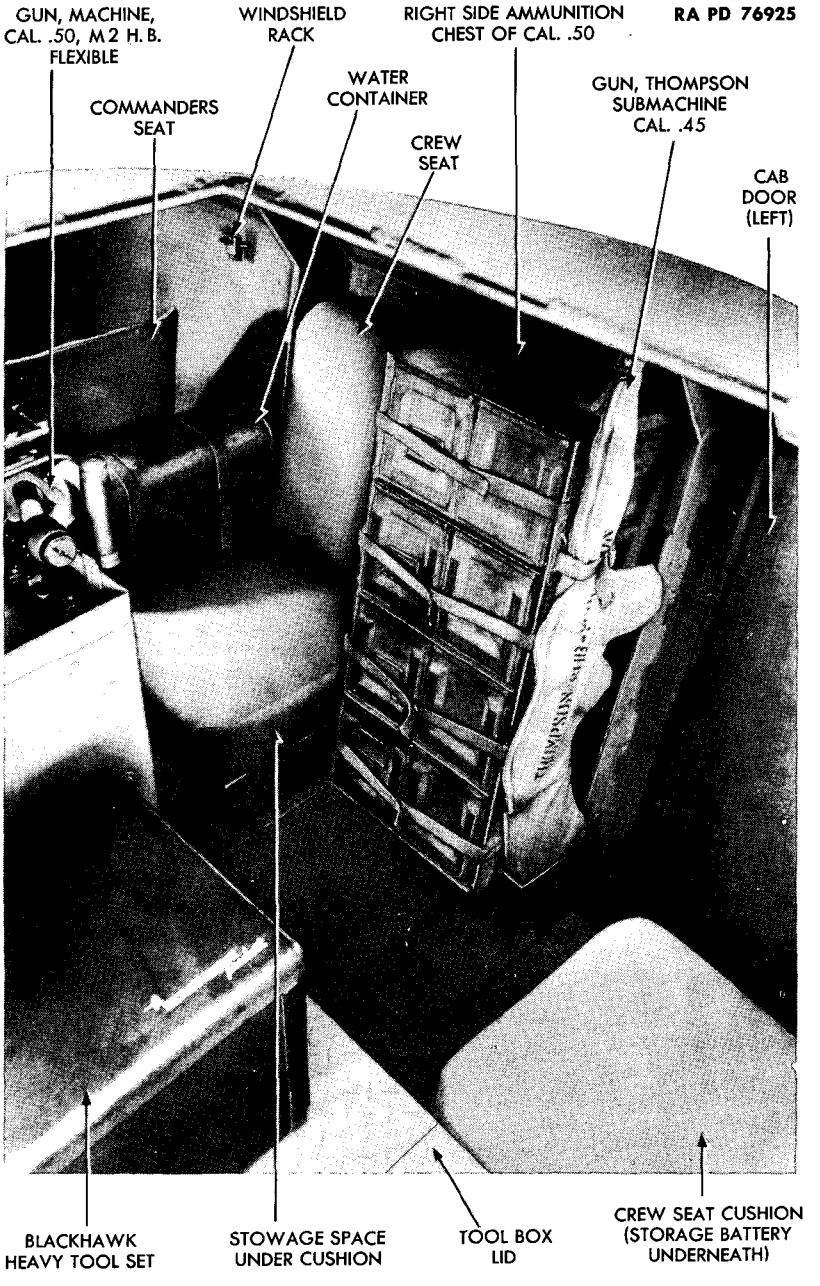


Figure 71—Stowage Inside Cab—Right Side

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

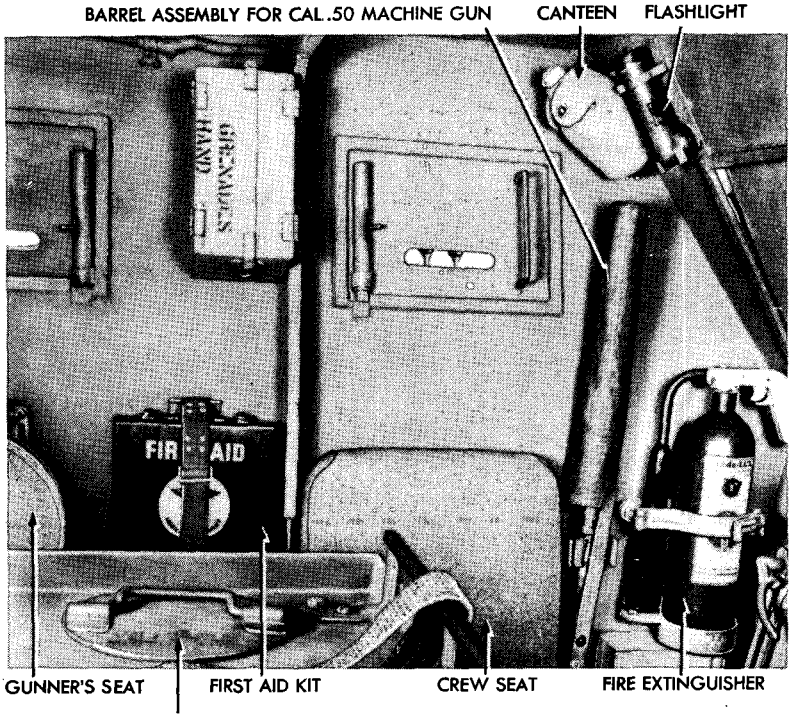


Figure 72—Stowage Inside Cab—Rear Right Side

Item	Number Carried	Where Carried
KIT, tool, w/roll, complete	1	Right side compartment
Consists of:		
HAMMER, machs, ball peen, 32-oz (41-H-527)	1	Tool kit
HANDLE, wheel nut wrench	1	Tool kit
PLIERS, comb, slip-jt, 8-in. (41-P-1652)	1	Tool kit
SCREWDRIVER, 5½-in. blade (41-S-1117-80)	1	Tool kit
WRENCH, adj, crescent-type, 8-in. (41-W-486)	1	Tool kit
WRENCH, axle nut	1	Tool kit
WRENCH, rocker beam adjusting nut	1	Tool kit
WRENCH, screw, adj, 12-in. (41-W-2343)	1	Tool kit
WRENCH, wheel nut	1	Tool kit
PEDESTAL, jack	2	Top decking

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

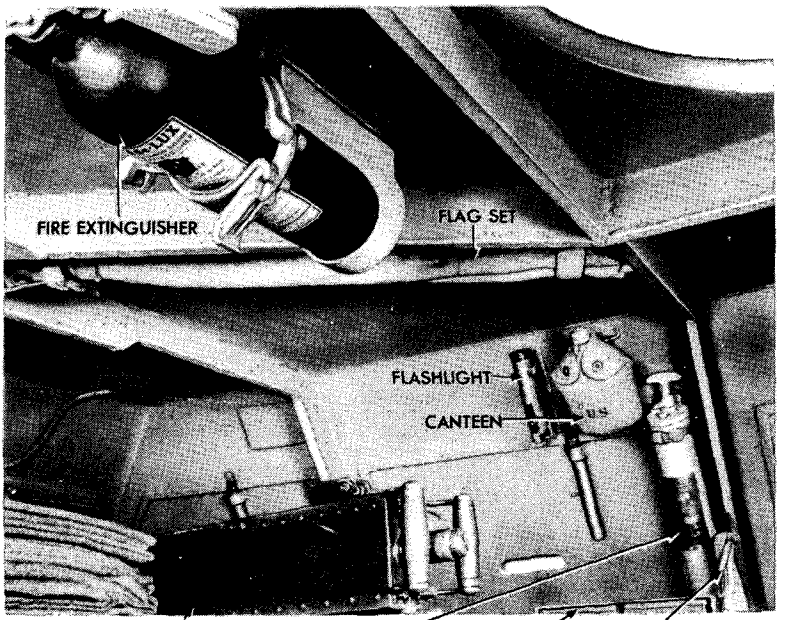


Figure 73—Stowage Inside Cab—Upper Right Side

d. Truck Tractor Accessories.

Item	Number Carried	Where Carried
APPARATUS, decontaminating, M2	2	Inside cab
BAG (for spotlight arm)	1	Cab
BLADE, hacksaw, 10-in.	12	Tool box
BOOK, technical manual, TM 9-767	1	Cab
BUCKET, canvas, 18-qt	1	Tool box
CONTAINER, water, 5-gal	2	Cab
CONTAINER, 5-gal	1	Cab
COVER, headlight	2	Cab
COVER, siren	1	
EXTINGUISHER, fire	4	Cab
FLAG-SET, M238, complete	1	Cab
FLASHLIGHT	5	Cab
GUIDE, lubrication, War Dept. No. 138	1	Cab
HAMMER, claw, 20-oz	1	Tool box

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

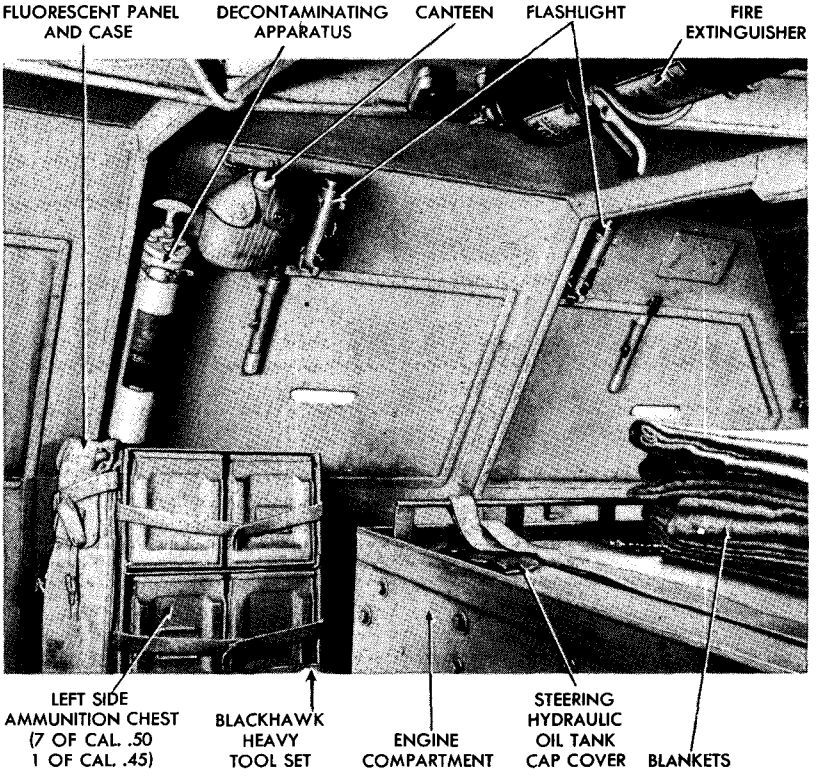
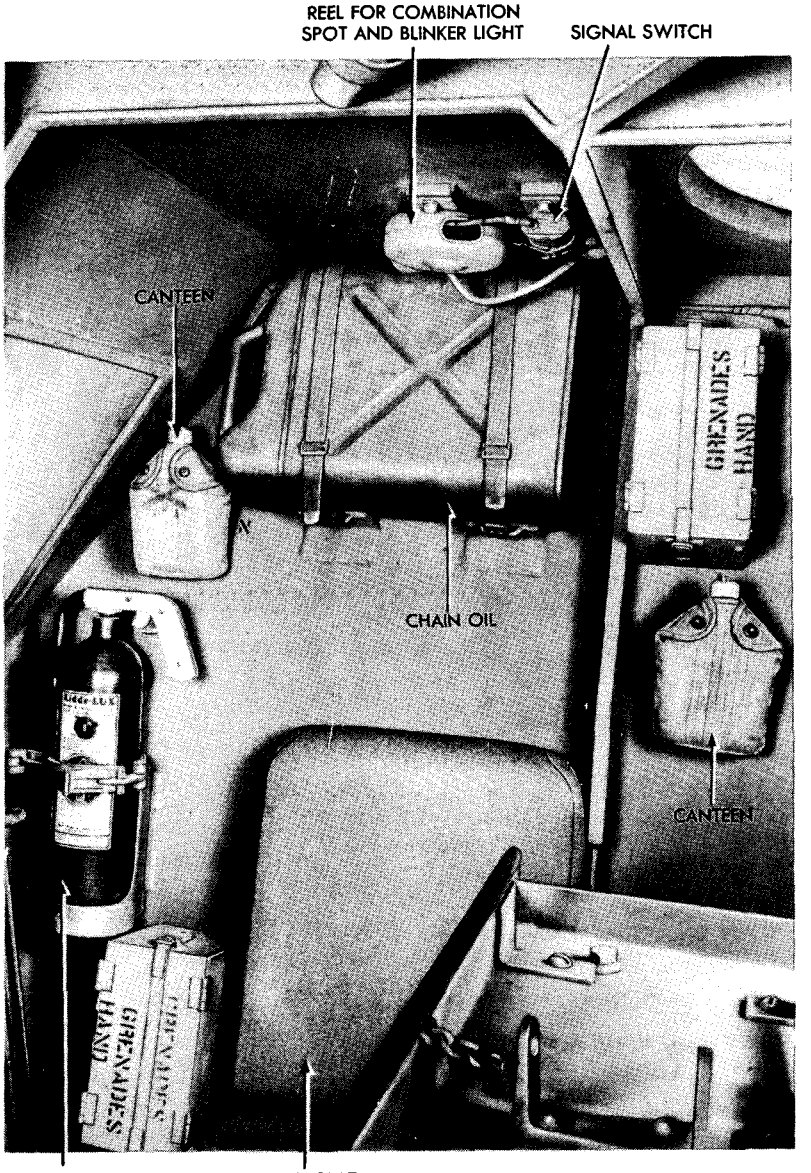


Figure 74—Stowage Inside Cab—Left Side

Item	Number Carried	Where Carried
KIT, first aid	2	On cab
KIT, tire repair, cold patch	1	Tool box
KIT, spare parts	1	Tool box
MITTENS, asbestos	1 pair	Tool box
NET, camouflage, 45- x 45-ft	1	Top of cab
OIL, engine, qt (in can)	8	Tool box
OILER, ½-pt, 4-in. straight spout	1	Tool box
TAPE, friction, ¾-in. wide, 30 ft roll	1	Tool box
TUBE, flexible nozzle	2	Tool box
WIRE, iron, soft, 14 ga, 16-ft roll	1	Tool box
e. Trailer Accessories.		
APPARATUS, decontaminating, M2	2	



RA PD 76923

Figure 75—Stowage Inside Cab—Rear Left Side

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

RA PD 77082

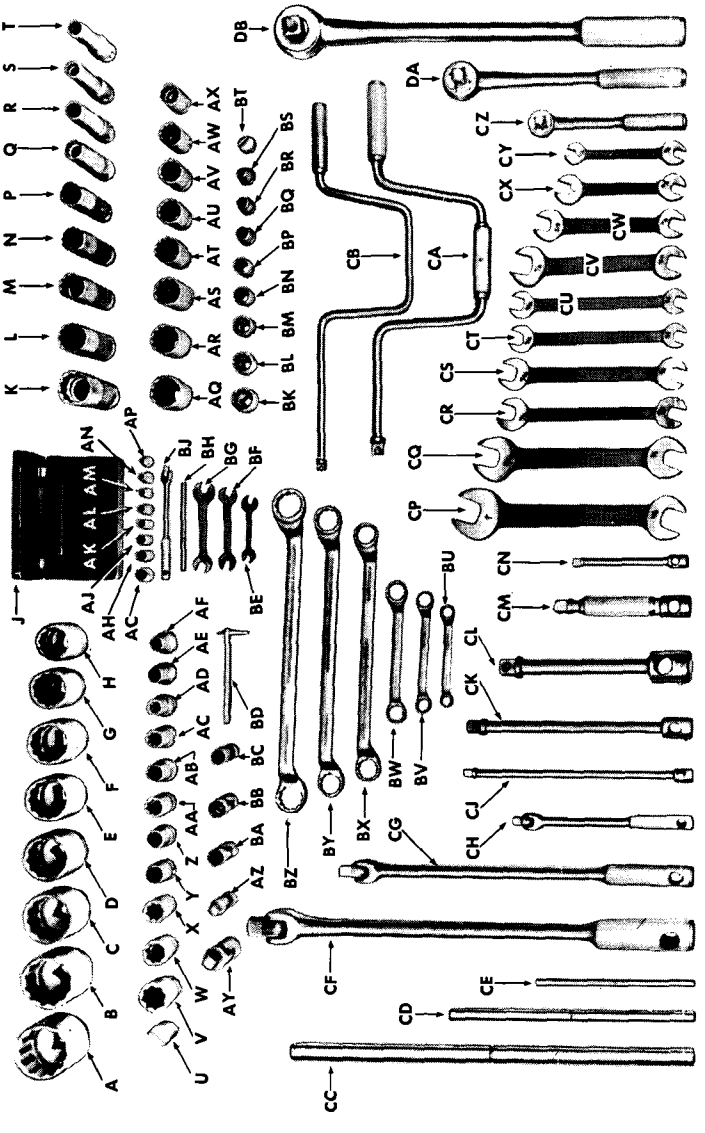


Figure 76—Tool Equipment in Cab Tool Box

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

A—WRENCH, SOCKET, DBLE-HEX, $1\frac{13}{16}$-IN. (41-W-3052)
B—WRENCH, SOCKET, DBLE-HEX, $1\frac{3}{4}$-IN. (41-W-3048)
C—WRENCH, SOCKET, DBLE-HEX, $1\frac{5}{8}$-IN. (41-W-3046)
D—WRENCH, SOCKET, DBLE-HEX, $1\frac{1}{2}$-IN.
E—WRENCH, SOCKET, DBLE-HEX, $1\frac{7}{16}$-IN. (41-W-3044)
F—WRENCH, SOCKET, DBLE-HEX, $1\frac{3}{8}$-IN. (41-W-3042)
G—WRENCH, SOCKET, DBLE-HEX, $1\frac{1}{4}$-IN. (41-W-3038)
H—WRENCH, SOCKET, DBLE-HEX, $1\frac{1}{8}$-IN. (41-W-3036)
J—PLASTIC CASE
K—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $1\frac{1}{8}$-IN. (41-W-3329)
L—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, 1-IN. (41-W-3328)
M—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $\frac{7}{8}$-IN. (41-W-3326)
N—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $1\frac{3}{16}$-IN. (41-W-3325)
P—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $\frac{3}{4}$-IN. (41-W-3324)
Q—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $\frac{5}{8}$-IN. (41-W-3322)
R—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $\frac{9}{16}$-IN. (41-W-3321)
S—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $\frac{1}{2}$-IN. (41-W-3320)
T—WRENCH, SOCKET, EXT-DEEP, DBLE-HEX, $\frac{1}{2}$-IN.
U—BIT, SOCKET WRENCH, $1\frac{1}{2}$ IN. LONG (41-B-648)
V—WRENCH, SOCKET, DOUBLE-SQUARE, $\frac{3}{4}$-IN. (41-W-3001-450)
W—WRENCH, SOCKET, DOUBLE-SQUARE, $\frac{5}{8}$-IN. (41-W-3001-375)
X—WRENCH, SOCKET, DOUBLE-SQUARE, $\frac{9}{16}$-IN. (41-W-3001-350)
Y—WRENCH, SOCKET, DOUBLE-SQUARE, $\frac{1}{2}$-IN. (41-W-3001-325)
Z—WRENCH, SOCKET, DBLE-HEX, $1\frac{9}{32}$-IN. (41-W-3011)
AA—WRENCH, SOCKET, DBLE-HEX, $\frac{5}{8}$-IN. (41-W-2999-175)
AB—WRENCH, SOCKET, DBLE-HEX, $\frac{9}{16}$-IN. (41-W-2999-125)
AC—WRENCH, SOCKET, DOUBLE-SQUARE, $\frac{7}{16}$-IN. (41-W-2999-75)
AD—WRENCH, SOCKET, DBLE-HEX, $\frac{1}{2}$-IN. (41-W-2999-100)
AE—WRENCH, SOCKET, DBLE-HEX, $\frac{7}{16}$-IN. (41-W-3005)
AF—WRENCH, SOCKET, DBLE-HEX, $\frac{3}{8}$-IN. (41-W-2999-50)
AG—WRENCH, SOCKET, DBLE-HEX, $\frac{7}{16}$-IN. (41-W-2977)
AH—WRENCH, SOCKET, DBLE-HEX, $\frac{3}{8}$-IN.
AJ—WRENCH, SOCKET, HEX, $1\frac{1}{32}$-IN. (41-W-2975)
AK—WRENCH, SOCKET, HEX, $\frac{5}{16}$-IN. (41-W-2974)
AL—WRENCH, SOCKET, HEX, $\frac{9}{32}$-IN. (41-W-2973-100)
AM—WRENCH, SOCKET, HEX, $\frac{1}{4}$-IN. (41-W-2972)
AN—WRENCH, SOCKET, HEX, $\frac{7}{32}$-IN. (41-W-2971)
AP—WRENCH, SOCKET, HEX, $\frac{5}{16}$-IN. (41-W-2970)
AQ—WRENCH, SOCKET, DBLE-HEX, $1\frac{1}{16}$-IN. (41-W-3029)
AR—WRENCH, SOCKET, DBLE-HEX, 1-IN. (41-W-3027)
AS—WRENCH, SOCKET, DBLE-HEX, $1\frac{5}{16}$-IN. (41-W-3025)
AT—WRENCH, SOCKET, DBLE-HEX, $\frac{7}{8}$-IN. (41-W-3023)
AU—WRENCH, SOCKET, DBLE-HEX, $1\frac{3}{16}$-IN. (41-W-3021)
AV—WRENCH, SOCKET, DBLE-HEX, $2\frac{5}{32}$-IN. (41-W-3019)
AW—WRENCH, SOCKET, DBLE-HEX, $\frac{3}{4}$-IN. (41-W-3017)
AX—WRENCH, SOCKET, DBLE-HEX, $1\frac{1}{16}$-IN. (41-W-2999-225)
AY—JOINT, UNIVERSAL, $\frac{3}{8}$-IN., SQ-DRIVE (41-J-378)
AZ—JOINT, UNIVERSAL, $\frac{1}{2}$-IN. SQ-DRIVE (41-J-380)
BA—WRENCH, SOCKET, UNIVERSAL JOINT, DBLE-HEX, $\frac{5}{8}$-IN. (41-W-2999-210)
BB—WRENCH, SOCKET, UNIVERSAL JOINT, DBLE-HEX, $\frac{9}{16}$-IN. (41-W-2999-145)

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Legend for Figure 76—Tool Equipment in Cab Tool Box

BC—WRENCH, SOCKET, UNIVERSAL JOINT, DBLE-HEX, 1/2-IN. (41-W-2999-120)
BD—KEY, RELEASE (41-K-83)
BE—WRENCH, ENGRS, DBLE-HD, 1/4- x 9/32-IN., IGNITION (41-W-966)
BF—WRENCH, ENGRS, DBLE-HD, 5/16- x 13/32-IN., IGNITION (41-W-990-50)
BG—WRENCH, ENGRS, DBLE-HD, 3/8- x 7/16-IN., IGNITION (41-W-991)
BH—BAR, CROSS, HANDLE, 4 IN. LONG (41-B-153)
BJ—HANDLE, HINGED OFFSET, 5 IN. LONG (41-H-1502-75)
BK—WRENCH, SOCKET, DBLE-HEX, 3/4-IN. (41-W-2999-250)
BL—WRENCH, SOCKET, DBLE-HEX, 11/16-IN. (41-W-3015)
BM—WRENCH, SOCKET, DBLE-HEX, 5/8-IN. (41-W-3013)
BN—WRENCH, SOCKET, DBLE-HEX, 9/16-IN. (41-W-3009)
BP—WRENCH, SOCKET, DBLE-HEX, 1/2-IN. (41-W-3007)
BQ—WRENCH, SOCKET, DBLE-HEX, 7/16-IN. (41-W-2977)
BR—WRENCH, SOCKET, DBLE-HEX, 3/8-IN.
BS—WRENCH, SOCKET, DBLE-HEX, 5/16-IN. (41-W-2999-25)
BT—BIT, SOCKET WRENCH, 1 IN. LONG (41-B-644)
BU—WRENCH, BOX, 3/8- x 7/16-IN., SHORT, DBLE-HEX (41-W-620)
BV—WRENCH, BOX, 1/2- x 9/16-IN., SHORT, DBLE-HEX (41-W-622)
BW—WRENCH, BOX, 5/8- x 11/16-IN., SHORT, DBLE-HEX (41-W-602)
BX—WRENCH, BOX, 3/4- x 25/32-IN., LONG, DBLE-HEX (41-W-603-25)
BY—WRENCH, BOX, 13/16- x 7/8-IN., LONG, DBLE-HEX (41-W-605)
BZ—WRENCH, BOX, 15/16- x 1-IN., LONG, DBLE-HEX (41-W-608)
CA—HANDLE, SPEEDER, 18 IN. LONG (41-H-1507-95)
CB—HANDLE, SPEEDER, 17 IN. LONG (41-H-1508)

CC—BAR, CROSS, HANDLE, 18 IN. LONG (41-B-309-25)
CD—BAR, CROSS, HANDLE, 11 IN. LONG (41-B-135)
CE—BAR, CROSS, HANDLE, 7 IN. LONG (41-B-312)
CF—HANDLE, HINGED OFFSET, 19 IN. LONG (41-H-1504-25)
CG—HANDLE, HINGED OFFSET, 15 5/8 IN. LONG (41-H-1502-100)
CH—HANDLE, HINGED OFFSET, 8 IN. LONG (41-H-1502-85)
CJ—BAR, EXTENSION, 10 IN. LONG (41-B-305-700)
CK—BAR, EXTENSION, 10 IN. LONG (41-B-309)
CL—BAR, EXTENSION, 8 1/2 IN. LONG (41-B-309-20)
CM—BAR, EXTENSION, 6 IN. LONG (41-B-307)
CN—BAR, EXTENSION, 5 IN. LONG (41-B-305-500)
CP—WRENCH, ENGRS, DBLE-HD, 15/16- x 1-IN. (41-W-1021)
CQ—WRENCH, ENGRS, DBLE-HD, 3/4- x 13/16-IN. (41-W-1012)
CR—WRENCH, ENGRS, DBLE-HD, 11/16- x 7/8-IN. (41-W-1011-40)
CS—WRENCH, ENGRS, DBLE-HD, 5/8- x 11/16-IN., TAPPET (41-W-3580)
CT—WRENCH, ENGRS, DBLE-HD, 3/4- x 7/8-IN., TAPPET (41-W-3584)
CU—WRENCH, ENGRS, DBLE-HD, 1/2- x 9/16-IN., TAPPET (41-W-3576)
CV—WRENCH, ENGRS, DBLE-HD, 3/16- x 7/32-IN., IGNITION (41-W-965)
CW—WRENCH, ENGRS, DBLE-HD, 9/16- x 5/8-IN. (41-W-1005)
CX—WRENCH, ENGRS, DBLE-HD, 7/16- x 1/2-IN. (41-W-1000)
CY—WRENCH, ENGRS, DBLE-HD, 5/16- x 3/8-IN. (41-W-990)
CZ—HANDLE, RATCHET, REVERSIBLE, 7 IN. LONG (41-H-1504-560)
DA—HANDLE, RATCHET, REVERSIBLE, 10 1/2 IN. LONG (41-H-1505)
DB—HANDLE, RATCHET, REVERSIBLE, 18 IN. LONG (41-H-1506)

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Legend for Figure 76—Tool Equipment in Cab Tool Box

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Item	Number Carried	Where Carried
CABLE, lighting and braking assembly	1	Front side compartment (normally left coupled in working position)
COVER, wheel, right front	1	Top decking
COVER, wheel, left front	1	Top decking
COVER, wheel, right rear	1	Top decking
COVER, wheel, left rear	1	Top decking
LAMP, clearance, right hand	1	Front, special mounting brackets
LAMP, clearance, left hand	1	Front, special mounting brackets
NET, camouflage, 45- x 45-ft	1	
f. Armament.		
GUN, submachine, cal. .45, Thompson M1928A1 or M1A1	1	In cab
GUN, machine, cal. .50, Browning, M2, HB	1	Cab
MOUNT, truck, M32	1	On cab
MOUNT, tripod, machine gun, cal. .50, M3	1	On cab
PROJECTOR, signal, ground, M4	1	

32. SALVAGE EQUIPMENT AND VEHICLE SPARE PARTS.

a. Truck Tractor Salvage Equipment.		
AX, chopping, 5-lb	2	On cab
BAR, tow, w/whiffletree	1	Cab
BAR, jimmy, 3/4- x 30-in. (41-B-225)	2	Tool box
CHISEL, 1- x 24-in.	2	Tool box
CHISEL, blacksmiths, 1 1/4-in. (41-C-906)	1	Tool box
CLIP, wire rope (for 3/4-in. wire rope)	6	
CLIP, wire rope (for 7/8-in. wire rope)	8	
CLIPPER, bolt, heavy, 5/8-in. cap (41-C-2283)	1	Cab
CUTTING AND WELDING EQUIPMENT, set	1	
Consisting of:		
ADAPTER, acetylene tank	1	
CYLINDER, acetylene	1	
CYLINDER, oxygen	1	
GOGGLES, welders, pr	1	

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

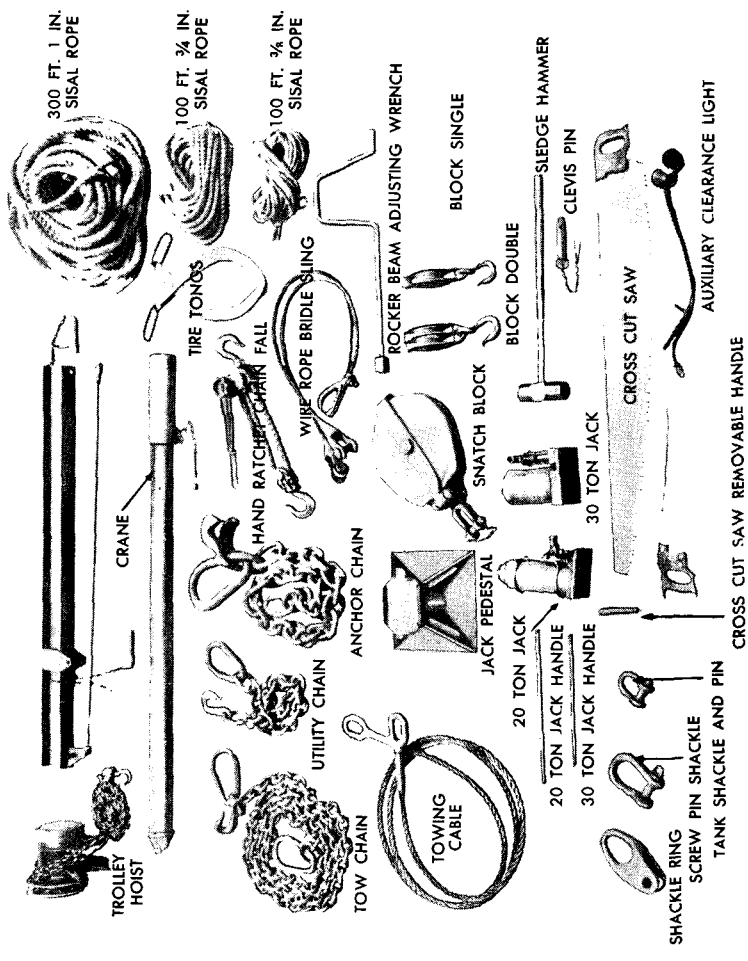

Figure 77—Equipment

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Item	Number Carried	Where Carried
HOSE, welding, 50 ft coil	2	
LIGHTER, spark, w/6 flints	1	
MIXER, welding gas	1	
REGULATOR, acetylene	1	
REGULATOR, oxygen	1	
TIP, cutting, No. 1	1	
TIP, cutting, No. 3	1	
TIP, welding, 2-in.	1	
TIP, welding, 4-in.	1	
TIP, welding, 6-in.	1	
TIP, welding, 8-in.	1	
TORCH, cutting	1	
TORCH, welding	1	
WRENCH, oxy-acetylene	1	

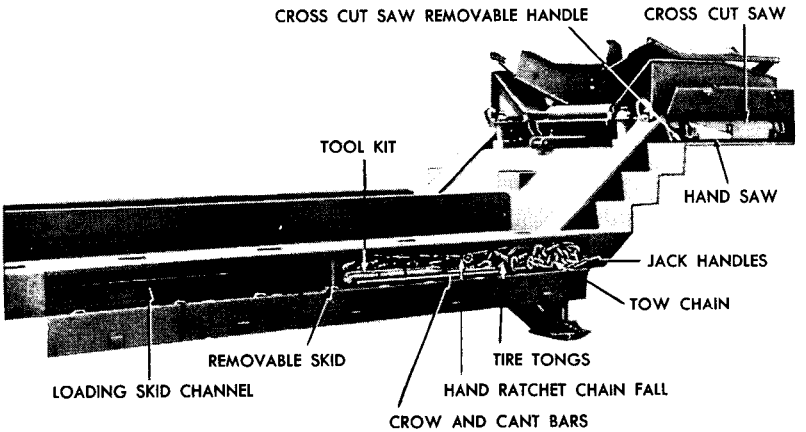

Figure 78—Equipment Stowage—Right Compartments

Item	Number Carried	Where Carried
FLARE, truck, kerosene, 40-oz, 12-hr	6	
FRAME, hacksaw (41-F-3390)	1	Tool box
HANDLE, railroad pick, M1	2	On cab
HOSE, air brake, 13½-ft	1	Tool box
KIT, tool (Blackhawk No. 100), w/steel chest, complete (41-B-3613-500) (consists of items shown in fig. 76)	1	Cab
LIGHT, portable, 6-volt	1	Tool box
LIGHT, inspection, w/50-ft cord	1	Tool box
MATTOCK, pick, M1 (w/o handle)	2	On cab
PAULIN, 12 x 12 ft	1	Tool box

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

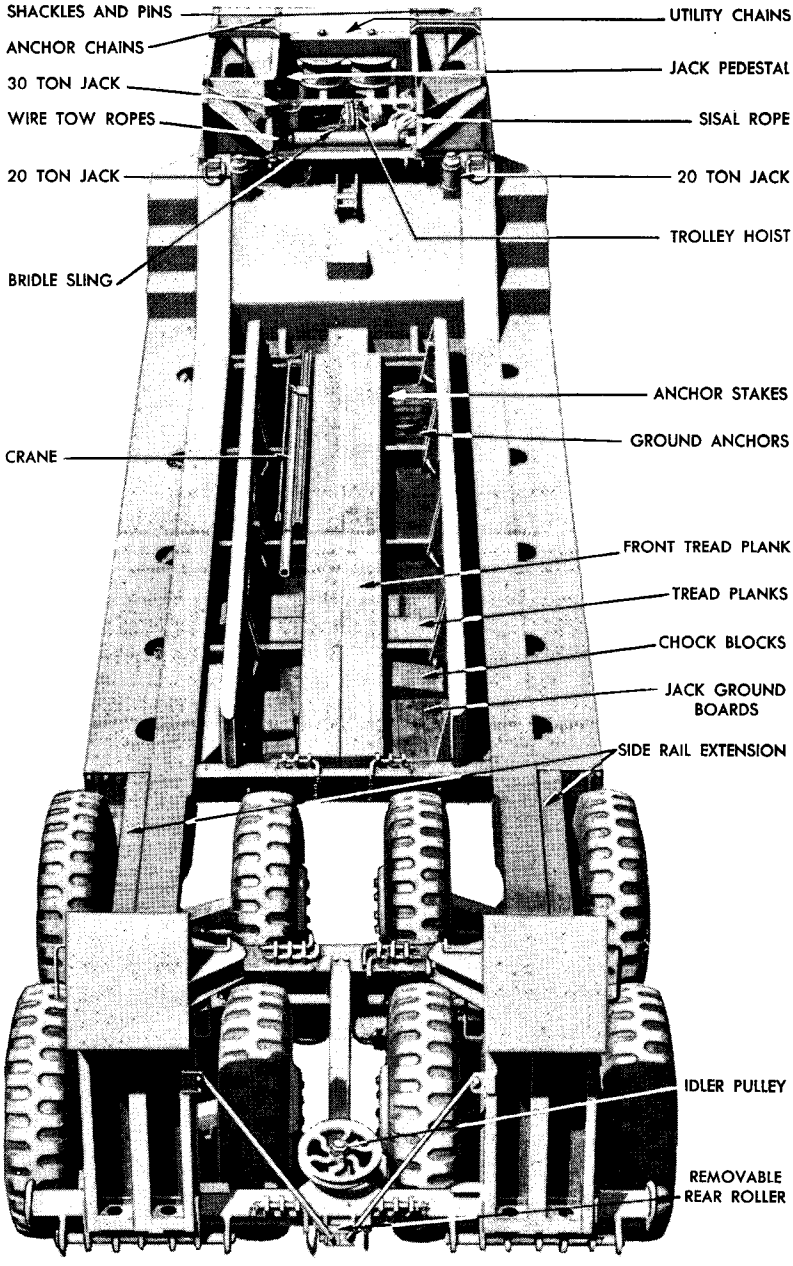

Figure 79—Equipment Stowage—Top Decking

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

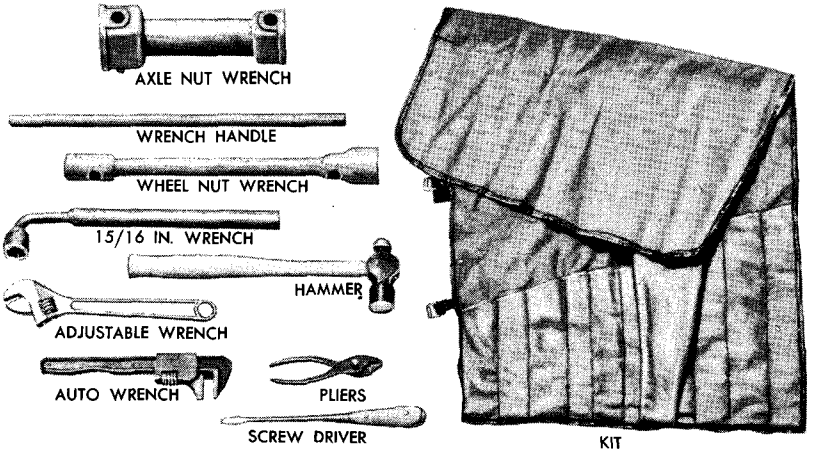

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Figure 80—Semitrailer Tools

Item	Number Carried	Where Carried
SCREWDRIVER, 18-in. blade	1	
SHOVEL, D-handle, round point	2	On cab
SLEDGE, blacksmith's, 10-lb	2	On cab
THIMBLE, wire rope (for 7/8-in. wire rope)	1	
THIMBLE, wire rope (for 3/4-in. wire rope)	1	
VISE, 5-in. (41-V-163)	1	Tool box
b. Trailer Salvage Equipment.		
ANCHOR, ground, 3 row	2	Front compartment lower decking
Consisting of:		
ANCHOR, ground	6	
STAKE, anchor	20	
BLOCK, ordinary, w/becket	1	Left side compartment near front
BLOCK, ordinary, w/o becket	1	Left side compartment near front
SKID, removable, rear, L.H.	1	Left side compartment
SKID, removable, rear, R.H.	1	Right side compartment
SLEDGE, blacksmith's, 12-lb	2	Right side compartment

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

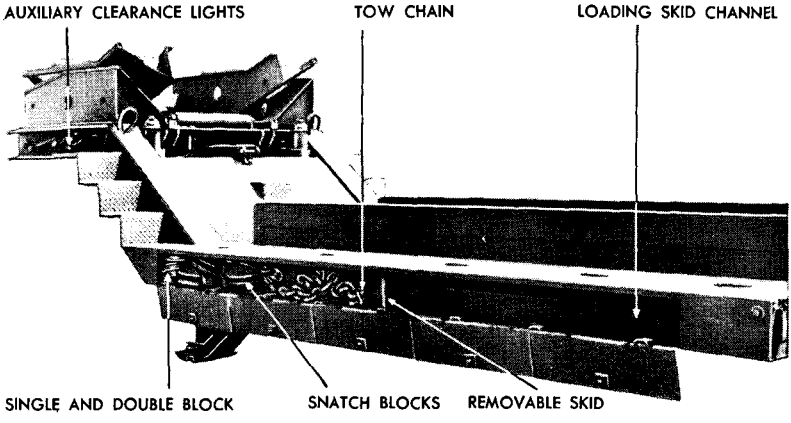

Figure 81—Equipment Stowage—Left Compartments

c. Truck Tractor Spare Parts.

Item	Number Carried	Where Carried
BELT, fan	2	Tool box
CAP, tire valve	5	Tool box
CHAIN, roller, 2-in. pitch, 166 pitches long	1	
FITTING, fiege clevis type (for 7/8-in. wire rope)	2	Tool box
FITTING, fiege clevis type (for 3/4-in. wire rope)	1	Tool box
FUSE, automotive	2 of each type used	
LAMP, inspection light	2	Tool box
LAMP-SET	6	Cab
Consisting of:		
LAMP, blackout marker	1	
LAMP, clearance	1	
LAMP, desk	1	
LAMP, dome	1	
LAMP, floodlight	1	
LAMP, panel	1	
LINK, half, 2-in. pitch, roller drive chain	4	Tool box
LINK, half, 1-in. pitch, winch drive chain	2	Tool box
NUT, rim	3	Tool box
PIN, cotter, split (assorted in box), set	1	Tool box

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

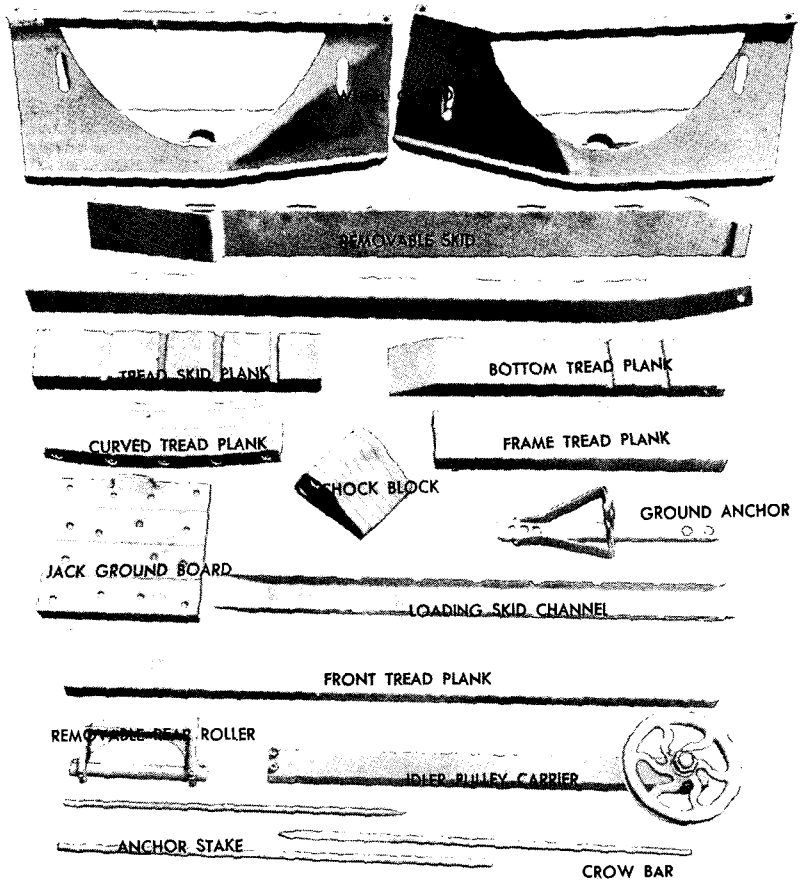

Figure 82—Equipment

Item	Number Carried	Where Carried
PITCH, complete, 2-in. pitch, roller drive chain	10	Tool box
PITCH, complete, 1-in. pitch, winch drive chain	6	Tool box
PLUG, auxiliary transmission	1	Tool box
PLUG, engine	1	Tool box
PLUG, front axle	1	Tool box
PLUG, jackshaft	1	Tool box
PLUG, rear axle	1	Tool box
PLUG, spark, 18-mm	2	Tool box

TOOLS AND EQUIPMENT STOWAGE ON THE VEHICLE

Item	Number Carried	Where Carried
PLUG, split, hollow, fiege clevis type (for 7/8-in. wire rope)	2	Tool box
PLUG, split, hollow, fiege clevis type (for 3/4-in. wire rope)	2	Tool box
PLUG, steering gear	1	Tool box
PLUG, transfer case	1	Tool box
PLUG, transmission	1	Tool box
PLUG, winch drive	1	Tool box
SPACER, wheel, single (in bag)	40	Tool box

PART TWO—TRACTOR MAINTENANCE INSTRUCTIONS

Section IX

NEW VEHICLE RUN-IN TEST

33. INTRODUCTION.

a. Purpose. When a new or reconditioned vehicle is first received at the using organization, it is necessary for second echelon personnel to determine whether or not the vehicle will operate satisfactorily when placed in service. For this purpose, inspect all accessories, subassemblies, assemblies, tools, and equipment to see that they are in place and correctly adjusted. In addition, they will perform a run-in test of at least 50 miles as directed in AR 850-15, according to procedures in paragraph 34 below.

b. Correction of Deficiencies.

(1) Deficiencies disclosed during the course of the run-in test will be treated as follows:

(a) Correct any deficiencies within the scope of the maintenance echelon of the using organization before the vehicle is placed in service.

(b) Refer deficiencies beyond the scope of the maintenance echelon of the using organization to a higher echelon for correction.

(c) Bring deficiencies of serious nature to the attention of the supplying organization.

34. RUN-IN PROCEDURES.

a. Preliminary Service.

(1) FIRE EXTINGUISHERS. See that portable extinguishers are present, and in good condition. Test any but CO_2 type, momentarily for proper operation. Inspect valves of CO_2 extinguishers. If they appear to have been opened, or are damaged, report them for exchange or refill. Mount all types securely.

(2) FUEL, OIL AND WATER. Fill fuel tanks. Check engine crankcase, and coolant supply. Add oil or coolant as necessary to bring to correct levels. Allow room for expansion in fuel tanks and radiator. During freezing weather, test value of antifreeze, and add as necessary to protect cooling system against freezing. CAUTION: *If there is a tag attached to filler cap concerning engine oil in crankcase, follow instructions on tag before driving the vehicle.*

(3) FUEL FILTER. Inspect filter for leaks, damage, secure mountings and connections. Remove sediment bowl drain plug and drain off dirt and water. If an appreciable amount of dirt or water is

NEW VEHICLE RUN-IN TEST

present, remove bowl and clean both bowl and element in dry-cleaning solvent, and also drain water and dirt from bottom of fuel tanks. Drain only until fuel runs clean.

(4) BATTERIES. Make hydrometer and voltage test of both batteries. If necessary, add distilled or clean water to bottom of filler wells when cap is off safety-fill vents.

(5) AIR BRAKE TANKS. Drain water from all air brake reservoir tanks and close drain cocks.

(6) AIR CLEANERS AND BREATHER CAPS. Examine carburetor and air compressor, air cleaners, and crankcase breather cap to see if they are in good condition and secure. Remove elements, and wash thoroughly in dry-cleaning solvent. Fill reservoirs to bead level with fresh oil and reinstall securely. Be sure all gaskets are in good condition and that ducts and air horn connections are tight.

(7) ACCESSORIES AND BELTS. See that accessories such as carburetor, generator, regulator, cranking motor, water pump, fan, oil filter, and air compressor are securely mounted. Make sure that fan and generator drive belts are properly adjusted to have ½-inch finger-pressure deflection.

(8) ELECTRICAL WIRING. Examine all accessible wiring and conduits to see if they are in good condition, securely connected, and properly supported.

(9) TIRES. See that all tires including spares are properly inflated, to 90 pounds cool; that stems are in correct position, all valve caps present and fingertight. Remove objects lodged in treads or carcasses and between duals, and inspect for damage. See that spares are secure in carriers.

(10) WHEEL AND FLANGE NUTS. See that all wheel mounting lug nuts and axle flange nuts are present and secure.

(11) FENDERS AND BUMPERS. Examine front fenders and bumper, rear splash guards, brush guards, and radiator grille, for looseness and damage.

(12) TOWING CONNECTIONS. Inspect all towing devices for looseness or damage. See that pintle and fifth wheel connections operate properly, and latch securely.

(13) BODY AND TARPAULIN. Inspect cab for looseness or damage. See that doors and port covers operate properly and latch securely in open or closed position; that tarpaulin or camouflage nut is secure and not damaged. Examine seats, stowage boxes, safety devices, hardware, and all body attachments to see if they are in good condition, correctly and securely assembled and mounted.

(14) ARMOR AND WINCHES. Examine all body armor plate port covers, hinges, latches, and props for looseness and damage. Inspect both winches to see if they are in good condition, correctly assembled and secure. Test operation of winches and control mechanism, and see that drive chains and sprockets are not excessively worn, and that the chains are properly adjusted (par. 209). Test winch drag brakes. They should retard drum spinning when cables are unwound. To test winch automatic brakes, place vehicle at top of steep grade

and use winches to pull another vehicle up grade. Throw out clutch and if towed vehicle starts to back down grade, brake needs adjustment. Also, start lowering towed vehicle down grade. If, when clutch is released, towed vehicle drifts more than 1 or 2 inches, brakes need adjustment. When winch cables are unwound, inspect them for damage, and as cables are rewound on drums evenly and tightly clean them and apply a coating of clean engine oil.

(15) LUBRICATE. Perform a complete lubrication of the vehicle, covering all intervals, according to the instructions on the Lubrication Guide, paragraph 30, except gear cases, wheel bearings, and other units lubricated in items 1 to 13. Check all gear case oil levels, and add as necessary to bring to correct level. Change only if condition of oil indicates the necessity, or if gear oil is not of proper grade for existing atmospheric temperature. NOTE: *Perform items (16) to (19) during lubrication.*

(16) SPRINGS AND SUSPENSIONS. Inspect front springs and shock absorbers, rear tandem unit radius rods, stabilizer beams, retainers, trunnions, spring cases, and axle beams to be sure they are in good condition, correctly assembled and secure; that oiler cups are present and oil lines not leaking; and that wear plates are not excessively worn.

(17) STEERING LINKAGE. See that all steering arms, rods, and connections are in good condition and secure; and that gear case is securely mounted and not leaking excessively. Inspect steering hydraulic booster system to see that all tanks, lines and connections are secure and not leaking excessively, and see that hydraulic oil tank is full.

(18) PROPELLER SHAFTS, CENTER BEARINGS AND VENTS. Inspect all shafts, universal joints, and center bearing (pillow block) to see if they are in good condition, correctly assembled, alined, secure, and not leaking excessively at seals or vents. Be sure vent passages are not clogged.

(19) AXLE AND TRANSFER VENTS. See that axle housing and transfer case vents are present, in good condition, and not clogged.

(20) CHOKE. See that choke valve opens and closes properly in response to operation of choke button.

(21) ENGINE WARM-UP. Start engine, noting if cranking motor action is satisfactory, and any tendency toward difficult starting. Set hand throttle to run engine at fast idle during warm-up. During warm-up, reset choke button so engine will run smoothly, and to prevent overchoking and oil dilution.

(22) INSTRUMENTS.

(a) Oil Pressure Gage. Immediately after engine starts, observe if oil pressure is satisfactory. (Normal pressures, hot are 40 lb at idle speed, 60 to 80 lb at operating speeds.) Stop engine if oil pressure is not indicated in 30 seconds.

(b) Ammeter. Ammeter should show slight positive (+) charge. High charge may be indicated until generator restores to battery current used in starting.

NEW VEHICLE RUN-IN TEST

(c) Temperature Gages. Coolant and engine oil temperatures should rise gradually during warm-up to normal operating range. For coolant 140°F to 160°F. For engine oil 110°F to 130°F.

(d) Air Pressure Gage. During warm-up, air pressure should build up to 100 pounds. Governor should cut off air from compressor at this pressure and should again cut in if pressure in lines and reservoirs is reduced to 85 pounds. Warning indicator (buzzer) should sound at pressures below 60 pounds.

(e) Tachometer. Free pointer should indicate engine speed in revolutions per minute. The locking pointer should indicate and remain at highest engine speed attained. Should not exceed 2,200 revolutions per minute.

(f) Fuel Gage. Gage should register "FULL" if tank has been filled.

(23) ENGINE CONTROLS. Observe if engine responds properly to controls and if controls operate without excessive looseness or binding.

(24) HORNS AND WINDSHIELD WIPERS. See that horns and windshield wipers are in good condition and secure. If tactical situation permits, test horns for proper operation and tone. See if wiper arms will operate through their full range and that blade contacts glass evenly and firmly.

(25) GLASS AND REAR VIEW MIRRORS. Clean all body glass and mirrors, and inspect for looseness and damage. Adjust rear view mirrors for correct vision.

(26) LAMPS (LIGHTS) AND REFLECTORS. Clean lenses and inspect all units for looseness and damage. If tactical situation permits, open and close all light switches to see if lamps respond properly.

(27) LEAKS, GENERAL. Look under vehicle, and within engine compartment, for indications of fuel, oil, hydraulic fluid, and coolant leaks. Trace any leaks found to source and correct or report them to designated authority.

(28) TOOLS AND EQUIPMENT. Check tools and On Vehicle Stowage Lists, paragraphs 31 and 32, to be sure all items are present, and see that they are serviceable and properly mounted or stowed.

b. Run-in Test. Perform the following procedures (1) to (11) inclusive during the road test of the vehicle. On vehicles which have been driven 50 miles or more in the course of delivery from the supplying to the using organization, reduce the length of the road test to the least mileage necessary to make observations listed below. CAUTION: *Continuous operation of the vehicle at speeds approaching the maximum indicated on the caution plate should be avoided during the test.*

(1) DASH INSTRUMENTS AND GAGES. Do not move vehicle until engine temperature reaches 135°F. Maximum safe operating temperature is 200°F. Observe readings of ammeter, tachometer, oil, temperature, air pressure and fuel gages to be sure they are indicating the proper function of the units to which they apply. Also see that

speedometer registers the vehicle speed and that odometer registers accumulating mileage.

(2) BRAKES: FOOT AND HAND. Test service air brakes to see if they stop vehicle effectively without side pull, chatter, or squealing. Be sure application valve closes when treadle pressure is released, and that there is not an excessive drop in air pressure when brakes are applied, and that roller to treadle clearance is 0.030. Parking brake should hold vehicle on a reasonable incline, with ⅓ ratchet travel in reserve and should lock securely in applied position. CAUTION: *Avoid long application of brakes until shoes have become seated. Do not apply full treadle pressure except for an emergency stop.*

(3) CLUTCH. Observe if clutch operates smoothly without grab, chatter or squeal on engagement, or slippage (under load) when fully engaged. See that pedal has ¾-inch free travel before meeting resistance. CAUTION: *Do not ride clutch pedal at any time, and do not engage and disengage new clutch severely or unnecessarily until driven and driving disks have become properly worn in.*

(4) TRANSMISSION AND TRANSFER. Gearshift mechanism should operate easily and smoothly, and gears should operate without unusual noise, and not slip out of mesh.

(5) STEERING. Observe steering action for binding or looseness, and note any excessive pull to one side, wander, shimmy, or wheel tramp. See that column bracket and wheel are secure. Observe if steering hydraulic booster system appears to operate properly to assist steering effort.

(6) ENGINE. Be on the alert for any abnormal engine operating characteristics or unusual noise, such as lack of pulling power or acceleration, backfiring, misfiring, stalling, overheating, or excessive exhaust smoke. Observe if engine responds properly to all controls.

(7) UNUSUAL NOISES. Be on the alert throughout road test for any unusual noise from body and attachments, running gear, suspensions, or wheels, that might indicate looseness, damage, wear, inadequate lubrication, or underinflated tires.

(8) HALT VEHICLE AT 10-MILE INTERVALS FOR SERVICES (9) TO (11) BELOW.

(9) AIR BRAKE SYSTEM LEAKS. With air pressure at governed maximum (100 lb) and brakes applied, stop engine. There should not be a noticeable drop in pressure in 1 minute.

(10) TEMPERATURES. Cautiously hand-feel each brake drum and wheel hub for abnormal temperatures. Examine transmission transfer and rear axle housings for indications of overheating, or excessive lubricant leaks at seals, gaskets, or vents. Transfer temperatures will run higher than c ' er units.

(11) LEAKS. /ith engine running, and fuel, engine oil, and cooling systems ur :r pressure, look within engine compartment and under vehicle f indications of leaks.

c. Upon c npletion of run-in test, correct or report any deficiencies note Report general condition of vehicle to designated individual in au ority.

Section X

SECOND ECHELON PREVENTIVE MAINTENANCE

35. SECOND ECHELON PREVENTIVE MAINTENANCE SERVICES.

a. Regular scheduled maintenance inspections and services are a preventive maintenance function of the using arms, and are the responsibility of commanders of operating organizations.

(1) FREQUENCY. The frequencies of the preventive maintenance services outlined herein are considered a minimum requirement for normal operation of vehicles. Under unusual operating conditions such as extreme temperatures, dusty, or sandy terrain, it may be necessary to perform certain maintenance services more frequently.

(2) FIRST ECHELON PARTICIPATION. The drivers should accompany their vehicles and assist the mechanics while periodic second echelon preventive maintenance services are performed. Ordinarily the driver should present the vehicle for a scheduled preventive maintenance service in a reasonably clean condition; that is, it should be dry and not caked with mud or grease to such an extent that inspection and servicing will be seriously hampered. However, the vehicle should not be washed or wiped thoroughly clean, since certain types of defects, such as cracks, leaks, and loose or shifted parts or assemblies are more evident if the surfaces are slightly soiled or dusty.

(3) If instructions other than those contained in the general procedures in paragraph (4) or the specific procedures in paragraph (5) which follow, are required for the correct performance of a preventive maintenance service or for correction of a deficiency, other sections of the vehicle operator's manual pertaining to the item involved, or a designated individual in authority, should be consulted.

(4) GENERAL PROCEDURES. These general procedures are basic instructions which are to be followed when performing the services on the items listed in the specific procedures. NOTE: *The second echelon personnel must be thoroughly trained in these procedures so that they will apply them automatically.*

(a) When new or overhauled subassemblies are installed to correct deficiencies, care should be taken to see that they are clean, correctly installed, properly lubricated and adjusted.

(b) When installing new lubricant retainer seals, a coating of the lubricant should be wiped over the sealing surface of the lip of the seal. When the new seal is a leather seal, it should be soaked in SAE 10 engine oil (warm if practicable) for at least 30 minutes. Then the leather lip should be worked carefully by hand before installing the seal. The lip must not be scratched or marred.

(c) The general inspection of each item applies also to any supporting member or connection and usually includes a check to see whether or not the item is in good condition, correctly assembled,

secure, or excessively worn. The mechanics must be thoroughly trained in the following explanations of these terms:

1. The inspection for "good condition" is usually an external visual inspection to determine whether or not the unit is damaged beyond safe or serviceable limits. The term "good condition" is explained further by the following: not bent or twisted, not chafed or burned, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut.

2. The inspection of a unit to see that it is "correctly assembled" is usually an external visual inspection to see whether or not it is in its normal assembled position in the vehicle.

3. The inspection of a unit to determine if it is "secure" is usually an external visual examination, a wrench, hand-feel, or a pry-bar check for looseness. Such an inspection should include any brackets, lock washers, lock nuts, locking wires, or cotter pins used in assembly.

4. "Excessively worn" will be understood to mean worn close to, or beyond, serviceable limits, and likely to result in a failure if not replaced before the next scheduled inspection.

(d) Special Services. These are indicated by repeating the item numbers in the columns which show the interval at which the services are to be performed, and show that the parts or assemblies are to receive certain mandatory services. For example, an item number in one or both columns opposite a "TIGHTEN" procedure, means that the actual tightening of the object must be performed. The special services include:

1. Adjust. Make all necessary adjustments in accordance with the pertinent section of the vehicle operator's manual, special bulletins, or other current directives.

2. Clean. Clean units of the vehicle with dry-cleaning solvent to remove excess lubricant, dirt, and other foreign material. After the parts are cleaned, rinse them in clean dry-cleaning solvent and dry them thoroughly. Take care to keep the parts clean until reassembled, and be certain to keep dry-cleaning solvent away from rubber or other material which it will damage. Clean the protective grease coating from new parts since this material is not usually a good lubricant.

3. Special lubrication. This applies either to lubrication operations that do not appear on the vehicle lubrication chart or to items that do appear on such charts but should be performed in connection with the maintenance operations if parts have to be disassembled for inspection or service.

4. Serve. This usually consists of performing special operations, such as replenishing battery water, draining and refilling units with oil, and changing the oil filter cartridge.

5. Tighten. All tightening operations should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice. Use torque-indicating wrench where specified. Do not overtighten, as this may strip threads or cause distortion. Tightening will always be understood to include

the correct installation of lock washers, lock nuts, and cotter pins provided to secure the tightening.

(e) When conditions make it difficult to perform the complete preventive maintenance procedures at one time, they can sometimes be handled in sections, planning to complete all operations within the week if possible. All available time at halts and in bivouac areas must be utilized, if necessary, to assure that maintenance operations are completed. When limited by the tactical situation, items with Special Services in the columns, should be given first consideration.

(f) The numbers of the preventive maintenance procedures that follow are identical with those outlined on W.D., A.G.O. Form No. 461, which is the Preventive Maintenance Service Work Sheet for Wheeled and Half-track Vehicles. Certain items on the work sheet that do not apply to this vehicle are not included in the procedures in this manual. In general, the numerical sequence of items on the work sheet is followed in the manual procedures, but in some instances there is deviation for conservation of the mechanic's time and effort.

(5) SPECIFIC PROCEDURES. The procedures for performing each item in the 1,000-mile (monthly) and 6,000-mile (six-month) maintenance procedures are described in the following chart. Each page of the chart has two columns at its left edge corresponding to the 6,000-mile and the 1,000-mile maintenance, respectively. Very often it will be found that a particular procedure does not apply to both scheduled maintenances. In order to determine which procedure to follow, look down the column corresponding to the maintenance due, and wherever an item number appears perform the operations indicated opposite the number.

ROAD TEST

MAINTENANCE	
6,000 Mile	1,000 Mile
1	1
2	2

NOTE: *When the tactical situation does not permit a full road test, perform those items which require little or no movement of the vehicle. When a road test is possible, it should be for preferably four, and not over six, miles.*

Before-operation Inspection. Perform this inspection as outlined in paragraph 25.

Air Pressure (Build-up, Governor Cut-off, Low-pressure Indicator). During warm-up period operate engine at fast idle long enough to observe if air brake pressure builds up at normal rate to specified maximum (105 pounds) and that governor then cuts off air from compressor. With engine at normal idling speed, bleed air pressure from system by repeated brake application and observe if compressor cuts in at about 85 pounds. With engine stopped, continue test. Low-pressure indicator (buzzer) should sound at pressures

MAINTENANCE	
6,000 Mile	1,000 Mile
3	3
4	4
5	5

below 60 pounds. Any abnormal drop in air pressure except from brake application should be investigated by making elimination soapsuds tests.

Dash Instruments and Gages.

OIL PRESSURE GAGE. Oil pressure should be 60 to 80 pounds at normal operating engine speed, and 40 pounds (minimum) at a slow idle (400 revolutions per minute), engine warm.

AMMETER. Should show high charge for short period after starting, until generator restores to batteries current used in starting. Above 10 to 12 miles per hour with lights and accessories off, ammeter should show a slight charge. Zero reading with lights and accessories on is normal.

ENGINE TEMPERATURE GAGES. Gages should show gradual increase during warm-up; normal operating coolant temperature is 140°F to 160°F, oil temperature 110°F to 130°. CAUTION: *Do not move vehicle until coolant temperature reaches 135°F.*

TACHOMETER. White pointer on tachometer should indicate actual engine revolutions per minute at any given time. Red pointer indicates, and remains at, highest revolution per minute attained, and should not exceed recommended governed engine speed, 2,200 revolutions per minute.

AIR PRESSURE GAGE. Refer to item 2 for specifications and tests.

FUEL GAGE. With ignition switch at "ON" position, fuel gage should register approximate amount of fuel in tanks.

SPEEDOMETER. While vehicle is in motion, speedometer should register vehicle miles per hour, and odometer should record total accumulated mileage.

Horns, Mirrors and Windshield Wipers. If tactical situation permits, test horns for proper operation and tone. Examine rear vision mirror and wipers to see if they are in good condition and secure. Test operation of wiper motors and see that wiper blades contact glass evenly and operate through their full range without indications of loose wiper motor mountings. Adjust rear vision mirrors for correct vision.

Brakes: Service, Parking, and Semitrailer (Braking Effect, Feel, Side Pull, Noise, Chatter, Pedal Travel, Hand Air Control). Operate both truck and semitrailer brakes at various speeds during road test.

SERVICE BRAKES. Apply foot-pedal sufficiently to stop vehicle in minimum safe distance and observe their

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
		effectiveness, any pull to one side, unusual noise or chatter. Pedal should have ¼- to 5/16-inch clearance between pedal roller and plunger. Apply right- and left-rear truck brakes separately, by use of relative hand-application valve, to test effectiveness. SEMITRAILER BRAKES. If semitrailer is connected, test semitrailer brakes separately by use of center hand-application valve and observe their effectiveness. Note any erratic action of semitrailer that might indicate uneven brake shoe pressure. PARKING BRAKE. Apply parking brake while stopped on reasonable incline. Observe if it holds vehicle effectively, that lever has ⅓ travel in reserve, and latches securely in applied position.
6	6	**Clutch (Free Travel, Drag, Noise, Chatter, Grab, Slip).** Pedal free travel should be 1½ inch before meeting resistance. Test clutch for drag when shifting into low gear. Clutch should stop transmission entirely, while vehicle is stationary, and shift should be made without unusual noise. When pedal is depressed note any unusual noise which may indicate defective or dry release bearing. With transmission in gear, note any tendency to chatter or grab when clutch is engaged, or slippage when fully engaged, under load. NOTE: *Never allow pedal free play to become less than ½ inch.*
7	7	**Transmission and Transfer (Lever Action, Declutching, Power Take-off, Vibration, Noise).** With vehicle in motion, shift through the entire transmission gear range and operate declutching and power take-off, noting whether or not levers move easily and snap into each position. Note if all units operate without slipping out of gear, unusual noise or vibration, under either light or heavy load.
8	8	**Steering (Free Play, Bind, Wander, Shimmy, Side Pull, Column and Wheel).** With vehicle in motion, move steering wheel fully in both directions and observe whether or not there is any indication of looseness or binding. Note any tendency to wander, shimmy, or pull to one side. See that steering column and wheel are in good condition and secure. Observe if steering hydraulic booster system operates properly to assist steering effort.
9	9	**Engine (Idle, Acceleration, Power, Noise, and Governed Speed).** Observe engine operating characteristics as follows: IDLE. Engine should idle smoothly without stalling.

MAINTENANCE	
6,000 Mile	1,000 Mile

UNUSUAL NOISES. Listen for knocks and rattles as the engine is accelerated and decelerated, and while it is under either a light or a heavy load.

ACCELERATION AND POWER. Operate the engine at various speeds in all gear ratios, noting if the vehicle has normal pulling power and acceleration. Note any tendency to stall while shifting. A slight ping during fast acceleration is normal. Continued or heavy ping may indicate early timing, heavy accumulation of carbon, or low octane number fuel.

GOVERNED SPEED. With the vehicle in a low gear, slowly depress the accelerator to the toeboard and by observing the speedometer reading, see that the vehicle reaches, but does not exceed, the governed speed specified on the caution plate. Observe tachometer reading and note if the engine speed exceeds the specified 2,100 revolutions per minute.

10	10	**Unusual Noises (Attachments, Cab, Body, Wheels).** Be on alert during road test for any noise that may indicate loose or damaged attachments mounted on vehicle, loose cab mountings, floor plates, doors, windshield or hardware. Listen particularly for indications of loose wheel mountings. While semitrailer is connected and in motion, have assistant listen for any unusual noise from attachments, axles, suspension units or wheels on semitrailer.
12	12	**Air-brake System Leaks.** Test truck and semitrailer air brakes for leaks with air pressure at governed maximum. With all brakes applied and engine stopped, there should not be a noticeable drop in pressure within one minute. If any pressure drop occurs during this check, test system for leaks by soapsuds method.
13	13	**Temperatures (Brake Drums, Hubs, Axles, Transmissions and Transfer).** At completion of run, feel brake drums and hubs of both truck and trailer for abnormally high or low temperatures. Cautiously feel axles (including semitrailer) and transmissions and transfer for overheating.
14	14	**Leaks (Engine Oil, Water, Fuel).** Inspect engine compartment and ground under vehicle for evidence of oil, fuel, and water leaks.

MAINTENANCE OPERATIONS

Raise Truck and Block Safely

16	16	**Gear Oil Level and Leaks (Axles, Transmissions, and Transfer).** Remove plugs and inspect axles, transmissions and transfer to see that lubricant is at proper

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
		level, in good condition, and not leaking at seals or gaskets. Add oil as necessary. NOTE: *Safe level is from lower edge of filler hole when hot to ½ inch below when cold.* If change of lubricant is due or if condition warrants, drain and refill units according to Lubrication Guide instructions, paragraph 30. CAUTION: *Be sure to fill power take-off housing and front axle declutching housing through their separate filler holes at the same time transfer case is being refilled.*
17	17	**Unusual Noises (Engine, Belts, Accessories, Transmission, Transfer, Shafts and Joints, Axles and Wheel Bearings).** With engine running, observe as follows: ENGINE, BELTS AND ACCESSORIES. Accelerate and decelerate the engine momentarily and listen for any unusual noise in these units that might indicate damaged, loose, or excessively worn engine parts, drive belts, or accessories. Also be sure to locate and correct or report any unusual engine noise heard during the road test. TRANSMISSION, TRANSFER, PROPELLER SHAFTS AND JOINTS, AXLES, AND WHEEL BEARINGS. With the transmission in an intermediate gear, and front driving axle engaged, operate these units at a constant moderate speed by use of the hand throttle, and listen for any unusual noise that might indicate damaged, loose, or excessively worn unit parts. Also observe all propeller shafts and wheels for vibrations and runout, and for vibrations in the other units which may indicate looseness or unbalance. Also be sure to locate, correct or report, any noise noted during road test.
18	18	**Cylinder Heads and Gaskets.** Look for cracks or indications of oil, coolant, or compression leaks around studs, cap screws, and gaskets. CAUTION: *Cylinder heads should not be tightened unless there is definite evidence of leaks. If tightening is necessary, use torque indicating wrench, and tighten head nuts in the proper sequence and to 105 foot-pounds tension.*
	19	**Valve Mechanism (Clearance, Cover Gasket).** Adjust tappet clearances only when necessary, as indicated by valve noise or faulty engine performance.
19		ADJUST. Adjust clearances in proper sequence (par. 68 **b**) to 0.021 inch hot, on both the exhaust and intake valves. Take care lock nuts are secure when clearances are last checked. Replace unserviceable valve cover gaskets.
22	22	**Batteries (Cables, Hold-downs, Carrier, Record Gravity and Voltage).** Clean batteries; inspect for leaks; test and record specific gravity and voltage on each cell. Reddish-brown discoloration of electrolyte

MAINTENANCE 6,000 Mile	MAINTENANCE 1,000 Mile	
		may indicate overcharge due to improper regulator action. Inspect cables, bolts, and nuts for good condition. Lightly grease and tighten terminals, posts and bolts. Tighten hold-downs. If carrier is corroded, remove batteries, clean and repaint carrier. Make a high rate discharge test according to instruction with test instrument. A true test cannot be made if specific gravity is below 1.225. If difference of reading between cells of each battery is more than 30 percent, report. Fill to correct level with distilled or pure water, using safety-fill method.
	20	**Spark Plugs.** Inspect installed plugs to see that insulators are in good condition and wiped clean. Make sure there are no leaks around insulators or gaskets. NOTE: *When faulty performance indicates need, remove plugs and inspect for broken insulators, excessive carbon, burned electrodes, and wide gaps. Replace unserviceable plugs. Correct gap 0.020 inch. Report excessive deposits or damaged insulators, as these conditions may indicate incorrect heat range.*
20		SERVE. Clean deposits from electrodes and insulators, inspect for cracks; use cleaner if available, if not, install new or reconditioned plugs. Adjust gap to 0.020 inch. After completing item 21, install plugs, using new gaskets. Do not overtighten.
21		**Compression Test.** With all plugs out, place gage in spark plug hole and with throttle wide open, rotate engine with cranking motor. Test each cylinder; minimum reading should not be less than 90 pounds, with allowable variation of 10 pounds between cylinders. Record reading on W.D., A.G.O. Form No. 461.
23	23	**Crankcase (Leaks, Oil Level).** With engine idling, observe crankcase, valve covers, timing-gear covers and clutch housing for oil leaks. Stop engine and after oil has drained into crankcase, see if oil registers full on bayonet gage. Add oil to proper level. When an oil change is due, or condition warrants, drain and refill according to Lubrication Guide, paragraph 30. Do not start engine until item 24 is completed.
24	24	**Oil Filters, Coolers, and Lines.** Inspect oil filters, coolers, and lines for good condition; secure mounting and leaks.
	24	Drain filter sediment bowl. Clean out cooler core air passages.
24		SERVE. If filter element change is due or condition warrants, service filter according to Lubrication Guide, paragraph 30.
25	25	**Radiator (Core, Shell, Mountings, Hose, Cap and Gasket, Antifreeze Record, Overflow Pipe).** Inspect

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MAINTENANCE		
6,000 Mile	1,000 Mile	
		all applicable items to see if they are in good condition, secure, and not leaking. Be sure overflow pipe is not kinked or clogged. Examine condition of coolant to see whether or not it is so contaminated that cooling system should be cleaned. If cleaning is necessary, proceed only according to current directives covering proper procedure and recommended cleaner neutralizer, and inhibitor materials. Clean all insects, dirt, or grease deposits from core air passages and inspect for bent cooling fins. CAUTION: *Use only a suitably shaped piece of wood or blunt instrument to straighten fins.* If antifreeze is in use, test its protective value and record in space provided on back of work sheet Form No. 461.
25		TIGHTEN. Carefully tighten all loose radiator mountings, water connections and hose clamps.
26	26	**Water Pump and Fan.** Inspect pump to see if it is in good condition, secure, and not leaking. Examine shaft for end play or bearing looseness. Inspect fan to see if it is in good condition and that blades and hub are secure. Loosen drive belts and examine fan for hub or bearing wear. Leave drive belts loose until adjustment is made (item 29).
		TIGHTEN. Carefully tighten water pump and fan assembly and mounting nuts.
27	27	**Generator, Cranking Motor, and Switch.** Inspect generator, cranking motor, and cranking motor switch to see if they are in good condition, securely mounted, and if wiring connections are clean and secure. Remove generator and cranking motor inspection covers and examine commutators and brushes to see if they are in good condition and clean, if brushes are free in brush holders and have sufficient spring tension to hold them in proper contact with commutators and if brush connection wires are secure and not grounding.
27		CLEAN. Blow out commutator end of generator and cranking motor with compressed air. If commutators are dirty, clean only with flint paper 2/0 (do not use emery) placed over end of suitable sized piece of wood, and again blow out with air.
27		TIGHTEN. Carefully tighten cranking motor mounting bolts.
28	28	**Air Compressor (Unloader Valve, Governor, Lines).** Examine compressor to see that it is in good condition, properly alined with its drive flange, and secure. Check unloader-valve clearance, 0.010 to 0.015 inch. See if

MAINTENANCE	
6,000 Mile	1,000 Mile
28	
29	29
30	30
31	31

governor is in good condition and securely mounted, if all compressor air and water lines in engine compartment are secure and not leaking.

CLEAN. Clean compressor air intake and governor air strainers in dry-cleaning solvent; dry; apply a thin film of engine oil to strainers and reinstall securely.

SPECIAL LUBRICATION. Apply a few drops of engine oil to unloader-valve fulcrum pin and kerosene or dry-cleaning solvent to upper valve stem of governor.

ADJUST. Set unloader-valve clearances at 0.010 inch to 0.015 inch.

Drive Belts and Pulleys. Examine drive belts for evidence of fraying condition, excessive wear, and deterioration. Inspect drive pulleys and hubs to see if they are in good condition and securely mounted.

ADJUST. If necessary, adjust drive belts so fan has ½-inch free travel at tip of blades.

Tachometer Drive and Adapter. See if they are in good condition, correctly assembled, and secure. Inspect the flexible drive shaft for kinks and connection for indications of oil leaks.

Distributor (Cap, Rotor, Points, Shaft, Advance Units). Observe if distributor body and external attachments are in good condition and secure. Examine other parts as follows:

CAP, ROTOR, AND POINTS. Clean dirt from cap and remove. Inspect cap, rotor, and breaker plate to see if they are in good condition, secure, and serviceably clean. Pay particular attention to cracks in cap and rotor, corrosion of terminals and connections, and to burned rotor bar or contact points. See that points are well alined and adjusted to from 0.018 inch to 0.024 inch when wide open. If inside of distributor is dirty, remove assembly, clean in dry-cleaning solvent, dry thoroughly with compressed air, and lubricate its friction parts very lightly. When cleaning, remove wick and lubrication cup, clean them, reoil and replace after cleaning distributor. If breaker points are pitted, burned, or worn to an unserviceable degree, replace. Also replace condenser if points are pitted, as this may be the cause. When cleaning points, use fine file or flint paper 2/0 (never use emery) and blow out filing with compressed air.

SHAFT. Test shaft by hand-feel for excessive wear in shaft or bushings.

CENTRIFUGAL ADVANCE. Install rotor on shaft and test distributor governor by finger force for normal range of movement permitted by mechanism. Note if it will

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE		
6,000 Mile	1,000 Mile	
		return to original position when released without hang-up or binding.
		MANUAL SPARK CONTROL. Inspect control for proper operation, wear, or damage.
31	31	SPECIAL LUBRICATION. Lubricate cam surfaces, breaker arm pin, and wick according to Lubrication Guide instructions (par. 30).
31		ADJUST. Set breaker point gaps to from 0.018 inch to 0.024 inch.
32	32	**Coils and Wiring.** Inspect coils, ignition wiring, and conduits to see if they are in good condition, clean, securely connected, and properly mounted. Inspect all low voltage wiring in engine compartment in like manner.
33	33	**Manifolds and Heat Control (Gaskets, Seasonal Setting).** Inspect for looseness, damage, or exhaust leaks at gaskets. Examine for evidence of cracks or sand holes usually indicated by carbon streaks. Set heat control for correct seasonal use.
33		TIGHTEN. Carefully tighten all manifold assembly and mounting nuts securely.
34	34	**Air Cleaners.** Inspect carburetor air cleaners and trailer brake line air cleaners to see if they are in good condition, securely mounted and connected, and not leaking. Clean and service according to Lubrication Guide instructions, paragraph 30. Be sure gaskets are in place and all joints and air hose connections are tight.
35	35	**Breather Cap.** See that crankcase breather cap is in good condition, secure and not leaking. Clean and service according to Lubrication Guide instructions, paragraph 30.
36	36	**Carburetor (Choke, Throttle, Linkage, and Governor).** See that they are in good condition, correctly assembled, and securely installed; that carburetor does not leak; that control linkage, including choke and throttle shaft, is not excessively worn; if choke valve opens fully when the control is in its released position; if throttle valve opens fully when the accelerator is fully depressed; and if the governor is secure and properly sealed.
37	37	**Fuel Filters, Screens and Lines.** Examine filters to see if they are in good condition, securely mounted and connected, and not leaking.
		CLEAN. Close fuel shut-off and remove filter sediment bowls and elements. Wash clean in dry-cleaning solvent and reassemble securely, being sure gaskets are in place.

MAINTENANCE	
6,000 Mile	1,000 Mile
		CAUTION: *If elements cannot be cleaned by washing, replace unit. Do not scrape element to clean.* Turn on fuel supply and recheck for leaks.
38	38	**Fuel Pump (Pressure).** Inspect pump to see if it is in good condition, securely mounted, and not leaking. Remove sediment bowl and screen, and wash in dry-cleaning solvent. Be sure gasket is in place and serviceable when bowl is reinstalled.
38		Attach a test gage to pressure side of fuel pump and after starting engine as in item 39, see that pressure is 2½ pounds minimum, 4 pounds maximum at idle speed.
39	39	**Cranking Motor (Action, Noise, Speed).** Start the engine, observing if general action of cranking motor is satisfactory, particularly that it engages and operates properly without excessive noise and has adequate cranking speed; and if the engine starts readily. Also, as soon as engine starts, note whether or not oil pressure gage and ammeter indications are satisfactory.
40	40	**Leaks (Engine Oil, Fuel, and Water).** With engine running, recheck all points of oil, fuel, and cooling systems for leaks. Trace any found to source and correct or report them.
41	41	**Ignition Timing (Advance).** With engine running, and a neon timing light connected, observe if ignition timing is correct. See paragraph 104. Also note whether or not automatic controls advance the timing as engine is accelerated gradually.
41		ADJUST. Adjust ignition timing to specifications in paragraph 104.
42	42	**Engine Idle and Vacuum Test.** Inspect as follows:
		ADJUST. Connect a vacuum gage at plug in center of intake manifold, adjust engine to its normal speed by means of throttle stop screw, and then adjust the idle-mixture adjusting needle until vacuum gage indicates a steady maximum reading. If these latter adjustments are made simultaneously, time will be saved.
42	42	VACUUM TEST. With the engine running at normal idling speed, vacuum gage should read about 18 to 21 inches and pointer should be steady. A needle fluctuating between 10 and 15 inches, may indicate a defective cylinder head gasket or valve. An extremely low reading may indicate a leak in intake manifold or gasket. Accelerate and decelerate engine quickly. If vacuum gage indicator fails to drop to approximately two inches as throttle is opened, and then fails to recoil to at least 24 inches as throttle is closed, it may be an indication of diluted oil, poor piston-ring sealing, or abnormal restriction in

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
		carburetor, air cleaner, or exhaust. NOTE: *Above readings apply to sea level. There will be approximately a one-inch drop for each 1,000 feet of altitude.*
43	43	**Regulator Unit (Connections, Voltage, Current, and Cut-out).** Inspect regulator unit to see if it is in good condition, securely mounted, connected and clean.
43		TEST. Connect a low-voltage-circuit tester and observe if voltage regulator, current regulator, and cut-out control generator output properly. Follow instructions in vehicle manual or those which accompany test instrument. Replace if test shows faulty operation. CAUTION: *This test should be made only after regulator unit has reached normal operating temperature.*
44	44	**Power Tire Inflation (Connection, Line).** Inspect tire inflation connection at reserve tank to see that it is in good condition and clean. Be sure that cap is present and connected by safety chain. Note whether or not valve turns easily and is not excessively worn. Examine air hose for deterioration and check for damage or clogging. Connect hose and test system for proper function when performing item No. 47. With inflation valve open and governor cut out, see if air pressure will build up to 150 pounds, and if safety valve operates at that pressure.
47	47	**Tires and Rims (Valve Stems and Caps, Condition, Direction, Matching Spare Carrier).** Inspect both truck and trailer tires as follows: VALVE STEMS AND CAPS. Observe if all valve stems are in good condition and in correct position, and if all valve caps are present and installed securely. Do not tighten with pliers. CONDITION. Examine all tires for cuts, bruises, breaks, and blisters. Remove embedded glass, nails, and stones. Look for irregular tread wear, watching for any sign of flat spots, cupping, feather edges, and one-sided wear. Remove tires worn thin at center of tread (or other unserviceable tires) and exchange for new or retreaded tires. Any mechanical deficiencies causing such conditions should be determined and corrected, or reported. Wheel positions of tires with irregular wear should be changed to even up wear. Front tires, worn irregularly, should be moved to rear-wheel positions. DIRECTION. Directional tires and non-directional tires should not be installed on same vehicle. Directional tires on rear wheels should be mounted so that the "V" of chevron will point down when viewed from the front. Directional tires on all front wheels will ordinarily be

MAINTENANCE	
6,000 Mile	1,000 Mile

mounted so that "V" of chevrons will point up when viewed from front of vehicle.

MATCHING. With tires properly inflated, inspect them to see if they are matched according to over-all circumference and type of tread.

SPARE TIRE CARRIER. See whether or not spare tire carrier is in good condition and secure.

RIMS. All rims and their lock rings or flanges should be in good condition and secure.

47 — TIGHTEN. Tighten all wheel rim flange or lug nuts securely.

47 — SERVE. With truck and semitrailer tires properly inflated to 90 pounds (cool) check over-all circumference of all tires including spares. Select tires to be mounted on duals or on driving axles so they will not have difference in over-all circumference exceeding the ¾-inch limits specified in current directives and bulletins. Mount all dual tires with the larger tire outside. The valve stems on inner wheels should point out and the valve stems on outer wheels should point in, and should be opposite each other. Spares must be matched properly and mounted for use on one of the road wheels at intervals not exceeding ninety days. A convenient time to do this is during these maintenance services. CAUTION: *After performing the tire-matching service, do not reinstall wheels until wheel-bearing services are completed.*

48 — **Rear Brakes (Drums, Supports, Cams, and Shafts).** (On 6,000-mile maintenance several wheel bearing and brake items up to 52 are group services and overlap. Perform in best order for economy of time and orderly reassembly.) After removing rear wheels, inspect both truck and semitrailer and service as follows:

DRUMS AND SUPPORTS. Clean dirt and grease from drums and supports (adapters—semitrailer) keeping dry-cleaning solvent away from linings. Examine drums and supports to see if they are in good condition, securely mounted and if drums are excessively worn or scored.

CAMS AND SHAFTS. See if cams and shafts are excessively worn, where they contact; if camshafts operate freely in collar and if shafts and collars are worn.

TIGHTEN. Tighten brake support cap screws and hub to drum nuts securely.

49 — **Rear Brake Shoes (Linings, Anchors, Springs).** Examine truck and semitrailer linings without removing

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MAINTENANCE	
6,000 Mile	1,000 Mile

drums to see if they are so worn bolt heads may contact drums within next 1,000 miles of operation. If vehicle has been operated in deep water, mud, or loose sand, remove forward right rear wheel and examine lining for damage. If this lining must be replaced, remove all wheels, check their brakes and service as necessary, being sure to clean, lubricate, and adjust all removed wheel bearings as described in section XXVI.

ADJUST. Adjust both truck and semitrailer shoes by minor method if necessary.

49	Remove truck and semitrailer rear wheels. See that linings are in good condition, tightly secured to brake shoes, in good wearing contact with drums, free of dirt or lubricant, and not excessively worn. Also see if shoes are in good condition, properly secured to anchors, guides, and retracting springs, and that springs have sufficient tension to return shoes properly to released position. Thickness of lining at most worn point should be enough for at least 1,000 miles of service before bolt heads are likely to contact drums.

CLEAN. Clean all dirt and grease from linings with wire brush, cloth, or compressed air.

ADJUST. After subsequent related items to 60 inclusive are completed, adjust shoes by minor method. If new linings have been installed, adjust by major method described in paragraph 169, for truck, and part three, for semitrailer. Adjust slack adjusters so diaphragm push-rod travel is at minimum, approximately ¾ inch, and drum to lining clearance is 0.004 inch to 0.006 inch at heel.

50	50	**Radius Rods.** Inspect to see that rods are tight and adjusted so as to give the following deflections in the drive chains: left front and right rear, 2-inch deflection; right front and left rear, 5-inch deflection. Be sure that each chain has the same number of links.
51	51	**Rear Stabilizer Beam, Truck (Retainers, Trunnions, Spring Cases, Axle Beams).** Inspect applicable units to see if they are in good condition, securely assembled and mounted, and not leaking lubricant excessively. Be sure trunnion oiler cups are present and that cups, oil lines and connections are secure and not leaking; that trunnion and coil spring retainer caps are tight, and wear plates not excessively worn.
51	51	**Walking Beam, Semitrailer (Mountings, Support Brackets, Shifting Screws, Brake Cylinder Carriers).**

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6,000 Mile	1,000 Mile
		Inspect all items to see if they are in good condition, correctly assembled and secure. See that beam shifting screws are set in correct position and securely locked.
52	52	**Rear Wheels (Bearings, Seals, Drive Flanges, and Nuts).** Inspect and service as follows:
	52	WHEELS. Inspect truck and semitrailer wheels to see if they are in good condition and secure.
		BEARINGS AND SEALS. Check for looseness of wheel bearing adjustment. Revolve wheels and listen for evidence of dry or damaged bearings. Inspect around flanges and brake supports or adapters for lubricant leaks.
		DRIVE FLANGES AND NUTS. Note if truck sprocket drive flanges are in good condition, not excessively worn, and if nuts are tightened securely.
52		CLEAN. Disassemble both truck and semitrailer rear wheel bearings and oil seals. Clean thoroughly in dry-cleaning solvent and examine bearing cups and cones to see that they are in good condition; that the machined surfaces that they contact are in good condition; and if there is any excessive wear.
52		SPECIAL LUBRICATION. When all of the related items are to the point where wheel bearings are to be re-installed, lubricate bearings according to instructions on Lubrication Guide (par. 30).
52		ADJUST. After lubricating truck and semitrailer wheel bearings, reassemble hub and drum assemblies into place, and adjust wheel bearings correctly according to section XXVI, for truck, and paragraph 253 **b**, for semitrailer.
55	55	**Steering Knuckles (Joints, Bearings, Boots).** Inspect to see if knuckle housings are in good condition. Look for cracks, particularly around steering arms. See if outside knuckle boots, clamps and guards are in good condition and secure. Remove lubrication plug and examine sample of lubricant to see if it is contaminated.
55		CLEAN. Remove constant velocity universal joint assembly. Wash thoroughly in dry-cleaning solvent. Without disassembly of universal joint, inspect parts to see that they are in good condition and not excessively worn. Pay particular attention to universal joint pilots, balls, cage, races, axle splines, flanges and pivot bearings.
55		SPECIAL LUBICATION. Pack new lubricant well into constant velocity universal joint until it fills all space be-

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MAINTENANCE	
6,000 Mile	1,000 Mile
		tween balls, cages, and races. Reassemble steering knuckle, taking care to replace any unserviceable lubricant retainer boots.
55		ADJUST. Use every precaution to reinstall all units in the position from which they were removed at disassembly, to insure correct axle end play adjustment.
56	56	**Front Springs (Clips, Leaves, U-bolts, Hangers, and Shackles).** See if all items are in good condition, correctly assembled, and secure. Spring clips and bolts should be in place; spring leaves should not be shifted out of their correct position. This may be an indication of a sheared center bolt. Note if deflection of both springs is normal and approximately the same. Test hangers and bolts for excessive wear by means of a pry bar.
		TIGHTEN. Tighten all spring U-bolts securely and uniformly.
57	57	**Steering (Arms, Tie Rods, Drag-Link, Seals and Boots, Pitman Arm, Gear, Column and Wheel).** See if these items are in good condition, correctly and securely assembled and mounted, if steering gear case is leaking lubricant, and if lubricant is at proper level. Pay particular attention to Pitman arm to see if it is securely mounted and not bent out of its normal shape. Also observe if steering system hydraulic booster is in good condition, secure and not leaking at tank pump or line connections.
57		TIGHTEN. Tighten Pitman arm shaft nut securely. Also tighten steering gear case assembly and mounting nuts or screws, taking care not to disturb adjusting screws and lock nuts. CAUTION: *Loosen steering column bracket when tightening steering case mounting nuts, so as not to distort column.*
57		SERVE. Clean and refill hydraulic system according to Lubrication Guide, paragraph 30.
60	60	**Front Wheels (Bearings, Seals, Flanges, Axle End Play and Nuts).** Inspect front wheels, bearings, seals, drive flanges and nuts in same manner as in item 52 for similar rear wheel items.
60		CLEAN. Disassemble, clean, and inspect the front wheel bearings and oil seals in the same manner as described in item 52, taking care to check the universal joint end play, so that end play adjustment may be made conveniently when reassembling.
60		SPECIAL LUBRICATION. Apply in same manner as described in item 52.

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MAINTENANCE	
6,000 Mile	1,000 Mile
60		ADJUST. Adjust wheel bearings in same manner as described in item 52, and adjust brake shoes as described in item 49.
61	61	**Front Axle (Pinion End Play, Seal, Vent, and Alinement).** If front axle appears to be out of line, measure distance from front spring eyebolt to center of axle spring pad on each side. Distance should be equal. Inspect axle housing to see if it is in good condition and not leaking. Examine pinion shaft for excessive end play and seal for leaks.
		CLEAN. Clean axle housing vent thoroughly.
62	62	**Front Propeller Shaft (Joints, Alinement, Seals, and Flanges).** See if these items are in good condition, correctly and securely assembled and mounted; if the universal joints are properly alined with each other and are not excessively worn; that the slip joint is free, not excessively worn, and well lubricated; and that the seals on the universal joints and slip joint do not leak.
62		TIGHTEN. Tighten all universal-joint-assembly and companion-flange bolts securely.
63	63	**Engine Mountings.** Check to see that engine mountings are in good condition and tight. Be sure to check both front engine support and all rubber mountings to determine that rubber is not separating from its metal backing. If the mounting bolts are loose, tighten them properly, taking care not to overtighten. Remove oil or grease from the rubber mounting. Adjust rubber mounting grease shields. Inspect ground straps for damage and loose connections.
64	64	**Hand Brake.** Inspect ratchet, pawl and linkage for damage and looseness, brake drum for scoring, lining for grease or oil. Examine lining to see whether or not it is loose or worn thin.
64		ADJUST. Adjust clearance to between $\frac{1}{4}$ and $\frac{5}{16}$ inch at center of shoe. NOTE: *Be sure that the emergency hand brake is free regardless of clearance required. Hand brake should hold vehicle when parked with $\frac{1}{3}$ of its travel in reserve.*
65	65	**Clutch Pedal (Free Travel, Linkage, Return Spring).** Check pedal free travel. Should be $1\frac{1}{2}$ inches before meeting resistance. Examine to see if pedal is securely mounted to shaft, if clutch operating linkage is in good

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MAINTENANCE	
6,000 Mile	1,000 Mile
65		condition, secure, and not excessively worn at friction joints. See if return spring has proper tension to bring pedal to correct released position. ADJUST. Adjust plate when clutch pedal free travel is ½ inch or less (par. 78).
66	66	**Brake Pedal.** Inspect to see that brake pedal operates freely and that the clearance between the pedal roller and plunger is 0.030 inch.
69	69	**Air Brake Application Valves.** Inspect valves and linkage for damage, wear, and looseness. See that the three application valves located on steering column operate freely; that the right valve operates brake on right bogie; that the left application valve operates left brake; that center valve operates trailer brake and that the foot-treadle valve operates all brakes. See that all valves are closed securely when controls are in the off position.
70	70	**Air Brake Reservoirs.** See that reservoirs on both truck and semitrailer are in good condition and secure. Drain off water and close cocks. Test semitrailer release valve for proper operation by pressing button.
71	71	**Transmission (Mountings, Seals, Linkage).** Note if transmission cases are in good condition and securely mounted; inspect for lubricant leaks at seals and gaskets. Examine control linkage and shift mechanism for damage or excessive wear.
71		TIGHTEN. Tighten mountings securely.
72	72	**Transfer (Mountings, Linkage, Seals, Vent).** See that case is in good condition, and securely mounted; that transmission and declutching control linkage and shaft mechanism are securely connected and not damaged; and that vent is open. Look for evidence of lubrication leaks at seals and gaskets. Clean vent passage, if clogged.
72		TIGHTEN. Draw up all external assembly and mounting nuts securely.
73	73	**Rear Propeller Shafts.** Inspect in same manner as in item 62. TIGHTEN. Draw up all universal joint and companion flange bolts securely.
74	74	**Center Bearings.** Inspect all drive shaft center bearings to be sure they are in good condition, securely mounted, and not leaking. Tighten securely.
75	75	**Rear Axle, Truck (Pinion End Play, Seals, Vent, and Alinement).** Inspect in the same manner as in item 61

MAINTENANCE	
6,000 Mile	1,000 Mile
		for front axle. See that jackshaft sprockets are in good condition, secure and not excessively worn. Recheck drive chain adjustments; see paragraph 146.
75	75	REAR AXLES, SEMITRAILER. Inspect the four axle assemblies to see if they are in good condition, correctly and securely assembled to walking beam, and in proper alinement.
75	75	CLEAN. Clean axle housing vent thoroughly.
77	77	**Rear Springs.** Inspect carrier axle leaf springs for damage or sag, and see that they are secure. Be sure that stirrups are in place and secure. NOTE: *Two coil springs are located diagonally on the bogie suspension system.*
79	79	**Cab Mountings.** Note if they are all in good condition and secure. Be sure that springs on cab mountings are in good condition and properly compressed. These springs should be neither loose, nor compressed, until solid. TIGHTEN. Tighten cab mountings evenly and securely, taking care to loosen the steering column clamp before alining or tightening cab. When tightening spring-loaded mounting bolts, do not compress springs fully. After completing this service, be sure to tighten steering column clamp.
80	80	**Frame (Side and Cross Members).** Inspect both truck and semitrailer frames, brackets, side rails, and cross members to see if they are in good condition, secure, and correctly alined. If the frame appears to be out of line, report condition.
81	81	**Wiring, Conduit, and Grommets.** Observe these items underneath truck and semitrailer to see if they are in good condition, properly supported, connected, and secure.
82	82	**Fuel Tank, Fittings, and Lines.** Inspect fuel tanks to see if they are in good condition and securely mounted. Examine caps for defective gaskets or plugged vents. See that filler necks are in good condition and that caps fit securely.
82		Remove the fuel tank drain plugs and drain off the accumulated water and dirt in bottom of tanks. Drain only until fuel runs clear. Use necessary precautions against fire.
83	83	**Brake Lines (Fittings and Hose).** Examine all lines and fittings and air brake hose under both truck and

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6,000 Mile	1,000 Mile
		semitrailer to see if they are in good condition, securely connected, and supported so lines or hose will not chafe against other vehicle parts.
83		Remove semitrailer air brake relay valve, clean thoroughly with brake fluid and reinstall securely.
84	84	**Exhaust Pipes and Muffler.** Examine exhaust pipe to see if it is securely attached to exhaust manifold, that gasket or packing does not show visible evidence of leakage, and that the other end of exhaust pipe is clamped securely to muffler. Inspect muffler to see if it is in good condition and securely mounted. Check tailpipe to see if it is securely clamped to muffler, properly supported, and unobstructed at its outer end. See that drain holes in muffler are at lowest point, not clogged, and that exhaust line from heat riser is not restricted.
85	85	**Vehicle Lubrication.** If due, lubricate all points of vehicle in accordance with instructions in vehicle Lubrication Guide, current lubrication bulletins or directives, and the following instructions: Use only clean lubricant. Keep all lubricant containers and dispensers covered, except when withdrawing lubricant. Lubrication of items on the "Preventive Maintenance Service and Technical Inspection Work Sheet" that are marked with an "L" (special lubrication symbol) should be omitted on this "Vehicle Lubrication" Service with the exception of the external lubrication cup of the distributor. This will avoid duplication and, in some cases, overlubrication. If lubrication fittings, flexible lines, vents, or plugs are found missing or damaged, they should be replaced immediately. Clean hole in which new fitting is to be installed, install fitting, and then lubricate the unit. Open any clogged lubrication passages or pressure fitting holes until lubricant is properly delivered. The correct cold oil level in axles, transfer case, and transmission is from ½ inch below to lower side of filler-plug hole. CAUTION: *Do not fill to overflowing. Reinstall all drain and filler plugs securely. Take care that any required gaskets are in good condition and in place on the reinstalled plugs.* Do not apply more than the specified amount of lubricant to generator, cranking motor, distributor, or water pump. Wipe off lubricant that may drip onto brakes, rubber parts, or detract from vehicle's appearance.

LOWER TRUCK TO GROUND

86	86	**Toe-in and Turning Stops.** With front wheels on ground and in straight ahead position, use a toe-in gage to determine if adjustment is as specified; should be

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		$\frac{1}{8}$ inch plus or minus $\frac{1}{32}$ inch. Turn wheels fully in both directions and see if turn is limited by stops. In this position, note if tires clear all parts of vehicle.
87	87	**Winches (Clutch, Drive, Brakes, Shear Pin, Cable).** Observe whether or not all items are in good condition, correctly assembled and secure. See that clutches move freely and levers latch securely. Test drum brakes. Should hold drums from spinning when cables are unwound. Test each winch automatic safety brake. Set truck at the top of a steep bank. Fasten the winch line to a vehicle at the bottom of the bank. Start pulling the vehicle up the bank. Throw out the engine clutch; if vehicle starts to back down, the brake needs adjusting. Start lowering the vehicle down the bank; throw out engine clutch; if vehicle does not stop or drifts more than one or two inches, brake needs adjusting. See paragraph 169. When lining is worn to rivet heads or does not hold vehicle after adjustment is made, the lining should be replaced. CAUTION: *The lining used on the Gar Wood automatic worm brake is a special type, developed especially for this purpose. Do not substitute ordinary brake lining, as a serious injury or accident may result.* Inspect propeller shaft in same manner as in item 62, and see that proper shear pin is installed. Propeller shaft front yoke should slide freely on worm shaft to insure safety feature of shear pin. See if sprockets and drive chains are in good condition, adequately lubricated, and chains not too slack. Inspect cables to see if they are in good condition, evenly wound, and note whether or not cable chains and hooks are securely attached. Lubricate winch clutch according to Lubrication Guide, paragraph 30, moving clutch back and forth to be sure it is free.
87		CLEAN AND SERVE. Unwind cables and inspect for broken or frayed strands and for flat or rusty spots. Clean entire length of cables with cloth saturated with very thin oil or kerosene. Remove excess oil or kerosene and as cables are rewound evenly on drums, apply a thin film of engine oil. Sample oil in worm gear housing for contamination. If oil change is due or condition of oil warrants, drain and refill according to Lubrication Guide, paragraph 30.
88	88	**Fifth Wheel.** Examine fifth wheel unit on truck to be sure it is in good condition and correctly assembled. Tighten all assembly and mounting nuts securely. Inspect all accessible friction surfaces, jaw and lock assemblies for good condition and excessive wear. If attached, disconnect semitrailer, clean base plate thoroughly, inspect for damage and relubricate according to

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		instructions in Lubrication Guide, paragraph 30. Inspect semitrailer king-pin connection for good condition and excessive wear.
89	89	**Tractor-to-Semitrailer Brake Hose, Wiring and Connections.** Check brake hose and wiring connections to see that they are in good condition and securely fastened to clips, springs, and brackets so that they will not chafe or interfere with working parts. Check semitrailer brake shut-off valve to see that it operates properly. NOTE: *Always moisten rubber applicators before making connections.*
91	91	**Lamps (Lights) (Head, Tail, Body, Stop, and Blackout).** Operate all truck and semitrailer switches and note if lamps respond. Include stop and blackout lights. See if foot-switch controls headlight beams properly and if beams are aimed so as not to blind oncoming traffic. Examine all truck and semitrailer lights to see if they are in good condition and securely mounted and if lenses are dirty.
91		ADJUST. Adjust lamp unit beams.
92	92	**Safety Reflectors.** See if they are all present on both truck and semitrailer, in good condition, clean, and secure.
93	93	**Front Bumper and Tow Hooks.** See if they are in good condition and secure.
94	94	**Engine Compartment Doors and Fasteners.** Inspect panels and insulators to see if they are in good condition, secure, and that all fasteners latch properly.
95	95	**Front Fenders.** Examine fenders to see if they are in good condition and securely mounted.
96	96	**Cab.** Inspect doors, hardware, glass, seats, grab rails, ventilators, and map compartment for good condition and security. See that ventilators open properly and are adequately lubricated. See that doors can be closed and latched securely.
98	98	**Circuit Breaker and Fuse Block.** Check for cleanliness, security, and tight connections.
100	100	**Body Trailer.** Inspect units such as platforms, ramps and braces, cable guides and rollers, stowage compartments, and catwalks to be sure they are in good condition, correctly assembled and securely mounted.
101	101	**Pintle Hook.** Examine pintles to see if they are in good condition and securely mounted to frame. Test pintle and latch to see if they operate properly, are adequately

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6,000 Mile	1,000 Mile
		lubricated, and if lock pin is present and securely attached by chain. Pay particular attention for broken spring or worn drawbar.
102	102	**Armor Plate.** Check to see that all cab armor is in good condition and secure, including peep-holes, port covers, and fasteners.
103	103	**Paint and Markings.** Examine paint of entire truck and semitrailer to see if it is in good condition, paying particular attention to any bright spots in finish that might cause glare or reflection. Inspect vehicle markings and identification for legibility. Include identification plates and their mountings, if furnished.
104	104	**Radio Bonding (Suppressors, Filters, Condensers, and Shielding).** See if all bonding connections are in good condition, clean, and secure, and note if all items are securely mounted. NOTE: *Any irregularities, except cleaning and tightening, should be reported to Signal Corps personnel.*
105	105	**Armament.** Check to see that gun mounting and rails are in good condition, clean and secure. NOTE: *Refer all mounted guns, spare gun parts and covers to the armorer or gun commander for all inspections and services.*
		ITEMS SPECIAL TO SEMITRAILER
124	124	**Tow Hitch.** Inspect fifth wheel king-pin connection, tow loops and clevises to see if they are in good condition, secure, and not excessively worn.
		TIGHTEN. Tighten all assembly and mounting nuts securely.
125	125	**Air Connections.** Inspect semitrailer air-line connections to truck to be sure they are in good condition, not excessively worn, and will couple securely without leaking.
127	127	**Landing Gear (Front Supports).** Examine legs, struts, and all coupling and hinge pins to see if they are in good condition, secure and not excessively worn. Lubricate all frictional surfaces by oilcan or hand greasing.
127		TIGHTEN. Draw up all assembly and mounting nuts securely.
		TOOLS AND EQUIPMENT
131	131	**Tools (Vehicle and Pioneer).** Inspect truck and semitrailer standard and Pioneer Tools and semitrailer special loading and securing equipment to see if they

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		are all present (see on vehicle stowage list, paragraph 32), in good condition, clean, and properly stowed, or securely mounted. Also examine tools which have cutting edges to see that they are sharp. Any tools mounted on outside of truck or semitrailer which have bright or polished surfaces, should be painted or otherwise treated to prevent rust, glare, or reflection.
132	132	**Fire Extinguishers.** See if fire extinguishers are in good condition, securely mounted, and fully charged. The charge may be determined on gas-type extinguishers by weighing with a scale, and on liquid-type by shaking. Also be sure nozzles are free from corrosion.
133	133	**Decontaminators.** Check to see that both decontaminators are in good condition, securely mounted, fully charged and nozzles free and clean. Inspect refill date on tags; refill is required every three months.
134	134	**First Aid Kit (if Specified).** See if first aid kit is in good condition and that all of its items are present and properly packed. Report any deficiencies immediately.
135	135	**Publications and Form No. 26.** The truck, semitrailer and equipment manuals, Lubrication Guides, and Standard Form No. 26 (Accident Report Form) should be present, legible, and properly stowed.
136	136	**Traction Devices (Chains).** Examine tire chains to be sure they are in good condition, clean (if not in use), not excessively worn, protected against rust, and properly mounted or stowed.
137	137	**Tow (Chains, Cables, Bar, Rope, Snatch Blocks).** See if the provided towing devices are in good condition, clean, and properly stowed. Tow chains or cables should be properly protected against rust when not in use. If snatch blocks are furnished, check to see that they operate freely.
138	138	**Spare Shear Pins, Fuses and Bulbs.** See that these items when issued are present in correct quantities; that they are in good condition and properly stowed.
139	139	**Fuel, Oil and Water Cans and Brackets.** Inspect for damage, leaks, and loose mountings. Caps must be on chains.
141	141	**Modifications (FSMWO's Completed).** Inspect vehicle to determine if all Field Service Modification Work

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Orders have been completed, and entered on W.D., A.G.O. Form No. 478. Enter any replacement of major unit assemblies made at time of this service.

Final Road Test. Make a final road test, rechecking applicable items 2 to 14 inclusive, and also be sure to recheck the transmission, transfer case, and all driving axles to see that the lubricant is at the correct level and not leaking. Confine this road test to the minimum distance to make necessary observations. NOTE: *Correct or report all deficiencies found during final road test.*

Section XI

ORGANIZATION TOOLS AND EQUIPMENT

36. STANDARD TOOLS AND EQUIPMENT.

a. All standard tools and equipment available to second echelon are listed in SNL-N19.

37. SPECIAL TOOLS.

Tool	Federal Stock Number	Manufacturer's Number
Puller, front axle flange	41-P-2907-450	SES-1-314
Puller, front axle ball joint	41-P-2896	SES-1-201
Strap, engine lifting	41-S-5908	SES-1-103
Spacer, engine lifting	41-S-3868-375	SES-1-140
Stud, engine lifting	41-S-6009-850	SES-1-134
Wrench, oil filter	41-W-2942	SES-1-141

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Section XII

TROUBLE SHOOTING

38. GENERAL.

a. This section contains trouble shooting information and tests which can be made to help determine the causes of some of the trouble that may develop in tanks used under average climatic conditions (about 32°F). Each symptom of trouble given under the individual unit or system is followed by a list of possible causes of the trouble. The tests necessary to determine which one of the possible causes is responsible for the trouble are explained after each possible cause.

39. ENGINE.

a. Engine Will Not Turn.

(1) INTERNAL DAMAGE IN ENGINE. Notify higher authority.

TROUBLE SHOOTING

(2) CRANKING MOTOR INOPERATIVE. See paragraph 44.

(3) BATTERY DISCHARGED. See paragraph 45.

b. Engine Turns, but Will Not Start.

(1) INOPERATIVE FUEL SYSTEM. Remove outlet line at fuel pump and, with ignition switch "OFF," turn engine with cranking motor. If free flow of fuel is not evident, fuel is not reaching carburetor. See paragraph 41.

(2) INOPERATIVE IGNITION SYSTEM. Turn on one ignition switch, then remove cable from a spark plug controlled by the ignition switch turned on, hold cable terminal ¼ inch from cylinder block and crank engine. If a spark does not jump the ¼-inch gap, the ignition is inadequate. See paragraph 43.

c. Engine Does Not Develop Full Power.

(1) IMPROPER IGNITION. See paragraph 43.

(2) OIL TEMPERATURE TOO HIGH. See f (3) below.

(3) IMPROPER VALVE ADJUSTMENT. Check clearance and adjust if necessary. See paragraph 68.

(4) USE OF IMPROPER FUEL. See paragraph 3 for fuel specifications.

(5) PREIGNITION. If the proper octane fuel is being used and the ignition system is functioning satisfactorily, spark plugs of improper heat range may be a cause of trouble (par. 105); otherwise internal engine troubles would be indicated. Notify higher authority.

(6) CLOGGED FUEL FILTER. Clean filter (par. 89).

(7) CLOGGED FUEL STRAINER IN CARBURETOR. Clean (par. 85).

(8) AIR LEAKS AT CARBURETOR OR MANIFOLD FLANGES. With engine running at 800 revolutions per minute, apply a small amount of oil at carburetor gaskets and manifold flanges. If oil is sucked in, there is evidence of a leak. Notify higher authority.

(9) LOW ENGINE COMPRESSION OR IMPROPER VALVE TIMING. If the engine does not develop full power with fuel reaching the combustion chambers and with adequate ignition and sufficient oil in the engine lubrication system, low compression or improper valve timing would be indicated. Notify higher authority.

(10) INCORRECT GOVERNOR SETTING. Disconnect governor linkage at the carburetor and check for sprung linkage or stuck throttle. If the throttle and linkage operate freely, start the engine and accelerate; if speed of 2,400 revolutions per minute is reached, the governor is faulty. Replace governor or adjust governor (par. 91).

d. Engine Misfires.

(1) FAULTY IGNITION SYSTEM (par. 43).

(2) LOW ENGINE COMPRESSION. See c (9) above.

(3) INCORRECT CARBURETOR ADJUSTMENT. Adjust carburetor (par. 65).

(4) CLOGGED FUEL TANK CAP VENTS. Open vents or replace cap.

(5) RESTRICTED FUEL FLOW (par. 87).

(6) WATER IN FUEL. Remove drain plug at bottom of filter and inspect for water.

e. Excessive Oil Consumption.

(1) OIL VISCOSITY TOO LOW. Drain and refill with proper grade of oil (par. 30).

(2) EXTERNAL OIL LEAKS. Inspect for external oil leakage at oil line connections.

(3) OVERHEATED COMBUSTION CHAMBERS. Check oil temperature

f. Engine Will Not Stop.

(1) FAULTY CARBURETOR. Replace (par. 85).

(2) DEFECTIVE IGNITION SWITCHES OR WIRING (par. 43).

(3) OVERHEATED COMBUSTION CHAMBERS. Check oil temperature gage for evidence of high oil temperature. Determine if all cooling surfaces of the engine are free of dirt and oil. Remove obstructions from engine oil cooler; see that radiator doors are open. Test for clogging in oil filters and oil cooler.

40. CLUTCH.

a. Clutch Drag. Idle the engine at 800 revolutions per minute, then push the clutch pedal to its fully released position and allow time for the clutch to stop. Shift the main transmission into first or reverse gear. If the shift cannot be made without a severe clash of the gears or if, after engagement of the gears, there is a jumping or creeping movement of the vehicle with the clutch still fully released, the clutch is at fault.

(1) EXCESSIVE PEDAL CLEARANCE. Adjust clutch linkage (par. 79).

(2) WARPED OR CRACKED DRIVEN PLATE. Replace damaged parts (par. 82).

b. Clutch Slips.

(1) IMPROPER CLUTCH ADJUSTMENT. Adjust clutch (par. 78).

(2) DIRT IN CLUTCH CAUSING BINDING OF DRIVEN PLATE. Disassemble and clean or replace driven plate.

(3) CLUTCH DRIVEN PLATE FACINGS WORN. Replace plate.

c. Complete Failure of Clutch to Engage or Release.

(1) DISCONNECTED CLUTCH LINKAGE OR BINDING IN CLUTCH LINKAGE. Inspect linkage and replace parts (par. 79).

(2) BROKEN OR DAMAGED CLUTCH PLATES. Replace damaged plates (par. 82).

(3) DAMAGED CLUTCH PILOT BEARING. Replace (par. 80).

(4) EXCESSIVE FREE PLAY IN CLUTCH PEDAL. Adjust pedal free play (par. 78).

TROUBLE SHOOTING

41. FUEL SYSTEM.

a. Fuel Does Not Reach Carburetor.

(1) LACK OF FUEL. Check right and left tank fuel gages on instrument panel and, if necessary, replenish fuel.

(2) GASOLINE TANK FILLER CAP VENTS CLOGGED. Open hole in filler cap with a piece of wire.

(3) INOPERATIVE FUEL PUMP, CLOGGED FUEL FILTER OR LINES. Remove drain plug from fuel filter, start engine and check fuel flow from the tanks. If the fuel does not flow freely at the filter, clean or replace lines leading to fuel tanks.

(4) SERVICE FUEL FILTER (par. 89). If the fuel flows freely through filter but does not reach carburetor, the fuel pump is inoperative. Replace pump (par. 84).

b. Fuel Does Not Reach Cylinders.

(1) CARBURETOR STRAINER CLOGGED. Clean or replace (par. 85).

(2) THROTTLE NOT OPENING. Adjust carburetor (par. 65).

(3) CARBURETOR JETS CLOGGED. Replace carburetor (par. 85).

(4) LOW FUEL PUMP PRESSURE. Test fuel pump (pars. 65 and 85) and replace if necessary (par. 85).

42. COOLING SYSTEM.

a. Overheating.

(1) LACK OF WATER. Fill cooling system (par. 95).

(2) ANTIFREEZE SOLUTION WEAK. Test antifreeze solution and refill if necessary.

(3) WATER PUMP INOPERATIVE. Remove outlet hose from pump, start engine and observe flow of water. If no flow of water is seen, replace water pump (par. 99).

(4) FAN BELTS LOOSE OR BROKEN. Adjust or replace fan belts (par. 97).

(5) THERMOSTAT STICKING. Start engine and observe water temperature gage. If water temperature continues to rise after engine has reached a normal operating temperature, it indicates thermostat is inoperative. Replace (par. 98).

(6) COOLING SYSTEM CLOGGED. Clean cooling system (par. 95).

(7) BRAKES DRAGGING. Adjust brakes (par. 171).

(8) ENGINE OIL SUPPLY LOW. See paragraph 72.

b. Engine Slow in Reaching Normal Operating Temperature.

(1) THERMOSTAT NOT CLOSING. Start engine and observe water temperature gage. If water temperature does not rise rapidly to a normal operating temperature it indicates thermostat is inoperative. Replace (par. 98).

(2) WATER TEMPERATURE GAGE INOPERATIVE. Replace gage (par. 199).

c. Leaking.

(1) HOSE DEFECTIVE OR LOOSE. Tighten hose connections and if leaking continues, replace hose (par. 99).

(2) WATER PUMP PACKING WORN. If there is leakage around water pump drive shaft, replace pump (par. 99).

(3) RADIATOR CORE DAMAGED. If leaking is at radiator and at the tanks or core, replace radiator (par. 101).

43. IGNITION SYSTEM.

a. Engine Will Not Start.

(1) LOOSE OR CORRODED CONNECTIONS IN THE AMMETER, IGNITION SWITCHES, COILS OR DISTRIBUTOR. Remove ignition wiring, clean terminals with crocus cloth and replace wiring.

(2) CRACKED, OIL SOAKED, WET, CHAFED OR WORN HIGH-TENSION WIRE INSULATION. Clean all high-tension wiring and inspect for damaged insulation or oil and replace if found.

(3) HIGH-TENSION WIRES NOT INSTALLED ACCORDING TO ENGINE FIRING ORDER. Install wiring as instructed in paragraph 106.

(4) BREAKER POINT GAPS TOO WIDE OR BREAKER POINTS NOT SYNCHRONIZED. Adjust points (par. 104).

(5) DISTRIBUTOR CAP CRACKED. Replace cap.

(6) IGNITION COILS CRACKED OR BROKEN. Replace coils.

(7) IGNITION COILS WET OR DIRTY. Remove coils, wipe off with dry cloth, then blow dry with compressed air.

b. Improper Ignition.

(1) IGNITION SWITCHES OR WIRING FAULTY. If engine runs unevenly there may be a ground in either of the ignition switches or in the wiring. Run the engine with the right ignition switch on, and the left off. Then reverse the procedure and determine which circuit is at fault. Inspect wiring for loose terminals, corroded terminals and broken insulation. Remove, clean, and adjust spark plugs, then replace plugs and repeat test above. If engine continues to run unevenly, replace ignition coil.

44. CRANKING MOTOR AND GENERATING SYSTEM.

a. Cranking Motor Will Not Operate.

(1) IGNITION SWITCHES NOT TURNED ON. Turn both ignition switches on. The engine will start more easily if both switches are in their "ON" position.

(2) BATTERIES DISCHARGED OR IN LOW STATE OF CHARGE. Test batteries as instructed in tune-up (par. 65). Recharge or replace batteries.

(3) DEFECTIVE MAGNETIC STARTING SWITCH. Test as instructed in tune-up (par. 65) and replace.

(4) BATTERY OR ENGINE GROUND CONNECTION FAULTY. Inspect condition of battery ground strap and engine ground strap and if

broken replace. If straps are in good condition, remove and clean, then replace and tighten securely.

(5) BATTERY TERMINALS CORRODED OR CONNECTIONS LOOSE. Remove battery connections and clean, then replace and tighten securely.

(6) STARTING SWITCH BROKEN. Use a short piece of wire and connect it at head and behind the switch so that the switch is bypassed, then attempt to start engine again. If engine will start with switch bypassed, replace switch.

(7) BROKEN STARTING PINION OR BENDIX SPRING; STARTING DRIVE DIRTY OR GUMMED. Replace cranking motor (par. 110).

(8) BROKEN FLYWHEEL RING GEAR. Remove handle cover on flywheel housing and inspect condition of flywheel ring gear. If broken notify higher authority.

(9) CRANKING MOTOR INOPERATIVE DUE TO LOOSE TERMINAL CONNECTIONS OR TERMINALS DAMAGED. Replace cranking motor.

45. BATTERIES AND LIGHTING SYSTEM.

a. Batteries Run Down.

(1) FAULTY BATTERIES. Test batteries (par. 65).

(2) IGNITION SWITCHES LEFT ON WHEN NOT IN USE. Turn switches off when not in use.

(3) FAULTY MAGNETIC STARTING SWITCH TEST (par. 65). If found to be at fault, replace.

(4) GROUNDED DISTRIBUTOR TEST (par. 65). If found to be at fault, replace.

(5) INOPERATIVE VOLTAGE REGULATOR TEST (par. 65). If found to be at fault, replace.

(6) FAULTY IGNITION COILS TEST (par. 65). If found to be at fault, replace.

(7) FAULTY GENERATOR TEST CHARGING RATE (par. 65). If found to be at fault, replace.

b. Ammeter Does Not Show Charge.

(1) VOLTAGE REGULATOR CIRCUIT BREAKER OPEN. Replace voltage regulator.

(2) AMMETER INOPERATIVE. If the ammeter fails to register a charge, turn on all lights and see if a discharge is shown. If no discharge is observed, connect a new ammeter temporarily to the leads in the instrument panel. If a reading is obtained, the ammeter is faulty. If no reading is obtained, test wiring leading to ammeter.

(3) VOLTAGE REGULATOR INOPERATIVE. Test regulator as in paragraph 65, Tune-up.

(4) GENERATOR INOPERATIVE (par. 65, Tune-up).

(5) LOOSE OR CORRODED CONNECTIONS. Clean and tighten connections.

(6) GROUND STRAP LOOSE OR BROKEN. Inspect and tighten or replace ground strap.

c. Ammeter Shows Excessive Charge.

(1) VOLTAGE REGULATOR CURRENT REGULATOR IMPROPERLY ADJUSTED. Replace voltage regulator.

(2) BATTERIES RUN DOWN. Test batteries (par. 65). Recharge or replace.

(3) BATTERIES SHORTED INTERNALLY. Test batteries and replace if faulty.

d. Ammeter Shows Discharge with Engine Running.

(1) GENERATOR NOT OPERATING. Replace generator.

(2) REGULATOR CIRCUIT BREAKER CUT-IN. Voltage too high, replace voltage regulator.

(3) SHORT CIRCUITS. Test battery voltage regulator and generator as instructed in Tune-up (par. 65).

(4) GENERATOR DRIVE CHAIN LOOSE OR BROKEN. Notify higher authority.

e. Ammeter Shows Heavy Discharge with Engine Stopped.

(1) SHORT CIRCUITS. See **d** (3) above. Regulator circuit breaker points stuck. Test voltage regulator as instructed in Tune-up (par. 65).

(2) AMMETER HAND STICKS OR AMMETER BURNED OUT. Replace ammeter.

f. Ammeter Hand Fluctuates Rapidly.

(1) GENERATOR DRIVE CHAIN LOOSE OR BROKEN. Notify higher authority.

(2) REGULATOR CIRCUIT BREAKER CUT-IN VOLTAGE TOO LOW OR CONTACTS BURNED. Test voltage regulator (par. 65).

(3) VOLTAGE REGULATOR LOOSELY MOUNTED OR COVER LOOSE. Tighten regulator on mounting and tighten cover.

(4) GENERATOR OR REGULATOR FAULTY. Tighten all voltage regulator bolts and mounting. If needle continues to fluctuate, the condition is probably caused by an incorrect setting of the regulator circuit breaker, worn generator brushes, faulty regulator drive chain or drive coupling. Connect a jumper wire between the battery terminal and armature terminal marked "A" in the voltage regulator. If the fluctuation stops with the jumper wire connected, it indicates that the regulator circuit breaker points have been vibrating; replace the voltage regulator. If the fluctuation continues, it indicates that the generator is at fault; replace the generator (par. 108).

g. All Lights Will Not Burn.

(1) MAIN LIGHT SWITCH TURNED OFF. Turn switch on.

(2) FAULTY OR DISCHARGED BATTERY. See paragraph 65.

(3) LOOSE OR CORRODED TERMINALS. Clean and tighten connections.

(4) FAULTY LIGHT SWITCH OR SHORT CIRCUITS. Turn on main light switch and instrument panel light switch. If battery connections

and wiring are satisfactory, the panel light will burn, indicating that current is reaching the instrument panel. If lights controlled by light switch fail to operate, try light switch in its various positions, and if the switch and wiring connections inside the panel and the conduit connections on the back of the panel are satisfactory, some of the lights will burn. Locate the burned-out fuse and replace with new one. Turn on switch and if fuse burns out a second time it will indicate a short in that circuit. Test that circuit for trouble and correct. If no short exists and lights controlled by light switch do not function, loose wiring connections or a faulty main lighting switch are indicated. Inspect for loose connections or replace switch.

h. All Lights Burn Dim.

(1) BATTERY DISCHARGED OR LOOSE OR CORRODED TERMINALS (par. 65).

(2) SWITCH CONTACT BURNED. Replace switch.

(3) LOOSE CONNECTIONS IN INSTRUMENT PANEL FEED WIRES CAUSING HIGH RESISTANCE. Tighten connections.

i. One or More Lamp-units Burn Out Continually.

(1) GROUND STRAPS OR CONNECTIONS LOOSE OR BROKEN. Clean and tighten all connections. Replace broken ground straps.

(2) BATTERY GROUND CABLE LOOSE OR BROKEN. Tighten or replace cable.

(3) VOLTAGE REGULATOR IMPROPERLY ADJUSTED. See paragraph 65.

46. TRANSFER CASE, MAIN AND AUXILIARY TRANSMISSIONS.

a. Lubricant Leakage.

(1) LOOSE DRAIN PLUGS. Tighten.

(2) OIL SEALS OR GASKETS DEFECTIVE. Inspect main and auxiliary transmissions for leakage of lubricant around oil seals and gaskets and if found, notify higher authority.

b. Main Transmission Gears Cannot Be Shifted. Replace the transmission (par. 131).

c. Auxiliary Transmission Gears Cannot Be Shifted. Replace the transmission (par. 131).

d. Hard Shifting and Severe Gear Clash.

(1) CONTROLS AND LINKAGE IMPROPERLY ADJUSTED. Adjust controls and linkage (par. 132).

(2) INCORRECT CLUTCH LINKAGE ADJUSTMENT. Adjust (par. 79).

(3) CLUTCH DRAGGING. Adjust clutch (par. 78).

(4) DAMAGED TRANSMISSION PARTS. Notify higher authority.

e. Backlash.

(1) WORN OR DAMAGED TRANSMISSION PARTS. Notify higher authority.

(2) WORN OR DAMAGED PROPELLER SHAFTS AND UNIVERSAL JOINT. Replace.

47. PROPELLER SHAFTS AND UNIVERSAL JOINTS.

a. Backlash.

(1) WORN OR DAMAGED UNIVERSAL JOINT OR INCORRECT BEARINGS. Replace (par. 140).

(2) LOOSE BOLTS AT UNIVERSAL JOINT COMPANION FLANGES. Tighten bolts.

b. Vibration in Propeller Shaft.

(1) WORN OR DAMAGED UNIVERSAL JOINT. Replace.

(2) LOOSE BOLTS AT UNIVERSAL JOINT COMPANION FLANGE. Tighten flange bolts.

48. FRONT AXLE.

a. Jerky Operation of Front Wheels.

(1) WHEELS OUT OF ALINEMENT. Adjust toe-in (par. 143).

(2) TIE ROD WORN OR BENT. Replace tie rod (par. 143).

(3) KNUCKLE BEARING ROLLERS AND CUPS SCORED OR WORN. If trouble shooting of steering system (par. 54) does not remedy trouble, notify higher authority as knuckle bearings are probable cause.

(4) WHEEL BEARINGS OUT OF ADJUSTMENT. Adjust wheel bearings (par. 176).

b. Impossible to Engage Front Axle.

(1) TRANSFER CASE INOPERATIVE. Check linkage to transfer case (par. 135), and if satisfactory, replace auxiliary transmission (par. 133).

(2) DIFFERENTIAL INOPERATIVE. Disconnect propeller shaft and try to turn drive pinion. If it is impossible to turn, replace axle assembly (par. 146).

c. Vehicle Wanders to One Side.

(1) BRAKE SHOES DRAGGING. Adjust brake shoes (par. 171).

(2) WHEEL BEARINGS OUT OF ADJUSTMENT. Adjust bearings (par. 176).

(3) STEERING GEAR OUT OF ADJUSTMENT. Adjust (par. 187).

49. REAR AXLE TANDEM UNIT.

a. Continuous Noise When Driving.

(1) WHEEL BEARINGS TOO TIGHT. Adjust wheel bearings (par. 176).

(2) DRIVE CHAINS TOO TIGHT. Adjust drive chains.

(3) RADIUS RODS IMPROPERLY ADJUSTED. Adjust radius rods.

b. Backlash. (Jerky operation when starting and stopping.)

(1) AXLE AND JACKSHAFT LOOSE. Tighten (par. 149) or replace (par. 149).

(2) DRIVE CHAINS TOO LOOSE. Adjust drive chains (par. 146).

(3) DIFFERENTIAL AND SIDE GEAR THRUST WASHER WORN. Notify higher authority.

(4) INCORRECT ADJUSTMENT BETWEEN BEVEL GEAR AND BEVEL PINION. Notify higher authority.

c. Noise and Unbalanced Condition at Rear of Vehicle.

(1) COIL SPRINGS BROKEN. Replace (par. 179).

(2) RADIUS RODS OUT OF ADJUSTMENT. Adjust (par. 146).

(3) DRIVE CHAINS BROKEN. Replace (par. 146).

(4) DRIVE CHAIN OILER INOPERATIVE. Service drive chain oiler (par. 147).

50. SERVICE BRAKE SYSTEM.

a. Air Pressure Builds Up Slowly in Reservoirs.

(1) LEAKING BRAKE VALVE. Start engine and allow it to run until the air pressure gage shows 60 pounds or over. Then stop the engine and place all brake valves in their released positions. Observe the drop in the reservoir pressure as registered by the air gage. The drop should not exceed three pounds per minute. Repeat the procedure, this time with the brake valves in their applied position. The drop in air pressure should not exceed five pounds per minute. Then check the brake valve delivery pressure by connecting an accurate air test gage to the service line outlet at the rear of the tractor and open the service line outlet cock. When the foot-operated brake valve is depressed to its fully applied position, the air test gage should register approximately the full reservoir pressure as is registered on the dash air pressure gage. When the hand-operated brake valve, immediately in front of the driver, is moved to its fully applied position, the air test gage should register at least 60 pounds pressure. Then make an operating test which must be done with the tractor connected to the trailer. First, test the operation of the foot-operated brake valve by depressing the pedal to its applied position and check to be sure that the brakes on both the tractor and trailer apply and release properly. Second, check the operation of the hand-operated brake valve immediately in front of the driver by moving it to its applied position and observe that only the trailer brakes are applied. Third, check the operation of the hand-operated brake valve on the driver's right-hand side of the steering column by moving it to its applied position and observe that only the brakes on the right rear tractor wheels are applied. Fourth, check the operation of the hand-operated brake valve on the driver's left-hand side of the steering column by moving it to its applied position and observe that only the brakes on the left rear tractor wheels are applied.

(2) LEAKING AIR COMPRESSOR DISCHARGE VALVES. Replace air compressor.

(3) LEAKING LINES OR CONNECTIONS. Apply soapsuds at connections and if air bubble appears, replace tubing and fittings, or tighten fittings.

(4) NO CLEARANCE AT COMPRESSOR UNLOADER VALVE. Check and adjust clearance to 0.010 inch minimum to 0.015 inch maximum.

(5) CLOGGED AIR CLEANERS. Clean air cleaners.

(6) WORN AIR COMPRESSOR PISTON RINGS. Replace air compressor.

(7) CARBON IN AIR COMPRESSOR DISCHARGE LINE. Replace discharge line.

b. Quick Loss of Reservoir Pressure When Engine is Stopped and Brakes are Released.

(1) WORN OR LEAKING COMPRESSOR DISCHARGE VALVES. Replace compressor.

(2) TUBING OR CONNECTIONS LEAKING. Replace tubing and fittings or tighten fittings.

(3) LEAKING BRAKE VALVES. See **a** (2) above.

(4) LEAKING GOVERNOR. Observe at what pressure, registered by the air gage, the governor cuts out and compression is stopped. This pressure should be approximately 100 to 105 pounds. Then while slowly reducing the air pressure in the reservoir and operating one of the brake valves observe at what pressure the governor cuts in and compression is resumed. This pressure should be approximately 80 to 85 pounds.

c. Quick Drop in the Reservoir Air Pressure When Brakes are Applied.

(1) LEAKING BRAKE VALVE. See **a** (2) above.

(2) LEAKING DOUBLE CHECK VALVE. Replace valve.

(3) LEAKING BRAKE CYLINDER PACKING CUP. Replace brake cylinder.

(4) LEAKING RELAY VALVE. Replace valve.

(5) LEAKING LINES OR CONNECTIONS. See **a** (3) above.

d. Pressure in Air Brake System Rises Above 105 Pounds Due to Compressor Not Unloading.

(1) BROKEN UNLOADER DIAPHRAGM IN THE COMPRESSOR CYLINDER HEAD. Replace compressor.

(2) CLEARANCE TOO GREAT AT COMPRESSOR UNLOADER VALVES. Adjust clearance 0.210 inch minimum, 0.215 inch maximum.

(3) RESTRICTION IN LINE FROM GOVERNOR TO COMPRESSOR UNLOADING MECHANISM. Replace air line.

(4) GOVERNOR NOT OPERATING. See **b** (4) above.

e. Slow Brake Application.

(1) LOW BRAKE VALVE DELIVERY PRESSURE. Replace brake valve.

(2) RESTRICTION IN TUBING OR HOSE. Replace tubing or hose.

(3) LEAKING BRAKE VALVE DIAPHRAGM OR PISTON PACKING CUP. Replace brake valve.

(4) DEFECTIVE DOUBLE CHECK VALVE. Replace valve.

f. Slow Brake Release.

(1) RESTRICTION IN TUBING OR HOSE. Replace tubing or hose.

(2) FAULTY BRAKE VALVE. Replace valve.

g. Insufficient Brakes.

(1) RESTRICTION IN TUBING OR HOSE. Replace tubing or hose.

(2) BRAKE LINING WORN EXCESSIVELY OR BRAKES OUT OF ADJUSTMENT. Replace brake shoes (par. 171) or adjust brakes (par. 171).

(3) TRACTOR AIR BRAKE EQUIPMENT IMPROPERLY CONNECTED TO SEMITRAILER. Check hose lines from tractor to semitrailer for proper connection. Make certain that the cut-out cocks in the air lines are open. Cocks are open when handles are across the pipe.

(4) COMPRESSOR FAILS TO MAINTAIN ADEQUATE SUPPLY OF AIR PRESSURE. Check air brake system for leaks by using soapsuds and if leak is not found, replace air compressor.

51. PROPELLER SHAFT BRAKE SYSTEM.

a. Brake Does Not Hold.

(1) NORMAL WEAR OF BRAKE SHOE LINING. Adjust brake (par. 171).

(2) BRAKE SHOES IMPROPERLY ADJUSTED. Adjust shoes (par. 171).

(3) BRAKE SHOE LINING BURNED OR GLAZED. Replace brake shoes (par. 171).

(4) BRAKE DISK BURNED AND WARPED. Notify higher authority.

(5) BRAKE CONTROLS AND LINKAGE OUT OF ADJUSTMENT. Adjust linkage (par. 171).

52. WHEELS, HUBS, WHEEL BEARINGS, AND TIRES.

a. Wheels Pounding.

(1) LOOSE HUB BEARINGS. Adjust bearings (par. 176).

(2) WHEEL CAP NUTS LOOSE. Tighten nuts.

b. Difficult Steering.

(1) TIRES UNDERINFLATED. Inflate tires.

c. Pulls to One Side.

(1) TIRES UNEVENLY INFLATED. Inflate tires.

d. Excessive or Uneven Tire Wear.

(1) TIRES UNDERINFLATED. Inflate tires.

(2) IMPROPER TOE-IN. Adjust toe-in.

e. Shimmy.

(1) BENT FRONT WHEEL. Install new wheel (par. 175).

(2) LOOSE BEARINGS. Adjust bearings (par. 176).

(3) STEERING CONNECTIONS LOOSE (par. 189).

(4) IMPROPER CASTER OR CAMBER. Notify higher authority.

53. SPRINGS AND SHOCK ABSORBERS.

a. Frame Strikes Bottom.

(1) REAR COIL SPRINGS BROKEN. Replace (par. 179).

(2) FRONT SPRINGS BROKEN. Replace (par. 178).

(3) SHOCK ABSORBERS INOPERATIVE. Replace (par. 180).

b. Hard Riding.

(1) INSUFFICIENT CHASSIS LUBRICATION. Lubricate (par. 30).

(2) SHACKLE PINS SEIZED. Replace (par. 178).

(3) SHOCK ABSORBERS INOPERATIVE. Replace (par. 180).

54. STEERING GEAR AND HYDRAULIC SYSTEM.

a. Hard Steering.

(1) HYDRAULIC PUMP INOPERATIVE. Remove line from pump to steering gear and observe flow of oil. Oil should have strong flow and under 750 pounds pressure; if not, replace hydraulic pump (par. 182).

(2) HYDRAULIC CYLINDER WORN AND SCORED. Remove line from cylinder and observe flow of oil. Oil should have strong flow and under 750 pounds pressure; if not, replace cylinder (par. 183).

(3) NO OIL IN HYDRAULIC OIL TANK. Fill tank (par. 185).

b. Road Shock Causing Kick-back at Steering Wheel.

(1) HYDRAULIC SYSTEM OUT OF ADJUSTMENT. Notify higher authority.

55. BODY AND FRAME.

a. Truck Wanders.

(1) BENT FRAME. Notify higher authority.

b. Excessive Noise.

(1) CAB WELDS BROKEN OR CAB LOOSE. Weld cab or tighten cab mounting bolts.

(2) FRAME BROKEN, BRACKETS LOOSE. Notify higher authority.

56. INSTRUMENTS.

a. Any Instrument Inoperative. Tighten wiring or line connections and if instrument still does not operate, replace with new part.

b. Tachometer Inoperative.

(1) BROKEN OR KINKED CABLE. Replace cable.

(2) FAULTY TACHOMETER DRIVEHEAD. Replace head.

(3) TACHOMETER ADAPTER BROKEN. Replace adapter.

(4) TACHOMETER BROKEN. Replace tachometer.

57. FRONT WINCH.

a. Front Winch Drum Fails to Operate with Propeller Shaft Turning.

(1) BROKEN SHEAR PIN. Replace pin.

b. Winch Clutch Sticks on Drum Shaft.

(1) DRUM SHAFT RUSTY OR DIRTY. Clean and lubricate drum shaft and winch clutch.

c. Front Winch Jaw Clutch Slips Out.

(1) CLUTCH JAWS ARE WORN. Notify higher authority.

(2) SPROCKET TEETH ARE WORN. Notify higher authority.

d. Oil Leaks at Front Winch Jaw Clutch.

(1) FELTS IN RETAINER PLATE AND COVER ARE WORN. Notify higher authority.

(2) DRIVE SHAFT BEARING AT SPROCKET WORN. Notify higher authority.

e. Propeller Shaft Pounds.

(1) BUSHINGS IN UNIVERSAL JOINT YOKE WORN. Replace propeller shaft assembly.

(2) DOUBLE BEARINGS WORN. Replace (par. 204).

58. TANDEM REAR WINCHES.

a. Winch Drum Fails to Operate.

(1) BROKEN SHEAR PIN. Replace universal joint shear pin.

b. Oil Leaks when Ball Bearings on Drum Shaft Are Worn. Notify higher authority.

(1) OIL SEALS WORN. Notify higher authority.

(2) DRUM SHAFT BUSHINGS WORN.

(3) DRUM SHAFT SLEEVE WORN. Notify higher authority.

c. Winch Fails to Hold Load.

(1) SAFETY BRAKE SPRING TOO LOOSE. Service safety brake (par. 212).

(2) BRAKE LINING WORN OR DEFECTIVE. Adjust or replace safety brake shoe.

d. Winch Brake Overheats. Adjust safety or drag brake.

e. Chain Tightener Noisy.

(1) DRIVE CHAIN TOO TIGHT. Notify higher authority.

(2) DRIVE CHAIN WORN. Notify higher authority.

f. Drive Chain has Jerky Action.

(1) CHAIN SPROCKETS WORN. Notify higher authority.

g. Drive Chain Comes Off while Operating.

(1) CHAIN IS TOO LOOSE. Notify higher authority.

h. Winch Clutch Sticks on Drum Shaft.

(1) DRUM SHAFT RUSTY OR DIRTY. Clean and lubricate drum shaft and winch clutch.

i. Winch Jaw Clutch Slips Out.

(1) CLUTCH JAWS WORN. Notify higher authority.

j. Pound in Drive Shaft.

(1) BUSHINGS AND YOKES WORN. Replace drive shaft assembly.

(2) DRIVE SHAFT BEARINGS WORN. Replace drive shaft assembly.

k. Tandem Rear Winch Gearshift Inoperative. Replace tandem rear winch.

(1) FRONT MOUNTED WINCH NOISY AND WILL NOT RETRIEVE LOAD. Replace winch (pars. 205-206).

59. SEMITRAILER BRAKE SYSTEM.

a. No Brakes.

(1) SOURCE OF AIR SUPPLY SHUT OFF AT TRUCK. Open shut-off valves at rear of towing vehicle.

(2) AIR JUMPER HOSE BETWEEN TRUCK AND SEMITRAILER NOT PROPERLY COUPLED. Make certain air jumper hose tagged service is coupled to connection on semitrailer tagged service. Service line is on the right side of semitrailer.

(3) LOW BRAKE LINE PRESSURE. Check air pressure gage on towing vehicle. Pressure must not be below 60 pounds.

b. One or More Brakes Running Hot.

(1) IMPROPER ADJUSTMENT. Give brake minor brake adjustment.

(2) GUIDE RETURN SPRING BROKEN IN HUB. Replace spring.

(3) LACK OF LUBRICATION. Lubricate all linkage.

(4) DRIVING WITH HAND OR FOOT CONTROL IN OR PARTLY IN THE APPLIED POSITION. Place brake control lever in the released position.

(5) BENT BRAKE ROD. Straighten or replace.

(6) PILED-UP MUD OR GRAVEL IN HOLLOW SECTION OF WALKING BEAM. Remove brake cylinder carrier and clean.

c. Slow Brake Application or Slow Release.

(1) LOW BRAKE LINE PRESSURE. Check air pressure at towing vehicle.

(2) EXCESSIVE TRAVEL IN CYLINDER PUSH ROD. Give brakes a minor adjustment.

(3) BINDING LEVERS AND CLEVIS PINS, LACK OF LUBRICATION. Lubricate clevis pins and levers.

(4) DIRTY AIR CLEANER. Clean air cleaner.

d. Drop in Air Pressure.

(1) EXCESSIVE LEAKAGE IN RELAY-EMERGENCY VALVE EXHAUST PORT. Worn check valve body. Replace relay-emergency valve.

(2) AIR LEAKAGE AT TUBING CONNECTORS. Paint connector fitting with soapy water; tighten connector body and then the connector nut until leak disappears.

(3) EXCESSIVE LEAKAGE AT SERVICE LINE OR EMERGENCY LINE COUPLINGS DUE TO DAMAGED PACKING RING IN HOSE COUPLING. Replace hose coupling.

(4) EXCESSIVE LEAKAGE AT SERVICE LINE COUPLING WHEN JUMPER HOSE IS DISCONNECTED DUE TO DIRTY OR WORN INLET VALVE. Replace one or both relay-emergency valves.

(5) EXCESSIVE LEAKAGE AT EMERGENCY LINE COUPLING WHEN JUMPER HOSE IS DISCONNECTED DUE TO DEFECTIVE CHECK VALVE DISK OR DEFECTIVE DIAPHRAGM. Replace one or both relay-emergency valves.

e. Brake Drags.

(1) GREASE RETAINER IN HUB DAMAGED OR WHEEL BEARINGS OVERLUBRICATED. Replace hub grease retainer felt, or properly lubricated hub bearings.

60. SEMITRAILER LIGHTING SYSTEM.

a. All Lights Will Not Burn.

(1) LIGHT JUMPER CABLE NOT FULLY PLUGGED INTO COUPLING LIGHT SOCKET. Plug jumper cable into coupling light socket.

(2) LIGHT SWITCH OFF. Turn switch on.

(3) CORRODED TERMINAL BLADES. Clean.

(4) FUSES BURNED OUT. Replace fuses. Fuses are 20-ampere, 1 inch x ¼ inch.

b. Individual Lights or Circuits Inoperative.

(1) LAMP BURNED OUT. Replace lamp.

(2) LOOSE CONNECTION OR GROUND AT LIGHT. Tighten or clean.

(3) SHORT CIRCUITS OR GROUNDS. See Part Three, this manual.

c. Dim Lights.

(1) INSUFFICIENT VOLTAGE. Check source of supply, which will be the jumper cable between towing vehicle and semitrailer. Make certain each terminal blade has current flowing through blade.

(2) DIRTY LENS. Remove lens and clean.

(3) LAMP OF IMPROPER VOLTAGE USED. Clearance lamp should be 12-volt, three-candlepower, single-contact.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

61. SEMITRAILER WALKING BEAM.

a. Noisy.

(1) TRUNNION SHAFT LOOSE IN ITS MOUNTINGS. Tighten cap screws and stud nut holding trunnion shaft to mounting bracket.

(2) SHIFTING SCREW LOOSE. Tighten special nuts located on inner side of shifting bracket.

(3) EXCESSIVE WEAR IN WALKING BEAM BUSHING. Notify higher authority, or replace walking beam.

(4) WHEELS RUNNING OUT OF ALINEMENT. Bent walking beam. Notify higher authority.

62. SEMITRAILER TRUNNION AXLE.

a. Noisy.

(1) TRUNNION AXLE LOOSE. Tighten nut holding trunnion axle to walking beam.

(2) BUSHING WORN. Notify higher authority or replace trunnion axle.

b. Wobbly Wheel.

(1) BENT TRUNNION AXLE. If wheel is tight and hub bearings are properly adjusted, a bent trunnion axle is indicated. Notify higher authority or replace.

63. SEMITRAILER HUBS AND DRUMS.

a. Hub Bearings Running Hot. Insufficient lubrication or improper wheel bearing adjustment, lubricate and adjust wheel bearings.

b. Wheel Wobbles. Loose stud nuts or hub bearings out of adjustment. Tighten stud nuts holding wheel to hub or adjust hub bearings.

c. Lubricant Leaking Out of Hub onto Brake Lining. Overlubricated or grease retainer damaged. Replace felt retainer and lubricate wheel bearing properly.

d. Tires Rubbing Semitrailer Frame. Walking beam is not moved to the extreme out position. Adjust shifting screw.

Section XIII

ENGINE DESCRIPTION, DATA, MAINTENANCE, AND ADJUSTMENT IN VEHICLE

64. DESCRIPTION AND DATA.

a. Description (figs. 83 and 84). The engine is a six-cylinder Hall-Scott internal combustion gasoline engine with overhead valves and camshaft. The engine consists of four major assemblies which are the cylinder head, cylinder block, upper crankcase, and lower crankcase. Attached to the exterior of the right side of the engine are the cranking motor and oil filters. The carburetor, generator, distributor, ignition coils, fuel pump, air compressor, and hydraulic oil pump are on the left side. The water pump, fan, and oil cooler are secured to the front of the engine. The engine is mounted on the frame and is inside the cab where removable side covers provide access to it. The engine top cover is bolted in place.

b. Data.

Make	Hall-Scott
Model	440 Hall-Scott
Number of cylinders	6
Bore	5¾ in.
Stroke	7 in.
Firing order	1-4-2-6-3-5
Displacement	1,090 cu in.
Rated net horsepower at 2,000 rpm	240
Maximum permissible engine speed:	
Short periods	2,100 rpm
Sustained	1,800 rpm
Oil capacity (to refill engine)	6 gal
Weight of engine with accessories	2,100 lb
Octane rating of fuel for maximum efficiency	72 to 87
Serial number location	Upper crankcase (exhaust side)

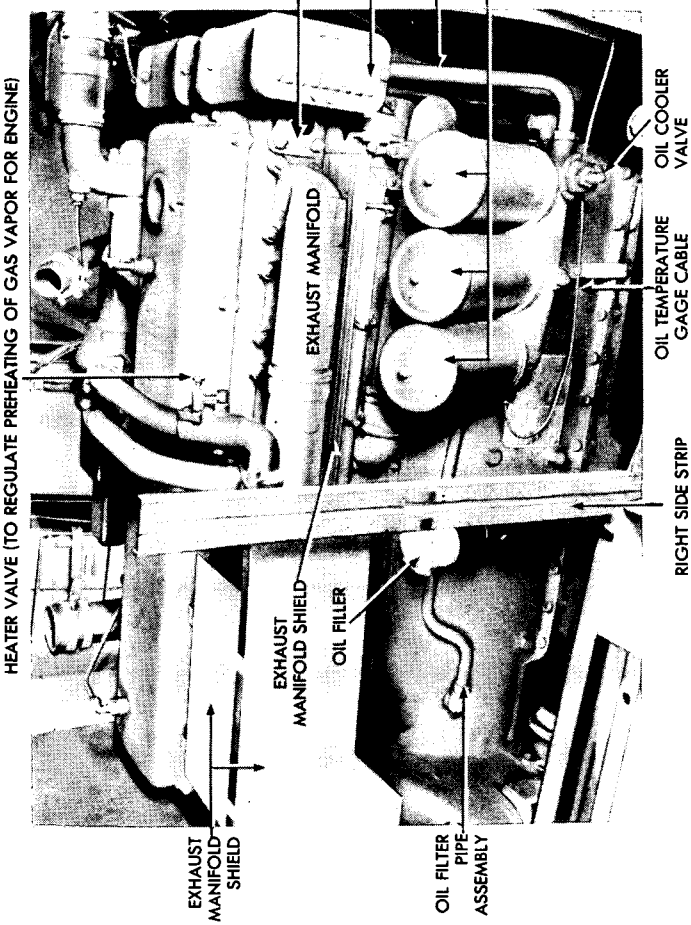

Figure 83—Right Side of Engine (Covers Removed)

ENGINE, DESCRIPTION, DATA, MAINTENANCE AND ADJUSTMENT IN VEHICLE

65. TUNE-UP.

a. Minor Tune-up.

(1) SPARK PLUG ADJUSTMENT. Remove and clean spark plugs (par. 105).

(2) DISTRIBUTOR POINT ADJUSTMENT. Remove distributor cap and examine condition of breaker points (2 sets). Points must be clean, smooth, and make full contact. If points are pitted or not smooth, file or hone them until they are smooth. Clean points with dry-cleaning solvent. Adjust points for full contact, then adjust gap of points.

(3) CHECK BATTERY AND IGNITION WIRING. Examine all ignition wires, ignition coil high-tension wires, and ignition coil to distributor wires for corrosion at terminals, and broken or cracked insulation. Clean off corrosion with crocus cloth and replace wires which have broken or cracked insulation. Examine spark plug suppressors and see that they are screwed firmly onto ignition wires. Press ignition wires firmly into distributor cap and onto spark plugs. Tighten ignition coil to distributor wires and ignition coil high-tension wires.

(4) LUBRICATE DISTRIBUTOR. Lubricate distributor as instructed in lubrication chart.

(5) ADJUST CARBURETOR. Start engine and allow engine to warm up to a normal operating temperature. Turn idler adjusting screw clockwise onto its seat and then back off screw 1½ turns. Tachometer reading should be 500 revolutions per minute.

(6) ADJUST FAN BELTS (par. 97).

b. Engine Major Tune-up.

(1) VACUUM GAGE TEST. Start engine and allow it to warm up to a normal operating temperature. Attach vacuum gage to heater valve housing; then idle engine to 500 revolutions per minute and read vacuum gage. Reading should be 18 to 21 inches and hold steady or have a slight flutter. If gage hand is not steady, it indicates that carburetor idling adjustment is incorrect, some spark plugs are not firing, valves are sticking, valve seats are burned, valves are adjusted too tightly, there are leaks at intake manifold or carburetor connections, or that distributor or valve timing is incorrect.

(2) COMPRESSION GAGE TEST. Start engine and allow it to warm up to a normal operating temperature. Stop engine and remove all spark plugs. Open carburetor throttle. Insert compression gage in a spark plug hole and hold gage tightly in hole. Crank engine with starting motor until gage reaches its highest reading. Record reading and repeat procedure on balance of cylinders. Minimum reading should be not lower than 90 pounds with maximum allowable variation of 10 pounds. NOTE: *Low readings indicate sticking valves, burned valve seats or worn piston rings.* To determine whether or not valves or piston rings are the cause of the low readings, insert two or three tablespoons of engine oil into the cylinder, then turn engine over several times with cranking motor. Repeat procedure for vacuum and compression gage tests. If reading is constant, piston

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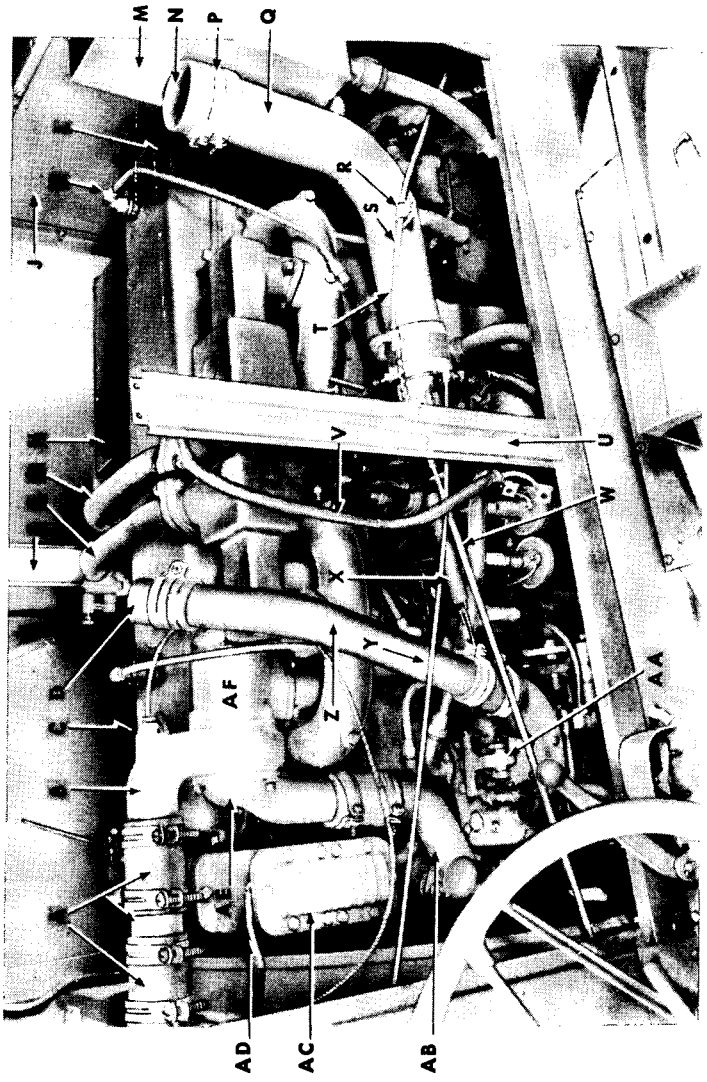

Figure 84—Left Side of Engine (Covers Removed)

ENGINE, DESCRIPTION, DATA, MAINTENANCE AND ADJUSTMENT IN VEHICLE

A—RADIATOR TOP CONNECTION

B—THERMOSTAT VALVE BODY

C—WATER TEMPERATURE GAGE CABLE

D—HOSE CONNECTION

E—HEATER VALVE PIPE ASSEMBLY

F—RIGHT SIDE STRIP

G—HEATER VALVE HOUSING PIPE

H—EXHAUST MANIFOLD SHIELD

J—ENGINE REAR COVER

K—ROCKER ARM COVER VENTILATOR

L—ROCKER ARM COVER

M—HYDRAULIC OIL TANK

N—HOSE CONNECTION

P—HOSE CLAMP

Q—CARBURETOR TO AIR DUCT PIPE

R—CLAMP

S—THROTTLE CONTROL TUBING FOR TANDEM WINCH THROTTLE CONTROL CABLE

T—TANDEM WINCH THROTTLE CONTROL CABLE

U—LEFT SIDE STRIP

V—VOLTAGE REGULATOR CABLE

W—THROTTLE ROD (FOR HAND THROTTLE AND ACCELERATOR PEDAL)

X—ACCELERATOR ROD SPRING

Y—CHOKE ROD

Z—AIR COMPRESSOR TO AIR DUCT PIPE

AA—AIR COMPRESSOR

AB—WATER PUMP INLET ELBOW

AC—OIL COOLER ASSEMBLY

AD—RADIO FILTER WIRE

AE—THERMOSTAT BYPASS ELBOW

AF—WATER OUTLET MANIFOLD

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Legend for Figure 84—Left Side of Engine (Covers Removed)

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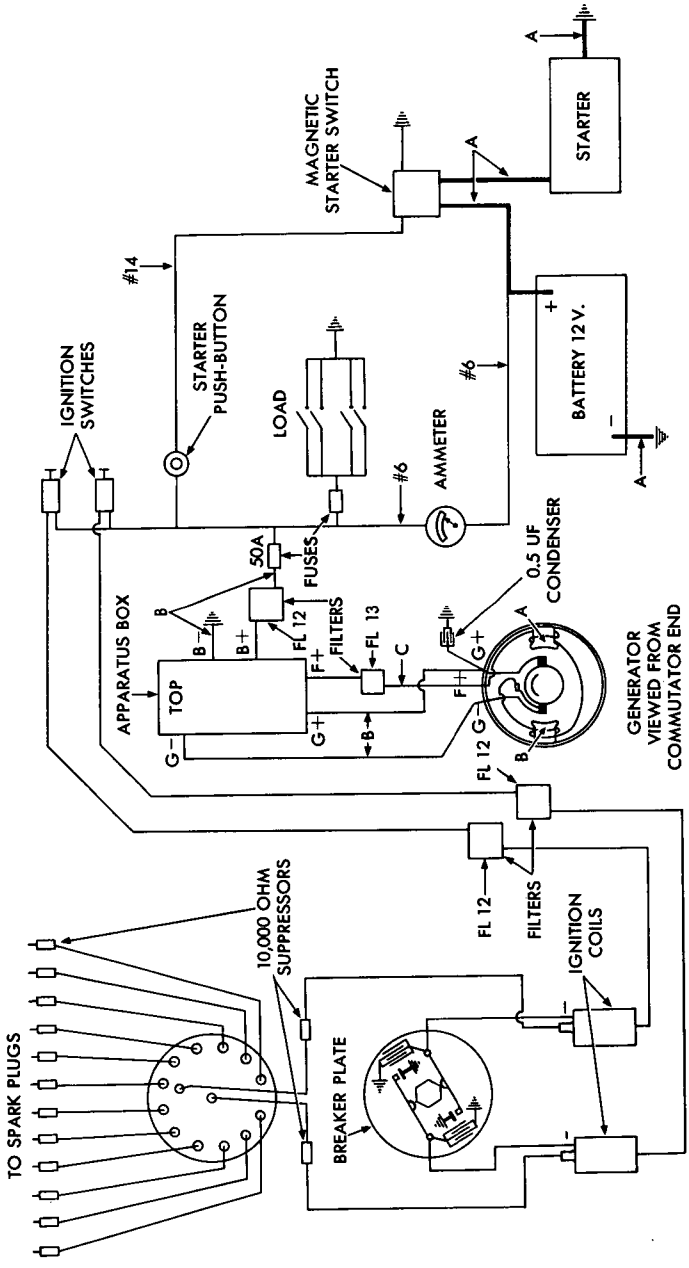

Figure 85—Engine Wiring Diagram

and piston rings are sealing and holding compression; if reading drops, valves are at fault.

(3) VALVES AND ROCKER ARMS. Adjust valve tappets and repeat compression gage test. If compression reading is still low, notify higher authority.

(4) BATTERY CAPACITY TEST. Take hydrometer gravity reading of battery. Connect a voltmeter positive lead wire to battery positive terminal and then connect voltmeter negative lead wire to battery negative terminal. Turn off all lights and voltmeter reading should

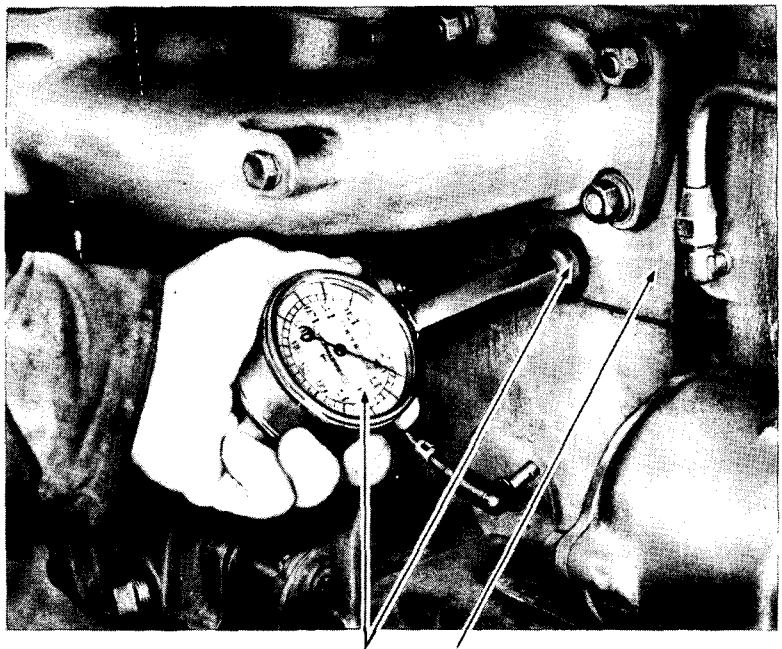

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Figure 86—Checking Cylinder Compression with Gage (41-G-124)

be 12 to 16 volts (without any draw of current from battery). If hydrometer gravity reading or voltmeter reading is low, then recharge battery.

(5) BATTERY VOLTAGE DROP TEST. Connect voltmeter positive-lead wire to battery positive terminal and voltmeter negative-lead wire to battery negative terminal. Turn ignition switches off, then crank engine by pressing starter button and at same time record voltmeter reading. Connect voltmeter positive-lead wire to a ground on engine and voltmeter negative-lead wire to magnetic starting switch battery terminal. Turn ignition switch off, crank engine by

pressing starter button, and at same time record voltmeter reading. Difference between readings should not be greater than 0.25 volt and if reading is greater, make test described in (6) below. Clean and tighten screws which hold battery wires on fuse block, voltage regulator, and magnetic starting switch.

(6) BATTERY CABLE AND CABLE CONNECTIONS TEST. Connect voltmeter positive-lead wire to battery positive terminal and voltmeter negative-lead wire to a ground on engine. Crank engine by

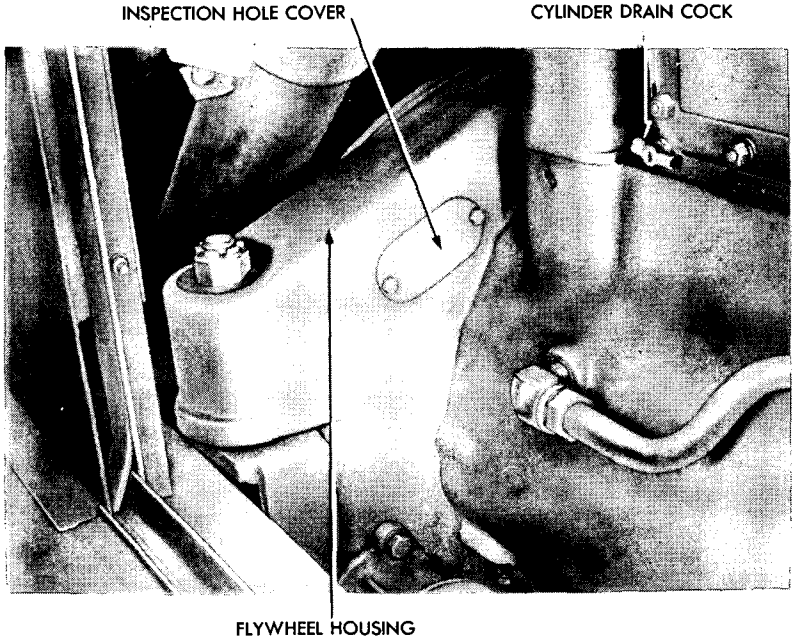

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Figure 87—Flywheel Inspection Hole Cover

pressing starter button and at same time record voltmeter reading, which should be not more than 0.1 volt. If reading is higher, then tighten battery positive cable connection at battery terminal, also magnetic starting switch cable at battery terminal. If engine is cranked very slowly when starter button is pressed, it indicates a faulty magnetic starting switch. Replace switch.

(7) MAGNETIC STARTER SWITCH. Connect voltmeter positive-lead wire to magnetic starter switch terminal for cranking motor wire, then connect voltmeter negative-lead wire to magnetic starter switch terminal for battery wire. Crank engine by pressing starter button and at same time record voltmeter reading which should be not more than 0.2 volt. If reading is more, then clean and tighten all

magnetic starter switch and cranking motor connections. Repeat test procedure above and if reading is more than 0.2 volt, replace switch.

(8) DISTRIBUTOR GROUND TEST. Connect voltmeter positive-lead wire to ground on engine and connect voltmeter negative-lead wire to distributor high-tension terminal. Disconnect ignition coil to distributor wire (right coil). Remove distributor cap and turn distributor shaft until breaker points are closed, then turn ignition switch on. Voltmeter reading should not be more than 0.01 volt. Repeat procedure on opposite terminal on distributor for ignition coil to distributor wire (right coil). A voltmeter reading of more than 0.01 volt indicates breaker point contact incorrect, distributor dirty or loose. Clean distributor, adjust contact points, and tighten mounting screws. Turn distributor shaft until breaker points are open and then turn ignition switch on. Voltmeter reading between distributor terminal and ground should be exactly the same as battery voltage.

(9) DISTRIBUTOR TIMING. Attach synchroscope ground lead wire to engine, then attach remaining synchroscope wire to No. 1 spark plug. Start and run engine, at idle speed (500 rpm), and if ignition timing is correctly set, the "IGN" mark on flywheel will show in line with pointer. If timing is not correct, retime distributor until mark lines up with pointer.

(10) ADJUST IGNITION TIMING. Remove spark plug from No. 1 (front) cylinder. Place a finger over spark plug hole and crank engine by having someone press starter button in quick, successive movements. When air pressure against finger indicates that piston is coming up on compression stroke, then remove distributor cap and continue cranking engine until breaker points just begin to open. Remove flywheel inspection hole cover (fig. 87) from flywheel housing. Mark "IGN" on flywheel should be in line with pointer and if it is not in line, then set ignition timing as instructed in next step.

(11) SET IGNTION TIMING. NOTE: *Distributor is driven clockwise.* Loosen distributor cap screws and turn distributor counterclockwise until breaker points just begin to open and then tighten distributor cap screws.

(12) HIGH-TENSION CABLES TEST. Connect a high-tension tester to No. 1 spark plug and to a ground. Run engine at idle speed (500 rpm). Set high-tension tester to 15-mm. If spark is weak or irregular, connect high-tension tester to No. 1 socket of distributor cap. An irregular spark across 15-mm gap indicates a defective No. 1 cable. Repeat this test on all spark plug wires. If an irregular spark is obtained on some, but not on all tests, then check distributor cap for a crack in cap or for burned sectors. If a regular spark is not obtained on any tests, then replace rotor.

(13) IGNITION COILS. Remove high-tension cable from center of distributor and connect high-tension tester cable and distributor. Close high-tension gap and run engine at idle speed. Open gap in high-tension tester to 15-mm and note spark. Remove high-tension cable from both ignition coils, then connect high-tension tester direct

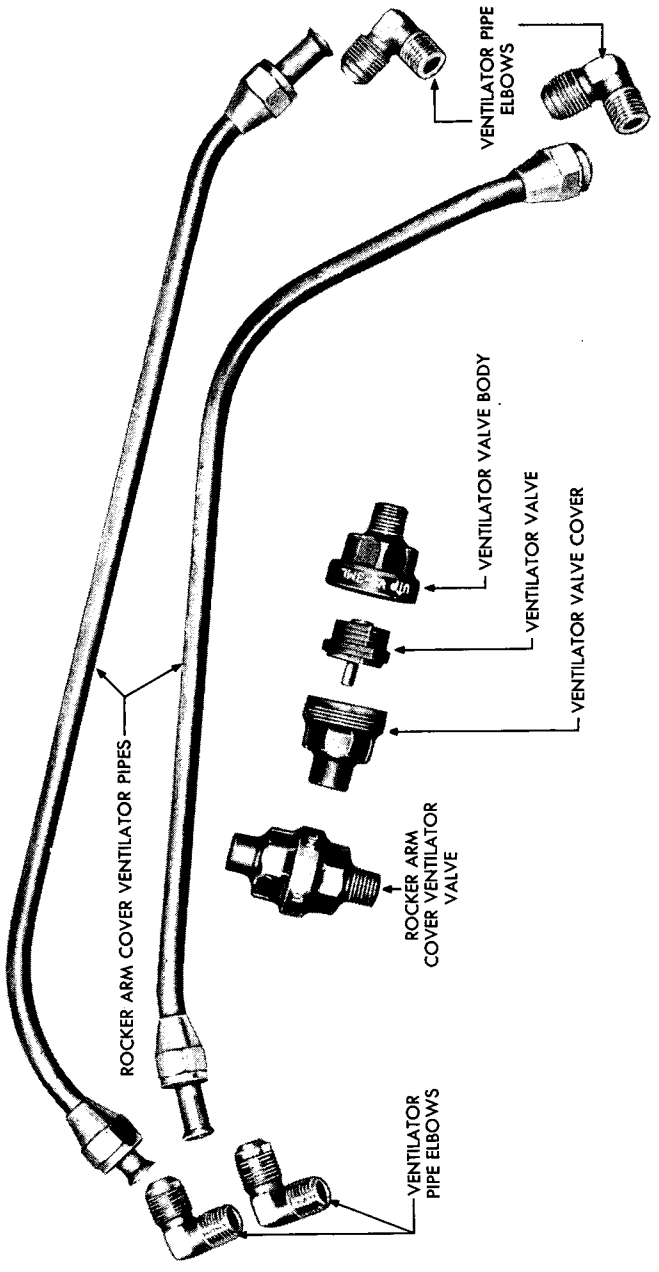

Figure 88—Rocker Arm Cover Ventilators—Disassembled

to a coil and to distributor. Repeat test procedure above. If spark is more regular than in high-tension cables test, install a new high-tension cable. Repeat procedure on remaining high-tension cable. If a spark is not obtained with a 15-mm gap, then replace ignition coil.

(14) GENERATOR CHARGING RATE. Disconnect "B" plus wire at voltage regulator, then connect an ammeter positive wire to terminal of wire just disconnected. Connect ammeter negative wire to battery terminal on voltage regulator. Connect voltmeter negative wire to "B" plus terminal on voltage regulator, then connect voltmeter positive wire to a ground on engine. Connect a jumper wire to "F" plus terminal on voltage regulator and to a ground on engine. Start the engine. With engine running at 1,200 revolutions per minute, the generator charging rate should be 55 amperes at 12 volts. If reading is not 50 to 65 amperes, replace voltage regulator.

(15) VOLTAGE REGULATOR TEST. Disconnect battery wire at "B" plus terminal on voltage regulator, then connect an ammeter positive wire to terminal of wire just disconnected. Connect the ammeter negative wire to "B" plus terminal of regulator. Connect voltmeter negative to "B" plus terminal on voltage regulator, then connect voltmeter positive wire to a ground on engine. Do not install a jumper wire from regulator to ground. Start and run engine until it is at a normal operating temperature. Run engine at 1,200 revolutions per minute, then turn voltmeter resistance in until ammeter reads 15 amperes. Voltage regulator must be at a temperature of 70°F. Voltmeter reading must not be less than 14.2 or more than 14.8 volts. If the reading is not within this range, replace voltage regulator.

(16) FUEL PUMP. Remove sediment bowl and clean. Remove gasket and screen and clean screen (soft brush). If gasket is hard and brittle, replace gasket. Tighten all fuel pump connections. Tighten cover screws.

(17) FUEL PUMP TEST. Remove fuel pump to tank valve pipe and fuel pump to carburetor pipe and attach a fuel pump pressure gage. Measure pressure of fuel pump. Pressure reading should be eight pounds.

(18) AIR CLEANER CHECK. Remove and clean the two air cleaners.

(19) HEATER VALVE HOUSING PIPE ASSEMBLY. Set heater valve plunger knob in heater valve housing pipe at "C" in extremely cold weather and at "H" in extremely hot weather. The proper setting for temperate climates is determined by trying out the settings on the three intermediate holes provided for use in temperate weather.

66. ROCKER ARM COVER AND GASKET.

a. Description. The rocker arm cover is attached to the cylinder head and covers the valve mechanism in order to prevent dirt from getting into the mechanism and also to prevent lubricant from being splashed out of the cylinder head.

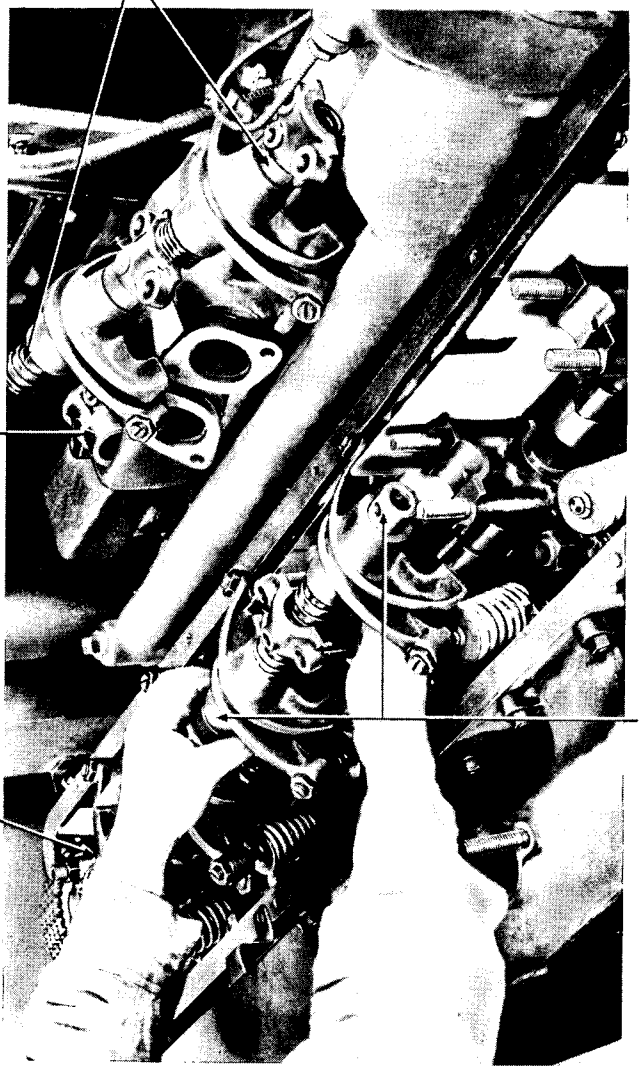

Figure 89—Removing Rocker Arm Shaft Assembly—Center

b. Removal.

(1) REMOVE EXHAUST MANIFOLD SHIELD (par. 93).

(2) REMOVE HEATER VALVE PIPES (par. 93).

(3) REMOVE ROCKER ARM COVER VENTILATOR PIPES (par. 67).

(4) REMOVE ROCKER ARM COVER AND GASKET. Remove rocker arm cover cap screws and plain washers which hold rocker arm cover base. Remove rocker arm cover and rocker arm cover ventilator valves. Lift off cover gasket and discard.

c. Installation of Rocker Arm Cover and Gasket.

(1) INSTALL ROCKER ARM COVER AND GASKET. Install new rocker arm cover gasket, then install rocker arm cover and secure with cap screws and plain washers.

(2) INSTALL ROCKER ARM COVER VENTILATOR PIPES (par. 67).

(3) INSTALL EXHAUST MANIFOLD SHIELD AND HEATER VALVE PIPES. Install exhaust manifold shield (par. 93) and heater valve pipes (par. 67).

67. ROCKER ARM COVER VENTILATORS (fig. 88).

a. Description. The rocker arm cover ventilators relieve the air pressure and oil vapors which are built up in the cylinder head by the action of the valve mechanism. The air under pressure and the oil vapors pass through the valves and pipes to the intake manifolds and from the intake manifolds they are drawn into the combustion chamber by the suction stroke of the piston.

b. Removal. Disconnect two rocker arm cover ventilator pipes at ventilator valves and intake manifolds, and remove pipes. Remove two rocker arm cover ventilator valves from rocker arm cover, then remove two ventilator pipe elbows from valves.

c. Maintenance. Remove ventilator valve cover from ventilator valve body and remove ventilator valve from body. Clean in dry-cleaning solvent. Install ventilator valve in ventilator valve body. Screw ventilator valve cover on body, then screw ventilator pipe elbows on valve.

d. Installation. Install rocker arm cover ventilator valves on rocker arm cover. Connect rocker arm cover ventilator pipes to ventilator valves and intake manifolds.

68. VALVE TAPPETS ADJUSTMENT.

a. Turn engine over counterclockwise with crank until No. 6 exhaust valve rocker is at highest position (exhaust valve fully closed). Loosen tappet screw lock nuts on both tappet screws on No. 1 cylinder rocker arms and loosen tappet screws. Insert 0.021-inch feeler gage between exhaust tappet screw and exhaust valve stem. Turn tappet screw down until it holds gage firmly, then back off screw until gage can be just pulled out. Holding screw accurately in this position, tighten lock nut. Follow same procedure for adjusting intake valve tappet for No. 1 cylinder.

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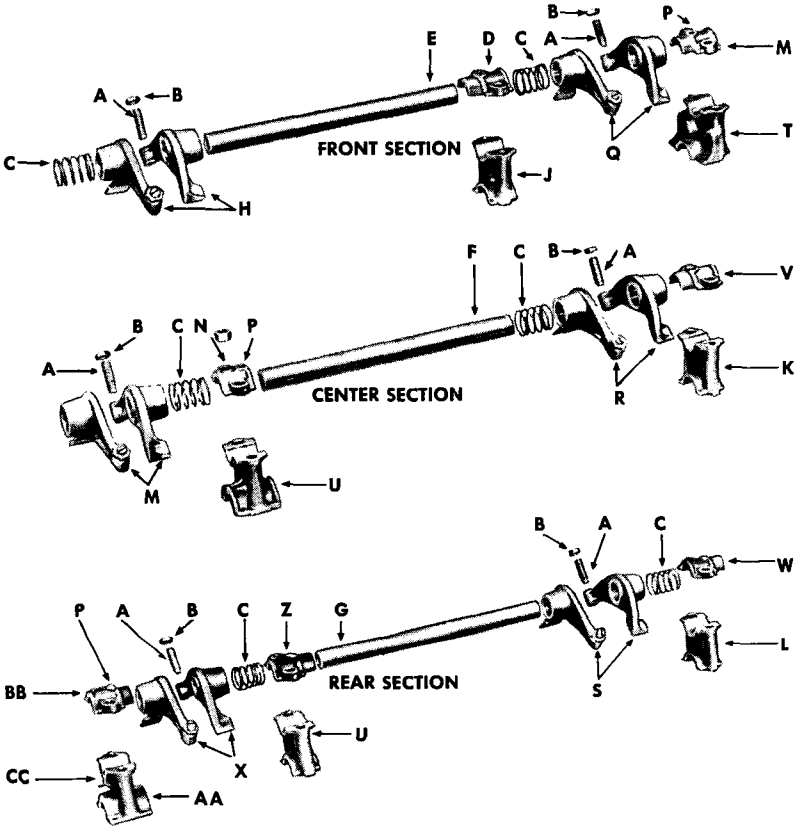

A—ROCKER ARM TAPPET SCREW
B—ROCKER ARM TAPPET SCREW LOCK NUT
C—ROCKER ARM SPACING SPRING
D—ROCKER ARM SHAFT CAP (INTERMEDIATE NO. 6)
E—ROCKER ARM SHAFT (FRONT)
F—ROCKER ARM SHAFT (CENTER)
G—ROCKER ARM SHAFT (REAR)
H—ROCKER ARM (NO. 5 CYLINDER)
J—CAMSHAFT BEARING BRACKET (INTERMEDIATE NO. 6)
K—CAMSHAFT BEARING BRACKET (INTERMEDIATE NO. 5)
L—CAMSHAFT BEARING BRACKET (INTERMEDIATE NO. 3)
M—ROCKER ARM SHAFT CAP (FRONT NO. 7)
N—ROCKER ARM SHAFT CAP (CENTER NO. 4)
P—DOWEL
Q—ROCKER ARM (NO. 6 CYLINDER)
R—ROCKER ARM (NO. 4 CYLINDER)
S—ROCKER ARM (NO. 2 CYLINDER)
T—CAMSHAFT BEARING BRACKET (FRONT NO. 7)
U—CAMSHAFT BEARING BRACKET (CENTER NO. 4)
V—ROCKER ARM SHAFT CAP (INTERMEDIATE NO. 5)
W—ROCKER ARM SHAFT BEARING CAP (INTERMEDIATE NO. 3)
X—ROCKER ARM (NO. 3 CYLINDER)
Y—ROCKER ARM (NO. 1 CYLINDER)
Z—ROCKER ARM SHAFT BEARING CAP (INTERMEDIATE NO. 2)
AA—CAMSHAFT BEARING THRUST BRACKET (NO. 1)
BB—ROCKER ARM SHAFT BEARING CAP (REAR NO. 1)
CC—STEEL PIN

RA PD 75252

Figure 90—Rocker Arms and Shafts—Disassembled

b. Adjust tappets for No. 4 cylinder by first closing exhaust valve in No. 3 cylinder, then proceed same as for No. 1. Tappets are to be adjusted in the following sequence:

(1) Adjust No. 1 with No. 6 exhaust valve closed.
(2) Adjust No. 4 with No. 3 exhaust valve closed.
(3) Adjust No. 2 with No. 5 exhaust valve closed.

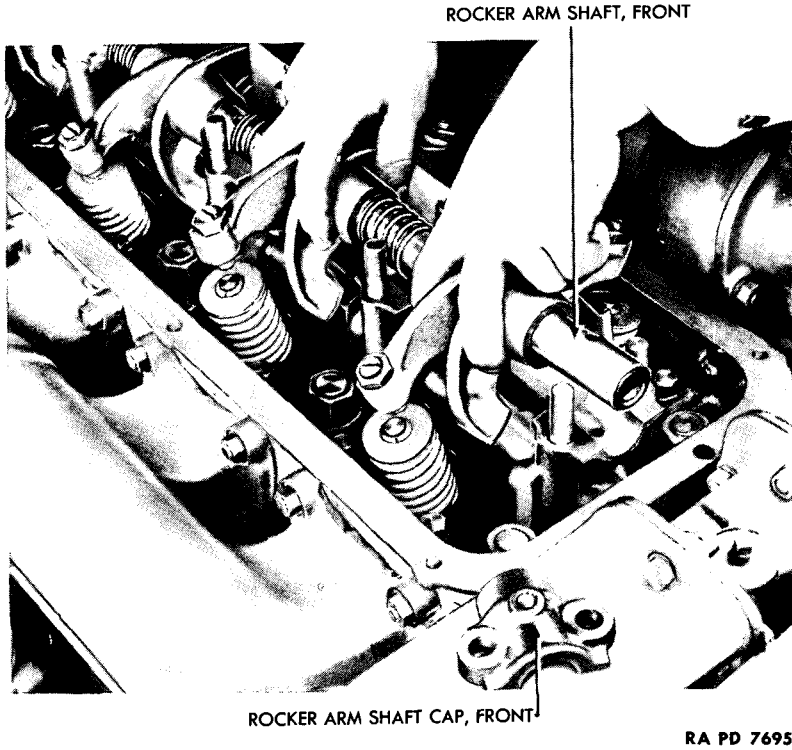

Figure 91—Installing Rocker Arm Shaft Assembly

(4) Adjust No. 6 with No. 1 exhaust valve closed.
(5) Adjust No. 3 with No. 4 exhaust valve closed.
(6) Adjust No. 5 with No. 2 exhaust valve closed.

69. ROCKER ARMS.

a. Description. The rocker arms are located on the rocker arm shafts and have a shoe at one end which follows the contour of the camshaft cam. On the opposite end of the rocker arm is a tappet screw held by a lock nut and this screw rests upon the end of the valve stem. When the camshaft turns, it moves the rocker arm to

open or close the valves. The amount of valve opening is controlled by the tappet screw position.

b. Remove Rocker Arm.

(1) REMOVE ROCKER ARM COVER (par. 66).

(2) REMOVE ROCKER ARM SHAFT ASSEMBLY. Mark each rocker arm assembly and the cylinder head with location of arm so that arms can be replaced in same location from which they were removed. Remove (from front) third pair of nuts and lock washers

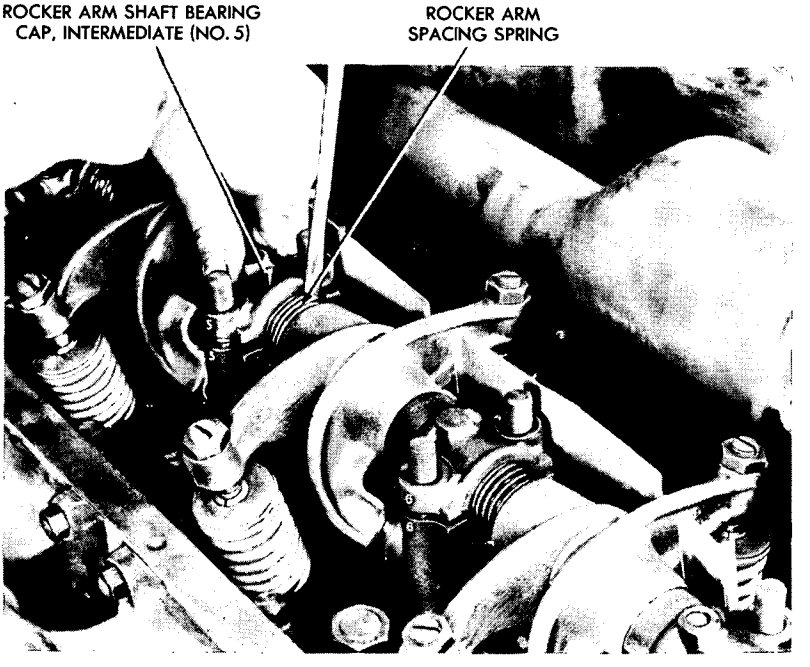

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Figure 92—Installing Rocker Arm Shaft Assembly

from camshaft bearing bracket studs, then remove front pair of nuts and lock washers, and second pair of nuts and lock washers. Lift off front rocker arm shaft assembly and rocker arm shaft bearing intermediate cap. Remove (from front) fifth pair of nuts and lock washers from camshaft bearing bracket studs, then remove fourth pair of nuts and lock washers. Remove rocker arm center shaft assembly. Remove rear pair of nuts and lock washers from camshaft bearing bracket studs and then remove sixth pair of nuts and lock washers. Remove rocker arm rear shaft assembly.

(3) REMOVE ROCKER ARMS FROM SHAFTS. Lift off rocker arm shaft bearing caps. Slide rocker arms and spacing springs off shafts.

(4) DISASSEMBLE ROCKER ARM ASSEMBLY. Remove rocker arm tappet lock nut, then remove arm tappet screw. Repeat procedure on remaining rocker arm assemblies.

c. Install Rocker Arms.

(1) INSTALL REAR ROCKER SHAFT AND ROCKER ARMS (figs. 91 and 92). Install tappet screws and tappet screw lock nuts on rocker arms, then install rocker arms for No. 1 cylinder onto rear of rocker arm shaft. Screw tappet screws only part way in. Install spacing

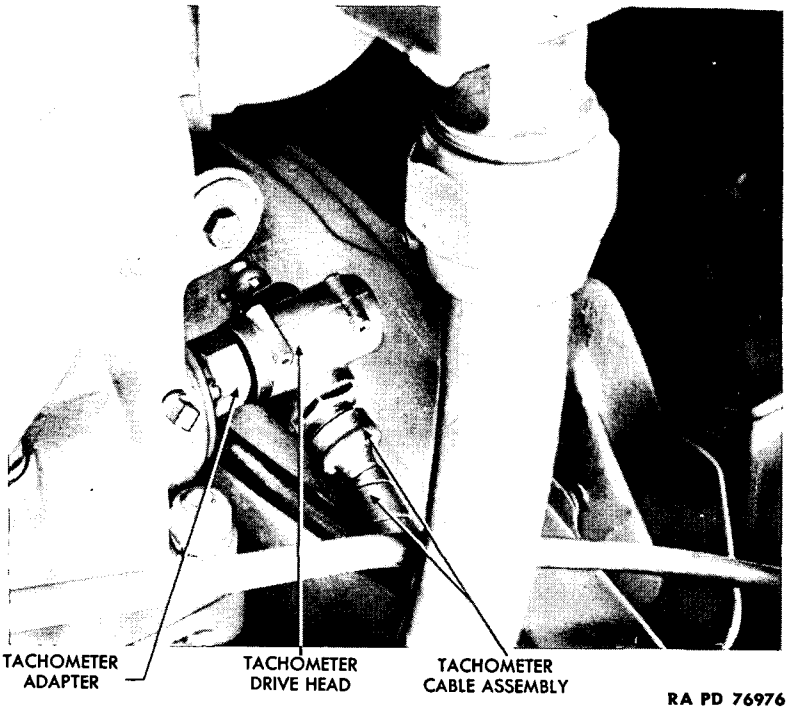


Figure 93—Tachometer Adapter and Cable

spring and rocker arms for No. 2 cylinder onto front end of shaft and slip second spacing spring over front end of shaft. Install shaft assembly on three rear brackets (figs. 91 and 92). Place rocker arm shaft bearing cap No. 1 on shaft with dowel in cap fitting into hole in shaft. (Do not install nuts on studs at this time.) Compress spacing spring against rocker arms until it is held by bearing bracket. Push cap No. 2 down onto shaft. Install cap and secure with lock washers and nuts, screwed on loosely. Place cap No. 3 on studs and press down into position while simultaneously compressing the spring (fig. 92). With all three caps installed on studs, install lock washers

and nuts over caps No. 1 and No. 3. Tighten nuts on caps in the following sequence: No. 2, No. 1, No. 3. Leave No. 3 cap fingertight until center section of rocker shaft is installed. NOTE: *In order to maintain alinement of rocker shafts, it is important that center of each section be tightened before ends.*

(2) INSTALL CENTER ROCKER SHAFT AND ROCKER ARMS (fig. 92). Install spring and rocker arms on rear of rocker shaft. Install spring and rocker arms on front end of shaft. Lay center (No. 4) cap on shaft between springs. Place assembly on brackets with No. 4 cap

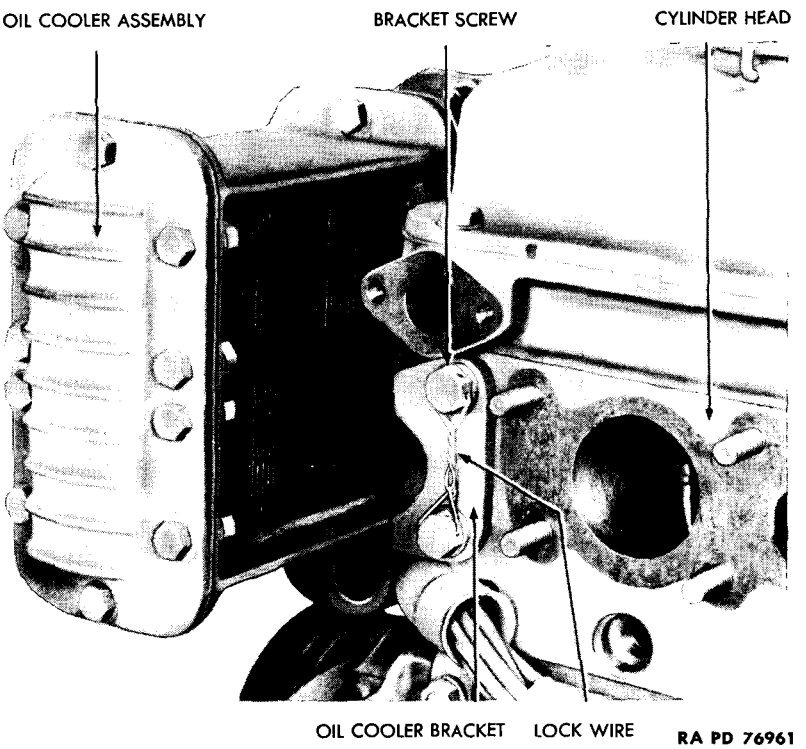


Figure 94—Oil Cooler Installed

in place over studs. Install lock washers and nuts over No. 4 cap, but do not tighten. Compress springs both ways from center so as to allow cap No. 4 to seat on shaft. Tighten nuts on Nos. 3 and 4 caps, then place No. 5 cap on studs.

(3) INSTALL FRONT ROCKER SHAFT AND ROCKER ARMS. Install spring and rocker arms from front end of shaft, then install rocker arms and spring from rear end of shaft. Place shaft in position (fig. 91) and install No. 7 cap on bracket, fitting dowel into hole in shaft. Compress spring until it catches on No. 6 bracket. Install cap No. 6 and fasten with lock washers and nuts, fingertight. Press

down No. 5 cap while compressing spring (fig. 92) and install lock washers and nuts on caps Nos. 5 and 7. Tighten nuts on No. 6 cap first, then on No. 7, and then No. 5. (All rocker arm shaft cap nuts must be tightened to 40 foot-pounds.)

(4) MAKE PRELIMINARY TAPPET ADJUSTMENT. Adjust tappets (par. 68) and install rocker arm cover (par. 66).

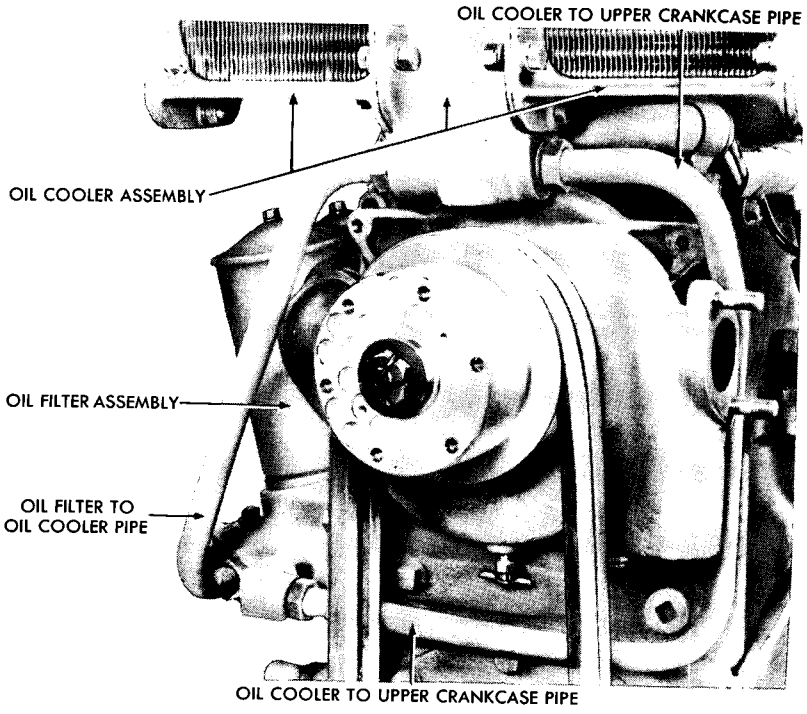


Figure 95—Oil Cooler Pipes

70. TACHOMETER ADAPTER.

a. Description. The tachometer adapter is fastened to the sprocket housing of the engine and drives the tachometer drive head and tachometer cable to record the revolutions per minute of the engine on the tachometer head.

b. Removal. Disconnect tachometer cable assembly from tachometer drive head, then unscrew adapter from sprocket housing.

c. Installation. Screw tachometer adapter on sprocket housing, then screw tachometer cable on tachometer drive head.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

71. OIL COOLER ASSEMBLY.

a. Description and Data.

(1) DESCRIPTION. The oil cooler assembly is mounted on the front of the engine at the rear of the fan and its purpose is to provide a means of cooling the engine oil in extremely hot climates. Oil is piped from the oil filter to a central tank in the oil cooler. When the oil has filled the lower half of the oil cooler tank, it passes through one of the two oil cooler cores into the upper half of the tank and then through the opposite core and into a return pipe attached to the oil filters. A bypass is provided in the oil cooler for use if the oil cooler becomes plugged. It permits the oil to pass through the cooler lower tank without circulating through the cores. A hand-operated shut-off is located on the oil filter.

(2) DATA.

Make	Hall-Scott
Model	440
Type	air-cooled

b. Removal. Remove three nuts and lock washers that hold thermostat bypass elbow and then remove two nuts and lock washers that hold water pump inlet elbow to water pump assembly. Remove thermostat bypass elbow and the water pump inlet elbow as an assembly. Remove water pump inlet elbow gasket. Remove two cap screws and lock washers that hold cylinder head oil drain pipe and remove the pipe. Remove wire and oil cooler bracket screws. Loosen pipe (oil cooler to upper crankcase) at oil cooler assembly. Remove pipe (oil filter to oil cooler) from both the oil filter and oil cooler. Remove fan blades and lift out oil cooler.

c. Maintenance. Clean the oil cooler assembly in dry-cleaning solvent. Remove the pipe plug from top of oil cooler base and flush interior of cooler assembly, using a pressure gun to force sediment, oil, and sludge out.

d. Installation. Install oil cooler on engine and fasten with two oil cooler bracket screws on each side of engine. Wire screws in place. Install pipe (oil filter to oil cooler) and fasten to filter and cooler. Install cylinder head oil drain pipe and fasten with two cap screws and lock washers. Install water pump inlet elbow gasket, then install thermostat bypass elbow and water pump inlet elbow assembly. Fasten elbows with nuts and lock washers.

72. OIL FILTER ASSEMBLY.

a. Description and Data.

(1) DESCRIPTION. The oil filters are of the replaceable element type and are mounted on the right side of the engine. They are connected to an oil duct which is cast on the inside of the crankcase. There are three oil filters used, all mounted on a common base. The oil pump forces oil out of the oil duct and through the oil filters and then either through the oil cooler or back into the engine oil sump.

ENGINE, DESCRIPTION, DATA, MAINTENANCE AND ADJUSTMENT IN VEHICLE

(2) DATA.

Make	Winslow
Model	HS 440
Type	cartridge

b. Maintenance. Remove oil filter cover screw, lock washers, cover, and gasket. Lift out oil filter element, retaining spring and washer; then lift out the element. Clean oil filter body with dry-cleaning solvent. Place a new element down over stud and onto

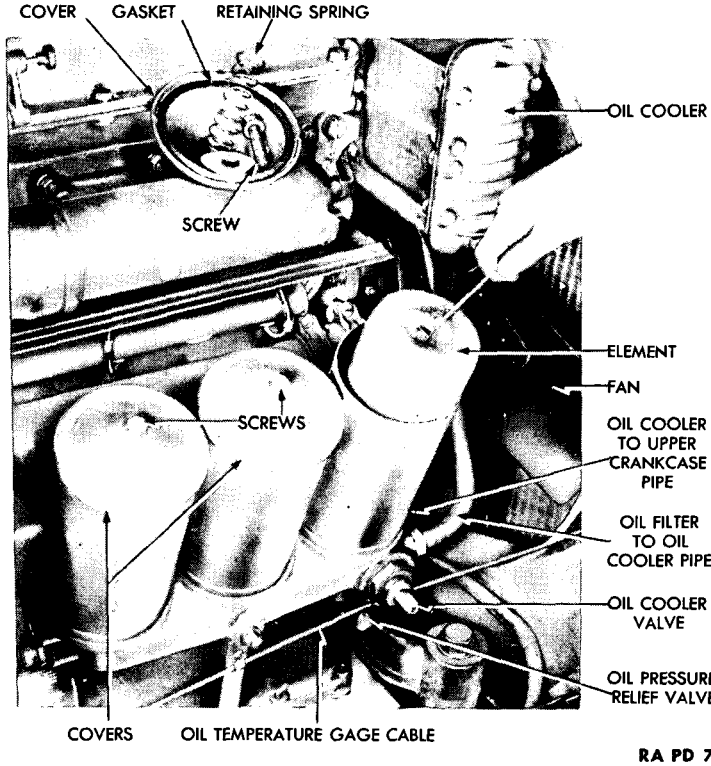


Figure 96—Removing Oil Filter Element

shell plate screw. Place element retaining washer over stud and on element. Place element retaining spring and cover with new gasket in place on top of shell. Holding cap down against spring tension, install cover screw and lock washers. Tighten screw.

c. Removal of Oil Filter Assembly. Disconnect oil temperature gage cable from oil filter. Then disconnect at oil filter, the oil filter to oil cooler pipe, and oil cooler to upper crankcase pipe. Remove

four nuts and lock washers that hold oil filter assembly to upper crankcase and remove filter assembly. Remove drain plug from oil filter base and drain all oil and sludge. Clean any remaining oil and sludge out of filter with a pressure gun and dry-cleaning solvent.

d. Installation of Oil Filter Assembly. Install filter assembly on upper crankcase and fasten with four nuts and lock washers. Connect at oil filter, the oil filter to oil cooler pipe, and the oil cooler to upper crankcase pipe. Connect oil temperature gage cable to oil filter.

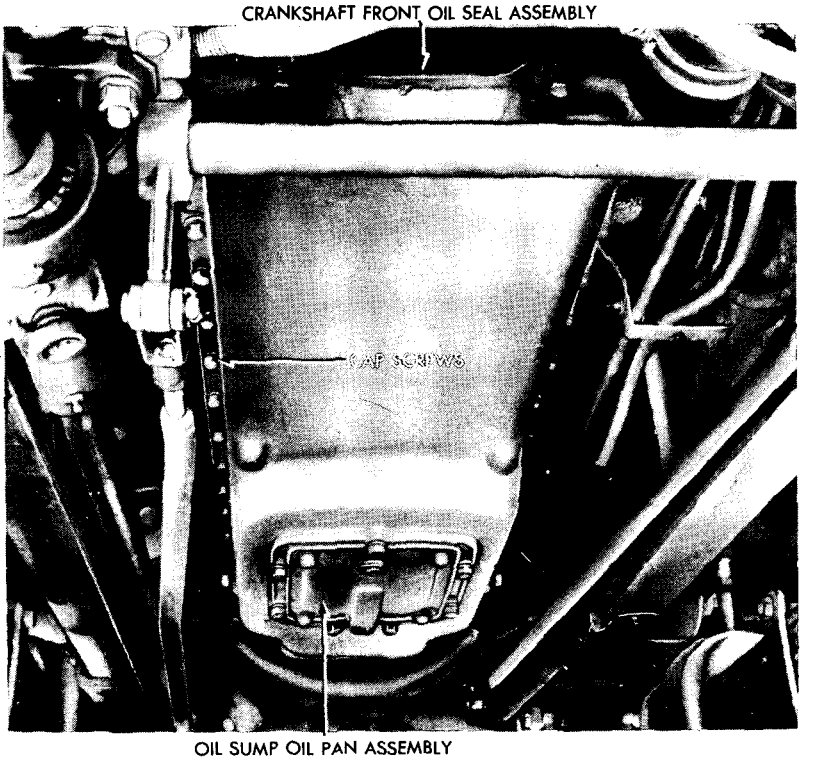


Figure 97—Removing Lower Crankcase

73. OIL LINES AND CONNECTIONS (EXTERNAL).

a. Description. The oil lines and connections connect the main oil duct, which is cast as an integral part of the crankcase, to the filtering and cooling units and to the mechanism which requires a constant supply of oil.

b. Removal.

(1) REMOVE OIL COOLER PIPES. Remove pipe (oil cooler to upper crankcase) from oil cooler and upper crankcase. Remove pipe (oil

filter to oil cooler) from oil filter and oil cooler. Remove elbow from upper crankcase for oil cooler to upper crankcase pipe.

(2) REMOVE OIL FILTER PIPE. Loosen nut that holds oil filter pipe to upper crankcase at rear right side of crankcase, then repeat procedure at front end of pipe at oil filter. Loosen thumb screw and remove oil filler from crankcase. Lift oil filter pipe off upper crankcase. Remove oil pipe elbow at rear end of upper crankcase and remove oil filter pipe connector at front end of upper crankcase.

(3) REMOVE CYLINDER HEAD OIL DRAIN PIPE. Remove three nuts and lock washers that hold thermostat bypass elbow and then remove two nuts and lock washers that hold water pump inlet elbow to water pump. Remove thermostat bypass elbow and water pump inlet elbow as an assembly. Remove water pump inlet elbow gasket. Remove two cap screws and lock washers that hold cylinder head oil drain pipe to cylinder head and remove pipe from upper crankcase.

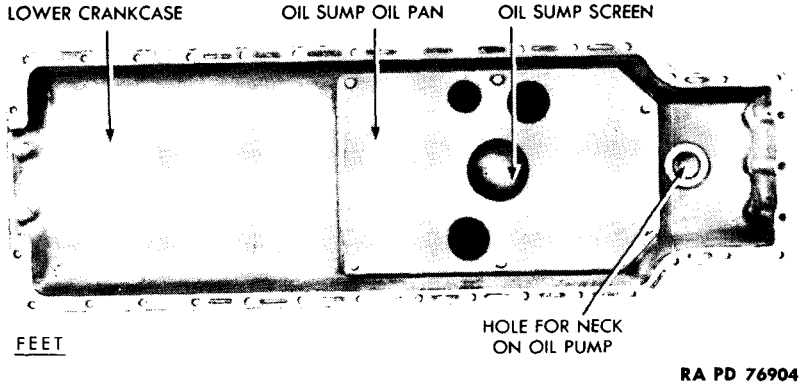


Figure 98—Interior of Lower Crankcase

(4) REMOVE ACCESSORY DRIVE HOUSING OIL PIPE. Remove air compressor (par. 153). Disconnect accessory drive housing oil pipe at front of upper crankcase and at accessory drive housing. Remove elbow at front of upper crankcase and then remove fitting at accessory drive housing.

(5) REMOVE OIL PRESSURE GAGE FITTING. Remove flexible hose from elbow at rear of upper crankcase and remove elbow. The flexible hose connects to a tube that is fastened to the frame. The oil pressure gage is connected to a flexible hose which is also connected to the tube in the frame.

(6) REMOVE CYLINDER HEAD TO SPROCKET HOUSING PIPE. Remove pipe from cylinder head and sprocket housing fittings. Then remove elbow from cylinder head and oil pipe connector from sprocket housing.

c. Installation.

(1) INSTALL OIL COOLER PIPES. Install elbow on upper crankcase for oil cooler to upper crankcase pipe, then install pipe (oil filter to oil cooler) on oil filter and oil cooler. Install pipe (oil cooler to upper crankcase) on oil cooler and upper crankcase.

(2) INSTALL OIL FILTER PIPE. Apply white lead to oil filter pipe elbow. Install elbow into tapped hole in crankcase. Secure oil filter pipe to elbow. Install triple tube connector in boss on upper crankcase, first coating thread with white lead. Install oil filter pipe to triple tube connector.

(3) INSTALL CYLINDER HEAD OIL DRAIN PIPE. Install one end of cylinder head oil drain pipe in upper crankcase and secure other end with two cap screws and lock washers. Install water pump inlet elbow gasket, then install thermostat bypass elbow and water pump inlet elbow, as an assembly. Fasten water pump inlet elbow with two nuts and lock washers. Fasten thermostat bypass elbow with three nuts and lock washers.

(4) INSTALL ACCESSORY DRIVE HOUSING OIL PIPE. Install elbow at front of upper crankcase and then install fitting at accessory drive housing. Connect accessory drive housing oil pipe to front of upper crankcase and to accessory drive housing.

(5) INSTALL OIL PRESSURE GAGE FITTING. Install elbow at rear of upper crankcase, then install flexible hose on elbow. The flexible hose connects to a tube that is fastened to the frame. The oil pressure gage is connected to a flexible hose which is also connected to the tube within the frame.

(6) INSTALL CYLINDER HEAD TO SPROCKET HOUSING PIPE. Install oil pipe connector in sprocket housing and then install elbow in cylinder head. Install pipe and fasten to sprocket housing and cylinder head.

74. LOWER CRANKCASE ASSEMBLY (OIL PAN).

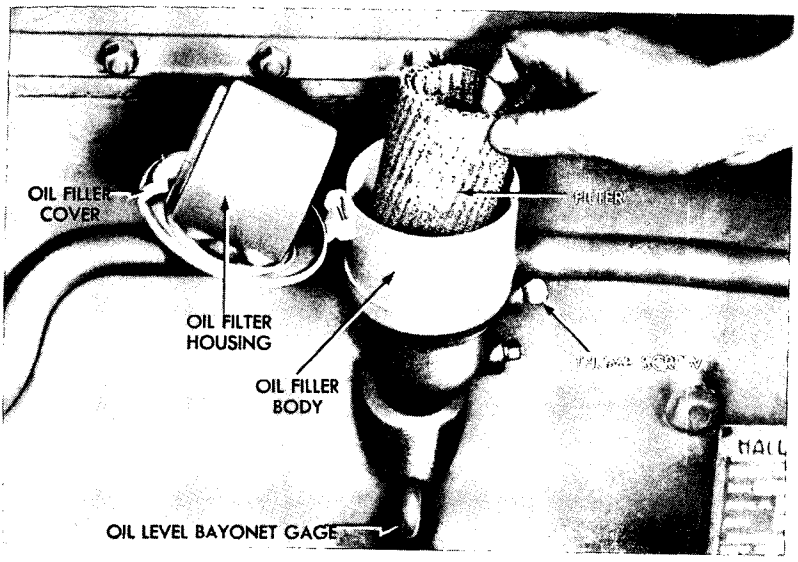
a. Description. The lower crankcase contains the oil sump and oil sump screen and is secured to the upper crankcase with cap screws and lock washers. All engine oil is filtered in the lower crankcase before being taken by the oil pump and circulated throughout the engine.

b. Removal of Lower Crankcase (fig. 97). Remove 35 cap screws, lock washers, and plain washers which hold lower crankcase assembly to upper crankcase assembly. Remove two lower cap screws and lock washers which hold crankshaft front oil seal assembly to lower crankcase and loosen remaining cap screws. Remove flywheel housing dust cover cap screws and lock washers which hold dust cover to flywheel housing and then remove dust cover. Remove lower crankcase assembly and gasket.

c. Maintenance. Remove oil sump pan screen (fig. 98). Remove cap screws and lock washers which hold oil sump oil pan assembly to lower crankcase and lift off pan and pan gasket. Remove cap

screws and lock washers which hold oil sump pan screen clamp plate (to oil sump oil pan) and remove plate and oil sump screen. Clean all parts in dry-cleaning solvent and dry with compressed air. Remove all particles of dirt from screen. Install oil sump screen in oil sump oil pan, then install oil sump pan screen clamp plate and fasten with cap screws and lock washers.

d. Installation of Lower Crankcase (fig. 97). Place new gasket on mounting flange of lower crankcase. Install lower crankcase onto upper crankcase, inserting oil pump intake pipe into oil seal in lower crankcase. Install 35 cap screws and lock washers that hold lower crankcase to upper crankcase and tighten cap screws. Install two



RA PD 76945

Figure 99—Removing Filter from Oil Filler

cap screws and lock washers through front oil seal assembly into lower crankcase. Tighten remaining cap screws in front oil seal assembly. Install three long cap screws and lock washers that hold rear end of lower crankcase. Install dust cover on front of flywheel housing with four cap screws, flat washers, and lock washers.

75. OIL FILLER AND BREATHER.

a. Description (fig. 99). The oil filler assembly is composed of a body and cover which enclose a filter element. The tube through which oil for the engine is poured is in the center of the body and a filter of wire mesh screening is fitted around this tube. A filter

housing is fitted over the filter. The oil filler assembly is held into the crankcase breather oil filler extension by a thumb screw.

b. Removal (fig. 99). Loosen thumb screw and lift oil filler body out of upper crankcase. Remove filter from oil filler body.

c. Maintenance (fig. 99).

(1) REMOVE OIL FILTER. Open filler cap and lift out filter housing, filter element, and gasket.

(2) CLEAN FILLER ASSEMBLY. Pour out all oil in oil filler body, then wash filter and body in dry-cleaning solvent and dry with compressed air.

(3) INSTALL OIL FILTER. Place oil filler gasket on bottom of oil filler body, then saturate filter with oil. Install filter and oil filter housing in oil filler body. Fill oil filler body up to ridge in body with OE 10 engine oil.

d. Installation (fig. 99). Install oil filler body in opening in upper crankcase and fasten with thumb screw.

76. MANIFOLDS AND HEATER VALVE PIPES.

a. Description.

(1) EXHAUST MANIFOLD. The exhaust manifold is made in three sections and is held to the right side of the cylinder head with studs and brass nuts. Gaskets are used between the manifold and the cylinder head. The exhaust manifold conducts burned gas away from the cylinder.

(2) HEATER MANIFOLD. The heater manifold is secured to the top of the intake manifolds by studs and nuts and contains air which is heated by the exhaust manifold. The heater valve pipes are attached to the heater manifold to conduct the air to, and from, the manifold.

(3) INTAKE MANIFOLDS. The two intake manifolds are secured to the left side of the cylinder head by studs and nuts. They carry the atomized fuel from the carburetor to the engine combustion chambers. Gaskets are between the manifolds and the cylinder head.

(4) WATER OUTLET MANIFOLD. The water outlet manifold is secured to the left side of the cylinder head and pipes the heated water from the engine cooling system to the radiator, where it is cooled ready to be used over again. The manifold is attached by studs and nuts to the head. Gaskets are between the manifold and head.

(5) HEATER VALVE PIPES. The two heater valve pipes over the top of the engine are used to conduct hot air from the exhaust manifold to the heater manifolds and back to the exhaust manifold. The pipes are a slip fit into the heater manifold and are clamped onto the exhaust manifold. No gaskets are used.

b. Exhaust Manifold Removal. Remove exhaust manifold shield (par. 93). Remove two remaining nuts and bolts that hold manifold to manifold tail pipe. Remove six nuts and lock washers from the six studs on the underside of the manifold and remove manifold

heat baffle shield. Remove two nuts and lock washers that hold manifold flange heat baffle shield to two studs at right rear side of cylinder block and then remove shield. Remove heater valve pipe (par. 76 j). Remove remaining nuts that hold manifold to cylinder block and lift manifold and six manifold gaskets off the studs. Separate the three sections of the manifold.

c. Exhaust Manifold Installation. Lay the three sections of the exhaust manifold, flange side down, on a flat surface and push them together. Install six manifold gaskets on manifold studs in the cylinder head. Install manifold on manifold studs and then install manifold flange heating baffle shield on two studs at right rear side of cylinder block and secure with lock washers and nuts. Install manifold heating baffle shield on six studs on underside of manifold

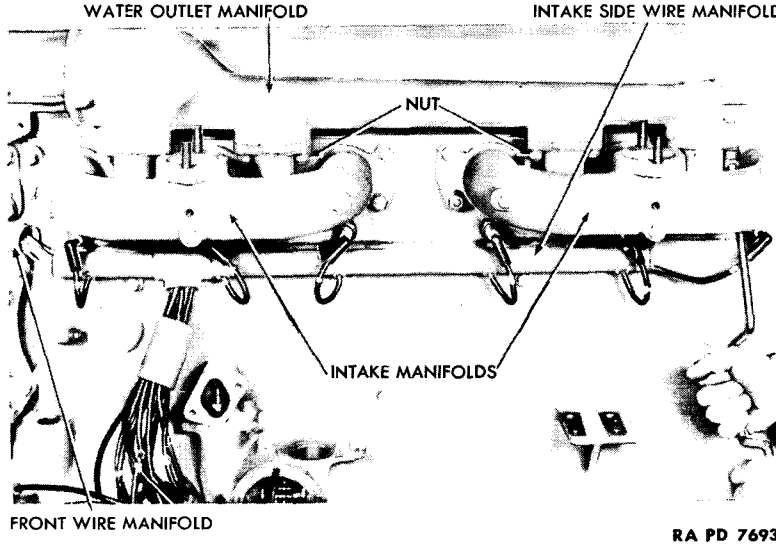


Figure 100—Removing Water Outlet Manifold

and secure with nuts and lock washers. Install exhaust manifold shield (par. 93), then install remaining manifold nuts. Connect manifold tail pipe to manifold with two bolts and nuts.

d. Heater Manifold Removal. Remove valve housing pipe and heater valve pipe (par. 76 j). Remove four nuts and lock washers that hold governor throttle valve housing to carburetor. Remove four nuts and lock washers that hold heater manifold to intake manifolds and remove heater manifold.

e. Heater Manifold Installation. Install heater manifold on intake manifolds and secure with four nuts and lock washers. Install four nuts and lock washers that hold governor throttle valve housing

to carburetor. Install heater valve housing pipe and heater valve pipe (par. 76 l).

f. Intake Manifold Removal. Remove heater manifold (par. 76 d), then remove rocker arm cover ventilator pipe (par. 67). Loosen hose clamps which hold pipe from air compressor to air duct and remove pipe. Remove 24 nuts, flat washers, and lock washers that hold intake manifold to cylinder head and remove two intake manifolds and gaskets.

g. Intake Manifold Installation. Install two intake manifolds with new gaskets on cylinder head and secure with 24 nuts, flat washers, and lock washers. Install pipe on air compressor and air duct and secure with hose clamps. Install rocker arm cover ventilator pipes (par. 67), then install heater manifold (par. 76 e).

h. Water Outlet Manifold Removal. Disconnect water temperature gage cable from water outlet manifold, loosen hose clamp, and remove pipe from air compressor to air duct. Loosen hose clamps and remove radiator top hose connection. Loosen hose clamps which hold hose connection thermostat bypass elbow to water pump inlet and slide hose down. Remove three nuts and lock washers which hold thermostat bypass elbow to thermostat valve body and remove elbow and gasket. Pull thermostat valve body off water outlet manifold and remove gasket. Then pull thermostat out of manifold. Remove heater manifold (par. 76 d). Remove eight nuts and lock washers and plain washers that hold water outlet manifold to intake manifold and remove four water outlet manifold gaskets.

i. Water Outlet Manifold Installation. Install four new water outlet manifold gaskets on intake manifolds and then install thermostat in water outlet manifold. Install new thermostat gasket on water outlet manifold and install thermostat valve body on manifold. Install new thermostat gasket and thermostat bypass elbow on thermostat valve body and fasten with three nuts and lock washers. Install water outlet manifold on intake manifolds and secure with eight nuts, lock washers, and plain washers. Slide hose onto thermostat bypass elbow and then secure hose to water pump inlet and bypass elbow with hose clamps. Install water temperature gage cable in water outlet manifold, then install heater manifold (par. 76 e). Install radiator top hose connection and secure with hose clamps, then install bypass connection air compressor to air duct and secure with hose clamps.

j. Heater Valve Pipes Removal. Remove two nuts which hold heater valve housing pipe to exhaust manifold, then remove two bolts and nuts which hold heater valve pipe to tail pipe. Lift heater valve pipe coupling off and pull pipes out of heater manifold.

k. Heater Valve Pipes Maintenance. Remove two bolts, nuts, and lock washers which hold heater valve pipe flange to heater valve housing pipe and remove flange. Drive pin from the heater valve control arm and lift off heater valve control arm assembly. Unscrew heater valve plunger knob from heater valve locking plunger, then remove plunger and heater valve plunger spring from

heater valve control arm. Break brazing from heater valve housing pipe, then break loose heater valve from heater valve shaft and drive shaft out of heater valve housing pipe. Remove heater control valve from inside pipe. Assemble heater valve housing pipe as follows: Install heater valve pipe flange on heater valve pipe and fasten with two bolts, nuts, and lock washers. Install heater control valve in heater valve housing pipe and push heater valve shaft through pipe and valve, then braze valve onto shaft. Braze heater valve pipe upper and lower halves together, then install heater plunger spring in heater valve control arm. Install heater valve lock plunger, then screw heater valve plunger knob on plunger. Install heater valve control arm and secure with pin. Install heater valve pipe flange and secure with two bolts, nuts, and lock washers.

l. **Heater Valve Pipe Installation.** Install heater valve pipe and heater valve housing pipe in heater manifold. Install heater valve pipe coupling, then install two bolts and nuts which hold heater valve pipe to tail pipe. Install two nuts which hold heater valve housing pipe to exhaust manifold.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section XIV

CLUTCH AND LINKAGE

77. DESCRIPTION AND DATA.

a. Description (fig. 104). The clutch is a two-plate, dry-disk type. It consists of an intermediate plate which is pinned to the flywheel and two driven disks which are used to contact the plate, one on the flywheel side and one on the pressure plate side. Depressing the clutch pedal relieves the pressure of the driven disks on the intermediate plate and the flow of engine power to the transmission is interrupted.

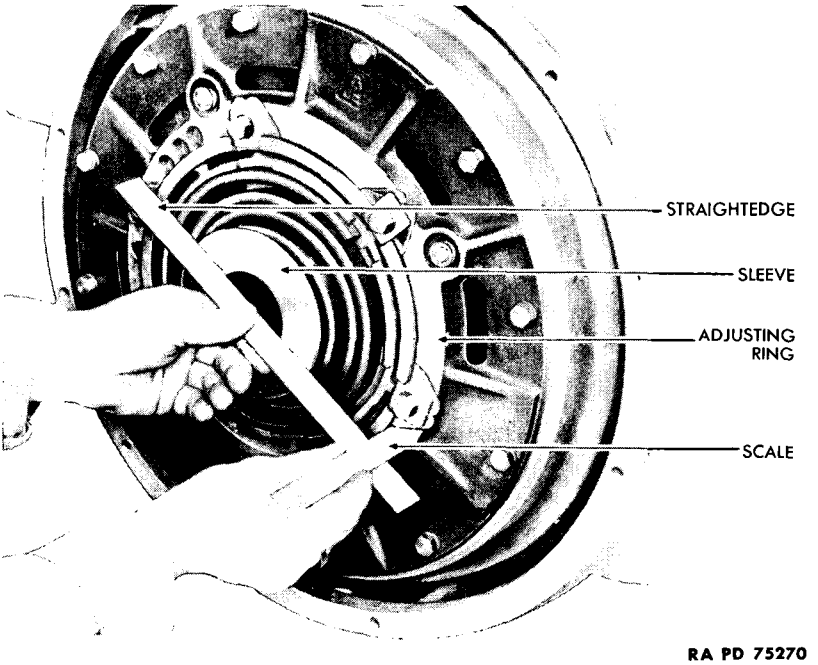


Figure 101—Inspecting Clutch for Adjustment

CLUTCH AND LINKAGE

b. Data.

Make	Lipe Rollway Corp.
Number of pressure plates	2
Free travel of clutch pedal	½ in.
Clutch adjustment	shims

78. CLUTCH ADJUSTMENT.

a. Adjustment (fig. 101).

(1) NOTE: *Clutch adjustment is made by removal of adjusting shims from under clutch adjusting straps. Adjusting straps are*

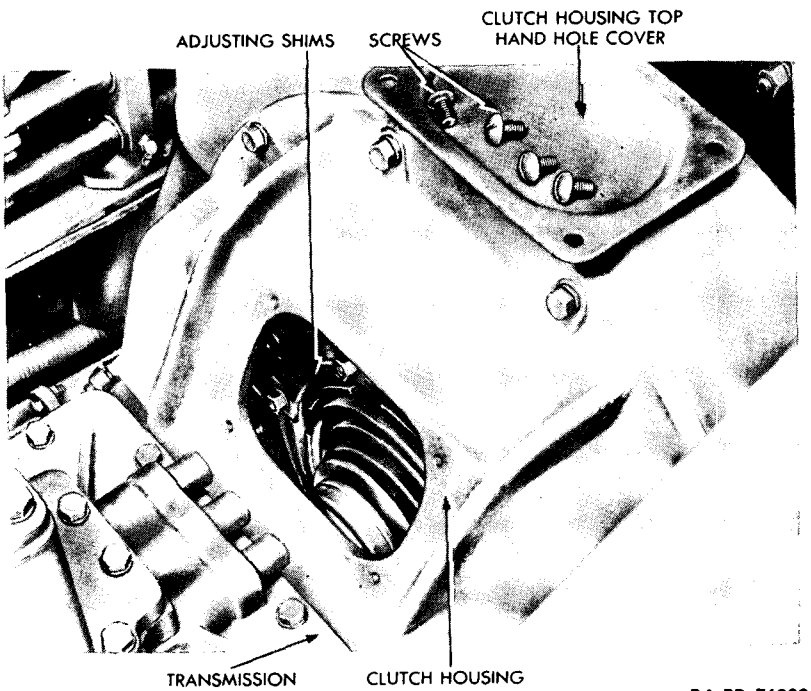


Figure 102—Clutch Housing Top Cover

reached through clutch housing top and bottom handhole covers (fig. 102). Adjust clutch as soon as free travel of clutch pedal (before clutch disengages) becomes ½ inch or less.

(2) CHECK CLUTCH ADJUSTMENT (fig. 537). Remove transmission cover (par. 131). Depress clutch pedal, thereby pushing clutch release bearing forward, and measure distance between machined hub of flywheel ring and flange of sleeve. This is done by placing a 12-inch straightedge across flange of sleeve and measuring from inside of straightedge to machined hub of ring. This distance should

be 1⅛ inches plus or minus, 1/16 inch. If measurement is more than 1 3/16 inches it is an indication of excessive wear on disks.

(3) ADJUST CLUTCH FOR WEAR (figs. 101 and 102). Work through holes in clutch housing from which covers have been removed and loosen all six nuts on studs in flywheel ring. This releases pressure on shims so that one or more shims can be removed with pliers. Removing one shim reduces distance found above 7/64 inch. After removing shim and tightening nuts, recheck adjustment. NOTE: *Make certain all of shim is removed each time, as no portion must be left between clutch adjusting plate and clutch flywheel ring.* Mark each clutch adjusting strap with a piece of chalk as soon as shim has been removed. This will prevent removing more than one shim

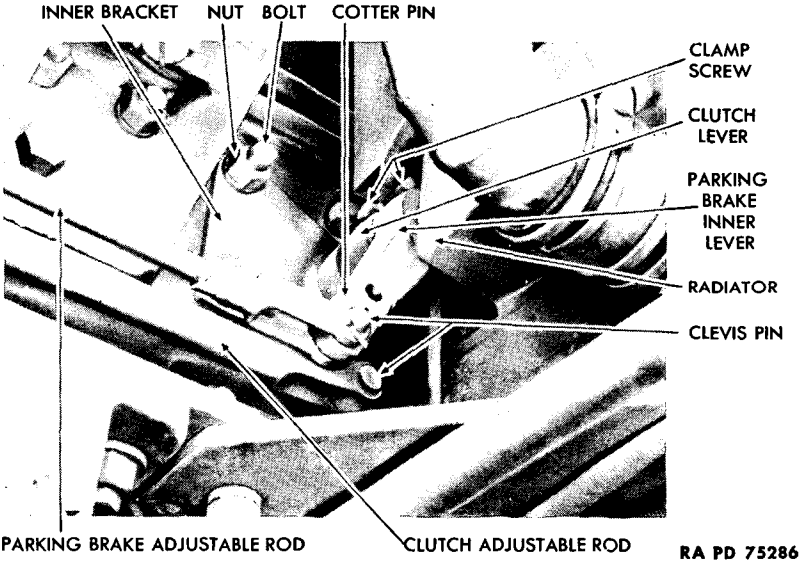


Figure 103—Clutch Pedal and Linkage—Inner End

from each strap, since an error can be easily made when working through both top and bottom holes of clutch housing.

(4) MEASURE CLUTCH RELEASE BEARING CLEARANCE (fig. 101). Measure distance from face of clutch release bearing to thrust face of clutch sleeve (fig. 101). Measurement must be from 1/8 to 5/32 inch. Adjust clutch pedal linkage (par. 79) until measurement is within these limits.

(5) FINAL WEAR ADJUSTMENT OF CLUTCH (fig. 101). A clutch which has been adjusted until all clutch adjusting shims have been removed may be given one final adjustment before clutch-driven disk facing must be replaced. Final wear adjustment is made by adjusting clutch pedal linkage (par. 79) so that clutch throwout

CLUTCH AND LINKAGE

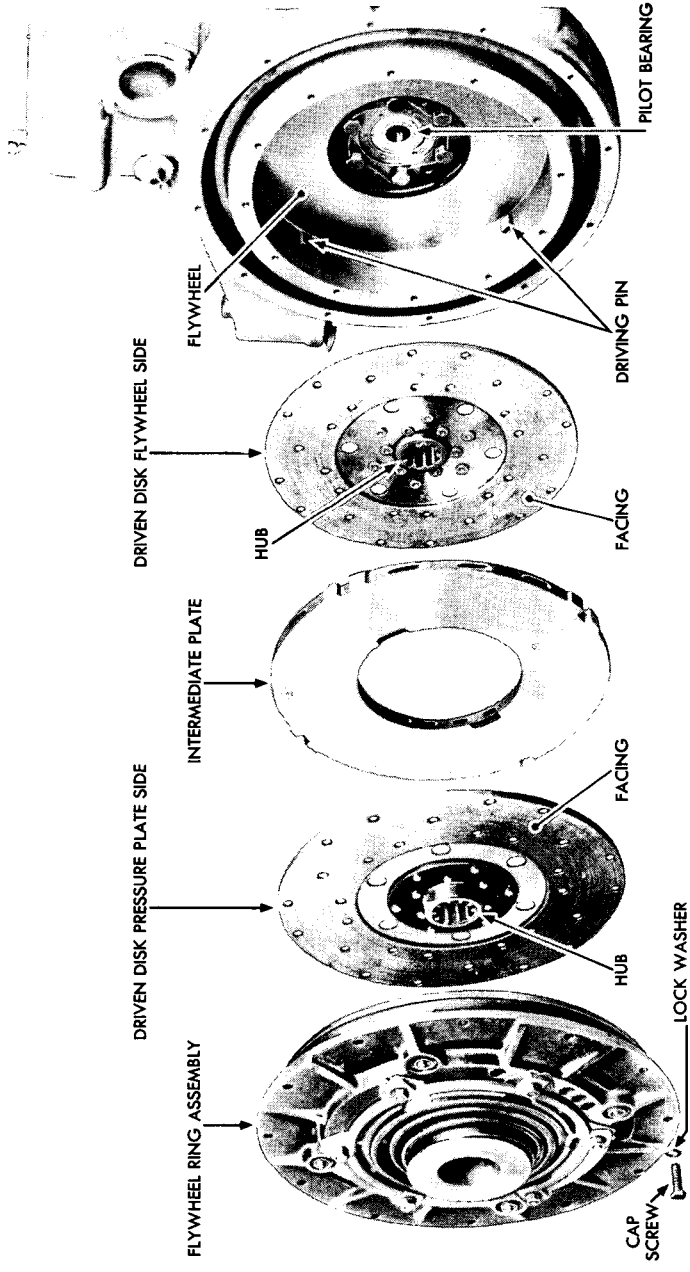


Figure 104—Clutch Removed from Flywheel

bearing clearance can be obtained. This final wear adjustment should be used only if installation of a new clutch-driven disk facing is impossible.

79. CLUTCH LINKAGE AND CONTROLS.

a. Description (fig. 103). The clutch pedal is attached to a clutch pedal cross tube which is under the floorboard. The clutch pedal is splined and fits on splines of the cross tube; the hand brake lever is keyed onto a cross shaft which operates inside of the clutch pedal cross tube. It is impossible to remove the hand brake lever, clutch pedal or any of the cross linkage with the cab on the chassis. The clutch adjustable rod which connects the cross tube to the clutch can be replaced.

b. Adjustment. Disconnect clutch adjustable rod at clutch throwout shaft, by removing cotter pin and clevis pin, and loosen lock nut. Turn clevis on or off rod, until free travel of clutch pedal is ½ inch.

80. CLUTCH PILOT BEARING.

a. Description (fig. 104). The clutch pilot bearing is a ball bearing which is fitted into the bone of the flywheel to receive the end of the transmission main drive gear shaft. This bearing supports the shaft and maintains alinement of the clutch parts with the transmission in order to prevent binding.

b. Removal (fig. 104).

(1) REMOVE TRANSMISSION. Remove transmission assembly as instructed in paragraph 131.

(2) REMOVE CLUTCH. Mark position of clutch in flywheel with chalk. Remove 12 cap screws and lock washers which hold clutch to flywheel and lift clutch flywheel ring out of flywheel. Lift outer driven disk, intermediate plate and inner driven disk out of flywheel.

(3) REMOVE CLUTCH PILOT BEARING. Using bearing remover, pull pilot bearing out of bore of flywheel.

c. Installation.

(1) INSTALL CLUTCH PILOT BEARING. Place pilot bearing in bone of flywheel and tap bearing into bone with wooden block.

(2) INSTALL CLUTCH. Install inner driven disk against flywheel with long hub side in. Place intermediate plate against inner driven disk with arrow-marked side out. Place outer driven disk against intermediate plate with long hub side out. Insert a clutch pilot arbor through the disks and plate until pilot of arbor enters pilot bearing. Place flywheel ring over arbor and against flywheel, then fasten ring with 12 cap screws and lock washers. CAUTION: *Tighten each cap screw a little at a time and alternate the tightening so that ring will fit evenly on flywheel.*

(3) INSTALL TRANSMISSION (par. 131).

CLUTCH AND LINKAGE

81. CLUTCH RELEASE BEARING.

a. Description (fig. 105). The clutch release bearing is located in the clutch housing on the clutch release mechanism and the load occasioned by releasing and engaging the clutch is carried by this bearing.

b. Removal (fig. 105).

(1) REMOVE TRANSMISSION. Remove main transmission (par. 131).

(2) REMOVE CLUTCH RELEASE YOKE AND PEDAL SHAFTS. Remove lock wire from two cap screws in clutch release yoke, then remove cap screws. Pull short shaft out of clutch housing, then pull long shaft out of housing and remove key from shaft.

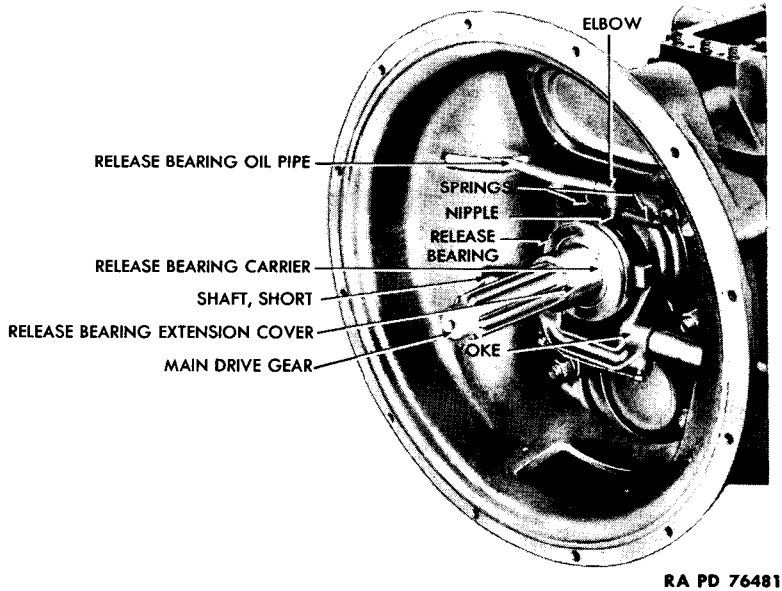


Figure 105—Clutch Release Assembly

(3) REMOVE RELEASE BEARING. Remove yoke from housing and remove release bearing oil pipe from elbow. Slip ends of oil pipe tension spring up over top of oil pipe nipple. Slide clutch release bearing carrier off release bearing extension cover.

c. Installation (fig. 105).

(1) INSTALL RELEASE BEARING. Press clutch release bearing on bearing carrier, then slide carrier on release bearing extension cover. Slip ends of oil pipe tension spring up over top of oil pipe nipple. Install release bearing oil pipe in elbow.

(2) INSTALL CLUTCH RELEASE YOKE AND PEDAL SHAFTS. Slide long shaft through left side of clutch housing, then install key in

shaft and slide shaft on release yoke. Install short shaft through opposite side of clutch housing and into yoke. Install two cap screws which secure yoke to shafts and lock cap screws with wire.

82. CLUTCH DRIVEN DISKS.

a. Description. The transmission of engine power to the transmission is by means of an intermediate plate, which is pinned to the flywheel, and two driven disks. One driven disk is on each side of the intermediate plate and these disks contact the plate to make a friction connection between the clutch and transmission.

b. Removal.

(1) REMOVE TRANSMISSION (par. 131).

(2) REMOVE DRIVEN DISKS. Mark position of clutch in flywheel, then remove 12 cap screws and lock washers that hold clutch to flywheel and lift clutch flywheel ring off flywheel. Lift outer driven disk, intermediate plate and inner driven disk out of flywheel.

c. Installation.

(1) INSTALL DRIVEN DISKS. Install inner driven disk against flywheel with long hub side in. Place intermediate plate against inner driven disk with arrow-marked side out. Place outer driven disk against intermediate plate with long hub side out. Insert a clutch pilot arbor through the disks and plate until pilot or arbor enter pilot bearing. Place flywheel ring over arbor and against flywheel, then fasten ring with 12 cap screws and lock washers. Tighten each cap screw alternately, a little at a time, so that ring will fit evenly on flywheel.

(2) INSTALL TRANSMISSION (par. 131).

Section XV

FUEL, AIR INTAKE, AND EXHAUST SYSTEMS

83. DESCRIPTION AND DATA.

a. Description.

(1) FUEL SYSTEM (fig. 106). The fuel system consists of two fuel tanks connected to the fuel tank change-over valve, a fuel filter connected between the valve and the fuel pump, a fuel pump carburetor, and air cleaner, and the governor assembly. Fuel stored in the two fuel tanks is conducted through fuel lines through the fuel tank change-over valve to the fuel filter and then to the fuel pump. The pump forces fuel to the carburetor where it is mixed with air that has been cleaned by the air cleaners and the mixture is then drawn into the combustion chamber of the engine by vacuum caused by the down stroke of the pistons.

(2) AIR INTAKE SYSTEM (fig. 106). The air intake system consists of two oil bath type air cleaners which clean the air, and the cleaned air is then conducted to the air duct. The air duct is an integral part of the engine top cover, and two openings from it carry the air through pipes to the air compressor and the carburetor.

(3) EXHAUST SYSTEM. The exhaust system carries the burned gas from the engine to the atmosphere. The system consists of an exhaust pipe (exhaust manifold to muffler), muffler, tail pipe (exhaust stack), exhaust stack shield, and heater valve exhaust pipe.

b. Data.

Fuel Pump:
- Make ..... AC Spark Plug Co.
- Model ..... D (1537759)
- Location ..... left side of engine
- Driven by ..... accessory drive shaft
- Capacity ..... 24 gal in one hour

Carburetor:
- Make ..... Zenith
- Model ..... 1510 MS

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

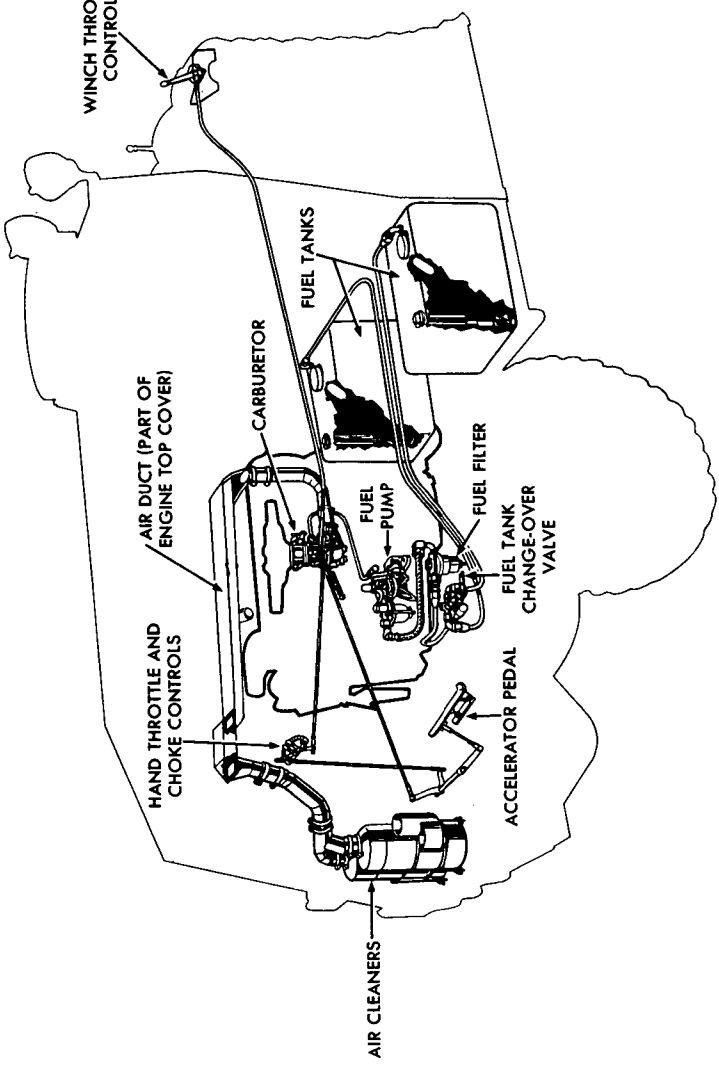


Figure 106—Schematic View of Fuel System

FUEL, AIR INTAKE, AND EXHAUST SYSTEMS

Air Cleaner:
- Make ..... Vortox
- Model ..... EX 3944 A
- Location ..... under right front corner of cab

Fuel Tanks:
- Make ..... Pacific Car & Foundry
- Capacity ..... 50 gal
- Number needed 2
- Location ..... right and left side
- Filler cap location .... under filler cap lid (inside cab)
- Fuel tank gage unit ..... Stewart-Warner

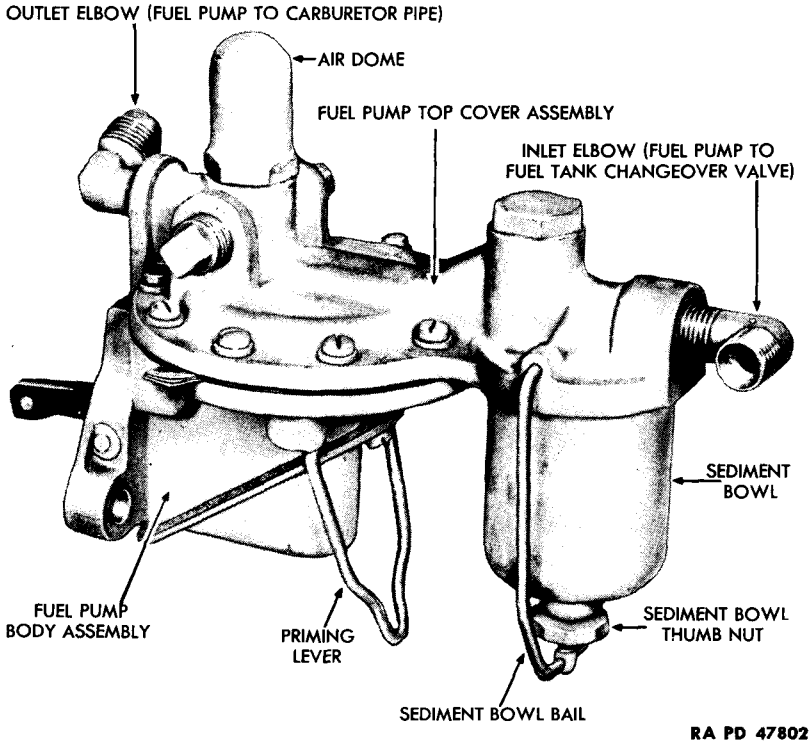


Figure 107—Fuel Pump Assembly

Governor:
- Make ..... Hall-Scott
- Model 320578
- Location ..... left rear side of engine
- Driven by ..... camshaft accessory drive chain
- Adjustment ..... screw

Fuel Tank Change-over Valve:
Make ..... Weatherhead
Model 6747
Location ..... left forward side of frame
Fuel Filter:
Make ..... Cuno
Model ..... DS
Location ..... left forward side of frame

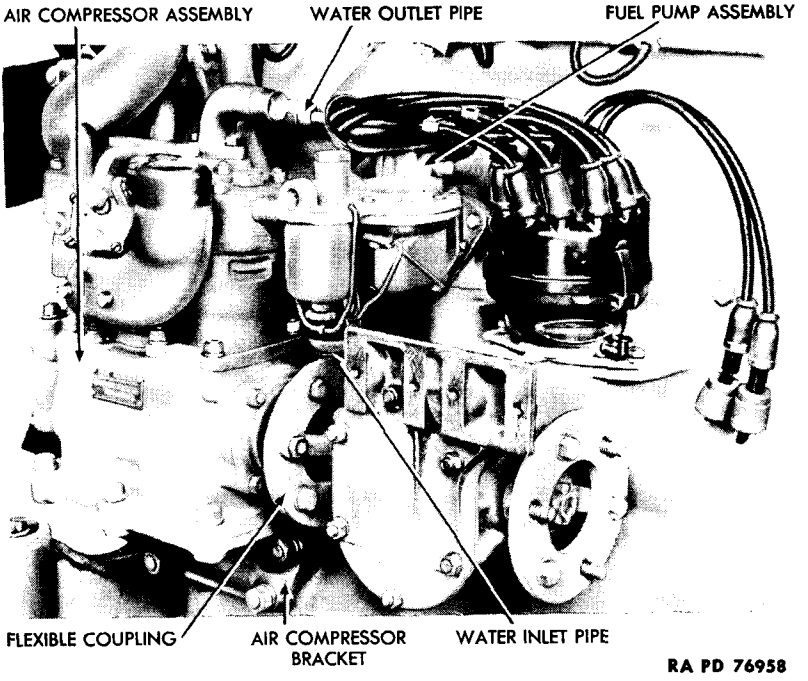


Figure 108—Fuel Pump Installed

84. FUEL PUMP.

a. Description (fig. 107). The fuel pump assembly is of the diaphragm type and is mechanically operated from an eccentric on the accessory drive shaft. In addition to being operated by the accessory drive shaft, the fuel pump is equipped with a hand-operated priming lever which is used to pump an initial supply of fuel into carburetor in case the vehicle has run out of fuel or the carburetor bowl has been emptied for any reason.

b. Maintenance. Loosen the thumb nut on bail and pull bail off sediment bowl and clean bowl thoroughly with dry-cleaning solvent. Install bowl and secure with bail by tightening thumb nut.

c. Removal (fig. 108). Loosen distributor cap by prying off two distributor cap clamps and then lift off distributor cap assembly and pull cap away from fuel pump to carburetor pipe. Remove distributor rotor and place out of way. Disconnect fuel pump to carburetor pipe from fuel pump, loosen carburetor filter plug, and push pipe backward, slightly. Remove fuel pump to fuel filter pipe. Remove two cap screws and lock washers which hold fuel pump to upper crankcase and lift fuel pump and fuel pump gasket off upper crankcase.

d. Installation (fig. 108). Install fuel pump assembly and a new fuel pump gasket on upper crankcase and fasten with two cap screws and lock washers. Install fuel pump to fuel filter pipe. Attach fuel pump to carburetor pipe to fuel pump and then tighten carburetor filter plug. Install distributor rotor and distributor cap assembly.

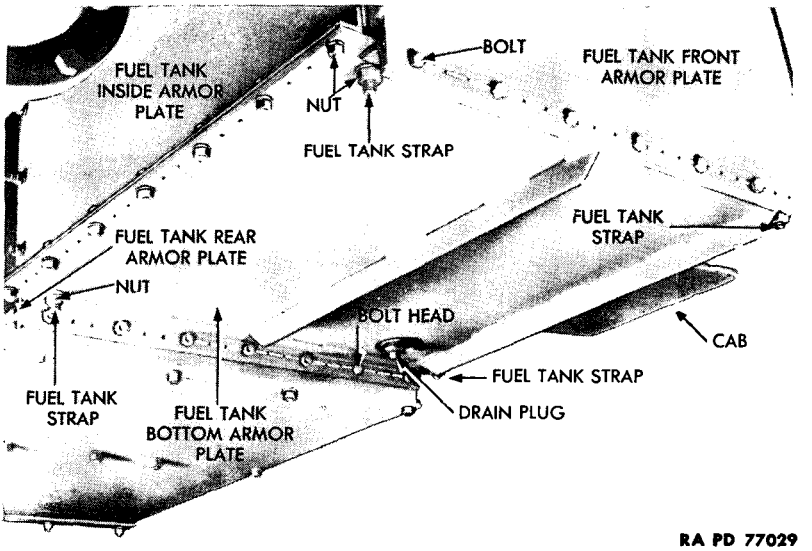


Figure 109—Fuel Tank—Underneath View

85. CARBURETOR.

a. Description. The carburetor is a four jet, four venturi, updraft type. It is secured to a throttle box which in turn is secured to the intake manifold on the right side of the engine block. A governor is built into the throttle box and pre-adjusted for a given high speed.

b. Adjustment of Carburetor. After engine has been warmed up to normal operating temperature, turn idle adjusting screw clockwise onto its seat and then back off screw 1½ turns. Tachometer reading should be about 500 revolutions per minute.

c. Removal (fig. 84). Loosen clamp and remove throttle control tubing for tandem winch throttle control cable from clamp. Remove

bolt, nut and lock washer that holds tandem winch throttle control cable to carburetor. Loosen hose clamps and remove carburetor to air duct pipe. Remove nut and lock washer that holds choke rod to carburetor, then repeat procedure on throttle rod. Disconnect accelerator rod spring. Disconnect fuel pump to carburetor pipe at fuel pump. Remove four nuts which hold carburetor to governor throttle valve housing and pull carburetor down and remove.

d. Installation (fig. 84). Install carburetor on governor throttle valve housing and fasten with four nuts. Connect fuel pump to carburetor pipe at fuel pump. Connect accelerator rod spring. Install

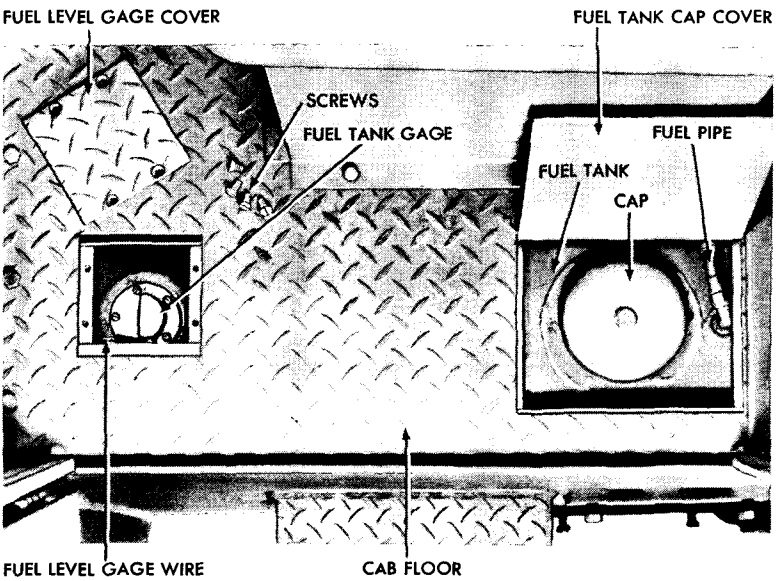


Figure 110—Fuel Tank Filler Cap and Gage Covers

choke rod and throttle rod on carburetor and fasten with nuts and lock washers. Install carburetor to air duct pipe and tighten hose clamps. Install tandem winch throttle control cable on carburetor and fasten with bolt, nut, and lock washer. Install throttle control tubing under clamp and tighten clamp.

86. FUEL TANKS.

a. Description. Two fuel tanks of 50 gallons capacity each are located on the right and left sides of the chassis along side of the cab doors. The fuel tank caps are inside cab under a lid that is a part of the floor. Fuel from the fuel tanks is carried to the carburetor by piping as shown in figure 106. The tanks are protected by the cab armor plates on all sides and by a single piece of armor plate on the bottom.

FUEL, AIR INTAKE, AND EXHAUST SYSTEMS

b. Removal (figs. 109, 110, and 111).

(1) DISCONNECT FUEL TANK. Lift fuel tank cap cover (inside cab) and disconnect fuel pipe from fuel tank. Remove four screws that hold fuel level gage cover to cab floor and remove cover. Remove nut and lock washer that hold fuel level gage wire to fuel tank and remove wire from terminal. Unclamp two oxygen and one acetylene welding bottles and remove bottles. Place a hydraulic jack under fuel tank so that fuel tank will be supported after being loosened.

(2) REMOVE FUEL TANK (fig. 111). Remove drain plug in sediment bowl of fuel tank and drain fuel into a dry, clean container.

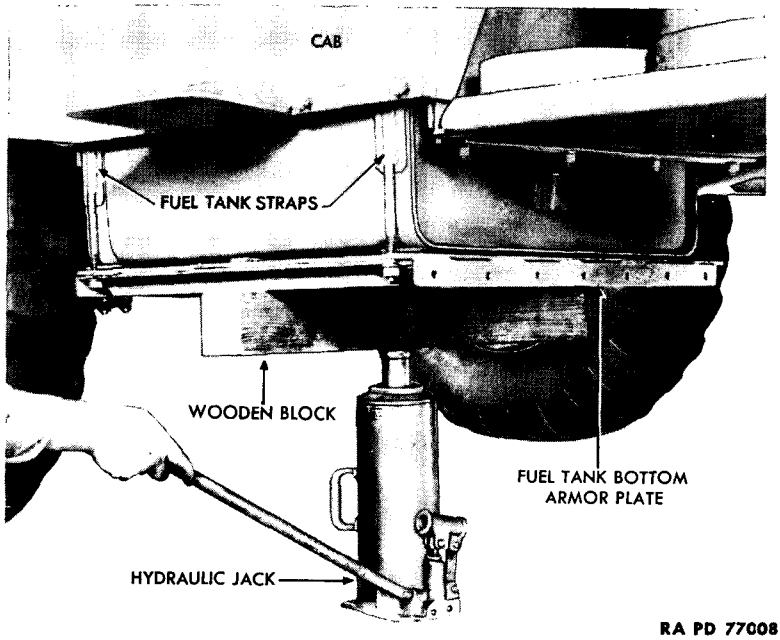


Figure 111—Removing Left Fuel Tank

Remove seven bolts, nuts, and lock washers that hold fuel tank bottom armor plate to fuel tank front armor plate. Remove seven bolts, nuts, and lock washers that hold fuel tank inside armor plate to fuel tank bottom armor plate. Remove seven bolts, nuts, and lock washers that hold fuel tank rear armor plate to fuel tank bottom armor plate. Lower fuel tank to ground by means of hydraulic jack. Remove four nuts and lock washers that hold fuel tank straps to fuel tank bottom armor plate and remove two fuel tank straps. Remove fuel tank bottom armor plate from under tank, then remove three pieces of insulation between bottom armor plate and fuel tank and two pieces of insulation from under the two straps.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

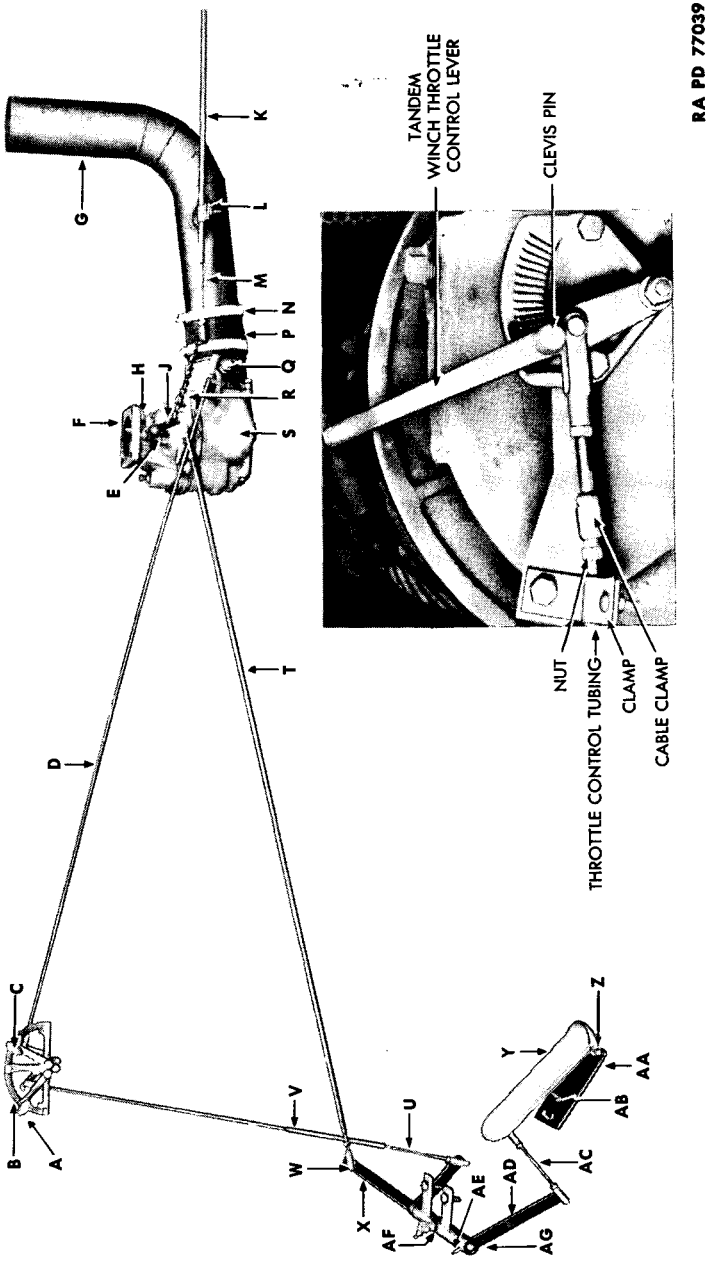


Figure 112—Throttle and Choke Linkage

A—THROTTLE CONTROL

B—SECTOR

C—CHOKE CONTROL

D—CHOKE ROD

E—THROTTLE STOP LEVER

F—THROTTLE PLATE

G—CARBURETOR TO AIR DUCT PIPE

H—THROTTLE STOP SCREW

J—THROTTLE CLAMP LEVER

K—THROTTLE CONTROL TUBING (TANDEM WINCH THROTTLE CONTROL)

L—LAMP

M—THROTTLE CONTROL CABLE (TANDEM WINCH THROTTLE CONTROL)

N—HOSE CLAMP

P—HOSE

Q—AIR SHUTTER LEVER

R—THROTTLE CONTROL CHAIN (TANDEM WINCH THROTTLE CONTROL)

S—CARBURETOR

T—ACCELERATOR TO CARBURETOR ROD

U—LOWER THROTTLE ROD

V—UPPER THROTTLE ROD

W—BALL JOINT (AT ENDS OF ALL RODS)

X—ACCELERATOR BELL CRANK

Y—ACCELERATOR PEDAL

Z—PIN

AA—ACCELERATOR PEDAL BASE

AB—ACCELERATOR PEDAL STOP

AC—ACCELERATOR ROD

AD—ACCELERATOR BELL CRANK LEVER

AE—PIN

AF—BELL CRANKSHAFT BRACKET

AG—CROSS SHAFT

RA PD 77039A

Legend for Figure 112—Throttle and Choke Linkage

c. Maintenance. Scrape off all dirt and other impurities from inside walls of tank and then clean thoroughly with dry-cleaning solvent.

d. Installation (figs. 109, 110, and 111).

(1) INSTALL FUEL TANK. Position insulation on bottom armor plate and then place fuel tank on armor plate. Install two fuel tank straps and fasten straps to armor plate with four nuts and lock washers. Raise fuel tank into position with hydraulic jack and then install 21 bolts, nuts, and lock washers which fasten fuel tank bottom armor plate to fuel tank front, inside and rear fuel tank armor plates. Install drain plug in fuel tank.

(2) CONNECT FUEL TANK. Install two oxygen and one acetylene welding bottles and pull clamps down onto bottles. Install fuel level gage wire on terminal of fuel tank and fasten wire with nut and lock washer. Install fuel level gage cover on cab floor and fasten with two screws. Connect fuel pipe at fuel tank. Fill fuel tank with fuel and lower fuel tank cap cover.

87. FUEL PIPING.

a. Description (fig. 106). Fuel is conducted from the two fuel tanks to the fuel tank change-over valve, through the fuel filter, to the fuel pump, and then to the carburetor by means of piping. All piping is connected by means of a sleeve and a connector. The sleeve is a sliding fit on the pipe and is inside of the connector which is threaded to complete the connection.

b. Repair of Fuel Piping.

(1) Pipes which are cracked inside a connector may be repaired, provided the pipe is long enough to permit its being shortened ½ inch. Shove sleeve back from end of pipe and saw off end of pipe. Remove sleeve and use new part. CAUTION: *Piping that is cut with a hacksaw must be cut squarely and never at an angle.*

(2) Kinked tubing usually breaks when straightened; however, if a kinked tube is straightened, it must be carefully inspected for splitting or obstructing at the spot where it was kinked.

(3) Split tubing should be replaced, but in an emergency can be soldered, after which it must be inspected for leaks or obstruction caused by soldering.

(4) Piping that is bent to form coils or shapes must be filled with sand and then bent by hand. Clean pipe of sand with compressed air.

c. Removal. Unscrew the connector and pull connector and sleeve back from the fuel system unit. Repeat procedure at opposite end of pipe and remove pipe, being careful not to kink the pipe during removal.

d. Installation. Push end of pipe firmly into fuel system unit fitting, then slide sleeve up to, and into, fuel system unit fitting. Slide connector up to fuel system unit fitting, turn connector into fitting by hand as far as possible, and tighten connector with a wrench. Do not overtighten; connector must be snug.

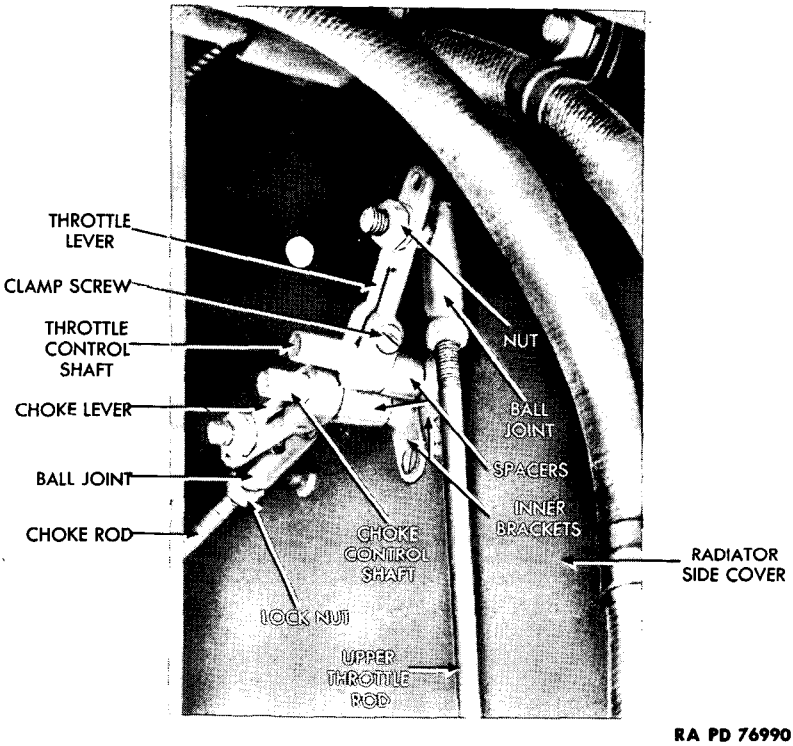


Figure 113—Throttle and Control Linkage (Inside Radiator Door)

88. THROTTLE AND CHOKE LINKAGE.

a. Description (fig. 112). The throttle and control linkage is composed of rods with adjustable yokes which connect the hand throttle lever, choke lever, and accelerator pedal to the carburetor. The hand throttle and choke levers are on the quadrant on the side of the radiator cover, and the accelerator pedal is on the cab floor. The accelerator pedal and hand throttle lever perform the same function in accelerating or decelerating the engine revolutions per minute. The choke lever is used for introducing a rich fuel mixture into the engine combustion chambers.

b. Adjustment. Throttle rods must be installed so that when there is no pressure on accelerator pedal, the throttle plate (fig. 112) is closed (throttle stop lever is all the way forward). Adjustment is made by removing clevis pin and turning the yoke. The throttle plate must be wide open when accelerator pedal is fully depressed (throttle stop lever is all the way back) and the accelerator pedal stop must be adjusted accordingly by loosening the lock nut and turning the stop screw.

c. **Removal** (figs. 112 and 113).

(1) REMOVE HAND THROTTLE LINKAGE. Reaching through radiator door opening remove two clamp screws which hold throttle lever and choke lever to hand throttle control shaft and choke control shaft, then remove levers. Remove a spacer from throttle control shaft and choke control shaft. Remove four screws that hold inner brackets to radiator side cover and remove two brackets. From inside cab remove three bolts, nuts, and lock washers that hold sector to radiator side cover and pull sector with controls off cover. Pull throttle control and choke control out of sector. Remove nut and lock washer that hold choke rod rear ball and socket to carburetor, remove nut and lock washer that hold choke rod front ball and socket to choke lever, and remove lever. Loosen lock nuts at both ends of choke rod and remove ball joints and lock nuts. Remove choke rod by pulling through bracket on radiator. Remove nut and lock washer that hold lower throttle rod to accelerator bell crank. Remove nut and lock washer that hold upper throttle rod to throttle lever and remove throttle lever. Loosen lock nuts at both ends of throttle rods and remove ball joints and lock nuts.

(2) REMOVE ACCELERATOR CONTROL LINKAGE. Remove two bolts, nuts, and lock washers that hold accelerator pedal to floor, and remove nut and lock washer that hold accelerator rod to pedal. Push pedal off rod and remove pedal. Remove two cotter pins and straight pin that hold pedal to base and remove pedal. Remove opposite end of accelerator rod from bell crank lever by removing nut and lock washer. Loosen two lock nuts, remove ball joints from rod, and then remove lock nuts. Remove accelerator rod spring. Remove nuts and lock washers that hold accelerator to carburetor rod to bell crank and to carburetor, then loosen lock nuts and remove spring clip and ball joints from rod and remove lock nuts. Remove two bolts, nuts, and lock washers that hold bell crank assembly to dash and remove bell crank assembly. Remove pin that holds bell crank lever to cross shaft and remove lever. Pull cross shaft with bell crank out of bell crank shaft bracket and drive pin out of bell crank and cross shaft and remove bell crank. Remove two bushings from bracket.

(3) REMOVE TANDEM WINCH THROTTLE CONTROL. Remove cotter pin and rod end pin at tandem winch throttle control. Loosen lock nut and remove yoke. Remove cable clamp from throttle control cable. Remove throttle control tubing from clamp on winch then remove tubing from clips on end of winch and cab. Remove tubing from clamp on air duct pipe to carburetor. Remove bolt, nut, and lock washer that holds throttle control chain to carburetor. Pull throttle control cable out of throttle control tubing. NOTE: *The throttle control chain is welded to the throttle control cable.*

d. **Installation** (figs. 112 and 113).

(1) INSTALL TANDEM WINCH THROTTLE CONTROL. Install throttle control cable in throttle control tubing. Attach throttle control chain to carburetor and fasten with bolt, nut, and lock washer. Install throttle control tubing under clamp on air duct pipe to carburetor, under clip on cab, and under clamp at rear of winch. Install cable

clamp on throttle control cable. Install yoke lock nut and yoke on cable. Install cable yoke on tandem winch throttle control and fasten with rod end pin and cotter pin. Adjust yoke on cable until tandem winch throttle control has to be moved five or six notches before throttle starts to open.

(2) INSTALL ACCELERATOR CONTROL LINKAGE. Press two bushings into bell crank shaft bracket. Install cross shaft in bell crank and fasten bell crank to shaft with a pin. Install lever on cross shaft and fasten with pin. Install bell crank assembly on dash and fasten with two bolts, nuts, and lock washers. Install spring clip ball joints and lock nuts on accelerator to carburetor rod and fasten rod to bell crank with nut and lock washer. Install two lock nuts and ball joints on accelerator rod and attach rod to bell crank with nut and lock washer. Install pedal on base and fasten with straight pin and two cotter pins. Install pedal on accelerator rod and fasten with nut and lock washer. Install pedal on floor and fasten with two bolts, nuts, and lock washers. Adjust accelerator control linkage so that carburetor throttle valve rests on stop screw when idling and rests against carburetor stop when accelerator pedal is fully advanced.

(3) INSTALL HAND THROTTLE LINKAGE. Install ball joints and lock nuts on upper and lower throttle rods. Install upper throttle rod on throttle lever and fasten with nut and lock washer. Attach lower throttle rod to accelerator bell crank and fasten with nut and lock washer. Install choke rod through bracket on radiator, then install lock nuts and ball joints on choke rod and attach choke rod to throttle lever and to carburetor with nuts and lock washers. Install throttle control and choke control in sector. Install sector on radiator side cover and fasten with three bolts, nuts, and lock washers. Install two inner brackets on radiator side cover and fasten with four screws. Install spacer on throttle control shaft and choke control shaft. Install throttle lever and choke lever on hand throttle control shaft and choke control shaft and fasten with two clamp screws.

89. FUEL FILTER.

a. Description (fig. 106). The fuel filter is of the built-up metal disk type and is located between the fuel tank change-over valve and the fuel pump. The function of the filter is to remove any water or impurities in the fuel. A drain plug is threaded into the bottom of the filter for draining any water or sediment which may accumulate in the filter bowl.

b. Maintenance. Remove drain plug from bottom of filter and remove fuel line at top, then use a low air pressure and blow out filter. A strong pressure must not be used, or damage to filter disks will result.

c. Removal of Fuel Filter (fig. 106). Disconnect fuel filter to fuel pump line and fuel tank change-over valve line at filter. Loosen fuel filter clamp bolt, nut, and lock washer and remove fuel filter.

d. Installation (fig. 106). Install fuel filter in fuel filter clamp and tighten clamp bolt, nut, and lock washer. Connect filter to fuel tank change-over valve line and filter to fuel pump line to filter.

90. FUEL TANK CHANGE-OVER VALVE.

a. Description. The fuel tank change-over valve is located at the right of the driver and is a two-way valve having a handle to enable the driver to select the fuel tank from which he wants to take fuel. Both fuel tanks are connected to the fuel tank change-over valve.

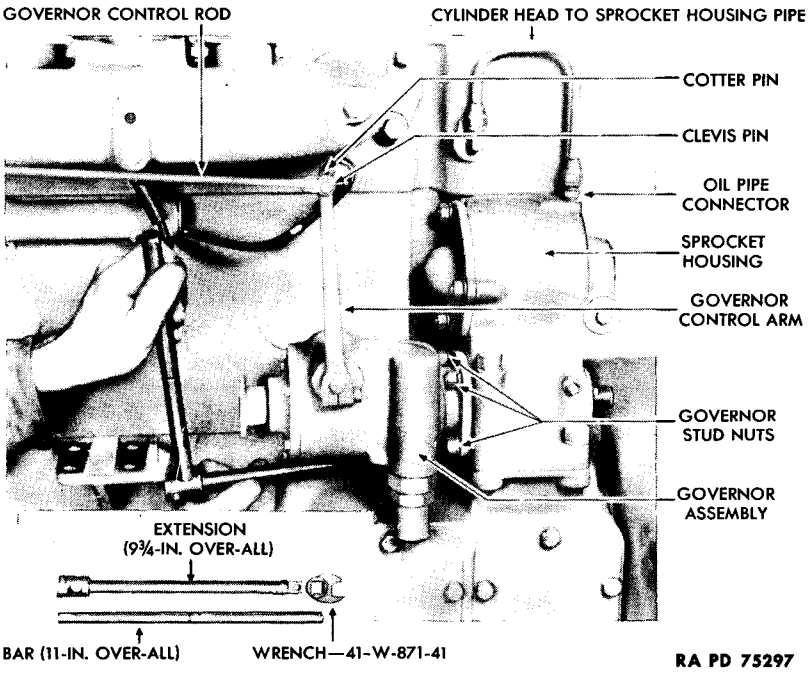


Figure 114—Governor Assembly Removal

b. Removal (fig. 106). Disconnect right and left fuel tank lines and fuel filter line at change-over valve. Remove screw and lock washer which hold handle on fuel tank change-over valve and then remove handle from valve stem. Remove two bolts, nuts, and lock washers which hold fuel tank change-over valve assembly to shifting rod tunnel and lift off valve assembly.

c. Installation (fig. 106). Install fuel tank change-over valve assembly on shifting rod tunnel and fasten with two bolts, nuts, and lock washers. Install handle on valve stem and fasten with screw and lock washer. Connect right- and left-hand fuel tank lines and fuel filter line to change-over valve connections.

FUEL, AIR INTAKE, AND EXHAUST SYSTEMS

91. GOVERNOR.

a. Description (fig. 114). The governor assembly is mounted on the sprocket housing on left side of engine. The governor is of the centrifugal type, having two weights operating on pins. The movement of the weights outward is controlled by the revolutions per minute of the engine. Adjustment of the governor is by means of a governor adjusting screw operating against a governor control spring. The governor throttle valve housing assembly consists of a throttle valve directly above the carburetor. This valve is operated by the governor and opens or closes the throttle valve according to the setting of the governor. The setting of the throttle valve is adjustable and the rod which connects the throttle valve to the governor is not adjustable. Adjustment of the governor setting must be accompanied by a setting of the governor throttle valve.

b. Adjustment. NOTE: *Any adjustment of the governor setting must be accompanied by a new setting of the governor throttle valve.*

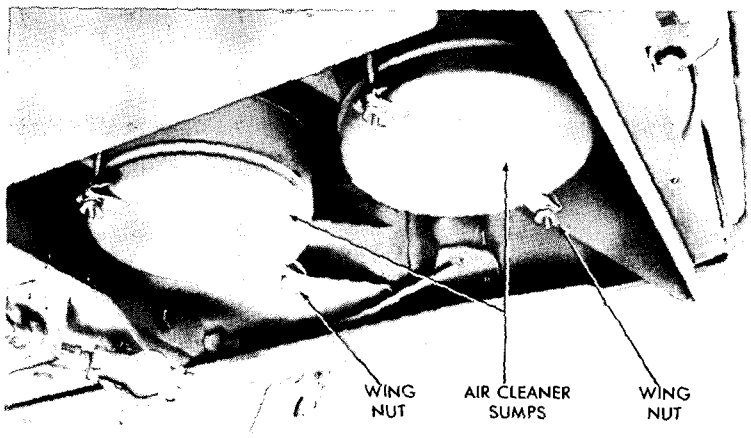


Figure 115—Air Cleaners RA PD 76482

(1) GOVERNOR ADJUSTMENT. Remove governor adjusting screw cap and loosen governor adjusting screw lock nut. Start engine and run it at 2,100 revolutions per minute on tachometer. Turn governor adjusting screw up to the point where tachometer starts to show a revolutions per minute of more than 2,100 revolutions per minute. Release throttle, if reading does not stand at 2,100, adjust screw until it does. At 2,100 revolutions per minute governor throttle valve should be wide open and stop lever must be up against stop lever screw. If lever is not against screw, loosen nut on screw and turn stop lever screw until it holds throttle valve wide open. Tighten nut.

(2) THROTTLE VALVE ADJUSTMENT. Remove carburetor (par. 85), and governor throttle valve housing assembly can be pulled down. Loosen nut on stop lever screw and turn screw until throttle valve is

0.006 inch open. Tighten nut on stop lever screw and withdraw feeler gage. Push valve housing up and install carburetor (par. 85).

c. **Removal** (fig. 114). Loosen hose clamps that hold carburetor to air duct pipe and remove pipe. Remove cotter pin and rod end pin which hold governor control arm to governor control rod. Remove governor lower inside stud nut and lock washer, using a crowfoot wrench, and remove three remaining nuts and lock washers, using a standard wrench. Lift governor assembly and governor housing gasket off sprocket housing.

d. **Installation** (fig. 114). Place governor assembly into position, using a new governor housing gasket. Install governor lower inside stud nut and lock washer, using a crowfoot wrench, then install three

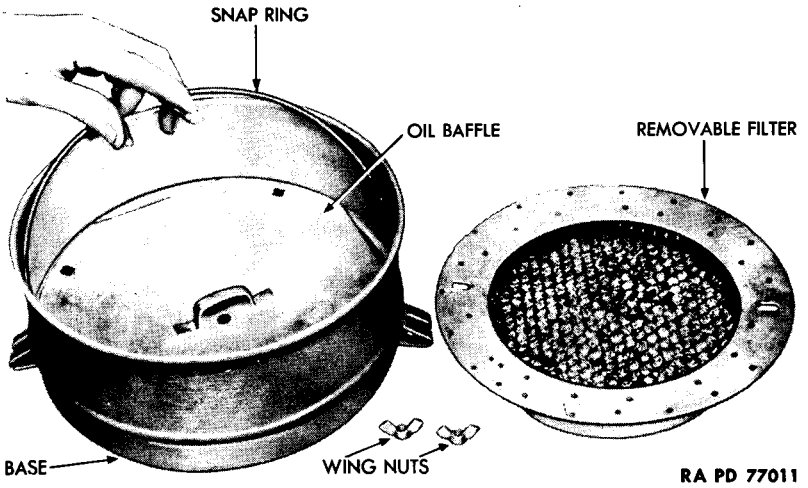


Figure 116—Air Cleaner Base

remaining nuts and lock washers, using a standard wrench. Fasten governor control rod to governor control arm with rod end pin and cotter pin. Install carburetor to air duct pipe and tighten hose clamps.

92. AIR CLEANERS.

a. **Description** (figs. 115 and 116). The two air cleaners are of the oil bath type; they are located at the right front corner of the cab and are accessible from underneath. The function of the air cleaners is to remove all dust and dirt from the air before the air is combined with the fuel. Air entering the cleaners passes into oil chambers where, due to impact and sudden reversal of air flow, most of the dust in the removable filter is thrown into the oil in the base and settles in the bottom of the cleaner. Partially cleaned air passes through a dense oil-wetted, copper-mesh strainer where the remaining dust is trapped.

b. Maintenance (fig. 116). Unscrew wing nuts to loosen holding bolts, then move bolts outward and lift base off body. Dump all oil in the base into a container and discard oil. Unscrew two wing nuts, then remove nuts and lift out removable filter. Remove snap ring that holds oil baffle and lift out baffle. The air cleaner bodies and base must be cleaned regularly and the intervals for cleaning depend upon the conditions under which the vehicle is operating. (Preventive Maintenance Inspection, par. 35). Clean both air cleaners with dry-cleaning solvent and dry with compressed air. This operation should be repeated several times, or until all dirt and dust have been removed. Inspect for dents or damage that will permit any air to enter the air cleaners except through the inlet. Flush permanent filter (inside air cleaner body) thoroughly with dry-cleaning solvent and then dry with compressed air. Wash removable filter thoroughly with dry-cleaning solvent and dry with compressed air. Then install removable filter in air cleaner body and fasten with two wing nuts. Fill air cleaner base with 1¾ quarts of engine oil, install oil baffle, and secure with snap ring.

c. Removal (fig. 115). Disconnect air line to air horn, remove right bolt, nut, and lock washer that hold air horn to bracket and push horn to left of vehicle. Remove five bolts, nuts, and lock washers that hold air cleaner side pan and remove pan. Loosen hose clamps that hold hose to the top of left air cleaner and push hose off air cleaner. Loosen two clamps and remove left air cleaner. Loosen hose clamps that hold hose to top of right air cleaner and push hose off air cleaner. Remove top connection from air cleaners. Loosen two clamps and remove right air cleaner.

d. Installation. Install right air cleaner, with inlet opening as far to rear as possible. Tighten two clamps that hold air cleaner. Install top connection and install hose connection to right air cleaner and tighten hose clamps. Install left air cleaner and tighten two clamps that hold air cleaner. Install hose connection of left air cleaner and tighten hose clamps. Install air cleaner side pan and fasten with five bolts, nuts, and lock washers. Straighten air horn and install bolt, nut, and lock washer that hold horn to bracket; connect air line to horn. Install air cleaner base.

93. EXHAUST PIPE, MUFFLER, TAIL PIPE, AND HEATER VALVE EXHAUST PIPE.

a. Exhaust Pipe.

(1) DESCRIPTION. The exhaust pipe connects the exhaust manifold to the muffler. It is secured to the exhaust manifold by a flange and is a slip fit into the muffler end casting.

(2) REMOVAL. Remove four bolts and nuts which hold exhaust pipe to exhaust manifold and remove exhaust pipe from muffler by pulling forward on the pipe.

(3) INSTALLATION. Slide exhaust pipe into muffler and then secure exhaust pipe flange to exhaust manifold with four bolts and nuts.

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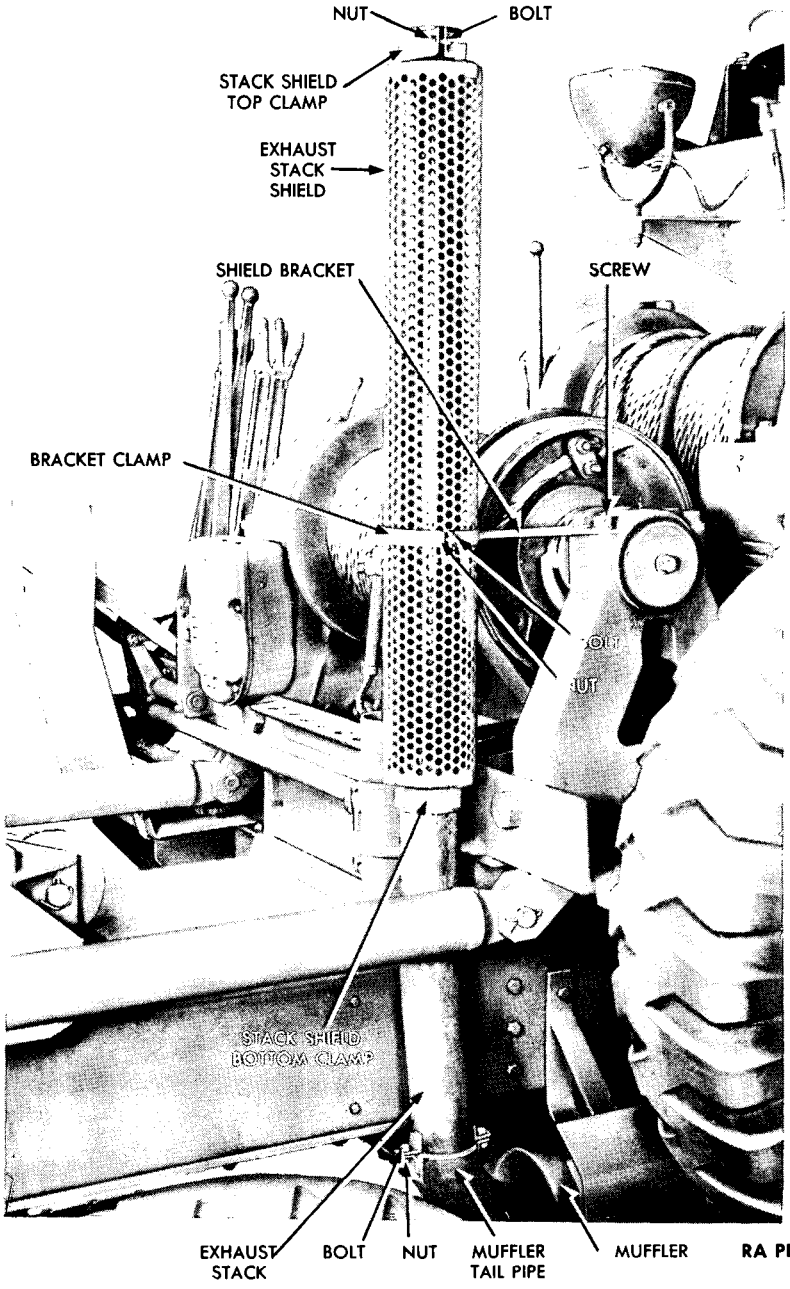

Figure 117—Exhaust Stack

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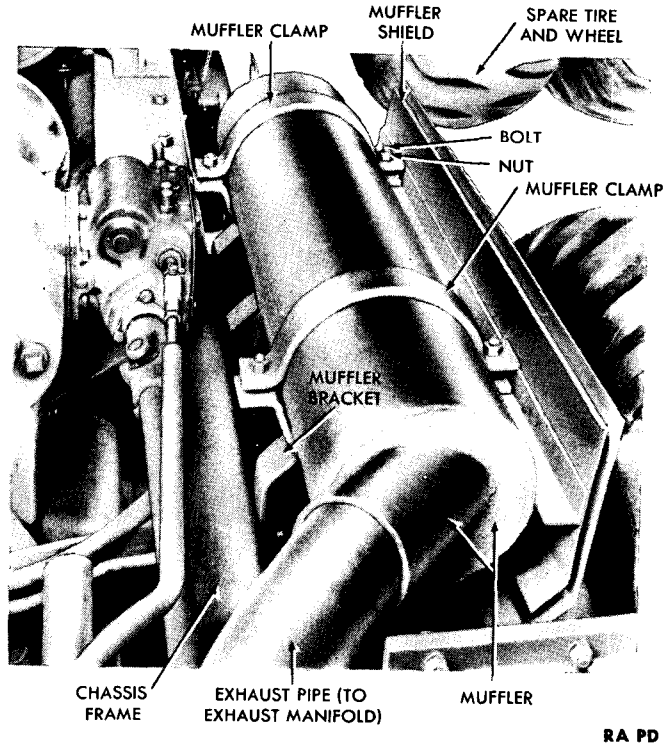

Figure 118—Muffler and Mounting—Underneath View

b. Muffler (fig. 118).

(1) DESCRIPTION. The cylindrical manifold is secured to brackets which in turn are bolted to the frame. Burned gas enters from the pipe at the front of the muffler. The noise of the exploded gas is deadened by the muffler and then the gas is allowed to escape out of the rear end of the muffler.

(2) REMOVAL. Remove four bolts and nuts which hold two muffler clamps to the muffler bracket, then lift the muffler clamps off the muffler. Pull the muffler to the rear and off the exhaust pipe. Push the four bolts out of the muffler bracket and remove the muffler shield.

(3) INSTALLATION. Slide muffler toward the front onto the exhaust pipe. Install muffler shield on muffler bracket and fasten by pushing four bolts into the bracket. Install muffler clamps in muffler bracket and secure with four nuts on the four bolts.

c. Tail Pipe (fig. 117).

(1) DESCRIPTION. The tail pipe (exhaust stack) attaches to the rear end of the muffler and extends upward alongside of the tandem

rear winch and this tail pipe conducts burned gas to the atmosphere. To protect the crew from being burned an exhaust stack shield surrounds the tail pipe.

(2) REMOVAL (fig. 117).

(a) Remove Exhaust Stack and Exhaust Stack Shield. Remove two bolts and nuts which hold exhaust stack to muffler tail pipe. Remove two bolts and nuts that hold exhaust stack shield to shield bracket and remove bracket clamp. Remove exhaust stack with shield as a unit. Remove stack shield top clamp bolt and nut and then remove stack shield bottom clamp bolt and nut. Lift shield off stack.

(3) INSTALLATION (fig. 177).

(a) Install Exhaust Stack and Exhaust Stack Shield. Install shield on stack and fasten with stack shield top clamp bolt and nut, also stack shield bottom clamp bolt and nut. Install stack and shield assembly and fasten by placing bracket clamp around shield and then fastening clamp with two bolts and nuts. Attach exhaust stack to muffler tail pipe with two bolts and nuts.

d. Heater Valve Exhaust Pipe.

(1) DESCRIPTION. The heater valve exhaust pipe carries exhaust gas from the heater manifold to the atmosphere.

(2) REMOVAL. Remove two bolts and nuts that hold pipe to heater pipe flange, then remove clamp which holds pipe to frame. Remove pipe.

(3) INSTALLATION. Install pipe on heater pipe flange and fasten with two bolts and nuts, then install clamp that holds pipe to frame.

Section XVI

COOLING SYSTEM

94. DESCRIPTION AND DATA.

a. Description. The cooling system of the engine consists of a radiator, water pump, fan and belts, water manifold, and thermostat. The radiator has incorporated into its construction a shroud for the fan in order to direct air to the fan blades. The water pump is mounted on the front end of the engine cylinder block and is driven by two "V" belts operated by a pulley on the crankshaft. The six fan blades are riveted to a spider and the spider is fastened to the water pump. The fan is driven by the same belts that drive the water pump. The thermostat is located in the water outlet manifold and thermostat valve body and does not open to allow the cooled water in the radiator to circulate through the engine cylinder block and cylinder head until the water has reached 160°F. The function of the thermostat is to hold operating temperatures of the water within a definite range.

b. Data.

Fan:

Number blades	6
Diameter of fan	28 in.
Adjustment	adjusting screw

Water Pump:

Make	Hall-Scott
Type	impeller
Location	front of engine

Radiator:

Make	Young
Model	37923
Capacity (complete cooling system)	16 gallons
Location of filler cap	lid at front of engine compartment in cab

Thermostat:

Make	Fulton Sylphon
Type	by-pass

Location	water outlet manifold
Starts to open at	160°F
Fully open at	175°F

95. MAINTENANCE OF COOLING SYSTEM.

a. Filling Cooling System. Remove cover from engine compartment top at right of driver and then remove radiator cap. Fill cooling system. Start engine and allow to run until water temperature gage reads 180°F. Shut off engine and fill cooling system again.

b. Inspection of Cooling System Units. Inspect all hose connections and hose connection clamps. Clamps must be tight and hose connections must not leak. Inspect drain cocks on radiator, water pump and cylinder block for leakage. Examine all gaskets at water connections for leaks and tighten all bolts and nuts at these water connections.

c. Reverse Flushing.

(1) RADIATOR. Remove thermostat (par. 98), then remove upper and lower radiator hose, and replace radiator cap. Attach a length of hose to the radiator top connection, then attach a length of hose to the radiator lower connection and insert reverse flushing gun in this hose. Connect the water hose of the gun to a water tap and the air hose to a compressed air line. Turn on the water and when the radiator is full, turn on the air in short blasts. Allow radiator to fill with water between blasts of air. Continue this flushing until water from top hose runs clear.

(2) CYLINDER. Remove hose from water pump inlet and attach a length of hose to the inlet, then remove hose from water pump outlet and attach a length of hose to the outlet, then insert gun in this hose. Repeat procedure above (1).

d. Antifreeze.

(1) Ethylene glycol is the only antifreeze compound prescribed for use in Ordnance vehicles. Pour solution into radiator until radiator is filled. Start engine and run until water temperature gage registers 185 degrees. Pour remainder of solution into radiator.

e. Antifreeze Chart.

Ethylene Glycol (Quart)	Water (Quart)	Protects to Degrees F.	Gravity
0	40	32	1.000
4	36	26	1.016
8	32	16	1.031
12	28	— 3	1.045
16	24	—11	1.058
20	20	—31	1.070

f. Draining of Cooling System. Open radiator drain cock, cylinder block drain cock, and water pump drain cock. Radiator drain cock is on bottom of radiator and can be reached from underneath

the vehicle. Cylinder block drain cock is on right rear side of cylinder. Water pump drain cock is at bottom of water pump. The air compressor can be drained of water by removing pipe plug in air compressor head. Drain ethylene glycol solution into containers so that it can be used again.

96. FAN.

a. Description. There are six blades on the fan assembly which is secured onto the front of the water pump by six cap screws that are wired in place. The fan and water pump are operated by two belts driven from a pulley on the crankshaft.

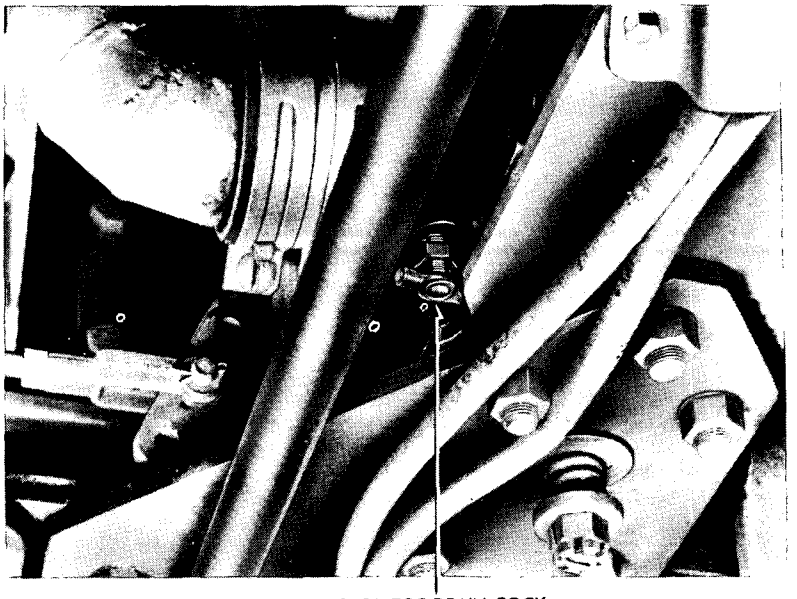

Figure 119—Radiator Drain Cock

b. Removal. Remove lock wires from six cap screws that hold fan to water pump and place fan in radiator shroud. Remove water pump assembly (par. 99) and lift fan out of radiator shroud.

c. Installation. Install fan in radiator shroud, then install water pump assembly (par. 99). Fasten fan to water pump with six fan cap screws and secure screws in place with lock wires.

97 FAN BELTS.

a. Description. There are two "V" type fan belts which are driven from a pulley on the crankshaft. These belts operate the fan and the water pump and must be kept tight in order to prevent overheating of the engine.

b. Adjustment. Loosen four nuts which hold water pump to the water pump side brackets. Loosen set screw lock nut and turn set screw up to tighten belts; continue tightening until it is just possible to turn the crankshaft by applying hand pressure at the fan blades. Tighten set screw lock nut and nuts which secure fan pump to side brackets.

c. Removal. Loosen four nuts that hold water pump to water pump side bracket. Loosen set screw lock nut and turn set screw to lowest adjustment. Lower water pump as far as possible. Pry fan

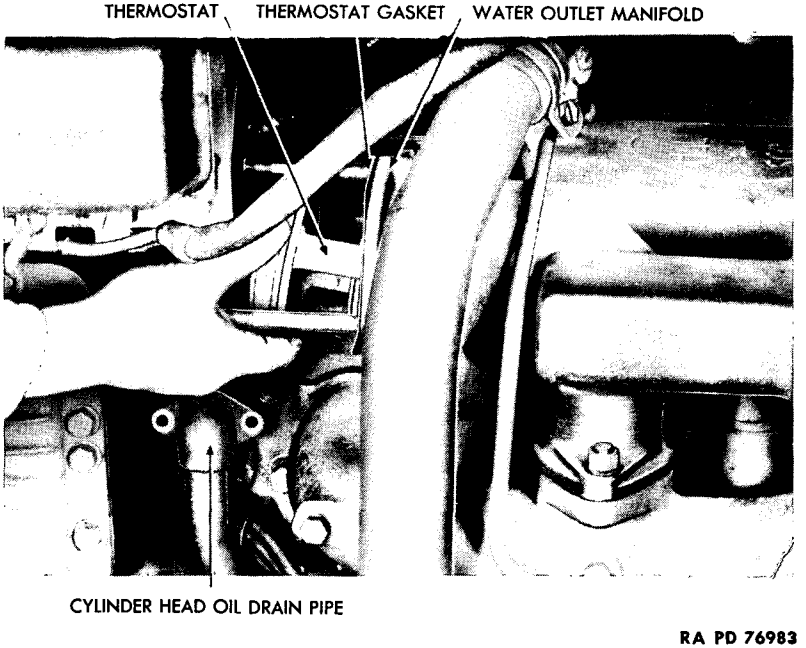

Figure 120—Removing Thermostat

belts off water pump pulley and then remove belts over fan blades and off crankshaft pulley.

d. Installation. Install fan belts over fan blades and onto crankshaft pulley. Pry belts onto water pump pulley. Raise water pump by turning set screw up until belts are tight, then tighten set screw lock nut and tighten the four nuts that hold water pump to side brackets. Test adjustment as in (**b**).

98. THERMOSTAT.

a. Description (fig. 120). The thermostat is a bellows type and is located in the water outlet manifold and thermostat valve body. It bypasses the cooling liquid around the radiator during the warm-up

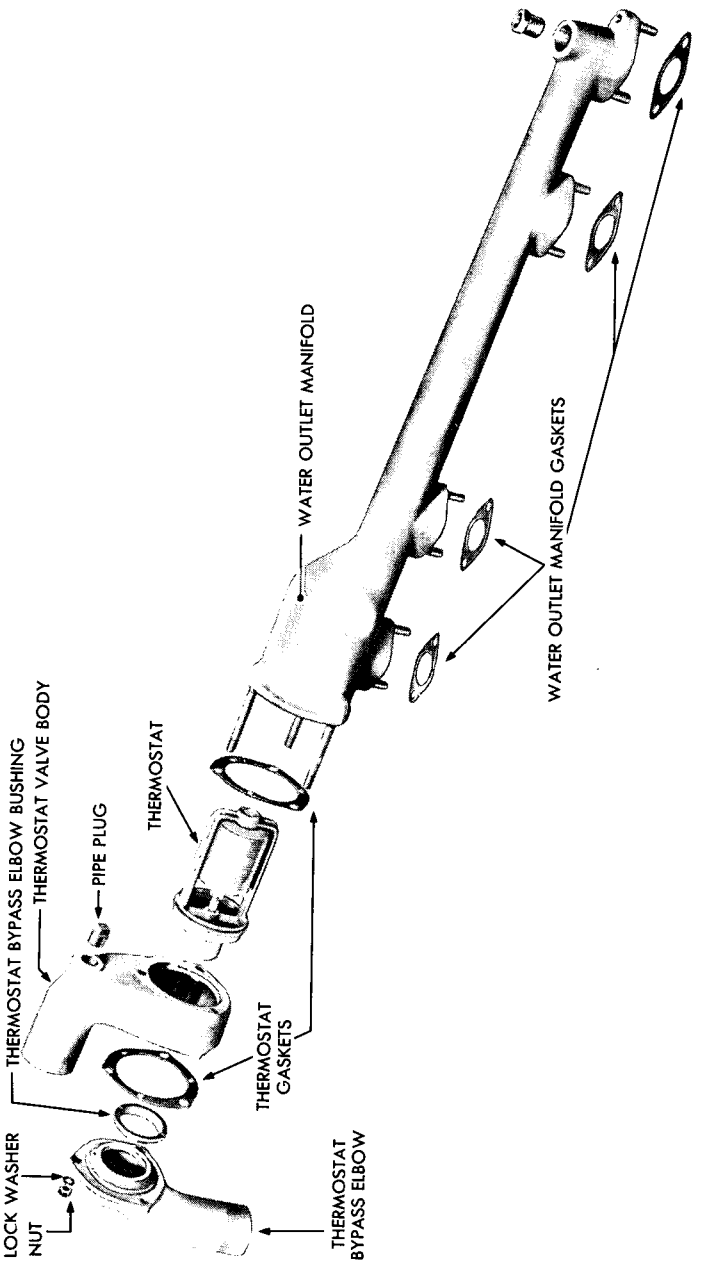

Figure 121—Water Outlet Manifold and Thermostat—Disassembled

period and does not open to allow the cooled water in the radiator to circulate until the water has reached 160°F.

b. Removal (fig. 120). Remove three nuts and lock washers that hold thermostat bypass elbow, and then remove two nuts and lock washers, that hold water pump inlet elbow to water pump. Remove thermostat bypass elbow with water pump inlet elbow as an assembly. Remove water pump inlet elbow gasket. Loosen hose clamps and remove radiator top hose assembly. Disconnect water tempera-

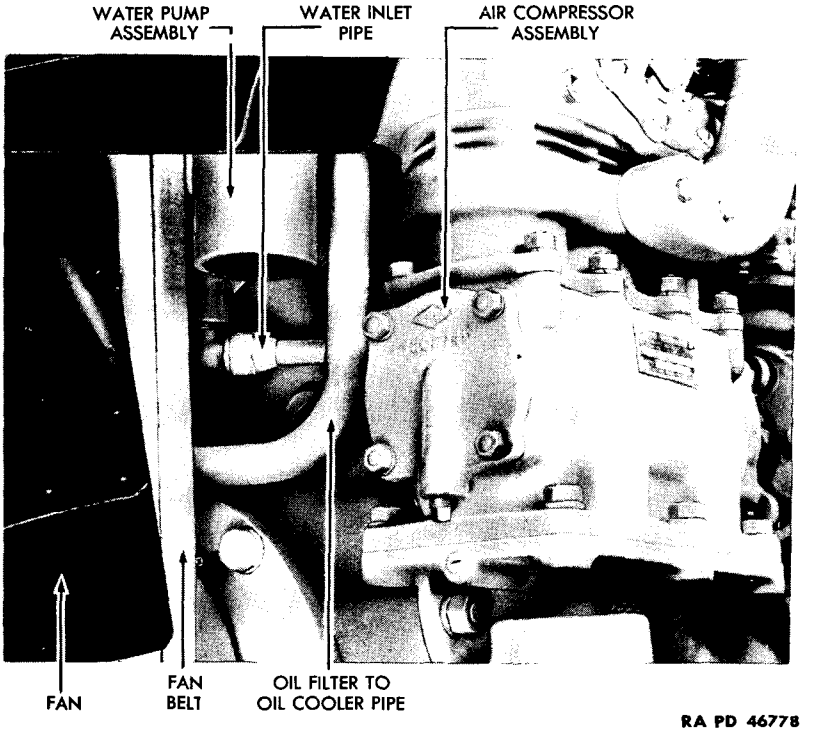

Figure 122—Water Inlet Pipe Installed

ture gage. Remove thermostat gasket. Remove two cap screws and lock washers that hold cylinder head oil drain pipe to cylinder head, and remove pipe from upper crankcase. Pull thermostat valve body off water outlet manifold and then remove thermostat from inside of water outlet manifold. Lift thermostat gasket off water outlet manifold.

c. Test. The temperature at which a thermostat opens is very important and it should be checked whenever the cooling system is being checked. Place the thermostat in a container of water along with a thermometer. Heat the water until the thermostat starts to

COOLING SYSTEM

open. The thermometer should read from 160°F to 165°F. Continue heating the water until the thermostat is wide open. The thermometer should read 175°F to 180°F. Thermostats that do not open completely, or open at too low or at too high a temperature, must be replaced. A thermostat that opens too soon will cause the engine to operate at too low a temperature, and the thermostat that opens too late, or sticks in a closed position, may cause the engine to overheat.

d. Installation (fig. 121). Install thermostat gasket on water outlet manifold, then install thermostat in the manifold. Place thermo-

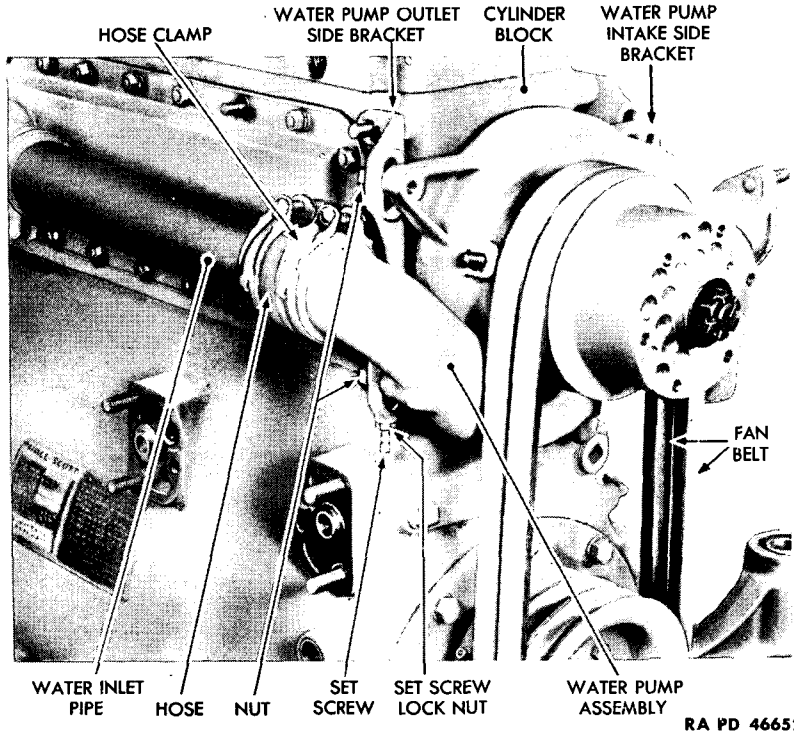

Figure 123—Water Pump Installed

stat valve body on manifold. Install cylinder head oil drain pipe in upper crankcase and then secure the opposite end to the cylinder head with two cap screws and lock washers. Install another thermostat gasket on valve body. Connect water temperature gage and then install radiator top hose and secure with hose clamps. Install water pump inlet elbow gasket, and then install thermostat bypass and water pump inlet elbow, as an assembly. Secure water pump inlet elbow to water pump with two nuts and lock washers, then secure thermostat bypass elbow with three nuts and lock washers.

99. WATER PUMP.

a. Description (fig. 123). The water pump is an impeller type and is fastened to the front end of the engine cylinder block. The fan is secured to the front of the pump pulley and both are driven by two "V" belts which are driven by a pulley on the crankshaft.

b. Removal (figs. 122 and 123). Remove fan (par. 96). Loosen hose clamps on water inlet pipe and slide hose off water pump. Loosen two nuts which hold water pump assembly to water pump outlet side bracket. Loosen adjusting set screw lock nut about five

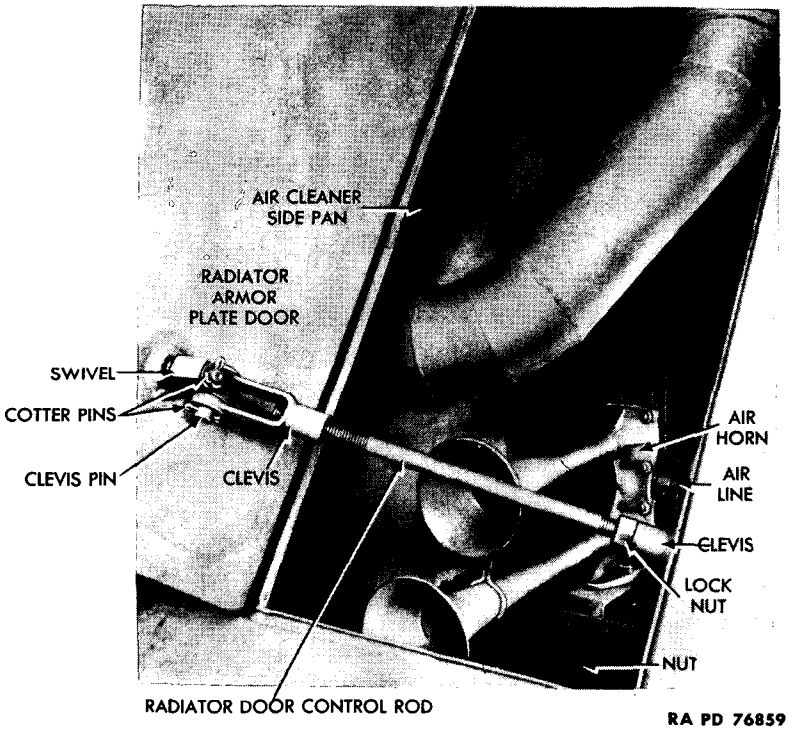

Figure 124—Disconnecting Radiator Armor Plate Doors

threads. Loosen hose clamps on water inlet elbow and thermostat by-pass elbow and slide hose up. Loosen hose clamps on bottom hose (to radiator) and push hose down. Loosen two nuts that hold pump to intake side bracket. Hold hand under water pump and allow pump to slide down slowly, thereby relieving tension on fan belts. Remove four nuts that were loosened above and remove four lock washers and plain washers. Remove pump and fan belts in one operation.

c. Installation (figs. 122 and 123). Install fan belts on water pump pulley, position pump on engine, and install four nuts, lock washers

and plain washers that hold pump to side brackets. Adjust pump (par. 96) and tighten nuts. Install bottom hose on pump and tighten hose clamps. Install hose on water inlet pipe and tighten hose clamps. Install fan (par. 96).

100. RADIATOR SHUTTERS AND LINKAGE.

a. Description (figs. 125 and 126). The two armor plate doors on the front of the cab protect the radiator from damage during combat. The two doors can be opened or closed by means of a lever at the commander's seat.

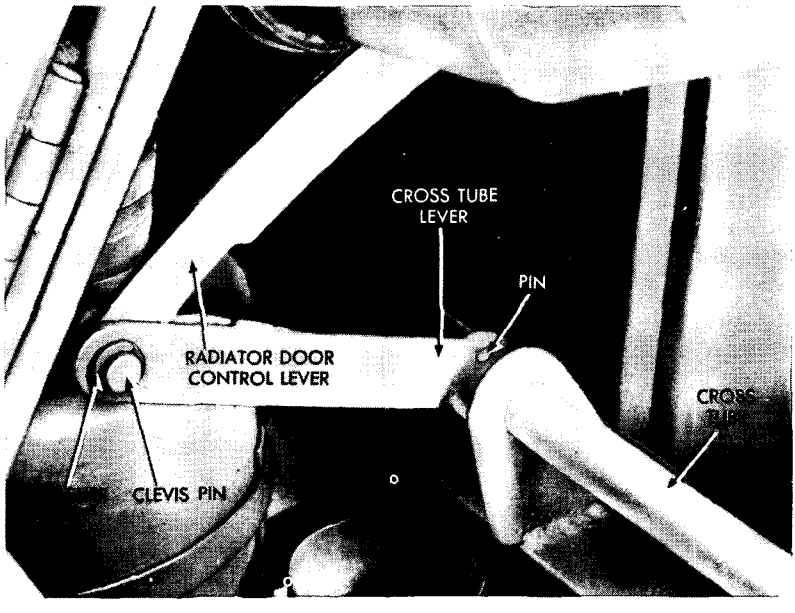

Figure 125—Radiator Armor Plate Door Linkage

b. Adjustment (fig. 124). Radiator doors must be straight open (right angle to front of cab). To adjust, remove cotter pin and clevis pin from radiator door control rods at end of rod having lock nut; turn clevis on or off rod until each door is at right angles; then tighten lock nut and install clevis and cotter pins.

c. Removal (figs. 124, 125, and 126). Disconnect air line to air horn. Remove bolt, nut, and lock washer that holds air horn to right side of bracket and push horn toward left of vehicle. Remove five bolts, nuts, and lock washers that hold air cleaner side pan and remove pan. Remove cotter pins and clevis pins that hold radiator door control rods to doors, and push control rods out of the way. Remove cotter pin and clevis pin that hold cross tube lever to

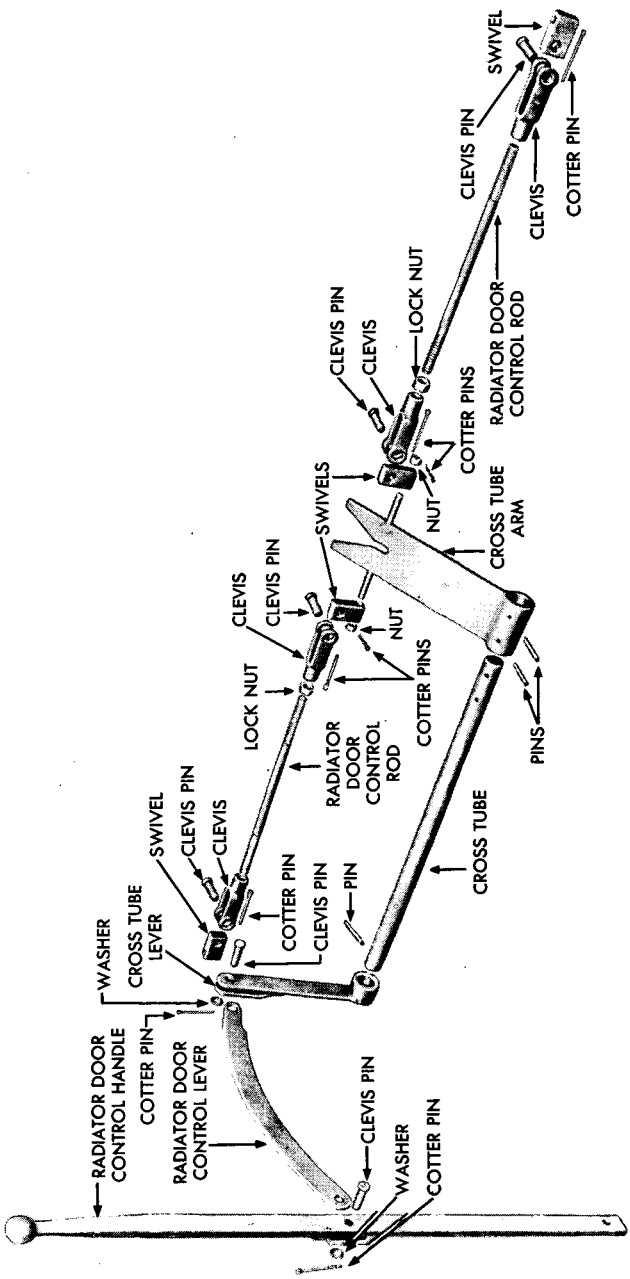

Figure 126—Radiator Armor Plate Door Linkage—Disassembled

COOLING SYSTEM

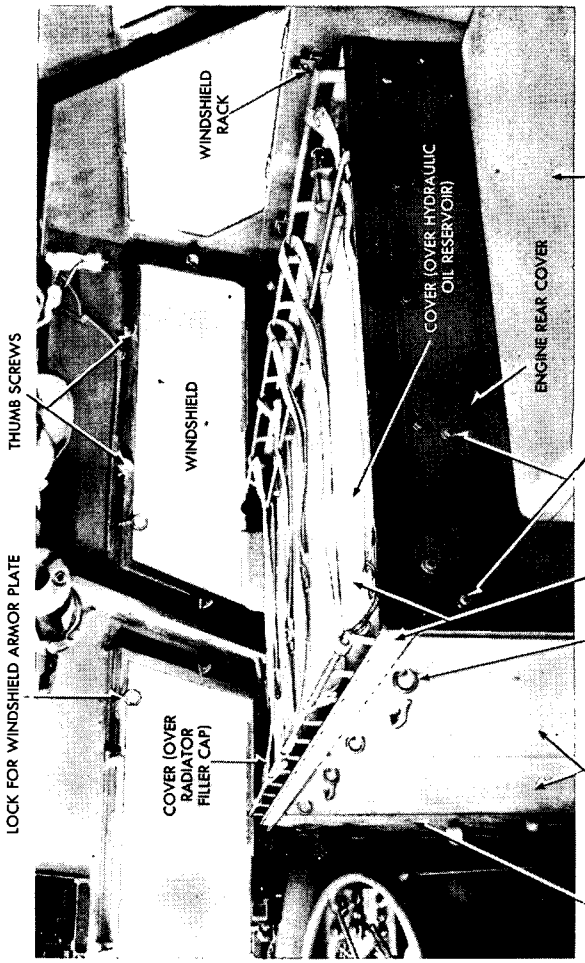

Figure 127—Engine Top and Side Covers

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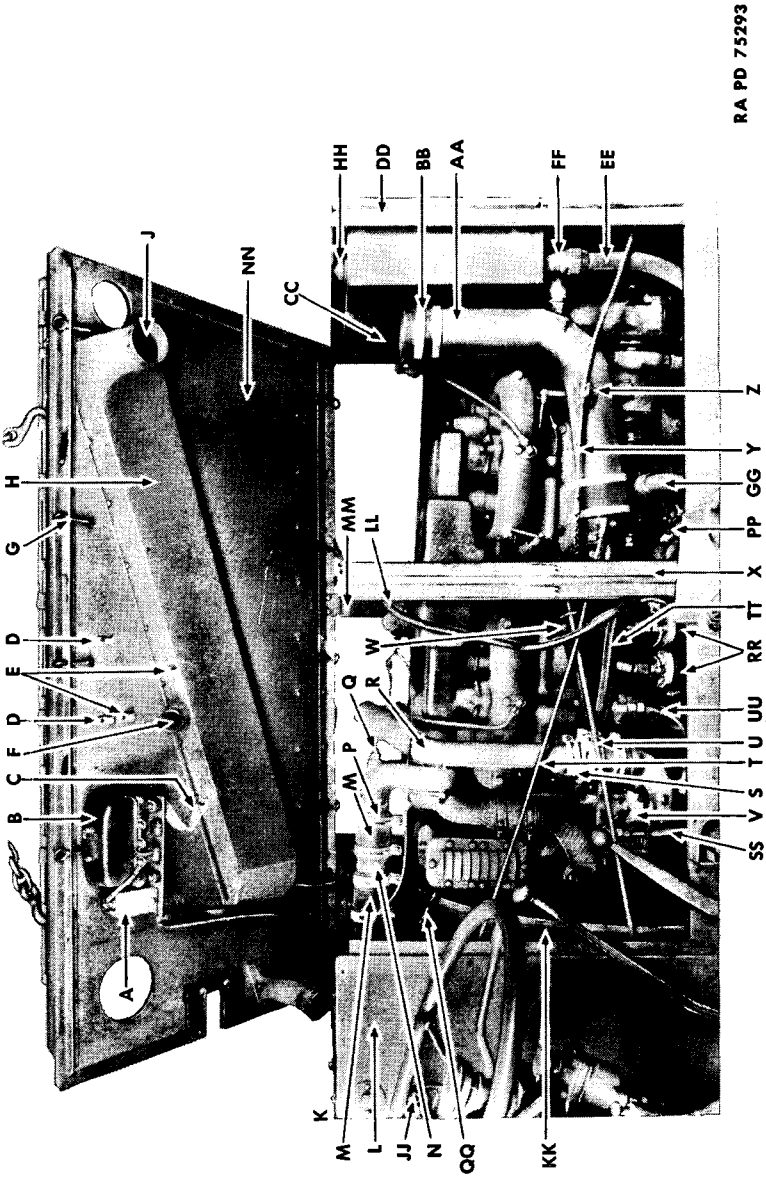

Figure 128—Engine Top Cover Connections

A—RADIO FILTER
B—VOLTAGE REGULATOR
C—VOLTAGE REGULATOR GROUND STRAP
D—VOLTAGE REGULATOR CABLE CLAMPS
E—WATER TEMPERATURE TUBE CLAMP
F—CONNECTION FOR AIR COMPRESSOR PIPE
G—TURNBUCKLE
H—AIR DUCT
J—CONNECTION FOR CARBURETOR AIR PIPE
K—CONNECTION FOR AIR CLEANER PIPE
L—RADIATOR SIDE COVER
M—RADIATOR TOP HOSE
N—CONNECTOR PIPE
P—HOSE CLAMPS
Q—WATER TEMPERATURE TUBE
R—AIR COMPRESSOR TO AIR DUCT PIPE
S—HOSE CLAMP
T—CHOKE ROD
U—ACCELERATOR ROD
V—AIR COMPRESSOR
W—THROTTLE SPRING
X—RIGHT SIDE STRIP
Y—REAR WINCH THROTTLE CABLE
Z—CLAMP
AA—CARBURETOR TO AIR DUCT PIPE
BB—HOSE CLAMP
CC—ENGINE REAR COVER
DD—ENGINE REAR COVER FRAME
EE—HYDRAULIC OIL LINE (FROM RESERVOIR TO STEERING GEAR)
FF—HYDRAULIC OIL LINE (FROM RESERVOIR TO HYDRAULIC PUMP)
GG—HYDRAULIC OIL LINE (FROM HYDRAULIC PUMP TO STEERING GEAR)
HH—HYDRAULIC OIL RESERVOIR FILLER CAP
JJ—CHOKE CONTROL
KK—RADIATOR
LL—VOLTAGE REGULATOR CABLE
MM—RIGHT SIDE STRIP
NN—ENGINE TOP COVER
PP—GENERATOR
QQ—RADIO FILTER WIRE
RR—IGNITION COILS
SS—AIR LINE TO GOVERNOR
TT—AIR LINE TO AIR RESERVOIRS
UU—FUEL LINE (FUEL FILTER TO FUEL PUMP)

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Legend for Figure 128—Engine Top Cover Connections

radiator door control lever at side of commander's seat, then remove pin that holds cross tube lever to cross tube and remove lever. Remove cotter pin and clevis pin which hold radiator door control rods to cross tube arm and remove lever. Remove cross tube with arm from cab. Drive two pins out of cross tube arm and remove arm. Remove cotter pins, washers, and swivels from radiator doors. Remove cotter pin, clevis pin, and washer that hold radiator door control handle to floor of cab, and then remove handle with radiator door control lever. Remove cotter pin, clevis pin, and washer that hold radiator door control lever to radiator door control handle. Remove clevis from both ends of both radiator door control rods, then remove two lock nuts from end of each rod. Remove cotter pins and swivels from cross tube arm.

d. Installation (figs. 124, 125, and 126). Install lock nuts on both radiator door control rods and then install four yokes on rods. Install two swivels, nuts, and cotter pins on cross tube arm. Install radiator door control lever on radiator door control handle with a clevis pin, washer, and cotter pin. Install handle in bracket on floor of cab and fasten with clevis pin, washer, and cotter pin. Install washer, swivel, washer and cotter pin on radiator doors. Install cross tube arm on cross tube and fasten with two pins. Install cross tube inside front of cab and fasten with clevis pins and cotter pins. Install cross tube lever on cross tube and fasten with pin, then attach lever to radiator door control lever with clevis pin and cotter pin. Attach radiator door control rods to doors and fasten with clevis pins and cotter pins. Install air cleaner side pan and fasten with five bolts, nuts, and lock washers. Straighten air horn and install bolt, nut, and lock washer to fasten horn to bracket. Connect air line to air horn. Adjust shutters as in subparagraph b above.

101. RADIATOR.

a. Description. The radiator is of the fin and tubular core construction. It is mounted at the front of the vehicle and the core is shrouded. The filler opening is located on the top left side of the radiator. The radiator is protected from damage during combat by two radiator armor plate doors, operated by a lever at the commander's seat.

b. Removal.

(1) PRELIMINARY INSTRUCTIONS. Disconnect battery. Drain cooling system (par. 95). Remove stowage from top of engine top cover. Turn turnbuckles and remove four engine side covers (two on right and two on left). Remove covers over radiator filler cap and over hydraulic steering oil reservoir filler cap.

(2) REMOVE SIDE STRIPS (figs. 128 and 129). Remove two nuts and lock washers that hold left and right side strips to engine top cover. Then remove two bolts, nuts, and lock washers that hold left strip at bottom and remove strip.

(3) DISCONNECT AIR DUCT PIPES (figs. 128 and 129). Disconnect carburetor air duct pipe at air duct (on engine top cover) by loosen-

ing top hose clamp and prying hose off air duct elbow. Disconnect air compressor air duct pipe by loosening top hose clamp and prying off air duct elbow.

(4) DISCONNECT WATER TEMPERATURE TUBE AND VOLTAGE REGULATOR CABLE (figs. 128 and 129). Loosen two water temperature tube clamp screws on under side of engine top cover and slide tube from under clamps. Loosen two clamp screws that hold voltage regulator cable conduit to top cover and remove conduit from clamps.

(5) DISCONNECT AIR CLEANERS. Disconnect air cleaner to air duct pipe by loosening top hose clamp and pulling hose off connec-

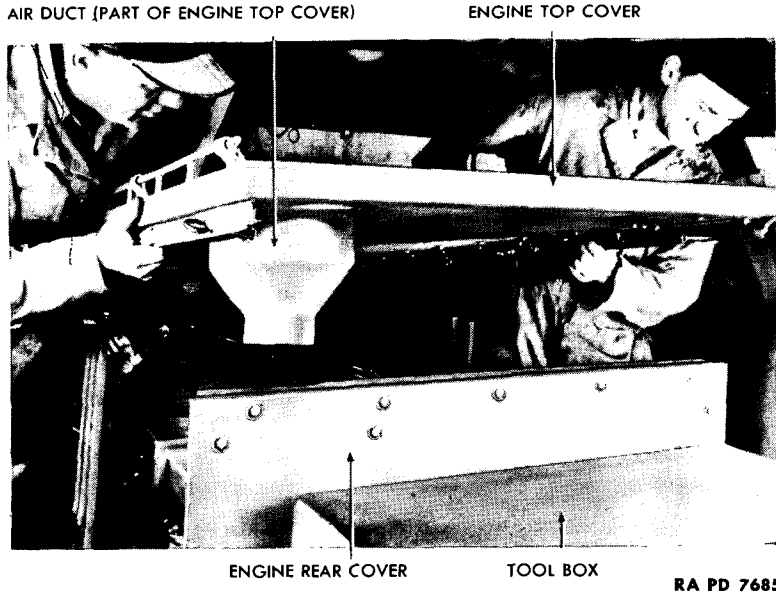


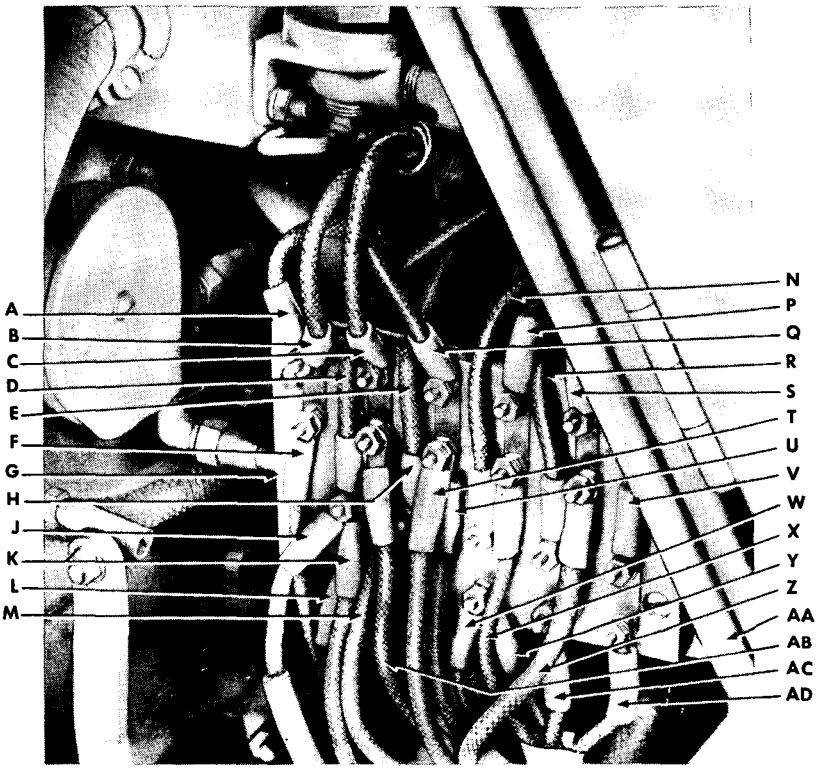
Figure 129—Removing Engine Top Cover

tion on air duct. Remove two bolts, nuts, and lock washers which hold connection for air cleaners on air duct and drive bolts out of engine top cover, then remove connection from cover.

(6) REMOVE VOLTAGE REGULATOR WIRING (fig. 128). Remove two screws and lock washers which hold wires to voltage regulator and remove wires. Remove voltage regulator ground strap at thermostat valve housing stud by removing nut, lock washer, and star washer.

(7) REMOVE ENGINE TOP COVER (fig. 129). Remove top rear bolt, nut, and lock washer that hold each radiator side cover to engine top cover. Remove five bolts, nuts, lock washers, and star washers that hold engine top cover to dash. NOTE: *These bolts are under the windshield and the nuts are accessible by reaching through the*

40-TON TANK TRANSPORTER TRUCK-TRAILER M25



A—SWITCH TO JUNCTION BLOCK HEAD LAMP WIRE
B—JUNCTION BLOCK TO DIMMER SWITCH WIRE
C—DIMMER SWITCH TO JUNCTION BLOCK (LOW BEAM ON HEAD LAMP)
D—ALL BLACKOUT LIGHTS (LIGHT SWITCH TO JUNCTION BLOCK) EXCEPT BLACKOUT DRIVING LIGHT
E—FLOODLIGHT SWITCH ON INSTRUMENT PANEL TO JUNCTION BLOCK
F—SERVICE CLEARANCE LIGHT
G—MAIN JUNCTION BLOCK
H—FLOODLIGHT
J—BLACKOUT MARKER LIGHT (RIGHT)
K—BLACKOUT MARKER LIGHT (LEFT)
L—BLACKOUT CLEARANCE LIGHT
M—LOW BEAM ON HEADLIGHT (RIGHT)
N—SPOTLIGHT REEL TO JUNCTION BLOCK, ALSO WINDSHIELD WIPER MOTORS
P—BLACKOUT DRIVING LIGHT SWITCH
Q—DIMMER SWITCH TO JUNCTION BLOCK (HIGH BEAM ON HEAD LAMP)
R—SPOTLIGHT SWITCH
S—SIREN MOTOR SWITCH TO JUNCTION BLOCK
T—HIGH BEAM ON HEADLIGHT (RIGHT)
U—HIGH BEAM ON HEADLIGHT (LEFT)
V—SIREN LIGHT
W—WINDSHIELD WIPERS, DOME LIGHT AND READING LIGHT
X—BLACKOUT DRIVING LIGHT
Y—SPOTLIGHT REEL
Z—SIREN MOTOR
AA—FRONT OF CAB (INSIDE RADIATOR DOOR)
AB—LOW BEAM ON HEADLIGHT (LEFT)
AC—SPOTLIGHT
AD—SIREN LIGHT

NOTE—REMOVAL OF WIRES A TO L, INCLUSIVE, IS NECESSARY FOR REMOVAL OF CAB

RA PD 74941

Figure 130—Main Junction Block Wiring

COOLING SYSTEM

radiator door openings in the front of the cab. Pry bolts out of the top cover. Remove four bolts, nuts, lock washers, and star washers that hold rear end of engine top cover to engine rear cover. Remove screw and lock washer that hold radio filter wire to engine top cover. Remove engine top cover and lift cover out of cab.

(8) REMOVE WELDING TANKS AND WHIFFLETREE. Unlatch acetylene and oxygen tanks and lift tanks off vehicle. Remove whiffletree from back of cab.

(9) REMOVE FLOODLIGHTS. Remove floodlights and disconnect cab wiring. Remove wires A to L (fig. 130) at main junction block. CAUTION: *Tag all wires before removing from junction block.*

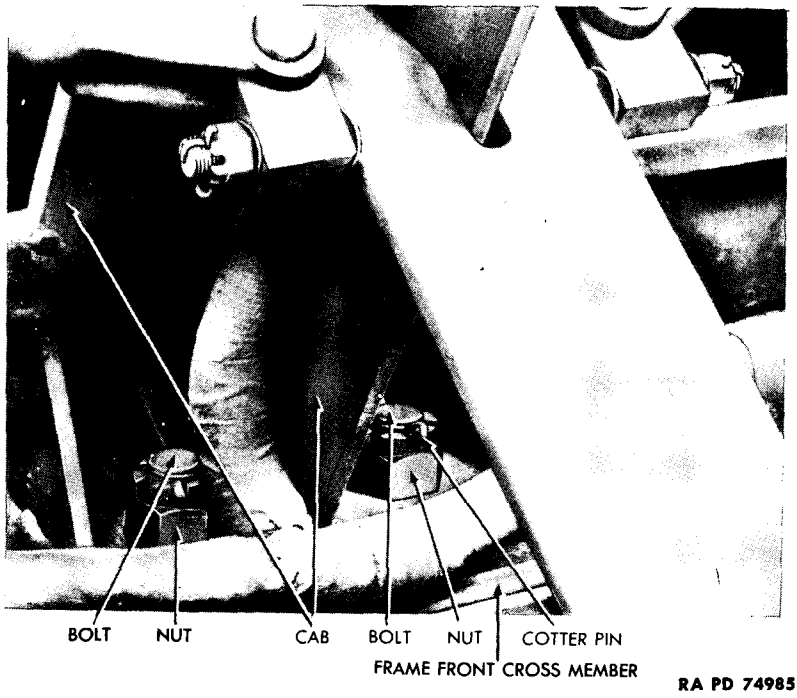


Figure 131—Cab Front Mounting Bolts

(10) DISCONNECT RADIATOR SHUTTERS AND FRONT GROUND STRAP. Remove cotter pin and clevis pin that hold radiator shutters to controls and push shutter controls back and out of the way. Remove cap screw which holds front ground strap to frame front cross member. Remove two bolts, nuts, and cotter pins which hold cab to front cross member of frame and are accessible from inside of radiator shutters.

(11) DISCONNECT WHEEL HOUSE. Remove one bolt, nut, and lock washer at rear corner of right wheel house strap, five bolts, nuts, and

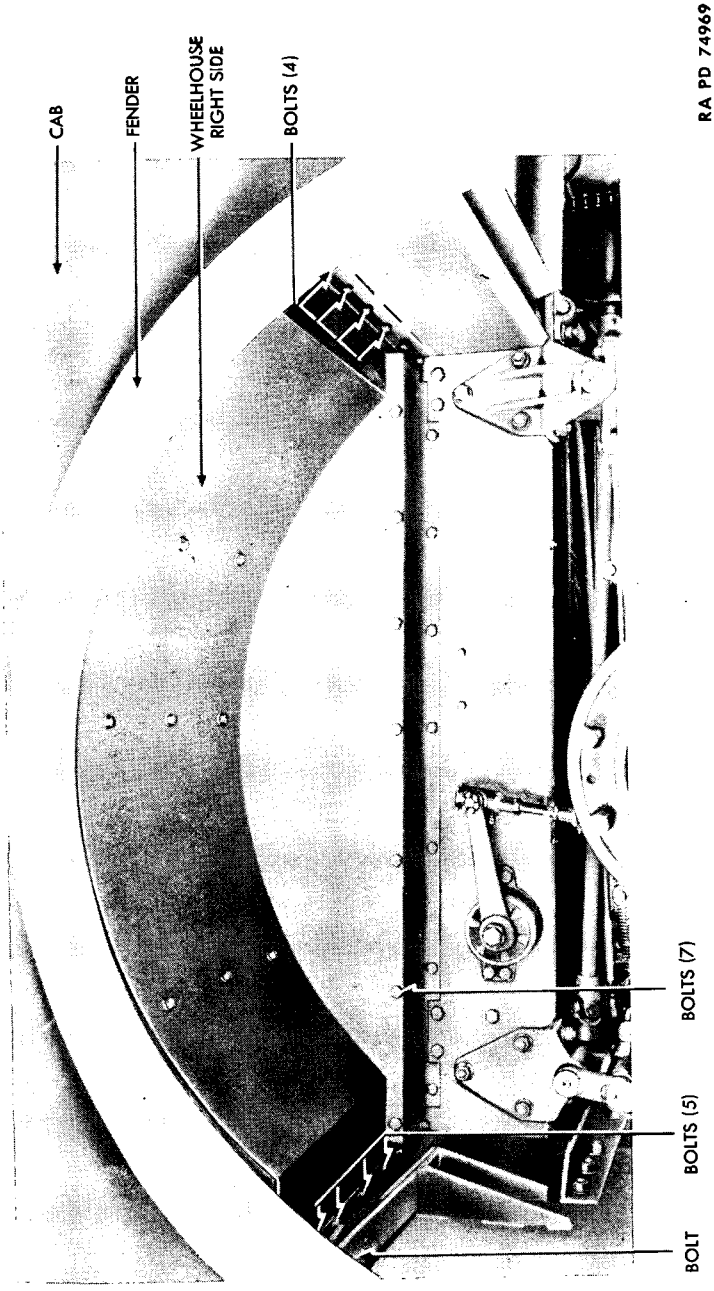


Figure 132—Wheelhouse—Right Side

lock washers at rear edge of right wheel house, and seven bolts, nuts, and lock washers at inner edge of right wheel house (fig. 132). Remove screw holding right wheel house ground strap. Remove one bolt, nut, and lock washer at rear corner of left wheel house strap. Remove screw holding left wheel house ground strap.

(12) DISCONNECT CAB ANGLE IRONS (fig. 133). Remove five bolts, nuts, and lock washers that hold cab angle irons to each side of cab.

(13) REMOVE CAB RIGHT FILLER STRAP (fig. 134). Remove five bolts, nuts, and lock washers which hold cab right filler strap (at right of commander's seat) then repeat procedure on opposite side (at left of driver's seat).

(14) REMOVE AMMUNITION BOX (fig. 135). Remove four bolts, nuts, and lock washers which hold right ammunition box to cab right door frame and lift off box.

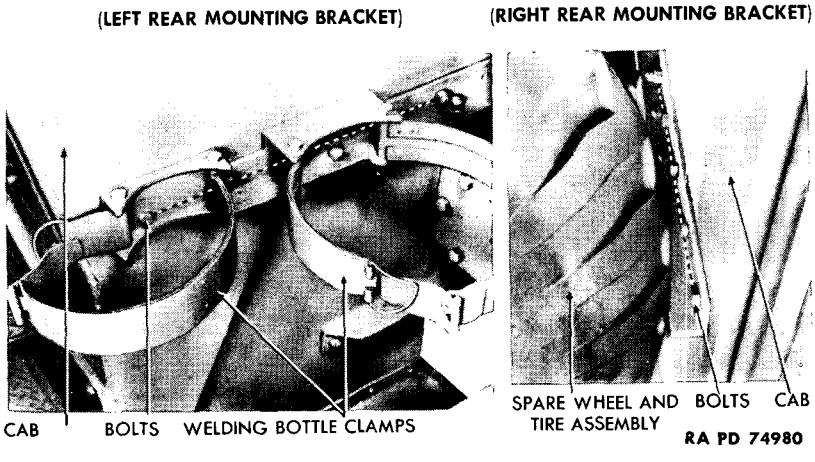


Figure 133—Cab Rear Mounting Bracket

(15) REMOVE CREW AND COMMANDER'S SEAT (fig. 135). Remove two bolts, nuts, and lock washers which hold right crew seat back and lift back upward and off cab. Lift crew right seat cushion off its frame. Remove four bolts, nuts, and lock washers that hold commander's seat to cab (nuts are under wheel house and bolts inside cab). Remove right water can.

(16) REMOVE RIGHT WHEEL HOUSE (fig. 134). Pry right wheel house up from cab, lift wheel house up and lay it alongside engine, out of way.

(17) REMOVE CAB (fig. 136). Attach chain through cab at cab windows and attach loose chain to a hoist on right side. Repeat procedure on opposite side of cab, attaching chain to another hoist. Raise cab off chassis by having an operator on both sides of tractor to operate hoists.

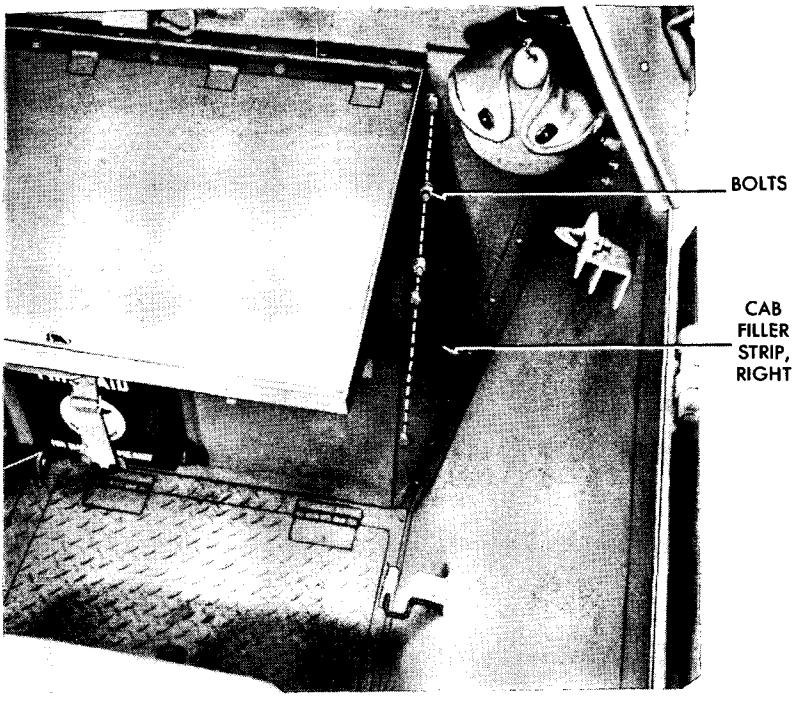


Figure 134—Cab Right Filler Strip

(18) DISCONNECT RADIATOR (figs. 137 and 138). Remove three bolts, nuts, and lock washers that hold radiator top tie plate and remove plate. Loosen two hose clamps and remove radiator bottom hose. Loosen hose clamps and remove two radiator top hose with connection pipe. Remove two screws which hold wiring cable to radiator bottom tank and remove two clamps.

(19) DISCONNECT OIL TEMPERATURE INDICATOR CABLE AND ACCELERATOR ROD AND REMOVE FAN. Remove four bolts, nuts, and lock washers that hold radiator right side plate and radiator filler to commander's desk and lift side plate out. Loosen three clamps that hold oil temperature indicator cable to radiator and remove cable from clamps, then remove cable from oil filter assembly. Remove clamp that holds accelerator rod to radiator. Remove six cap screws and lock wire that hold fan blade assembly to water pump and push fan blade assembly into fan shroud of radiator.

(20) REMOVE RADIATOR ASSEMBLY (fig. 139). Remove two radiator mounting stud nuts, bottom washers, springs, and top washers. Place a steel bar in bracket, secure a rope to bracket and attach rope to a hoist. Tip the top of radiator back about an inch and lift radiator assembly out of chassis.

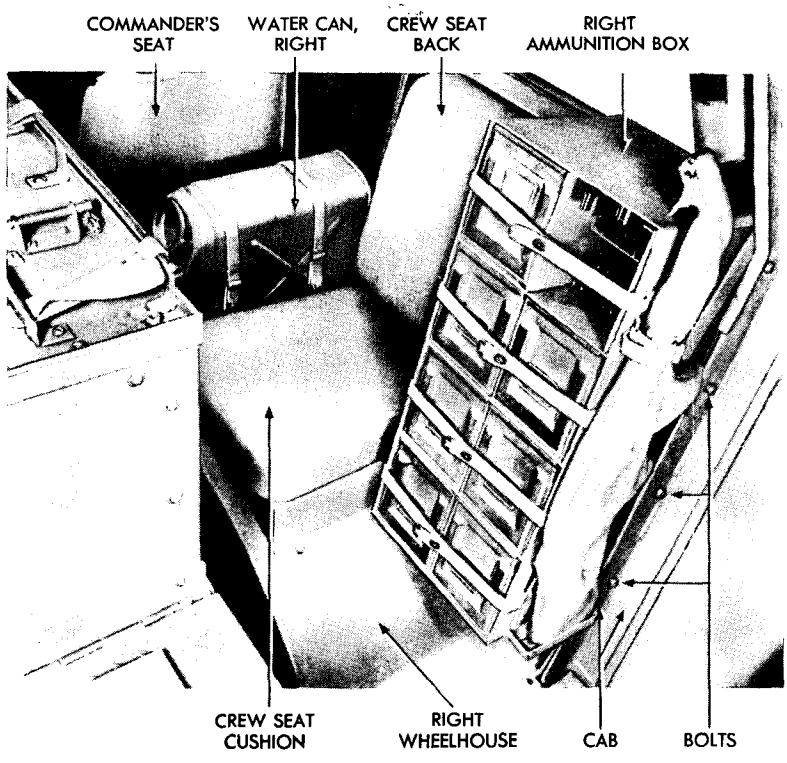


Figure 135—Right Side of Cab

c. Installation.

(1) INSTALL RADIATOR (figs. 137, 138, and 139). Install fan blade assembly in radiator shroud. Attach rope to radiator and to a hoist and lift radiator into place on chassis. Install radiator top tie plate and fasten with three bolts, nuts, and lock washers. Install radiator bottom hose and fasten with two hose clamps. Install radiator top hose and fasten with two hose clamps. Attach wiring cable to radiator lower core with two clamps and screws. Install two radiator mounting stud top washers, springs, bottom washers, and nuts and secure radiator to chassis frame.

(2) INSTALL FAN AND RADIATOR SIDE PLATE. Install fan blade assembly on water pump and fasten with six cap screws and lock wire. Install oil temperature indicator cable under three clamps on radiator and tighten clamp screws; then attach cable to oil filter. Install accelerator rod and clamp on radiator and fasten clamp with screw. Install radiator right side plate and fasten plate to radiator filler and commander's desk with four bolts, nuts, and lock washers.

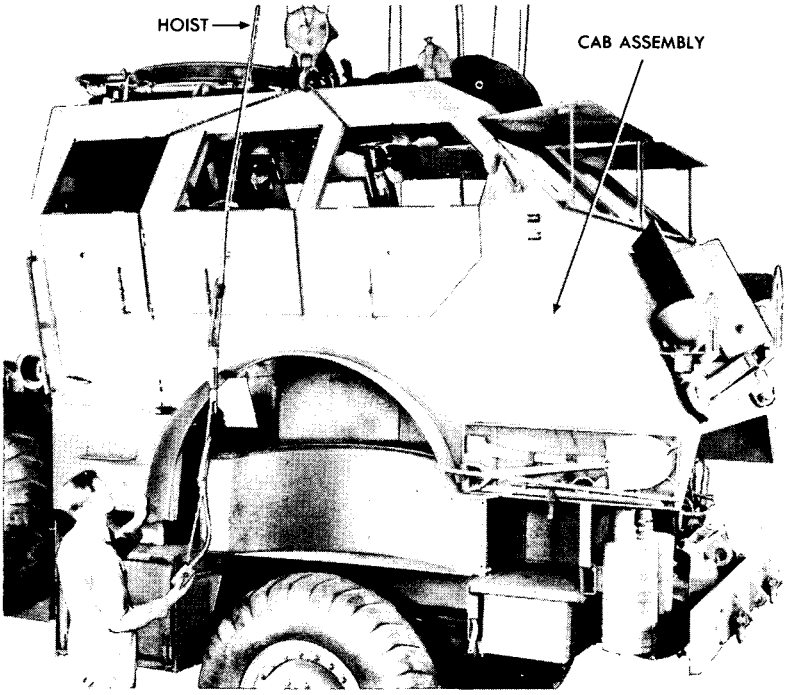


Figure 136—Removing Cab Assembly

(3) INSTALL CAB, WHEEL HOUSE, AND SEATS. Use two hoists and attach to cab at windows with chains (fig. 136). Lift cab and position it on chassis. Install right wheel house. Install right water can and then install commander's seat and fasten with four bolts, nuts, and lock washers. Install crew right seat cushion and right and left seat backs and fasten with two bolts, nuts, and lock washers.

(4) INSTALL AMMUNITION BOX, CAB FILLER STRIP, AND ANGLE IRON. Install right ammunition box and fasten with four bolts, nuts, and lock washers (fig. 135). Install cab right and left filler strips and fasten with bolts, nuts, and lock washers (fig. 134). Install cab right angle iron and cab left angle iron (fig. 133), and fasten with bolts, nuts, and lock washers.

(5) SECURE WHEEL HOUSE. Install bolt, nut, and lock washers at rear corner of left wheel house strap. Install screw that holds right wheel house ground strap. Install seven bolts, nuts, and lock washers at inner edge of right wheel house (fig. 132), then install five bolts, nuts, and lock washers at rear edge of right wheel house. Install one bolt, nut, and lock washer at rear corner of right wheel house strap.

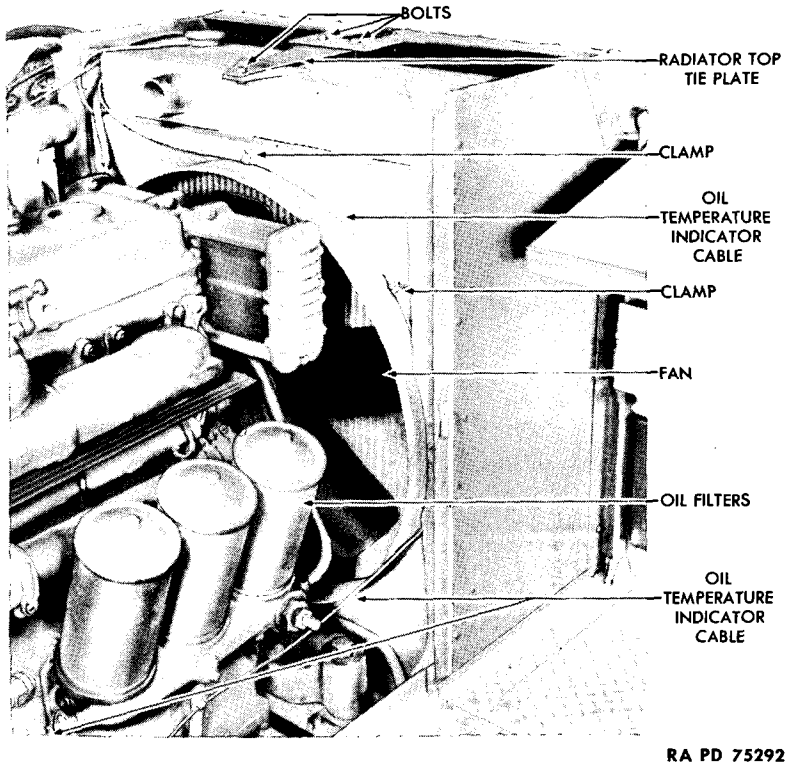


Figure 137—Radiator in Chassis—Rear View

(6) CONNECT WIRING AND RADIATOR SHUTTERS. Fasten front ground strap with screw. Connect shutter controls by installing clevis pin and cotter pin. Connect wires (A to L, fig. 130) at main junction block. Install two bolts, nuts, and cotter pins that hold front of cab to frame. Install floodlights, whiffletree, and welding tanks.

(7) INSTALL ENGINE TOP COVER (fig. 129). Install engine top cover. Attach radio filter wire to engine top cover and fasten with screw and lock washers. Install four bolts, nuts, lock washers, and star washers that hold rear end of engine top cover to engine rear cover. From inside radiator door openings install five bolts, nuts, lock washers, and star washers that hold engine top cover to dash (bolts are installed from bottom of cover with nuts on top). Install top rear bolt, nut, and lock washers that hold radiator side cover to engine top cover and repeat procedure on opposite side.

(8) CONNECT VOLTAGE REGULATOR (fig. 128). Attach voltage regulator ground strap to thermostat valve housing stud and fasten

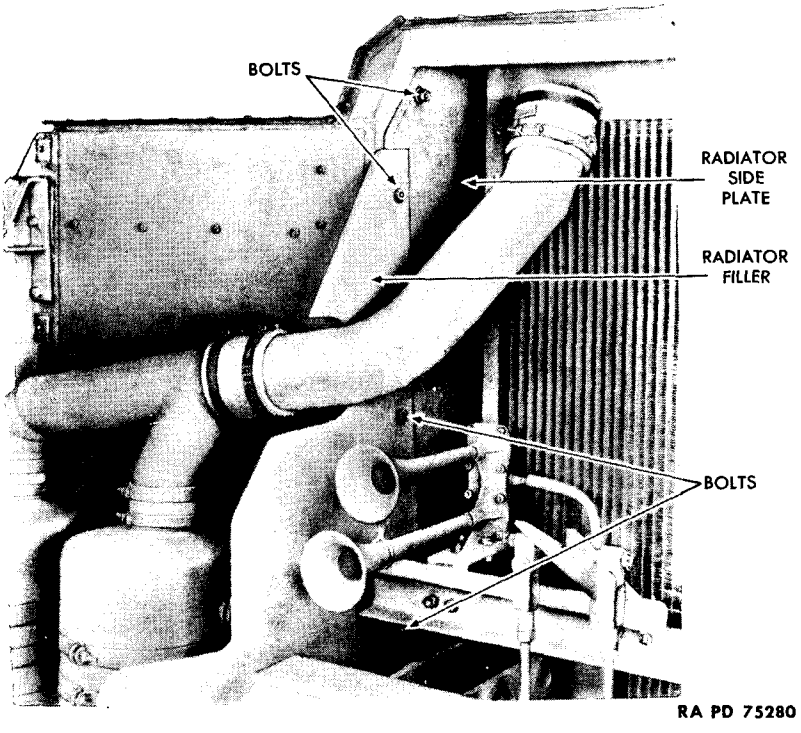


Figure 138—Radiator in Chassis—Front View

with nut, lock washers, and star washer. Attach wires to voltage regulator and fasten with two screws and lock washers.

(9) CONNECT AIR CLEANERS. Install air cleaner connection on engine top cover and fasten with two bolts, nuts, and lock washers. Attach air cleaner to air duct pipe by installing hose and tightening hose clamps.

(10) CLAMP VOLTAGE REGULATOR CABLE AND WATER TEMPERATURE TUBE. Install voltage regulator cable conduit under two clamps on engine top cover and tighten clamp screws. Install water temperature tube under two clamps on engine top cover and tighten clamp screws.

(11) CONNECT AIR COMPRESSOR AND CARBURETOR TO AIR DUCT. Install hose for air compressor to air duct pipe on air duct elbow and tighten hose clamps. Install hose for carburetor air duct pipe on air duct and tighten hose clamps.

(12) Install left side strip and fasten at bottom with two bolts, nuts, and lock washers, then attach top of left side strip and top right side strip to engine top cover with nuts and lock washers.

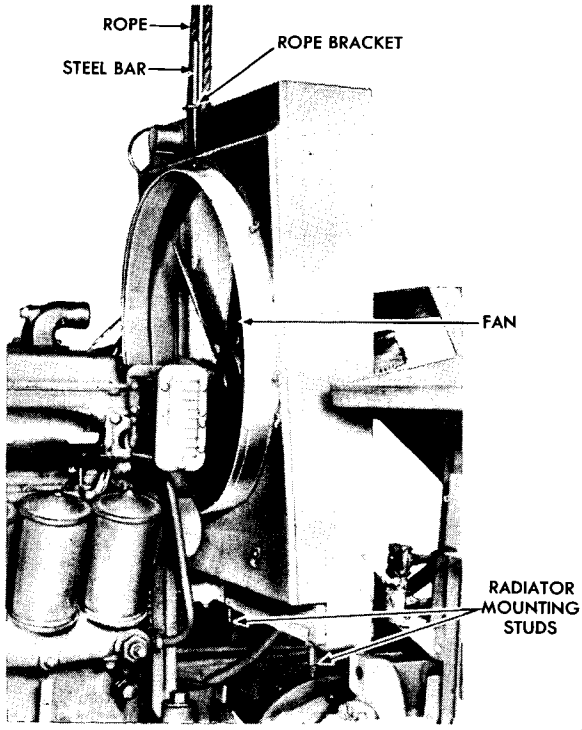


Figure 139—Radiator Partly Removed

(13) INSTALL ENGINE SIDE COVERS (fig. 127). Install covers over radiator filler cap and over hydraulic steering oil reservoir. Install four engine side covers and fasten with turnbuckles.

(14) FILL COOLING SYSTEM AND CONNECT BATTERY. Install stowage on top of engine top cover. Fill cooling system (par. 95). Connect battery.

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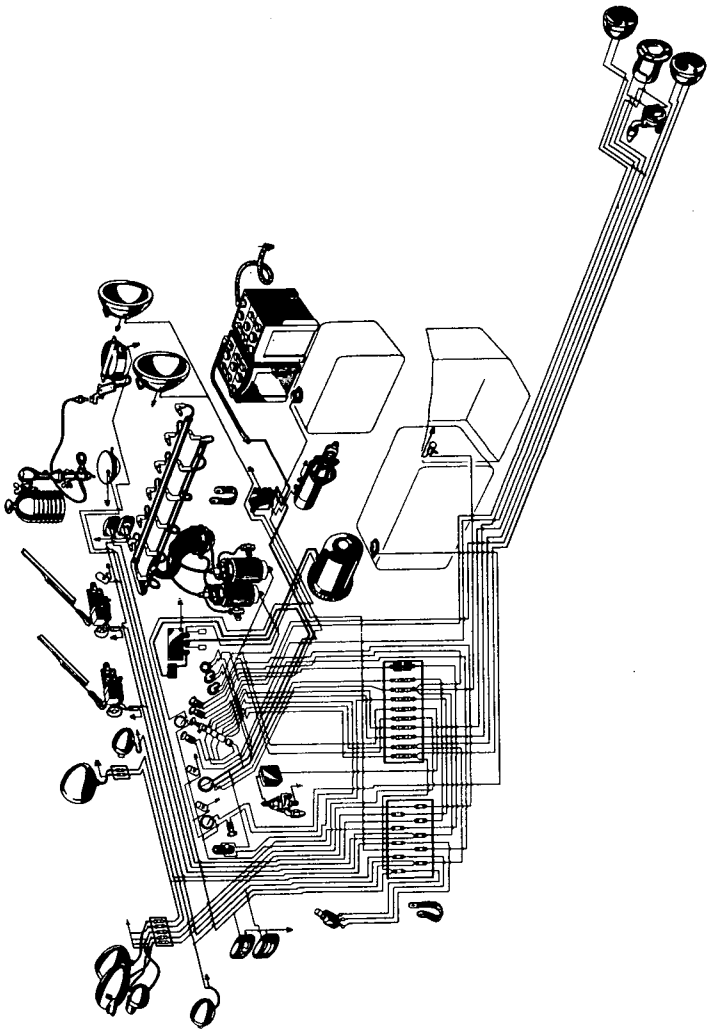


Figure 140—Wiring Diagram

Section XVII

IGNITION SYSTEM

102. DESCRIPTION AND DATA.

a. Description. The ignition system consists of two sets of spark plugs, two ignition switches, two ignition coils, a distributor and ignition wiring to connect these units. Each cylinder has two spark plugs, one on the left and the other on the right side. Two ignition switches control the flow of current to these plugs. The two ignition coils are connected to two sets of breaker points in the distributor. The ignition wiring is contained in three manifolds, a long manifold at each side of the cylinder and a short manifold across the front of the cylinder block. The two ignition switches are on the instrument panel and are described in section XXX of this manual.

b. Data.

(1) IGNITION COILS.
Make ..... Electric Auto-Lite
Model CP-4001

(2) DISTRIBUTOR.
Make ..... Electric Auto-Lite
Model IGE-4029

(3) SPARK PLUGS.
Make ..... Champion
Model 6 COM-62

103. IGNITION COILS.

a. Description. The two ignition coils are secured to the left side of the engine upper crankcase. They are connected to the battery on the low tension side and to the distributor on the high tension side. The ignition coils are used to transform the low voltage supplied by the batteries into the high voltage energy necessary to jump the spark plug gaps.

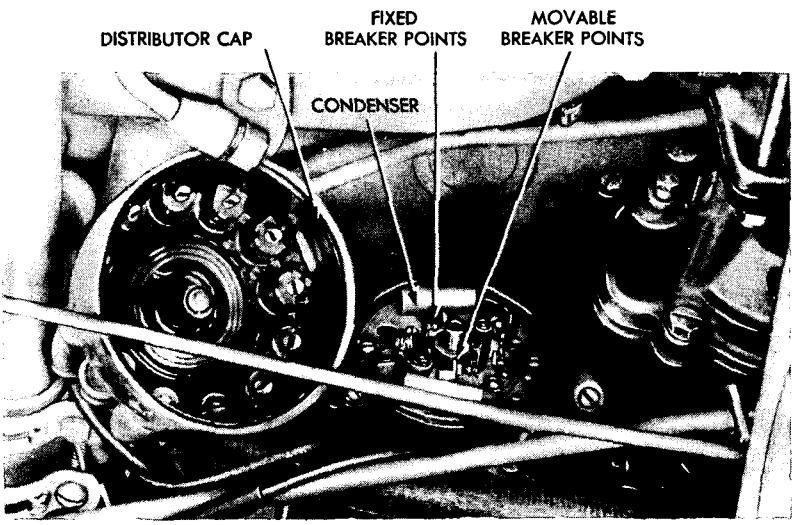
b. Removal. Remove two nuts and lock washers which hold wires (ignition switch to coil). Remove two nuts and lock washers that hold capacitors on coils and unscrew two high tension wire terminals from ignition coils. Remove two wiring nuts and lock washers (ignition-coil-to-distributor) at distributor and remove wires. Remove four cap screws and lock washers which hold ignition coils to ignition coil bracket cover, and remove coils and capacitors.

c. Installation. Install two ignition coils on ignition coil bracket cover, then install capacitors and fasten coils and capacitors with

four cap screws and lock washers. Install wires (ignition-coil-to-distributor) and fasten with nuts and lock washers. Screw high tension wire terminals on coils. Install two nuts and lock washers that hold capacitors on coils. Install wires (ignition-switch-to-coil) on coils and fasten with nuts and lock washers.

104. DISTRIBUTOR.

a. Description. The distributor is located on the left side of the engine and is gear driven from the accessory drive shaft. The distributor has two sets of breaker points, one set in a fixed position and



RA PD 76966

Figure 141—Distributor—Cap Removed

the other movable. The distributor cap is clamped on the distributor base and has 12 connections for the 12 spark plug wires, and two connections for the two ignition coil wires.

b. Maintenance and Adjustment.

(1) PRELIMINARY INSTRUCTIONS. Pry two distributor cap clamps off distributor cap. Pull spark plug wires out of cap and pull high tension wires out of cap. Remove rotor from distributor shaft.

(2) INSPECT BREAKER CONTACTS. If breaker points are a grayish color and only slightly pitted, they need not be replaced. Replace rough or pitted breaker contacts as instructed below. If it is necessary to use the old breaker contacts, hone them with a stone to a smooth, flat surface. Do not file.

(3) DISTRIBUTOR CAP. Visually inspect distributor cap for cracks, carbon streaks, and corroded high tension terminals. Replace cap if any of these conditions are found. Inspect the inserts on inside of cap. After a distributor has had normal use, the vertical face of the inserts becomes slightly burned. NOTE: *Do not file. If the burning is excessive, replace the cap.* Examine inserts for signs of burning on horizontal faces. If burning is noticeable at this point, it is an indication that gap between rotor and insert is too large. If this condition is found, replace both cap and rotor.

(4) ROTOR. Inspect rotor for cracks, and replace rotor, if cracked. Inspect rotor contact for evidence of burning on top of metal strip. After normal use, the end of the metal strip may become slightly burned. If evidence of burning is found on top of metal strip, replace rotor and cap.

(5) CONDENSER. Check the condenser on an M1 circuit tester. Connect bare clip of low tension lead to a ground on engine; connect red clip to battery or starting switch terminal. Insert condenser in the clip on tester, and attach short test lead to condenser pigtail. Place coil test switch at "test coil." Turn on rotor switch. Adjust variable spark gap to highest setting possible without missing. Move condenser test switch to "vehicle cord" and observe effect on high tension output and on arcing at tester breaker contacts. Repeat test several times, changing position of condenser pigtail lead. If switching to "vehicle cord" does not result in arcing and spark does not miss, condenser is satisfactory. If arcing does occur or spark misses, condenser is not functioning normally and must be replaced. If moving condenser lead affects action, it indicates a faulty lead, and condenser must be replaced.

c. Remove Condenser. Remove screw and lock washer which hold condenser wire to breaker arm, then remove screw and lock washer which hold condenser to breaker sub-plate and remove condenser with wire. Remove screw and lock washer which hold remaining condenser to breaker sub-plate, then remove screw and lock washer which hold condenser wire and coil connector wire to breaker arm. Remove condenser and wire. Remove screw and lock washer which hold coil connector wire to breaker sub-plate and remove wire.

d. Remove Breaker Points. Remove two breaker arm spring clips, then remove two breaker arm assemblies (one from breaker sub-plate and other from breaker partial plate). Remove two breaker contact screw lock nuts, then remove two breaker contact screws from breaker partial plate and breaker sub-plate.

e. Install Breaker Points. Install two breaker contact screws (one on breaker partial plate and other on breaker sub-plate) and install two breaker contact screw lock nuts but do not tighten nuts. Install two breaker arm assemblies (one on breaker sub-plate and other on breaker partial plate), then install two breaker arm spring clips. Install coil connector wire on breaker sub-plate and fasten with screw and lock washer.

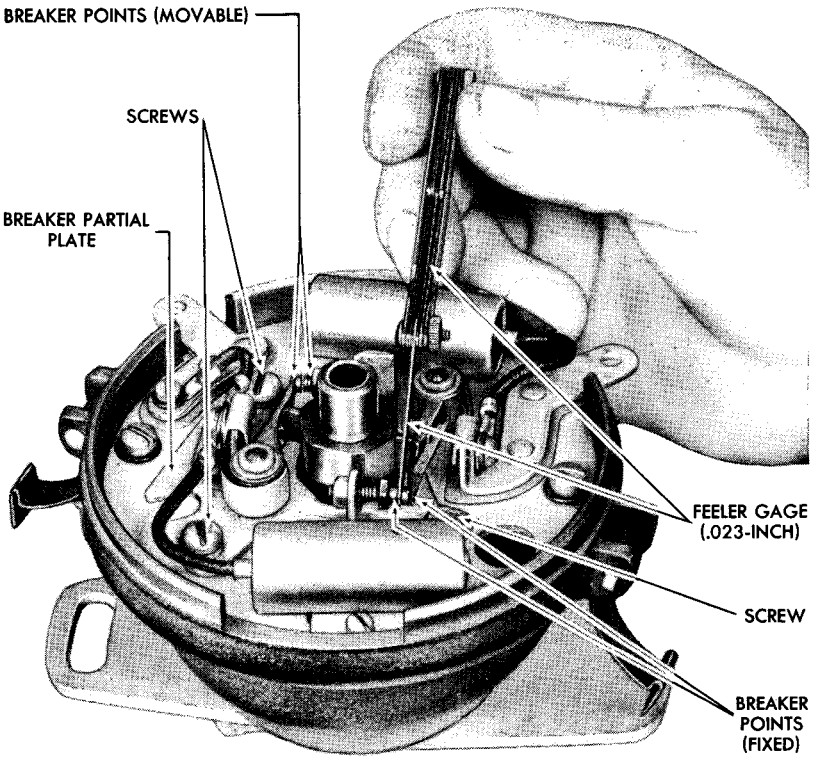


Figure 142—Checking Breaker Point Gap RA PD 47798

f. Install Condenser. Install condenser and wire on breaker sub-plate and fasten with screw and lock washer, connect condenser wire to breaker arm and install coil connector wire to breaker arm and fasten with screw and lock washer. Install condenser and wire on breaker sub-plate and fasten with screw and lock washer, then connect wire to breaker arm and fasten with screw and lock washer. NOTE: *Breaker arm spring and ground strip must be assembled between clamp and bracket.*

g. Remove Distributor. Remove screws and lock washers that hold two ignition-coil-to-distributor wires to distributor. Remove two cap screws, lock washers and plain washers that hold distributor to upper crankcase and lift distributor out of upper crankcase. Remove distributor gasket.

h. Install Distributor. Install distributor and distributor gasket and then install two cap screws, lock washers, and plain washers, which secure distributor, but do not tighten. Turn distributor counter-clockwise until breaker points close, then turn clockwise until breaker points just begin to open and tighten cap screws installed above.

IGNITION SYSTEM

Adjust breaker point gap (above). Install ignition-coil-to-distributor wires, and fasten with screws and lock washers. Install ignition-coil-to-distributor high tension wires and then install spark plug wires. NOTE: *Distributor cap and ignition wires are numbered. Install wire in hole in cap having same number. Front ignition coil high tension wire goes to hole in cap marked "L" and rear ignition coil high tension wire goes to hole in cap marked "R." Distributor rotates in a clockwise direction.*

i. Set Breaker Point Gap. Turn distributor shaft until both breaker points are fully open, then measure (feeler gage) gap between the stationary points; the gap should be 0.023 inch and if it is not,

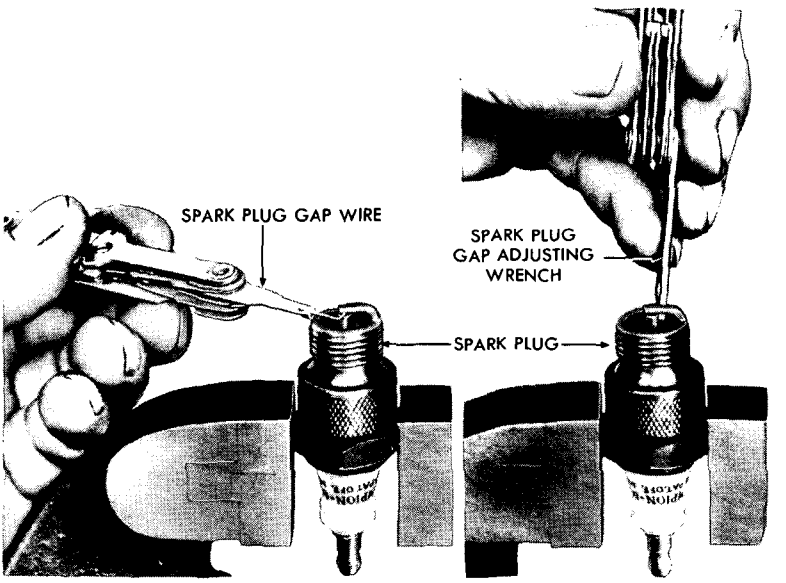


Figure 143—Adjusting Spark Plug Gap

turn breaker contact screw until 0.023 inch is obtained, then tighten breaker contact screw lock nut. Repeat procedure on opposite (movable) breaker points. Turn distributor shaft and observe whether or not both sets of points open at same time, if not, loosen three screws which hold breaker partial plate, and turn plate until both sets of breaker points open simultaneously.

j. Lubricate. Lubricate cam sleeve felt wick with light engine oil and lubricate distributor.

k. End Play. Remove distributor cap and measure end play of distributor shaft (feeler gage). End play should be 0.003 inch to 0.010 inch and if not, replace distributor.

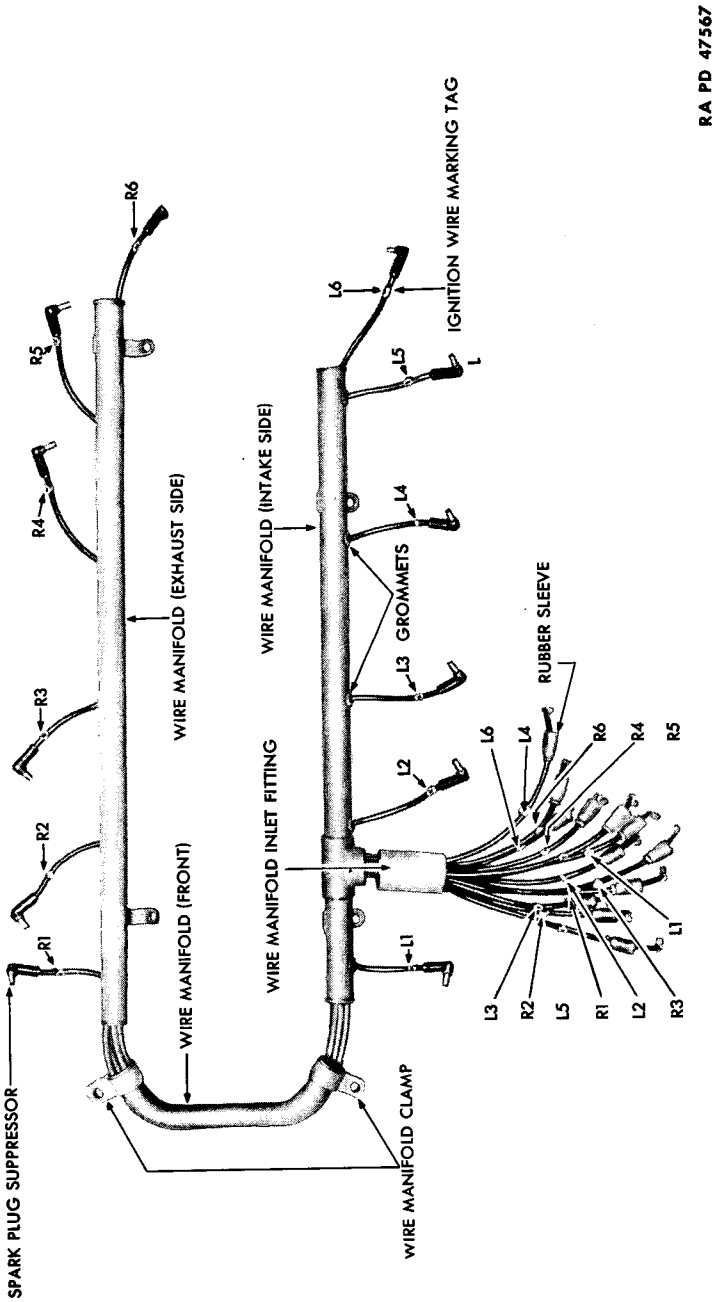


Figure 144—Ignition Wire Manifolds and Wires

l. Set Ignition Timing. Loosen clamp screw (fig. 141). Remove the distributor cap. Set flywheel at "IGN." Turn distributor until breaker points are open, then tighten clamp screw. Check timing by attaching synchroscope ground lead to engine, and then attach remaining lead to No. 1 spark plug. Run engine at idling speed and observe (with timing light) position of "IGN" mark on flywheel when distributor fires No. 1 spark plug. If it is not directly opposite pointer in ignition timing hole (in flywheel housing) loosen clamp screw and rotate distributor until mark is in line with pointer.

105. SPARK PLUGS.

a. Description and Data. The spark plugs are 14 mm in size and of one piece construction. Two spark plugs are used for each cylinder and are located on the left and right sides of the cylinder block.

b. Maintenance and Adjustment.

(1) Refer to paragraph 65 (tune-up), for complete information on cleaning plugs and adjusting spark gap.

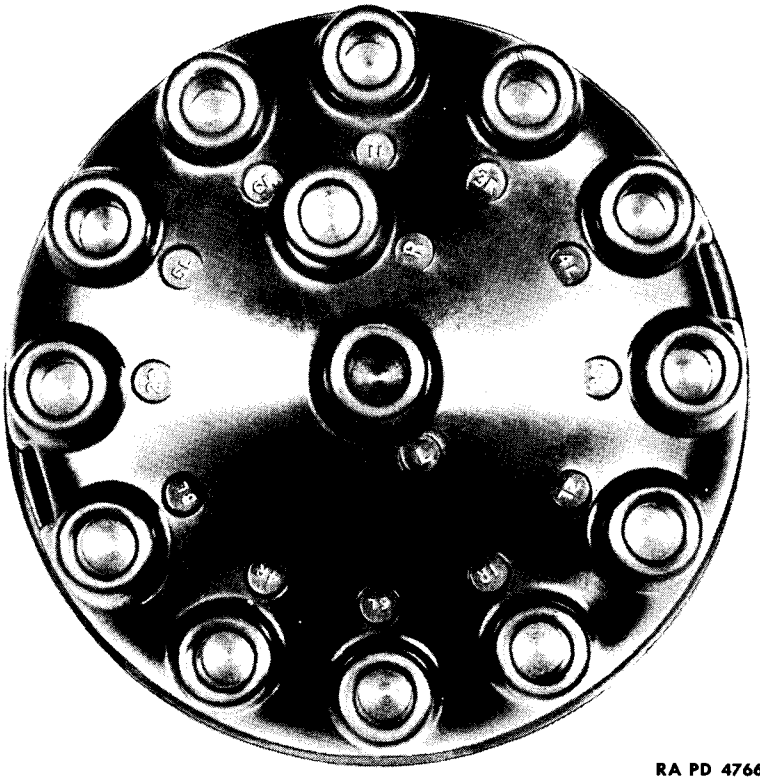
(2) All spark plugs must be of the same characteristics and in the same heat dissipation range, otherwise trouble will be experienced with either fouling, due to too cold a plug or with pre-ignition and premature failure of the plug, due to too hot a plug. The air gap must be checked and adjusted so that it is 0.018 inch to 0.020 inch (an excessive gap will cause difficult starting and a breaking down of the insulation in the ignition coils, and a close gap will cause uneven idling and irregular engine firing, at high speeds). Make certain spark plugs selected for installation have been tested in a spark plug testing machine.

c. Removal. Pull ignition wires off the 12 spark plugs. Remove each plug, using special wrench provided to prevent breakage of porcelains, and use new gaskets.

d. Installation. Lightly coat new spark plug gaskets with engine oil and insert gaskets into gasket seat in cylinder head. Use special spark plug wrench and draw plugs down tightly against the gasket, making certain gaskets are firmly and squarely seated. NOTE: *If a gasket is allowed to cock so that plug does not seat firmly and tightly, or if a plug is not drawn down tight, then "blowby" will occur which will cause excessive heating of the plug and result in pre-ignition and premature failure of the plug.*

106. IGNITION WIRING.

a. Description. The wires for the spark plugs are carried in metal manifolds attached to the sides and front of the cylinder block. Each wire has a metal band which is stamped "R" or "L" to show whether or not the wire is for the right or left side of the engine. The band is also stamped with the cylinder number for which it is intended. The distributor cap is marked in the same manner (fig. 145) so that wires can be properly installed. Spark plug suppressors are used on each wire to prevent radio interference.



RA PD 47660

Figure 145—Distributor Cap Markings

b. Inspection of Wire Manifold and Wires Assembly. Before removing any ignition wire, test each wire by holding one end of the wire being tested, to the terminal of a charged battery and touch opposite end to a ground; if a spark occurs, the ignition wire is not broken. Replace any ignition wire showing no spark or a weak spark.

c. Replacing Ignition Wire. Remove ignition wire marking tag and rubber sleeve from ignition wire to be replaced, then unscrew spark plug suppressor from wire. Strip insulation off end of ignition wire to be replaced. Twist end of the new wire on end of wire being replaced, and solder both wires together. Pull old wire out and new wire will be installed. Install ignition wire marking tag and rubber sleeve and screw spark plug suppressor onto new ignition wire.

d. Remove Wire Manifold and Wires. Remove oil cooler assembly (par. 71), water pump assembly (par. 99), carburetor assembly (par. 85), and governor throttle valve housing assembly. Pull ignition wires off spark plugs and off distributor. Remove two nuts, flat washers, and lock washers which hold front wire manifold clamp to cylinder block. Remove two nuts and lock washers which

hold left side wire manifold to cylinder block and repeat procedure on right side wire manifold. Remove left side, right side, and front wire manifolds with ignition wires.

e. Install Wire Manifold and Wires. Place wire manifolds in position on engine and secure left side, right side, and front manifolds with two lock washers, flat washers, and nuts. Install ignition wires on spark plugs and distributor. Install governor throttle valve housing assembly, carburetor (par. 85), water pump (par. 99), and oil cooler assembly (par. 71).

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section XVIII

STARTING AND GENERATING SYSTEM

107. DESCRIPTION AND DATA.

a. Description. The starting and generating system consists of the generator, voltage regulator with radio filter, cranking motor, magnetic starter switch, and the starter switch. The generator supplies electrical energy to the storage batteries to maintain them in a charged condition. The voltage regulator is between the generator and batteries and regulates the generator output to the batteries. A filter is attached to the regulator and suppresses any radio interference. The cranking motor is the means of cranking the engine and is controlled by a magnetic starter switch which is operated by the starter switch. NOTE: *The starter switch is located on the instrument panel and is covered in section XXX.*

b. Data.

Generator:
- Make ..... Electric Auto-Lite
- Model GDJ-4820
- Type ..... third brush

Voltage Regulator:
- Make ..... Electric Auto-Lite
- Model VRH-4104-C1
- Type 3-unit

Cranking Motor:
- Make ..... Electric Auto-Lite
- Model 3LXWG-15-1R
- Type ..... Bendix

Magnetic Starter Switch:
- Make ..... Leece Neville
- Model 11-MS-12
- Volts 12

108. GENERATOR.

a. Description. The generator is a heavy duty, 12-volt ventilating unit, located on the left side of the engine and driven by the accessory drive shaft. The output of the generator is controlled by the voltage regulator located on the engine top cover.

b. Removal. Remove two nuts and lock washers that hold wiring to generator terminals. Remove capacitor and wires from terminals.

Remove two generator screws which hold generator to generator bracket. Remove three flexible coupling spider bolts and nuts and lift generator off bracket.

c. Installation.

(1) INSTALL GENERATOR. Install generator on bracket and then install three flexible coupling spider bolts and nuts. Fasten generator to bracket with two generator screws. Install capacitor and wires on generator terminals and fasten with two nuts and lock washers.

(2) POLARIZE GENERATOR. Reverse generator polarity will cause vibrating points to vibrate and burn. To make certain that generator

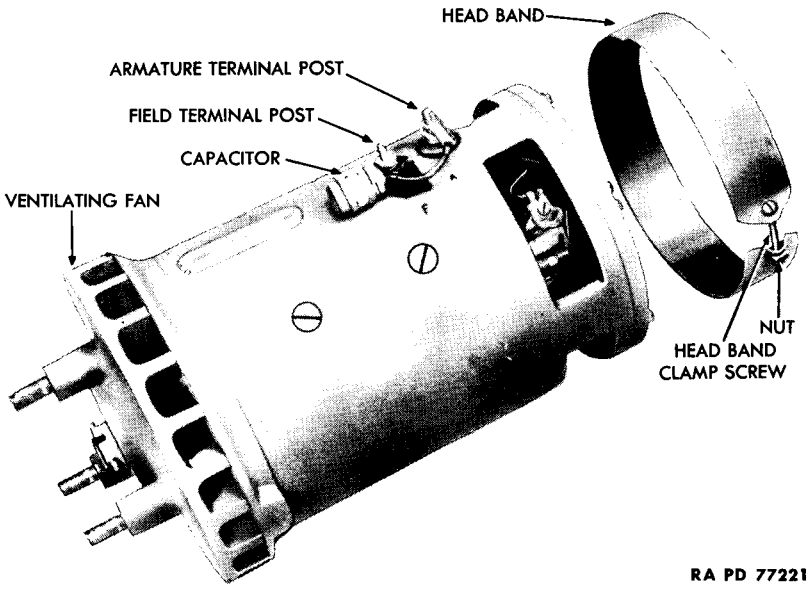


Figure 146—Generator with Head Band Removed

has correct polarity after regulator is reconnected, momentarily connect battery terminal of regulator to the armature terminal before starting engine. Momentary surge of battery current will correctly polarize generator.

109. VOLTAGE REGULATOR AND RADIO FILTER.

a. Description (fig. 128). The voltage regulator consists of three units, a circuit breaker, current limiting regulator, and a voltage regulator. The circuit breaker connects, and disconnects, the generator and battery. The voltage regulator and current-limit regulator maintain the batteries in the state of charge necessary for the operation of the electrical equipment. The regulator is secured to the engine top cover.

b. Removal. Remove three screws and lock washers that hold wires to voltage regulator. Remove two cap screws and lock washers that hold radio filter to bracket and pull filter forward until screw and lock washer which hold wire on back of filter can be removed. Lift radio filter off bracket. Remove four bolts, nuts, and lock washers that hold voltage regulator to bracket, and remove regulator from bracket.

c. Installation.

(1) INSTALL VOLTAGE REGULATOR. Install voltage regulator on bracket, then install three bolts, nuts, and lock washers, leaving bottom rear bolt out. Install one internal-external toothed washer on bolt, then install bolt through regulator, but not through bracket. Install internal-external toothed washer between regulator and bracket, then push bolt through washer. Install band strap on bolt, then install internal-external toothed washer. Install nut on bolt. Install radio filter on bracket and connect wire on back of filter,

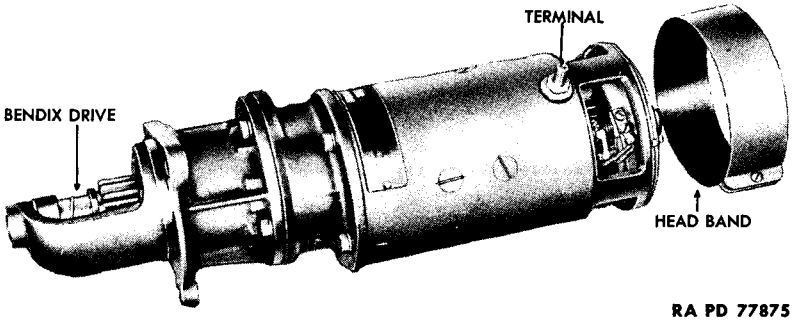


Figure 147—Cranking Motor with Head Band Removed

fastening with screw and lock washer. Secure filter to bracket with two cap screws and lock washers. Connect wires to voltage regulator and fasten with three screws and lock washers. NOTE: *Radio filter wire must be in the hole in the bracket.*

(2) POLARIZE GENERATOR. After the regulator has been installed on the vehicle, or after any adjustments or checks of either generator or regulator, always connect the armature and battery terminals of the regulator momentarily with a jumper. This permits a momentary surge of current to flow to the generator, which correctly polarizes it with respect to the battery. CAUTION: *Never operate the generator with the field circuit connected and the lead disconnected from the generator "A" terminal for more than a minute, as this might cause high voltage in the generator which would damage it.*

110. CRANKING MOTOR.

a. Description. The cranking motor is located on the right rear side of the engine and is secured to the flywheel housing. The crank-

ing motor is equipped with Bendix starting device which meshes with a ring gear on the flywheel to start the engine.

b. Removal. Remove nut and lock washer which hold cable from magnetic starter switch to cranking motor. Remove three cap screws and lock washers which hold motor to flywheel housing and remove motor.

111. MAGNETIC STARTER SWITCH.

a. Description and Data. The magnetic starter switch is a heavy duty switch mounted on the right and inside part of the frame, close to the cranking motor. The starter button on the instrument panel

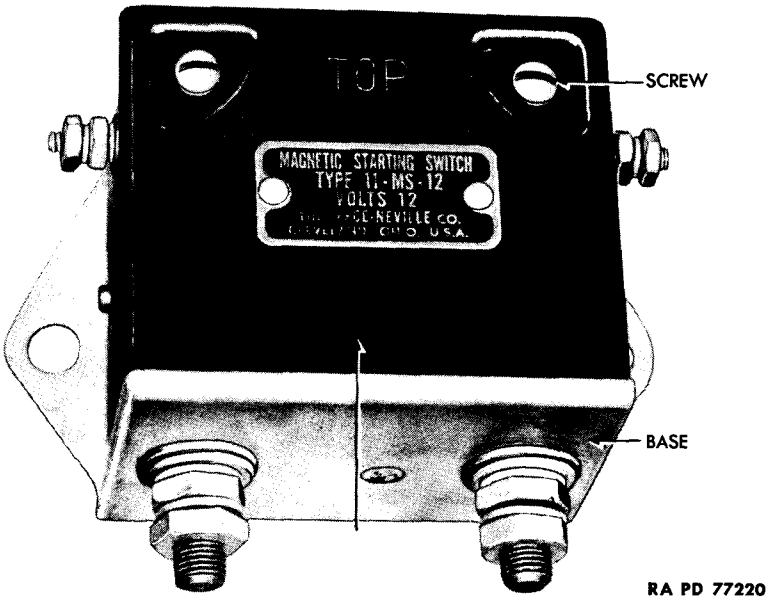


Figure 148—Magnetic Starter Switch

operates the magnetic starter switch, which, in turn, operates the cranking motor.

b. Removal. Remove two nuts and lock washers that hold cable to cranking motor and wiring to battery and starter button. Remove nut, lock washer, and plain washer which hold wire to starter button. Remove two bolts, nuts, and lock washers that hold switch to frame and remove switch.

c. Installation. Install magnetic starter switch on frame and fasten with two bolts, nuts, and lock washers. Connect wires to starter button, battery and cranking motor and fasten with bolts and nuts.

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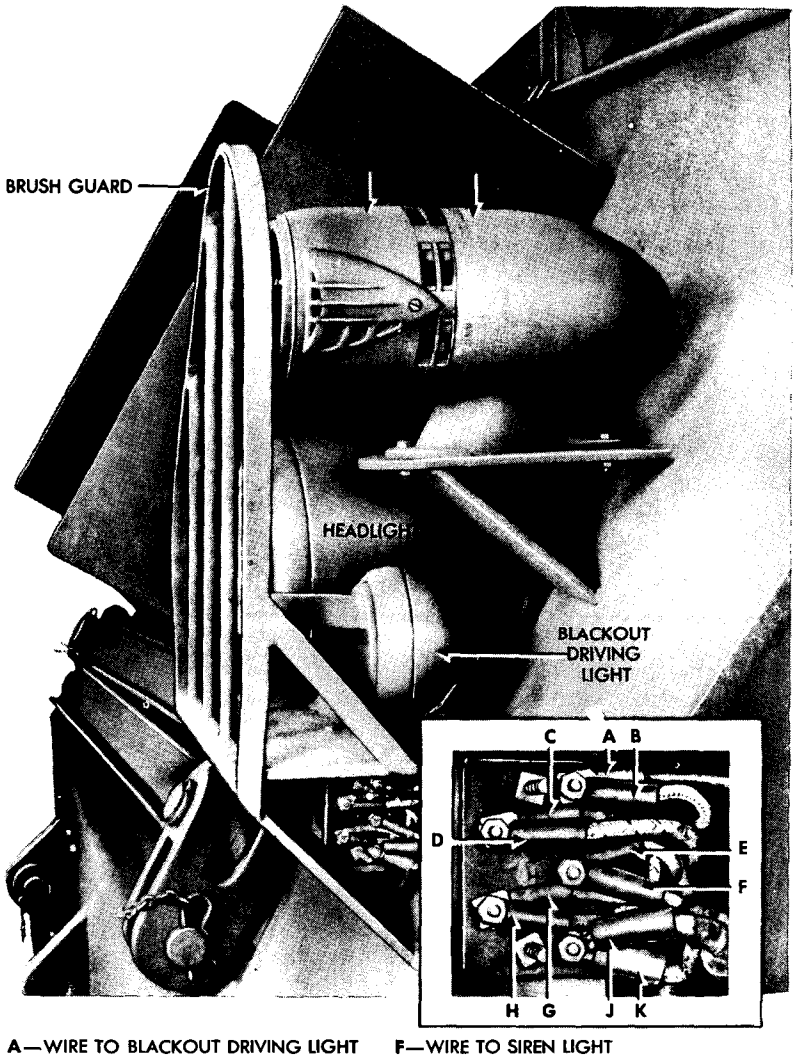

A—WIRE TO BLACKOUT DRIVING LIGHT
B—BLACKOUT DRIVING LIGHT WIRE FROM MAIN JUNCTION BLOCK
C—WIRE TO HIGH BEAM ON LEFT HEADLIGHT
D—WIRE TO HIGH BEAM FROM MAIN JUNCTION BLOCK
E—WIRE TO SIREN LIGHT FROM MAIN JUNCTION BLOCK
F—WIRE TO SIREN LIGHT
G—WIRE TO LOW BEAM ON LEFT HEADLIGHT
H—WIRE TO LOW BEAM FROM MAIN JUNCTION BLOCK
J—WIRE TO SIREN MOTOR
K—WIRE TO SIREN MOTOR FROM MAIN JUNCTION BLOCK

RA PD 77046

Figure 149—Lights on Left Front Corner of Cab

Section XIX

BATTERY AND LIGHTING SYSTEM

112. DESCRIPTION AND DATA.

a. Description. The battery, electrical units and lighting system comprise a 12-volt, single-wire system which is used for lighting and signaling purposes. Two 6-volt batteries are used and connected in series to give the 12 volts necessary to operate the system. The semitrailer lighting system is covered in part 3.

b. Data.

Unit	Make	Model or Type
Siren with light	Federal Electric	
Headlights	Guide	1004 K-12-16-162
Blackout driving light	Guide	551-3N
Floodlights	Dietz	600
Service tail and stop lights	Guide	3012C, sealed beam
Blackout tail and stop lights	Guide	3012D, sealed beam
Service clearance lights	Guide	
Blackout clearance lights	Guide	
Blackout marker lights	Guide	
Dome light	Yankee	404A
Dimmer switch	Delco-Remy	

113. SIREN WITH LIGHT.

a. Description (fig. 149). The siren with light is a combination siren and flashing signal light. The siren and light are located on the

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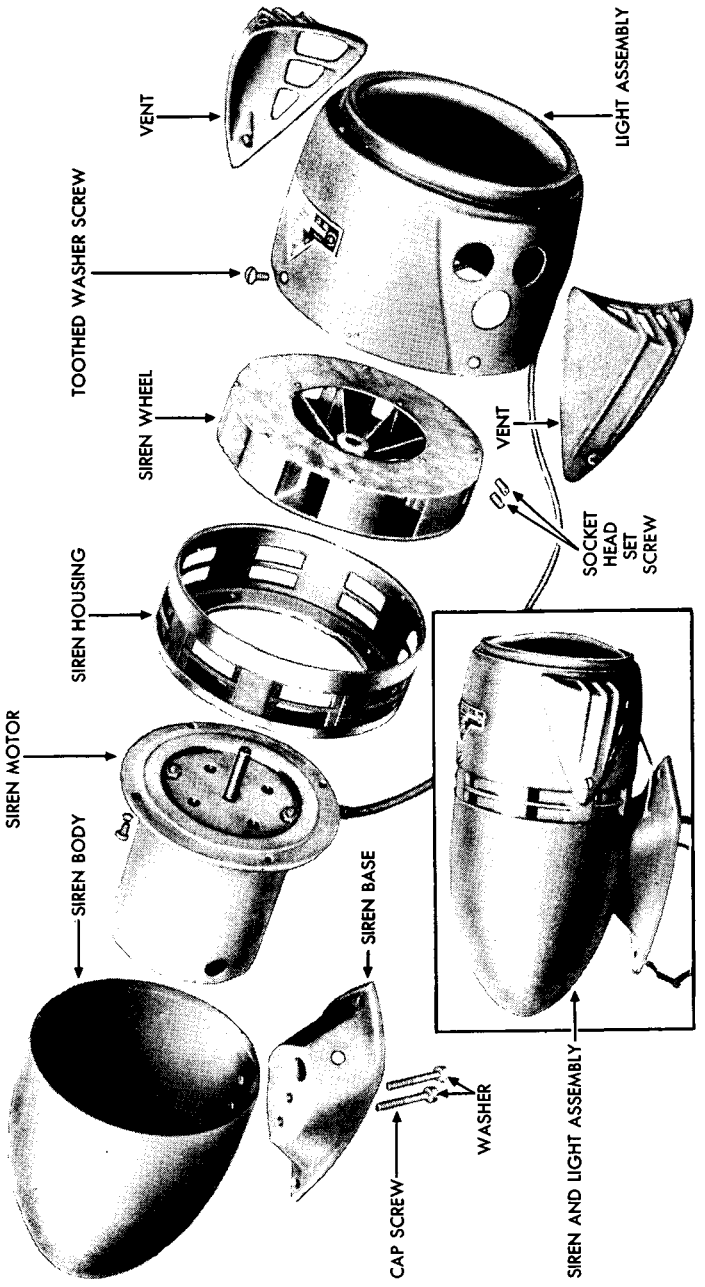

Figure 150—Siren and Light Subassemblies

left front corner of the cab. The flasher unit is a part of the instrument panel and its removal and installation is covered in paragraph 199.

b. Maintenance.

(1) REMOVE LIGHT ASSEMBLY (fig. 149). Remove two side vents by taking out attaching screws. Remove light assembly by taking out remaining two screws and lifting off light assembly.

(2) REMOVE BASE ASSEMBLY (fig. 150). Take out two cap screws that hold base to siren body and remove base assembly.

(3) REMOVE SIREN AND MOTOR ASSEMBLY (fig. 150). Push cord inward and lift out siren and motor assembly from siren body.

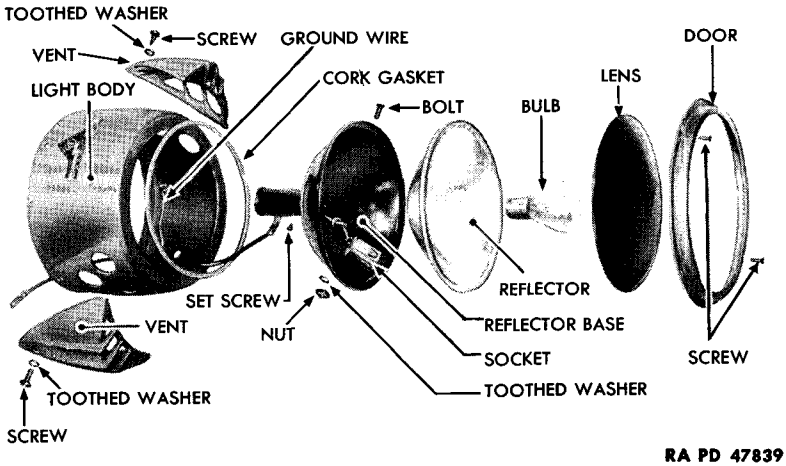

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Figure 151—Siren Light—Disassembled

(4) REMOVE SIREN FROM MOTOR (fig. 150). Remove two socket head set screws that hold siren wheel to motor armature shaft. Take off wheel. Remove four screws that hold siren housing to motor body flange. Lift off housing.

(5) DISASSEMBLE SIREN LIGHT ASSEMBLY (fig. 151). Take out two lens door attaching screws. Move door slightly counterclockwise and lift off. (Gasket remains on reflector). Remove bulb by pressing inward and turning counterclockwise. Lift out reflector with gasket. Pull out reflector base part way and disconnect ground wire from base. Remove gasket. Push lead wire into light body and remove base and lead wire from front of light body.

(6) REMOVE SOCKET FROM REFLECTOR BASE (fig. 151). Remove set screw that holds socket in sleeve of reflector base. Lift out plug in end of sleeve. Pull grommet out of sleeve of reflector base. Push wire inward all the way. Pull out socket. Unsolder wire from socket.

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(7) INSTALL SOCKET IN RELECTOR BASE (fig. 151). Thread wire into hole in sleeve of reflector base and up through hole in reflector. Tie knot near front end of wire and solder wire to lug at bottom of socket. Push socket down into hole in reflector, keeping wire pulled taut. When socket is down in place, fasten with set screw through reflector base sleeve. Install plug in end of sleeve.

(8) INSTALL REFLECTOR AND BASE ASSEMBLY (fig. 151). Place gasket around back of rim of reflector. Connect ground wire to reflector base with bolt, toothed lock washer and nut. Thread lead wire through hole in under side of light body from inside. Install assembly

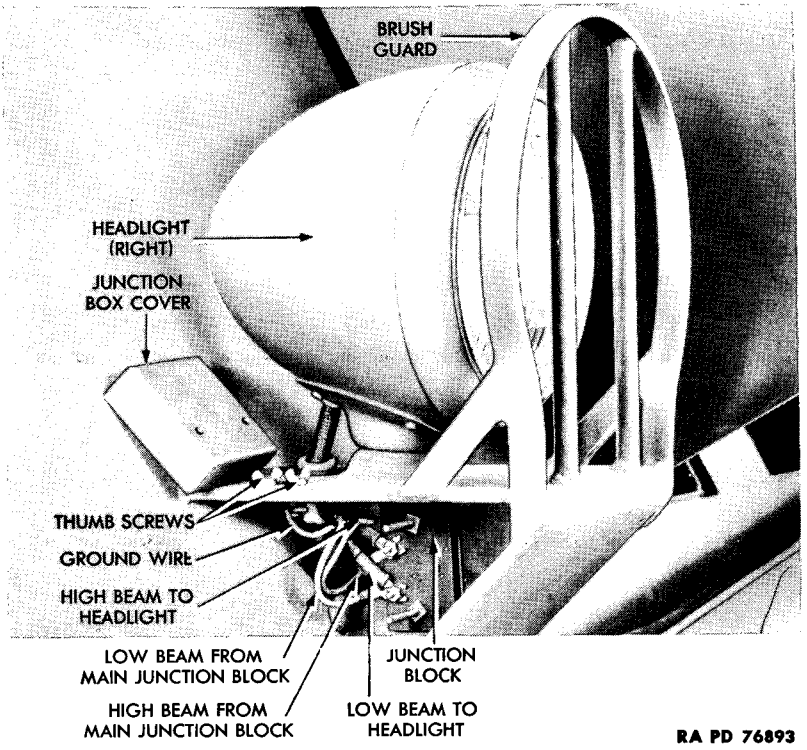

Figure 152—Right Headlight Installation

in place on front of light body. Place lens and door on front of light body. Turn slightly clockwise until attaching screw holes match. Install screws and tighten.

(9) INSTALL SIREN (WHEEL AND HOUSING) ON MOTOR (fig. 150). Place siren housing on flange on front of motor. Fasten with four screws and toothed lock washers. Place siren wheel on motor shaft with closed side of wheel toward motor. Fasten wheel by tightening two socket head set screws. Insert motor lead wire through front hole in siren body from inside and install motor in body. Insert motor

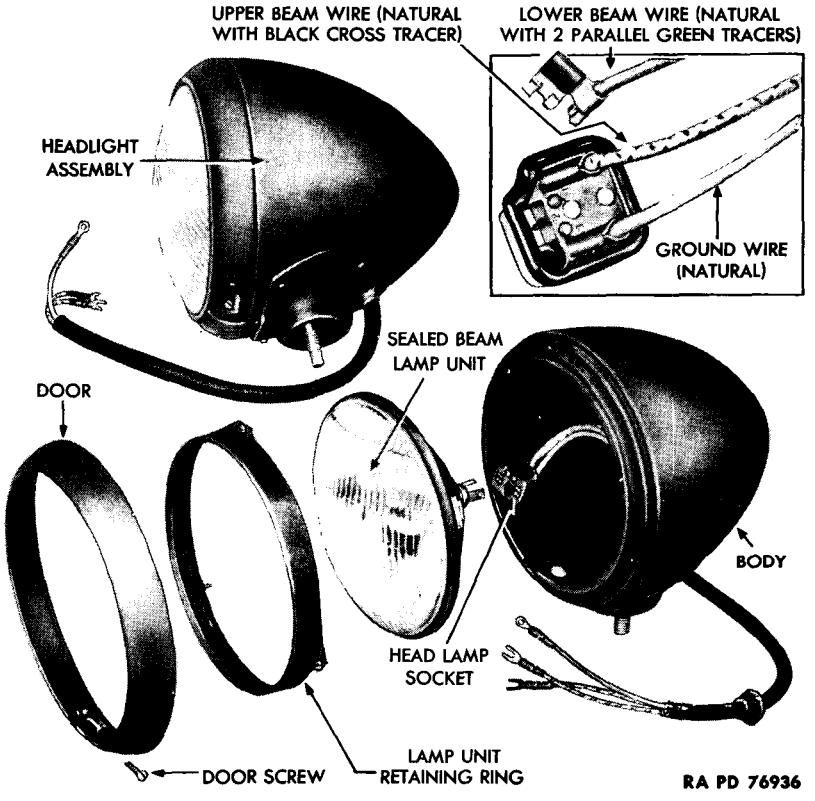

Figure 153—Headlight—Disassembled

lead wire through front hole in base. Fasten base to body with two cap screws and toothed lock washers.

(10) INSTALL LIGHT ASSEMBLY (fig. 149). Place light body over front edge of siren housing. Fasten with short screws and toothed lock washers at top and bottom. Place side vents in position, closed side up. Fasten with longer screws and toothed lock washers.

c. Removal (fig. 149). Remove two thumbscrews and lock washers from left junction box and remove box. Remove nuts and lock washers from terminals of yellow wire and white wire leading to siren. Remove two cab brackets and pull wiring through cab lamp bracket and siren cab bracket. Lift siren and light off siren cab bracket (fig. 149).

d. Installation (fig. 149). Install siren and light on siren cab bracket so that wiring can be inserted through siren cab bracket and cab lamp bracket. Fasten siren and light to siren cab bracket with two bolts, nuts, and lock washers. Attach yellow wire and white wire to junction block with nuts and lock washers. Install junction box and fasten with two thumbscrews and lock washers.

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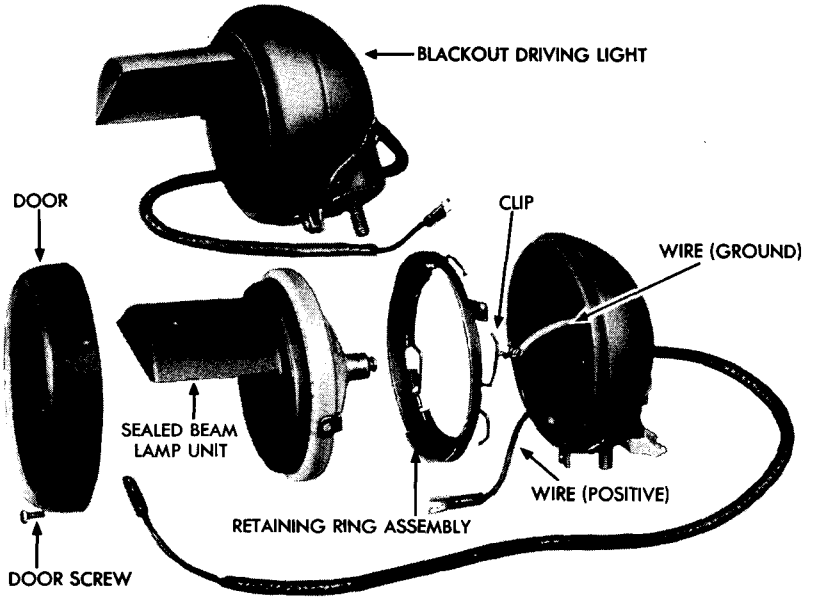
114. HEADLIGHTS.

a. Description (figs. 149 and 152). The two headlights are secured to the front of the cab. They consist of a body and lens which enclose a sealed beam lamp-unit. The lights are provided with canvas covers which are to be used when tractor is in storage.

b. Maintenance and Adjustment.

(1) SEALED BEAM LAMP-UNIT REPLACEMENT (fig. 153). Remove screw at bottom of light door and take off door. Remove sealed beam lamp-unit retaining ring by taking out three screws and lifting off



RA PD 48097

Figure 154—Blackout Driving Light—Disassembled

ring. Lift out sealed beam lamp-unit and disconnect plug. To install, connect plug to sealed beam lamp-unit and place it in position with lugs on lamp-unit fitting into slots in front of light body. In this position bottom of lens lines up with bracket side of the light body. Install lamp-unit retaining ring over lamp-unit with screw holes in ring lining up with those in body. Fasten ring with three screws.

(2) REPLACE WIRING (fig. 153). Wiring and terminal should be replaced as a unit if possible. Remove sealed beam lamp-unit. Remove grommet from light body. Slide grommet off conduit. Pull entire wiring assembly out from front of light. Install wiring assembly

by inserting through hole in body from inside. Install grommets. Install sealed beam lamp-unit. NOTE: *If it is necessary to replace one wire, care must be taken that wire is attached to correct recess in terminal socket. No. 1 recess is for upper beam (natural with black cross tracer). No. 2 recess is for lower beam (natural with two parallel green tracers). No. 3 recess is for ground (natural).*

(3) ADJUSTMENT (fig. 153). There is no adjustment of the headlight beam; however, the light can be positioned for altering the direction of the beam by using shims between the light and its mounting.

c. Removal (fig. 153). Remove two thumbscrews and lock washers that hold junction box cover, then remove cover. Remove nuts and lock washers that hold black-white wire and then white-

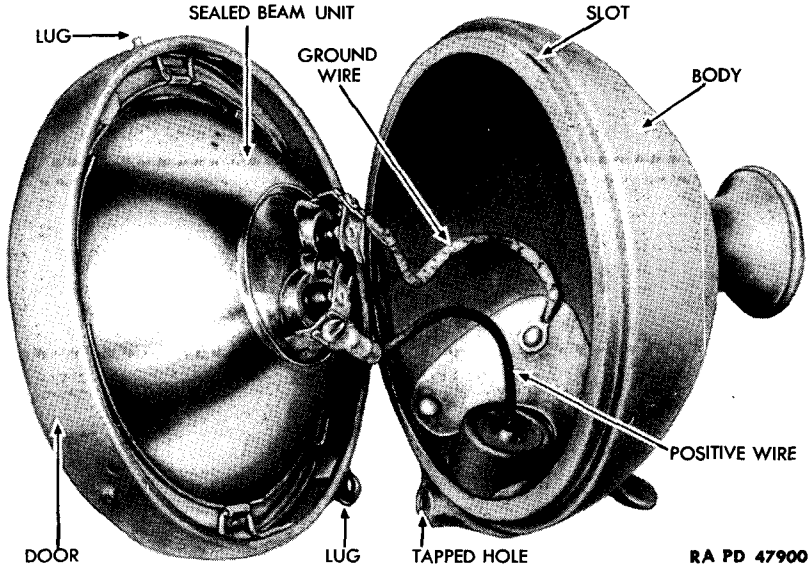


Figure 155—Spotlight Body and Door Assembly

green wire to junction block. Remove yellow ground wire by removing bolt and nut which hold wire to cam lamp bracket. Remove nut and lock washer which hold light to bracket and remove light with wires.

d. Installation (fig. 153). Install headlight so that wires pass through cab lamp bracket and fasten light to bracket with nut and lock washer. Attach yellow (ground) wire to cab lamp bracket with bolt and nut. Attach white-black wire and white-green wire to junction block (wiring diagram, fig. 140) and fasten with nuts and lock washers. Install junction box cover on left junction box and fasten with two thumbscrews and lock washers.

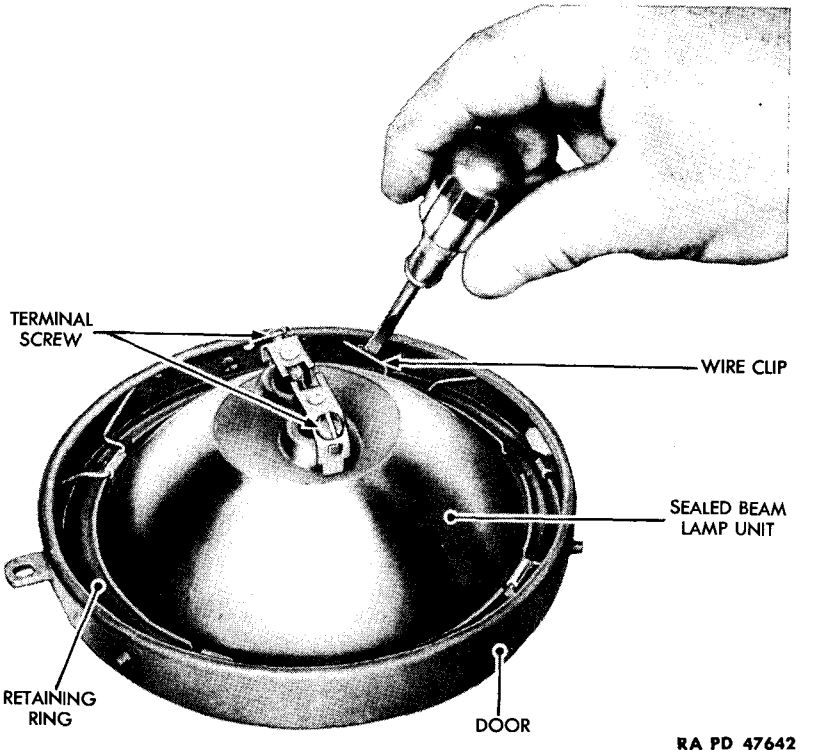


Figure 156—Removing Sealed Unit from Spotlight

115. BLACKOUT DRIVING LIGHT.

a. Description (fig. 154). The blackout driving light is located on the left front corner of the cab and consists of a body and lens in which is a sealed beam lamp-unit.

b. Maintenance (fig. 154).

(1) SEALED BEAM LAMP-UNIT REPLACEMENT. Remove door and unit as an assembly by taking out door screw at bottom of door. Remove screw and ground wire from unit retaining ring. Remove screw and positive wire terminal from center of sealed unit. Pry up retaining ring clips. Remove unit from door. Pull wiring and conduit out of body. Install wiring and conduit in body. Place new sealed unit in door with shield of unit opposite door screw lug, thus bringing shield at top when light is assembled. Install retaining ring with slot in ring over lug in side of sealed unit. Fasten ring with spring clips. Attach ground wire (natural color) to lug on retaining ring. Attach positive (black) wire to terminal in center of unit. Assemble unit and door assembly to body of light. Fasten with door screw at bottom of door.

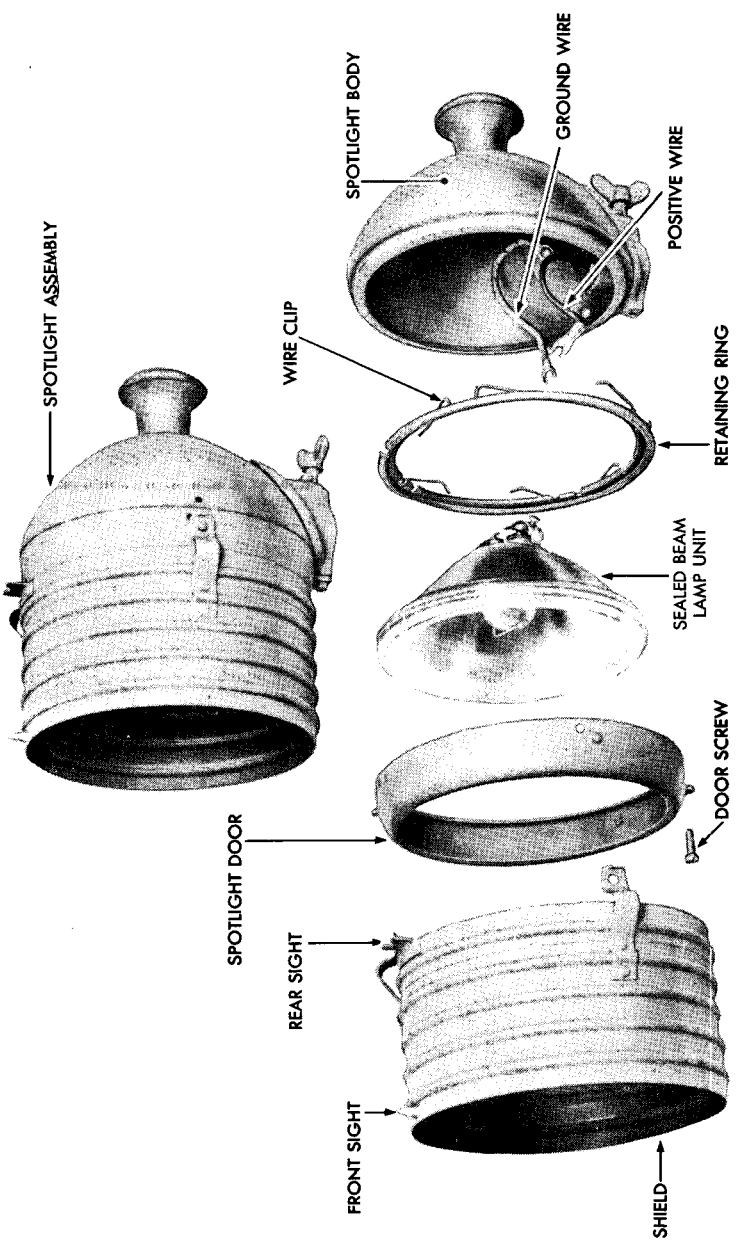


Figure 157—Spotlight—Disassembled

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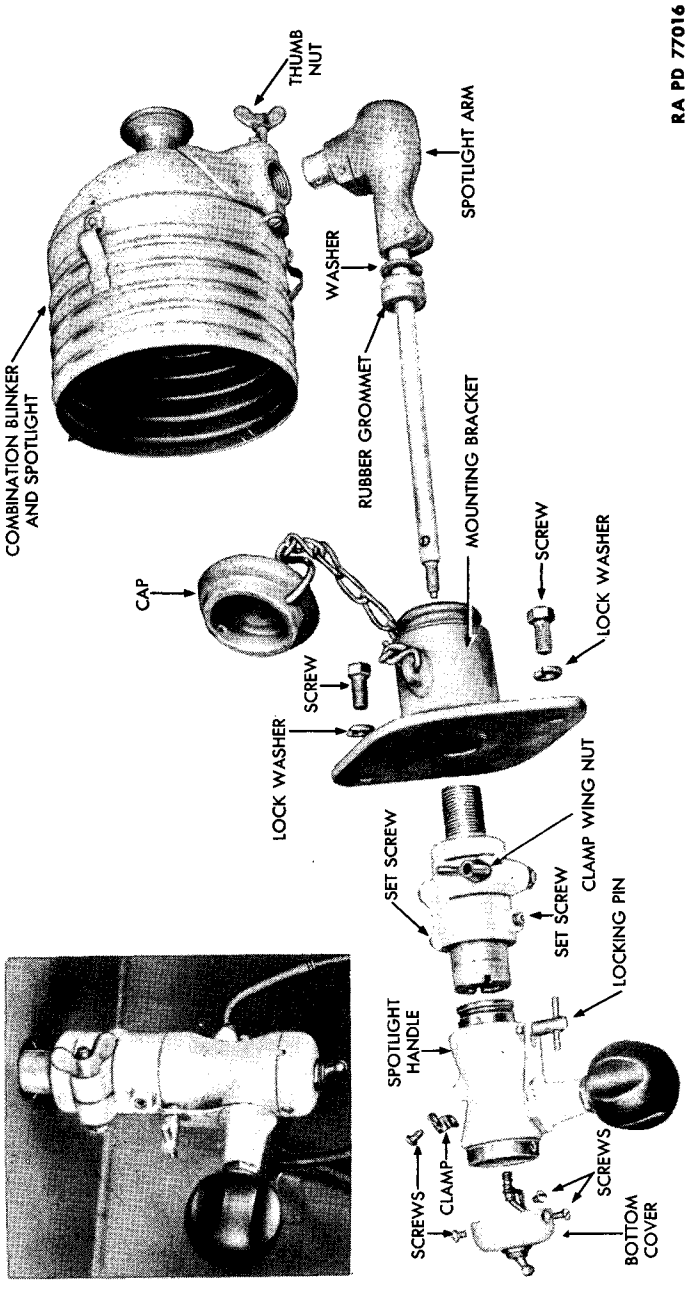

Figure 158—Units of Combination Blinker and Spotlight

(2) REPLACE POSITIVE WIRE. Remove sealed unit. Pull defective wire out from front. Insert new cord in through back of body. Fasten clip onto wire about six inches from end to prevent wire from being pulled out. Install terminal on end of wire with solder.

(3) REPLACE GROUND WIRE. Remove sealed unit. Unsolder and remove defective ground wire from body of light. Install new ground wire and solder terminal in body.

c. Removal (fig. 154). Remove two thumbscrews and lock washers from left junction box and remove junction box cover. Remove nut and lock washer from black wire leading to blackout driving light. Remove nut and lock washer that hold light to cab lamp bracket and pull wire through cab lamp bracket while at the same time lifting light off bracket.

d. Installation of Blackout Driving Light (fig. 154). Install blackout driving light so that wire passes through cab lamp bracket and then fasten light to bracket with nut and lock washer. Install black wire on junction block and fasten with nut and lock washer (wiring diagram, fig. 140). Install junction box cover and fasten with two thumbscrews and lock washers.

116. BLINKER AND SPOTLIGHT.

a. Description (fig. 158). The blinker and spotlight is located on the top of the cab at the right front corner and consists of a body with lens with a sealed beam lamp-unit. A removable shield is attached to the front of the light.

b. Remove Sealed Unit (fig. 156). Pry up three clips with screwdriver and lift off shield. Loosen wing nut and lift arm off lamp. Remove door with sealed unit. Remove door screw at bottom of door and lift off door with unit. Disconnect terminals from sealed unit but leave terminals connected to body. Pry up wire clip and remove retaining ring. Remove sealed unit from door.

c. Install Sealed Unit (fig. 156). Install sealed unit in door. Place retaining ring in position and fasten with clips (fig. 156). Fasten positive and ground wires which are in body to terminals on sealed unit. Install door on body by holding lug and inside of top of door into slot in body. Line up lug on bottom of door with tapped hole in bottom of body, then install and tighten door screw. Install shield on door by catching shield clips on three lugs on door. Unscrew wing screw at bottom of lamp far enough to install lamp on arm, then tighten wing screw.

d. Removal (fig. 158). Unscrew wing nut and remove combination blinker and spotlight from spotlight arm. Pull spotlight arm, washer, and rubber grommet off mounting bracket. Loosen two set screws in spotlight handle and remove spotlight knob assembly. Then unscrew upper part of spotlight handle from mounting bracket. Remove screw and clamp that holds wire on handle, then remove screws that hold bottom cover on handle. Remove screw that holds wire to switch. Remove cap screws and lock washers that hold mounting bracket to cab roof.

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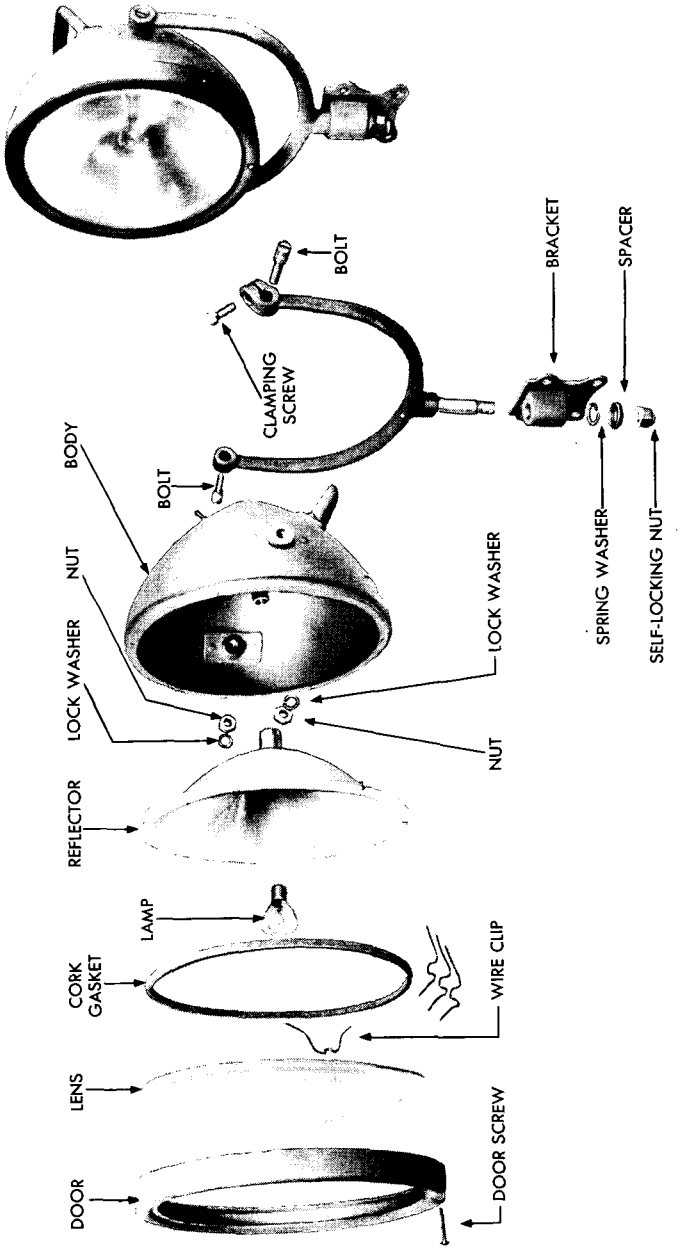


Figure 159—Floodlight—Disassembled

e. Installation (fig. 158). Install mounting bracket on cab roof and fasten with cap screws and lock washers. Screw upper half of spotlight handle into mounting bracket and then attach lower half of handle to upper half and tighten set screws. Install wiring under clamp and fasten clamp with screw, then attach wire to switch with screw. Install bottom cover and fasten with screws. Install spotlight arm in mounting bracket, then install spotlight on arm and tighten thumb nut. Loosen clamp wing nut to turn light in any position desired, then tighten nut.

117. FLOODLIGHTS.

a. Description (fig. 159). The two floodlights of the lamp type are mounted on the rear of the cab. They are for field use and each consists of a body, lens, and lamp.

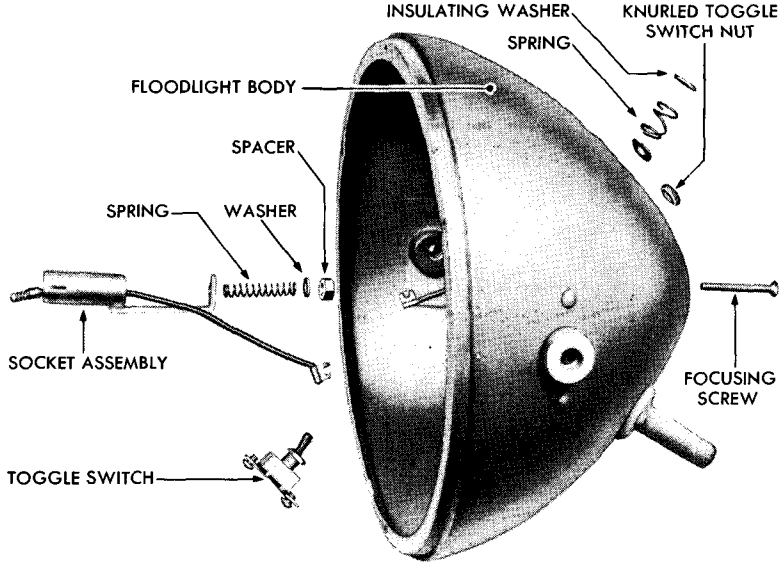


Figure 160—Floodlight Body—Disassembled

b. Maintenance (fig. 160).

(1) REMOVE LAMP. Remove screw from bottom side of front of door. Lift off lens and door together. Remove lamp by turning counterclockwise.

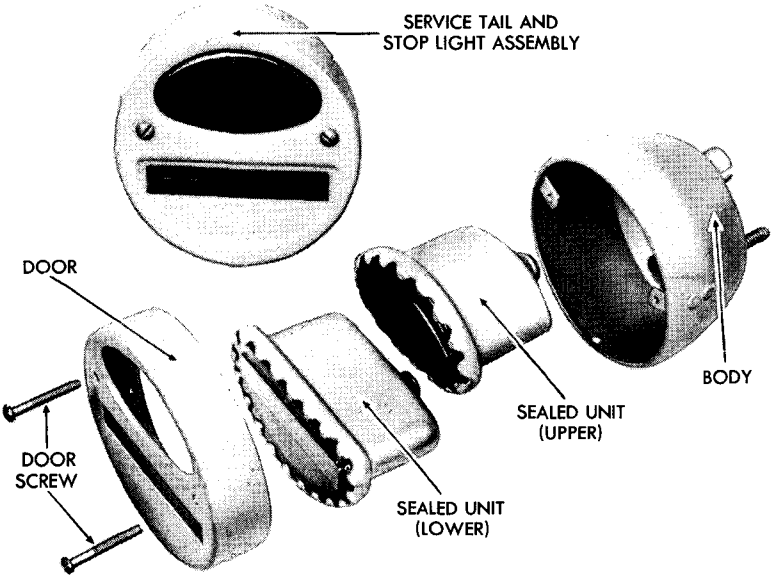
(2) REMOVE REFLECTOR. Remove cork gasket from reflector. Remove three screws that hold reflector to body of light. Lift off reflector.

(3) REMOVE MOUNTING BRACKET. Remove nuts and lock washers from inner ends of two bolts. Loosen clamp screw. Remove

bolts. Lift off mounting bracket assembly. Remove bracket by taking off self-locking nut. Remove spacer and spring washer from mounting arm. Remove bracket from mounting arm.

(4) REMOVE SWITCH. Remove lamp socket by first disconnecting wire from toggle switch body, then unscrewing focusing screw from outside back of body. Remove spring, washer, and spacer. Disconnect intake wire from toggle switch body. Remove knurled nut from toggle switch on outside of body. Remove switch from inside of body.

(5) INSTALL SWITCH. Install toggle switch by inserting from inside of body, fastening with knurled nut on outside. Insert focusing screw through hole in rear end of body and hold in place with the fingers. Place spacer, washer, and spring over screw. Hold socket



RA PD 47658

Figure 161—Service Tail and Stop Light—Disassembled

assembly in place while screwing focusing screw into tapped hole in end of socket mounting arm. Connect wire from socket to switch body. Connect intake wire to other post on switch body. Clamp post of mounting arm in vise with soft jaws. Place body between ends of mounting arm. Install bolts through arm and into body.

(6) INSTALL LAMP AND REFLECTOR. Turn socket assembly so that mounting arm is at top. Place reflector over socket with slot in reflector sleeve over end of mounting arm. Install three small screws that hold reflector to body. NOTE: *Tapped hole in bottom edge of light body should line up with notch in rim of reflector. Install lamp by pressing inward while turning clockwise.*

(7) INSTALL LENS. Install cork gasket, fastening in place with small quantity of shellac at four spots. Assemble lens to door, being sure top of lens is at opposite side of door from mounting screw hole. Fasten lens in with clips. Assemble lens to light body by hooking edge of door over lugs in top of front of body and lining up screw hole in door with tapped hole in bottom of face of body. Install door screw and tighten.

(8) ASSEMBLE BRACKET TO MOUNTING ARM. Insert post of mounting arm through bracket. Place spring washer and spacer over lower end of post. Fasten with self-locking nut.

c. Removal. Pull wiring connector out of light, then remove nuts, spacers and spring washers which hold light to bracket and lift lights out of brackets.

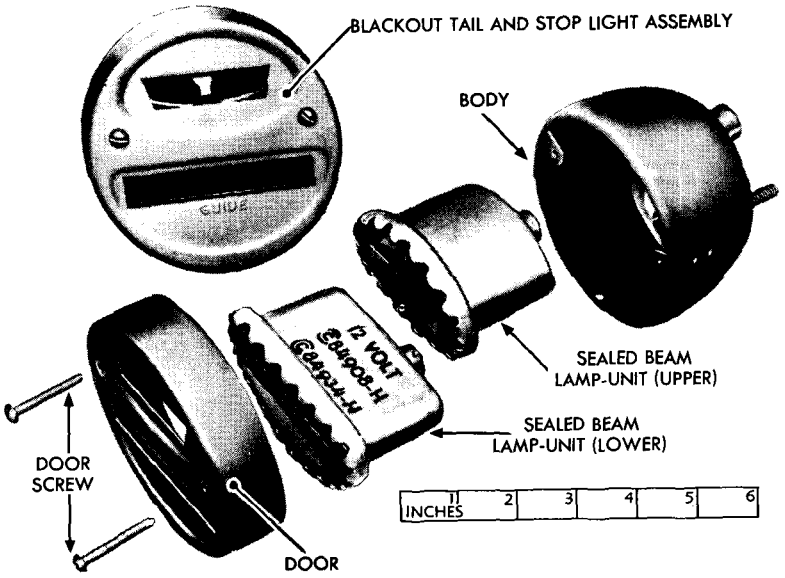


Figure 162—Blackout Tail and Stop Light—Disassembled

d. Installation. Install floodlights in brackets and then install spring washers, spacers, and nuts which hold lights to brackets. Install wiring connectors.

118. SERVICE TAIL AND STOP LIGHT.

a. Description (fig. 161). The service tail and stop light is used for normal driving conditions and is located on the rear of the chassis frame. The light consists of a body, door, and sealed beam lamp-unit.

b. Maintenance (fig. 161). Remove two screws and take off door, then remove sealed unit (upper or lower) and replace.

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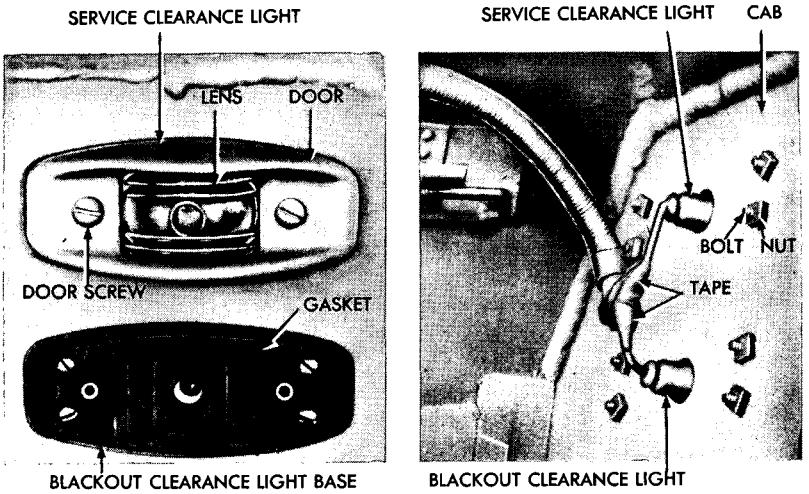

Figure 163—Service and Blackout Clearance Lights and Connections

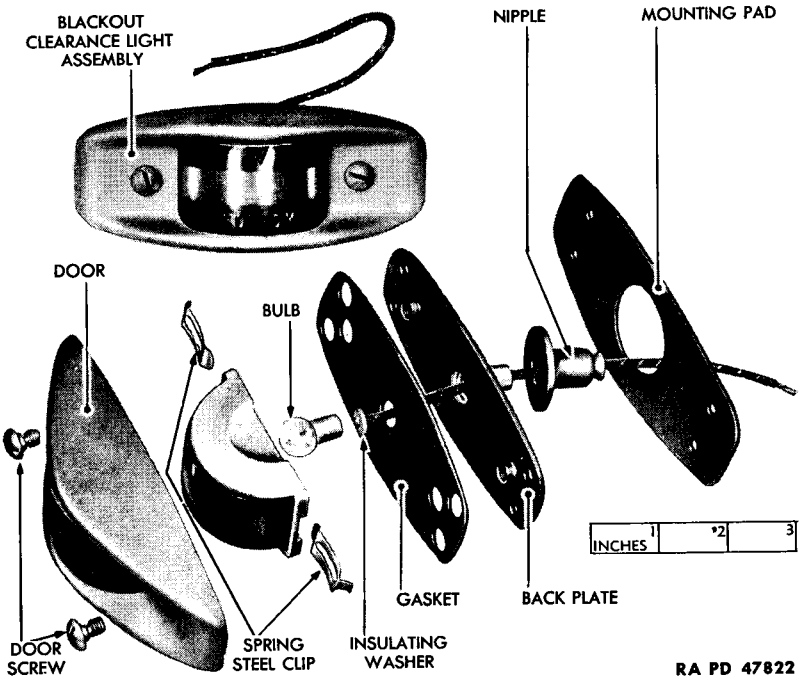

Figure 164—Blackout Clearance Light—Disassembled

c. Removal (fig. 161). Pull wiring connector out of light, then remove two nuts and lock washers which hold light to chassis frame and remove light.

d. Installation (fig. 161). Install light and fasten with two nuts and lock washers, then install wiring connector in light.

119. BLACKOUT TAIL AND STOP LIGHT.

a. Description (fig. 162). The blackout tail and stop light is used when driving under the blackout conditions and is located on

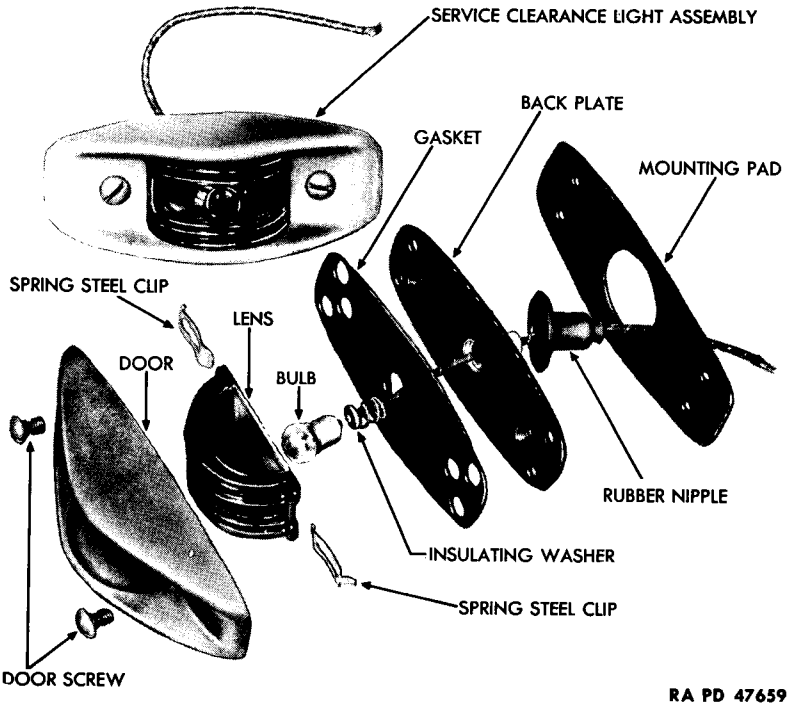

Figure 165—Service Clearance Light—Disassembled

the rear of the chassis frame. The light consists of a body, door, and two sealed beam lamp-units.

b. Maintenance (fig. 162). Remove two screws that hold door to body and remove two sealed units from body.

c. Removal (fig. 162). Pull wiring connector out of light and remove two nuts and lock washers that hold light to bracket. Remove light.

d. Installation (fig. 162). Install light on bracket and fasten with two nuts and lock washers. Install wiring connector in light.

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120. SERVICE AND BLACKOUT CLEARANCE LIGHTS.

a. Description (fig. 163). The service clearance lights and blackout clearance lights are to provide a means of judging the extreme width of the vehicle for passing or parking. The procedure for removal and installation is the same. The lights are secured to the upper front sides of the cab and consist of a door, base, and lamp.

b. Maintenance (figs. 164 and 165). Take out two screws that hold door to back plate. Lift off door with glass lens. Remove two spring steel door screws and retaining clips by pushing outward until lens can be lifted out of door. Move clips inward and lift off screws. Remove lamp by turning counterclockwise while pressing

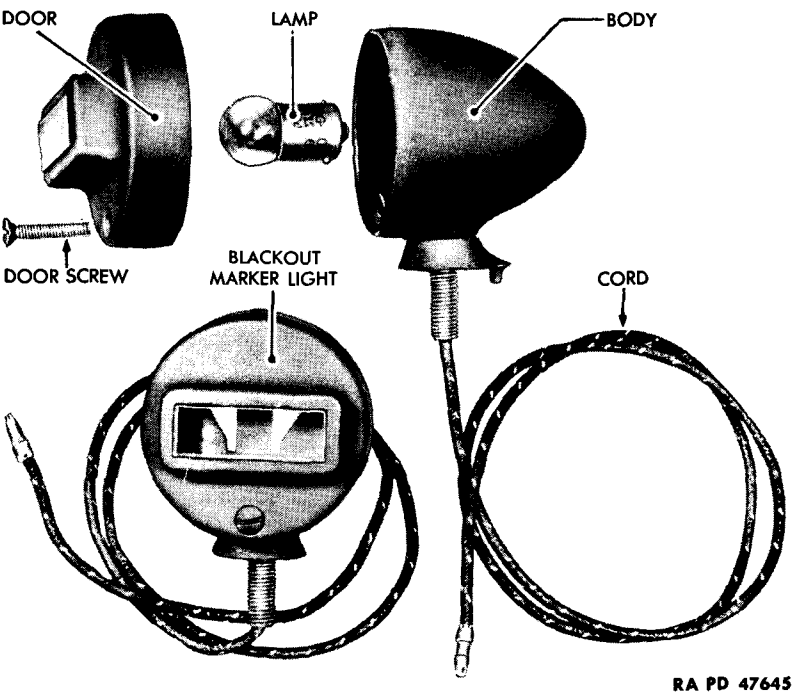


Figure 166—Blackout Marker Light

lamp inward. Lift off gasket and push wire through lamp opening. Remove wire and spring out of back plate and rubber nipple. Install wire and spring in back plate, install rubber nipple. Push wire through lamp opening, then install gasket. Install lamp, then clips on screws. Install lens and fasten with two steel door screws and retaining clips. Install door and fasten with two screws.

c. Removal (fig. 163). Remove two screws which hold door to cab and remove door. Remove lamp and remove door gasket. From inside cab remove tape from service clearance light wire and then

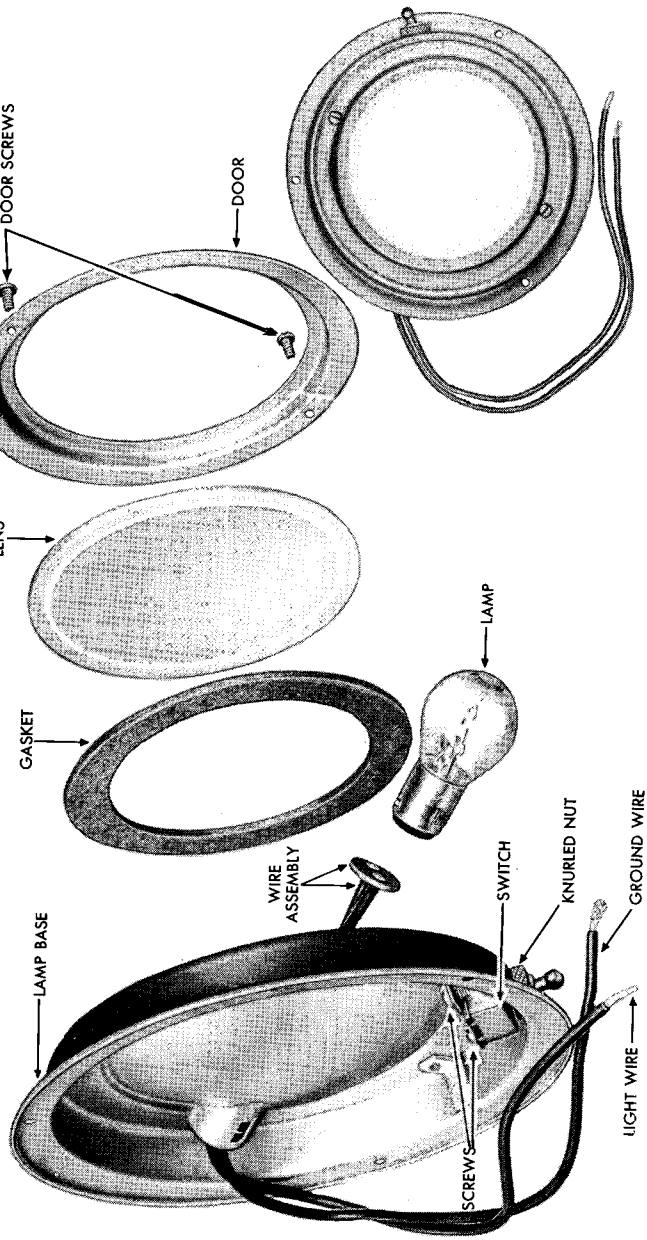


Figure 167—Dome Light—Disassembled

remove grommet from wire. Push wire through cab and remove wire. Remove four bolts, nuts, and lock washers which hold base and remove base and gasket.

d. Installation (fig. 163). Install base and gasket on cab and fasten with four bolts, nuts, and lock washers. Push wire through cab and install grommet. Connect wires inside cab and tape connection. Install lamp and cover gasket. Install cover and fasten with two screws.

121. BLACKOUT MARKER LIGHT.

a. Description (fig. 166). The blackout marker lights are located in the front bumper. The light consists of a body, door, and lamp.

b. Maintenance (fig. 166). Remove screw that holds door to body and remove door. Remove lamp. Install lamp and then install door. Fasten door to body with screw.

c. Removal (fig. 166). Disconnect wiring at main junction block. Remove nuts and lock washers that hold light to bumper and remove light.

d. Installation. Install lights on front bumper and fasten with nuts and lock washers. Connect wiring at main junction block (wiring diagram, fig. 140).

122. DOME LIGHT.

a. Description (fig. 167). The dome light in the center of the cab roof is operated by a switch located on the light. The light consists of a base, door, and lamp.

b. Maintenance (fig. 167). Remove two door screws and toothed lock washers. Take off door, lens, and gasket from lamp base. Remove lamp by pressing inward and turning counterclockwise. Remove screws from light wire and ground wire from switch base. Remove knurled nut from outside of switch. Remove switch from inside of lamp base. Pull wire assembly out of base. Install wire assembly in base. Install switch in base end; fasten with knurled nut. Attach light wire and ground wire in base and fasten with screws. Install lamp, then install gasket, lens, and door. Fasten with two screws and washers.

c. Removal. Remove three bolts, nuts, and lock washers that hold dome light to cab, pull light downward and disconnect wires.

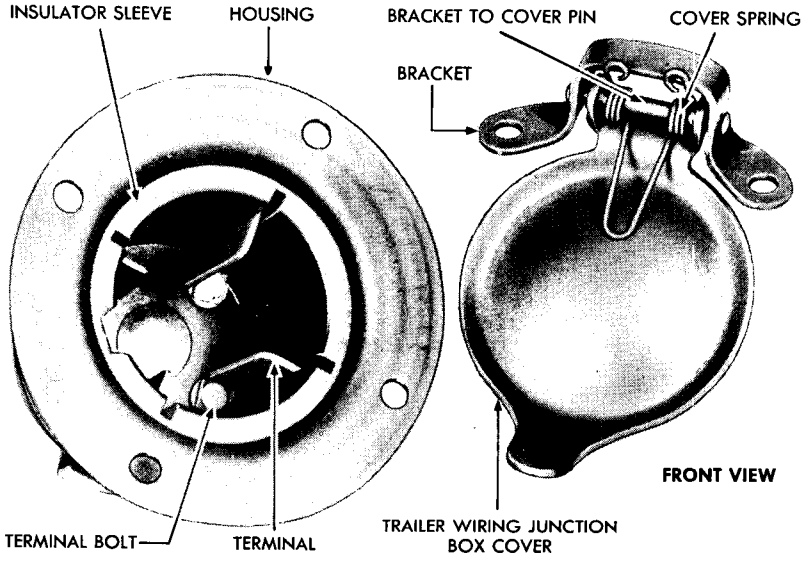
d. Installation. Install wires and then install light and fasten with three bolts, nuts, and lock washers.

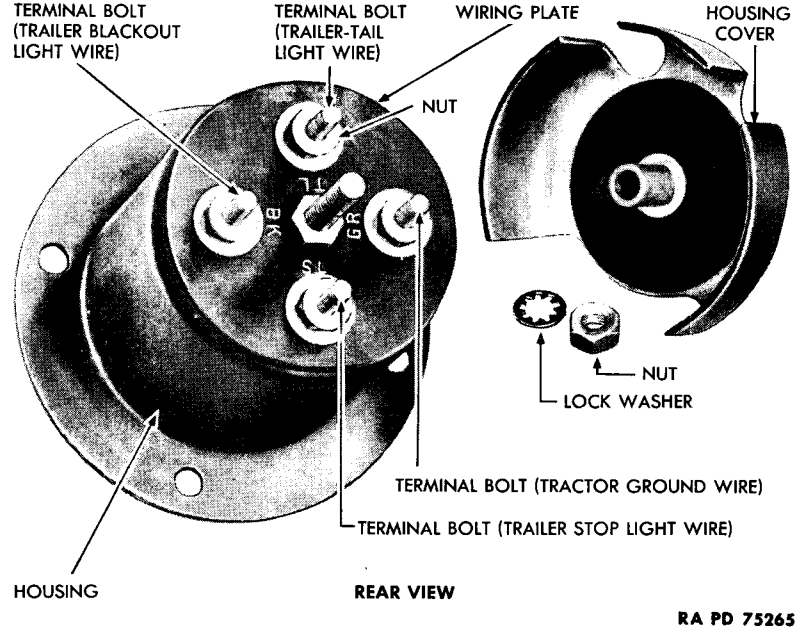
123. SEMITRAILER WIRING JUNCTION BOX.

a. Description (fig. 168). The semitrailer wiring junction box is at the rear of the tractor. A cable to join the junction box to the semitrailer is carried on the semitrailer and is used to join the tractor and semitrailer lighting systems. The box consists of a body with a hinged cover and contains the wiring terminals.

b. Maintenance (fig. 168). Drive bracket to cover and bracket and remove semitrailer wiring junction box cover from trailer wiring

BATTERY AND LIGHTING SYSTEM





RA PD 75265

Figure 168—Semitrailer Wiring Junction Box and Cover

junction box along with cover spring and bracket. Install bracket to cover pin through one side of semitrailer wiring junction box cover and bracket and then install cover spring on pin. Push pin through opposite side of cover and bracket, then rivet pin onto cover.

c. **Removal.** Remove housing cover bolt, nut, and lock washer, then remove cover. Remove four nuts from terminal bolts and then remove another four nuts. Remove four wire clips and semitrailer taillight wire, tractor ground wire (grounds to stop light mounting bolt), semitrailer stop light wire, and semitrailer blackout light wires from terminal bolts. Remove four bolts, nuts, and lock washers which hold semitrailer wiring junction box and semitrailer wiring

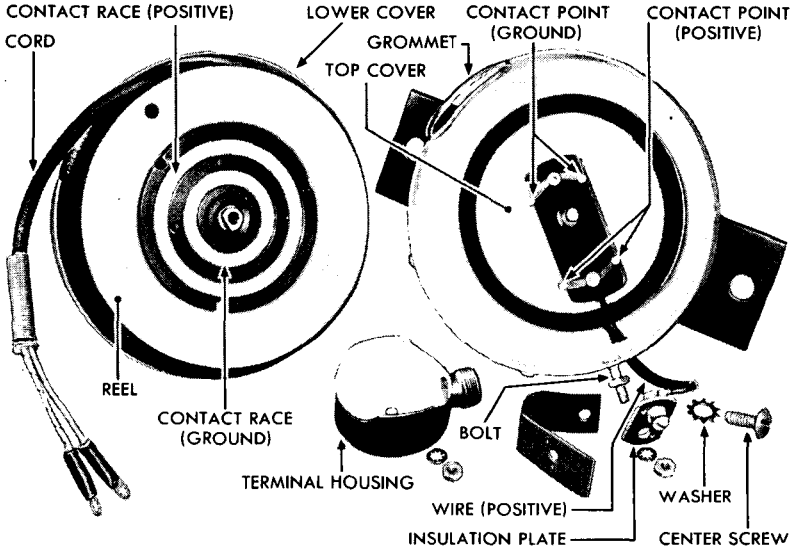


Figure 169—Signal Light Reel—Disassembled

junction box cover to chassis frame bracket. Remove box assembly and cover assembly.

d. **Installation.** Install semitrailer taillight wire, semitrailer blackout light wire, tractor ground wire (grounds to stop light mounting bolt), semitrailer stop light wire on terminal bolts, then install four wire nuts on terminal bolts and then install another four nuts on bolts.

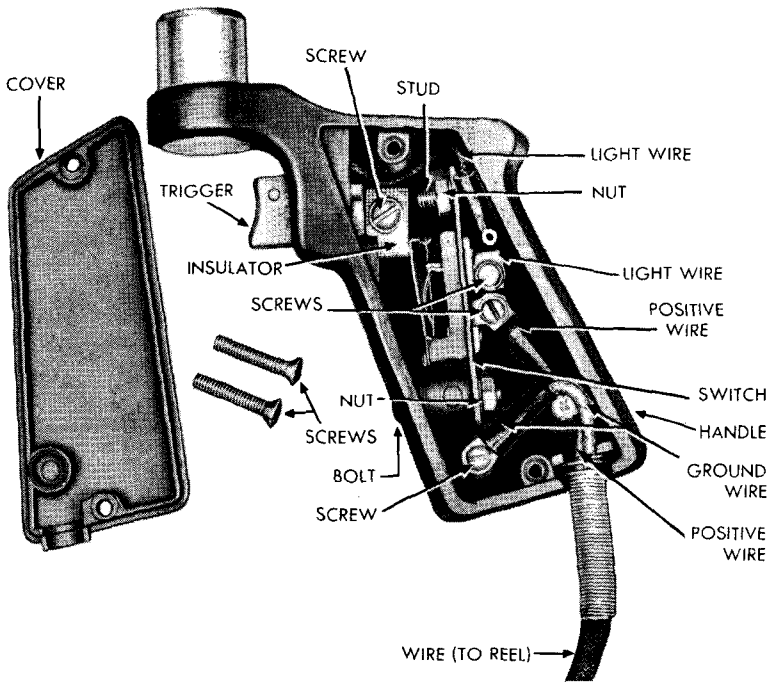
124. SIGNAL LIGHT REEL AND SWITCH.

a. **Description** (figs. 169 and 170). The signal light reel and switch are located on the inside roof of the cab and are the means

of using the combination blinker and spotlight at a distance from the vehicle.

b. Maintenance (figs. 169 and 170).

(1) REEL. Take out center screw and star washer. Remove top cover from body. Allow reel to unwind itself. Remove metal grommet from cord outlet spring. Wind wiring onto reel, being careful not to allow wiring to kink or twist. Wind reel about five turns to put tension on spring. Holding reel and lower cover together with spring under this tension, shake assembly until spring stop falls into place. NOTE: *The action of this spring is similar to that of an ordinary*



RA PD 75336

Figure 170—Signal Switch Assembly—Cover Removed

window shade roller. Place metal grommet over wiring and in position between two covers. Place covers together. Fasten with screw and toothed lock washer through top cover and into reel.

(2) SWITCH.

(a) Removal. Take out two screws that hold cover to handle and lift off cover. Remove screws that hold ground and positive wires to handle and remove wires. Remove screw that holds light wire to handle and remove wire. Remove screw and lock washer

that hold insulator and remove insulator, then lift trigger and spring out of handle. Remove nut and lock washer from bolt which holds switch and remove bolt from handle. Remove nut and lock washer from front stud which holds switch and remove switch.

(b) Installation. Install switch and secure with nut and lock washer, then install bolt, nut, and lock washer that hold switch on handle. Install trigger and spring in handle, then install insulator and secure with screw and lock washer. Install light wire and secure to handle with screw. Install ground and positive wires on handle and secure with screws. Install cover on handle and secure with two screws.

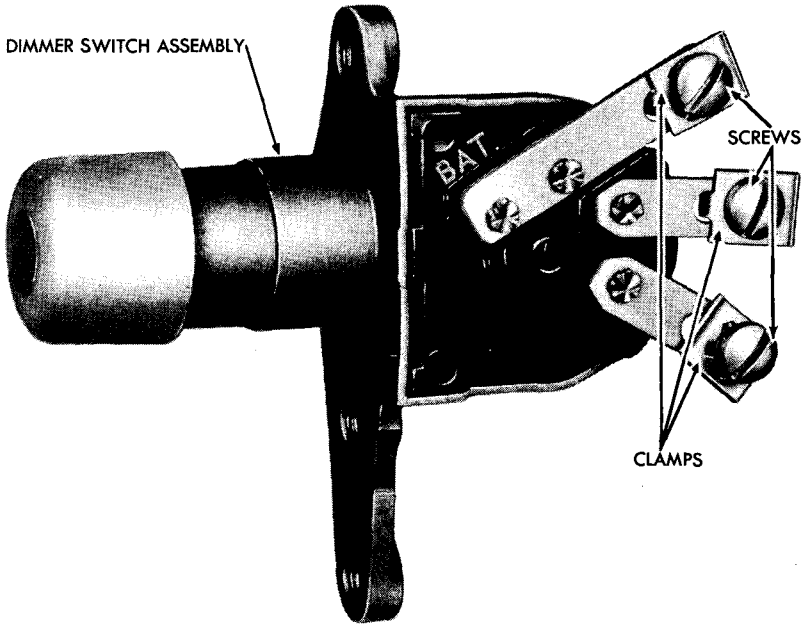


Figure 171—Dimmer Switch

c. Removal of Reel. Remove nut and washer that hold terminal housing on reel and disconnect wire. Remove two cap screws and lock washers that hold reel on cab, then repeat procedure on switch. Remove reel and switch.

d. Installation of Reel. Install reel and switch and fasten with four cap screws and lock washers. Connect wire to reel, then install terminal housing and fasten with nut and washer.

125. DIMMER SWITCH.

a. Description (fig. 171). The dimmer switch operates the high or low beam of the headlights and is located on the floor of the cab. The switch is of the plunger type.

b. Removal. Remove two screws and lock washers which hold dimmer switch to floorboard. From underneath floorboard, remove three screws and clamps which hold three wires to dimmer switch and remove dimmer switch from floorboard.

c. Installation. From underneath floorboard install dimmer switch in floorboard and from top of floorboard fasten switch with two screws and lock washers. From underneath floorboard install three wires on dimmer switch and fasten with three clamps and screws.

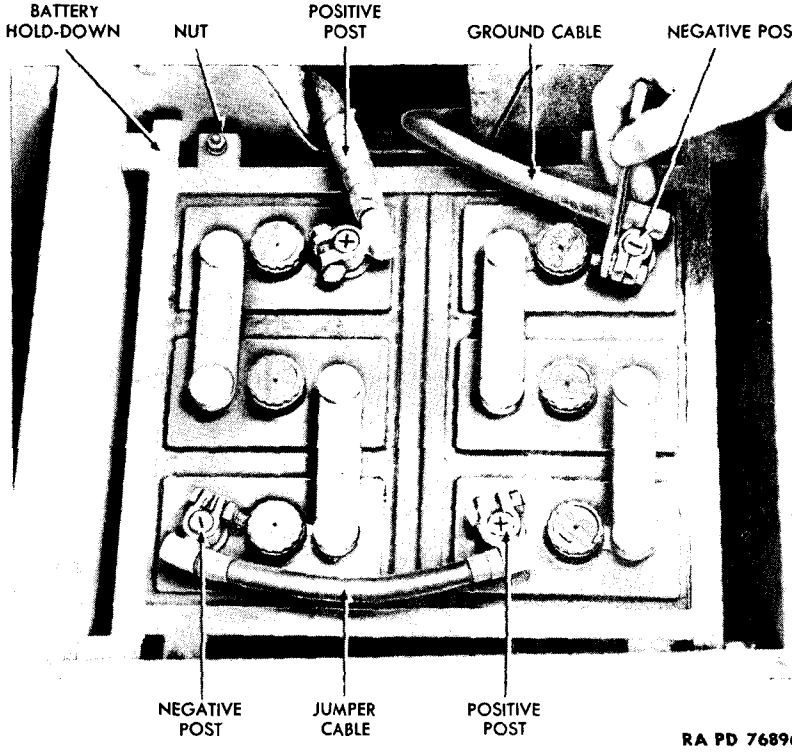


Figure 172—Disconnecting Battery

126. COMMANDER'S DESK LIGHT.

a. Description. The light over the commander's desk is a hooded, bulb-type light.

b. Removal. Pull hood (over lamp) off light. Remove lamp, then remove switch handle. Push socket up through light and melt solder that holds wire to lamp connector. Pull wire out of light, then remove nut and lock washer that hold light to cab bracket.

c. Installation. Install light on cab bracket and fasten with nut and lock washer. Push wire up through light and solder wire to lamp

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

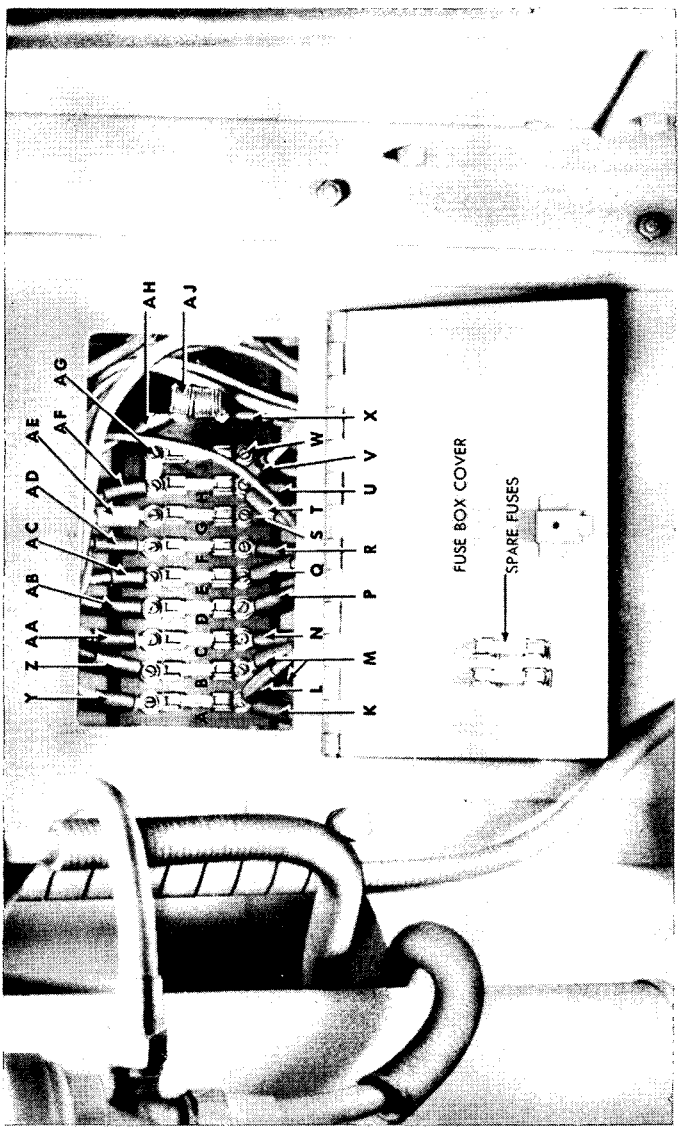


Figure 173—Fuse Box (Below Instrument Panel)

FUSES—

- **A**—FUSE FOR HEADLIGHTS, SERVICE CLEARANCE LIGHTS (TRACTOR AND TRAILER), SERVICE TAIL (TRACTOR AND TRAILER)
- **B**—BLACKOUT MARKER AND BLACKOUT TAIL (TRACTOR AND TRAILER)
- **C**—TRAILER TAILLIGHT
- **D**—STOP LIGHTS (TRACTOR AND TRAILER)
- **E**—FUEL GAGES
- **F**—LOW PRESSURE AIR INDICATOR
- **G**—SIREN MOTOR
- **H**—SIREN LIGHT, DOME LIGHT, READING LIGHT, WINDSHIELD MOTORS
- **J**—SPOT LIGHT REEL

* * *

- **K**—CAB JUNCTION BLOCK AND HEADLIGHTS
- **L**—TAIL AND STOP LIGHT
- **M**—BLACKOUT MARKER AND BLACKOUT TAILLIGHT
- **N**—TRAILER JUNCTION BOX (TO TRAILER TAILLIGHTS)
- **P**—STOP LIGHT SWITCH
- **Q**—FUEL GAGES
- **R**—LOW PRESSURE AIR INDICATOR
- **S**—SIREN MOTOR
- **T**—SIREN LIGHT
- **U**—DOME LIGHT, READING LIGHT, WINDSHIELD MOTORS
- **V**—TOOL BOX LIGHT
- **W**—SPOTLIGHT REEL
- **X**—BLACKOUT DRIVING LIGHT
- **Y**—TO "HT" TERMINAL ON LIGHT SWITCH
- **Z**—TO "BHT" TERMINAL ON LIGHT SWITCH
- **AA**—TO "BHT" TERMINAL ON LIGHT SWITCH
- **AB**—TO STOP LIGHT SWITCH
- **AC**—TO LEFT IGNITION SWITCH
- **AD**—TO RIGHT IGNITION SWITCH
- **AE**—TO SIREN SWITCH
- **AF**—TO AMMETER
- **AG**—TIED TO "W"
- **AH**—BLACKOUT DRIVING LIGHT SWITCH
- **AJ**—RESISTOR

RA PD 76999A

Legend for Figure 173—Fuse Box (Below Instrument Panel)

connector, then push wire back through light. Install switch handle, lamp, and hood.

127. BATTERY.

a. Description (fig. 172). There are two storage batteries located under the crew seat on the right rear wall of the cab. These are six-volt batteries connected in series.

b. Removal (fig. 172). Remove right rear crew seat cushion and seat pan. Disconnect ground cable and positive cables from battery posts. Remove jumper cable from batteries and then remove nuts that retain battery hold-down and remove hold-down. Lift two batteries out of battery box.

c. Installation (fig. 172). Install two batteries and connect jumper cable from positive to negative posts (fig. 172). Connect ground and positive cables and then install battery hold-down, fastening with nuts. Install seat pan and right rear crew seat cushion.

128. FUSES.

a. Description (fig. 173). The fuse box is located to the right of the steering column and just below the instrument panel. The fuses and the circuits fused are shown on the wiring diagram (fig. 140). There are two fuses on the inside of the fuse box cover.

b. Removal (fig. 173). Pull fuse out of clips on fuse block.

c. Installation (fig. 173). Install fuse into clips on fuse block.

Section XX

MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

129. DESCRIPTION AND DATA.

a. Description. The main transmission and clutch are located at the rear of the engine. A propeller shaft transmits power from the main transmission to the auxiliary transmission, which is located at the rear of the main transmission, and secured to the frame beneath the rear tandem winch assembly. The transfer case is secured to the rear of the auxiliary transmission. The declutch assembly is secured to the left-hand front side of the transfer case and is connected by a propeller shaft to the front differential and carrier assembly at the front axle, thus providing a means of obtaining front wheel drive when desired. A power take-off assembly is mounted on the right-hand side of the auxiliary transmission and drives the front mounted winch. A second power take-off assembly, mounted on the top of the auxiliary transmission, supplies power to drive the two winches of the tandem winch assembly. A propeller shaft from the transfer case to the rear differential and carrier assembly transmits power to drive the rear wheels through the jackshaft axle shafts.

b. Data.

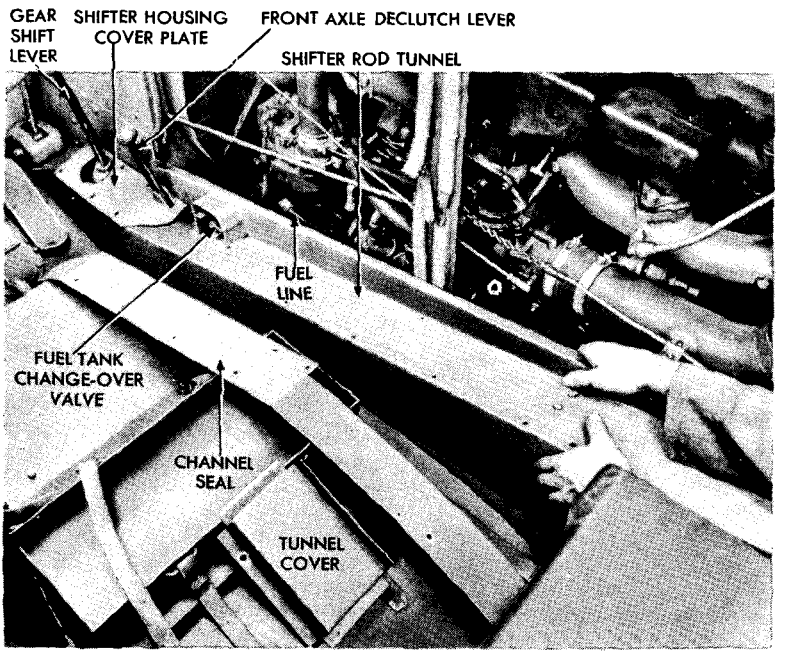
(1) TRANSFER CASE.
Make ..... Timken
Model T96

(2) DECLUTCH UNIT.
Make ..... Timken
Model T77

(3) AUXILIARY TRANSMISSION.
Make ..... Spicer
Model ..... 703 Special

(4) SIDE MOUNTED POWER TAKE-OFF.
Make ..... Spicer
Model ZG5

(5) TOP MOUNTED POWER TAKE-OFF.
Make ..... Spicer
Model 703
(6) MAIN TRANSMISSION.
Make ..... Fuller
Model 4B86



RA PD 77021

Figure 174—Removal of Shifter Rod Tunnel

130. MAIN TRANSMISSION INTERLOCK CONTROLS AND LINKAGE.

a. Description. The linkage necessary to connect the gearshift lever to the main transmission is located in a box-shaped housing (tunnel). This housing is secured to the cab floor at the left side of the engine. The linkage consists of a selector shaft and drag link which are connected to the gearshift lever at one end and to the transmission interlock control at the opposite end. The drag link and selector shaft are interconnected by means of two selector yokes secured to the front and rear of the selector shaft.

b. Removal (figs. 174 and 175).

(1) PRELIMINARY INSTRUCTIONS. Remove the engine front side cover and driver's seat (par. 194); water can from back of driver's seat; co-driver's seat (par. 194); and crew seat at left rear of cab (par. 194).

MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

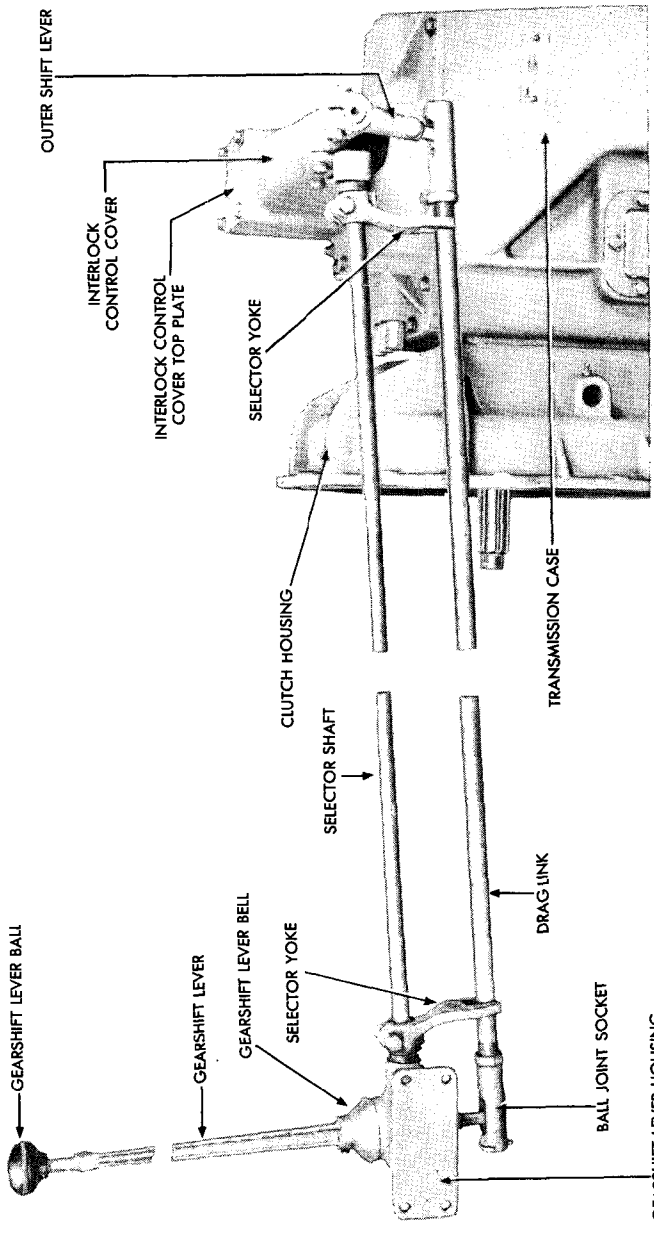


Figure 175—Transmission Interlock Controls

(2) REMOVE CHANNEL SEAL (fig. 174). Remove channel seal from between wheel housing and shifter rod tunnel by removing four bolts, nuts, and lock washers which hold seal to tunnel. Remove eight cap screws and lock washers and one bolt, nut, and lock washer which hold seal to wheel housing. Lift channel seal off wheel housing.

(3) LOOSEN SHIFTER ROD TUNNEL (fig. 174). Remove six cap screws and lock washers which hold shifter housing cover plate to tunnel and shifter housing cover. Remove four cap screws and lock

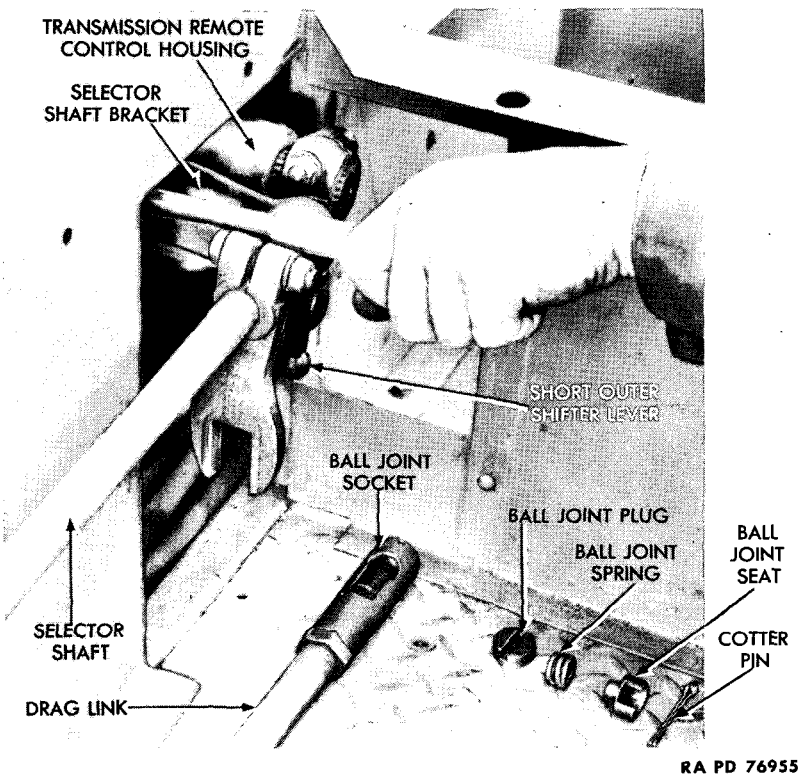


Figure 176—Disconnecting Selector Shaft Bracket from Remote Control Housing

washers which hold tunnel to transmission cover. Remove two bolts, nuts, and lock washers which hold tunnel to seat support. Remove seven cap screws and lock washers and one bolt, nut, and lock washer which hold tunnel to floor. Remove two cap screws and lock washers which hold front end of tunnel to shifter housing cover.

(4) DISCONNECT FUEL LINES. From the engine side of the tunnel, disconnect the three fuel lines from the fuel tank change-over valve.

(5) DISCONNECT GEARSHIFT LEVER AND FRONT AXLE DECLUTCH LEVER AND REMOVE TUNNEL (fig. 175). Place the gearshift lever in

reverse position and remove the cotter pin and straight pin which hold the front axle declutch lever to the shifter housing cover plate. Lift the plate up as far as possible on the two levers. Then pull the tunnel forward as far as possible and lift the rear end free of the seat support. The tunnel can then be lifted from the vehicle. Remove the shifter rod tunnel cover, which has been disconnected. Remove the cotter pin and clevis pin from the bottom of the declutch lever to free the lever from the clevis yoke and remove the lever and shifter housing cover plate.

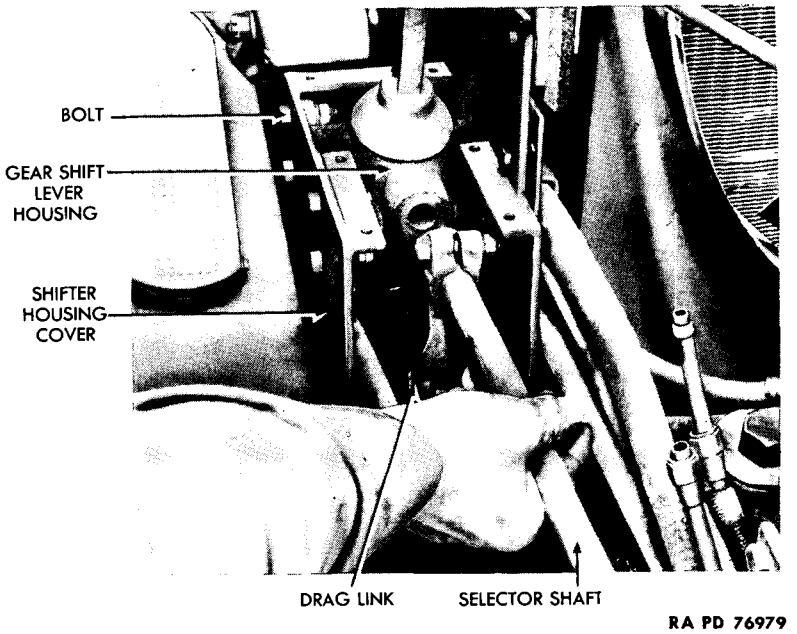


Figure 177—Removal of Selector Shaft

(6) REMOVE SELECTOR SHAFT. Remove the cotter pin and ball joint plug from the ball joint socket at the rear end of the drag link and remove the ball joint socket from the short outer shaft lever (fig. 177). Remove the ball joint spring and seat from the ball joint socket. Then remove the three cap screws and lock washers which secure the selector shaft bracket to the transmission remote control housing. At the front end of the selector shaft, pull the shaft from the gearshift lever housing.

(7) REMOVE DRAG LINK AND GEARSHIFT LEVER (fig. 177). Remove the four bolts, nuts, and lock washers which hold the gearshift lever housing to the shifter housing cover. The drag link with the gearshift lever and housing attached can then be lifted from the vehicle.

(8) REMOVE REMOTE CONTROL SELECTOR SHAFT (figs. 176 and 177). Remove selector shaft bracket and felt washer from rear end of selector shaft. Then remove clamp bolt, nut, and lock washer and remove selector yoke and Woodruff key. From front end of selector shaft, remove felt washer, clamp bolt, nut, and lock washer, and remove selector yoke and Woodruff key.

(9) REMOVE GEARSHIFT LEVER FROM DRAG LINK (figs. 176 and 177). Remove cotter pin from ball joint socket and plug. Then remove ball joint plug, spring, and seat from front end of drag link. Remove drag link from lower end of gearshift lever.

(10) REMOVE BALL JOINT SOCKET (figs. 176 and 177). Remove second ball joint seat from ball joint socket at front end of drag link. Then unscrew ball joint socket from end of drag link and remove jam nut. Unscrew ball joint socket at rear end of drag link and remove jam nut.

(11) REMOVE GEARSHIFT LEVER BELL (figs. 176 and 177). Remove gearshift lever grip and tension spring by twisting it clockwise. Remove tension spring washer. Remove machine screw and lock washer which hold bell to lever, remove bell, and pull lever from bottom of housing. Remove nut and lock washer from pivot pin and remove pin.

c. Installation.

(1) INSTALL BELL ON GEARSHIFT LEVER. Install pivot pin in housing, securing it with a nut and lock washer, then insert gearshift lever into housing and install bell over lever and on top of housing. Secure bell to lever with a lock washer and machine screw. Install tension spring by twisting it counterclockwise, then install gearshift lever grip on end of lever.

(2) INSTALL DRAG LINK BALL JOINT PLUG (fig. 180). Screw jam nut and ball joint socket onto each end of drag link, then install ball joint seat in socket at front end of drag link. Install lower end of gearshift lever in ball joint socket with ball joint seat back of ball, on end of lever. Install second ball joint seat, ball joint spring, and ball joint plug and secure plug to socket with cotter pin.

(3) INSTALL REMOTE CONTROL SELECTOR SHAFT (fig. 176). Install key in front end of selector shaft and install selector yoke. Secure yoke to shaft by installing clamp bolt, nut, and lock washer and install new felt washer on shaft, next to yoke. At rear end of selector shaft, install selector yoke in same manner, then install felt washer on shaft next to yoke and install selector shaft bracket over end of shaft.

(4) INSTALL DRAG LINK AND GEARSHIFT LEVER (figs. 176 and 177). Install drag link, with gearshift lever and housing attached, so that gearshift housing is alined with bolt holes in shifter housing cover. Secure housing to cover with four bolts, nuts, and lock washers.

(5) INSTALL SELECTOR SHAFT. Push front end of remote control selector shaft into position in gearshift housing. Secure selector shaft bracket to remote control housing with three cap screws and lock

washers. Install one ball joint seat in ball joint socket at rear end of drag link, and position socket over end of short outer shift lever. Then install remaining ball joint seat into socket, and install ball joint spring over seat. Install ball joint plug in end of ball joint socket, and lock plug in socket with cotter pin.

(6) INSTALL DECLUTCH LEVER (fig. 174). Insert declutch lever in shifter housing cover plate and attach end of lever to clevis yoke at end of control rod by installing clevis pin and cotter pin.

(7) INSTALL TUNNEL (fig. 174). Lift shifter rod tunnel into position, sliding it under shifter housing cover plate and ahead of crew seat support at left rear of cab. Place shifter rod tunnel cover in position at rear of tunnel. Install straight pin and cotter pin which hold front axle declutch lever to shifter housing cover plate. Install four cap screws and lock washers which hold tunnel to transmission cover. Install two bolts, nuts, and lock washers which hold tunnel to seat support and tunnel cover. Install seven cap screws and lock washers and one bolt, nut, and lock washer which hold tunnel to floor.

(8) CONNECT FUEL LINES. From engine side of tunnel, connect three fuel lines to fuel tank change-over valve.

(9) INSTALL SHIFTER HOUSING COVER. Install six cap screws and lock washers which hold shifter housing cover plate to tunnel and to shifter housing cover.

(10) INSTALL CHANNEL SEAL. Install channel seal, then install four bolts, nuts, and lock washers which hold seal to tunnel, and eight cap screws and lock washers and one bolt, nut, and lock washer which hold seal to housing.

(11) INSTALL SEATS AND ENGINE SIDE COVER. Install crew seat at left rear of cab (par. 194); co-driver's seat (par. 194); water can ahead of co-driver's seat, and driver's seat (par. 194). Install engine side cover.

131. MAIN TRANSMISSION.

a. Description. The main transmission is secured to the flywheel housing at the rear of the engine by means of the clutch housing, which in turn is secured to the front end of the transmission. A propeller shaft transmits power from the main transmission to the auxiliary transmission. The main transmission has four forward and one reverse speeds, and the auxiliary transmission provides three speed ranges for each of the main transmission speeds.

b. Removal.

(1) REMOVE TRANSMISSION COVER (fig. 179). Remove portable tool box from top of transmission cover, then open lids of transmission cover and remove all tools and stowage. Close lids, and remove four cap screws and lock washers from rear lid, and three bolts, nuts, and lock washers from front lid. Open lids and remove three countersunk head screws from each side of transmission cover. Lift the transmission cover from vehicle.

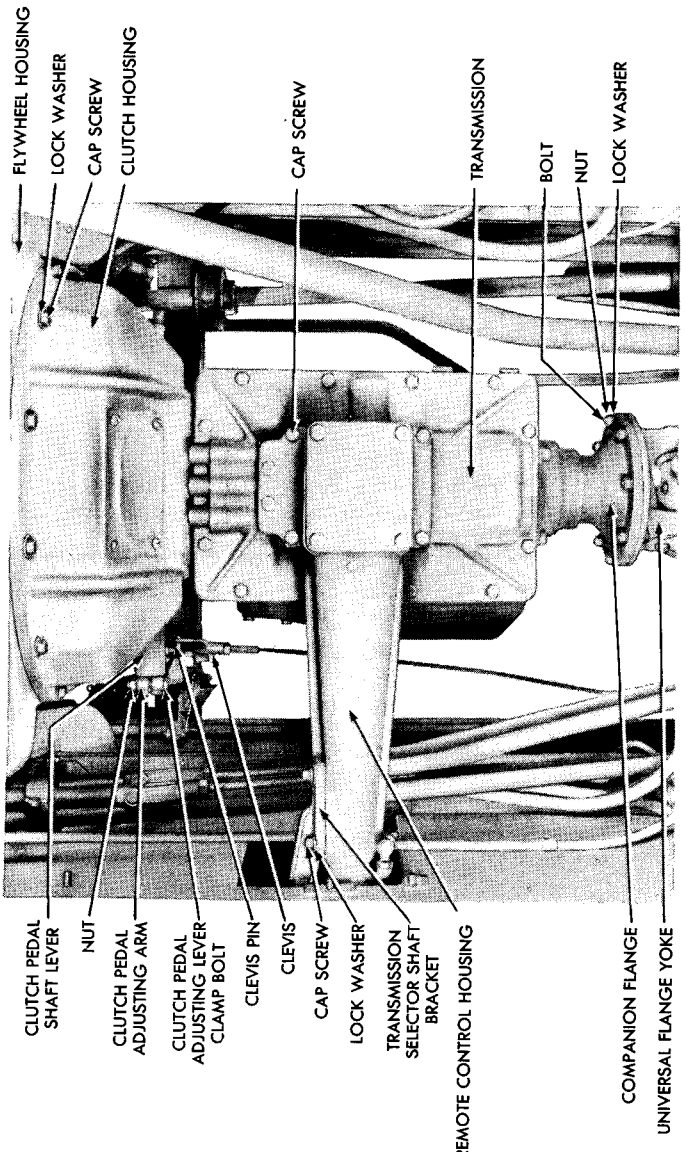


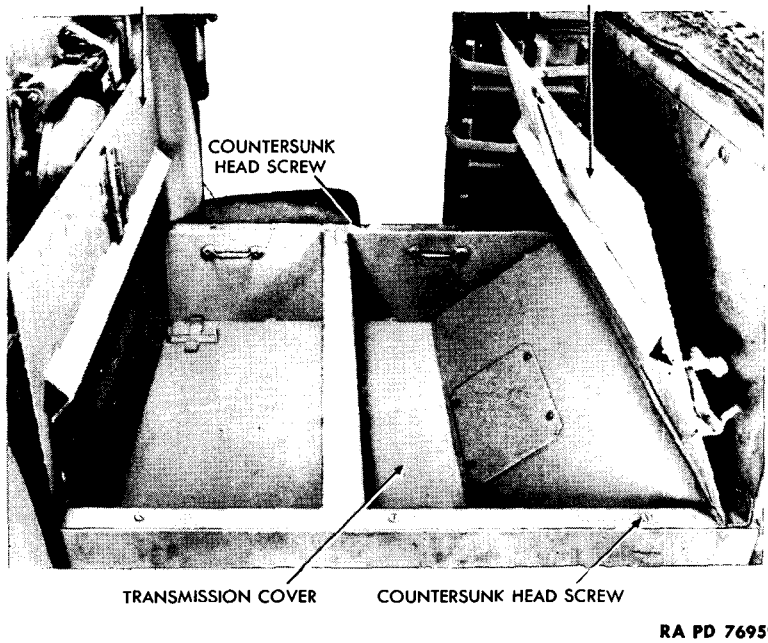
Figure 178—Transmission Installed

MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

(2) REMOVE MUFFLER, EXHAUST PIPE, AND HEATER VALVE PIPE EXHAUST PIPE. Follow the procedure in paragraph 93.

(3) REMOVE TRANSFER CASE TO FRONT AXLE PROPELLER SHAFT. Remove the transfer case to front axle propeller shaft (par. 139).

(4) REMOVE SHIFTER ROD TUNNEL COVER (fig. 174). Remove crew member's seat cushion and seat back from left rear of cab. Then remove the two machine screws and the bolt, nut, and lock washer which secure the shifter rod tunnel cover in position at rear of tunnel. This provides access to the drag link.



RA PD 76959

Figure 179—Transmission Cover

(5) DISCONNECT DRAG LINK FROM SHORT OUTSIDE SHIFT LEVER (fig. 180). Remove cotter pin from ball joint socket and remove ball joint plug, spring, and seat. The drag link can then be lowered out of the way.

(6) REMOVE SELECTOR SHAFT BRACKET (fig. 176). Remove the three cap screws and lock washers which secure the bracket to the front side of the remote control housing. Slide bracket off remote control selector shaft and remove the bracket.

(7) REMOVE REMOTE CONTROL HOUSING (fig. 176). Remove the six cap screws and lock washers which secure the housing to the transmission case and lift the housing from the transmission. Re-

move the control housing gasket. Remove the three bar position finder springs from shifting bar housing.

(8) REMOVE CLUTCH PEDAL SHAFT LEVER (fig. 176). Loosen nut on clutch pedal adjusting lever clamp bolt and pull clutch pedal adjusting arm from end of long clutch pedal shaft. Remove the cotter pin and clevis pin from the two clevises at lower end of arm and remove arm. The clutch pedal shaft lever can then be removed from the long clutch pedal shaft.

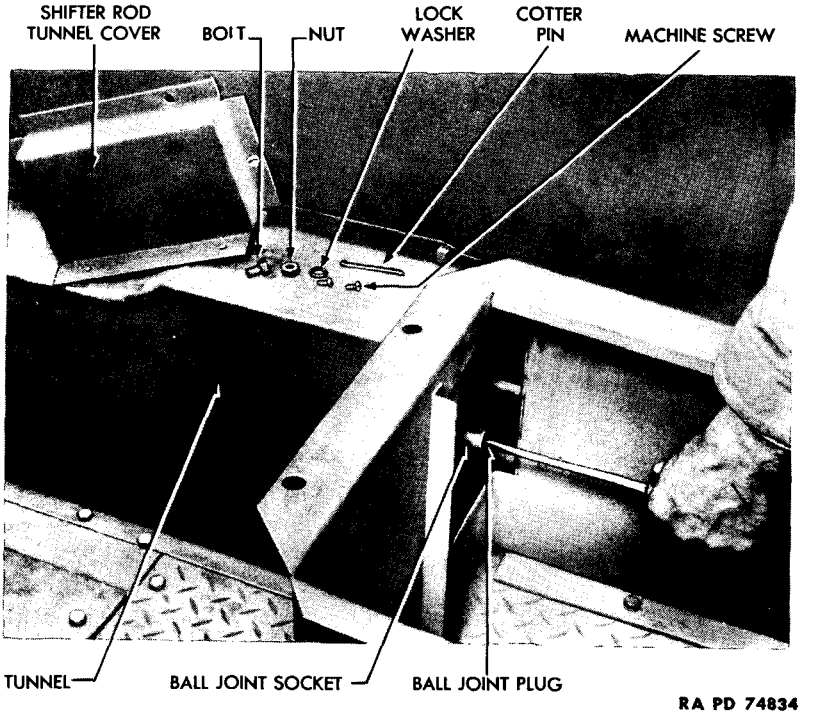


Figure 180—Disconnecting Drag Link from Short Outside Shift Lever

(9) DISCONNECT TRANSMISSION FROM UNIVERSAL JOINT (fig. 176). Remove the eight bolts, nuts, and lock washers which hold the companion flange to the universal flange yoke.

(10) DISCONNECT CLUTCH HOUSING FROM FLYWHEEL HOUSING (fig. 176). Remove the 12 cap screws and lock washers which secure the clutch housing to the flywheel housing.

(11) REMOVE TRANSMISSION FROM VEHICLE (fig. 181). Place a chain sling around transmission case and attach sling to a hoist suspended through gun mount. Pull the assembly back, free of the clutch housing, and lower it to a suitable dolly beneath the vehicle. When lowering the transmission, guide it carefully between the two

fuel tank support angles. By means of the dolly, slide transmission from beneath the vehicle.

c. Installation.

(1) INSTALL TRANSMISSION (fig. 181). Slide the transmission under the vehicle so it is in line with its installed position. Attach a chain sling around the transmission case, and by means of a hoist suspended through the gun mount, pull the transmission

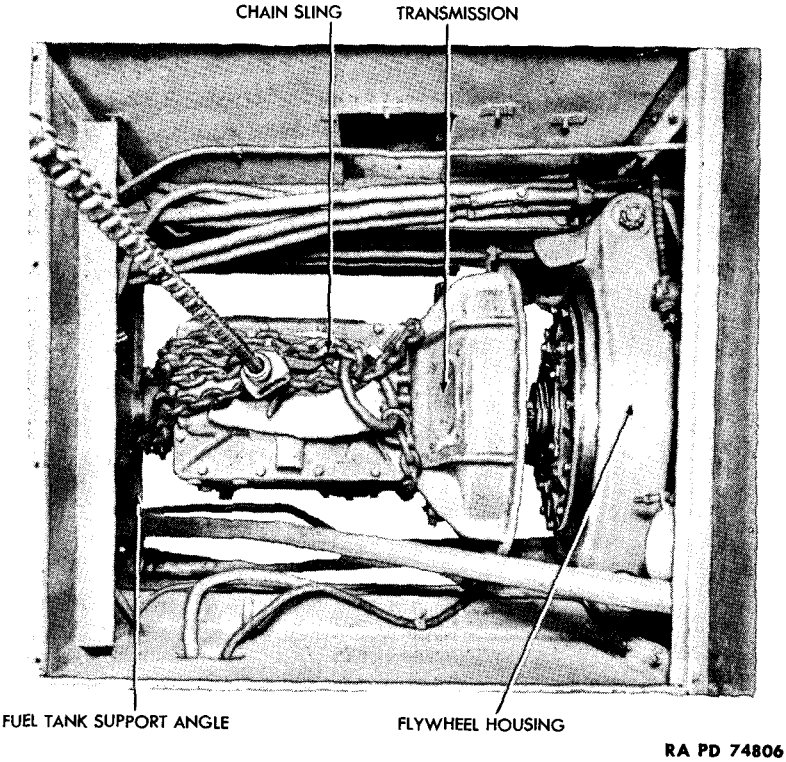


Figure 181—Removal of Transmission

upward, guiding it carefully between the two fuel tank support angles. Move transmission forward, guiding main shaft into clutch pilot bearing until housing is fitted directly against the flywheel housing, with cap screw holes of the flywheel housing, and the clutch housing, in alinement. Secure clutch housing to flywheel housing with 12 cap screws and lock washers.

(2) CONNECT TRANSMISSION TO UNIVERSAL JOINT (fig. 181). Install the eight bolts, nuts, and lock washers which hold the companion flange at the transmission to the universal flange yoke.

(3) INSTALL CLUTCH PEDAL SHAFT LEVER (fig. 181). Install the clutch pedal shaft lever on the long clutch pedal shaft. Then install the clutch pedal adjusting arm on the end of the long clutch pedal shaft, and secure the lower end of the arm to the two yokes at the ends of the two clutch shafts by installing clevis pin and securing it with a cotter pin. Tighten nut on clutch pedal adjusting lever clamp bolt.

(4) INSTALL REMOTE CONTROL HOUSING ON TRANSMISSION (fig. 181). Cement a new control housing gasket to the transmission case. Place remote control housing in position on transmission, making sure that transmission is in neutral, and that inner shifting lever is entered into slots of yoke bars. Secure the housing to the transmission case with six cap screws and lock washers.

(5) INSTALL SELECTOR SHAFT BRACKET (fig. 181). Slide the selector shaft bracket on the remote control selector shaft, and position bracket on front of remote control housing. Secure bracket to housing with three cap screws and lock washers.

(6) CONNECT DRAG LINK TO SHORT OUTSIDE SHIFT LEVER (fig. 180). Lift the drag link into position, with the ball joint socket at its rear end entered over end of short shift lever. Install ball joint seat, ball joint spring, and ball joint plug in end of ball joint socket.

(7) INSTALL SHIFTER ROD TUNNEL COVER (fig. 174). Place the shifter rod tunnel cover in position at the end of shifter rod tunnel, and secure it with two machine screws and a bolt, nut, and lock washer. Install cushion and seat back of crew member's seat at left rear of cab.

(8) INSTALL TRANSFER CASE TO FRONT AXLE PROPELLER SHAFT. Install transfer case to front axle propeller shaft (par. 140).

(9) INSTALL MUFFLER, EXHAUST PIPE, AND HEATER VALVE EXHAUST PIPE. Follow the procedure in paragraph 93.

(10) INSTALL TRANSMISSION COVER. Lift the transmission cover into position over transmission. Open lids of cover and install three countersunk-head machine screws at each side of cover. Then close lids and install four cap screws and lock washers in rear lid and three bolts, nuts, and lock washers in front lid. Open lids and install stowage.

132. AUXILIARY TRANSMISSION CONTROLS AND LINKAGE.

a. Description. The auxiliary transmission is mounted in the frame at the rear of the main transmission, below the tandem winches. A propeller shaft and universal joint assembly transmits power from the main transmission to the auxiliary transmission. The auxiliary transmission transmits power to the rear differential and carrier assembly to propel the rear wheels. It also transmits power to the transfer case which is mounted on the rear of the auxiliary transmission. The transfer case transmits power to the declutch assembly, and the declutch assembly transmits power to the front

differential and carrier assembly to drive the front axle. The auxiliary transmission also transmits power to the two power take-off assemblies which are mounted at the top and side of the auxiliary transmission.

b. Removal.

(1) REMOVE TRANSMISSION COVER (fig. 179). Remove portable tool box from top of transmission cover assembly. Open lids of transmission cover and remove all tools and stowage. Then close lids and remove four cap screws and lock washers from rear lid, and three bolts, nuts, and lock washers from front lid. Next open lids and remove three countersunk-head machine screws from each side of transmission cover. Lift transmission cover from vehicle.

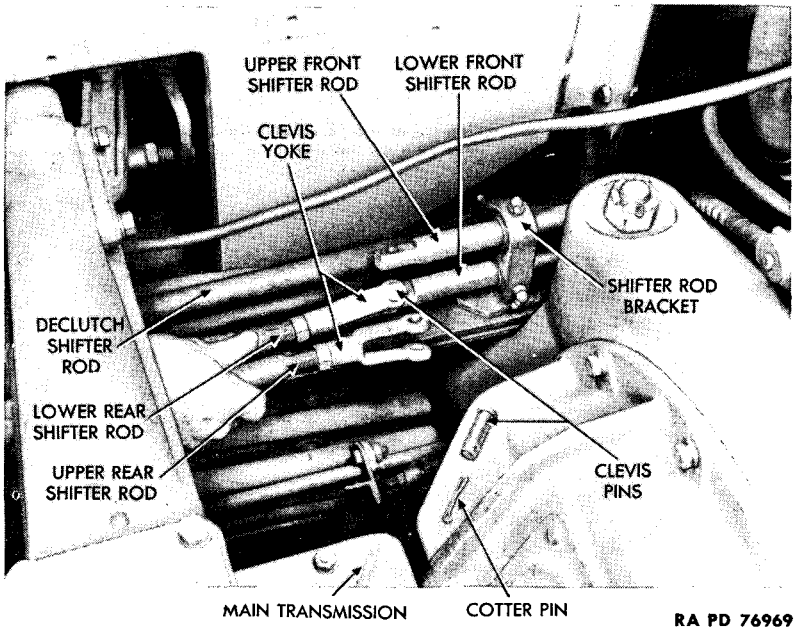


Figure 182—Removal of Auxiliary Transmission Shifter Rod

(2) REMOVE REAR SHIFTER RODS (fig. 182). At the front end of top mounting to auxiliary transmission power take-off assembly, disconnect upper and lower gear shifter rods by removing two cotter pins and clevis pins which hold upper rod to first speed shift rod and lower rod to second and third speed shifting rod. Then, in space underneath transmission cover assembly, remove two cotter pins and clevis pins, which secure upper rear shifter rod clevis yoke to upper front shifter rod, and lower rear shifter rod clevis yoke to lower front shifter rod. Remove upper and lower rods.

(3) REMOVE FRONT SHIFTER RODS (fig. 182). After removing rear rods, remove two bolts, nuts, and lock washers which secure shifter rod bracket to frame. Slide bracket back on rear declutch shifter rod and pull it off auxiliary transmission upper and lower front shifter rods. Then, from underneath left front end of vehicle, remove two cotter pins and clevis pins which secure the two shifter rods to auxiliary transmission shifting arms below shifting lever. Remove the two shifter rods.

(4) REMOVE SHIFTING LEVER (fig. 183). From underneath front end of vehicle, remove four bolts, nuts, and lock washers which secure shifting lever bracket to front bulkhead; two of bolt heads must be held from turning from inside cab. Lift out shifting lever, arms, and bracket.

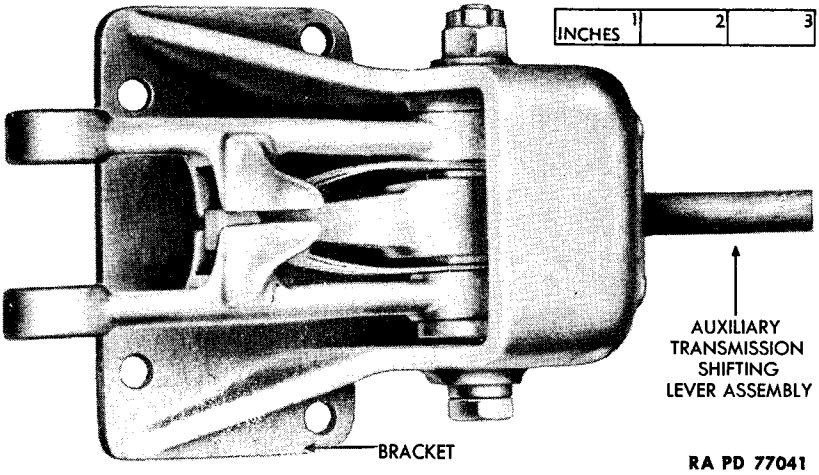


Figure 183—Auxiliary Transmission Shifting Lever Assembly

c. Installation.

(1) INSTALL AUXILIARY TRANSMISSION SHIFTING LEVER (fig. 183). Place shifting lever, arms, and bracket assembly into position from inside cab and install four bolts, nuts, and lock washers which secure bracket to front bulkhead. NOTE: *Except for two bolt heads, which must be held from turning from inside cab, access to bolts and nuts is from underneath left front end of vehicle.*

(2) INSTALL FRONT SHIFTER RODS (fig. 182). Place auxiliary transmission upper and lower front shifter rods in position and secure them to first, second, and third speed shifting arms with two clevis pins and cotter pins, working from underneath left front end of vehicle. Then, at rear of rods, slide shifter rod bracket, which is loose on declutch shifter rod, forward and insert rear ends of two auxiliary transmission front shifter rods into bracket. Secure bracket to frame with two bolts, nuts, and lock washers.

(3) INSTALL REAR SHIFTER RODS (fig. 182). Secure upper and lower rear shifting rods to front rods, attaching clevis yoke at front end of each rear rod to corresponding front rod with a clevis pin and cotter pin. At front end of top mounting to auxiliary transmission power take-off, connect upper and lower shifter rods to first speed shifting rod (upper) and to second and third speed shifting rod (lower), by installing two clevis pins and cotter pins.

(4) INSTALL TRANSMISSION COVER (fig. 179). Lift transmission cover assembly into position in cab. Open lids and install three countersunk-head screws in each side of cover. Next close lids and install four cap screws and lock washers in rear lid and three bolts, nuts, and lock washers in front lid. Open lids and install all tools and stowage, then install portable tool box on top of transmission cover.

133. AUXILIARY TRANSMISSION.

a. Description. The auxiliary transmission is mounted in the frame at the rear of the main transmission and below the tandem winch assembly, and is supported on frame cross members by two transfer case hanger studs, at the rear, and by the auxiliary transmission trunnion, in front. Power is transmitted to the auxiliary transmission from the main transmission by means of a propeller shaft. The auxiliary transmission transmits power to the rear differential and carrier assembly to propel the rear wheels, and also transmits power to the transfer case, which is mounted on the rear of the auxiliary transmission. The transfer case transmits power to the declutch assembly which is connected to the front axle assembly by a propeller shaft, thus making front wheel drive available when desired. The auxiliary transmission also transmits power to the two power take-off assemblies which are mounted at the top and side of the auxiliary transmission. The top power take-off drives the tandem rear mounted winches and the side power take-off drives the front mounted winch.

b. Removal.

(1) DISCONNECT AUXILIARY TRANSMISSION TO REAR DIFFERENTIAL AND CARRIER PROPELLER SHAFT. Remove eight bolts, nuts, and lock washers which hold companion flange to universal joint yoke at rear of auxiliary transmission, and lower propeller shaft and universal joint out of the way.

(2) DISCONNECT DECLUTCH TO FRONT DIFFERENTIAL PROPELLER SHAFT (fig. 178). Pry back two bearing cap lock straps from cap screws which hold two bearing caps to universal sleeve yoke (rear). Then remove two cap screws and two straps and bearing caps. Pry rear yoke so one universal joint bearing can be removed from yoke and journal, and then pry rear yoke in opposite direction to remove second bearing. Lower slip joint yoke and propeller shaft out of the way, and leave universal sleeve yoke attached to declutch assembly.

(3) DISCONNECT MAIN TRANSMISSION TO AUXILIARY TRANSMISSION PROPELLER SHAFT (fig. 178). Remove eight bolts, nuts, and lock washers which secure companion flange to front yoke. Then remove dust cap from forward yoke, and remove yoke from companion flange and propeller shaft.

(4) DISCONNECT SHIFTING ROD FROM POWER TAKE-OFF SHIFT ROD. Remove cotter pin and clevis pin which hold shifting rod to power take-off shift rod.

(5) DISCONNECT FRONT MOUNTED WINCH DRIVE SHAFT (fig. 178). NOTE: *The front mounted winch drive shaft is supported by means of two front mounted winch housing single bearings, which are attached to two fuel tank support angles.* In order to move drive shaft forward, first disconnect the two bearings from fuel tank support angles. Remove three bolts, nuts, and lock washers, which hold one bearing assembly and shield to rear support angle, and two nuts, bolts, and lock washers, which hold second bearing assembly to front support angle. Remove set screw from rear yoke at rear end of drive shaft and pull drive shaft forward, so rear yoke will be pulled free of side mounting power take-off intermediate gear shaft.

(6) DISCONNECT AUXILIARY TRANSMISSION GUARD (fig. 178). Disconnect guard from frame cross member by removing one bolt, nut, and lock washer and loosening the other bolt. Pull guard to one side, free of auxiliary transmission.

(7) DISCONNECT SHIFT ROD FROM TOP MOUNTING POWER TAKE-OFF GEARSHIFT ROD. Remove cotter pin and clevis pin, which secure power take-off gearshift rod to links of gearshift linkage, and lower shift rod out of the way.

(8) DISCONNECT TANDEM WINCH UNIVERSAL JOINT ASSEMBLY. Loosen set screw from rear yoke at side mounting to auxiliary transmission power take-off assembly. NOTE: *When the auxiliary transmission is ready to be lowered from vehicle, universal joint assembly will pull out from power take-off assembly.*

(9) DISCONNECT LOWER AND UPPER REAR SHIFTER RODS. Disconnect lower rear shifter rod at auxiliary transmission by removing cotter pin and clevis pin from yoke at rear end of rod. Disconnect upper rear shifter rod in the same manner.

(10) ATTACH CHAIN AND HOIST TO AUXILIARY TRANSMISSION (fig. 184). Place a chain sling sidewise around auxiliary transmission, first dropping chain back of rear tandem winch drum, around declutch assembly, and upward next to transfer case at rear of side power take-off assembly. Attach hoist to sling so that lift will be at rear of winch drum.

(11) DISCONNECT AUXILIARY TRANSMISSION FROM FRAME AT FRONT END (fig. 184). Remove two bolts, nuts, and lock washers which hold trunnion at front end of auxiliary transmission to frame cross member.

(12) DISCONNECT REAR END OF AUXILIARY TRANSMISSION FROM FRAME. Remove cotter pin from top nut of each transfer case hanger

stud. Because of the difficulty of gaining access to the two transfer case hanger studs, which support the transfer case end of the auxiliary transmission to the frame, the procedure for removal of top nuts is unusual. The top nut on each hanger stud cannot be turned, but can be kept from turning with an open-end wrench. Therefore loosen lower lock nut and move adjusting nut beneath it upward, locking the two nuts together and leaving the stud free to turn in hole in transfer case. Then use a wrench on both nuts

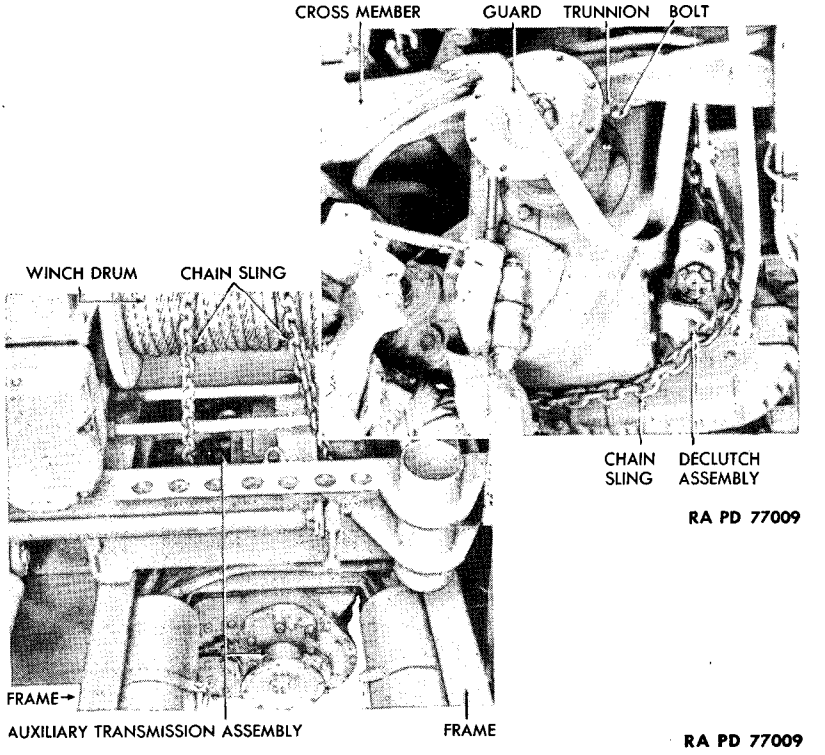


Figure 184—Removing Auxiliary Transmission

at the same time and turn stud while top nut is kept from turning by means of an open-end wrench. NOTE: *Readjust position of nuts on stud as required to unscrew stud from top nut. Repeat procedure to remove remaining transfer case hanger stud.*

(13) REMOVE AUXILIARY TRANSMISSION (fig. 184). Lower transmission slowly. The position of sling and hoist, back of rear tandem winch drum, will tend to pull assembly toward rear of the vehicle, which will enable tandem winch universal joint to pull free of top power take-off. Continue to lower auxiliary transmission, guiding

it carefully so it will clear all parts of frame and chassis. Place it on a dolly, and remove it from underneath the vehicle.

(14) REMOVE TOP MOUNTED POWER TAKE-OFF. Remove eight cap screws and lock washers which secure cover to top mounted power take-off case and remove cover and gasket. Remove eight cap screws and lock washers which secure power take-off to auxiliary transmission case and lift off power take-off and shifter housing gasket. NOTE: *The two cap screws, which secure power take-off to transmission, are inside the case.*

(15) REMOVE SIDE MOUNTED POWER TAKE-OFF. Proceed as outlined in subparagraph 136 **b** (2).

(16) REMOVE TRANSFER CASE AND DECLUTCH UNIT. Proceed as outlined in subparagraph 137 **b** (2) through (6). NOTE: *Do not remove speedometer adapter and driven gear from main shaft rear bearing cap.*

c. Installation.

(1) INSTALL TRANSFER CASE AND DECLUTCH UNIT ON AUXILIARY TRANSMISSION. Proceed as outlined in subparagraph 137 **c** (2) through (8).

(2) INSTALL SIDE MOUNTED POWER TAKE-OFF ON AUXILIARY TRANSMISSION. Refer to subparagraph 137 **c** (1).

(3) INSTALL TOP MOUNTED POWER TAKE-OFF ON AUXILIARY TRANSMISSION. Place a new shifter housing gasket on auxiliary transmission case and lift power take-off into position on case. Secure power take-off to auxiliary transmission case with eight cap screws and lock washers; two of the cap screws being inside the case. Install a new gasket on top of power take-off case and secure cover to case with eight cap screws and lock washers.

(4) ATTACH HOIST TO AUXILIARY TRANSMISSION AND LIFT IT INTO POSITION (fig. 184). Slide auxiliary transmission into position underneath frame and then place a chain sling around assembly, positioning chain sidewise around declutch assembly and in back of side mounted power take-off. Lower a hoist back of the rear tandem winch drum and attach hoist to chain sling. Lift assembly slowly upward; and as it is partly raised, install one end of tandem winch universal joint and install other end in top mounted power take-off assembly as it is being raised. Guide assembly carefully into position, making sure that it clears all frame and chassis parts. As it is raised into position be sure that trunnion is positioned correctly for bolts to be installed and push auxiliary transmission forward as required.

(5) SECURE REAR END OF AUXILIARY TRANSMISSION TO FRAME. With hanger studs through frame cross member, screw each stud into nut. Hold nut from turning with an open-end wrench and use a wrench on lower adjusting and lock nuts to turn stud into nut. When top nut is tight, tighten lower adjusting nut at each stud and lock it with lock nut. Lock top castellated nut with a cotter pin.

MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

(6) SECURE FRONT END OF AUXILIARY TRANSMISSION TO FRAME (fig. 184). Secure trunnion to frame cross member by installing two bolts, nuts and lock washers.

(7) CONNECT UPPER AND LOWER REAR SHIFTER ROD. Install cotter pin and clevis pin which secure yoke at rear end of lower rear shifter rod to auxiliary transmission. Repeat procedure on lower rear shifter rod.

(8) CONNECT TANDEM WINCH UNIVERSAL JOINT. Use a socket head set screw wrench to tighten the set screw which secures the rear yoke of the universal joint assembly to the power take-off assembly.

(9) CONNECT SHIFT ROD TO TOP MOUNTING POWER TAKE-OFF GEARSHIFT ROD. Install clevis pin and cotter pin which secure lever at end of shift rod to power take-off gearshift rod.

(10) INSTALL AUXILIARY TRANSMISSION GUARD. Lift guard into position around front end of auxiliary transmission and secure it to frame cross member by installing two bolts, nuts, and lock washers.

(11) CONNECT FRONT MOUNTED WINCH DRIVE SHAFT. Slide drive shaft back until its rear yoke is in position on intermediate gear shaft of side mounted to auxiliary transmission power take-off. Install socket head set screw which secures yoke to intermediate gear shaft. Then install three bolts, nuts, and lock washers, which secure front mounted winch housing single bearing and shield to rear fuel tank support angle. Next install two bolts, nuts, and lock washers which hold second bearing to front fuel tank support angle.

(12) CONNECT SHIFTING ROD TO POWER TAKE-OFF SHIFT ROD (fig. 185). Lift shifting rod in position on power take-off shift rod and secure two rods together by installing clevis and cotter pins.

(13) CONNECT MAIN TRANSMISSION TO AUXILIARY TRANSMISSION PROPELLER SHAFT. Install slip joint yoke on propeller shaft and aline yoke with companion flange front of auxiliary transmission. Secure yoke to companion flange with eight bolts, nuts and lock washers. Screw dust cap securely upon slip joint yoke of propeller shaft and universal joint.

(14) CONNECT DECLUTCH ASSEMBLY TO FRONT DIFFERENTIAL PROPELLER SHAFT. Install journal of universal into sleeve yoke which is attached to forward end of declutch assembly. Tap two bearing assemblies into position over ends of journal and into sleeve yoke, and install bearing cap and bearing cap lock strap over each bearing, securing with two cap screws and lock washers. Bend lock strap around cap screws.

(15) CONNECT AUXILIARY TRANSMISSION TO REAR DIFFERENTIAL PROPELLER SHAFT. Lift propeller shaft and universal joint into alinement with companion flange at rear of auxiliary transmission and secure yoke to companion flange by installing eight bolts, nuts, and lock washers.

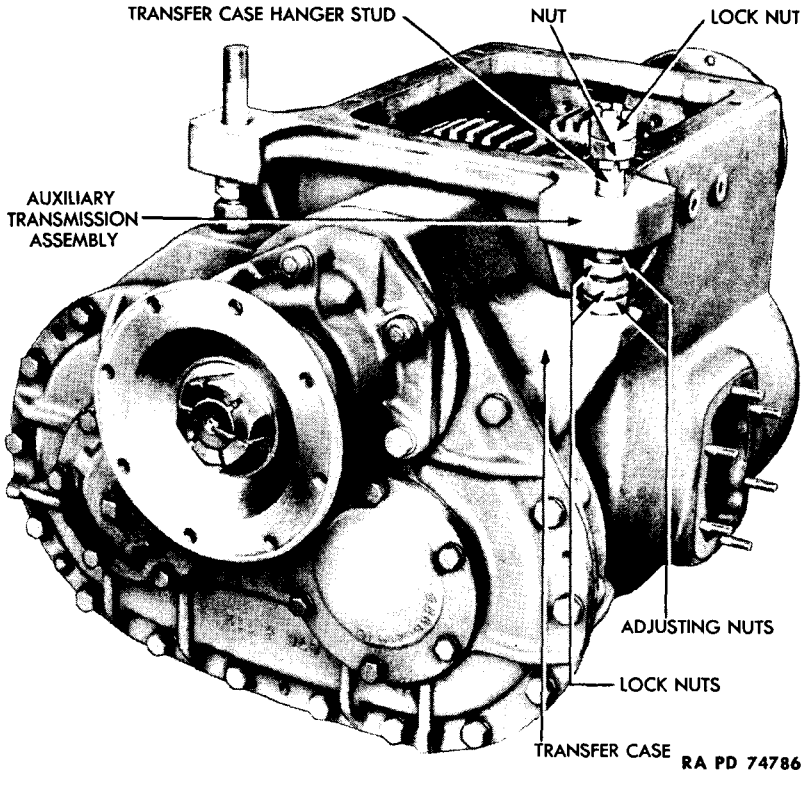


Figure 185—Transfer Case and Auxiliary Transmission Removed

134. TRANSFER CASE.

a. Description. The transfer case is secured to the rear of the auxiliary transmission. The transfer case gears are driven by the auxiliary main shaft gear. The declutch unit for driving the front axle differential is attached to the left front of the transfer case.

b. Removal.

(1) PRELIMINARY INSTRUCTIONS. Remove auxiliary transmission (par. 133). Remove side mounted power take-off (par. 136).

(2) REMOVE HANGER STUDS (fig. 185). Remove cotter pin lower castellated nut from each stud and lock it with a similar nut on top of stud. Loosen lock nuts between transfer case and auxiliary transmission case, then use two wrenches to keep the four nuts from turning and at same time use a third wrench to turn lower top nut and remove stud.

(3) REMOVE UNIVERSAL COMPANION FLANGE (fig. 181). Remove lock washer and castellated nut from end of transfer case main shaft. Pull off companion flange and remove key.

(4) REMOVE SPEEDOMETER DRIVEN AND DRIVE GEARS (figs. 186 and 187). Unscrew knurled nut which holds speedometer adapter to speedometer drive outlet cover and remove adapter. Then remove two cap screws which hold speedometer drive outlet cover to main shaft rear bearing cap. Remove outlet cover and outlet cover gasket. Remove three cap screws and lock washers and three nuts and lock washers which secure main shaft rear bearing cap to transfer case and remove bearing cap and gasket. Remove speedometer driven gear and key, then bend up lugs on main shaft rear bearing nut and lock washers. Remove main shaft rear protector washer and main shaft rear bearing retainer and gasket.

(5) REMOVE TRANSFER CASE COVER (fig. 188). Remove 16 cap screws and lock washers which secure transfer case cover to case.

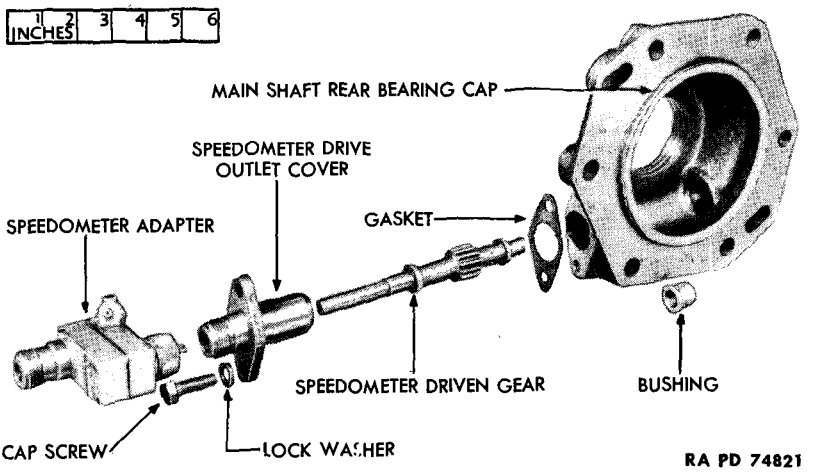


Figure 186—Components of Speedometer Drive Assembly

Install and tighten three puller screws to remove cover, with idler shaft, idler shaft gear, ball idler shaft bearing, and rear bearing driven shaft cup attached. Remove transfer case cover gasket.

(6) REMOVE TRANSFER CASE (fig. 185). Remove main drive gear and spacer from auxiliary transmission main shaft. Remove five cap screws and lock washers which secure transfer case to auxiliary transmission case and remove transfer case and transfer case gasket.

(7) REMOVE DECLUTCH ASSEMBLY FROM TRANSFER CASE (fig. 189). Lift driven shaft gear, declutch shaft, and attached parts from transfer case. Then remove six nuts and lock washers, which secure declutch shaft bearing carrier to cover, and remove carrier and gasket.

c. Installation.

(1) INSTALL DECLUTCH ASSEMBLY. Drive bearing cup into transfer case declutch shaft opening. Cement new declutch shaft bearing

carrier gasket to transfer case. Then place declutch assembly on case and secure with six nuts and lock washers.

(2) INSTALL TRANSFER CASE (fig. 185). Cement new auxiliary transmission and transfer case gasket to auxiliary transmission case, making sure that all traces of the old gasket have been removed. Install main drive gear spacer and gear on main shaft. Install transfer case with declutch assembly over long and short transfer case transmission studs on auxiliary transmission case. Install nuts on three short studs and install two cap screws and lock washers which secure

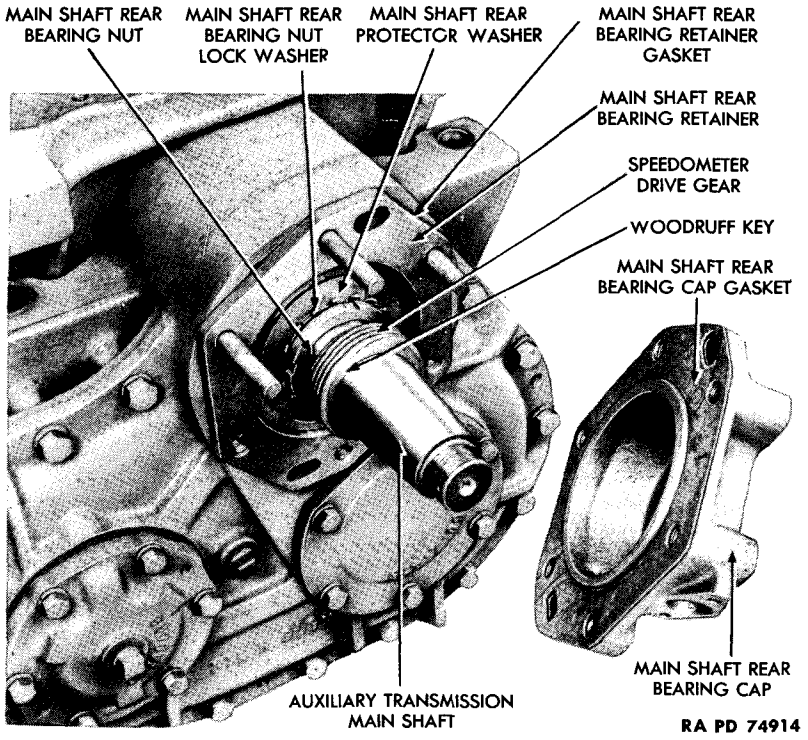


Figure 187—Speedometer Drive Gear Installed

transfer case to auxiliary transmission case. Lock cap screws and stud nuts with wire.

(3) INSTALL TRANSFER CASE COVER (fig. 188). Cement new transfer case cover gasket to mounting surface of transfer case. Be sure that all traces of old gasket have been removed. Lift transfer case cover into position on transfer case, with idler shaft gear meshing with driven shaft gear, and with cover dowel in dowel holes of transfer case. Secure cover to case with 16 cap screws and lock washers.

MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

(4) INSTALL AUXILIARY TRANSMISSION MAIN SHAFT REAR BEARING. Drive main shaft rear bearing into main shaft rear bearing retainer. Install main shaft rear bearing retainer gasket, cementing it to transfer case cover. Slide retainer and main shaft rear bearing into opening in transfer case cover.

(5) INSTALL SPEEDOMETER DRIVE GEAR (fig. 187). Place main shaft rear protector washer and main shaft rear adjusting nut lock washer on auxiliary transmission main shaft. Install main shaft rear bearing nut, tighten, and lock with lugs of lock washers. Insert key in slot of main shaft and slide speedometer drive gear into position with

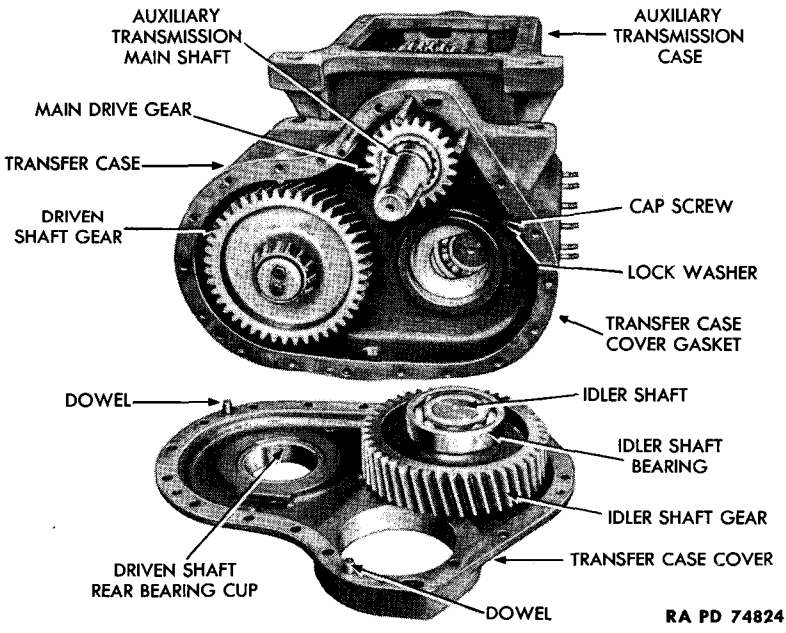


Figure 188—Cover Removed from Transfer Case

hub side inward. Drive speedometer gear bushing into main shaft rear bearing cap, then cement a new main shaft rear bearing cap gasket to main shaft rear bearing cap, and install cap over main shaft and studs on transfer case cover. Secure cap with three cap screws and nuts, and three cap screws and stud nuts.

(6) INSTALL SPEEDOMETER DRIVEN GEAR AND ADAPTER (figs. 186 and 187). Cement new speedometer drive outlet cover gasket to rear bearing cap. Install speedometer driven gear and speedometer outlet cover into rear bearing cap and secure cover to cap with two cap screws and lock washers. Install speedometer adapter to outlet cover and tighten knurled nut.

(7) INSTALL UNIVERSAL COMPANION FLANGE. Install key on main shaft and slide companion flange onto main shaft. Secure flange with castellated nut and cotter pin.

(8) INSTALL HANGER STUDS (fig. 185). Install two transfer case hanger studs which secure transfer case to auxiliary transmission case and also support assembly to frame cross member of vehicle. Insert each stud through holes in auxiliary transmission case and in turn screw on four nuts (two lock nuts and two adjusting nuts) and then position them between transfer case and auxiliary transmission case

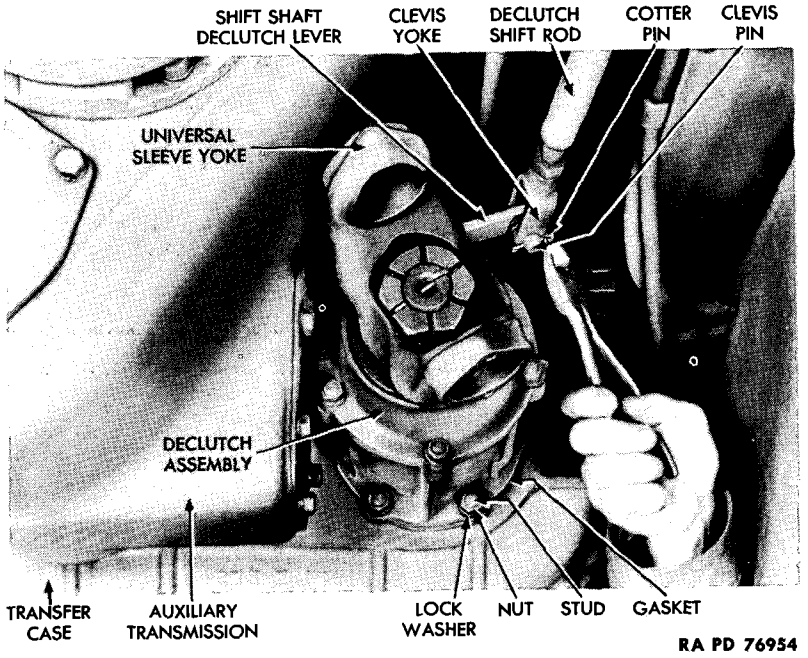


Figure 189—Removal of Declutch Assembly

as follows: Screw four nuts onto each stud until stud can enter through stud hole in transfer case and castellated nut and cotter pin can be installed at lower end of stud. (Stud threads should extend through castellated nut at least one and one-half threads.) Tighten two adjusting nuts and lock in position with two lock nuts. Install top castellated nut and cotter pin.

(9) INSTALL SIDE MOUNTED POWER TAKE-OFF ON AUXILIARY TRANSMISSION. Refer to paragraph 136.

(10) INSTALL AUXILIARY TRANSMISSION IN VEHICLE. Refer to paragraph 133.

MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

135. DECLUTCH ASSEMBLY, CONTROLS AND LINKAGE.

a. Description. The front axle declutch assembly is secured to the left-hand front side of the transfer case at the rear of the auxiliary transmission. It has a jaw clutch which can be engaged or disengaged by the driver in order to obtain front wheel drive when desired. A propeller shaft connected to the front end of the declutch assembly transmits power to the front differential and carrier assembly.

b. Removal of Declutch Assembly (fig. 189). Disconnect the universal joint from declutch assembly (par. 139), leaving cotter pin, declutch shaft nut, and universal sleeve yoke on declutch assembly. Then disconnect declutch shift rod clevis yoke by removing cotter and clevis pins which secure yoke to shift shaft declutch lever and move yoke out of the way. Remove six nuts and lock washers which secure declutch assembly to transfer case studs and remove declutch assembly and declutch shaft bearing carrier to case gasket.

c. Installation of Declutch Assembly. Cement new declutch shaft bearing carrier to case gasket in position over transfer case studs. Place declutch assembly in neutral position, lift declutch assembly onto transfer case studs, and install six nuts and lock washers. Place declutch shift rod clevis yoke in position on shift shaft declutch lever and secure with clevis and cotter pins. Connect propeller shaft and universal joint to the universal sleeve yoke at front end of declutch assembly (par. 139).

d. Removal of Declutch Controls and Linkage.

(1) REMOVE REAR DECLUTCH SHIFTER ROD (fig. 189). Remove cotter pin and clevis pin which hold clevis yoke at rear end of rear declutch shifter rod to shift shaft declutch lever. Then remove cotter pin and clevis pin which hold clevis yoke at front end of rear declutch shifter rod to front declutch shifter rod and remove rear rod.

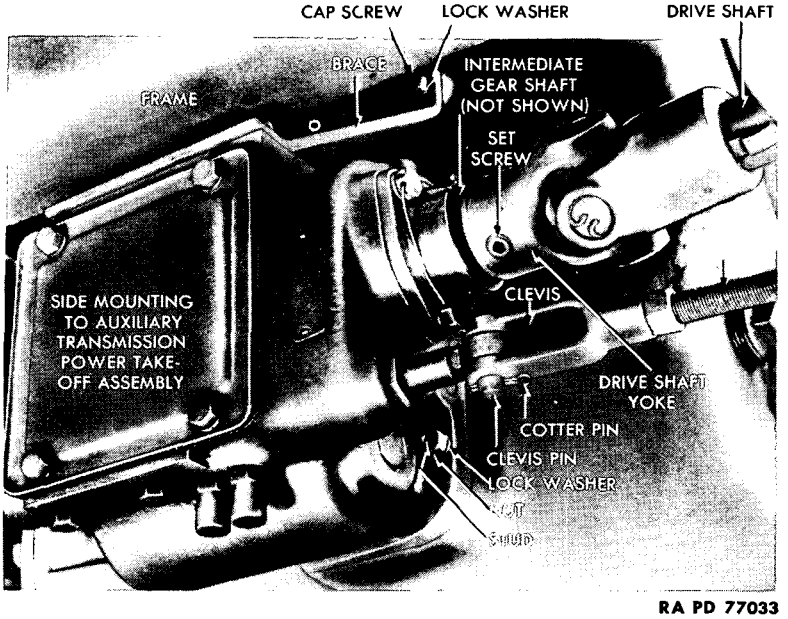
(2) REMOVE FRONT DECLUTCH SHIFTER ROD AND SHIFT ROD LEVER (fig. 189). Remove shifter rod tunnel as instructed in paragraph 130 **b** (3). NOTE: *This includes the removal of the declutch shift rod lever attached to the shifter housing cover plate.* Remove cotter pin and pin which secures lever to plate. Then disconnect two auxiliary transmission rear shifter rods from auxiliary transmission front shifter rods by removing two cotter and clevis pins which hold rods together. Remove two bolts, nuts, and lock washers, which secure front shifter rod bracket to frame, and slide bracket back on front declutch shifter rod until it is free of auxiliary transmission shifter rods. Remove front declutch shifter rod with front bracket attached by pulling rear end of rod through rear bracket below fuel tank rear support angle.

e. Installation of Declutch Controls and Linkage.

(1) INSTALL FRONT DECLUTCH SHIFTER ROD AND SHIFT ROD LEVER (fig. 189). Lift front declutch shifter rod with front shifter rod bracket attached into position, sliding rear end of rod through rear

shifter rod bracket below rear fuel tank support angle. Slide bracket forward and over auxiliary transmission front shifter rods and install two bolts, nuts, and lock washers which secure bracket to frame. Connect two auxiliary transmission rear shifter rods to auxiliary transmission front shifter rods by installing two clevis and cotter pins. Install declutch shift rod lever to shifting housing cover plate, securing lever to plate with pin and cotter pin. Install shifter rod tunnel as instructed in paragraph 130.

(2) INSTALL REAR DECLUTCH SHIFTER ROD (fig. 189). Install rear end of rear declutch shifter rod to shift shaft declutch lever by



RA PD 77033

Figure 190—Side Mounting to Auxiliary Transmission Power Take-off Assembly

installing clevis and cotter pins through clevis yoke and lever. Then install clevis and cotter pins which hold clevis yoke at front end of rear declutch shifter rod to front declutch shifter rod.

136. SIDE MOUNTING TO AUXILIARY TRANSMISSION POWER TAKE-OFF AND LNKAGE.

a. Description. The side mounting to auxiliary transmission power take-off assembly is bolted to the right side of the auxiliary transmission case. Power taken from the auxiliary transmission is transmitted through a drive shaft to the front mounted winch assembly. The front winch control lever is located in the driver's com-

partment, just below the driver's seat. A shift fork, secured to a shift rod, moves the intermediate gear in the assembly to obtain reverse, low, or high speeds, as desired.

b. Removal of Side Mounting to Auxiliary Transmission Power Take-off Assembly (fig. 190).

(1) DISCONNECT LINKAGE. Remove muffler (par. 93). Disconnect shift rod from power take-off assembly by removing cotter and clevis pins which secure shift rod clevis yoke to shift rod end. Lower

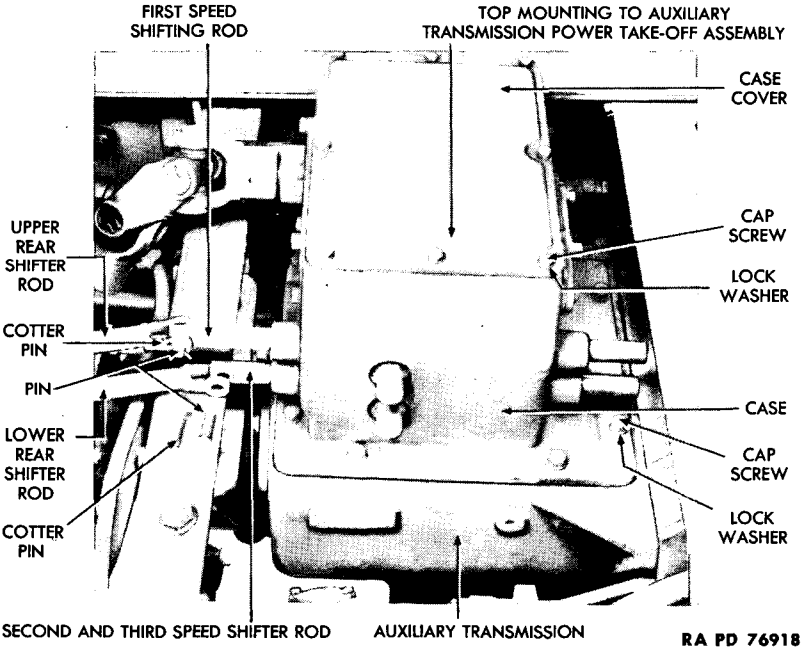


Figure 191—Removal of Top Mounting to Auxiliary Transmission Power Take-off

shift rod out of way, and disconnect drive shaft yoke from intermediate gear shaft by loosening socket head set screw in yoke from intermediate gear shaft by loosening socket head set screw in yoke. Disconnect supporting brace from auxiliary transmission case by removing two cap screws and lock washers.

(2) REMOVE POWER TAKE-OFF. Remove six nuts and lock washers which hold power take-off to auxiliary transmission case and pull power take-off from studs. Pull assembly back until intermediate gear shaft is pulled free of drive shaft yoke, and remove power take-off assembly. Remove two auxiliary transmission case to side mounting power take-off gaskets and side mounting power take-off filler block from studs on auxiliary transmission case.

c. Installation of Side Mounting to Auxiliary Transmission Power Take-off Assembly (fig. 190).

(1) INSTALL POWER TAKE-OFF. Cement a new power take-off gasket to auxiliary transmission case and similar gasket to side mounting power take-off case. Position filler block over studs on auxiliary transmission case. Lift power take-off assembly into position, sliding end of intermediate gear shaft into drive shaft yoke, and position power take-off assembly on studs. Secure assembly to

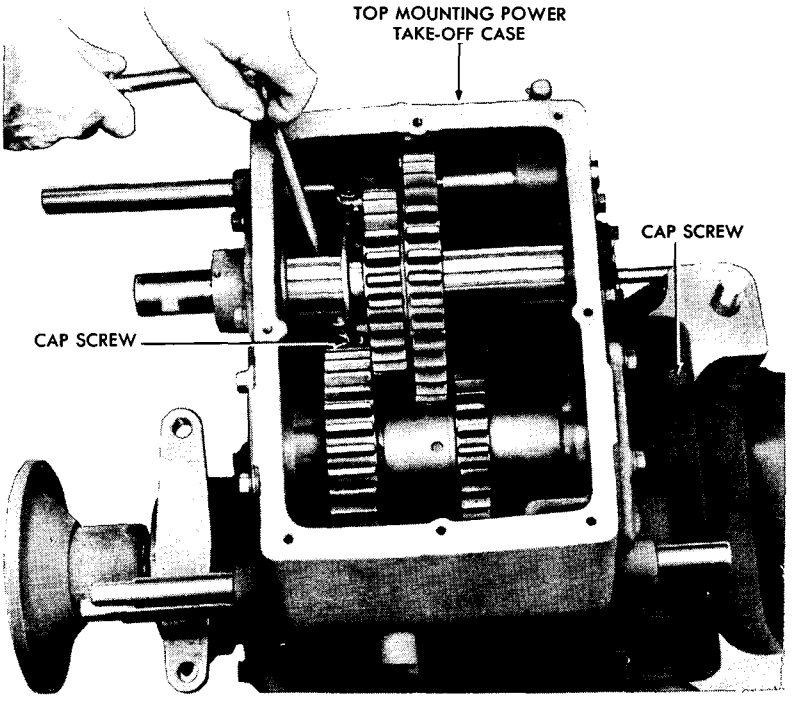


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Figure 192—Removing Top Mounting to Auxiliary Transmission Power Take-off Cap Screws

auxiliary transmission case with six nuts and lock washers. Then install two cap screws and lock washers which hold brace to auxiliary transmission case.

(2) CONNECT LINKAGE. Lift shift rod into position with clevis over shift rod end and secure clevis to end with clevis pin and cotter pin. Tighten socket head set screw in drive shaft yoke, securing yoke to intermediate gear shaft. Install muffler (par. 93).

d. Controls and Linkage. Removal and installation of controls and linkage are covered in paragraph 137.

MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

137. TOP MOUNTING TO AUXILIARY TRANSMISSION POWER TAKE-OFF AND LINKAGE.

a. Description. The top mounting to auxiliary transmission is mounted on top of the auxiliary transmission. It serves to transmit power to the front and rear tandem winches. A tandem winch universal joint assembly transmits power from the power take-off assembly to a drive sprocket which is connected by a chain to a driven sprocket on the tandem winch assembly. Power applied to either, or both, front and rear tandem winch assemblies by the power take-off is controlled by means of the winch control levers. These levers are located on the winches and connected to the power take-off shift rods by means of straight rods with clevises at each end.

b. Removal of Top Mounting to Auxiliary Transmission Power Take-off. Proceed as outlined in paragraph 136.

c. Installation of Top Mounting to Auxiliary Transmission Power Take-off. Proceed as outlined in paragraph 136.

d. Removal of Controls and Linkage (fig. 191). From underneath vehicle, remove cotter and link pins which secure two links to shifter rod at right front of top mounting to auxiliary transmission power take-off. Remove links by removing top cotter and link pins. Procedure for removal of remaining controls and linkage between power take-off and tandem winch assembly is given in paragraph 202.

e. Installation of Controls and Linkage (fig. 191). Install two links to shifter rod at right front rod of top mounting to auxiliary transmission power take-off, securing links to rod with link and cotter pins. Secure top ends of links to lever with another link and cotter pin. The procedure for installation of remaining controls and linkage between power take-off and tandem winch assembly is given in paragraph 202.

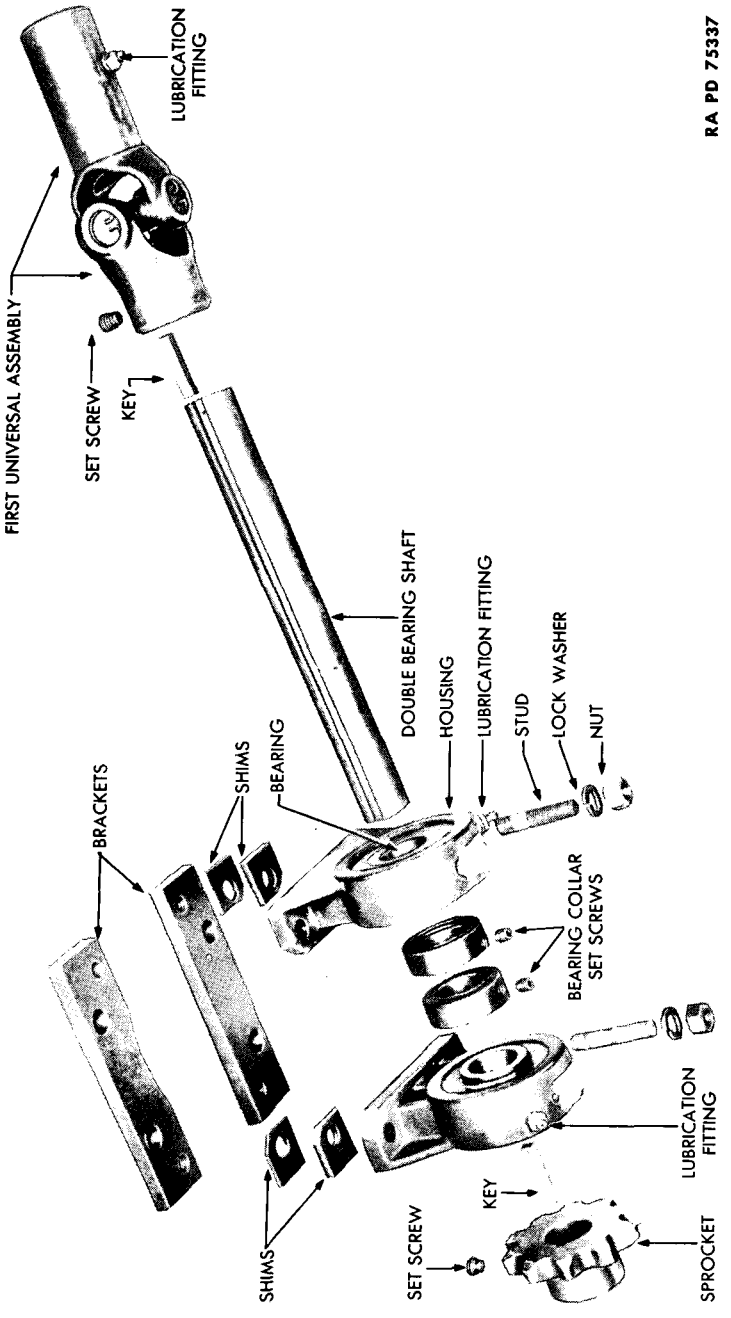

Figure 193—Double Bearing—Disassembled

Section XXI

PROPELLER SHAFTS AND UNIVERSAL JOINT ASSEMBLIES

138. DESCRIPTION AND DATA.

a. Description (fig. 193). Three propeller shaft and universal joint assemblies are used in the vehicle. One transmits power from the main transmission to the auxiliary transmission. Another transmits power from the auxiliary transmission to the rear differential and carrier assembly to propel the rear wheels. The third transmits power from the declutch assembly to the front differential and carrier assembly.

b. Data.

Unit	Make	Model
Main transmission to auxiliary transmission propeller shaft assembly	Spicer	1701-1D1X with 7008-1X joint set
Main transmission companion flange	Spicer	6-1-951
Auxiliary transmission companion flange	Spicer	6-1-884
Transfer case to front axle propeller shaft assembly	Spicer	1701-1X with 1708-1X joint set
Front axle companion flange	Spicer	6-1-591
Auxiliary transmission to rear axle propeller shaft assembly	Spicer	1801-1X with 1808-1X joint set
Auxiliary transmission companion flange	Spicer	K6 1/2-1-64
Rear axle companion flange	Spicer	K6 1/2-1-81

139. REMOVAL.

a. Removal of Transfer Case to Front Axle Propeller Shaft and Universal Joint Assembly.

(1) DISCONNECT COMPANION FLANGES AT DIFFERENTIAL AND CARRIER ASSEMBLY (fig. 193). Remove eight bolts, nuts, and lock washers which secure two companion flanges together at differential and carrier assembly at front end of the propeller shaft. Then unscrew universal slip yoke dust cap at rear of shaft and pull splined end of shaft from universal slip joint yoke.

(2) REMOVE REAR UNIVERSAL JOINT (fig. 193). Pry back two bearing cap lock straps from cap screws which hold two bearing caps to universal sleeve yoke (rear). Remove two cap screws from each bearing cap and remove two bearing caps. Pry rear yoke so one universal joint bearing assembly can be removed from yoke and journal.

Pry rear yoke in opposite direction to remove second bearing assembly. Remove front slip joint yoke with journal attached. This provides access to declutch shaft nut which holds rear yoke to declutch shaft. Remove cotter pin and declutch shaft nut and pull universal sleeve yoke from declutch shaft.

b. Removal of Main Transmission to Auxiliary Transmission, Propeller Shaft and Universal Joint Assembly (fig. 193). Remove eight bolts, nuts, and lock washers which secure flange at front end of propeller shaft to companion flange at main transmission (fig. 184). Unscrew dust cap, lower slip joint yoke from companion flange at main transmission and pull slip joint yoke from sleeve yoke at rear of propeller shaft. Remove eight bolts, nuts, and lock washers which secure flange at rear of propeller shaft to companion flange at auxiliary transmission and lower assembly (fig. 184). Remove rear universal joint assembly and sleeve yoke.

c. Removal of Transfer Case to Rear Axle Propeller Shaft and Universal Joint Assembly. Remove eight nuts and lock washers which secure universal flange yoke to companion flange at drive shaft brake drum. Then remove eight bolts, nuts, and lock washers which secure propeller shaft front flange to companion flange on transfer case at rear of auxiliary transmission. Remove assembly, pulling rear universal joint and flange yoke from companion flange.

140. INSTALLATION.

a. Installation of Transfer Case to Front Axle Propeller Shaft and Universal Joint Assembly.

(1) INSTALL REAR UNIVERSAL JOINT (fig. 193). Slide universal sleeve yoke onto declutch shaft, secure it with declutch shaft nut, and lock nut with a cotter pin. Install new gaskets on two universal journal gasket retainers on two opposing ends of journal which has slip joint yoke attached. Then insert slip joint yoke with journal attached into position in sleeve yoke, with journal through sleeve yoke holes. Tap a universal bearing assembly into position over two journal ends and into yoke. Install a universal bearing cap and bearing lock strap over each bearing, securing cap and strap to yoke with two cap screws. Bend lock strap nibs around cap screws.

(2) INSTALL FRONT UNIVERSAL JOINT (fig. 193). Insert splined end of front universal joint into universal slip joint yoke and tighten dust cap. Lift companion flange of universal joint into position against companion flange at front differential and carrier assembly and secure two flanges together with eight bolts, nuts, and lock washers.

b. Installation of Main Transmission to Auxiliary Transmission Propeller Shaft and Universal Joint Assembly (fig. 193). Install companion flange of rear universal joint assembly to companion flange at auxiliary transmission, securing flanges together with eight bolts, nuts, and lock washers. Then insert slip joint yoke of front universal joint assembly into sleeve yoke of rear universal joint assembly and tighten dust cap. Lift companion flange of front universal

joint assembly into position against companion flange at main transmission and secure the two flanges together with eight bolts, nuts, and lock washers.

c. **Installation of Transfer Case to Rear Axle Propeller Shaft and Universal Joint Assembly** (fig. 193). Lift propeller shaft into position with rear universal joint flange yoke over bolts which hold companion flange at drive shaft brake drum. Secure rear universal joint flange yoke to companion flange with eight nuts and lock washers. Secure front universal joint companion flange to companion flange at transfer case with eight bolts, nuts, and lock washers.

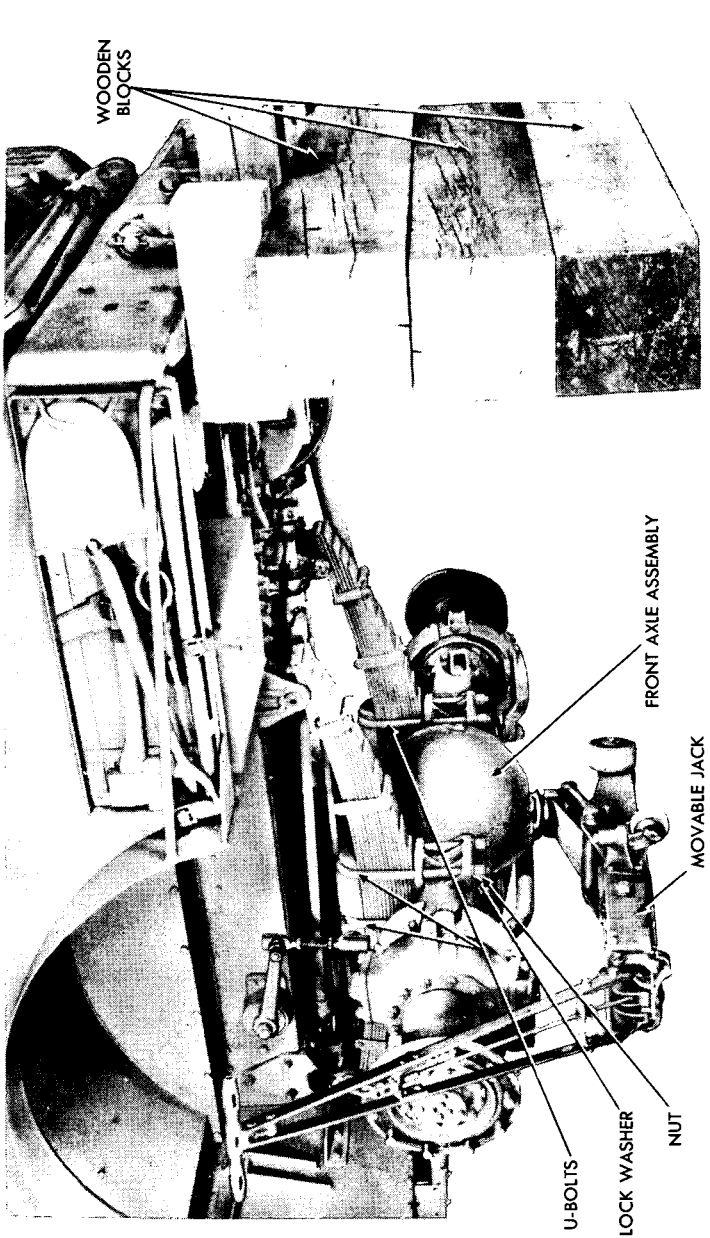

Figure 194—Front Axle Installed

Section XXII

FRONT AXLE

141. DESCRIPTION AND DATA.

a. Description. The front axle assembly consists of a banjo type housing which houses the two front axle shafts and the differential and carrier which is mounted in the housing at the center. An axle shaft on each side of the differential carrier assembly is connected by splines to differential side gears. Each axle shaft is connected at the outer end to a universal joint which is housed in a trunnion socket assembly. The axle is the full-floating type, designed so the entire wheel assembly and load are carried independent of the axle shaft. A hub assembly is attached to the outer end of each trunnion socket assembly. The steering tie rod is secured to lower arms at the bottom of each trunnion socket. A declutch assembly attached to the transfer case supplies power through a propeller shaft to the driving flange of the front differential and carrier assembly, which in turn drives the front axle shafts.

b. Data.

Make	Timken
Model	F 7900-A752
Gear ratio	7.69 to 1

142. TIE ROD AND TOE-IN ADJUSTMENT.

a. Description (fig. 195). The steering tie rod assembly consists of a tube with adjustable ends threaded and clamped to each end of the tube. The tie rod joins the two lower pin support and cross tube arms together at the rear of the front axle housing. When the steering wheel is turned, the steering knuckle to which the left-hand arm is attached turns accordingly, and by means of the tie rod, the right-hand arm and steering knuckle are turned at the same time.

b. Toe-in Adjustment. Toe-in is the angle to which the wheels point inward at the front. It is designed to maintain proper steering and to eliminate scuffing, dragging, and scrubbing of the tires on the road. Toe-in adjustment is made at the tie rod (fig. 195). Each end of the rod is threaded. The left-hand end has a coarse thread and the right-hand end, a fine thread. The tie rod ends screw on these threads and are clamped tight by two tie rod end clamp bolts. In addition, the right-hand tie rod end is secured by a lock nut which is also screwed on the end of the tie rod. Toe-in adjustments are usually made at the fine threaded end of the tie rod.

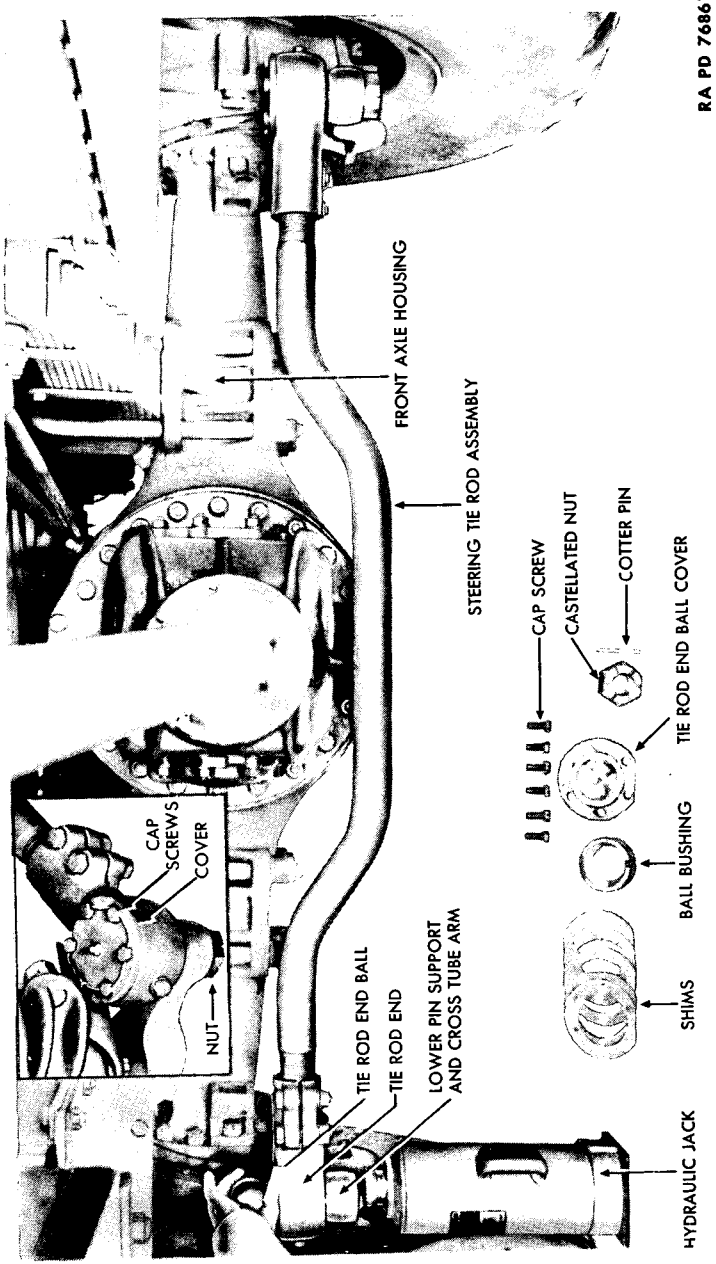

Figure 195—Removal of Steering Tie Rod Assembly

FRONT AXLE

(1) SCRIBING THE TIRES. With front wheels in a straight ahead position, place jacks under each end of front axle housing and raise both wheels about ½ inch (fig. 196). Place tire scriber in front of the tire so that its needle touches center of tire tread. Then spin wheel to scribe a line completely around tread (fig. 196). Repeat operation on opposite front tire. Release jacks, allowing wheels and tires to rest on ground.

(2) CHECKING TOE-IN. Place toe-in gage at rear of front wheels. Loosen toe-in gage pointer screw which controls vertical position of toe-in gage pointer, and slide pointer upward until it rests against scribed line on tire at hub height. Loosen toe-in gage scale indicator

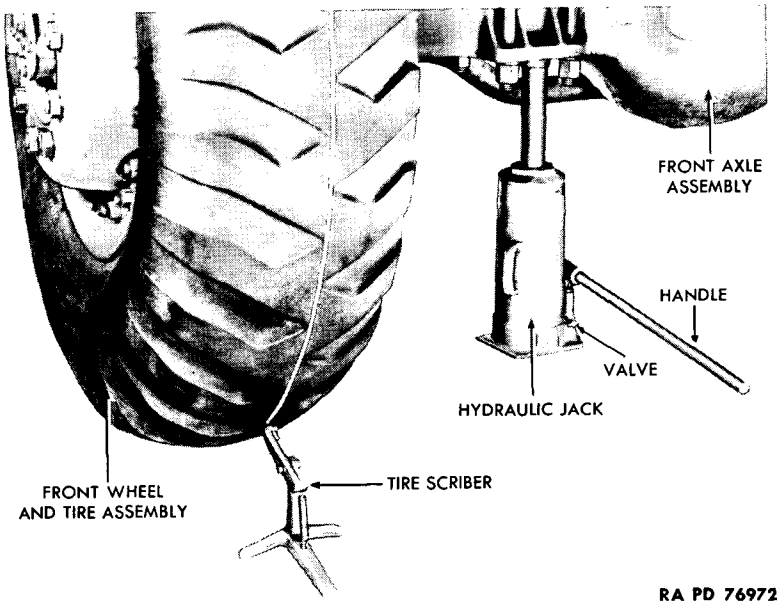

Figure 196—Scribing Tire

screw (fig. 197), and slide toe-in gage scale indicator along gage until it is at zero on scale. Tighten indicator screw. Carry toe-in gage around to front of wheels. Place gage so that one pointer is at scribed line on one tire. If toe-in adjustment is correct, opposite pointer will touch tire on the outside of scribed line. The distance of pointer to line (amount of toe-in) should be ⅛ inch and must not vary more than plus or minus 1/32 inch. Otherwise, adjustment is necessary.

(3) ADJUSTING TOE-IN. Remove cotter pin and nut on right-hand end of tie rod end ball, then remove wire and cap screws that hold cover and remove cover. Remove tie rod end ball, and loosen tie rod end clamp bolts. Turn tie rod end one turn for each ⅛-inch toe-in

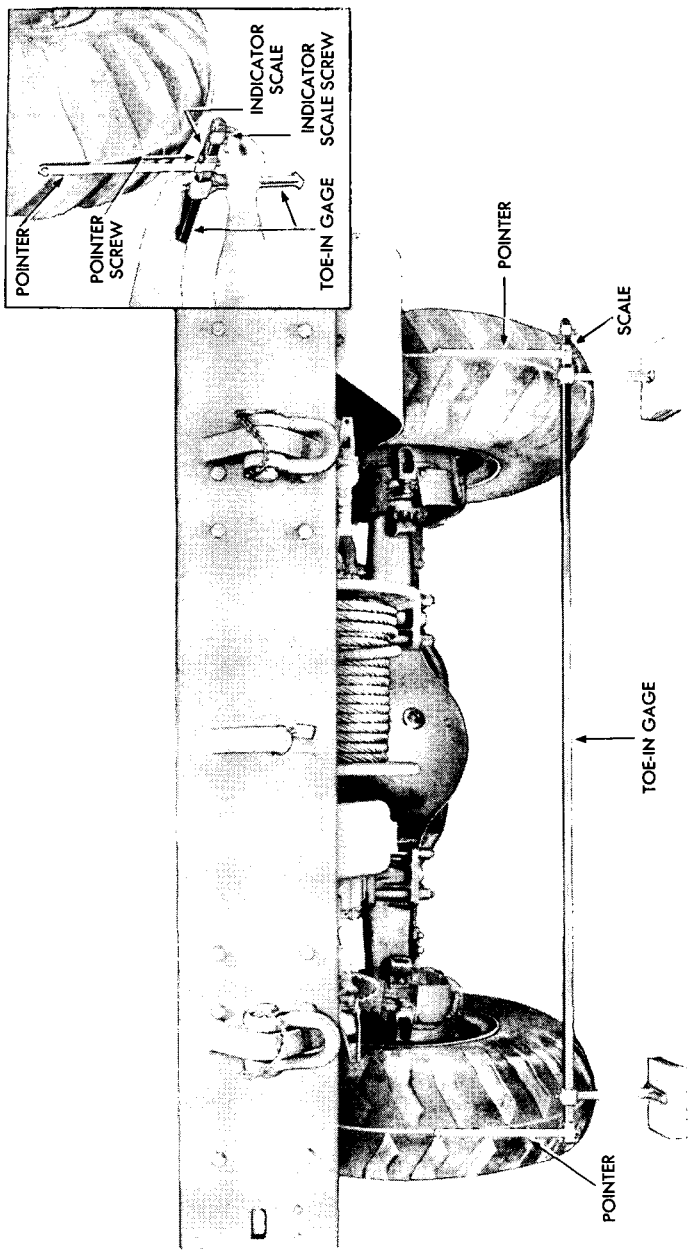

Figure 197—Indicating Amount of Toe-in

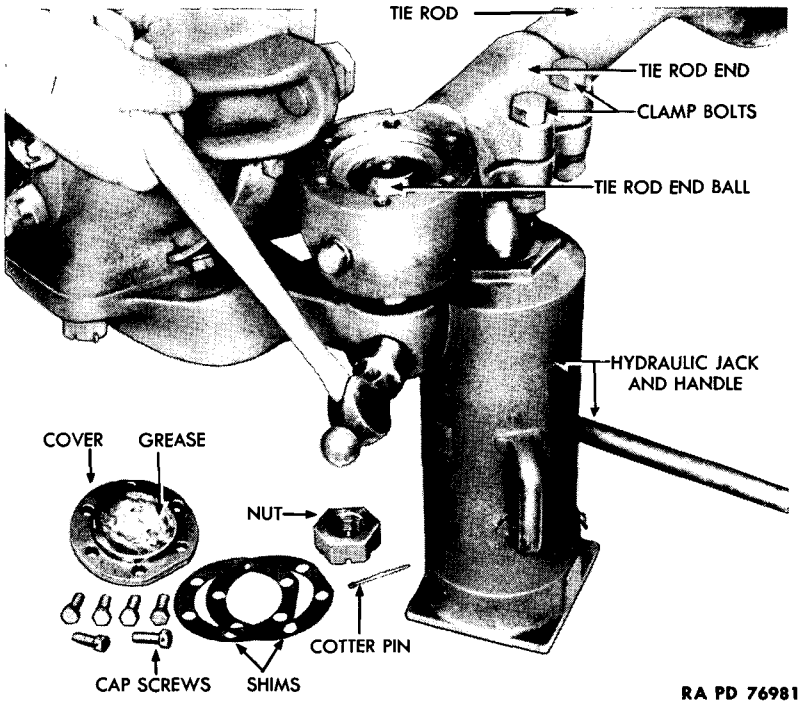

Figure 198—Removing Tie Rod End

adjustment. One turn of right-hand tie rod end onto tie rod decreases toe-in by ⅛ inch, and one turn off tie rod increases toe-in by ⅛ inch. If amount of toe-in adjustment necessary is too great to be made at right-hand fine thread tie rod end, disconnect left-hand tie rod end. Loosen clamp bolts and turn tie rod end one turn. Tighten clamp bolts and connect end. Then continue the adjustment at right-hand tie rod end. When adjustment has been made, tighten clamp bolts, and connect tie rod end to axle. Test toe-in again to check accuracy of adjustment.

c. **Remove Tie Rod** (fig. 195). Remove lock wire and six cap screws which secure tie rod end ball cover on tie rod end. Remove cover and shims from tie rod end: Then remove cotter pin and castellated nut from bottom of tie rod end ball, place a jack under tie rod end, and lift it up about an inch. Tap lower pin support and cross tube arm so tie rod end and ball will move up and out of arm. Place jack under tie rod end ball and drive tie rod end down against arm, thus moving tie rod end ball and ball bushing upward so bushing and ball can be lifted out. Leave tie rod end rest on arm, repeat procedure to remove tie rod end ball from other end of tie rod, and lift tie rod out.

d. Install Tie Rod (fig. 195). Lift tie rod onto two lower pin support and cross tube arms. Insert tie rod end ball at one end of tie rod and secure ball to arm with castellated nut and cotter pin. Install ball bushing on top of ball and install shims and cover. Secure cover with three of six cap screws and check for play of tie rod end ball. If play exists, remove one shim and recheck. Repeat this procedure as required to eliminate play and then install three remaining cap screws which hold cover to tie rod end. Lock cap screws with wire. Repeat procedure at opposite end of tie rod. Check front wheel toe-in as outlined in subparagraph **b** above.

143. REMOVAL.

a. Preliminary Instructions. Place heavy, long wooden blocks under front bumper to support the front end of the vehicle when wheels and front axle assembly are removed. Place heavy wooden blocks at front and rear of rear tires in order to prevent vehicle from sliding off blocks after front axle has been removed. Support center of front axle on a jack. Remove wheels and tires (par. 175).

b. Disconnect Steering Drag Link (fig. 194). Remove the cotter pin which locks threaded adjustment screw in rear end of steering drag link, and remove screw. Reach into end of drag link and remove steering drag link spring and spring retainer. Position steering wheel so as to center drag link over steering arm ball stud, and lift drag link upward and off stud.

c. Remove U-bolts (fig. 194). Remove two nuts and lock washers from each U-bolt, which secure front axle to right front spring. Remove nuts and lock washers from U-bolts which hold front axle to left front spring.

d. Disconnect Propeller Shaft. Remove eight bolts, nuts, and lock washers which secure two companion flanges at differential assembly.

e. Remove Front Axle (fig. 194). Lower front axle jack as low as possible and tap four U-bolts upward so they are free of front axle housing. CAUTION: *Rest assembly on jack so it will not fall, and pull assembly out from beneath vehicle.*

144. INSTALLATION.

a. Preliminary Instructions. Use a hoist to lift front axle into position beneath front springs, with U-bolt holes in front axle housing alined with front spring U-bolts.

b. Install Front Spring U-bolts. Jack up front axle so that housing is next to the springs, then tap U-bolts at each spring down through bolt holes in axle housing and secure each bolt with lock washer and nut.

c. Connect Steering Drag Link. Push rear end of drag link down over steering arm ball stud. Install spring retainer in steering drag

link spring and install retainer and spring into end of drag link. Then install threaded adjustment screw in end of drag link and tighten screw until spring tension is partially taken up. Lock screw by inserting a cotter pin through drag link and slot in screw.

d. Connect Propeller Shaft. Install eight bolts, nuts, and lock washers which secure two companion flanges at differential assembly.

e. Install Wheels and Tires. Install wheels and tires (par. 142). Then remove blocks from under front bumper and remove jack from beneath front axle housing.

f. Aline Front Wheels. Aline front wheels (par. 142).

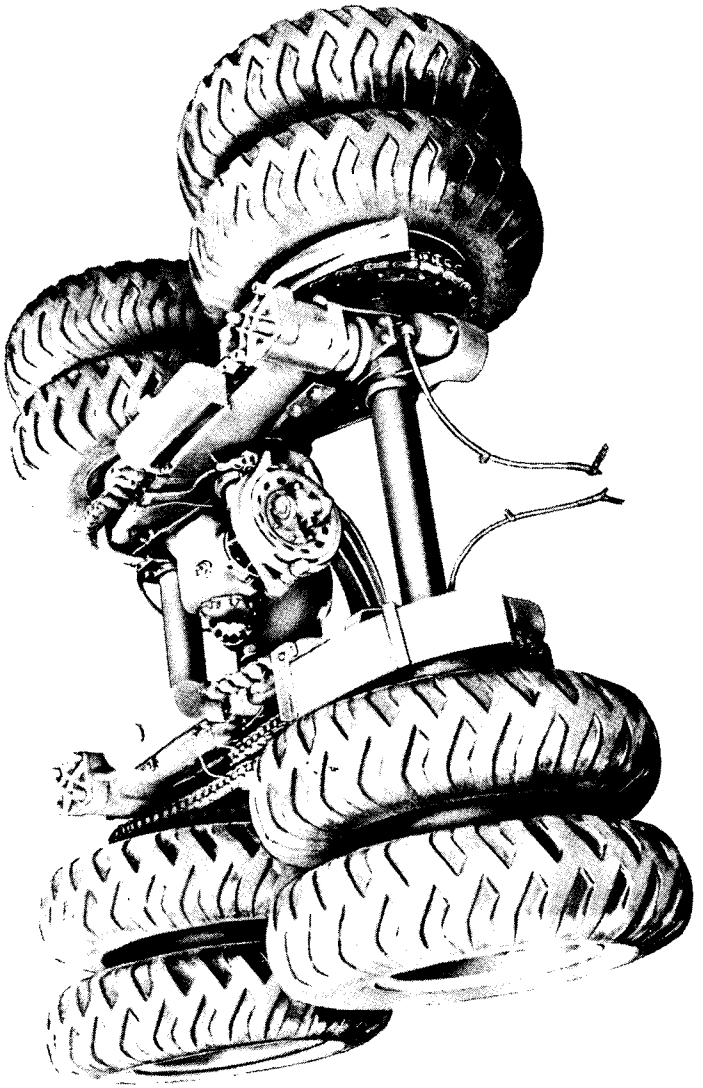

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Figure 199—Rear Axle Tandem Unit

Section XXIII

REAR AXLE TANDEM UNIT

145. DESCRIPTION AND DATA FOR TANDEM UNIT.

a. Description. The rear of the vehicle is supported by a tandem axle suspension. Power is supplied to the rear axle tandem unit assembly by a propeller shaft from the auxiliary transmission to the

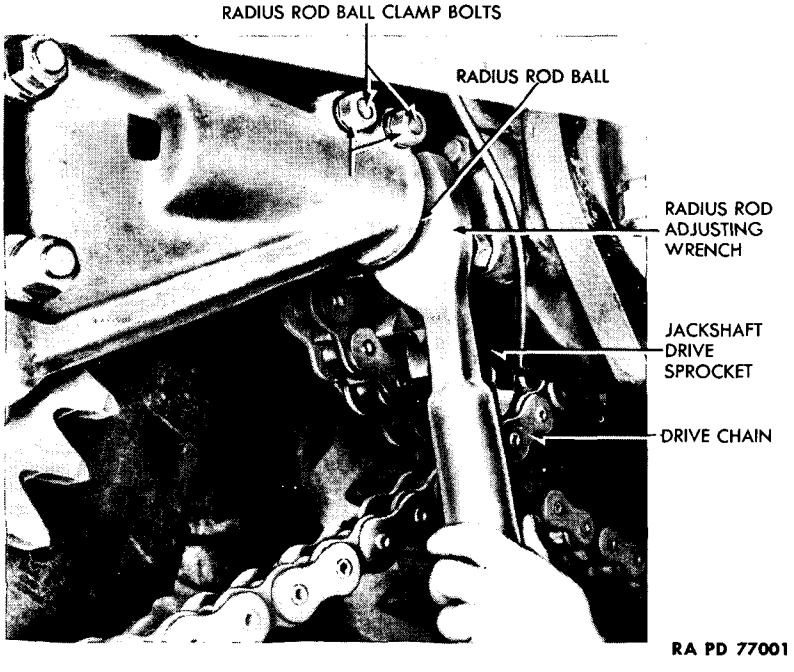

Figure 200—Adjustment of Radius Rods

rear differential and carrier assembly. Two jackshaft drive sprockets drive the stationary axle drive sprockets which are attached to the hubs on the two stationary carrier axles by means of drive chains. Two wheels are secured to each stationary axle hub. Thus the driving power is applied to all eight wheels of the rear axle tandem unit assembly. The jackshaft housing is supported at each end in a bushing

in a side stabilizer beam. The two carrier axle assemblies at front and rear of the jackshaft assembly support one end of each side stabilizer beam on a stabilizer block and the other end on a leaf spring. The leaf spring in turn supports the inner spring case which houses the two coil springs at the end of each side stabilizer beam. Radius rods attached to the service brake spider at each end of each stationary carrier axle are secured to the side stabilizer beams by radius rod ball caps. The radius rods are adjustable to permit adjusting of the drive chains to their proper tension. Each of the two stationary axle beams are secured to a side stabilizer beam and to a cross rod thrust plate on the jackshaft housing.

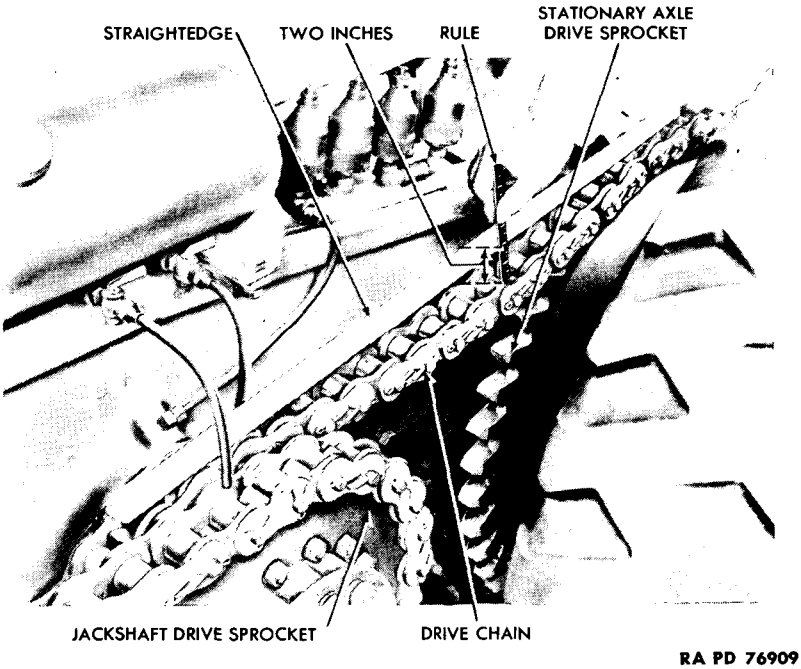

Figure 201—Measuring Slack in Drive Chain

b. Data.

Differential:

Make	Timken
Model	1828B2

146. DRIVE CHAINS.

a. Description (fig. 200). Two roller chains located at each side of the rear axle tandem unit drive the rear wheels. Each chain is driven by a jackshaft drive sprocket and the chain in turn drives a

sprocket which is attached to the brake drum and wheel hub. Chains are lubricated by two oil tanks which are mounted on top of the side stabilizer beams.

b. Adjustment (figs. 200 and 201). Loosen two radius rod ball clamp bolts on radius rod. Use radius rod adjusting wrench to loosen or tighten radius rod ball to obtain two inches of slack in chain at coil spring end or four inches of slack in chain at opposite end. Place a straightedge over links of chain, with ends of straightedge resting on top of chain over sprockets. At a point midway between sprockets, hold a ruler perpendicular to chain and depress chain as far as pos-

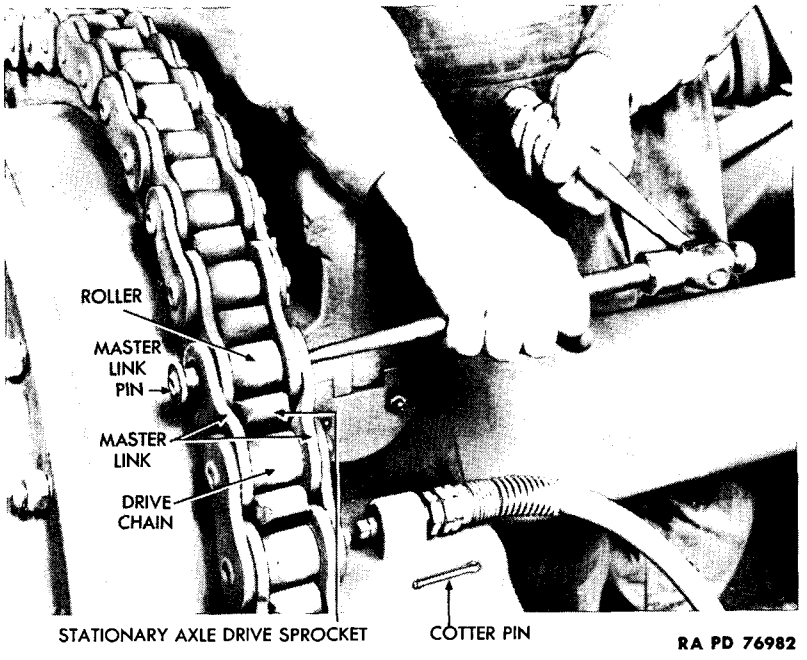

Figure 202—Removal of Drive Chain

sible, so all slack is taken up in chain at bottom. The measurement should be one half of required slack, or one inch for chains at the coil spring ends, and two inches for chains at the opposite ends. Always adjust all four drive chains at one time.

c. Removal (fig. 202). Move vehicle so that master link is over stationary axle drive sprocket. Remove cotter pin from end of master link pin and remove link. Lift chain from sprockets. Remove remaining chains in the same manner. Remove and wash drive chains in hot oil every 1,000 miles of operation.

d. Repair (figs. 203 and 204).

(1) REMOVE LINKS. Place the chain in chain vise, with vise jaws

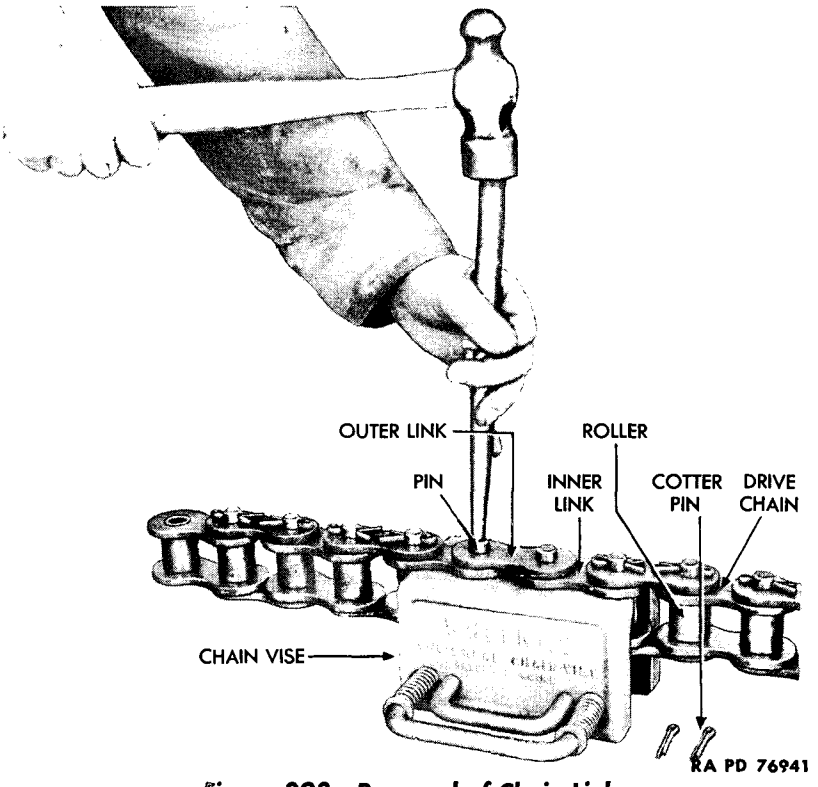

Figure 203—Removal of Chain Link

next to inner links, facing cotter pins, with link to be removed in center of vise. Then remove two cotter pins from link pins and drive two pins and link from chain. Remove additional links in the same manner as required to remove other outer and inner links or rollers which may be damaged.

(2) INSTALL NEW LINKS. Install new parts, assembling rollers between inner links, as required. Connect inner links and rollers by inserting link with two pins attached in inner links and rollers. Place chain in chain vise, with vise jaws next to inner links opposite cotter pin side of chain. Tap link into position through inner links and rollers and install cotter pins in link pins. Repeat procedure if necessary to install additional outer links.

e. Installation (fig. 202). Lift chain in position over jackshaft drive sprocket and stationary axle drive sprocket so that open ends of chain will be over stationary axle drive sprocket. Tap master link pin into position through outer master links and inner link and roller. Secure master link pin with a cotter pin. Install remaining drive chains in same manner.

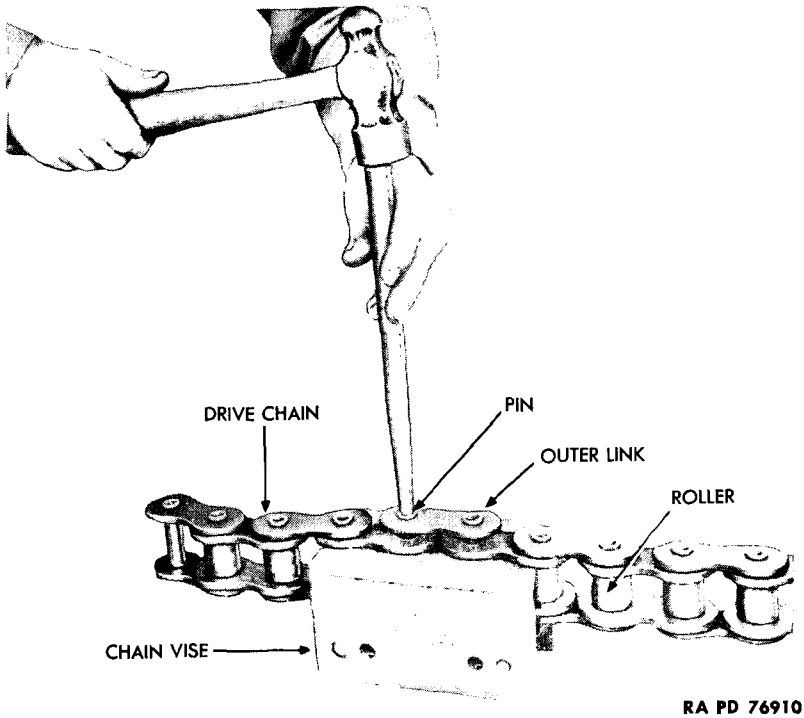

Figure 204—Installation of Chain Link

147. DRIVE CHAIN OIL TANK.

a. Description (fig. 205). A chain oiler tank with filler cap is secured to each side stabilizer beam. Two shut-off valves at the bottom of each tank permit a flow of oil through two copper tubes which expel oil when desired over the two chains and jackshaft drive sprocket on each side of the vehicle.

b. Removal (fig. 205). Remove four bolts, nuts, and lock washers which secure oil tank to brackets on side beam stabilizer and lift off tank. Remove tank from opposite side beam stabilizer in same way.

c. Maintenance. Remove filler cap and wash interior of tank with dry-cleaning solvent. Check mounting brackets to make certain they are securely welded to tank.

d. Installation (fig. 205). Lift chain oil tank into position on side stabilizer beam brackets. Then secure it to brackets with four bolts, nuts, and lock washers. Install remaining chain oil tank in same manner.

148. JACKSHAFT AXLE SHAFTS.

a. Description. The jackshaft axle drive shafts are enclosed in the jackshaft housing. Each shaft is splined on the inner end to mesh

with the splines of the differential side gears. The outer ends of the shafts are flanged and are secured to the jackshaft hub studs. The drive shafts are driven by the differential side gears and in turn drive the jackshaft hubs and sprockets which drive the chains.

b. Removal. Hold drive sprockets from turning by inserting a rod in hole in side stabilizer beam and between sprocket teeth. Remove 14 nuts which hold axle shaft flange to hub studs. (Seven nuts have lock washers under them and seven have dowels, the dowels and lock washers being used alternately.) Remove lock washers and dowels. Install two puller screws in puller screw holes in axle shaft flange and break shaft free of studs. Pull axle shaft straight out from jackshaft hub and remove axle flange gasket. Remove opposite axle shaft

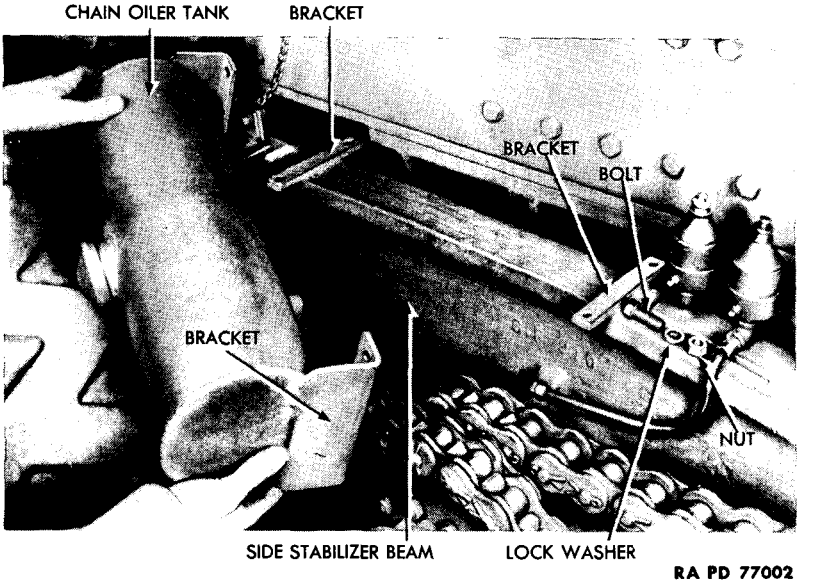

Figure 205—Removing Chain Oil Tank

in the same manner. NOTE: *To remove dowels, it may be necessary to pull shaft out slightly with puller screws, and then tap shaft back in place to loosen dowels so they can be lifted from the studs.*

c. Installation. Cement a new axle shaft flange gasket on flange and push shaft into jackshaft housing so that splined end of shaft slides into differential side gear splines. Install seven dowels and lock washers (dowels and lock washers are used alternately on hub studs) and 14 nuts which hold jackshaft axle shaft to hub studs. Hold sprockets from turning by inserting a rod in hole in side stabilizer beam and between sprocket teeth and tightening nuts. Install opposite jackshaft axle shaft in same manner.

REAR AXLE TANDEM UNIT

149. JACKSHAFT HUBS AND SPROCKETS.

a. Description (fig. 206). The jackshaft hub assemblies rotate on each end of the jackshaft housing on two roller bearings in each hub. The jackshaft axle shafts, driven by the differential side gears, are secured to studs on the two hubs, and drive the hubs. Two drive sprockets are secured to each hub by studs and nuts. The inner hub sprocket drives the chain to the rear stationary axle drive sprocket and the outer hub sprocket drives the chain to the front stationary axle drive sprocket.

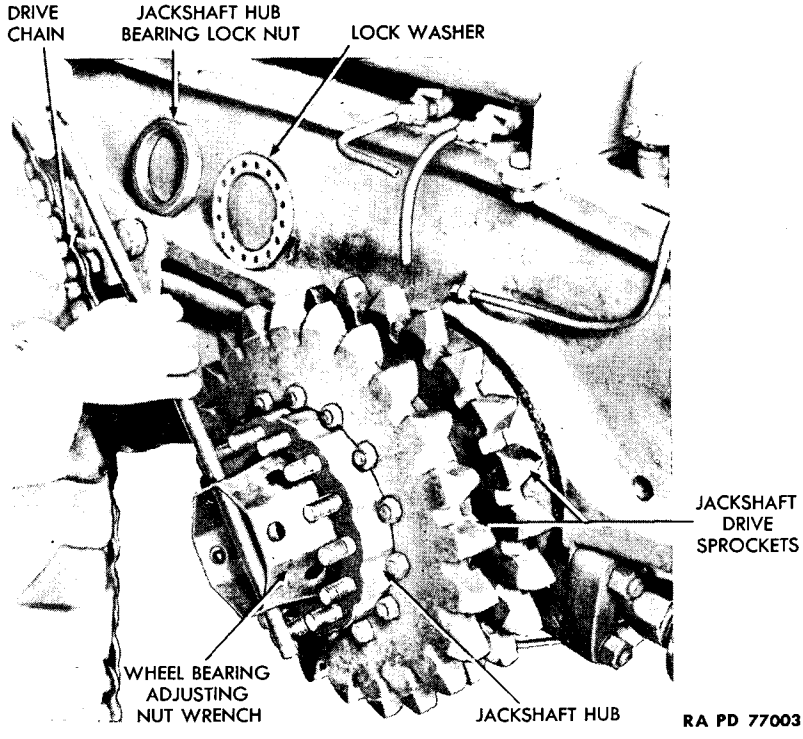

Figure 206—Removing Jackshaft Hub

b. Removal (fig. 206).

(1) REMOVE HUB AND SPROCKETS ASSEMBLIES. Remove two drive chains from sprockets on side of vehicle from which jackshaft hub is to be removed (par. 146). Remove jackshaft axle shaft (par. 148). Remove jackshaft hub bearing lock nut from jackshaft tube with wheel bearing nut wrench. Remove jackshaft bearing lock washer and use wheel bearing adjusting nut wrench to remove jackshaft hub bearing adjusting nut. Remove shim and lift off hub with jackshaft drive sprockets attached. Remove remaining hub in same manner.

(2) REMOVE DRIVE SPROCKETS FROM HUB. Remove 14 nuts which hold outer jackshaft drive sprocket to studs on hub. Tap around sprocket teeth until sprocket is driven off hub. Remove 14 nuts which hold inner sprocket to studs on hub and drive studs back through sprocket; as the studs are driven back, remove sprocket stud sleeves and sleeve pins. Tap around sprocket teeth until sprocket is removed from hub. Remove sprockets from other hub in same manner.

c. **Installation** (fig. 206).

(1) INSTALL SPROCKETS ON HUBS. First screw a threaded sleeve on each of the 14 jackshaft drive sprocket studs. Aline each sleeve

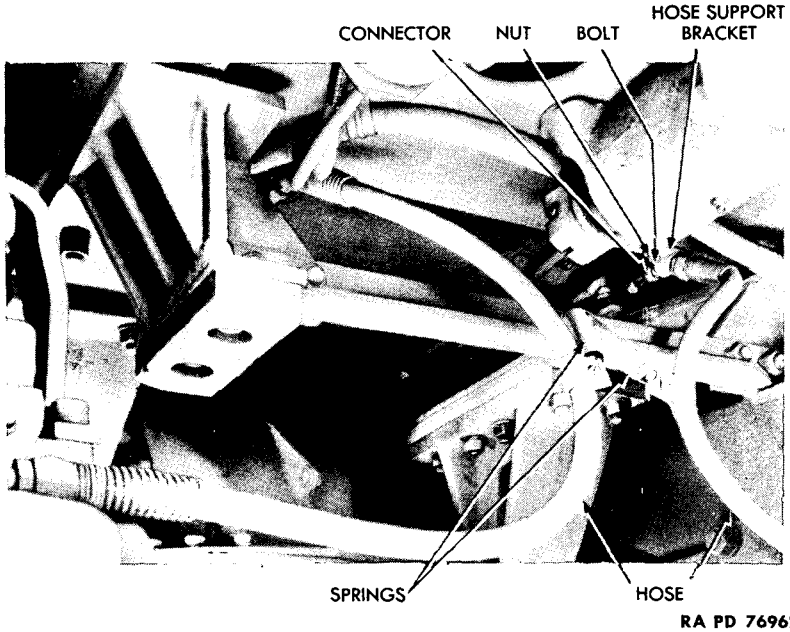

Figure 207—Double Check Valve to Brake Cylinder Hose

with pin notch in stud hole and install sleeve pins. Tap studs part way in, so other ends are flush with opposite side of hub. Place inner jackshaft drive sprocket over hub and tap around sprocket teeth until sprocket is in position against, and in alinement with, studs. Drive studs through stud holes in sprocket until studs are in fully installed position and secure sprockets to studs with nuts. Drive outer sprocket into position on hub over studs. Secure outer sprocket to hub by installing 14 nuts. Install sprockets on other hub in same manner.

(2) INSTALL HUB AND SPROCKETS ASSEMBLIES. Lift hub and drive sprockets assembly into position over jackshaft tube. Install shim and wheel bearing adjusting nut. Adjust wheel bearings (par.

176) and install jackshaft bearing lock washer and lock nut, using wheel bearing nut wrench. Install jackshaft axle shaft (par. 148). Install the two drive chains (par. 146). Install remaining hub and sprockets assembly in the same manner.

150. TANDEM UNIT REMOVAL.

a. Remove Transfer Case to Rear Axle Propeller Shaft. Refer to paragraph 139.

b. Disconnect Double Check Valve to Front Brake Cylinder Hose. Disconnect each hose from connector at bottom and rear of

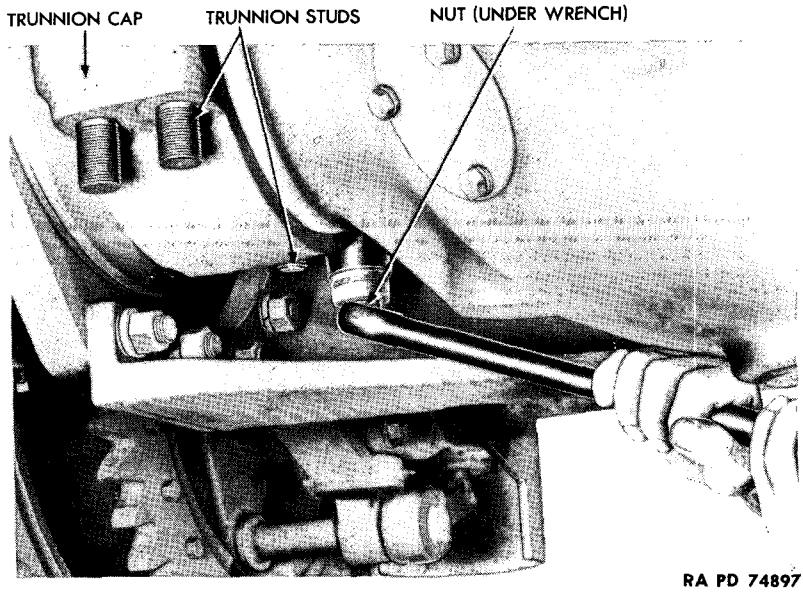

Figure 208—Disconnecting Right-hand Jackshaft Trunnion Cap from Trunnion

bracket. Remove bolt, nut, and lock washer which secure hose support brackets to frame and disconnect each hose at its rear connector. Disconnect springs. Leave each hose connected to its brake cylinder and lower it out of way.

c. Disconnect Drive Shaft Brake Rear Rod. Remove cotter pin and clevis pin from yoke clevis at rear end of drive shaft brake rear rod and remove rod and yoke clevis from drive shaft brake long lever.

d. Disconnect Double Check Valve to Rear Brake Cylinder Hose (fig. 207). Disconnect each rear brake hose from connector at bottom and front of bracket. Then remove bolts, nuts, and lock washers which secure rear hose support brackets to frame. Disconnect springs and lower each hose out of way.

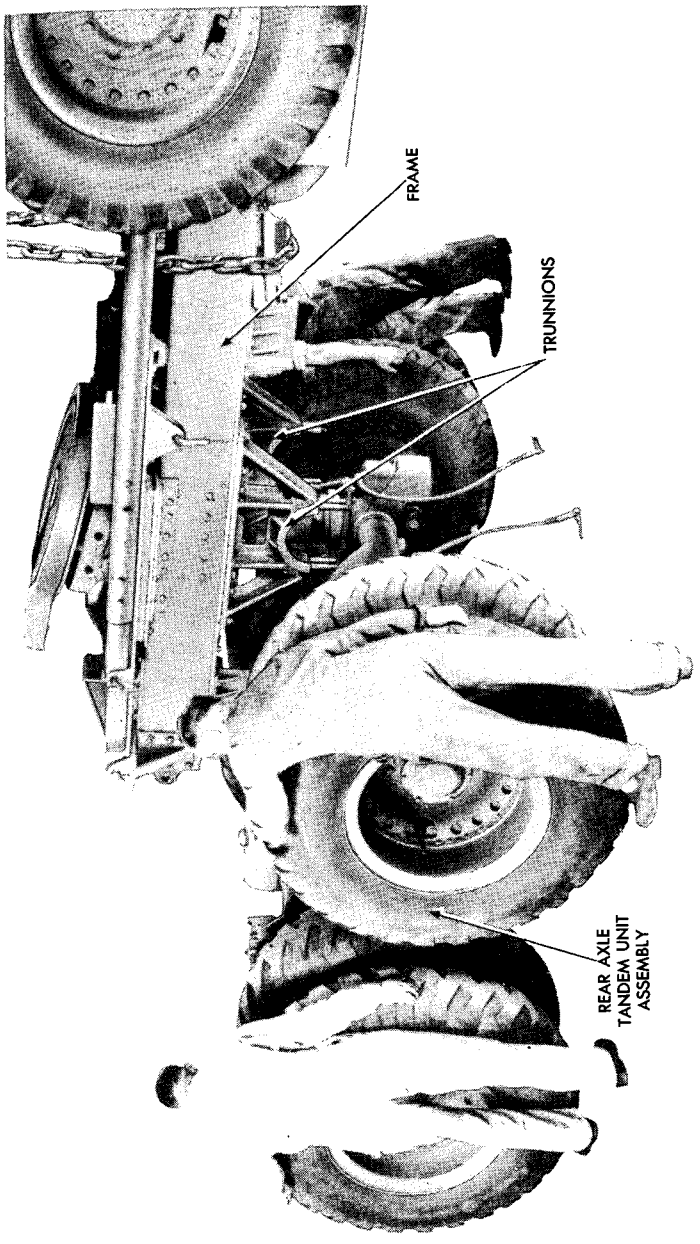

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Figure 209—Removal of Rear Axle Tandem Unit Assembly

e. Disconnect Left-hand Jackshaft Trunnion from Differential Case. Remove cotter pin, castellated nut, and bolt which secure trunnion to rear differential case at rear of trunnion.

f. Disconnect Right- and Left-hand Jackshaft Trunnion Caps from Trunnion. Remove four nuts and lock washers which secure right-hand trunnion cap to trunnion studs. Disconnect left-hand trunnion cap in the same manner.

g. Remove Rear Axle Tandem Unit. Block front wheels at front and rear of tires. Place a jack on wooden block at rear of vehicle under pintle. Jack up vehicle until trunnions are free of jackshaft trunnion caps and rear axle tandem unit is entirely free of vehicle. Block up unit with heavy wooden blocks and remove hydraulic jack and wooden block at extreme rear of vehicle. Roll rear axle tandem unit from under frame.

151. TANDEM UNIT INSTALLATION.

a. Position Rear Axle Tandem Unit (fig. 209). Position rear axle tandem unit assembly in direct line with rear of vehicle. Push assembly underneath rear end of vehicle, with jackshaft trunnion caps directly under studs of two trunnions on rear of frame.

b. Lower Vehicle on Rear Axle Tandem Unit. Remove wooden blocks at front of the rear axle tandem unit. Lower vehicle with jack until trunnion studs are entered through the jackshaft trunnion caps.

c. Secure Jackshaft Trunnion Caps to Trunnions (fig. 208). Install four nuts and lock washers which secure each trunnion cap to its mating trunnion. Then tap bolt which secures left-hand trunnion to rear differential case through differential case and install castellated nut and cotter pin on bolt.

d. Connect Double Check Valve to Brake Cylinder Hose (rear) (fig. 207). Lift right-hand hose into position with hose support bracket on frame and secure bracket to frame with two bolts, nuts, and lock washers. Install left-hand hose in same manner.

e. Connect Drive Shaft Brake Rear Rod. Lift yoke clevis at rear end of drive shaft brake rear rod into position on drive shaft brake long lever and secure it to lever with clevis pin and cotter pin.

f. Connect Double Check Valve to Brake Cylinder Front Hose (fig. 207). Lift left-hand hose support bracket in position on frame and secure bracket to frame with bolt, nut, and lock washer. In a similar manner, install right-hand hose.

g. Install Transfer Case to Rear Axle Propeller Shaft. See paragraph 140 c.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section XXIV

SERVICE BRAKE SYSTEM

152. DESCRIPTION AND DATA FOR SYSTEM.

a. Description and Operation.

(1) DESCRIPTION (fig. 210). The purpose of the compressed air brake equipment on the tractor is to operate the brakes on the four rear wheels of the tractor, also the brakes on the semitrailer. The air brake equipment also provides a source of compressed air supply for such uses as tire inflation and operating the air horn. The air brake system consists of an air compressor, two air reservoirs, a governor, three hand-operated valves, one foot-operated valve, an air pressure gage, air supply valve, relay valve, stop light air switch, low-pressure air indicator, and the necessary air lines and check valves to connect and control the units.

(2) OPERATION.

(a) All Rear Wheel Brakes. Pressure on the foot-operated brake valve allows compressed air to flow from the air reservoirs to the air manifold, then through double check valves to the brake cylinders, which actuate the slack adjusters and expand the brake shoes against the rear wheel brake drums. The brakes on the tractor and semitrailer rear wheels are applied by this valve which is located on the floor of the cab.

SERVICE BRAKE SYSTEM

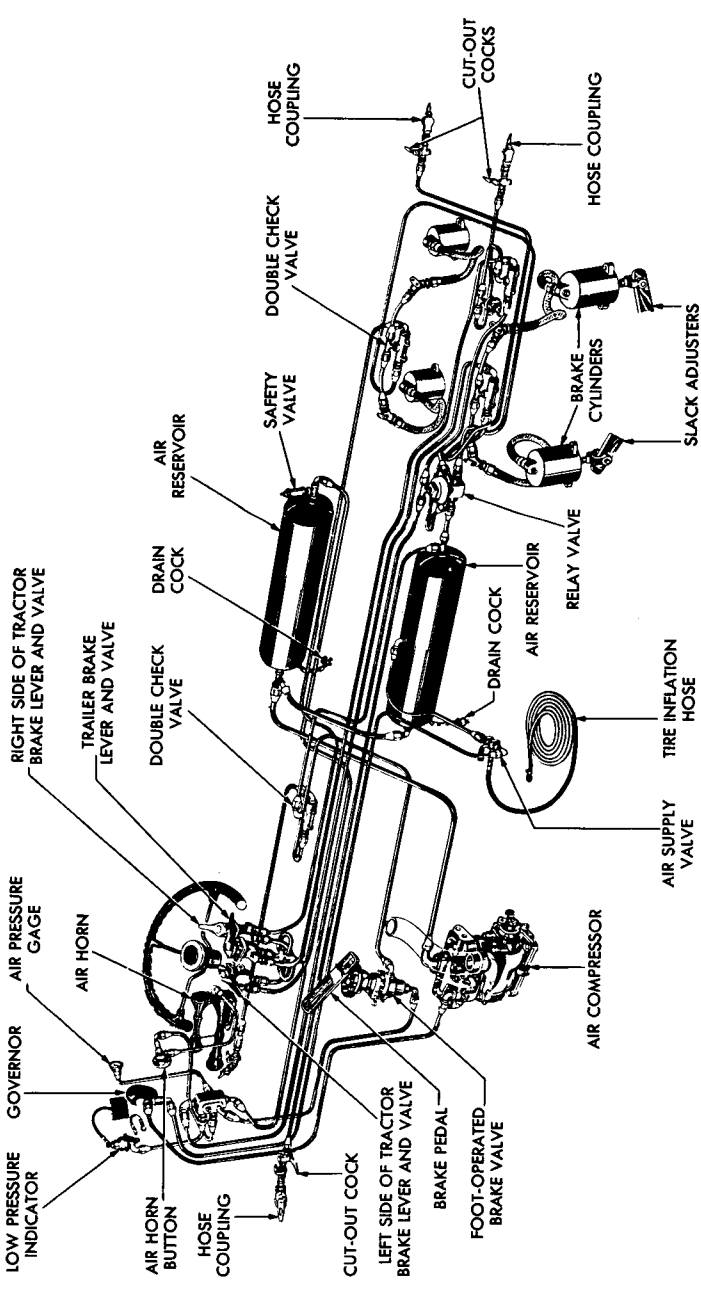

Figure 210—Air System, Schematic Drawing

(b) Left Rear Wheel Brakes. The hand-operated brake valve on the left side of the steering column operates the brakes on the left rear wheels of the tractor. Turning the lever of this valve to the right releases air pressure from the air reservoirs to the air manifold, then through a double check valve to the brake cylinders on the left rear wheels which actuates the left side slack adjusters and expands the brake shoes against brake drums on the left rear wheels.

(c) Right Rear Wheel Brakes. The hand-operated brake valve on the right side of the steering column operates the brakes on the right rear wheels of the tractor. The operation is the same as left rear wheel brakes.

(d) Semitrailer Wheel Brakes. The hand-operated brake valve in the center of the steering column operates the brakes on the semitrailer wheels. Details of operation of semitrailer wheel brakes are explained in Part Three of this manual.

b. Data.

Unit	Make	Model
Air compressor	Bendix Westinghouse	3UE12VW
Slack adjuster	Bendix Westinghouse	220938
Air horn	Bendix Westinghouse	217869
Low-pressure indicator	Bendix Westinghouse	215186
Air reservoir	Bendix Westinghouse	221393
Air manifold	Bendix Westinghouse	212322
Valves:		
Air horn	Bendix Westinghouse	217866
Air supply	Bendix Westinghouse	221192
Foot-operated brake	Bendix Westinghouse	216231
Hand-operated brakes (on tractor)	Bendix Westinghouse	221303
Hand-operated brakes (for trailer)	Bendix Westinghouse	215748
Relay valve	Bendix Westinghouse	217383
Safety valve	Bendix Westinghouse	215105
Single check valve	Bendix Westinghouse	220306

153. AIR COMPRESSOR.

a. Description (fig. 211). The air compressor is driven by the engine to furnish the compressed air necessary to operate the brake system. It is located on the left side of the engine and is a three-cylinder pump, water-cooled by the cooling system, and lubricated by the engine oiling system. The compressor is of the reciprocating single-acting type and runs continuously while the engine is running, but compresses air only when the governor is cut in.

b. Maintenance and Adjustment.

(1) MAINTENANCE. Check all air and water line connections and tighten if loose. Tighten flexible coupling nuts. Check clearance of unloader valves; it must be between 0.010 and 0.015 inch.

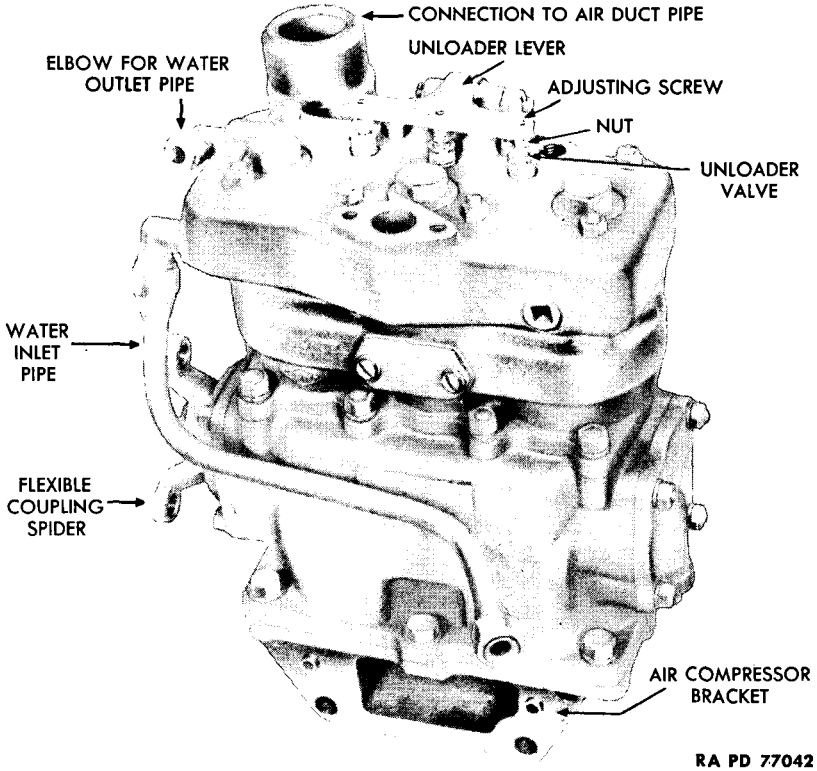

Figure 211—Air Compressor

(2) ADJUSTMENT. Loosen nut which secures each adjusting screw in position on unloader lever. Turn adjusting screw while holding a 0.012-inch feeler gage between square-head end of screw and unloader valve. When desired clearance is obtained, tighten nut while holding adjusting screw. Check clearance after tightening nut to be sure it is correct and has not changed during tightening operation.

c. Removal. Loosen hose clamps that hold air pipe to air duct and air compressor. Disconnect air lines to air governor and to air reservoir at air compressor. Unscrew three nuts and bolts which hold flexible coupling spider to flexible coupling thermoid disk. Disconnect water outlet pipe at air compressor and disconnect water inlet pipe at water pump. Push accessory shaft to the rear in order to obtain clearance. Remove four nuts and lock washers that hold air compressor bracket on upper crankcase. Remove air compressor with its bracket and water inlet pipe and then remove air compressor bracket gasket.

d. Installation. Install a new air compressor bracket gasket. Place air compressor with its bracket and water inlet pipe in posi-

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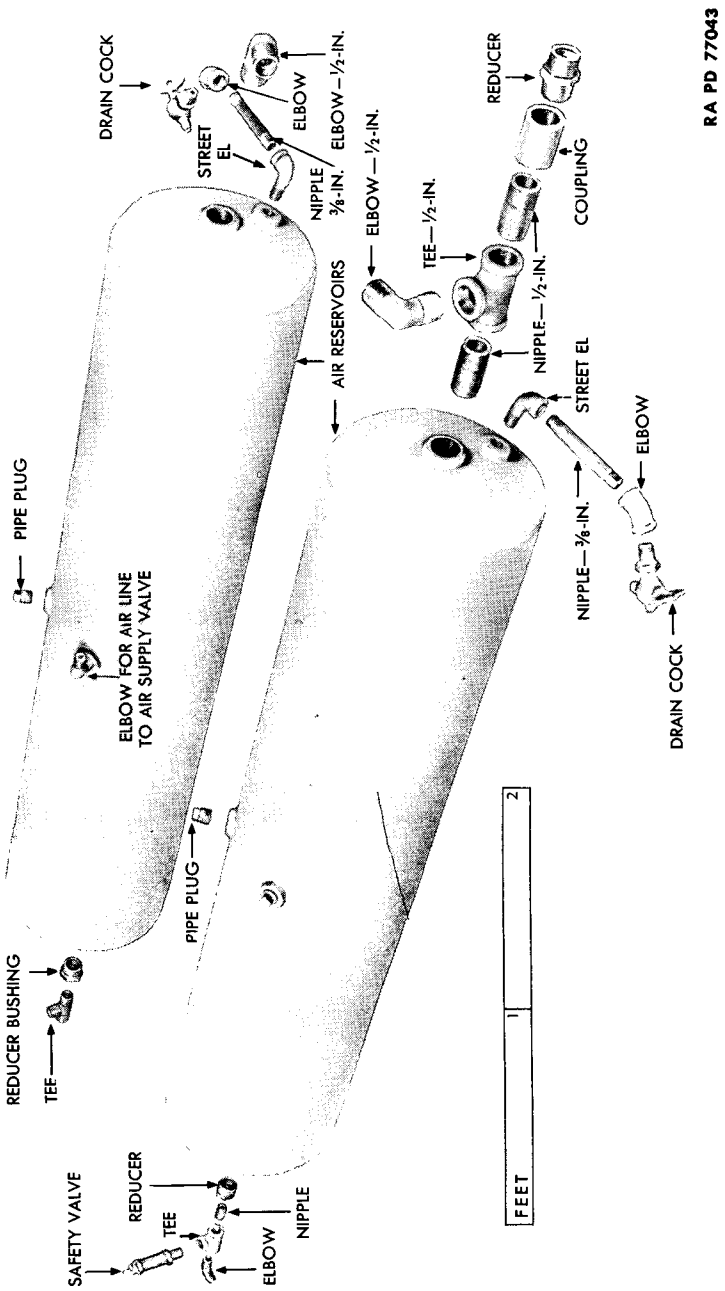

Figure 212—Air Reservoirs and Fittings

tion and fasten to upper crankcase with four nuts and lock washers. Connect water outlet pipe at air compressor and connect water inlet pipe at water pump. Install three bolts and nuts that hold flexible coupling spider to flexible coupling thermoid disk. Connect air lines to air governor and to air reservoir. Install air pipe to air duct and tighten hose clamps.

154. AIR RESERVOIRS.

a. Description (fig. 212). There are two cylindrical air reservoirs in the air brake system. They are connected together by pipes and fittings and each is clamped to the vehicle frame by U-bolts. Each

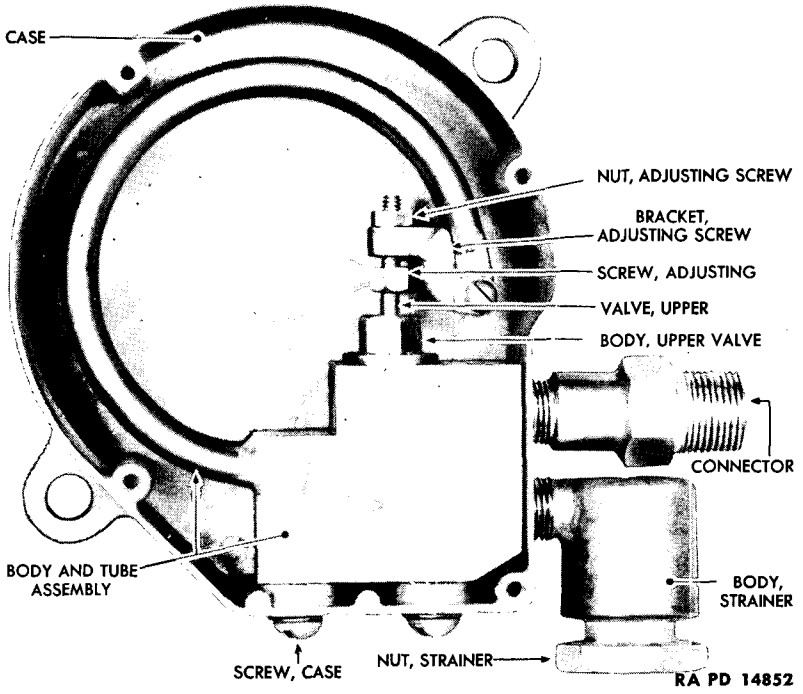

Figure 213—Interior of Governor

reservoir is equipped with a drain cock for the purpose of draining off accumulated moisture, and the right-hand reservoir has a safety valve to prevent damage if too much air pressure is built up due to failure of the governor.

b. Maintenance. Open drain cocks and drain water from reservoirs. Check operation of safety valves; they must pop open at 100 pounds pressure.

c. Removal. Loosen four bolts that hold plate over air reservoirs and remove plate. Disconnect air lines (fig. 210). Remove clamp

bolts, nuts, and lock washers, then spread clamps and remove reservoirs.

d. Installation. Install reservoir in clamp and fasten with bolt, nut, and lock washer. Connect air lines (fig. 210). Install plate over air reservoirs and secure with four bolts.

155. GOVERNOR.

a. Description. The governor is located on the left side of the vehicle inside the radiator door and is the means of limiting the amount of air pressure which the air compressor produces. When the pressure in the air reservoirs reaches 100 to 105 pounds, the governor causes the compressor unloader valves to open, stopping further compression. When the minimum pressure is reached in the air reservoirs (85 lb), the governor closes the compressor unloader valves and permits compression to start.

b. Adjustment (fig. 213). If air pressure range (85 to 105 lb) is incorrect, it is necessary to remove shims from underneath valve guide and higher authority must be notified. However, if pressure is within this range, the pressure setting may be raised or lowered by holding adjusting screw and loosening adjusting screw nut. Adjust pressure by turning adjusting screw; to raise the set pressure, turn adjusting screw clockwise; to lower the set pressure, turn adjusting screw counterclockwise. Tighten adjusting screw nut while holding adjusting screw.

c. Removal. Disconnect the two air lines at governor. Remove two bolts, nuts, and lock washers that hold governor to dash and lift it off.

d. Installation. Install governor on dash and fasten with two bolts, nuts, and lock washers. Connect the two air lines to governor.

156. SAFETY VALVE.

a. Description. The safety valve is located on top of the right air reservoir and protects the air system against building up excessive reservoir pressures. Air pressure in excess of 150 pounds is allowed to escape.

b. Maintenance. Loosen lock nut and adjust the set pressure by turning adjusting nut. Turn nut clockwise to increase set pressure or counterclockwise to decrease. Tighten lock nut.

c. Removal. Remove valve from tee on right air reservoir.

d. Installation. Install valve in tee on right air reservoir.

157. FOOT-OPERATED BRAKE VALVE.

a. Description (fig. 214). The brake pedal on the foot-operated brake valve controls the brakes on the rear wheels of the tractor and also on the semitrailer, and is located on the cab floor at the driver's seat.

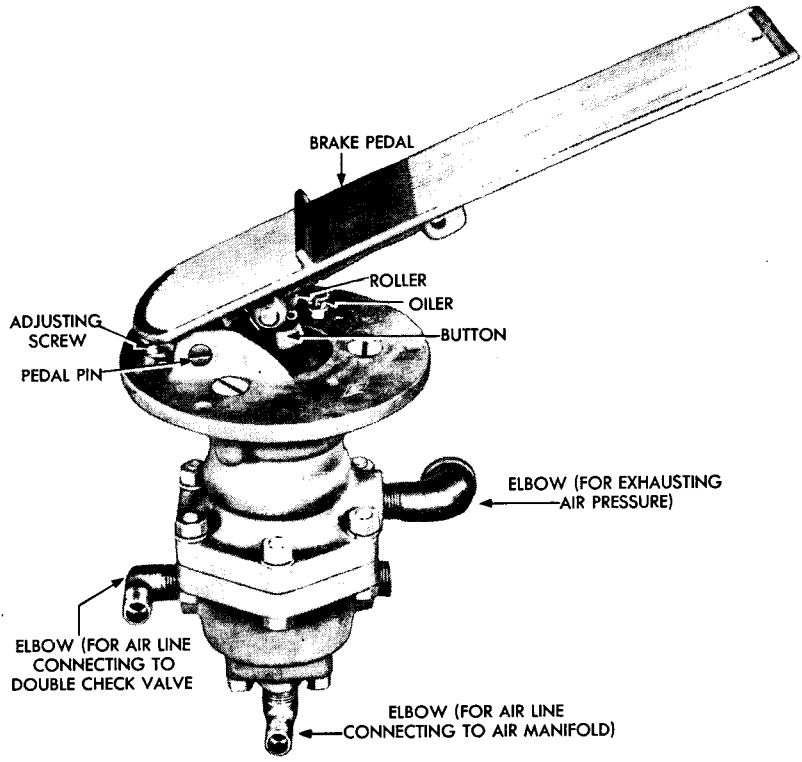

Figure 214—Foot-operated Brake Valve Assembly

b. Maintenance. Remove pedal pin and brake pedal. Release brake pedal and measure distance between roller and button which must be $\frac{1}{16}$ inch and if it is not, adjust free travel of pedal. Loosen lock nut and turn adjusting screw counterclockwise to decrease, and clockwise to increase, pedal travel. Tighten lock nut.

c. Removal. Disconnect two air lines at valve (fig. 210). Remove three bolts, nuts, and lock washers that hold valve to floorboard and remove valve.

d. Installation. Install valve assembly on floorboard and fasten with three bolts, nuts, and lock washers. Connect air lines (fig. 210).

158. HAND-OPERATED BRAKE VALVES.

a. Description. The three hand-operated brake valves operate the brakes on right side of tractor, left side of tractor, and on semi-trailer only. These valves are secured to the steering column below the steering wheel.

b. Removal. Remove bolts, nuts, and lock washers that hold valves to steering column. Disconnect inlet and outlet air lines at each valve (fig. 210) and remove valves.

c. Installation. Install valves on steering column and secure them with bolts, nuts, and lock washers that hold valves to steering column. Connect inlet and outlet air lines to each valve (fig. 210).

159. DOUBLE CHECK VALVES.

a. Description. Four double check valves are used to prevent loss of air pressure through an open exhaust of the brake valves which are not being operated. These valves are secured to the chassis frame (fig. 210).

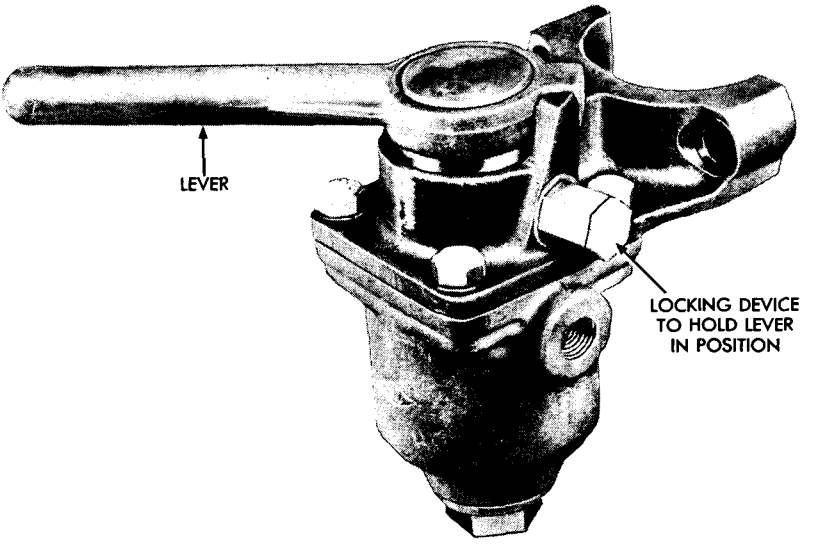

Figure 215—Hand-operated Brake Valve

b. Removal. Disconnect air lines from fittings (fig. 210). Remove bolt, nut, and lock washer that hold valve to frame and lift off valve.

c. Installation. Install valve on frame and fasten with bolt, nut, and lock washer. Connect air lines to inlet and outlet fittings on valve (fig. 210).

160. SINGLE CHECK VALVE.

a. Description. The single check valve protects the air system from air loss in case the emergency line cut-out cock is left open.

b. Removal. Disconnect inlet and outlet air lines from valve fittings (fig. 210). Remove bolt, nut, and lock washer that hold valve to frame, and lift off valve.

c. Installation. Install valve on frame and fasten with bolt, nut, and lock washer. Connect inlet and outlet air lines to valve fittings.

161. AIR SUPPLY VALVE.

a. Description. The air supply valve is in the left side tool box in the air line between the left reservoir and the governor. It is used to furnish air supply for inflating tires or any other purpose desired.

b. Removal. Disconnect inlet and outlet air lines from valve fittings (fig. 210). Remove two bolts, nuts, and lock washers that hold valve to tool box and lift out valve.

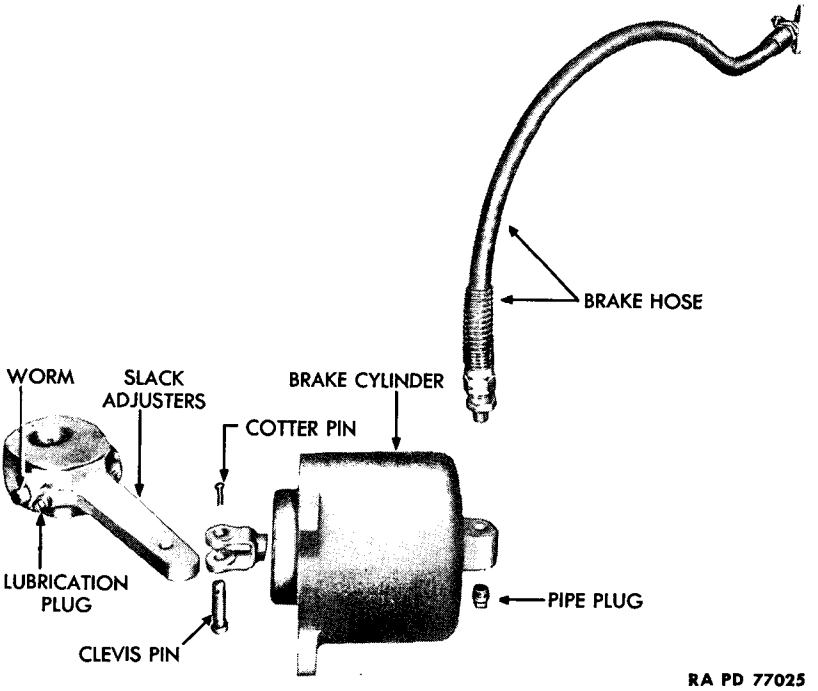

Figure 216—Brake Cylinder, Slack Adjuster, and Connections

c. Installation. Install valve in tool box and fasten with two bolts, nuts, and lock washers. Connect inlet and outlet air lines to valve fittings (fig. 210).

162. BRAKE CYLINDERS.

a. Description. The four brake cylinders are located on the rear axle tandem unit. They are used to operate the brakes on the rear wheels. The cylinders convert the energy of compressed air into the mechanical force necessary to operate the slack adjusters and brake shoes.

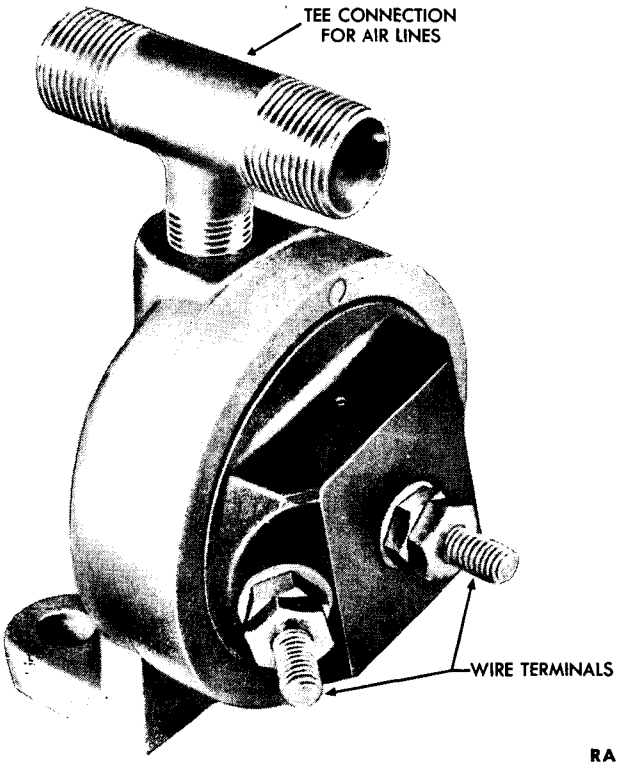

Figure 217—Stop Light Switch

b. Maintenance. The travel of the brake cylinder push rods should be kept at a minimum without the brakes dragging. Raise the wheel of brake to be adjusted off ground. Turn the adjusting screw of slack adjuster until the brake cylinder push rod travel is as short as possible with no perceptible drag on the brake when the wheel is turned.

163. SLACK ADJUSTERS.

a. Description. A slack adjuster is a part of each brake assembly and is the means of adjusting brakes to compensate for brake lining wear.

b. Adjustment. Build up air pressure to at least 80 pounds and maintain at least 60 pounds during brake adjustment. Adjust brakes (par. 171).

c. Removal. Disconnect slack adjuster by removing cotter pin and clevis pin, then remove screw and two washers that hold adjuster to brake camshaft. Remove adjuster from camshaft.

d. Installation. Install adjuster on brake camshaft and fasten with screw and two washers. Connect adjuster to brake cylinder with clevis pin and cotter pin.

164. STOP LIGHT AIR SWITCH.

a. Description. The stop light air switch controls the operation of the stop lights and is located at the rear of the chassis frame.

b. Removal. Disconnect two wires from terminal on switch, then disconnect two air lines from tee fitting on switch (fig. 210). Remove two bolts, nuts, and lock washers that hold switch to frame and remove switch.

c. Installation. Install switch on frame and fasten with two bolts, nuts, and lock washers. Connect the two air lines to the connection on switch and then connect two electric wires to switch terminals.

165. LOW-PRESSURE AIR INDICATOR.

a. Description. The low-pressure air indicator operates the low-pressure buzzer to warn the driver that air pressure has fallen below the safe operating point of 60 pounds.

b. Removal. Disconnect air line from fittings (fig. 210). Remove two nuts and lock washers that hold wires to indicator. Remove two bolts, nuts, and lock washers that hold indicator to dash and remove indicator.

c. Installation. Install indicator on dash and fasten with two bolts, nuts, and lock washers. Install two electric wires and fasten with two nuts and lock washers. Connect air line to indicator inlet fitting.

166. LOW-PRESSURE AIR INDICATOR BUZZER.

a. Description. The low-pressure air indicator buzzer is the means of signaling the driver that the air pressure has fallen below the safe point of 60 pounds. It is operated electrically by the low-pressure air indicator and is located on the front side of the dash.

b. Removal. Loosen cross recessed screw which holds cover to low-pressure air indicator buzzer and remove cover. Remove cover screw nut, insulation washer, and cover screw from cover. Then remove cover gasket. Remove two terminal screw nuts, lock washers, and plain washers from low-pressure air indicator buzzer terminals. Lift off two wires; one wire leads to low-pressure indicator and the other wire leads to fuse block. Remove two bolts, nuts, plain washers, and lock washers which hold low-pressure air indicator buzzer to dash and lift buzzer off dash.

c. Installation. Install buzzer on dash and fasten with two bolts, nuts, plain washers, and lock washers. Install two wires on buzzer terminals (fig. 210) and fasten with two terminal screw nuts, plain washers, and lock washers. Install cover gasket, then install the cover screw nut, insulation washer, and cover screw. Install cover and tighten cover screw.

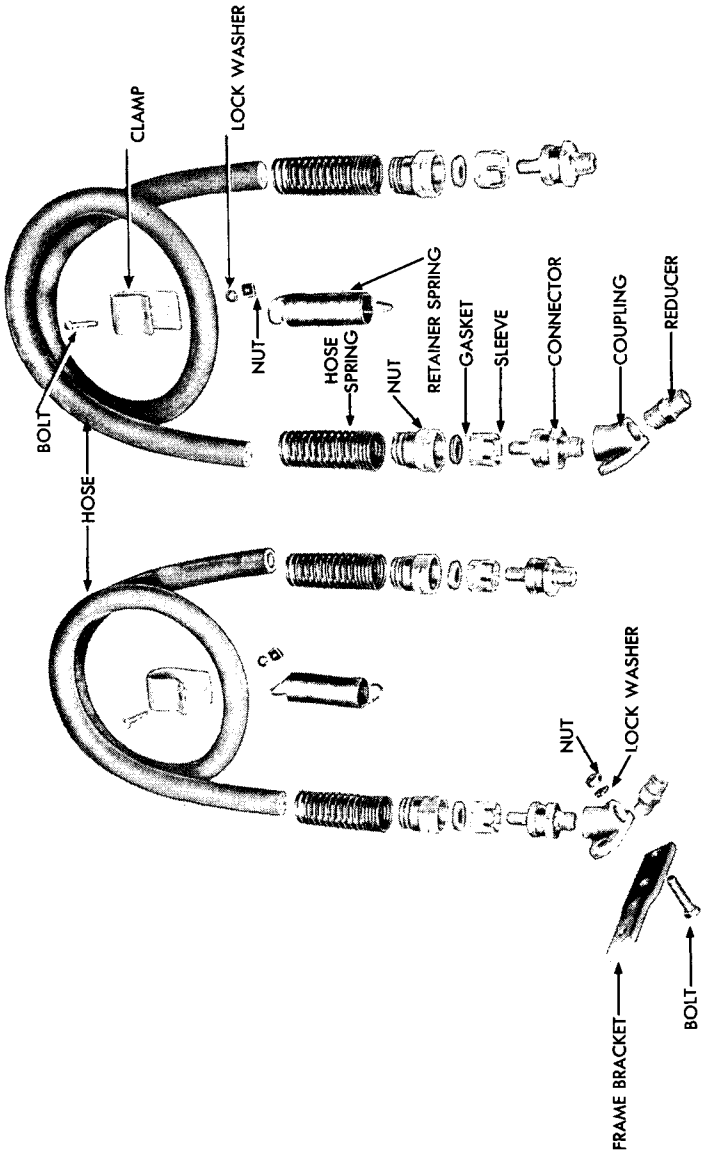

Figure 218—Air Hose and Fittings

SERVICE BRAKE SYSTEM

167. AIR LINES AND HOSE.

a. Description. The air lines and hose are used to carry the compressed air to the air units. The hose is used where movement of the vehicle might cause breakage of a metal air line.

b. Maintenance.

(1) FITTING AIR LINES (fig. 218). New pipes must be cut at a right angle to the outside wall of pipe. Slide nut and sleeve on pipe. Insert pipe all the way into body. Hold pipe in body and tighten nut until it is snug.

(2) FITTING AIR HOSE. Cut hose at right angle to outside wall of hose. Slide spring and nut on hose, then install sleeve about one inch

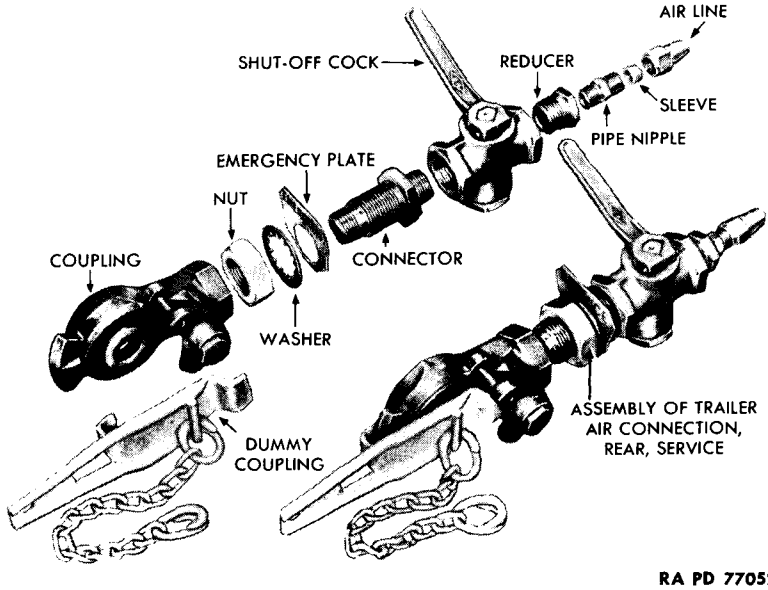

Figure 219—Semitrailer Air Connections—Rear

from end of hose. Place gasket over end of hose guide in connector. Remove protector from face of gasket. Install hose in connector. Slide sleeve against edge of connector and tighten nut until it is snug.

168. SEMITRAILER AIR CONNECTIONS.

a. Description (figs. 219 and 220). The service and emergency air connections are located at the front and at the rear of the tractor. They are used to connect the tractor to the semitrailer at the rear and, in case of a breakdown, to another vehicle at the front. Each connection contains a shut-off valve and a coupling which secures the connecting hose.

b. Removal of Front Service Connection. Remove connection parts in the following order: dummy coupling, coupling, pipe nipple, elbow, connector, service plate, washer, coupling nut, and pipe nipple (fig. 220).

c. Installation of Front Service Connection (fig. 220). Install pipe nipple, washer, coupling nut, service plate, connector, elbow, pipe nipple, coupling, and dummy coupling. Tighten fittings securely.

d. Removal of Front Emergency Connection. Remove connection parts in the following order: dummy coupling, coupling, pipe

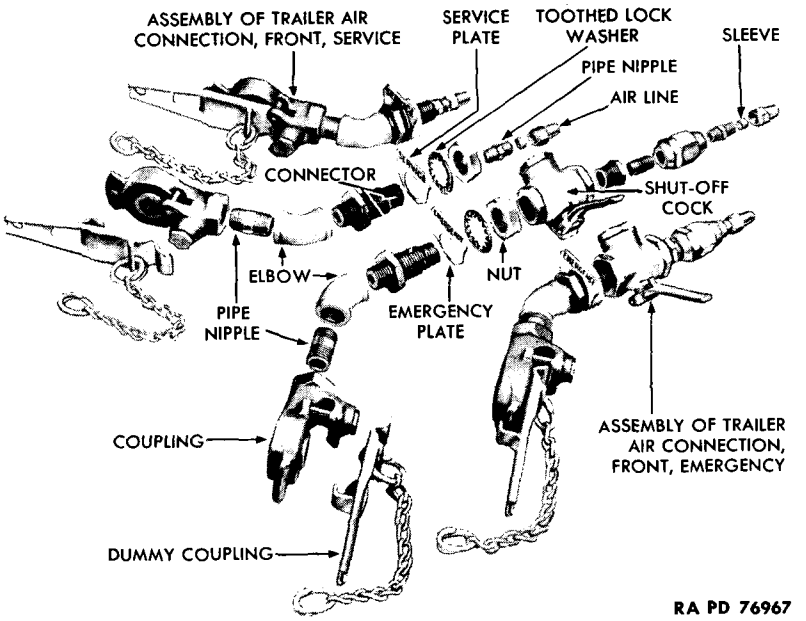

Figure 220—Semitrailer Air Connections—Front

nipple, elbow, connector, emergency plate, connector washer, coupling nut, shut-off cock, reducer, pipe nipple, check valve, and pipe nipple (fig. 220).

e. Installation of Front Emergency Connection (fig. 220). Install pipe nipple, check valve, pipe nipple, reducer, shut-off cock, coupling nut, connector washer, emergency plate, connector, elbow, pipe nipple, coupling, and dummy coupling. Tighten all fittings securely.

f. Removal of Rear Service or Emergency Connections (fig. 219). Remove parts in the following order: dummy coupling, coupling, connector, service or emergency plate, connector washer, coupling nut, shut-off cock, reducer, and pipe nipple.

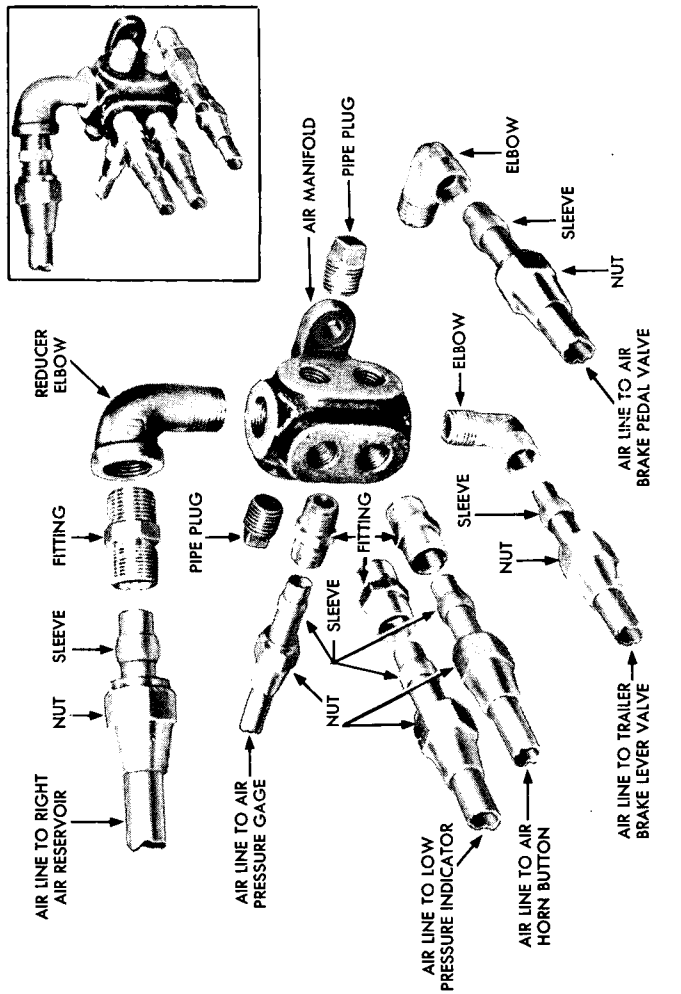

Figure 221—Air Manifold, Showing Air Lines

g. Installation of Rear Service or Emergency Connections (fig. 219). Install pipe nipple, reducer, shut-off cock, coupling nut, connector washer, service or emergency plate, connector, coupling, dummy coupling. Tighten fittings securely.

169. AIR MANIFOLD.

a. Description. The air manifold acts as a junction box for distribution of the compressed air to the various air units. The manifold is attached to the dash and is reached through the radiator door.

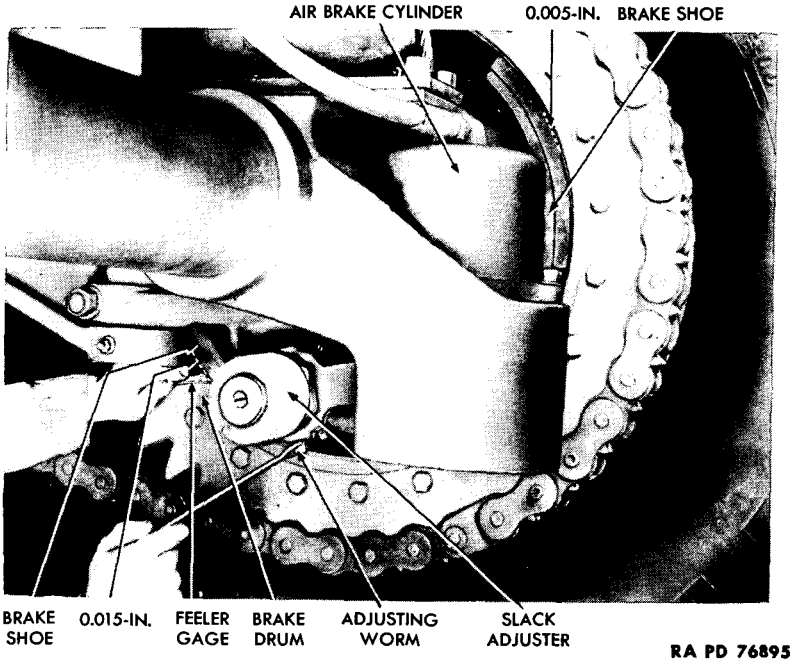

Figure 222—Adjustment of Service Brakes

b. Removal. Disconnect six air lines from inlet and outlet fittings. Remove two bolts, nuts, and lock washers that hold manifold to dash and lift off manifold.

c. Installation. Install manifold on dash and fasten with two bolts, nuts, and lock washers. Connect six air lines to manifold inlet and outlet fittings.

170. RELAY VALVE.

a. Description. The relay valve is located on the chassis frame at the rear of the left reservoir. This valve is connected by air lines to the foot-operated brake valve and wheel cylinders. It is operated by the foot valve to speed up application and release of wheel brakes.

b. Removal. Disconnect six air lines from inlet and outlet fittings on valve. Remove two bolts, nuts, and lock washers that hold valve to frame and lift off valve.

c. Installation. Install valve on frame and fasten with two bolts, nuts, and lock washers. Connect the six air lines to the valve inlet and outlet fittings.

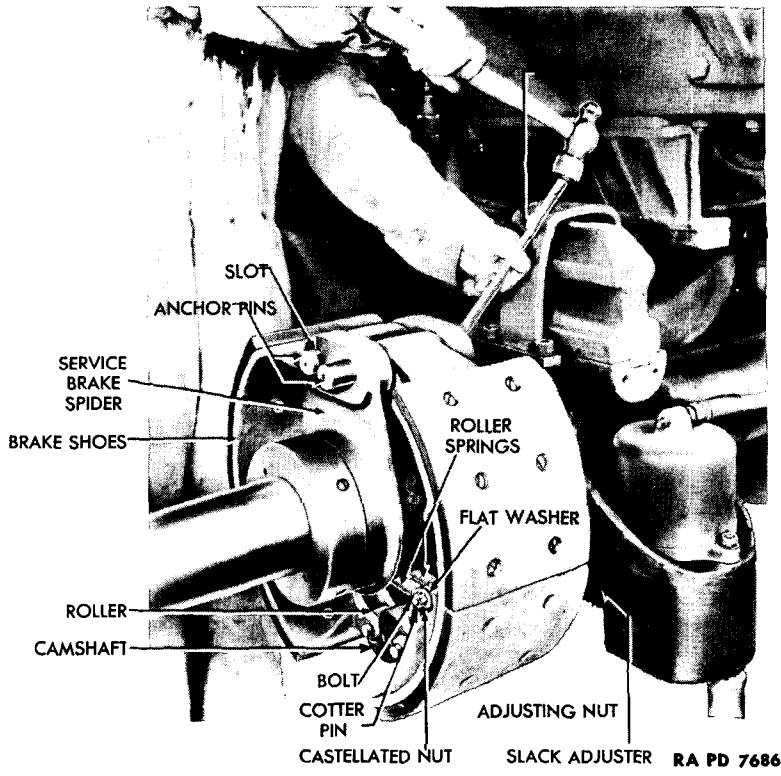

Figure 223—Removal of Service Brake Shoes

171. SERVICE BRAKE SHOES.

a. Description (fig. 222). There are four brake shoe assemblies in the rear axle tandem unit assembly, one for each of the four stationary axle hub and drum assemblies. Each brake shoe assembly is secured to the top of a brake spider by means of two brake shoe anchor pins, one pin securing each brake shoe to the spider. Brake drums are installed over the brake shoes and the brake shoes are expanded against the service brake drums by means of the service brake cam which operates against the brake shoe rollers. The cam is rotated by the slack adjuster which is secured to the camshaft. The lower ends of the brake shoes of each brake shoe assembly are

held together by two service brake roller springs, which are secured to the shoes by means of two bolts, four flat washers, and two castellated nuts and cotter pins.

b. Adjustment (fig. 222). Adjustment is made by means of the adjusting worm on the bottom of each air brake slack adjuster. Tighten or loosen the service brake shoes until the clearance, measured with a feeler gage between the lining and brake drum, is 0.005 inch at the toe (top) and 0.015 inch at the heel (bottom) of each shoe. Turn the slack adjuster adjusting worm clockwise to tighten shoes against the drum, and counterclockwise to loosen them.

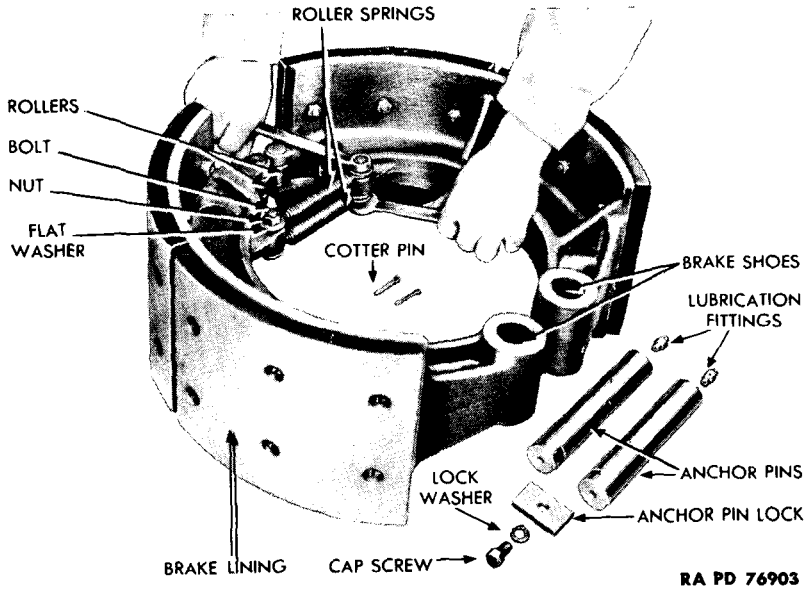

Figure 224—Removal of Service Brake Roller Springs

c. Removal (figs. 223 and 224).

(1) REMOVE HUB AND DRUM. Remove the wheels from hub and drum from which the brake shoes are to be removed, following the procedure given in paragraph 175. Then remove the hub and drum assembly, following the procedure given in paragraph 176.

(2) REMOVE BRAKE SHOE ASSEMBLY. Remove the cap screw and lock washers which secure the anchor pin lock to the brake spider. Then use a hammer and brass drift to drive out anchor pin, using caution not to damage the lubrication fitting. Do not remove the lubrication fitting, since the punch may damage fitting opening in the pin. Then lower one brake shoe and drive out the other anchor pin and lift off the brake shoe assembly.

(3) SEPARATE BRAKE SHOES. Remove the two bolts, castellated nuts and cotter pins, and four flat washers which secure the ends of the two roller springs to the two brake shoes at the bottom. Remove the other brake shoes in the same way.

d. Installation (figs. 223 and 224).

(1) INSTALL ROLLER SPRINGS. Loosen the brake adjusting worm on the slack adjuster as much as possible. Then secure the two brake shoes together at the bottom by means of the two roller springs, installing a bolt through each shoe and one end of each spring. Secure each bolt to spring and shoe with two flat washers, a castellated nut, and cotter pin.

(2) INSTALL BRAKE SHOE ASSEMBLY. Lift the brake shoe assembly into position on the brake spider and use a hammer and brass drift to drive the two anchor pins through the tops of the shoes and the brake spider. Install the anchor pin lock in the slots in the outer ends of the two anchor pins and secure lock to spider with a cap screw and lock washer.

(3) INSTALL HUB AND DRUM ASSEMBLY AND WHEELS. Install the hub and drum assembly (par. 176) and install wheels (par. 175). Adjust the brake shoes (subpar. **b** above).

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Section XXV

PROPELLER SHAFT BRAKE AND LINKAGE

172. DESCRIPTION AND DATA.

a. Description. The propeller shaft brake lever, located in the cab at the left of the driver, operates brake shoes which press against a propeller shaft brake drum. The drum is bolted between two uni-

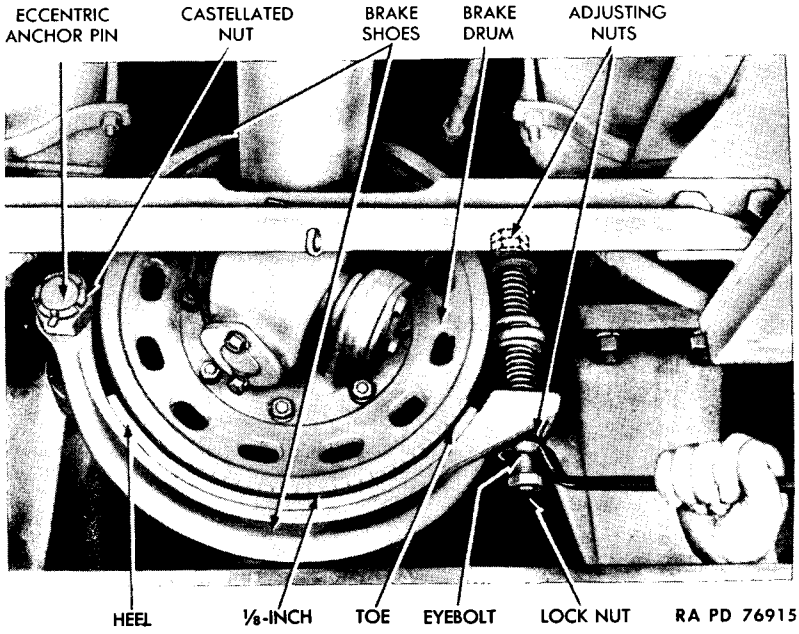

Figure 225—Adjustment of Drive Shaft Brake Shoes

versal joint companion flanges located at the rear of the transfer case. The brake lever and the clutch pedal use a cross linkage which is built in one unit. The rod which operates the brake extends from the brake and clutch cross linkage to the brake shoe actuating cam.

b. Data.

Make ..... Vulcan-Cochin
Model ..... A-FT 4712
Type ..... two-shoe

PROPELLER SHAFT BRAKE AND LINKAGE

173. SHOES AND DRUM.

a. Adjustment of Shoes (fig. 225).

(1) GENERAL. Adjustment procedure for parking brake linkage is given in paragraph 79. Clearance between drive shaft brake shoes and the brake drum should be ⅛ inch. Brake shoes are adjusted by means of an eccentric anchor pin for heel adjustment and by means of the eyebolt for toe adjustment.

(2) ADJUST BRAKE SHOES. Remove the rear cotter pin and castellated nut and turn the forward castellated nut, which is locked

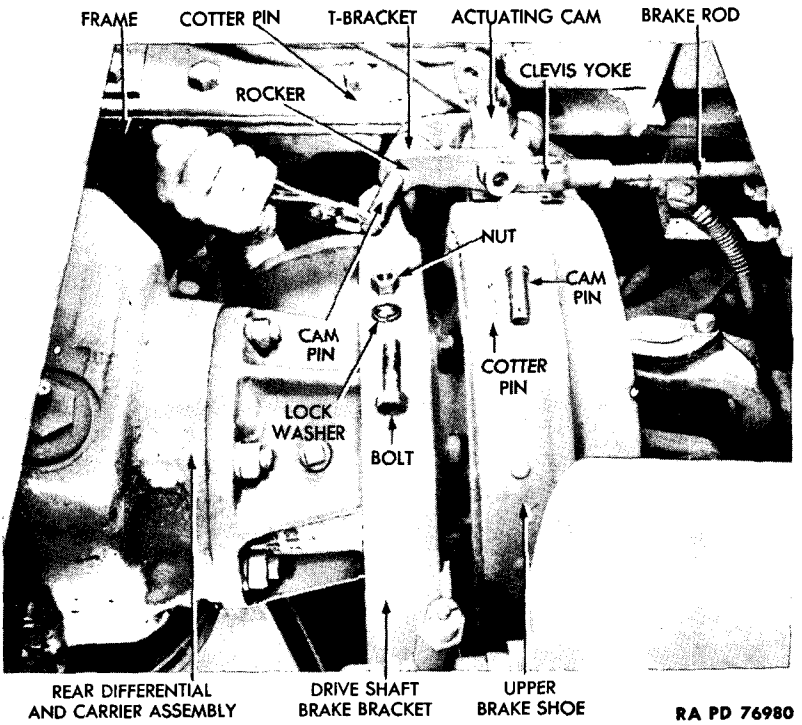

Figure 226—Disconnecting Drive Shaft Brake Rocker from T-bracket

to the anchor pin with a cotter pin, until ⅛-inch clearance at the heel of the brake shoes is attained. Then remove the lower lock nut on the eyebolt and adjust the top and lower adjusting nuts until ⅛-inch clearance is attained at toe of shoes.

b. Removal of Brake Shoes (fig. 227).

(1) REMOVE DUMMY COUPLING PLATE AND CAM PIN. Remove dummy coupling plate by loosening four cap screws until clips which secure plate to frame can be turned and lift plate from frame. From

underneath vehicle, remove cotter pin and cam pin which secure clevis yoke at rear end of brake rod to actuating cam.

(2) REMOVE ROCKER FROM T-BRACKET. Remove two bolts, nuts, and lock washers which secure T-bracket to the propeller shaft brake bracket. Turn T-bracket, rocker, and cam toward left side of frame and remove cam pin and cotter pin which secure rocker to T-bracket (fig. 208).

(3) REMOVE T-BRACKET. Remove lock nut, adjusting nut, and pad from bottom of eyebolt (fig. 209). Drop lower brake shoe and remove lower eyebolt spring, linkage rocker washers and T-bracket from eyebolt.

(4) REMOVE BRAKE SHOES. Next remove cotter pin and castellated nut from front end of anchor pin and remove lower brake shoe and upper brake shoe. Remove nut and linkage rocker washer from eyebolt and remove upper eyebolt spring and washers. Remove eyebolt and attached parts from upper brake shoe.

c. Installation of Brake Shoes (fig. 227).

(1) INSTALL BRAKE SHOES. Install eyebolt, with parts attached, through end of upper brake shoe and install linkage rocker washer, eyebolt spring and second washer in end of eyebolt. Secure them in place by installing the nut on the end of the eyebolt. Then position upper brake shoe on anchor pin and brake drum and place lower brake shoe on anchor pin. Install castellated nut on front end of anchor pin, and lock nut and anchor pin with a cotter pin.

(2) INSTALL T-BRACKET. Then install on eyebolt, in order named, T-bracket, one linkage rocker washer, lower eyebolt spring, second linkage rocker washer, pad adjusting nut, and lock nut.

(3) INSTALL ROCKER. With rear of T-bracket swung toward left side of frame, install cam pin and cotter pin which secure rocker to T-bracket. From underneath vehicle secure T-bracket to drive shaft brake bracket with two bolts, nuts, and lock washers. Connect brake rod to actuating cam by installing cam pin and cotter pin which hold clevis yoke to cam.

(4) INSTALL DUMMY COUPLING PLATE. Install dummy coupling plate, locking four clips under frame side channels and tightening four cap screws. Adjust brake shoes (subpar. **a** above).

d. Removal of Drum. Loosen brake shoes at eyebolt adjusting nut. Remove eight nuts and lock washers which secure universal flange yoke to companion flange. Remove yoke, tap bolts through companion flange, and remove drum from brake shoes.

e. Installation of Drum. Lift brake drum into position inside shoes and place universal flange yoke in position over drum. Install eight bolts from rear of companion flange through the flange and universal flange yoke and secure drum and yoke by installing nuts and lock washers on bolts. Adjust brake shoes (subpar. **a** above).

PROPELLER SHAFT BRAKE AND LINKAGE

Figure 227—Removal of Universal Flange Yoke from Companion Flange at Drive Shaft Brake Drum

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174. LEVERS AND LINKAGE.

a. Removal. Remove clutch and brake cross shaft linkage (par. 79). Remove clevis pins and cotter pins which hold brake rod to cross shaft and to brake shoe actuating cam and remove rod.

b. Installation. Install clutch and brake cross shaft linkage (par. 79). Install brake rod and secure to cross shaft and brake shoe actuating cam with clevis and cotter pins. Adjust brake as instructed in paragraph 173.

Section XXVI

WHEELS, HUBS, WHEEL BEARINGS, AND TIRES

175. WHEELS.

a. Description and Data.

(1) DESCRIPTION. Single steel wheels are used on the front wheels and dual steel wheels are used on the rear wheels. The wheels are secured to the wheel studs and carry the tires which are mounted on a demountable rim and secured with a tire retaining ring.

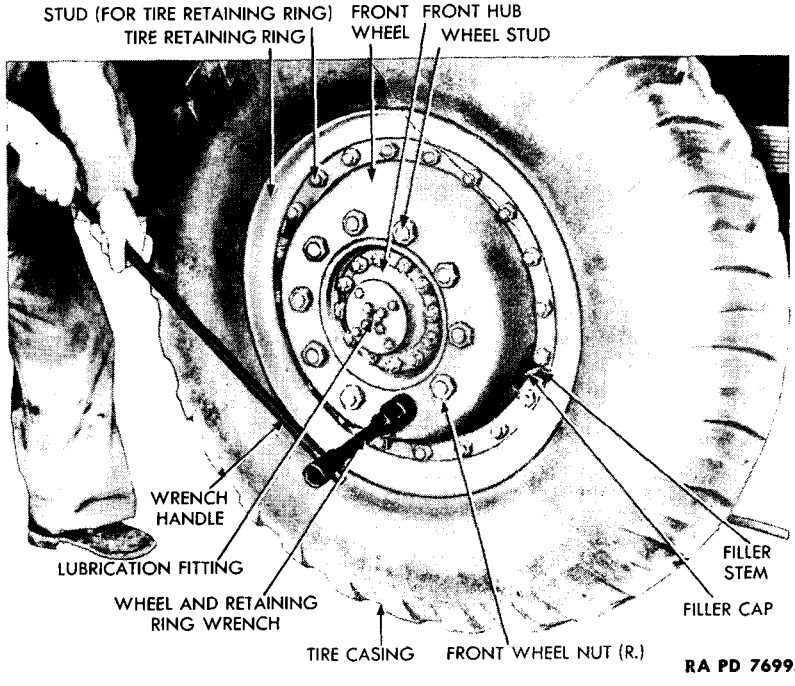

Figure 228—Removing Front Wheel and Tire Assembly

(2) DATA.

Make	Budd
Size	14.00–24

b. Removal. Jack up vehicle at wheel to be removed until tire is free of ground. Remove wheel nuts, using special wheel and retaining ring nut wrench and handle. Rock wheel off wheel studs and

roll wheel and tire assembly to one side. Remove tire assembly (par. 177).

c. **Installation.** Install tire assembly in place and rock wheel onto wheel studs. Install wheel stud nuts and tighten them securely. Lower vehicle and remove jack.

176. HUBS AND WHEEL BEARINGS.

a. Description and Data.

(1) DESCRIPTION.

(a) Front Hubs. The two front hub assemblies to which the front wheels are attached rotate on front wheel bearing cones and are

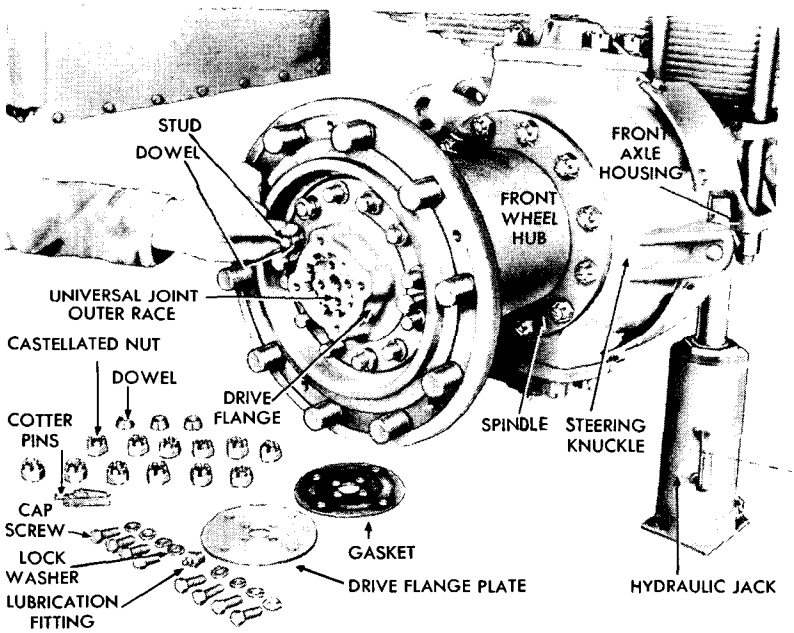

Figure 229—Removal of Front Axle Drive Flange

secured on the spindles by means of a wheel bearing adjusting nut, lock washer, and lock nut.

(b) Rear Hubs. There are four wheel and hub assemblies on the rear axle tandem unit, one at each end of each stationary carrier axle. The hub is bolted to the service brake drum and the stationary axle drive sprocket is bolted to the drum. Two of the four hub and drum assemblies have spacers between the sprocket and drum. Each hub rides on two roller type wheel bearings which are supported on the stationary carrier axle. Wheels are bolted to hub studs.

(2) DATA.

Bearings:

Make	Timken
Model:	
Rear wheel outer bearing cone	Tim 941
Rear wheel inner bearing cone	Tim 938
Rear wheel inner and outer bearing cup	Tim 932
Front wheel inner bearing cone	Tim 64450
Front wheel outer bearing cone	Tim 62400
Front wheel outer bearing cup	Tim 52638
Front wheel inner bearing cup	Tim 64700

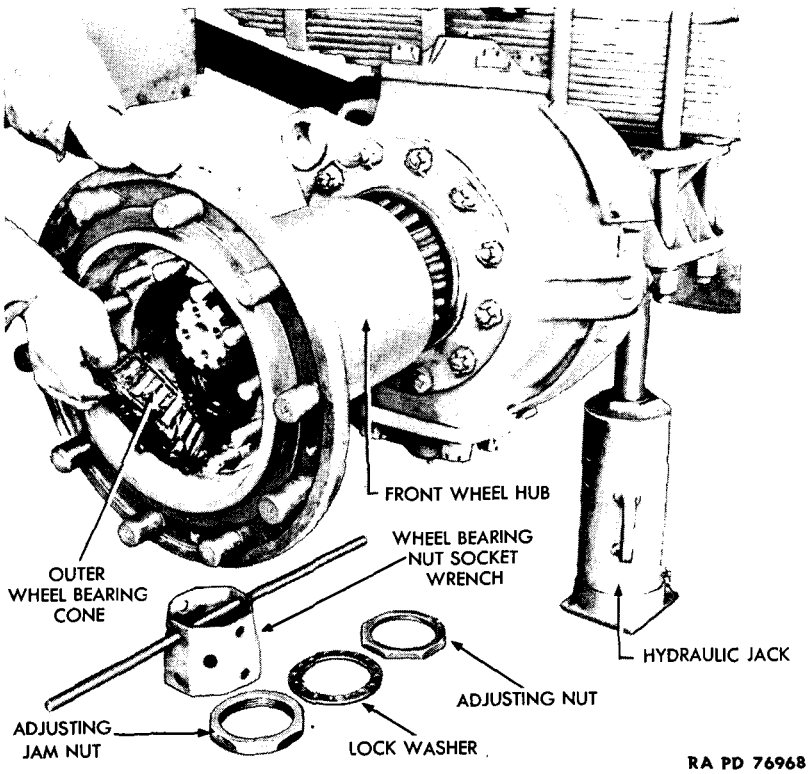

Figure 230—Removal of Outer Wheel Bearing Cone

b. Wheel Bearing. Raise wheel clear of ground with a jack and remove eight cap screws and lock washers which hold drive flange plate and then remove plate. Use wheel bearing nut socket wrench and remove wheel bearing adjusting lock nut and lock washer. Tighten wheel bearing adjusting nut until wheel binds when turned.

Revolve wheel eight or ten times to be sure that all bearing surfaces are in contact and then back off the wheel bearing adjusting nut sufficiently to permit wheel to revolve freely. Install bearing lock washer and lock nut and remove jack.

c. Removal of Front Hub and Wheel Bearings.

(1) REMOVE FRONT WHEEL. Remove wheel from hub which is to be removed, following the procedure given in paragraph 175.

(2) REMOVE FRONT AXLE SHAFT DRIVE FLANGE (fig. 229). Remove eight cap screws and lock washers which hold front axle drive flange plate to universal joint outer race and to drive flange and lift off plate and gasket. Remove lubrication fitting from universal joint

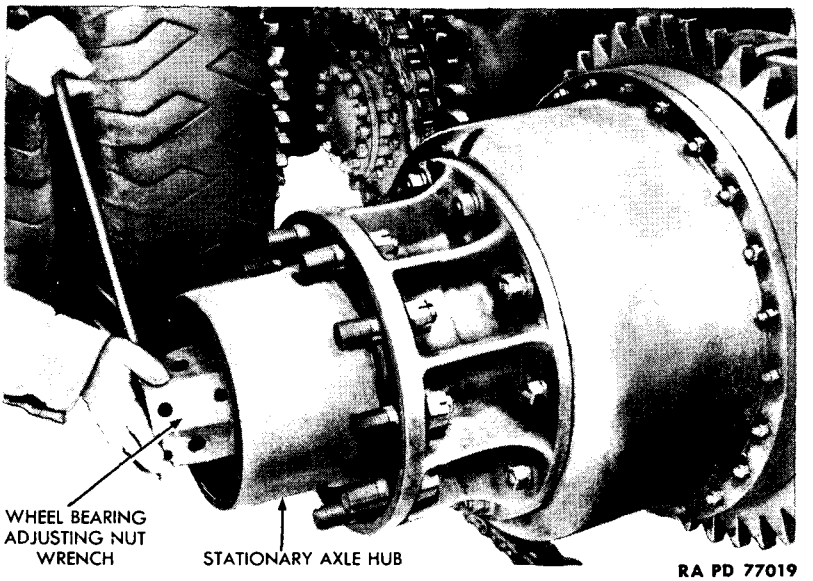

Figure 231—Removal of Rear Wheel Bearing Adjusting Nut

outer race. Next remove twelve cotter pins and castellated nuts which secure drive flange to hub studs. Use two puller screws and pull drive flange from hub sufficiently to remove the 12 dowels from hub studs. To remove dowels, loosen puller screws, tap drive flange back toward hub and lift dowels from studs and drive flange. Then again tighten puller screw until drive flange can be removed. Remove front axle drive flange gasket.

(3) REMOVE OUTER WHEEL BEARING CONE (fig. 230). Use special wheel bearing nut socket wrench to remove wheel bearing adjusting nut lock nut. Lift out lock washer and use same special wrench to remove wheel bearing adjusting nut. Pull hub forward slightly to loosen bearing cone, push hub back into its running position, and pull out cone.

(4) REMOVE FRONT WHEEL HUB, INNER BEARING CONE AND SEAL (fig. 230). Lift front wheel hub outward and off of front axle spindle. Remove wheel inner bearing cone and oil seal from spindle. Drive inner and outer bearing cups out of hub.

d. Maintenance. Clean bearings in dry-cleaning solvent and remove all grease and dirt. Dry bearings with compressed air, being careful to direct air stream across rollers to prevent them from spinning. Inspect cones and rollers for scratches, pitting, or chipped rollers, and replace any damaged parts.

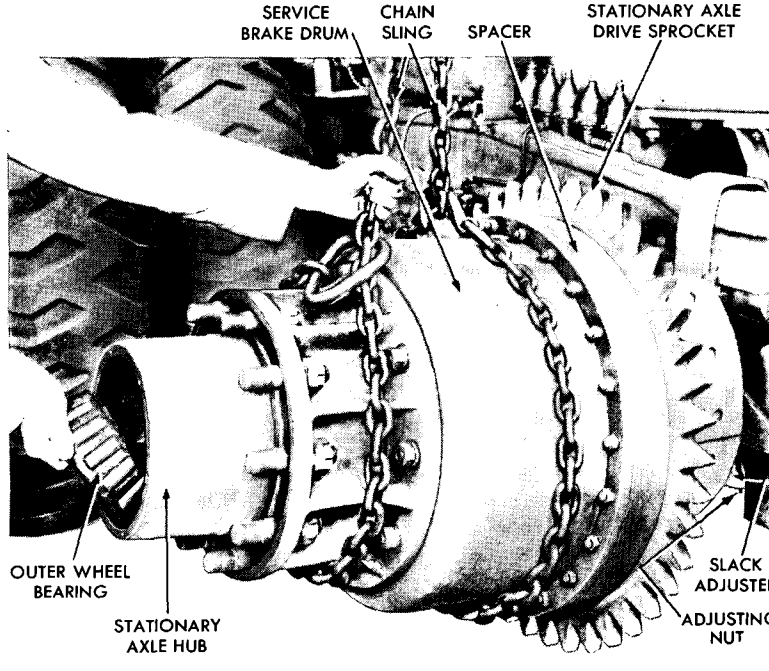

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Figure 232—Removal of Stationary Axle Hub and Drum Assembly

e. Installation of Front Hub and Bearings.

(1) INSTALL INNER AND OUTER BEARING CUPS. Drive cups into hub, tapping around circumference of cups so that they will not cock. NOTE: *Use a brass drift to prevent damaging cups.*

(2) INSTALL INNER BEARING SEAL AND CONE AND HUB (fig. 230). Install front wheel bearing oil seal on spindle and install inner wheel bearing cone next to oil seal. Lift hub into position on spindle.

(3) INSTALL OUTER WHEEL BEARING CONE AND BEARING NUTS (fig. 230). Place outer wheel bearing cone in position in hub and install wheel bearing adjusting nut, using special wheel bearing nut

socket wrench. Tighten nut until hub binds when turned. Revolve hub eight or ten times to be sure all bearing surfaces are in contact. Then back off wheel bearing adjusting nut just enough to permit hub to revolve freely. Install wheel bearing adjusting nut lock washer and use same wrench to install wheel bearing adjusting nut lock nut.

(4) INSTALL FRONT AXLE SHAFT DRIVE FLANGE (fig. 229). Install a new front axle drive flange gasket over hub studs. Then place drive flange in position over studs and install the 12 dowels, castellated nuts, and cotter pins. Install front axle shaft drive flange plate on front axle shaft and universal joint assembly outer race and on drive flange, and secure the plate with eight cap screws and lock washers.

(5) INSTALL FRONT WHEELS. Follow the procedure given in paragraph 175.

f. Removal of Stationary Axle Hub, Bearings and Oil Seal.

(1) REMOVE DRIVE CHAIN AND WHEELS. Remove drive chain from stationary axle sprocket at hub which is to be removed, following the procedure outlined in paragraph 146. Remove wheels from hub, following the procedure given in paragraph 175.

(2) REMOVE WHEEL BEARING NUTS. Remove six cap screws and lock washers, which hold stationary axle hub cap to hub, and remove cap and gasket. Use wheel bearing nut wrench and remove wheel bearing adjusting nut lock nut. Remove lock washer and wheel bearing adjusting nut using same wrench (fig. 231).

(3) REMOVE HUB AND DRUM. Loosen adjusting nut on slack adjuster to eliminate any pressure of brake shoes against brake drums. Place a chain sling around hub and drum and use a hoist to take weight of hub and drum off of axle. Pull hub and drum assembly outward. As this is done the outer wheel bearing cone will come loose and can be lifted out. Remove hub assembly from axle and lower it to floor. Then remove inner wheel bearing from stationary carrier axle.

(4) REMOVE HUB OIL SEAL AND BEARING CUPS (fig. 233). Remove eight cap screws and lock washers which secure wheel bearing oil seal wiper to hub and remove wiper. Then position a pry bar through outer end of hub and against oil seal and drive around circumference of oil seal toward brake drum until it is driven from the hub. CAUTION: *Never install a used oil seal.* Drive inner and outer bearing cups from hub, being careful not to cock cups while driving them out.

(5) REMOVE BRAKE DRUM AND DRIVE SPROCKET ASSEMBLY. Remove nuts, lock washers and cap screws which secure drum to hub, and lift off drum and sprocket assembly.

g. Installation of Stationary Axle Hub, Bearings and Oil Seal.

(1) INSTALL BEARING CUPS AND OIL SEAL. Drive bearing cups into position in hub, being careful to tap around circumference of cups to prevent cocking and damaging them. Drive a new oil seal into position in brake drum side of hub in same manner. Install wheel

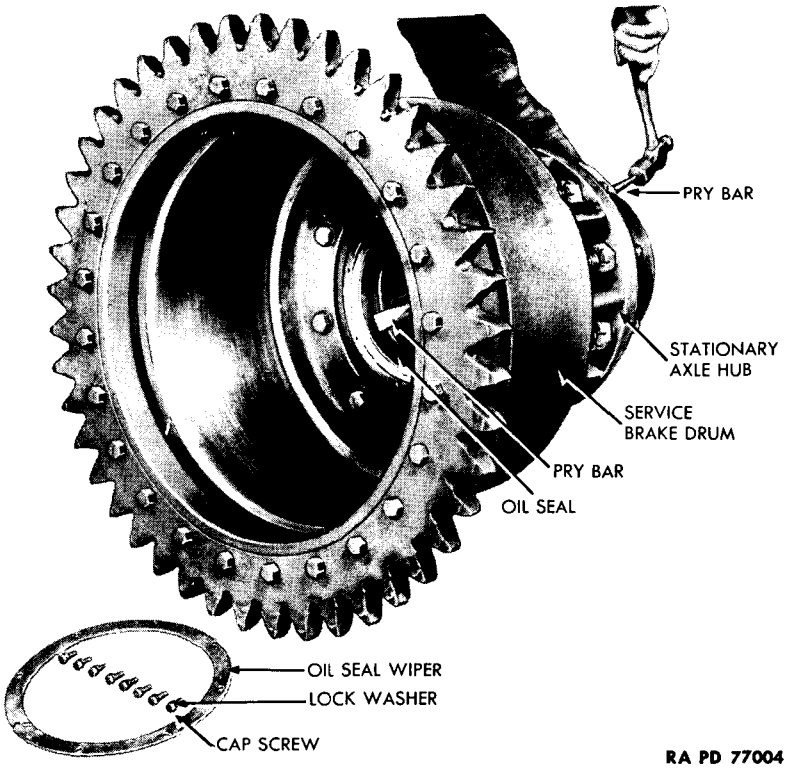

Figure 233—Removal of Stationary Axle Hub Oil Seal

bearing oil seal wiper over seal and secure it to hub with eight cap screws and lock washers.

(2) INSTALL BRAKE DRUM AND DRIVE SPROCKET ASSEMBLY. Place drum and sprocket assembly in position on hub and secure it to hub with cap screws, lock washers and nuts.

(3) INSTALL HUB AND DRUM ASSEMBLY. Place inner bearing cone in position on axle. Place a chain sling around hub and drum and use a hoist to lift assembly onto the axle, with brake drum in position over brake shoes. Before placing assembly over brake shoes, make sure that adjusting nut on slack adjuster has been loosened to prevent brake shoe from fitting tightly into brake drum. Then install outer wheel bearing cone on end of stationary carrier axle and into hub.

(4) INSTALL WHEEL BEARING NUTS AND ADJUST BEARINGS. Install wheel bearing adjusting nut on axle and tighten securely with wheel nut wrench. Then install lock washer next to nut, noting its position. Remove washer and back up nut a distance equivalent to

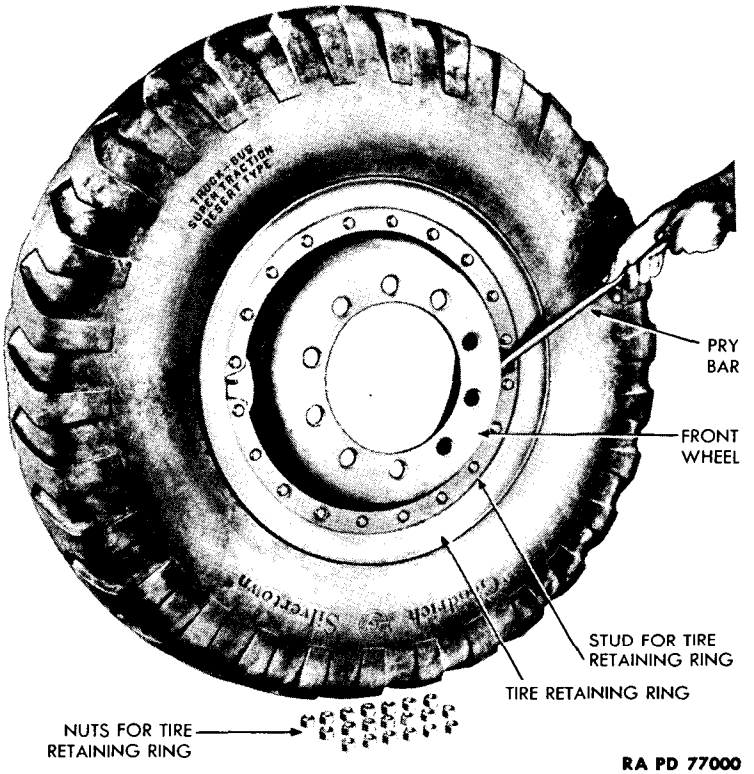

Figure 234—Removing Tire Retaining Ring

ten holes in lock washer. Reinstall lock washer and install adjusting nut lock nut.

(5) INSTALL HUB CAP. Cement a new gasket to stationary axle hub cap and install cap and gasket on hub, securing cap with six cap screws and lock washers.

(6) INSTALL DRIVE CHAIN AND WHEELS. Install drive chains (par. 146). Install wheel and tire assemblies (par. 175).

177. TIRES.

a. Description and Data.

(1) DESCRIPTION. The tires are of the combat or desert type and have puncture-proof inner tubes which are retained in the casing by a collapsible ring.

(2) DATA.

Make	Goodyear or Goodrich
Type	combat or desert
Air pressure	80 lb

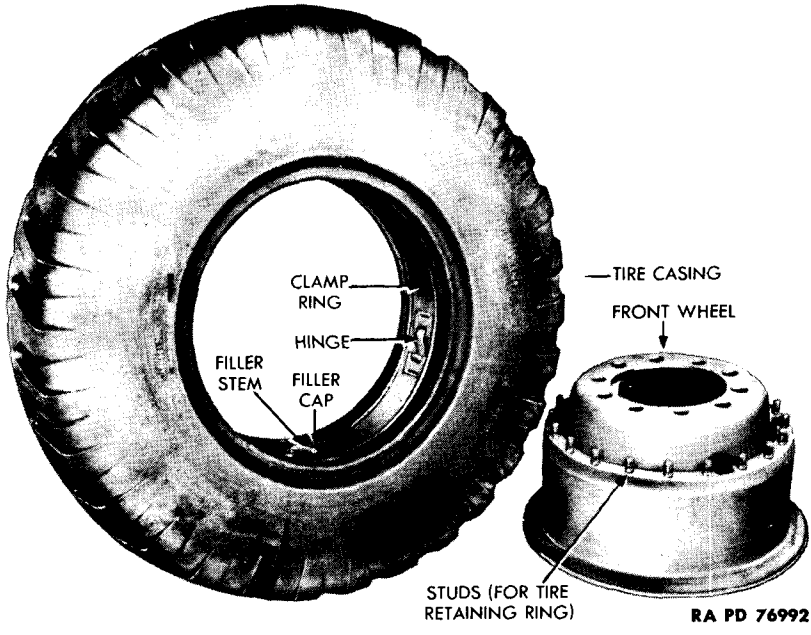

Figure 235—Tire Casing and Tube Assembly

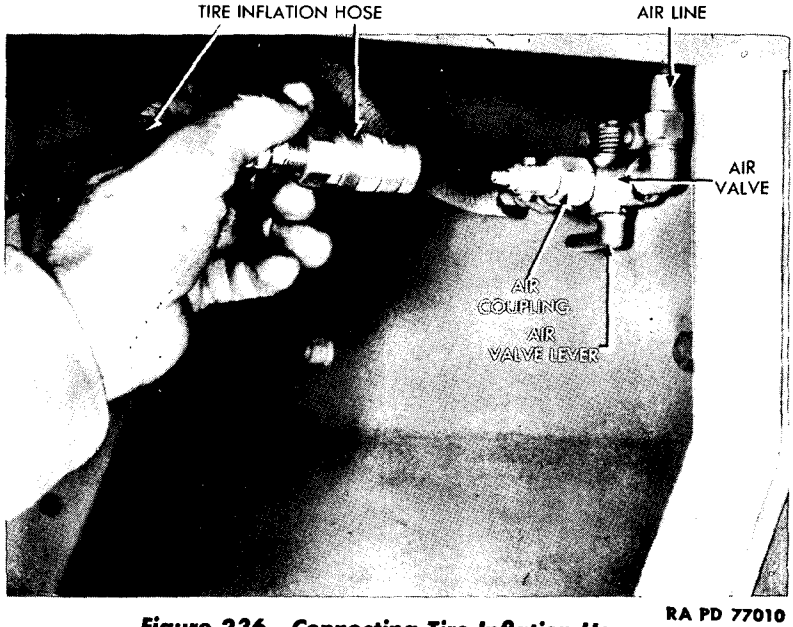

Figure 236—Connecting Tire Inflation Hose

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b. Removal. Remove wheel and tire assembly (par. 176). Remove nuts which hold retaining ring on wheel and pry off ring. Push wheel out of tire, then collapse clamp ring and remove from tire casing. Pull tube out of casing.

c. Maintenance. Inspect casings and tubes for cuts and bruises. Repair tubes by cold patching. Report damaged tires to higher authority.

d. Installation. Install tube in tire casing. Then install clamp ring and expand ring. Install wheel in casing and secure with tire retaining ring. Install wheel and tire assembly on vehicle (par. 176).

e. Inflation Hose. The tractor has a tool box just to the rear of the left door (fig. 236). One of the items that is carried in this box is an air hose. An air coupling which is a part of the air system is secured to the rear side of this tool box. Tires of the tractor or semi-trailer can be inflated by attaching the tire inflation hose to the coupling and then turning the air valve lever on the air coupling to its open position (fig. 236).

Section XXVII

SPRINGS AND SHOCK ABSORBERS

178. FRONT SPRINGS AND SHACKLES.

a. Description and Data.

(1) DESCRIPTION (fig. 194). Two semielliptic leaf springs are suspended to frame brackets at the front of the vehicle by means of shackles at the rear of each spring and directly to the brackets at the front of the springs. The springs are secured to the front axle housing by two U-bolts and a spring saddle at each spring. The upper end of each shackle is secured to the hanger bracket by a shackle bolt and bushing. The rear of each spring is secured to the lower end of the shackle in the same manner. The front shackle bolt secures the spring to the front bracket by means of a front spring eye and bushing which is clipped to the front ends of the spring leaves.

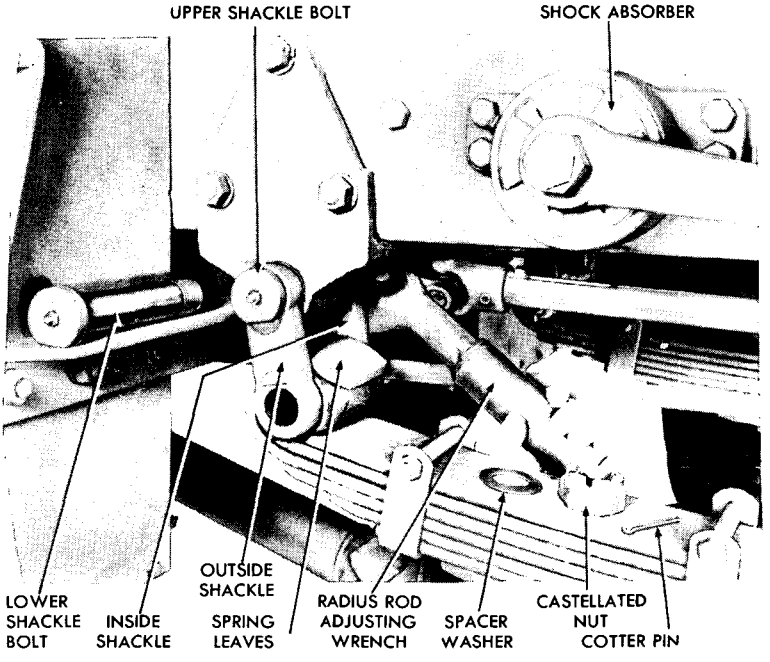

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Figure 237—Removal of Spring Shackles

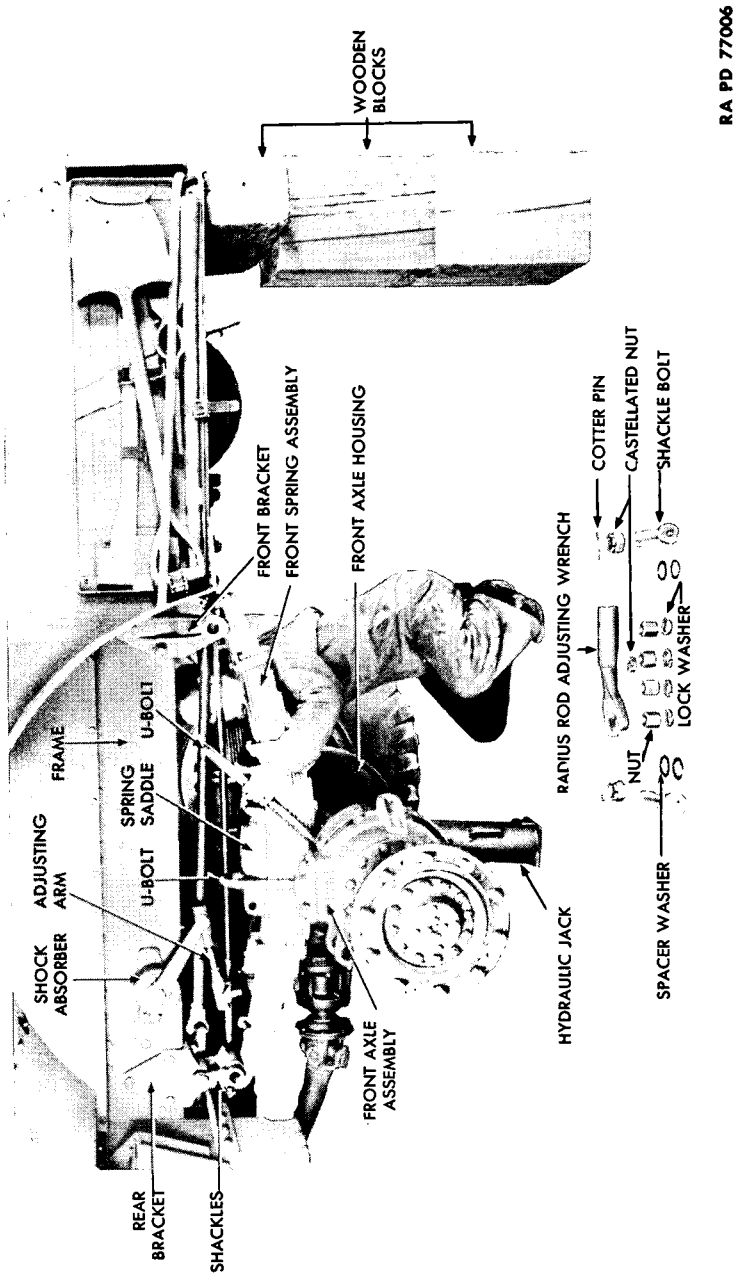


Figure 238—Removal of Front Springs

SPRINGS AND SHOCK ABSORBERS

b. Removal of Spring Shackles (fig. 237).

(1) JACK UP FRONT END OF VEHICLE. Using wooden blocks and a hydraulic jack, jack up front end of frame until weight of vehicle is taken off springs; this will eliminate binding at spring shackles.

(2) REMOVE SHACKLES. Then remove cotter pin and use radius rod adjusting nut wrench to remove castellated nut from lower shackle bolt at rear of spring. Drive bolt from spring and bushing. Remove two spacer washers. In a similar manner, remove upper shackle bolt and remove outside and inside shackles.

c. Installation of Spring Shackles (fig. 237). Install outer shackle on one shackle bolt. Then install a spacer washer and drive bolt through bracket and bushing. As bolt comes out back of bracket, install spacer washer, inner shackle and castellated nut. Tighten castellated nut with radius rod adjusting wrench and lock nut and bolt with a cotter pin. In a similar manner, install lower front spring shackle bolt through shackles and spring bushing. Lower vehicle to ground and remove jack and wood blocks.

d. Front Spring Removal (fig. 238).

(1) JACK UP VEHICLE AND REMOVE WHEEL. Block rear wheels so vehicle will not move forward or backward. Use a hoist or wooden blocks and a hydraulic jack to jack up front end of frame. Place wooden blocks under front end of frame and remove jack or hoist. Then remove wheel from side of the vehicle from which spring is to be removed. Do not move jack from under axle housing after wheel has been removed.

(2) REMOVE FRONT SPRING. Disconnect shock absorber arm from spring saddle by removing cotter pin and castellated nut from adjusting arm and bolt. Drive arm and bolt free of saddle. Remove four nuts and lock washers which secure two U-bolts around spring saddle and spring and to front axle housing. Then remove cotter pin and use radius rod adjusting wrench to remove castellated nut from shackle bolt at front of spring and drive bolt from bracket and spring. Remove two spacer washers. In a similar manner, remove lower shackle bolt at rear end of spring. By means of hydraulic jack, lower axle housing and spring until two U-bolts can be removed. Remove spring saddle; then remove spring. Remove other spring in same manner.

e. Front Spring Installation (fig. 238).

(1) INSTALL SPRING. Block up front end of frame and position a hydraulic jack under front axle housing on side where spring is to be installed. Then lift spring into position on front axle housing. Install spring saddle and two U-bolts over saddle, dropping U-bolts over spring and through front axle housing bolt holes.

(2) INSTALL SPRING AND LOWER VEHICLE. By means of hydraulic jack, raise front axle housing and spring until front bracket and rear shackle holes are in alinement with bushings in ends of spring. Insert a spacer washer at each side of bushing at each end of spring. Then drive lower rear spring shackle bolt through shackles and bushing at

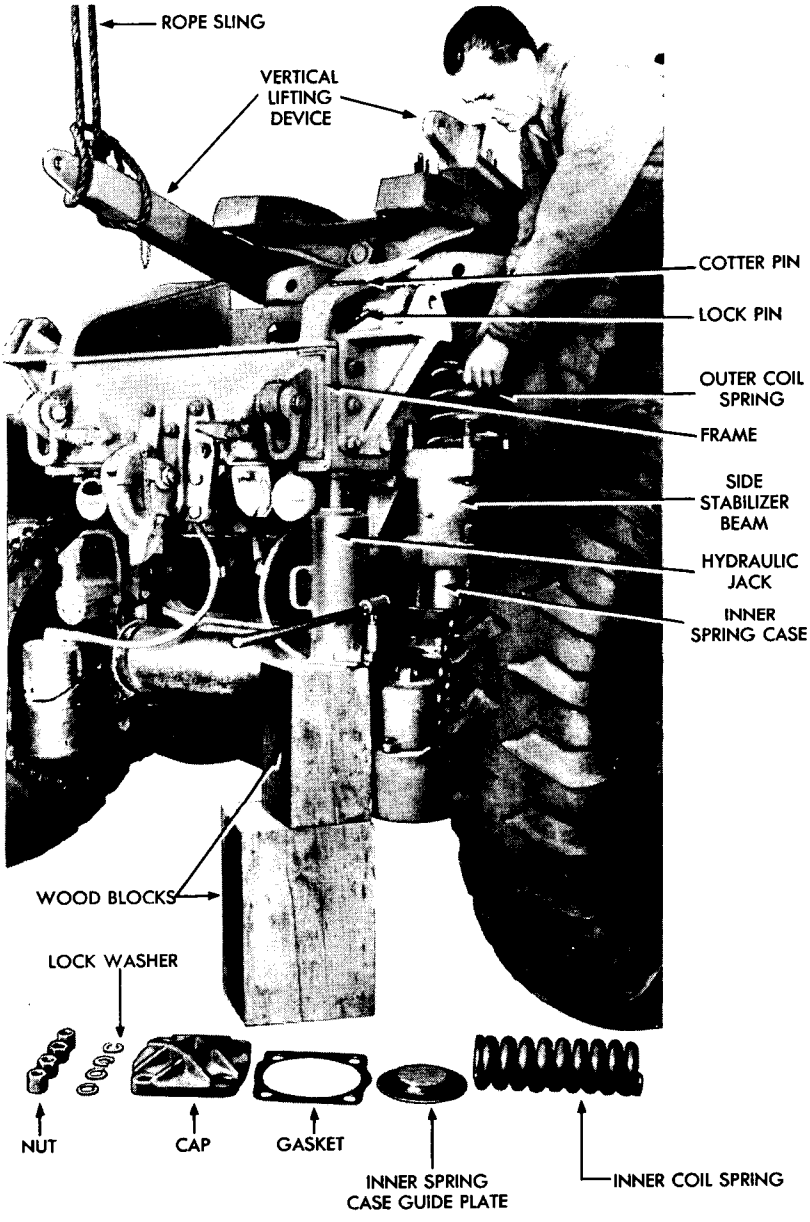


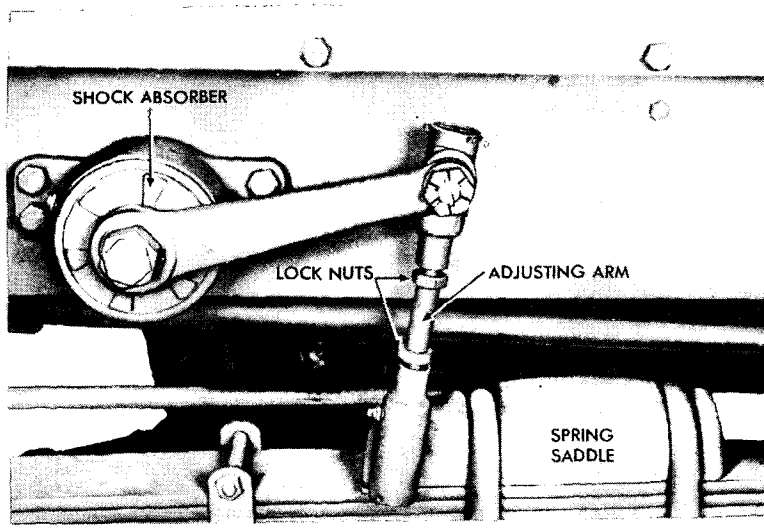
Figure 239—Removal of Stabilizer Springs

rear end of spring. Use a radius rod adjusting wrench to install castellated nut which secures bolt in place. Lock nut and bolt with a castellated nut. In a similar manner, install shackle bolt at front end of spring. Install other front spring in same manner.

179. REAR STABILIZER SPRINGS.

a. Description and Data (fig. 239).

(1) DESCRIPTION. The stabilizer springs consist of two coil springs, an inner and an outer, located in an inner spring case in the rear end of each side stabilizer beam. The inner spring case rests on the end of a leaf spring which is secured to the end of the side stabilizer



RA PD 76986

Figure 240—Adjustment of Shock Absorber

beam. The coil springs and inner case are secured in the spring opening in the end of the side stabilizer beam by an inner spring case end guide plate and stabilizer spring cap.

(2) DATA.

Type	coil
Number used	2 inner and 2 outer

b. Removal (fig. 239).

(1) LIFT VERTICAL LIFTING DEVICE. In order to lift inner and outer coil springs from inner spring case, it is necessary to lift the vertical lifting device. Remove two rear lock pins by first removing cotter pin from end of each lock pin. Use a hoist and rope sling to lift rear end of the vertical lifting device upward about a foot; if a hoist is not available, two men can lift it, and the vertical lifting device can be blocked up.

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(2) JACK UP REAR OF FRAME. Place a hydraulic jack on wooden blocks and jack up rear end of frame sufficiently for all pressure of coil springs to be taken off stabilizer spring cap.

(3) REMOVE COIL SPRINGS. Remove four nuts and lock washers which secure cap to studs on end of side stabilizer beam and remove cap and gasket. Lift out inner spring case end guide plate and remove inner and outer coil springs. NOTE: *If left-hand stabilizer springs are to be removed, remove two bolts, nuts, and lock washers which secure chain guard to side stabilizer beam, and remove chain guard before removing stabilizer spring cap.*

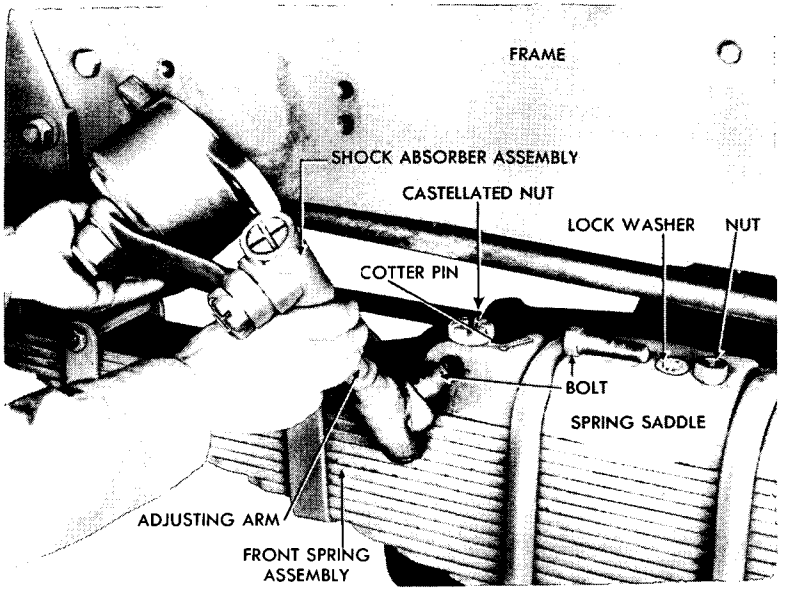

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Figure 241—Removal of Shock Absorber

c. Installation (fig. 239).

(1) INSTALL COIL SPRINGS. Install outer and inner coil springs in inner spring case. Install spring inner case and guide plate on top of springs. Install a new gasket and stabilizer spring cap. If left-hand springs are being installed, install chain guard with two straps over studs on end of side stabilizer beam and secure guard to beam with two bolts, nuts, and lock washers. Secure cap to studs with four nuts and lock washers.

(2) SECURE VERTICAL LIFTING DEVICE AND LOWER FRAME. Lower vertical lifting device and secure it in place by installing rear lock pins and secure lock pins with cotter pins. Lower rear of frame and remove jack and wooden blocks.

SPRINGS AND SHOCK ABSORBERS

180. SHOCK ABSORBERS AND LINKAGE.

a. Description. Two cam and lever type shock absorbers are used to control front spring action and absorb road shocks. One shock absorber is secured to each side of frame, and each shock absorber adjusting arm is attached at its lower end to the spring saddle.

b. Adjustment (fig. 240). Loosen two lock nuts on shock absorber adjusting arm. Then turn adjusting arm, extending length of arm to increase shock absorber pressure and shortening length to decrease pressure. When desired adjustment has been attained, tighten lock nuts.

c. Removal (fig. 241). Remove cotter pin and castellated nut which secure shock absorber adjusting arm to spring saddle. Then remove four bolts, nuts, and lock washers which secure shock absorber to frame. NOTE: *To remove these bolts, it is necessary to remove the right-hand engine compartment side cover and hold nuts, at inside of right-hand frame side channel, to prevent them from turning while bolts are unscrewed from outside frame. Lift shock absorber and linkage from vehicle. Remove second shock absorber in same manner.*

d. Installation (fig. 241). Lift shock absorber into position inserting adjusting bolt and lower bolt through hole in spring saddle. Secure shock absorber to frame with four bolts, nuts and lock washers holding nuts at inside of right-hand frame side channel while tightening bolts from outside of frame. Secure arm to spring saddle by installing a castellated nut and cotter pin on bolt. Install right-hand engine compartment side cover. Adjust shock absorber, if necessary, as outlined in subparagraph **b** above.

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Section XXVIII

STEERING GEAR AND HYDRAULIC SYSTEM

181. DESCRIPTION AND DATA FOR SYSTEM.

a. Description (fig. 242). The steering system consists of the steering gear assembly, which has a hydraulic cylinder with piston secured to the top of the steering gear housing, and a hydraulic control valve secured to the bottom of the steering gear housing. The hydraulic portion of the system consists of a hydraulic oil reservoir, secured to the inside of the rear engine cover, and connected by oil lines to a hydraulic pump located on the left side of the engine and driven by the engine sprocket chain. The hydraulic pump delivers the oil under pressure to the hydraulic control valve. A bypass is provided in the pump so that if oil is not required at the control valve, it is bypassed. If the steering wheel is turned to the right, or the left, the hydraulic system comes into operation automatically and is of great assistance to the operator in turning the vehicle. This is accomplished by piping the oil under pressure from the control valve to the hydraulic cylinder where it actuates the piston which applies pressure on the steering gear levers. Whenever effort at the steering wheel is released, the oil pressure becomes balanced and the hydraulic system is inoperative, causing the oil again to be bypassed at the pump.

b. Data.

Steering Gear:

Make	Ross
Model	780
Type	hydraulic

Hydraulic Pump:

Make	Bendix
Model	332872

Hydraulic Reservoir, Valve and Cylinder:

Make	Bendix

STEERING GEAR AND HYDRAULIC SYSTEM

182. HYDRAULIC PUMP.

a. Description (fig. 244). The hydraulic pump is a rotor type pump mounted on the left side of the engine. It is in operation during the time the engine is running and is driven from the governor drive shaft through a flexible coupling on the end of the pump drive shaft. It draws oil through a line from the reservoir and delivers the oil under pressure through an outlet line to the valve.

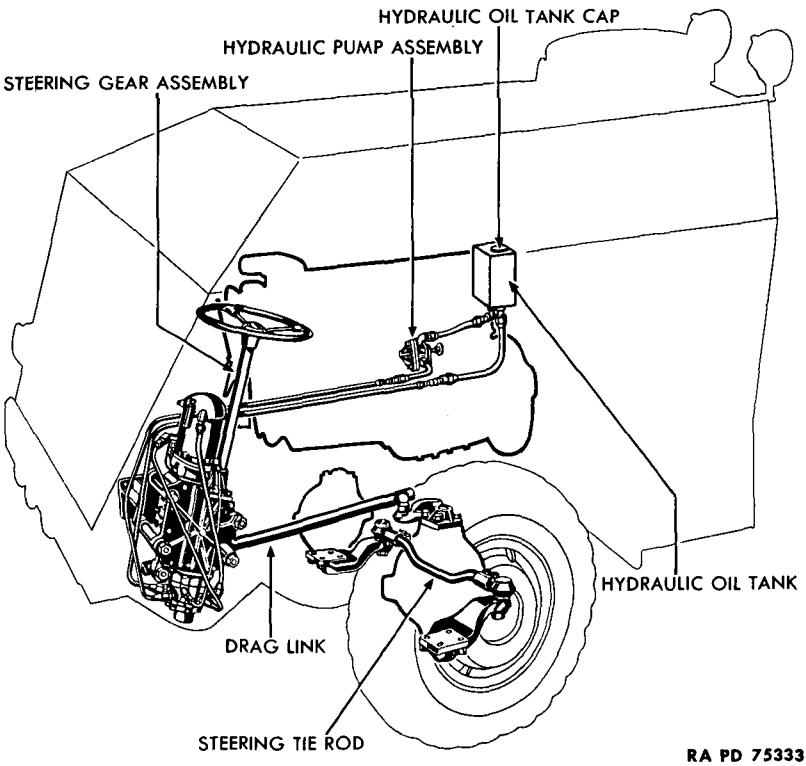

Figure 242—Hydraulic Steering System—Schematic View

b. Removal. Loosen clamps and remove carburetor to air duct pipe. Disconnect hydraulic oil flexible inlet and outlet hose from pump. Remove two flexible coupling nuts and bolts which hold coupling to flexible coupling flange. Remove four cap screws and lock washers which hold hydraulic pump to bracket on upper crankcase and lift pump assembly off upper crankcase.

c. Installation. Install pump on upper crankcase and fasten with four cap screws and lock washers. Connect flexible coupling to flexible coupling flange and fasten with two bolts and nuts. Connect hydraulic oil flexible hose to pump. Install carburetor to air duct pipe. Bleed system (par. 185).

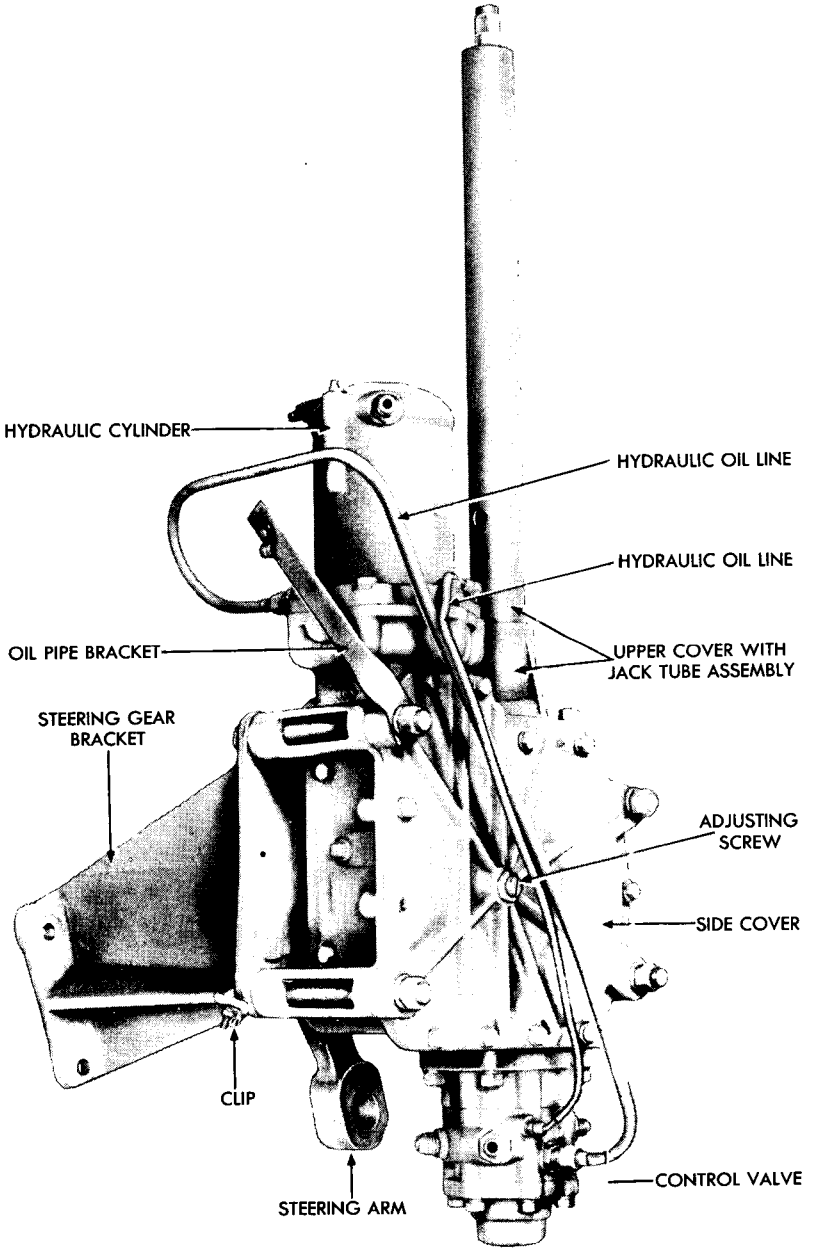

Figure 243—Steering Gear Assembly

STEERING GEAR AND HYDRAULIC SYSTEM

183. HYDRAULIC CYLINDER AND PISTON.

a. Description (fig. 245). The steering hydraulic cylinder is a hollow steel casting which is secured to the top of the steering gear housing. Oil lines connect the hydraulic control valve to the top and the bottom of the cylinder. The hydraulic steering piston operates inside the cylinder.

b. Removal.

(1) DISCONNECT OIL LINES. Disconnect oil line at control valve which is located at the bottom of the steering gear housing and drain oil into a receptacle. Disconnect oil lines at top and bottom of hydraulic cylinder.

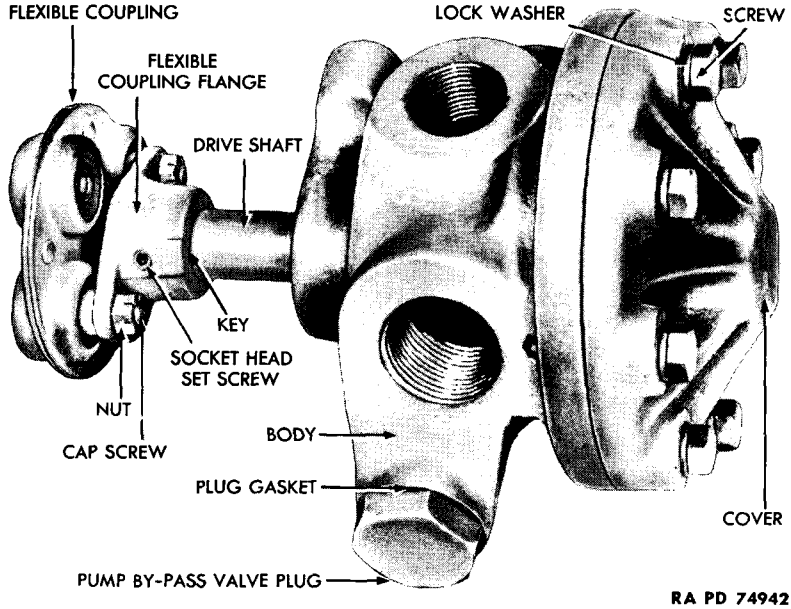

Figure 244—Hydraulic Pump

(2) REMOVING STEERING GEAR HOUSING COVER. Remove cab left corner filler by removing five cap screws and lock washers, and two nuts and lock washers from two bolts. Remove five cap screws and lock washers which hold steering gear housing cover and remove cover. Remove bolt, nut, and lock washers which hold clutch pedal pad, and remove pad.

(3) REMOVE CLUTCH PEDAL FLOOR PLATE. Remove five cap screws and lock washers which hold clutch pedal floor plate to floor. Remove two cap screws which hold dimmer switch in place. Lift floor plate up and over clutch pedal.

(4) REMOVE CYLINDER. Remove six cap screws and lock washers which hold hydraulic cylinder to steering gear housing and pull cylinder off hydraulic piston.

(5) REMOVE PISTON. Remove cotter pin and nut which hold piston on piston rod, then remove piston nut washer and piston assembly.

c. Installation.

(1) INSTALL PISTON AND CYLINDER. Install piston on piston rod, place piston rod washer on rod, and secure piston to rod with nut and cotter pin. Install cylinder over piston, push cylinder down carefully under steering gear housing and secure with six screws.

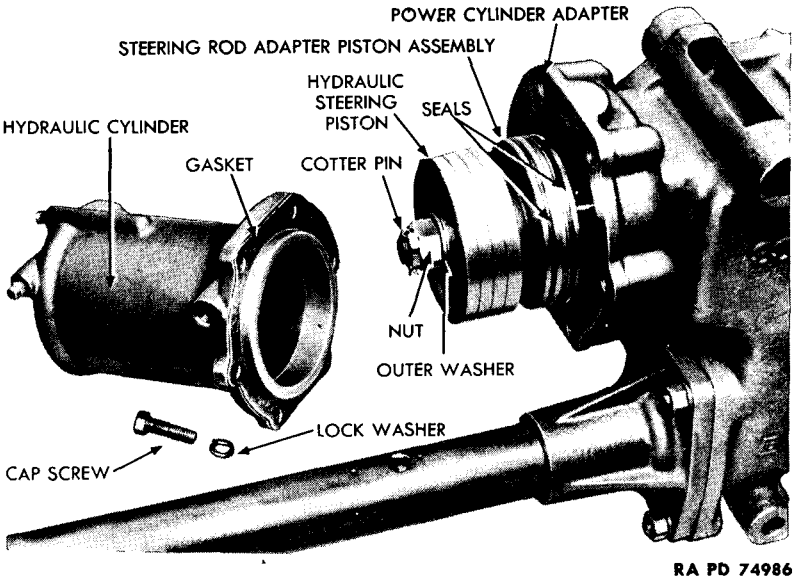

Figure 245—Steering Hydraulic Cylinder Removed

(2) INSTALL OIL LINES. Connect oil lines at top and bottom of cylinder. Then connect oil line at control valve which was disconnected for draining during removal.

(3) FILL HYDRAULIC OIL RESERVOIR AND BLEED. Fill hydraulic oil reservoir and bleed air from system as instructed in paragraph 185.

(4) INSTALL CLUTCH PEDAL FLOOR PLATE. Install floor plate over clutch pedal and onto cab floor. Install dimmer switch on floor plate and secure with two cap screws. Secure floor plate to cab floor with five cap screws and lock washers.

(5) INSTALL STEERING GEAR HOUSING COVER. Install clutch pedal pad on clutch pedal and secure with bolt, nut, and lock washer.

Install steering gear housing cover and secure with five cap screws and lock washers. Install cab left corner filler and secure with five cap screws and lock washers, and two nuts and lock washers on two bolts.

184. HYDRAULIC CONTROL VALVE.

a. Description. The hydraulic control valve is a spring-loaded, plunger type of valve which is secured to the bottom of the steering gear housing. The valve is connected to the hydraulic pump at its inlet side and to both ends of the hydraulic cylinder at the outlet side by oil lines.

b. Removal (fig. 246). Remove bolts, nuts, and lock washers that hold steering gear bottom cover on frame and remove cover. Dis-

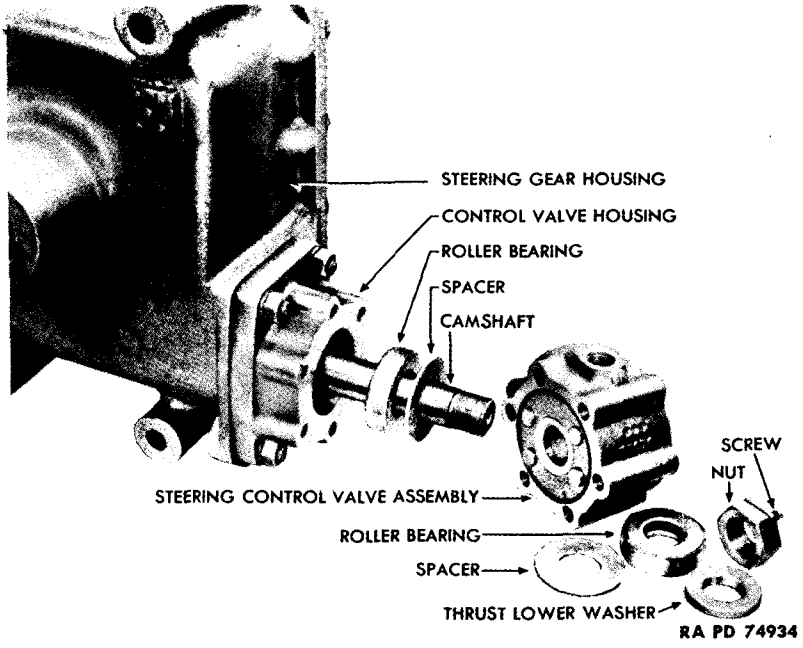

Figure 246—Steering Control Valve Removed

connect oil lines from valve fittings. Remove cap screws and lock washers which hold steering control valve cap on steering valve housing and remove cap. Remove set screw from steering control valve cap nut, then remove nut, camshaft valve, lower thrust washer, roller bearing, and spacer from worm shaft. Pull steering control valve assembly off camshaft.

c. Installation (fig. 246). Install steering control valve assembly on steering gear, then install spacer, lower bearing, camshaft lower

thrust washer, and nut on camshaft. Adjust bearings (par. 189). Install and tighten set screw in nut, and then install steering control valve cap on steering control valve housing, and secure with cap screws and lock washers. Connect oil lines to valve fittings and bleed system (par. 185). Install steering gear bottom cover on frame and secure with bolts, nuts, and lock washers.

185. HYDRAULIC OIL RESERVOIR, OIL LINES, AND CONNECTIONS.

a. Description (fig. 247). The hydraulic oil reservoir is located on the inside of the rear engine cover and is accessible for filling by

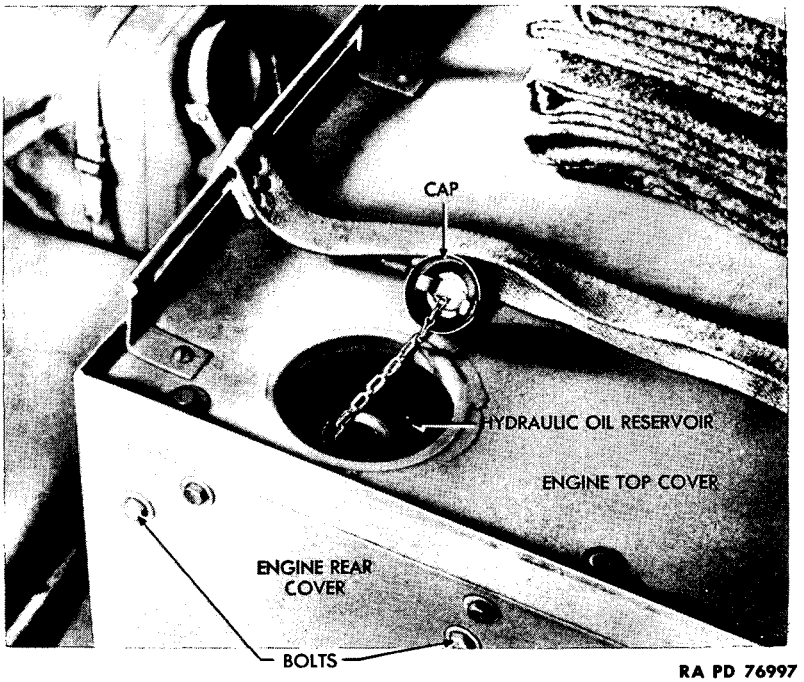

Figure 247—Hydraulic Oil Reservoir

removing a cover on the top of the engine top cover and then removing the cap on the hydraulic reservoir. The oil lines and oil hose connect the hydraulic pump, the pump to the hydraulic control valve, and the control valve to the hydraulic cylinder. The oil lines are connected by inverted flared tube nuts on the ends of the flared tubes, and the oil hose is composed of fittings on the end of the rubber hose.

b. Removal of Hydraulic Oil Reservoir. Remove engine left side cover, then disconnect two oil hose from reservoir. Remove four bolts, nuts, and lock washers, and remove reservoir.

c. Installation of Hydraulic Oil Reservoir. Install reservoir and fasten with four bolts, nuts, and washers. Connect two oil hose to reservoir. Install engine left side cover.

d. Bleeding System. Fill reservoir with oil, then turn steering wheel one turn to the left of center position. Open bleeder valve to lower bleed hole and start engine, then turn steering wheel to the left until oil comes through the open bleeder valve. Stop turning the wheel and allow oil to flow until it is free from air, and then close valve. Repeat the above procedure with the upper bleed hole open and the steering wheel turned to the right. NOTE: *During bleeding process*

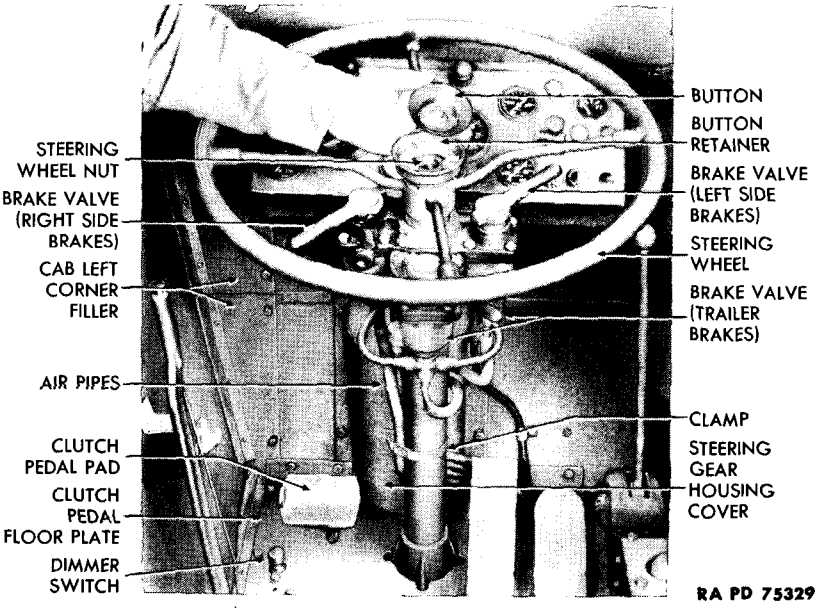

Figure 248—Removing Steering Wheel Button

keep sufficient oil in the reservoir to cover the ports at all times. At the finish of the bleeding operation, fill reservoir to its proper level.

e. Removal and Installation of Oil Lines and Hose. Remove oil lines by unscrewing flared tube nuts and each end of line from fittings to which they are attached. Remove hose in the same manner.

186. STEERING WHEEL.

a. Description. The steering wheel is located at the top of the steering gear column and is secured to the steering gear camshaft.

b. Removal. Remove button in center of steering wheel by pressing down and turning about ¼ turn. Remove three screws that hold button retainer and remove retainer. Remove steering wheel nut and lift steering wheel off steering gear camshaft.

c. **Installation.** Install steering wheel on camshaft and fasten with steering wheel nut. Install button retainer and fasten with three screws. Install button by pressing down and turning about ¼ turn.

187. STEERING ARM.

a. **Description.** The steering arm is secured to the lever shaft of the steering gear, and connects the steering gear to the drag link, in order to transmit the movement of the gear to the drag link, and thence to the front wheels.

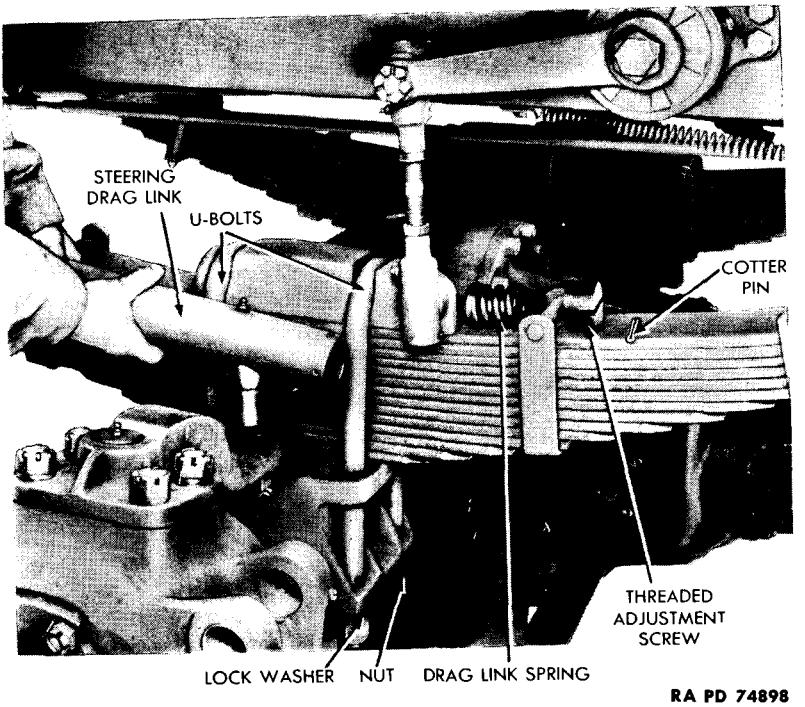

Figure 249—Disconnecting Steering Drag Link

b. **Removal.** Mark position of arm on lever shaft. Then remove cotter pin and plug which hold drag link to arm, and remove drag link from arm. Remove nut and lock washer which hold arm onto lever shaft, and pull arm off shaft. CAUTION: *Do not hammer arm off unless a support is used against end of lever shaft. Use light blows with hammer as they are more effective.*

c. **Installation.** Install steering arm on lever shaft so that marks made at removal line up. Then install lock washer and nut, and tighten securely. Install drag link on arm and secure with cotter pin.

STEERING GEAR AND HYDRAULIC SYSTEM

188. DRAG LINK.

a. Description. The drag link is the means of connecting the steering arm of the steering gear to the left front wheel steering knuckle, which in turn is connected to the right front wheel steering knuckle by a tie rod. It consists of a tube with ball sockets at each end which are held in position by a spring and threaded plug.

b. Removal. Remove cotter pin and plug, at each end of drag link, and lift drag link off steering arm and steering knuckle.

c. Installation. Turn front wheels in straight-ahead position and install drag link on steering arm and steering knuckle. Screw plug into both ends of drag link and secure with cotter pin.

189. STEERING ADJUSTMENTS.

a. General. There are two principal adjustments on this steering gear and a supplemental adjustment on the stud-roller bearing unit in the lever shaft. Principal adjustments are the adjustment of the roller thrust bearings on the camshaft, and the adjustment of the tapered stud in the cam groove for backlash. If an adjustment is required on the stud-roller bearing unit in the lever shaft, report condition to higher authority. When making adjustments outlined in steps **b** and **c** below, free the steering gear of all load by disconnecting the drag link from the left front wheel steering knuckle (par. 188).

b. Adjustment of Roller Thrust Bearings on Camshaft. Remove the steering control valve cap by removing six cap screws and lock washers. Make an adjusting flange tool by using a $\frac{3}{8}$-inch flat steel stock. Using the steering control valve cap as a template, drill bolt holes and cut out a hole in the center of the flat steel stock large enough to clear the thrust washer and bearing. If steel stock is not available, make an adjusting tool out of a spare steering control valve cap. Cut off the end of the cap at a point approximately $\frac{1}{4}$ inch from the outer flanged edge of the cap. Loosen the housing side cover adjusting screw (fig. 243). Use three of the cap screws which held the steering control valve cap in place and install the adjusting flange tool over the end of the shaft and against the valve body, and secure with these three screws. Remove set screw from adjusting nut. Tighten adjusting nut so there is no play in the upper or lower bearings. A test can be made by turning the steering wheel with the thumb and forefinger. There should be no perceptible drag felt in the steering wheel. If a drag is felt, loosen the adjusting nut and test again. After proper adjustment has been made, install set screw in adjusting nut, remove the adjusting flange tool, and install the steering control valve cap on the steering control valve housing. Secure the cap with lock washers and cap screws.

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c. Adjustment of Tapered Stud in Cam Groove for Backlash. Place steering gear in midposition. Tighten the housing side cover adjusting screw (fig. 243) until a very slight drag is felt through midposition when turning the steering wheel slowly from one extreme position to the other. While holding the adjusting screw, tighten lock nut. Recheck drag by turning steering wheel. Adjustment is correct if a slight drag is felt through midposition. Connect drag link to left front wheel steering knuckle (par. 188).

Section XXIX

CAB AND FRAME

190. DESCRIPTION AND DATA.

a. Description.

(1) CAB. The cab is constructed of armor plate which is welded together and secured to the chassis frame. The cab provides armor plate protection to the crew, engine, fuel, and engine cooling systems.

(2) FRAME. The chassis frame is of straight channel iron construction and consists of two side rails with cross members riveted together, and strengthened by gusset plates.

b. Data.

	Make
Frame unit	Pacific Car
Cab	Pacific Car
Front bumper	Pacific Car
Pintle hook	Pacific Car
Air horn	Westinghouse
Windshield wiper	Owen Dyneto (model 1739)

191. FRONT BUMPER.

a. Description. The front bumper is bolted to bumper mounting angles at the front end of the frame. Front blackout lights are supported on brackets which are mounted on the back of the bumper.

b. Removal. Remove two bolts, nuts, and lock washers which hold each blackout light bracket to bumper, and remove lights and brackets. Remove bolt, nut, lock washer, and clamp which hold blackout light cable to rear center of bumper. From both sides of bumper, remove four bolts, nuts, and lock washers which hold bumper to outer bumper mounting angles, and two bolts, nuts, and lock washers, which hold bumper to inner bumper mounting angles. Then, from both sides of bumper, remove one bolt, nut, and lock washer, that secures bumper to bottom of front end of frame-side channels and lift bumper from vehicle.

c. **Installation.** Lift front bumper into position on front end of vehicle, and in each end of front bumper install four bolts, nuts and lock washers that hold bumper to outer bumper mounting angles, and two bolts, nuts, and lock washers that hold bumper to inner bumper mounting angles. Then install bolt, nut, and lock washer that holds bumper to front end of frame side channels. Secure one blackout light bracket to each side of bumper with two bolts, nuts, and lock washers. Insert blackout light cable under clamp and install clamp to back of bumper with a bolt, nut, and lock washer.

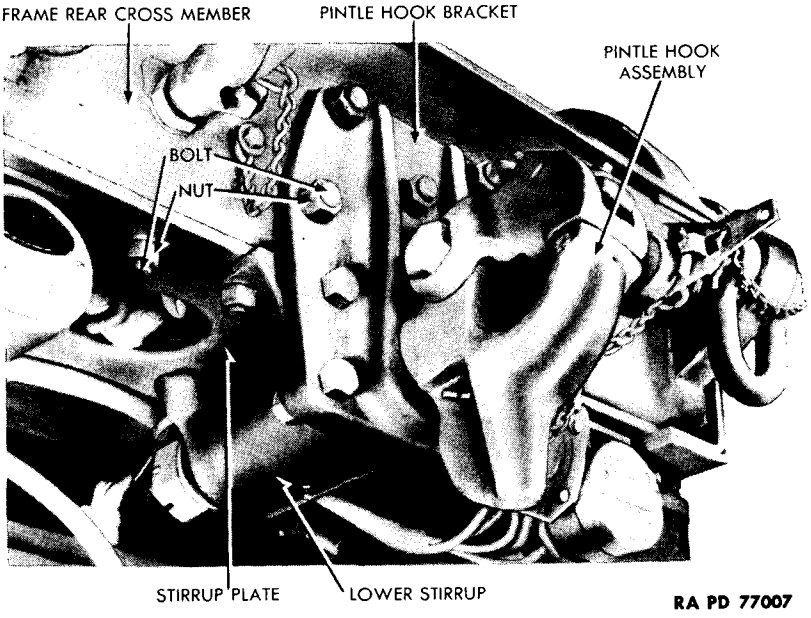

Figure 250—Removal of Pintle Hook Assembly

192. PINTLE HOOK.

a. **Description** (fig. 250). A standard army pintle hook assembly is secured to the rear end of the frame by means of two brackets. The pintle hook is provided as a means of attaching a towing cable when a cable is used to recover disabled materiel or for securing a drawbar lunette.

b. **Removal** (fig. 250). Remove four bolts, nuts, and lock washers that secure pintle hook lower stirrup to pintle hook stirrup plate. Then remove the five top bolts, nuts, and lock washers that hold pintle hook bracket to frame rear cross member, and lift pintle hook assembly from vehicle.

c. **Installation** (fig. 250). Lift pintle hook assembly into position at rear of frame with pintle hook bracket alined with bolt holes in frame rear cross member. Secure bracket to frame by installing the

five upper bolts, nuts, and lock washers. Secure pintle hook stirrup to pintle hook stirrup plate by installing four bolts, nuts, and lock washers.

193. AIR HORN AND HORN BUTTON ASSEMBLY.

a. Description (fig. 251). The horn assembly for signaling is operated by compressed air from the air system and is located inside right radiator door where it is secured to cab. The horn button is secured to the radiator cover at the driver's right.

b. Adjustment of Air Horn. Loosen lock nut at rear of horn and turn adjusting screw in, or out, until desired tone is obtained, then tighten lock nut.

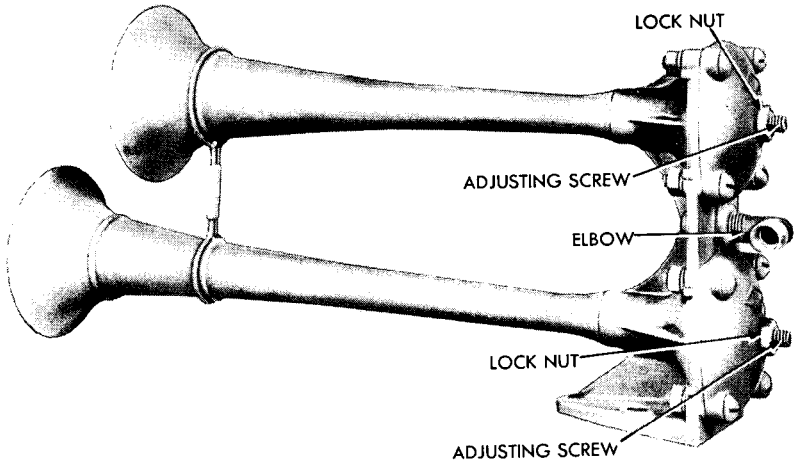

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Figure 251—Air Horn Assembly

c. Removal of Air Horn. Disconnect air line from elbow at rear of horn assembly. Remove two bolts, nuts, and lock washers that hold horn to frame cross member and remove horn.

d. Installation of Air Horn. Install horn on cross member and fasten with two bolts, nuts, and lock washers. Connect air line to elbow at rear of horn.

e. Removal of Horn Button Assembly. Reach inside radiator door opening and disconnect two air lines from fittings in horn button valve body and filter plug. Remove two bolts, nuts, and lock washers which hold button assembly to radiator side cover, and remove assembly.

f. Installation of Horn Button Assembly. Install horn button assembly on radiator side cover and fasten with two bolts, nuts, and lock washers. Connect two air lines to fittings in horn button valve body and filter plug.

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194. SEATS, CUSHIONS, AND SEAT FRAMES.

a. Description. There are seven seats in the cab: gunner's seat, four crew seats, commander's seat, and driver's seat. Two of the crew seats are secured to the rear wall of the cab and two are secured to the side walls of the cab. The driver's seat is at the left front corner of the cab and the commander's seat is directly across the cab in the right front corner. The gunner's seat is secured to the center of the rear wall of the cab. The right rear crew seat frame houses the storage batteries and the left rear frame contains tool and parts stowage.

b. Adjustment. The gunner's seat is operated by a lever. Pushing lever down unlocks seat so that it can be lowered for use. The gunner's seat is the only seat that is adjustable.

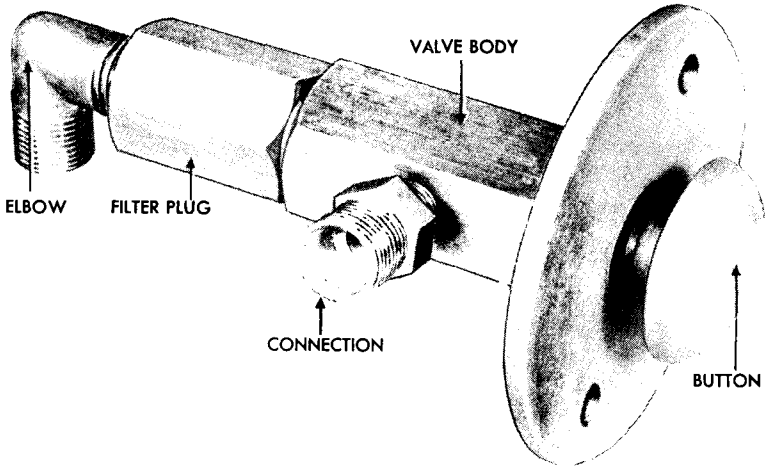

Figure 252—Horn Button Assembly

c. Removal and Installation of Crew Seat Cushions and Backs.

(1) REMOVAL. Remove backs by lifting up and off retainers which are welded to sides of cab, then lift seat cushions off seat frame.

(2) INSTALLATION. Install backs on retainers and then install cushions on seat frames.

d. Removal and Installation of Crew Seat Frames.

(1) REMOVAL. Remove bolts, nuts, and lock washers which hold rear frames to cab and side seats to wheel housings.

(2) INSTALLATION. Install frames and secure to cab or wheel housings with bolts, nuts, and lock washers.

CAB AND FRAME

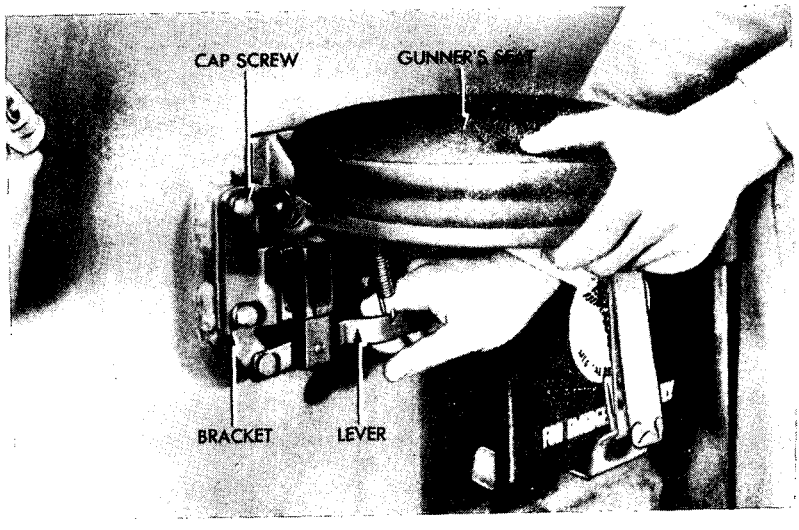

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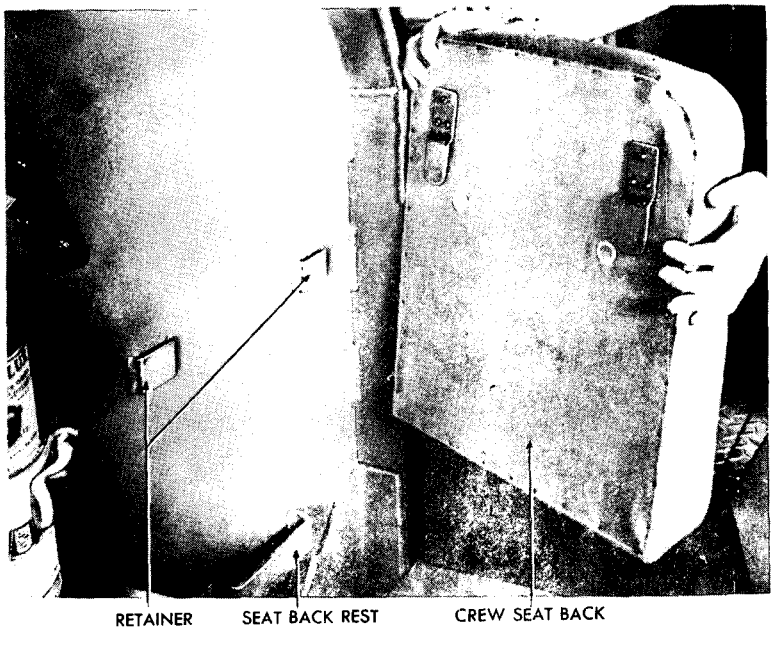
Figure 253—Gunner's Seat



RA PD 76939

Figure 254—Removing Crew Seat Back

e. Removal and Installation of Driver's Seat, Commander's Seat and Frames.

(1) REMOVAL. Both of these seats have the seat cushion and back in one frame. Remove bolts, nuts, and lock washers which secure frames to wheel housing, and remove seat assembly.

(2) INSTALLATION. Install seat assembly and secure to wheel housing with bolts, nuts, and lock washers.

f. Removal and Installation of Gunner's Seat.

(1) REMOVAL. The gunner's seat is fastened to a bracket which is welded on rear of cab, and is removed by taking out four cap screws and lock washers.

(2) INSTALLATION. Install seat on bracket and secure with four cap screws and lock washers.

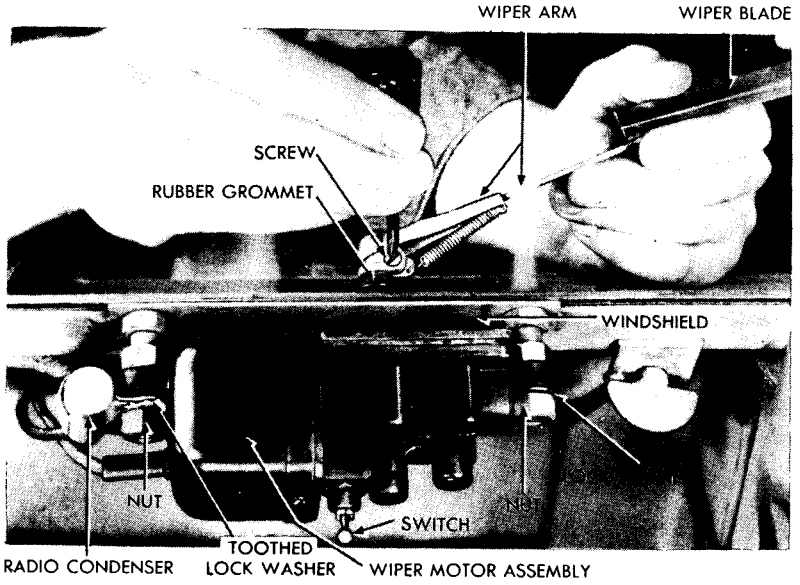


Figure 255—Removing Windshield Wiper

195. ARMOR PLATE DOORS.

a. Description. The cab window doors, radiator, and windshield doors are hinged. The hinge halves are welded to the shutters and cab.

b. Removal. Drive out hinge pins and remove door.

c. Installation. Install door and drive hinge pin into place.

196. WINDSHIELDS.

a. Removal. The windshields are removed by pulling wiper motor socket out of its connection and then loosening thumb screws that hold windshield in place. Store windshields in racks on side of cab.

b. Installation. Remove windshields from racks on side of cab, install in place, and fasten with thumb screws. Connect wiper motors

197. WINDSHIELD WIPERS.

a. Description. The two windshield wipers are electrically operated and each has a switch so that either, or both, can be turned off, or on. The wipers are secured to the windshield frame.

b. Removal. Disconnect green and red wires from wiper motor. Remove screw that holds wiper arm on motor shaft and pull wiper arm with wiper blade off motor shaft. Remove rubber grommet from outside of motor shaft. Remove two nuts, lock washers, internal-external toothed washer and radio condenser from wiper studs. Pull wiper motor assembly away from windshield, and off studs.

c. Installation. Install wiper motor on studs and install radio condenser, internal-external toothed washer, lock washer, and nuts. Install rubber grommet on outside end of motor shaft. Install wiper arm on motor shaft and secure it with screw. Connect wires to wiper motor terminals.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section XXX

INSTRUMENTS

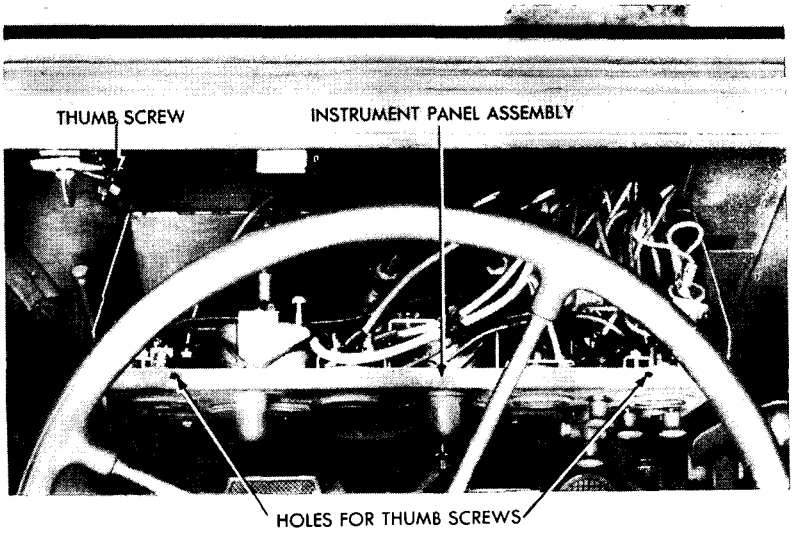
198. GAGES AND INSTRUMENTS ON INSTRUMENT PANEL.

a. Description. The instrument panel is located in front of the driver, and is hinged at the bottom to the cab. The panel can be lowered, in order to work on the inside, by removing two thumb screws and lowering panel. The gages and instruments used in the operation of the vehicle are located on the instrument panel and secured to it at the front.

b. Replacement. Before removing any instruments or gages, remove left windshield (par. 196) and disconnect battery (par. 127).

(1) RIGHT FUEL TANK GAGE.

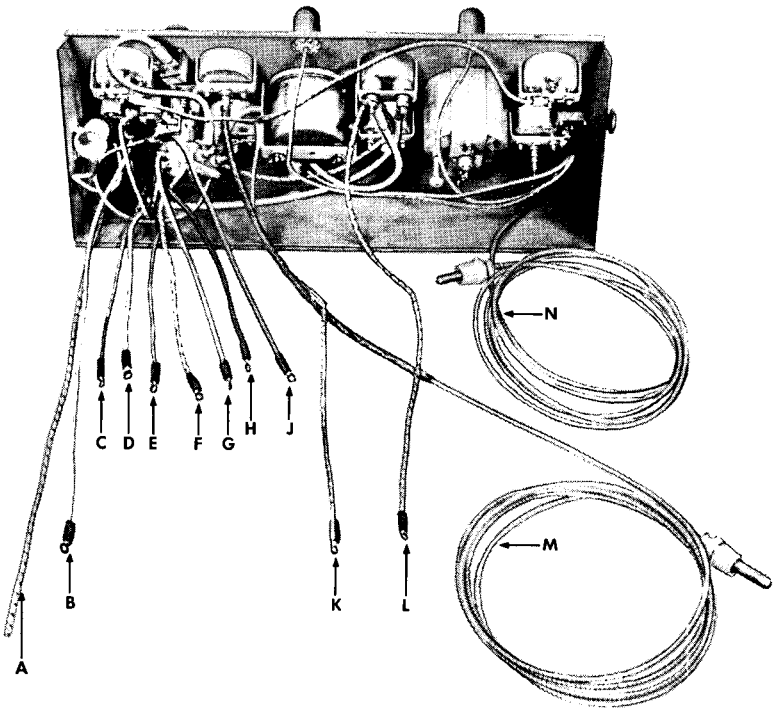
(a) Removal. Remove two nuts, plain washers, and lock washers which hold wires to gage terminals, and remove wires. Then remove two nuts and lock washers that hold gage to clamp. Remove clamp from gage and lift out gage.



RA PD 77018

Figure 256—Instrument Panel in Vehicle

INSTRUMENTS



A—STARTER BUTTON TO MAGNETIC STARTER SWITCH (GREEN, NO. 10, RED TRACER)

B—SIREN LIGHT SWITCH TO BOTTOM OF NO. 8 FUSE (YELLOW, NO. 14)

C—BLACKOUT DRIVE LIGHT SWITCH TO TOP OF RESISTOR ON FUSE BLOCK (GREEN, NO. 14)

D—RIGHT IGNITION SWITCH TO TOP OF NO. 6 FUSE (YELLOW, NO. 14)

E—LEFT IGNITION SWITCH TO TOP OF NO. 5 FUSE (RED, NO. 14)

F—"SW" ON LIGHT SWITCH TO TOP OF NO. 4 FUSE (YELLOW NO. 12 WITH RED, BROWN TRACER)

G—"BHT" ON LIGHT SWITCH TO TOP OF NO. 3 FUSE (GREEN, NO. 10)

H—"BHT" ON LIGHT SWITCH TO TOP OF NO. 2 FUSE (BLACK, NO. 14)

J—"HT" ON LIGHT SWITCH TO TOP OF NO. 1 FUSE (RED, NO. 10)

K—FUEL AND OIL GAGES TO BOTTOM OF NO. 5 FUSE (GREEN, NO. 14)

L—RIGHT SIDE OF AMMETER TO TOP OF NO. 8 FUSE (GREEN, NO. 10 WITH RED, BROWN TRACER)

M—OIL TEMPERATURE CABLE

N—WATER TEMPERATURE CABLE

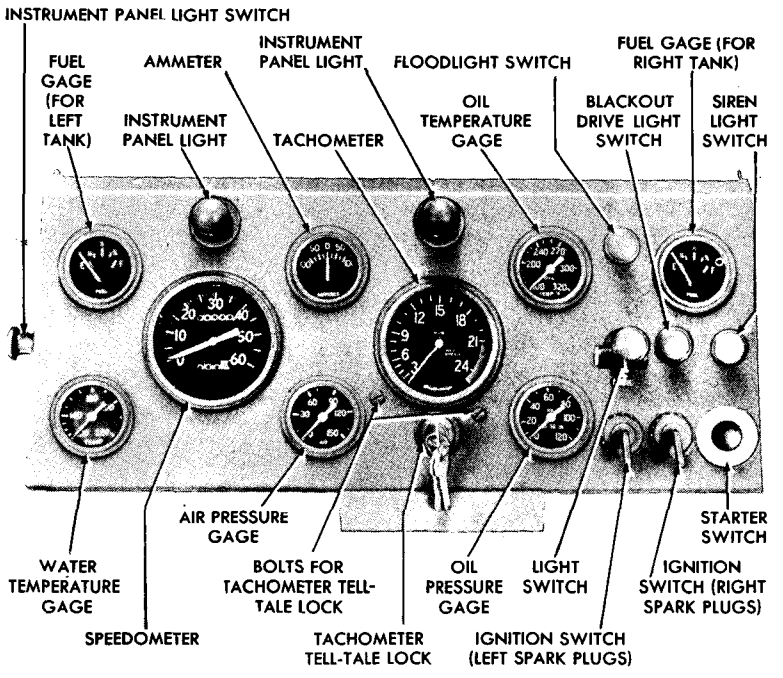
RA PD 77031

Figure 257—Instrument Panel Assembly—Rear View

(b) Installation. Install gage and fasten with clamp, nuts, and lock washers. Then install wires and fasten with two nuts, plain washers, and lock washers.

(2) SIREN LIGHT FLASHER.

(a) Removal. Remove two screws which hold wires to flasher and remove wires. Remove two bolts, nuts, and lock washers that hold flasher to end of instrument panel, and lift off flasher.



RA PD 76911

Figure 258—Instrument Panel Assembly—Front View

(b) Installation. Install flasher on panel and fasten with two bolts, nuts, and lock washers. Install wires and fasten with screws.

(3) OIL TEMPERATURE GAGE.

(a) Removal. Remove two nuts and lock washers that hold gage to clamp and remove clamp. Disconnect oil temperature gage cable at oil filter then disconnect cable from three clamps on radiator shell. Disconnect oil pressure flexible hose from oil pipe and pull hose out of rubber grommet in dash. Pull gage and cable out of instrument panel.

(b) Installation. Install gage and cable and fasten with clamp and two nuts and lock washers. Thread cable around radiator shell

and fasten with three clamps. Connect cable to oil filter, then push oil pressure flexible hose through rubber grommet in dash and connect hose to oil pipe.

(4) TACHOMETER.

(a) Removal. Disconnect cable from tachometer. Remove two wing nuts and lock washers that hold tachometer to clamp and remove clamp. Loosen two bolts which hold tachometer telltale lock and remove tachometer.

(b) Installation. Install tachometer, then install clamp and fasten with wing nuts and lock washers. Connect tachometer cable. Tighten bolts that hold tachometer telltale lock.

(5) AMMETER.

(a) Removal. Remove nut, plain washer, and lock washer that hold three wires on terminal post; then remove nut, plain washer, and lock washer that hold four wires on terminal post. Remove wires from terminals and then remove insulation washer, nut, and plain washer from each terminal. Remove nuts and washers that hold clamp and remove clamp. Pull ammeter off front of instrument panel. NOTE: *Tag wires so that they can be correctly connected at installation.*

(b) Installation. Install ammeter, then install clamp and fasten with nuts and washers. Install plain washers, insulation washers, and nuts on terminal posts; then install wires on posts. Fasten wires with nuts, plain washers and lock washers.

(6) LEFT FUEL TANK GAGE.

(a) Removal. Remove two nuts, lock washers, and flat washers from each terminal and pull off wires. Remove two nuts and lock washers that hold clamp to gage. Remove clamp and pull gage from front of instrument panel.

(b) Installation. Install gage, then install clamp and fasten with two nuts and lock washers. Install wires on terminals and fasten with nuts, lock washers and flat washers.

(7) SPEEDOMETER.

(a) Removal. Disconnect speedometer cable from speedometer. Remove two wing nuts and lock washers from clamp, remove clamp, and pull speedometer off front of instrument panel.

(b) Installation. Install speedometer on instrument panel, then install clamp and fasten with two wing nuts and lock washers. Connect speedometer cable.

(8) WATER TEMPERATURE GAGE.

(a) Removal. Remove water temperature gage cable from thermostat valve housing at engine. Loosen cable from three clamps on engine top cover and pull cable through opening between radiator and radiator side cover. Remove cable from clamps on dash. Remove two nuts and lock washers that hold clamp to gage, remove clamp, and pull gage and cable off front of instrument panel.

(b) Installation. Install gage and cable on instrument panel, then install clamp and secure it to gage with two nuts and lock washers. Install cable under clamps on dash, then push cable through opening between radiator and radiator side cover. Secure cable to engine top cover with three clamps and install cable in thermostat valve housing.

(9) AIR PRESSURE GAGE.

(a) Removal. Discharge air from air reservoirs by opening valve on bottom of air reservoir. Disconnect air line from gage. Remove two nuts and lock washers that hold clamp to gage, remove clamp and pull gage off front of instrument panel.

(b) Installation. Install gage on instrument panel, then install clamp and secure it to gage with two nuts and lock washers. Connect air line to gage. Close valve on bottom of air reservoir. Start engine and build air pressure up to at least 60 pounds.

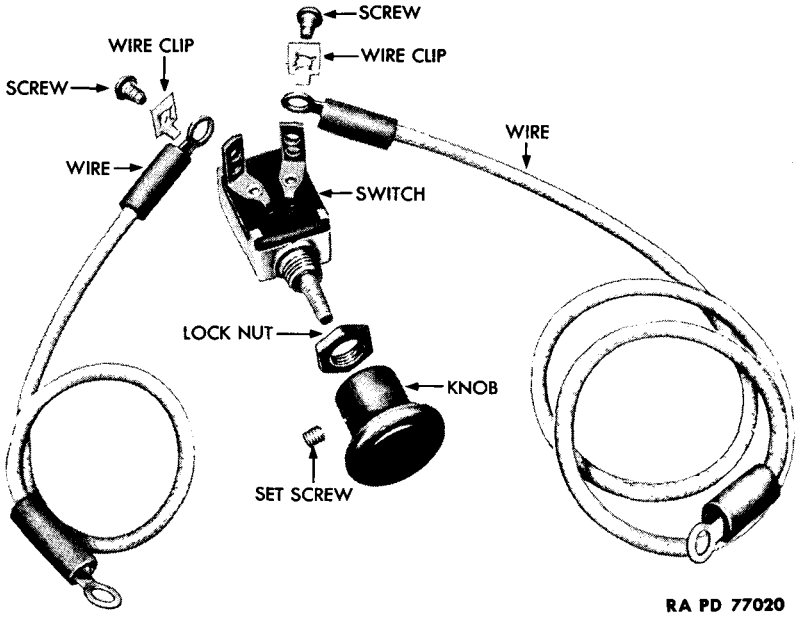


Figure 259—Siren Light Switch

(10) OIL PRESSURE GAGE.

(a) Removal. Disconnect oil line from gage. Remove two nuts and lock washers that hold clamp to gage, remove clamp and pull gage off front of instrument panel.

(b) Installation. Install gage on instrument panel, then install clamp and secure it to gage with two nuts and lock washers. Connect oil line to gage.

(11) INSTALL LEFT WINDSHIELD AND CONNECT BATTERY. Install left windshield (par. 196). Connect battery (par. 127).

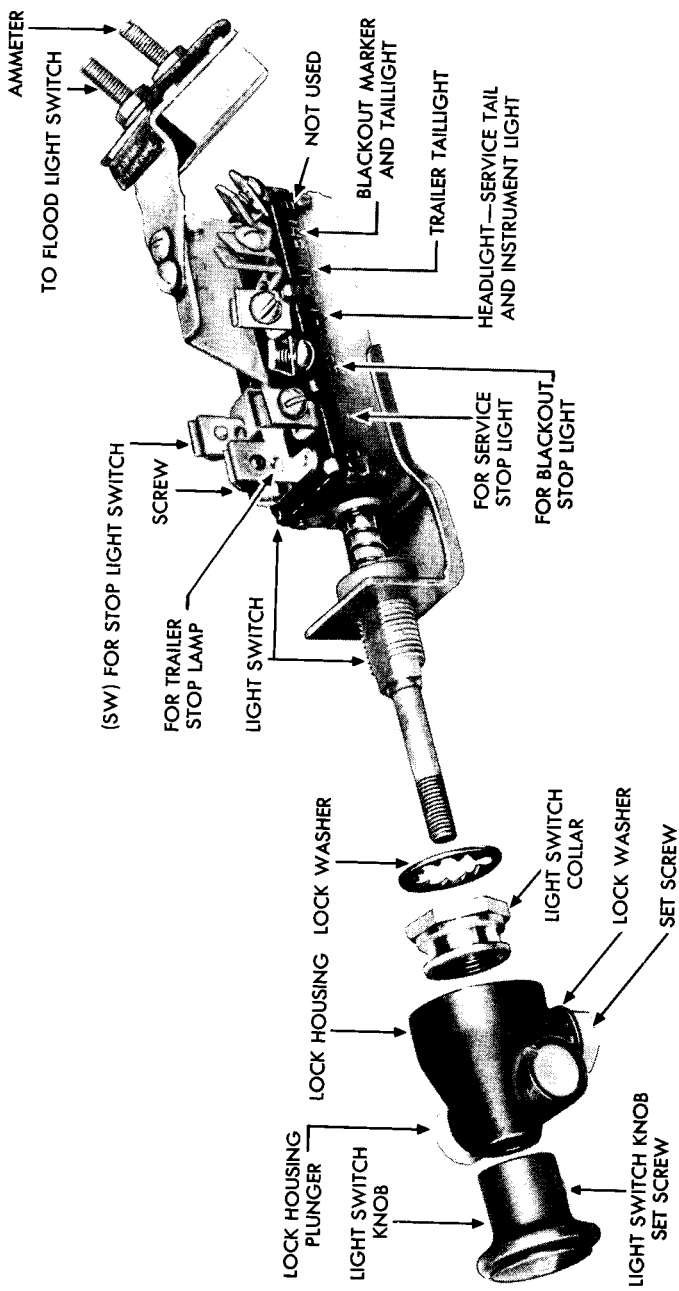


Figure 260—Light Switch

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

199. SWITCHES.

a. Description. The switches used for operation of lights and ignition are located on the instrument panel or adjacent to it.

b. Replacement. Before removing any switches, remove windshield (par. 196) and disconnect battery (par. 127).

(1) INSTRUMENT LIGHTS.

(a) Removal. There are two instrument lights. Pull instrument light hood off instrument panel. Pull socket out of hood and remove from socket.

(b) Installation. Install socket in hood and push socket into instrument panel.

(2) IGNITION SWITCHES.

(a) Removal. Remove lock nut from front of switch and push switch back into instrument panel so that wiring can be removed.

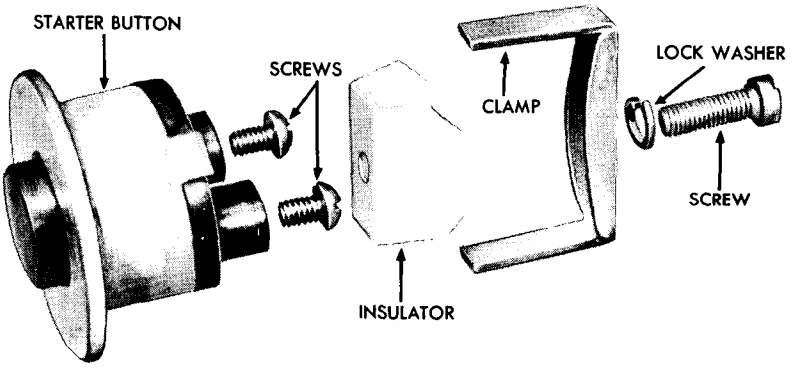


Figure 261—Starter Button

Remove screw and lock washer which holds two wires on terminal, then repeat procedure on other terminal having one wire. Remove switch from inside instrument panel. Remove right ignition switch.

(b) Installation. Install switch and secure wires with screws and lock washers. Install lock nut that holds switch to instrument panel.

(3) FLOODLIGHT SWITCH.

(a) Removal. Remove two screws and wire clips that hold two wires on switch. Remove set screw that holds knob on switch and unscrew knob. Remove lock nut that holds switch on instrument panel and remove switch from back of instrument panel.

(b) Installation. Install switch and fasten with lock nut. Screw knob on switch and fasten with set screw. Install wires and fasten with wire clips and screws.

INSTRUMENTS

(4) BLACKOUT DRIVING LIGHT SWITCH AND SIREN LIGHT SWITCH.

(a) Removal. Remove set screw that holds knob on switch and unscrew knob. Remove lock nut that holds switch on instrument panel and push switch into instrument panel. Remove two screws and wire clips that hold two wires on switch. Remove switch from inside instrument panel.

(b) Installation. Install switch and install wires on switch, fastening with two screws and wire clips. Install lock nut that holds switch on instrument panel. Screw knob on switch and fasten with set screw.

(5) MAIN LIGHT SWITCH.

(a) Removal. Remove set screw that holds knob on switch and unscrew knob. Loosen set screw that holds lock housing and pull

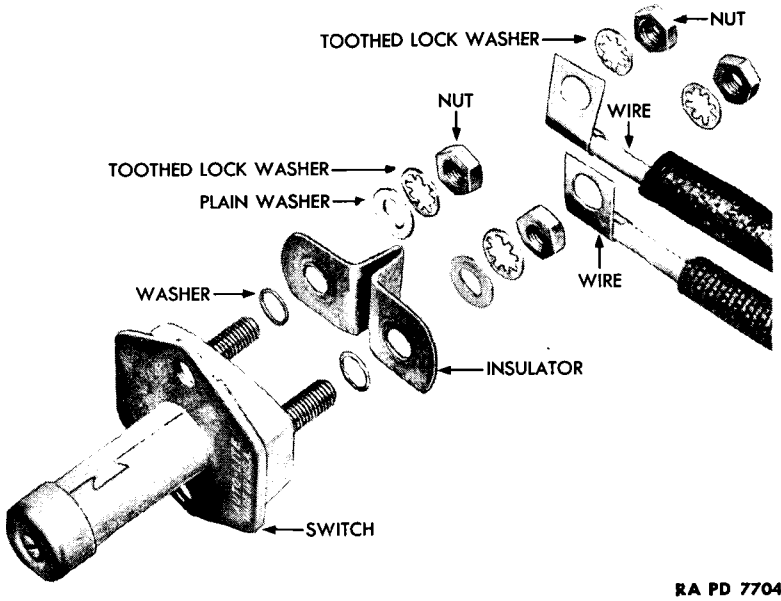


Figure 262—Siren Switch

housing off switch. Remove lock nut that holds switch to instrument panel; push switch into instrument panel. Remove two nuts and lock washers that hold two wires to circuit breaker. Remove seven screws and wire clips that hold wires to switch. Remove switch from inside of instrument panel.

(b) Installation. Install switch inside instrument panel and attach wires to switch with seven screws and wire clips. Install two wires on circuit breaker and fasten with two nuts and lock washers. Install lock nut that holds switch to instrument panel, then install lock

housing on switch and fasten with set screw. Screw knob on switch and fasten with set screw.

(6) TACHOMETER TELLTALE LOCK.

(a) Removal. Remove two bolts, nuts, and lock washers that hold lock on instrument panel and remove lock.

(b) Installation. Install lock and secure with bolts, nuts, and lock washers.

(7) STARTER BUTTON.

(a) Removal. Remove siren light flasher (par. 198), then remove screw and lock washer that holds clamp to button, push button into instrument panel and remove clamp. Remove two screws and wire clips that hold wires to button and remove button from inside instrument panel.

(b) Installation. Install button from inside instrument panel and attach wires with wire clips and screws. Push button into place and fasten with clamp, screw, and lock washer. Install siren light flasher.

(8) SIREN SWITCH.

(a) Removal. Remove two nuts and star washers that hold wires to switch, and remove wires. Remove nut, toothed lock washer, and plain washer that hold insulator, and remove insulator. Remove two plain washers and switch.

(b) Installation. Install switch, two washers, insulator, plain and toothed lock washers, and then fasten with nut. Connect wires and fasten with two nuts and toothed lock washers.

(9) DIMMER SWITCH.

(a) Removal. Remove bolt, nut, and lock washer that hold switch to floorboard, then remove three screws and wire clips that hold three wires to switch and remove switch.

(b) Installation. Install switch on floorboard and fasten with bolt, nut, and lock washer. Install wires and fasten with wire clips and screws.

(10) INSTRUMENT LIGHT SWITCH.

(a) Removal. Remove screws, wire clips, and wires from switch. Remove set screw and unscrew switch knob. Remove lock nut and then remove switch from panel.

(b) Installation. Install switch and fasten to instrument panel with lock nut. Screw knob on switch and fasten with set screw. Install wires and fasten with wire clips and screws.

Section XXXI

FRONT WINCH

200. DESCRIPTION AND DATA.

a. Description. The front mounted winch is secured to the front of the chassis frame and consists of a drum containing ¾-inch cable, an automatic brake, and a worm with worm gear for operating the drum.

b. Data.

Make	Gar Wood
Model	5M 713K
Cable	¾ in.
Length	300 ft

201. AUTOMATIC BRAKE.

a. Description. The automatic brake is secured to the drum shaft and consists of a housing with cover in which the brake drum and band are located. The brake holds the load on the cable to prevent it from being paid out too rapidly. The brake band is adjustable by means of a spring-loaded adjusting screw.

b. Adjustment.

(1) ADJUST BRAKE. Remove winch (par. 205), then remove brake case cover. With no load on winch, wedge rocker over with a piece of wood so that rocker holds contact at "O" (fig. 263). Slack off two brake adjusting nuts about ¼ inch and adjust nuts to make length of brake spring in this position 1⅝ inches (dimension "A," fig. 263). Jam first of two brake adjusting nuts against second nut to hold its position. Take up on two adjusting nuts until there is ⅛-inch clearance between spring spacer and first of brake adjusting nuts. Install cover. Install winch (par. 206).

(2) TEST AND READJUST BRAKE. Action of automatic brake is such that brake will automatically apply enough drag to hold a load when engine clutch is disengaged. When winch is reversed by power, brake should allow drum to turn for cable unwinding. Test holding power of brake by hoisting a load. Then start lowering load and disconnect engine clutch. If properly adjusted, brake will stop load from coming down more than 2 inches, and will hold it suspended. If brake does not hold load, remove winch and increase

brake spring tension by removing brake case cover, loosening lock nuts, the first of two top brake adjusting nuts and the second of two lower brake adjusting nuts. Tighten second of brake top adjusting nuts by one-half turn (fig. 263). Tighten lock nut while maintaining location of adjusting nut. With no load on winch, wedge rocker over with piece of wood so that rocker holds contact at "C" (fig. 263). Use screwdriver to hold spring spacer up into rocker as far as it will go. Dimension "B" (fig. 263) which is the space between spring spacer and first of two lower adjusting nuts, should then be about ⅛ inch. Tighten or loosen (whichever is necessary) adjusting nut

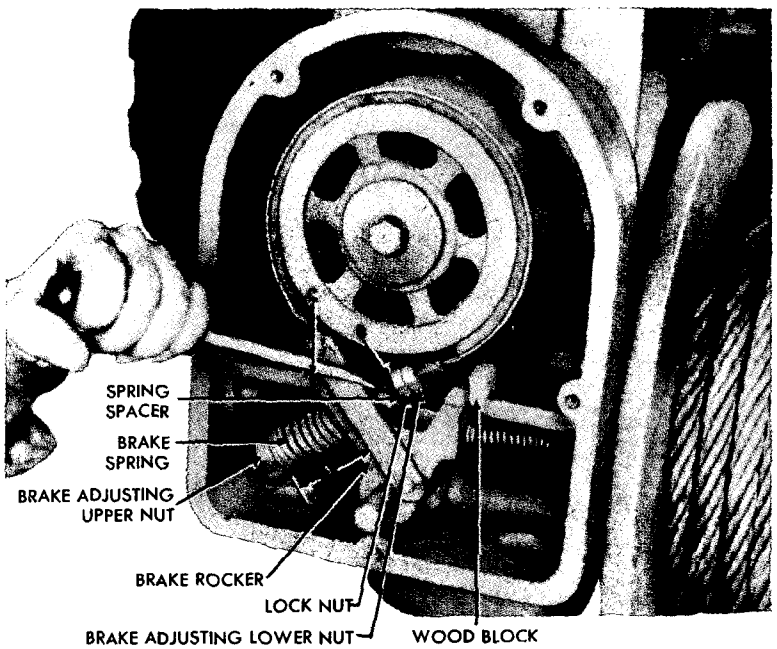


Figure 263—Checking Adjustment of Automatic Brake

until dimension "B" is about ⅛ inch. Then maintain location of brake adjusting nut and tighten lock nut against it. Install winch and test under load; if winch does not hold, repeat adjustment and test procedure until it will hold required load.

c. Removal. Remove cap screws and lock washers which hold cover on brake case and remove cover. Remove cap screw, lock washer, and retaining washer that hold brake drum, then pry off rocker spring. Pull brake drum with automatic brake band assembly off drum shaft.

d. Installation. Install brake drum with automatic brake band assembly on drum shaft. Install rocker spring, then install retaining

washer, lock washer, and cap screw that hold brake drum. Adjust brake (subpar. **b**, above). Install cover on brake case and secure with cap screws and lock washers.

202. CONTROLS AND LINKAGE.

a. Description (figs. 264 and 265). The controls and linkage for the front mounted winch consist of a cross tube with a lever clamped to each end, the lever rod and clevis at the driver's seat, and the power take-off control rod and clevis. The cross tube is secured to

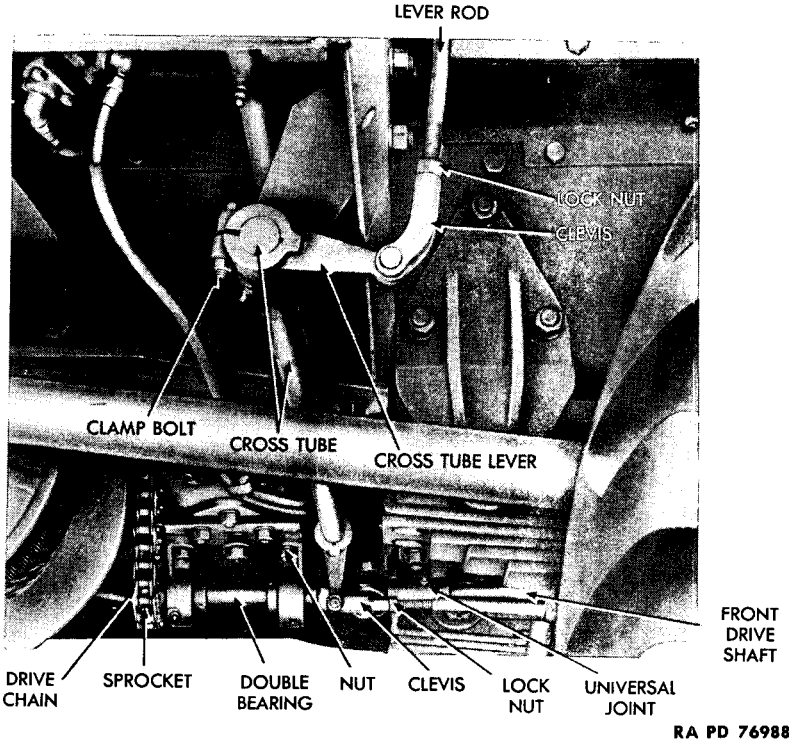


Figure 264—Front Winch Control Linkage

the lever rod clevis by the rear lever and to the power take-off control rod clevis by the front lever. The assembly is secured in bearings to the frame.

b. Removal (figs. 264 and 265). Remove cotter pins and clevis pins that hold control rod to power take-off and to cross tube lever, and remove control rod. Remove clevis pin holding lever rod to cross tube lever. Remove cross tube and levers.

c. Installation (figs. 264 and 265). Install cross tube and secure levers to tube. Position control rod to power take-off and to cross

tube lever, and fasten with clevis pins and cotter pins. Connect lever rod to cross tube lever and fasten with clevis pin and cotter pin.

203. SPROCKETS AND CHAINS.

a. Description. The sprockets to drive the front mounted winch are located on the power take-off propeller shaft on the outside of the double bearing and on the winch worm shaft. They are connected by a drive chain. The drive chains are covered in paragraphs 205 and 206.

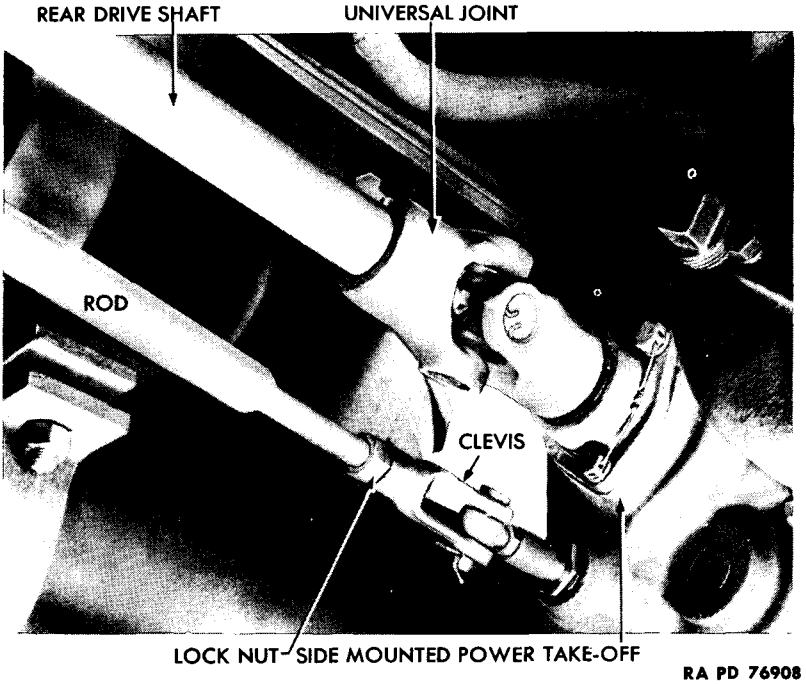


Figure 265—Front Winch Control Linkage

b. Double Bearing Sprocket.

(1) REMOVAL. Remove drive chain (par. 205). Remove cap screw, lock washer, and retaining washer, and pull off sprocket.

(2) INSTALLATION. Install sprocket, retaining washer, lock washer, and cap screw. Install drive chains (par. 206).

c. Worm Shaft Sprocket.

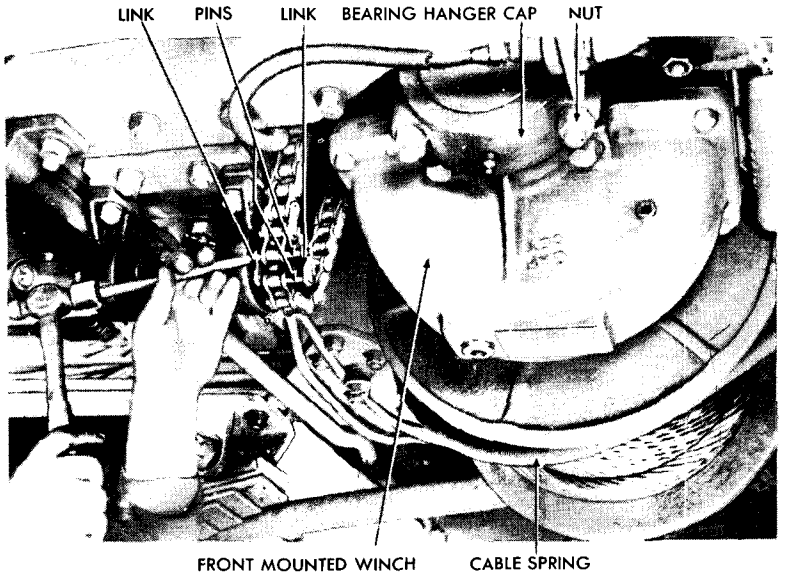
(1) REMOVAL. Remove drive chains (par. 205). Pull sprockets off worm shaft.

(2) INSTALLATION. Install sprocket on key in worm shaft. Install drive chains (par. 206).

FRONT WINCH

204. PROPELLER SHAFT AND DOUBLE BEARING.

a. Description. The propeller shaft and universal joints are connected to the auxiliary transmission side mounted power take-off at one end by means of a set screw which secures the universal joint to the power take-off shaft. The opposite end of the propeller shaft is mounted in a double bearing which is secured to the chassis frame. The winch drive sprocket is secured to the outer end of the propeller shaft.



RA PD 76919

Figure 266—Disconnecting Winch Chain

b. Removal.

(1) REMOVE DOUBLE BEARING. Remove drive chain (par. 205). Remove four nuts and lock washers that hold double bearing to chassis frame and lower bearing. Remove set screw which holds front section of propeller shaft in universal joint and pull propeller shaft with double bearing out of universal joint. Loosen set screws in double bearing collars and slide bearing off shaft.

(2) REMOVE PROPELLER SHAFT. Remove four bolts, nuts, and lock washers that hold the two single bearings to frame. Loosen set screws that hold universal joint to power take-off drive shaft, and remove center and rear sections of propeller shaft with the two single bearings.

c. Installation.

(1) INSTALL PROPELLER SHAFT. Install center and rear sections of propeller shaft with two single bearings across fuel tank brackets.

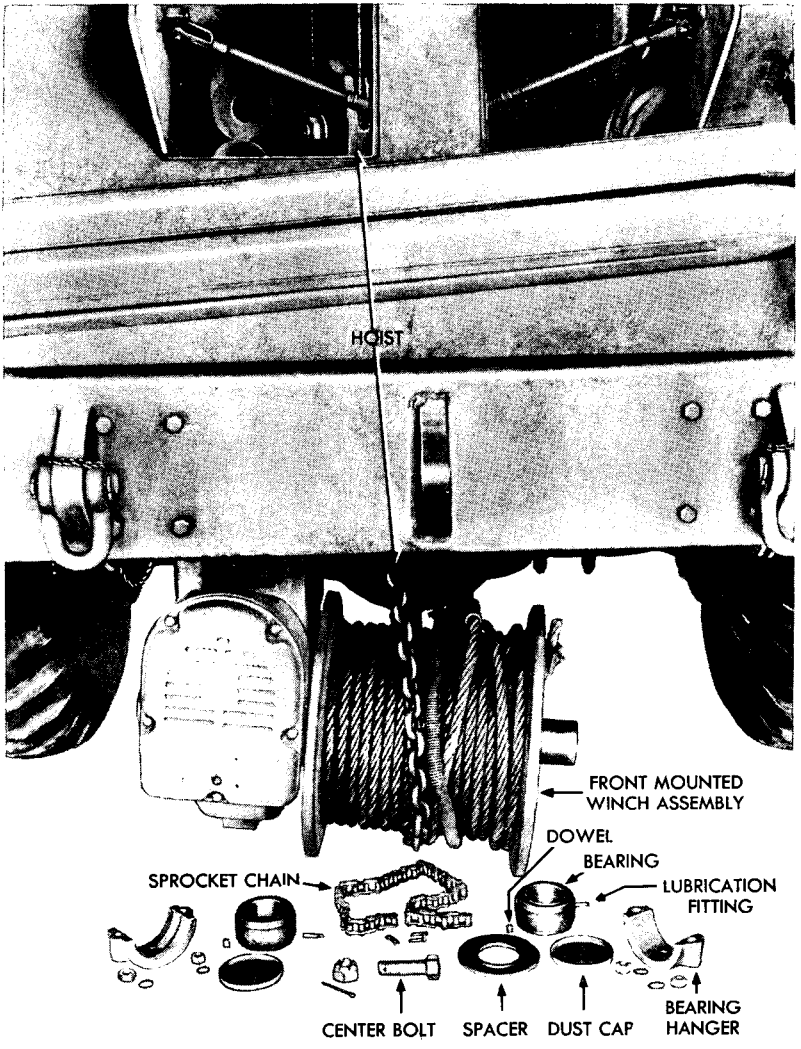


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Figure 267—Lowering Winch to Ground

Connect rear universal joint to power take-off drive shaft and secure with set screw. Fasten two single bearings to frame with four bolts, nuts, and lock washers, securing exhaust pipe shield at the same time.

(2) INSTALL DOUBLE BEARING. Slide double bearing and collars onto front section of propeller shaft, and secure collars with set screws. Position double bearing and shaft to frame, sliding end of shaft into universal joint. Tighten universal joint set screw and secure double bearing to frame with four nuts and lock washers. Install drive chain on sprocket (par. 206).

205. REMOVAL.

a. Remove Drive Chain (fig. 266). Remove two cotter pins from sprocket chain link pins and then drive out pins and remove chain.

b. Remove Winch (fig. 267). Unlock cable spring. Remove cotter pin from winch center mounting bolt nut by reaching through radiator door, then remove bolt and nut. Attach hoist to winch. Remove four nuts and lock washers that hold winch to bearing hanger, then remove two bearing hanger caps. Lower winch about eight inches and remove two bearing hanger dowels. Remove dust cap and bearing from right end of drum shaft and remove dust cap, bearing, and spacer from left end of drum shaft. Lower winch to ground. NOTE: *Cable clamp must be in such a position that it will not interfere with bearing hanger.*

206. INSTALLATION.

a. Install Front Mounted Winch (fig. 267). Raise winch until ready to install in place, and install dust cap and bearing on right end of drum shaft. Then install dust cap, bearing, and spacer on left end of drum shaft. Grease two bearing hanger dowels and install in bearing hanger. Raise winch until one side touches dowel, guide bearing onto dowel by inserting steel bar through lubrication fitting hole. Repeat procedure on opposite side. Make certain bearings are on dowels by trying bearing with steel bar; bearing will not turn if it is on dowel. Install bearing caps on same side they were removed from, and fasten with four nuts and lock washers. Install lubrication fitting in bearings. Remove hoist from winch and pull winch back to frame, then install winch center mounting bolt, nut, and cotter pin by reaching through radiator door.

b. Install Drive Chain (fig. 266). Install chain on winch sprocket and on drive sprocket, and install sprocket chain link pins and cotter pins. Connect cable spring.

Section XXXII

TANDEM REAR WINCHES

207. DESCRIPTION AND DATA.

a. Description (fig. 268).

(1) The tandem winch assembly consists of a front winch and a rear winch which are mounted together on a winch base which is secured to the chassis frame, at the rear of the cab. A platform is provided for the winch operator. A power take-off control lever, mounted on the left side of the tandem winch assembly, is provided to shift power take-off gears to obtain neutral, low, and high speeds for the front and rear tandem winches. A winch hand clutch lever, hand brake lever, and operating lever are provided for each of the two winches and are mounted on the left side of the winch rear base angle. A throttle control lever, mounted on the left side of the tandem rear winch, provides engine throttle control from the winch platform. An engine clutch control foot lever is provided at the rear of the platform to disengage the engine clutch when shifting the power take-off winch control lever.

(2) The wrap type safety brakes used on the tandem front and rear mounted winches are the same as those used on the vehicle front mounted winch. Brake replacement and adjustments are made in the same manner (par. 201), except that it is not necessary to remove either winch to take off brake housing covers.

b. Data.

Make	Gar Wood
Model	60-823B

208. CABLES.

a. Description. Each of the tandem winches and the front mounted winch carries 300 feet of cable for retrieving purposes. Each cable is secured to the winch drum at one end and carries a hook at the free end. NOTE: *The maintenance, removal, and installation of a cable is the same on all winches.*

b. Maintenance. Cable must be kept lubricated with engine oil. Unwind cable, then saturate a rag with oil and as cable is wound

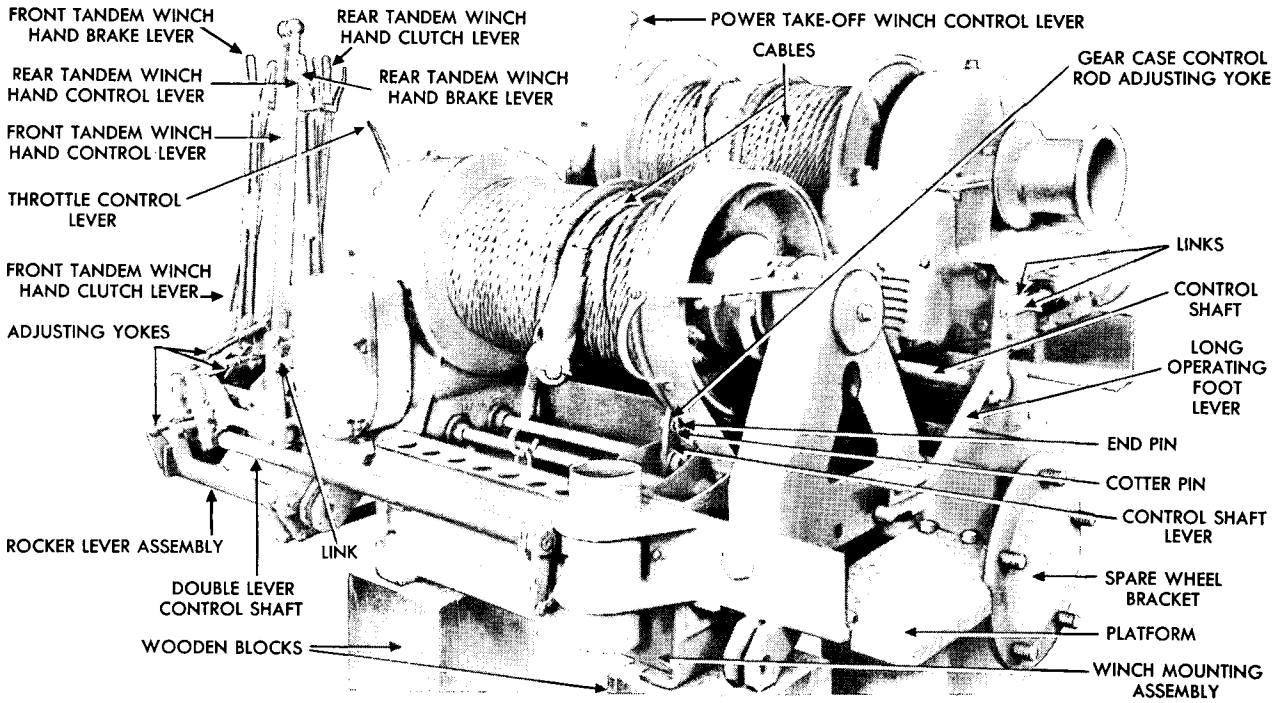

Figure 268—Tandem Winch Assembly—Rear View

onto drum, coat cable with oil. Cable must be wound on the drum in even layers and during the winding, the cable must be under tension so that it is tightly wrapped. The coil spring, used to hold end of cable on drum, must always be used to prevent cable loosening and cable end from dragging.

c. Removal. Disconnect spring, then start engine and place control lever in low. Unspool cable for about 15 feet and attach to another drum or lay where cable is out of dirt. If cable is being wound on a drum, guide cable with a steel bar so that it lays in even layers and does not kink. Stop engine and shift control lever to neutral. Remove cable clamp screws and clamp to release end of cable.

d. Installation. Insert end of cable under cable clamp and fasten clamp with cap screws. Anchor opposite end of cable securely so that a tension is maintained on the cable. Start engine and place control lever in low. Use a clean paint brush (or cloth) and engine oil, and coat cable as it is being wound. Guide cable onto drum with a steel bar held by two men, being careful not to kink cable or cross layers. When cable is completely on drum, stop engine, place control lever in neutral and attach spring to cable.

209. CHAINS AND CHAIN TIGHTENERS.

a. Description. There are three chains used to drive the rear tandem winches and these are: tandem drive line to layshaft chain, layshaft to tandem rear winch chain, and layshaft to tandem front winch chain. The two chain tighteners are idler sprockets, which are adjustable for removing slack from winch worm drive chains.

b. Chain Adjustment.

(1) DRIVE LINE TO LAYSHAFT CHAIN. The tandem drive line to layshaft chain is adjusted by installing shims under the single bearings to slacken chain and by removing shims to tighten chain. When a rule is placed perpendicular to the center of one side of the installed chain, play should not exceed 1/4 inch.

(2) LAYSHAFT TO WINCH CHAINS. Layshaft to rear tandem winch chain and layshaft to front tandem winch chain are adjusted by loosening the chain tightener assembly bolts and sliding the assembly back, or forward, as required to attain desired tightness. Bolts should then be tightened. When a rule is placed perpendicular to the center of the top of the chain between sprockets, play should not exceed one inch.

c. Remove Chains. Remove two cotter pins from two link pins which join links and remove link which is on cotter pin end of link pins. Drive the two pins and opposite link out of chain and remove chain.

d. Install Chains. Install chain and join ends by driving two pins and link through chain. Install link on the two pins and insert cotter pins in link pins.

e. Remove Chain Tighteners. Remove chain tightener assembly from front winch base rear angle by removing four bolts, nuts, and

lock washers which secure chain tightener bracket to base angle. Remove remaining chain tightener assembly by removing two bolts, nuts, and lock washers which secure each clamp to base front angle and base rear angle.

f. Install Chain Tighteners. Install chain tightener assembly on rear winch base and secure it with four bolts, nuts, and lock washers. Install remaining chain tightener assembly under two base angles with two clamps in position over bar. Secure clamps with four bolts, nuts, and lock washers.

210. SPROCKETS.

a. Description. Drive chain sprockets are secured to the input shafts of the front and rear winches of the rear tandem winch assembly and to the layshaft, chain tighteners, double bearing, and worm shafts.

b. Chain Tightener Sprocket.

(1) REMOVAL. Remove nut, lock washer, and flat washer from bearing pin. Remove set screw on bracket and pull sprocket assembly and spacer from bearing pin. Remove six screws, which secure inner and outer bearing covers to sprocket, and remove covers, felt seals, and gaskets. Remove felt oil seals from covers and press ball bearing from sprocket.

(2) INSTALLATION. Coat ball bearing with engine oil and press bearing into sprocket. Install new felt seals in inner and outer covers. Install new gaskets and secure covers on sprockets with six screws. Install spacer and sprocket on bearing pin and install set screw on bracket. Install flat washer, lock washer, and nut on bearing pin.

c. Input Shaft Sprocket.

(1) REMOVAL. Remove drive chains (par. 209). Remove cap screw, lock washer, and retaining washer from end of input shaft and pull sprocket from shaft.

(2) INSTALLATION. Install sprocket on key in input shaft and secure it with retaining washer, lock washer, and cap screw. Install drive chains (par. 209).

d. Worm Shaft Sprockets.

(1) REMOVAL. Remove drive chains (par. 209). Pull sprocket off shaft.

(2) INSTALLATION. Install sprocket on key in worm shaft and then install drive chain (par. 209).

e. Double Bearing Sprockets.

(1) REMOVAL. Remove drive chains (par. 209). Remove cap screw, lock washer, and retaining washer from end of bearing shaft and remove sprocket.

(2) INSTALLATION. Install sprocket on bearing shaft, then install retaining washer, lock washer, and cap screw. Install drive chain (par. 209).

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211. DOUBLE BEARING.

a. Description (fig. 269). The double bearing consists of a housing which is secured to the chassis frame, and contains two ball bearings in which the tandem front winch propeller shaft rotates.

b. Removal. Remove drive chain (par. 209). Disconnect universal joint. Remove four bolts, nuts, and lock washers which hold double bearing to chassis frame. Remove double bearing assembly and six shims. Remove cap screw, lock washer and retaining washer from end of bearing shaft and remove sprocket. Remove four cap screws and lock washers which hold each of two oil seal caps to bearing housing, and remove caps and gaskets. Press shaft out of housing, carrying one ball bearing with it and leaving opposite bear-

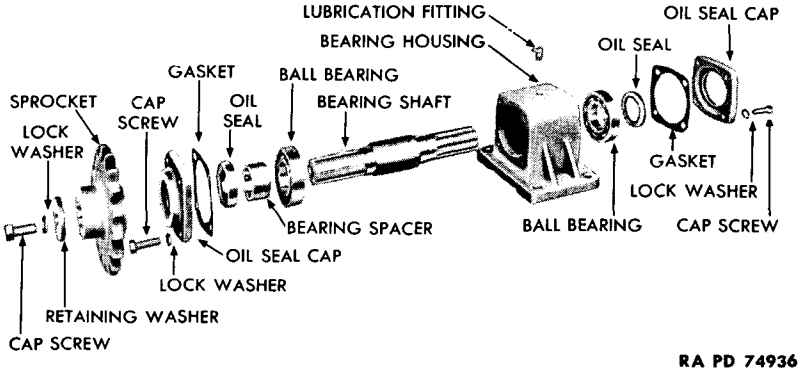

Figure 269—Double Bearing and Shaft—Disassembled

ing in housing. Remove bearing spacer from end of shaft and pull off ball bearing. Drive remaining ball bearing out of housing.

c. Installation. Press one ball bearing on bearing shaft, then install shaft and bearing in bearing housing and press ball bearing into position in housing. Press remaining ball bearing on opposite end of shaft and into bearing housing. Install bearing spacer on shaft next to ball bearing just installed. Install new oil seal in each oil seal cap. Install new end cover gasket between each cover and bearing housing and secure each cover to housing with four cap screws and lock washers. Install sprocket on shaft and then install retaining washer, securing it to end of shaft with cap screw and lock washer. Connect universal joint and install drive chain.

212. CONTROLS AND LINKAGE.

a. Description. The controls and linkage consist of the control levers for each winch, and the controls for the engine clutch and throttle. These controls are secured to the winch base close to the operator's platform and are connected to the units they operate by rod or cable linkage.

TANDEM REAR WINCHES

b. Adjustment. Operate the tandem winch assembly in a recovery operation. If any of the control levers do not operate quickly and easily, adjust the linkage by removing cotter and clevis pin and turning clevis on, or off, the rod. Then test again in a recovery operation. The control levers must return to neutral when released, and to insure this neutral position, the centering springs must be adjusted by means of the rod nuts. CAUTION: *Centering springs*

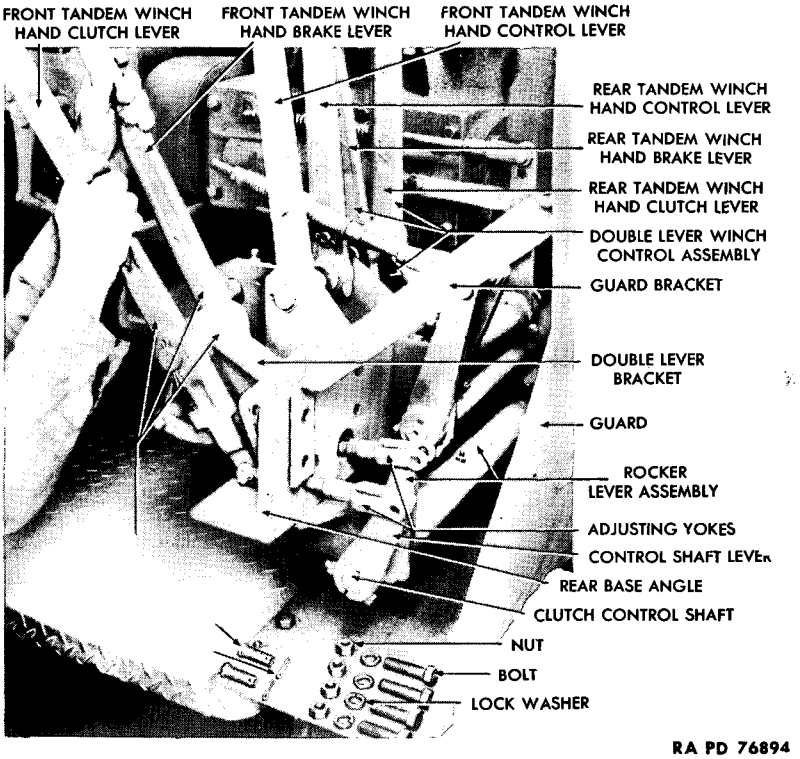

Figure 270—Removal of Front Tandem Winch Hand Clutch and Brake Levers

not adjusted correctly will throw the control lever too far and momentarily engage the opposite clutch, thus starting movement in the opposite direction.

c. Removal (figs. 270 and 271).

(1) REMOVE DOUBLE LEVER WINCH CONTROL ASSEMBLY (includes the tandem front winch hand brake and clutch levers). Remove two end pins and two cotter pins which hold brake and clutch adjusting yokes to control lever and to rocker lever assembly at rear of winch rear base angle. Then remove four nuts, bolts, and

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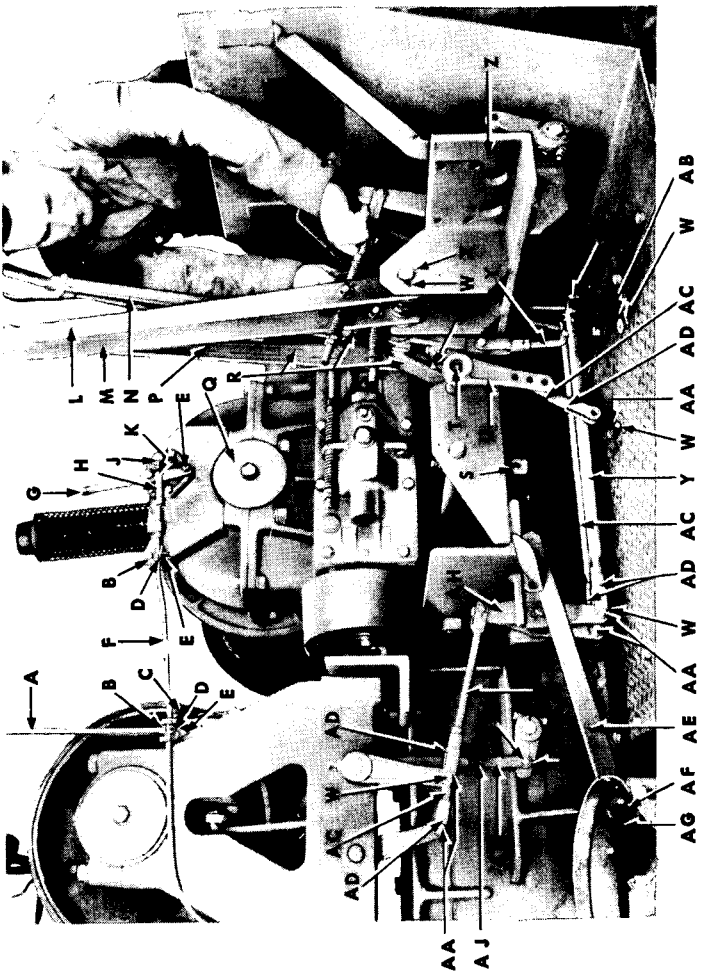

Figure 271—Removal of Rear Tandem Winch Hand Brake and Clutch Levers

A—POWER TAKE-OFF WINCH CONTROL LEVER
B—CLIP
C—BRACKET PIN
D—BRACKET
E—NUT
F—THROTTLE CONTROL CABLE AND TUBING
G—THROTTLE CONTROL LEVER
H—YOKE
J—QUADRANT
K—PIN
L—FRONT TANDEM WINCH HAND CONTROL LEVER
M—REAR TANDEM WINCH HAND CONTROL LEVER
N—REAR TANDEM WINCH HAND BRAKE LEVER
P—REAR TANDEM WINCH HAND CLUTCH LEVER
Q—REAR TANDEM WINCH
R—DOUBLE LEVER WINCH CONTROL ASSEMBLY
S—CLUTCH CONTROL LEVER
T—BRAKE CONTROL SHAFT
U—BRAKE CONTROL LEVER
V—SET SCREW
W—COTTER PIN
X—HAND LEVER PIN
Y—BRAKE CONTROL ROD
Z—REAR BASE ANGLE
AA—END PIN
AB—FLAT WASHER
AC—CLUTCH CONTROL ROD
AD—ADJUSTING YOKE
AE—ENGINE CLUTCH CONTROL FOOT LEVER
AF—ENGINE CLUTCH CONTROL SHAFT
AG—CLAMP BOLT (NOT SEEN)
AH—ROCKER LEVER
AJ—POWER TAKE-OFF WINCH CONTROL ROD

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Legend for Figure 271—Removal of Rear Tandem Winch Hand Brake and Clutch Levers

lock washers which hold double lever bracket to winch rear base angle. Lift front tandem winch double lever winch control assembly from vehicle (fig. 270).

(2) REMOVE TANDEM REAR WINCH HAND CLUTCH AND BRAKE LEVERS. Loosen set screw at top of rear winch brake control lever and remove cotter pin and flat washer which hold brake control rod to control lever. Then tap brake control lever partly off the control shaft so brake control rod can be pulled from brake control lever. Remove cotter pin and end pin which secure adjusting yoke at front end of clutch control rod to clutch control lever. Disconnect brake control lever from adjusting yoke at front end of brake control rod in the same manner. Then remove four bolts, nuts, and lock washers which secure double lever bracket to winch rear base angle, and lift two levers with bracket and double lever winch control from angle.

(3) REMOVE FRONT AND REAR TANDEM WINCH HAND CONTROL LEVERS. Remove two pins and end pin which hold adjusting yokes at rear of operating rods to operating levers. Then loosen two set screws on two collars between hand control levers. Remove cotter pin from one end of brake lever pin and drive lever pin from levers and winch rear base angle. Remove two hand control lever assemblies and two collars.

(4) REMOVE TANDEM FRONT WINCH LONG OPERATING FOOT LEVER (fig. 270). Remove two cotter pins and end pins which hold lever to adjusting yoke and to shaft rod link. Then loosen clamp bolt nut and pull off lever. Remove engine clutch-control foot lever at left side of tandem front winch by loosening nut and clamp bolt and pulling lever from engine clutch control shaft. Remove Woodruff key.

(5) REMOVE TANDEM REAR WINCH BRAKE AND CLUTCH CONTROL RODS (fig. 271). Remove cotter pin and end pin from adjusting yoke and lever at front end of each rod. Remove two rods. Remove short control rods by removing cotter pin and end pin from each end of each rod and its connecting control levers.

(6) REMOVE THROTTLE CONTROL LEVER (fig. 271). Remove nut and flat washer which hold lever to quadrant and remove end pin and cotter pin from yoke which holds cable to lever. Remove lever.

(7) REMOVE THROTTLE CONTROL CABLE AND TUBING (fig. 271). Remove two slotted screws and nuts which hold each of the two clips to brackets on winch. Then remove one clip at left front of winch by removing a bolt, nut, and lock washer. In similar manner, remove clip which secures tubing to transmission side of left rear seat support. Remove two slotted screws and nuts which hold clip and tubing to bracket on air cleaner pipe at rear of carburetor. Disconnect cable from carburetor by removing bolt, nut, and lock washer which secure cable chain to carburetor.

(8) REMOVE POWER TAKE-OFF WINCH CONTROL LEVER AND ROD (fig. 271). Remove lock pin from lever. Remove two cotter pins and end pins, which secure lever to bracket and control rod, and remove control lever. Remove cotter pin and end pin, which secure adjusting

yoke at lower end of power take-off winch control rod to control shaft lever, and remove rod.

d. Installation.

(1) INSTALL WINCH ENGINE CLUTCH CONTROL FOOT LEVER (fig. 271). Install lever on shaft and tighten clamp bolt nut.

(2) INSTALL TANDEM FRONT WINCH LONG OPERATING FOOT LEVER. Position lever on shaft on right side of tandem front winch and tighten clamp bolt nut. Install two end pins and cotter pins which secure lever to adjusting yoke and to shift rod links.

(3) INSTALL POWER TAKE-OFF WINCH CONTROL LEVER AND ROD (fig. 271). Secure control rod to control shaft lever by installing end pin through adjusting yoke and lever. Lock pin with a cotter pin. Then position control lever on bracket and control rod and install two end pins and cotter pins. Install lock pin in lever.

(4) INSTALL THROTTLE CONTROL CABLE AND TUBING (fig. 271). Position throttle control cable and tubing under rear of cab at left side of tandem winch assembly, placing cable along frame and to left side of engine. Install bolt, nut, and lock washer which secure cable chain to carburetor. Install two slotted screws and nuts, which hold clip and tubing to bracket on air cleaner pipe at rear of carburetor. Then install clip which secures tubing to transmission side of left rear seat support, securing clip to its bracket with two slotted screws and nuts. In a similar way, install two clips and tubing to brackets on winch.

(5) INSTALL THROTTLE CONTROL LEVER (fig. 271). Position lever on quadrant and install nut and flat washer which hold lever to quadrant. Install end pin and cotter pin which secure yoke at end of throttle control cable to lever.

(6) INSTALL TANDEM REAR WINCH BRAKE AND CLUTCH CONTROL RODS (fig. 271). Install short control rods to their connecting levers by installing an end pin and cotter pin to hold each end of each rod to its connecting control levers. Connect long brake and clutch control rods to adjusting yokes by installing end pins and cotter pins through yoke and rod at front end of each rod.

(7) INSTALL CONTROL LEVERS (figs. 270 and 271).

(a) Install Lever Pin. Install lever pin through winch rear base angle, two collars, and levers. Lock ends of lever pin with cotter pins. Position two collars next to levers and tighten set screws in collars. Secure adjusting yokes at rear of long control rods to operating levers by installing two end pins and cotter pins.

(b) Install Hand Clutch and Brake Levers. Install rear tandem winch hand clutch and brake levers, which are positioned next to rear winch. Lift two levers, with bracket attached, into position on winch rear base angle, and secure bracket to angle with four bolts, nuts, and lock washers.

(c) Install Brake Control Rod. Install end and cotter pins which secure yoke at front end of clutch control rod to clutch operating lever. Install brake control rod in brake control lever (in same hole in which it was originally installed) and lock rod with a cotter pin.

Tap brake control lever back into position on shaft and tighten set screw at top of control lever.

(d) Connect Brake and Clutch Control Rods. Install front tandem winch hand brake and clutch levers (with double lever bracket attached) on winch rear base angle. Install four nuts, bolts, and lock washers which secure bracket to angle. Install two end pins and cotter pins which hold brake and clutch control rods at bottom of control levers to control rocker levers at rear of winch base angle.

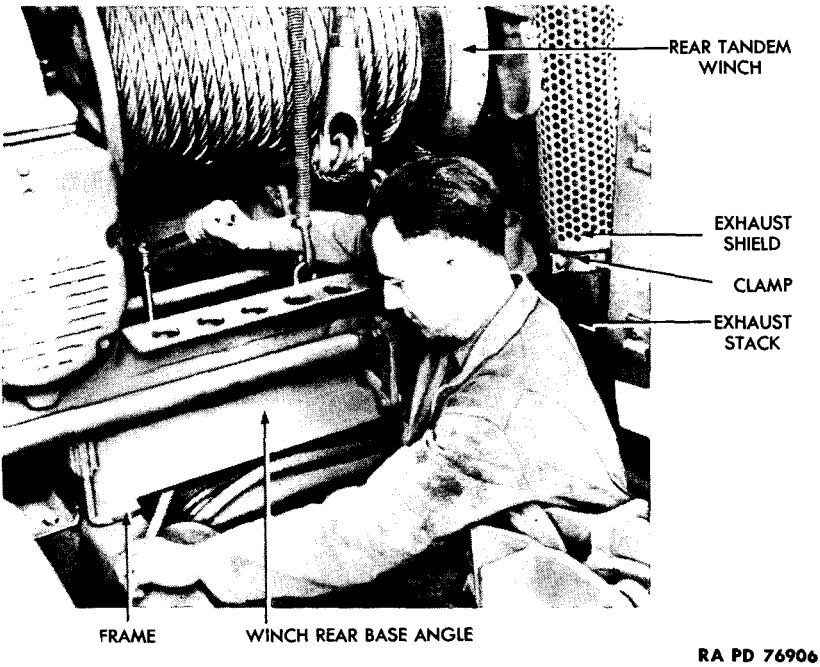


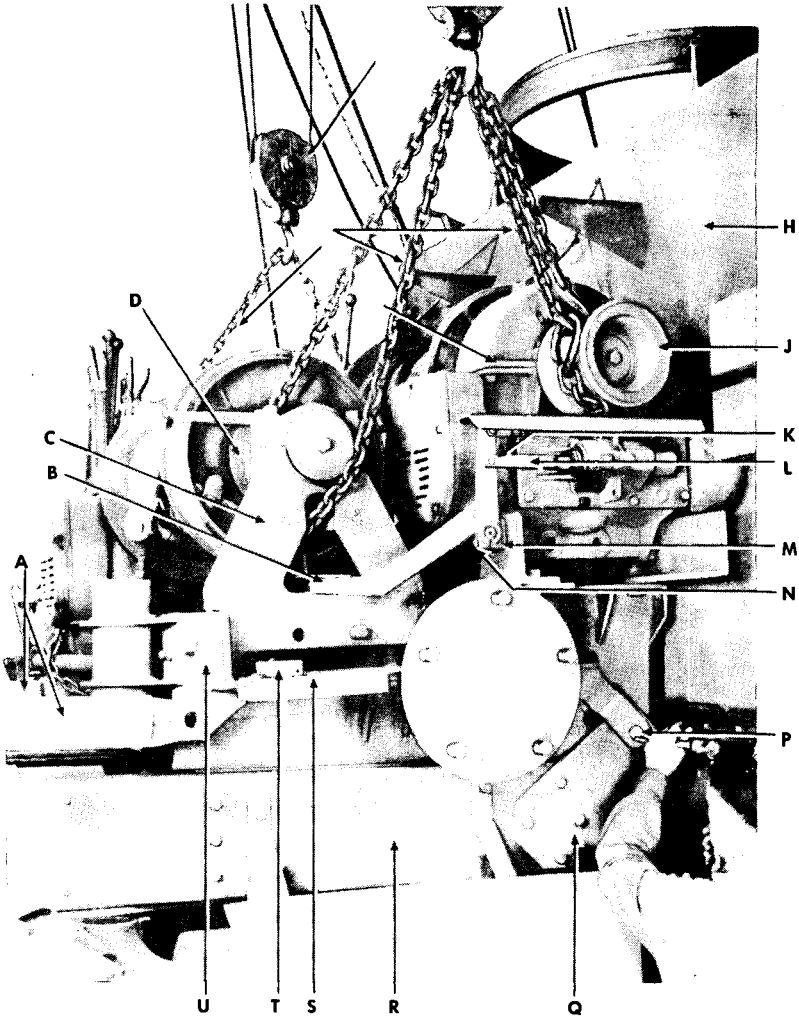
Figure 272—Removal of Tandem Winch Rear Mounting Bolts

213. REMOVAL OF TANDEM REAR WINCH.

a. Remove Tandem Winch Guard. From left side of the vehicle, remove two oxygen bottles and one acetylene bottle. Open door of stowage box on left side of vehicle so as to provide access to nuts and remove four bolts, nuts, and lock washers which secure guard to rear of stowage box, and three bolts, nuts, and lock washers which secure guard to top of box. Remove four bolts, nuts, and lock washers which secure guard brackets to winch rear base angle. Lift winch guard from vehicle.

b. Remove Throttle Control Cable and Tubing. Remove cotter and rod end pins which secure end yoke to throttle control hand lever. Remove two slotted head screws and nuts, which hold rear clip over cable and tubing to rear bracket. Disconnect cable and

TANDEM REAR WINCHES



A—VERTICAL LIFTING DEVICE
B—FRONT TANDEM WINCH LONG OPERATING FOOT LEVER
C—END BEARING FRAME
D—REAR TANDEM WINCH
E—CHAIN SLINGS
F—HOISTS
G—FRONT TANDEM WINCH
H—CAB
J—HEAD
K—PINS
L—LINK
M—CLAMP BOLT
N—NUT
P—MOUNTING HINGE PIN
Q—WINCH SUPPORT PLATE
R—FRAME
S—COTTER PIN
T—HINGE PIN
U—REAR BASE ANGLE

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Figure 273—Driving Mounting Hinge Pin from Frame Winch Support Plate

tubing from front bracket in the same manner. Pull cable and tubing to left and remove.

c. Remove Spare Tire and Wheel. Remove spare tire and wheel from right side of vehicle.

d. Remove Floodlights. Remove nut, washer, and spring which hold each floodlight to bracket at top rear of cab. Then remove cable plugs from each light and lift lights from brackets.

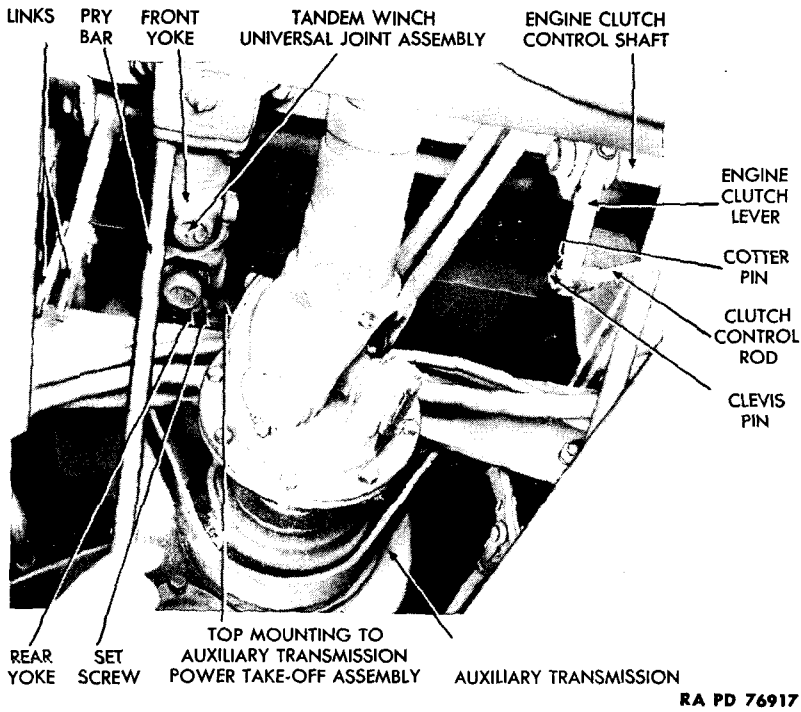

Figure 274—Positioning Tandem Winch Universal Joint Assembly for Removal of Winch Assembly

e. Remove Rear Mounting Bolts (fig. 272). Remove platform plate which is immediately back of tandem winch assembly by loosening four cap screws so that clips which secure plate to frame can be freed from frame. Lift plate out of the way to provide access to mounting bolts. Then remove two bolts, two springs, and four flat washers which secure winch rear base angle to frame cross member.

f. Remove Exhaust Stack and Shield. Remove one bolt, nut, and lock washer which hold top clamp to shield. Remove two bolts, nuts, and lock washers which secure bottom of stack to exhaust pipe. Lift stack and shield from exhaust pipe.

TANDEM REAR WINCHES

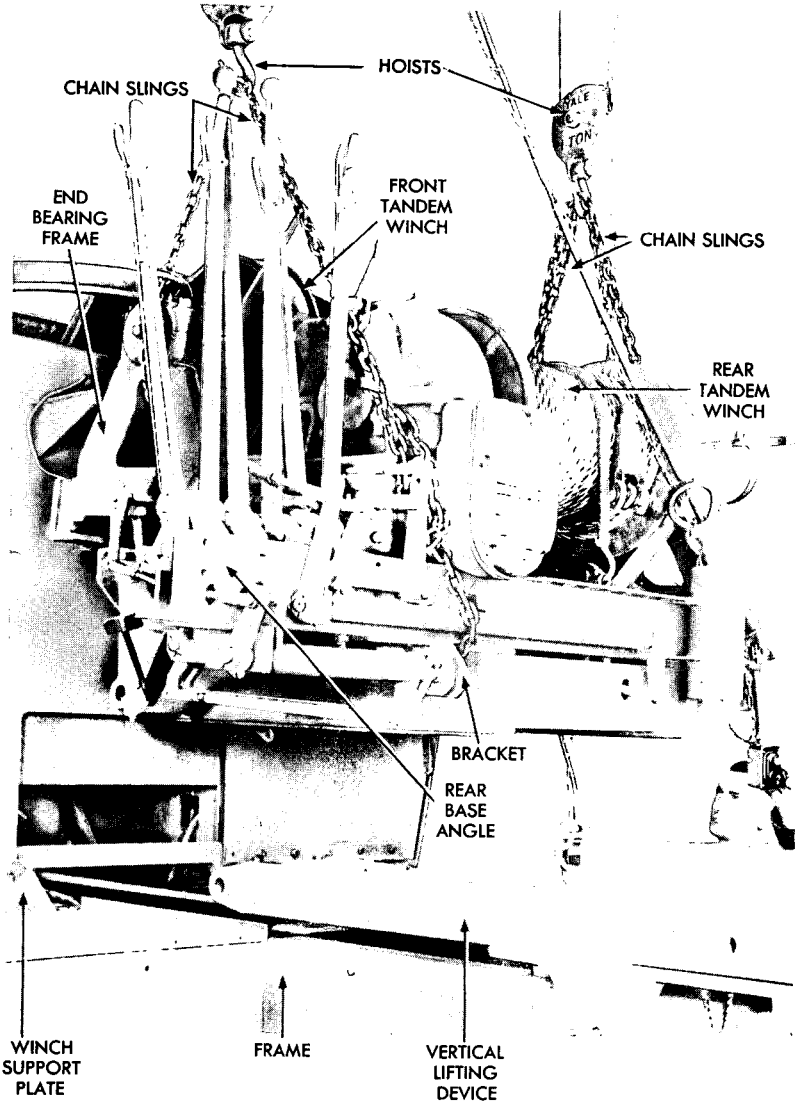

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Figure 275—Removal of Tandem Winch Assembly

g. Disconnect Vertical Lifting Device (fig. 273). From each side of front end of vertical lifting device, remove cotter pin and vertical lift hinge pin, which secure vertical lifting device to winch rear base angle.

h. Attach Hoists to Tandem Winch Assembly (figs. 273 and 275). Two hoists are require to lift tandem winch assembly and should be used at this point to remove weight of assembly from mounting hinge pins before pins are removed. On the left side of assembly, attach one chain sling around winch rear base angle, at right of vertical lifting device bracket, and then run chain over hoist hook and down through tandem front winch end bearing frame. On right side of tandem winch assembly, place one end of a chain sling through tandem winch end bearing frame, and place chain over second hoist hook and around front tandem winch head.

i. Remove Mounting Hinge Pins (fig. 273). Support weight of tandem winch assembly on hoists, sufficiently to remove load from two mounting hinge pins, which secure tandem winch assembly to winch support plate on each side of frame. Then remove cotter pin from end of each hinge pin and drive out pins.

j. Disconnect Links from Power Take-off Gearshift Rod (fig. 274). From underneath vehicle, remove cotter pin and end pin which secure the two links to top mounted power take-off gearshift rod.

k. Loosen Universal Joint Assembly (fig. 274). Loosen set screw which secures rear yoke to top mounting auxiliary transmission power take-off assembly. Then pry front yoke as far back toward power take-off assembly as possible.

l. Disconnect Engine Clutch Lever from Clutch Control Rod (fig. 274). Remove cotter pin and clevis pin which secure clevis yoke at end of engine clutch control rod to clutch lever.

m. Remove Tandem Winch Assembly (fig. 275). Using two hoists, lift tandem winch assembly straight up, lifting it slowly and guiding it carefully out of frame. Lift assembly onto wooden blocks, exercising caution to make sure it is not resting on parts which might become damaged.

214. INSTALLATION OF TANDEM REAR WINCH.

a. Lift Tandem Winch Assembly into Position on Frame (fig. 275). Attach two chain slings and two hoists to assembly. Lift assembly directly over its position on frame and lower it carefully, inserting rear yoke of universal joint assembly into position on splined end of bearing shaft. Then tighten set screw which secures rear universal joint yoke to power take-off (fig. 274).

b. Install Mounting Hinge Pins (fig. 273). Support the weight of tandem winch assembly on the two hoists and install two mounting hinge pins through frame winch support plates and winch base. Drive pins into position and lock them with cotter pins.

c. Connect Power Take-off and Engine Clutch Controls (fig. 274). From underneath vehicle, position two links on power take-off

gearshift rod and secure links to rod by installing link pin and cotter pin. Connect engine clutch lever to clutch control rod by installing clevis pin through clevis yoke and lever. Lock clevis pin with a cotter pin.

d. Connect Vertical Lifting Device (fig. 273). Connect each front end of vertical lifting device to winch rear base support angle by driving in two mounting hinge pins. Secure hinge pins with cotter pins.

e. Install Exhaust Stack and Shield (fig. 272). Lift exhaust stack and shield into position on exhaust pipe and install two bolts, nuts, and lock washers which secure bottom of stack to pipe. Position top clamp around shield and secure it with a bolt, nut, and lock washer.

f. Install Rear Mounting Bolts (fig. 272). Install two bolts, two springs, and four flat washers (one washer on each end of each spring) which secure winch rear base angle to frame. Install platform plate on frame immediately back of tandem winch assembly, positioning four clips under frame side channels and tightening four cap screws.

g. Install Throttle Control Cable and Tubing. Pull throttle cable and tubing into position on winch assembly. Secure tubing to two brackets by installing a clip and two slotted head screws and nuts to each bracket. Install rod end pin and cotter pin which secure end yoke to throttle control hand lever.

h. Install Spare Tire and Wheel. Install spare tire and wheel on right side of vehicle.

i. Install Floodlights. Place two floodlights in brackets at top rear of cab. Install spring, washer, and nut which hold each light to its bracket. Attach cable plug to back of each light.

j. Install Tandem Winch Guard. Lift tandem winch guard into position on left side of tandem winch assembly. Open doors of stowage box on left side of vehicle to provide access to nuts. Then install four bolts, nuts, and lock washers which secure guard to rear of stowage box and install three bolts, nuts, and lock washers which secure guard to top of box. Install four bolts, nuts, and lock washers which hold guard brackets to winch rear base angle. Secure two oxygen tanks and one acetylene tank in position at left rear of cab.

k. Remove Hoists and Chain Slings. Remove two chain slings and hoists from tandem winch assembly.

l. Adjust Winch Controls. Adjust winch controls as instructed in paragraph 212.

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Section XXXIII

FIFTH WHEEL

215. DESCRIPTION AND DATA.

a. Description (fig. 276). The lower fifth wheel coupler assembly is mounted on the rear of the frame. A spring-loaded locking jaw is actuated by a handle at the rear of the fifth wheel, and secures the semitrailer upper fifth wheel kingpin to the tractor lower fifth wheel, when coupling the semitrailer to the tractor.

b. Data.

Manufacturer	Fruehauf
Model	F

216. REMOVAL.

a. Remove Dummy Coupling Plate (fig. 276). Disconnect two coil springs from coupler mounting plate at rear of assembly. Remove dummy coupling plate in front of coupler by loosening four cap screws and lock washers so that clips underneath plate can be turned free of frame side channels. Removal of the dummy coupling plate provides access to bolts from underneath the coupler.

b. Remove Coupler (fig. 276). Remove 12 bolts, nuts, and lock washers which hold each coupler mounting bracket to frame side channel and coupler mounting plate at each side of fifth wheel coupler. Then attach a chain or rope sling to assembly and use a hoist to raise it straight up from frame and remove it from vehicle.

217. INSTALLATION.

a. Install Coupler (fig. 276). Attach a chain or rope sling to fifth wheel coupler and use a hoist to lift it into position on coupler mounting plate. Secure assembly to frame and coupler mounting plate by installing 12 bolts, nuts, and lock washers into each side of assembly.

b. Install Dummy Coupling Plate (fig. 276). Attach the two coil springs at rear of coupler to coupler mounting plate. Place dummy coupling plate in position on frame, positioning the four clips under frame side channels. Tighten the two cap screws and lock washers.

FIFTH WHEEL

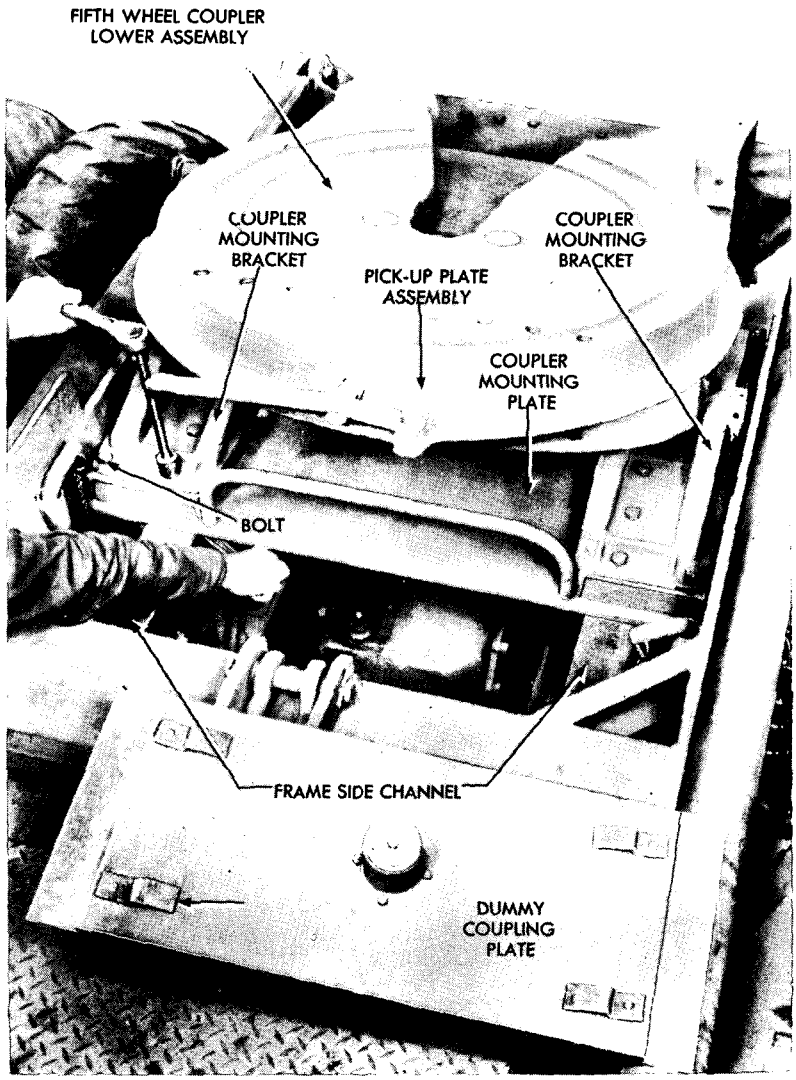

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Figure 276—Removal of Fifth Wheel Coupler Lower Assembly

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

PART THREE

SEMITRAILER MAINTENANCE INSTRUCTIONS

Section XXXIV

ORGANIZATION TOOLS AND EQUIPMENT

218. ORGANIZATION TOOLS AND EQUIPMENT.

a. In addition to the tools listed in paragraph 36, the following are available to the using arms for the maintenance of this vehicle:

(1) STANDARD TOOL SETS. The tool sets available to individuals (Specialists) and organizations, dependent upon the allocation in the Tables of Equipment are listed in SNL N-19. The components of these tool sets are also listed and illustrated.

(2) SPECIAL TOOLS. The special tools for servicing the vehicle are listed in paragraph 37.

Section XXXV

BRAKE SYSTEM

219. DESCRIPTION.

a. Description. The brakes are of the heavy duty, mechanical, internal expanding, two-shoe, eccentric anchor pin type, operating on the cam and lever principle. The "S" type cams are integral with the camshafts. The cams are carried on self-alining type ball bearings, plus needle bearings. The slack adjusters are of the 360-degree type, and permit rapid and proper adjustment of the brakes. The drums are of the ribbed type which permit fast dissipation of heat. The brakes are actuated by four air cylinders which are mounted in the hollow sections of walking beams; each cylinder provides braking power for two wheels. Emergency breakaway features are built into the emergency-relay valve, which will hold the semitrailer for a limited time should the semitrailer break away from the towing vehicle. An emergency brake release valve is provided to permit the release of the brakes when the tractor and the semitrailer are uncoupled. The brakes are controlled by a foot and hand control on the towing vehicle.

220. DATA.

Brakes:

Make	Fruehauf Trailer Company
Type	two-shoe internal expanding
Size	16 in. x 6 in.
Lining size	¾ thick x 6 in. 7¼ in. radius
Operating pressure	min. 60-lb
Copper air lines	⅜-in. and ½-in. dia
Jumper hose (length)	10½ ft
Relay-emergency valve (interchangeable with Bendix Westinghouse)	Midland

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

221. MINOR BRAKE ADJUSTMENT.

a. Jack-up Axle Assembly. Jack up wheel assembly until wheel clears ground (fig. 277). CAUTION: *When jacking axle assembly, place jack under axle jack bracket to prevent jack slippage.*

b. Adjusting Brake. Turn adjusting screw in a counterclockwise direction until wheel cannot be turned. Turn adjusting screw in a clockwise direction, about two notches or more, until wheel turns freely (fig. 278). Adjusting procedure on all eight wheels is identical.

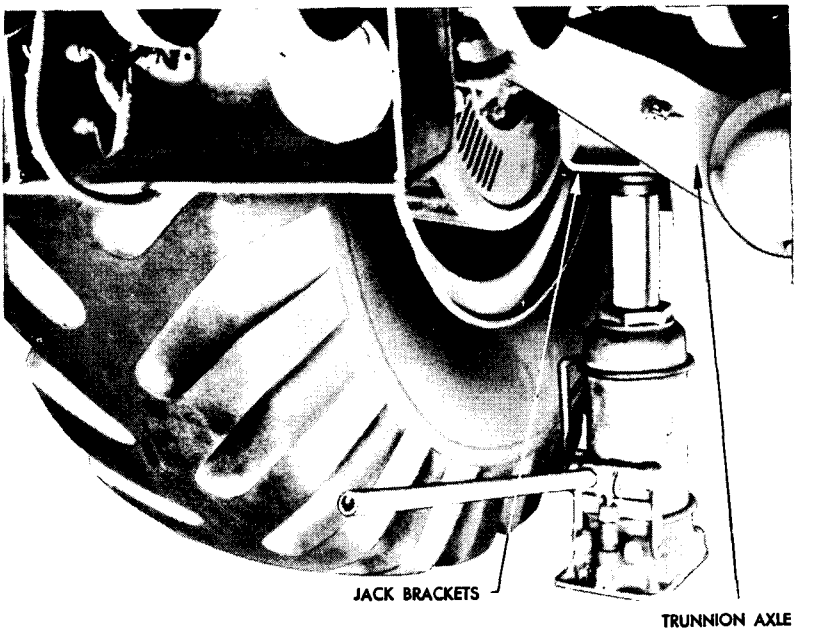


Figure 277—Jacking Trunnion Axle

222. MAJOR BRAKE ADJUSTMENT (fig. 279).

a. Adjustment. Make the following major brake adjustment only when the setting of the brake anchor pins has been disturbed, or when new lining, new shoes or new drums have been installed.

(1) Loosen both locking nuts on both anchor pins so that the anchor pins can be moved freely (fig. 295).

(2) Install the wheel assembly. NOTE: *If wheel assembly fails to move on axle spindle freely, slack off on the slack adjusters through counterclockwise movement of the slack adjuster adjusting screw, and centralize anchor pin eccentrics.*

(3) Turn the slack adjuster adjusting screw clockwise until the shoes are tight in the drum.

(4) Turn the eccentric anchor pin to right and left, and continue to tighten up on the slack adjuster until the brake shoes are centralized in the drum.

(5) Using a feeler gage, set the clearance at 0.010 inch at the eccentric end, and 0.015 inch at the cam end, of the brake shoes.

(6) Tighten lock nuts on the anchor pins while holding anchor pins firmly in position with wrench.

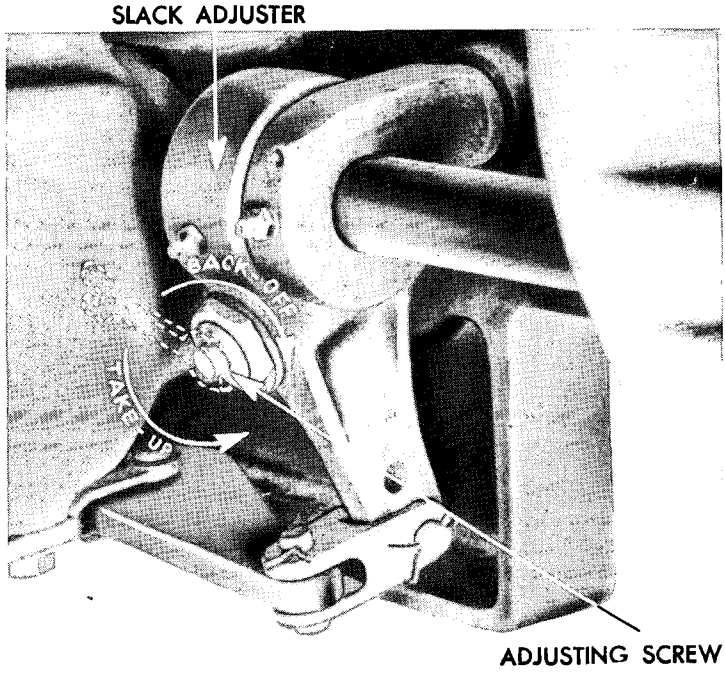


Figure 278—Minor Brake Adjustment

223. BRAKE CYLINDER.

a. Description. The two brake cylinders are mounted on a carrier plate. The plate in turn, is bolted to the underside of the walking beam. The function of the brake cylinder is to convert the energy of compressed air into the mechanical force necessary to expand the brake shoes against the brake drum and apply the brakes. Air pressure from the relay-emergency valve enters the port at rear of the brake cylinder. This air, held in check by a packing cup, moves a piston forward to rotate the slack adjuster and apply the brakes.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

b. Removal.

(1) REMOVE CARRIER ASSEMBLY. Disconnect air lines at walking beam (fig. 280). Pull cotter pin from rod end pin at slack adjuster end of equalizer link and drive out rod end pin (fig. 281). Repeat above operation on opposite side and opposite end of equalizer. Place jack under center of walking beam and raise jack until jack cap contacts mounting plate. Remove alemite fittings and grease lines which protrude from the walking beam. Remove 14 cap screws and 14 lock washers holding the brake cylinder carrier assembly to underside of walking beam (fig. 282). Remove jack and lower brake cylinder carrier assembly to ground (figs. 282 and 283).

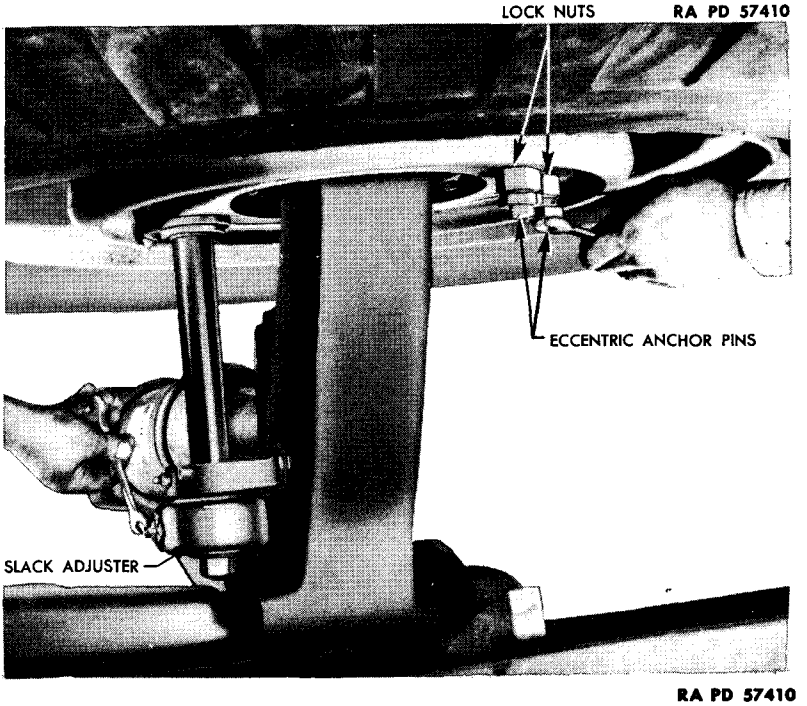
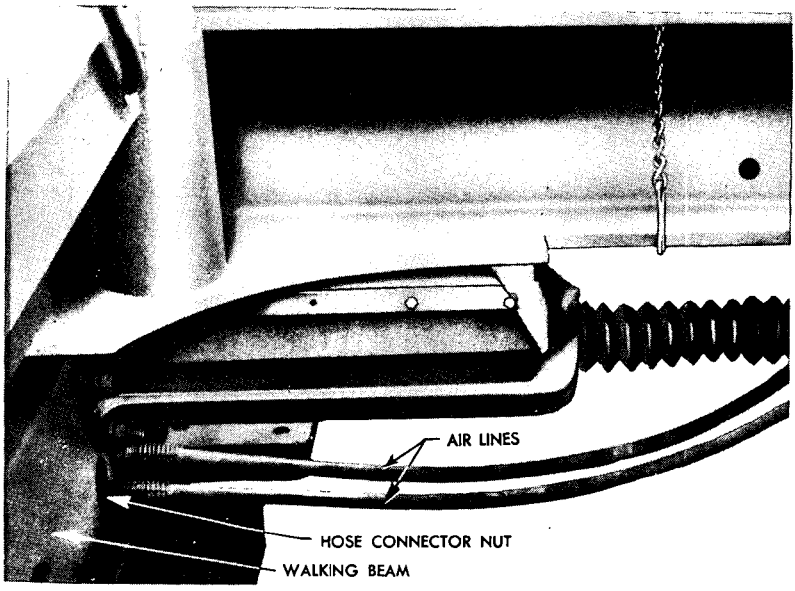


Figure 279—Major Brake Adjustment

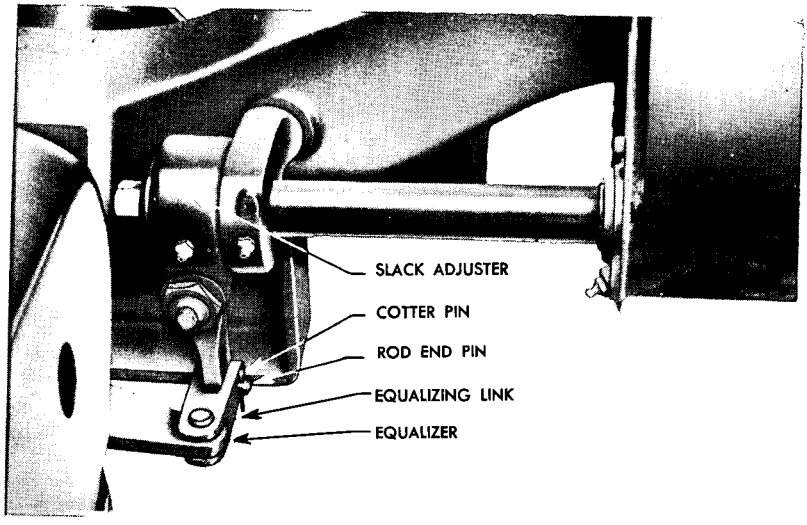
(2) REMOVE CYLINDER. Pull cotter pins from rear end of cylinder yoke. Drive out the two rod end pins. Lift cylinder off mounting bracket (fig. 282). Hold lock nut firmly with wrench and turn yoke off cylinder push rod.

c. Maintenance. Prior to installing cylinder, remove oil plug at air port. Inspect through the port to determine whether or not cylinder has sufficient amount of oil. NOTE: *Cylinder must have approximately 1½ ounce of light grade engine oil.*



RA PD 57393

Figure 280—Brake Cylinder Air Lines



RA PD 57394

Figure 281—Equalizer, Equalizer Links, and Slack Adjuster

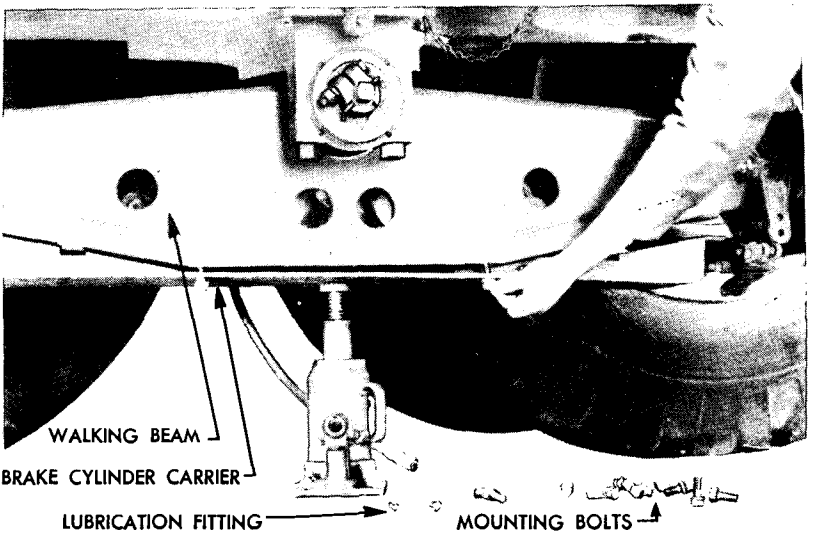


Figure 282—Removing Brake Carrier Mounting Cap Screws

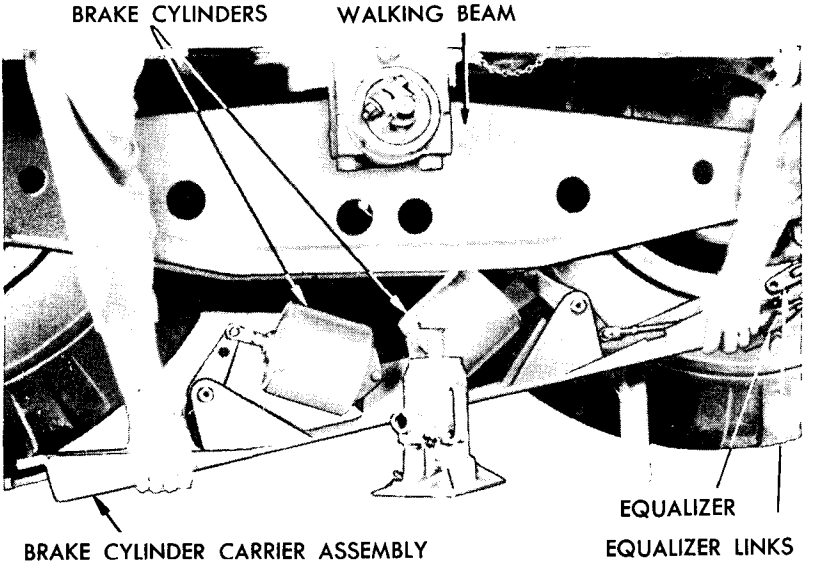
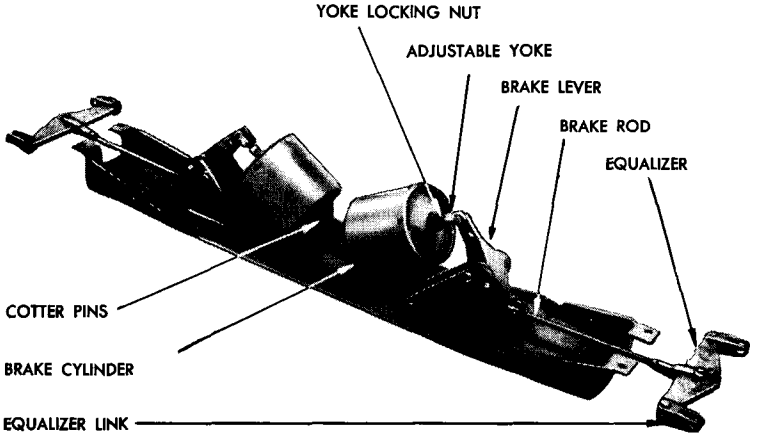


Figure 283—Removing Brake Carrier Assembly

d. Installation.

(1) INSTALLING CYLINDER ON CARRIER MOUNTING PLATE. Install jam nut on cylinder push rod. Turn jam nut on cylinder push rod as far as it can be turned Screw yoke onto cylinder push rod until it reaches a stop. Lock yoke in position with jam nut. Place cylinder on mounting bracket. Secure cylinder to bracket with rod end pin and cotter pin (fig. 285). NOTE: *When installing one cylinder it is very important that the air port in the cylinder be facing in the same direction as the port in the cylinder which is mounted on carrier. If two cylinders are being mounted, make certain both ports are facing in the same direction. If air ports are in opposite directions,*



RA PD 57397

Figure 284—Brake Cylinder Carrier Assembly

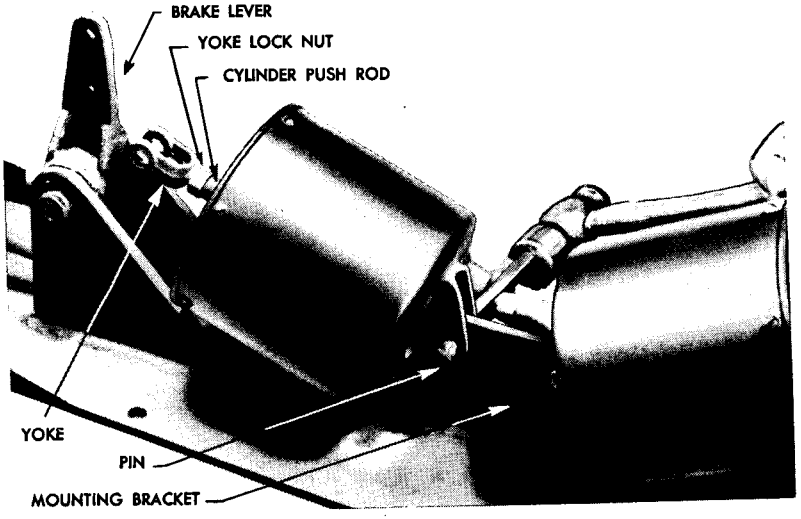
the air line which is coupled to the brake cylinder will not be long enough to accommodate both cylinders. Couple cylinder yoke to top hole in brake lever, using clevis pin and cotter pin to secure in place. Cover all rod end pins with oil. Tighten yoke jam nut and pull out on cylinder push rod to make certain cylinder operates freely. Remove hose connector body from cylinder and install it in air port in cylinder.

(2) INSTALLING CARRIER ASSEMBLY. Place jack under center of walking beam. Place cylinder carrier assembly on jack making certain the two air ports in cylinder are facing toward inner side of semitrailer (figs. 283 and 284). Bolt the carrier assembly to walking beam using 14 lock washers and 14 cap screws (fig. 282). Install the two oil lines and alemite fittings. Lubricate the two fittings. Couple the four equalizers to slack adjusters using rod end pins and cotter pins (fig. 281). Place several drops of oil on each rod end pin. Couple the two air hose to brake cylinders (fig. 280). Make minor

adjustment on brakes on the four wheels of the assembly which brake carrier assembly controls (par. 221). NOTE: *Prior to placing semitrailer into operation, place semitrailer brakes in the applied position. Cover hose connection with soapy water to detect air leaks. Should a leak be detected, tighten hose connection body and nut until leak disappears, however, a three-inch bubble in ten seconds is permissible.*

224. DRUMS.

a. Description. The drum is of cast mechanite iron with thirty cooling ribs spaced evenly around the outside diameter. The drum may be inspected without removing wheel and hub assembly from the trunnion axle.



RA PD 57398

Figure 285—Removing Brake Cylinder from Carrier

b. Inspection. Remove six cap screws holding upper and lower dust shield to brake mounting plate. Remove dust shields (fig. 286).

c. Removal. Remove wheel and hub assembly as one unit (par. 255 **a**). With one man holding nuts to prevent them from turning, remove the six mounting bolts holding drum to hub flange (fig. 287).

d. Installation. Tip wheel and hub assembly against semitrailer frame at about a 30-degree angle. Clean all dust and other foreign matter from surface of drum pilot. Place drum in position on drum pilot. Aline holes in drum with those in hub. Install bolts, nuts, and lock washers. Successively tighten opposite nuts to bring drum down evenly, and prevent cocking of drum on drum pilot. Install wheel and hub assembly on trunnion axle (par. 255 **d**).

225. AIR CLEANER.

a. Description. Air cleaners are mounted at rear end of top decking. One cleaner is installed in emergency brake air line and the other in service brake line. Air cleaners consist of a metal screen mounted in a housing; they are designed to prevent dirt, water and other foreign matter from entering the relay-emergency valve. No adjustment is required to maintain efficient functioning of cleaner. However, cleaner must be drained every 1,000 miles, and disassembled and thoroughly cleaned every 6,000 miles.

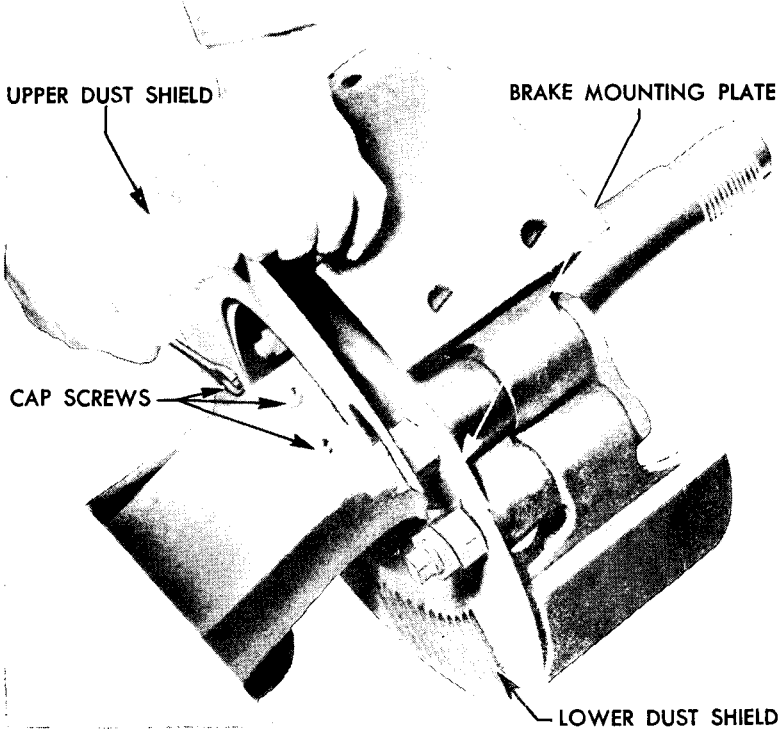


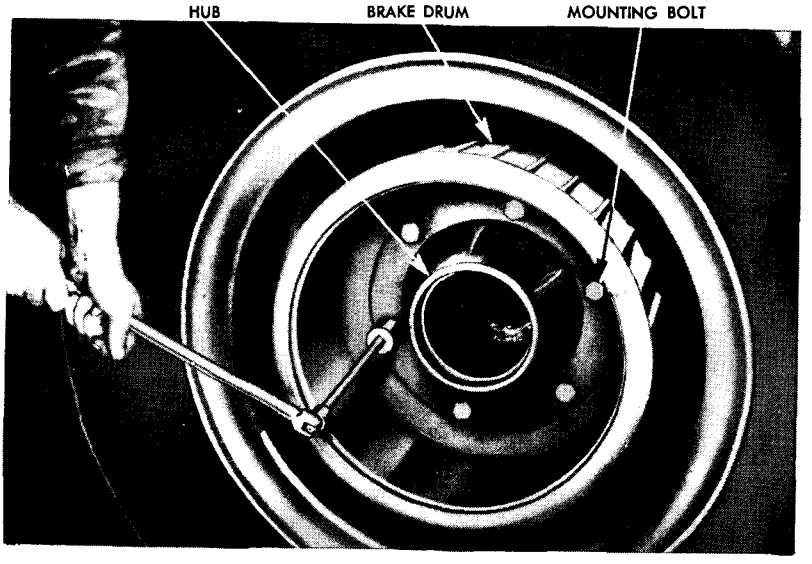
Figure 286—Removing Brake Dust Shields

b. Draining Air Cleaner (fig. 288). Close the service and the emergency air line shut-off valves at rear of towing vehicle. Remove drain plug from bottom of air cleaner, allow all moisture to drain, and replace plug. Close the two shut-off valves.

c. Cleaning (fig. 289). Remove the two cap screws holding sediment bowl to body. Remove strainer support and pull strainer out of body. Wash strainer in dry-cleaning solvent, and replace.

d. Removal (fig. 288). Shut off air supply at towing vehicle. Disconnect the two lines which lead into cleaner body. Remove the two connector bodies. Remove the two cap screws holding cleaner to mounting bracket, and lift cleaner out.

e. Installation. Place cleaner in position on mounting brackets. Install two cap screws, but do not tighten. Install the two connector bodies on the air cleaner. Couple the two air lines to the connector bodies and tighten the two cap screws holding cleaner to mounting bracket. Open air valves at rear of towing vehicle and test tubing



RA PD 57400

Figure 287—Removing Brake Drum from Wheel and Hub Assembly

connectors for leaks, using soapy water. Should leaks occur, tighten tube connector bodies and nuts. NOTE: *When installing cleaner, it is very important that the arrow embossed on the outer side be pointing toward the air line which runs to the rear of unit* (fig. 289). Open shut-off valves at rear of towing vehicle.

226. LINES, TUBING, AND CONNECTIONS.

a. Description (figs. 290, 298 and 299). Two flexible air lines, with couplings attached, are used between semitrailer and towing vehicle. Four flexible air lines are used between air outlet on main frame members and brake cylinders which are mounted on inside of walking beam. Balance of air lines are of ⅜-inch diameter copper tubing, except lines between air reservoirs and relay-emergency valve, which are ½-inch diameter tubing.

b. Removal. Close shut-off valves at rear of towing vehicle. Open drain cocks at underside of air reservoirs. Allow all air to drain from semitrailer brake system. Remove the brass nuts from each end of damaged tubing. Pry open clips holding tubing to frame and pull tubing and loom out.

c. Installation. Thread copper tubing through loom. Install the line, forming it to fit the frame work while making proper bends. Place tubing connector nut over tubing. Place sleeve over tubing

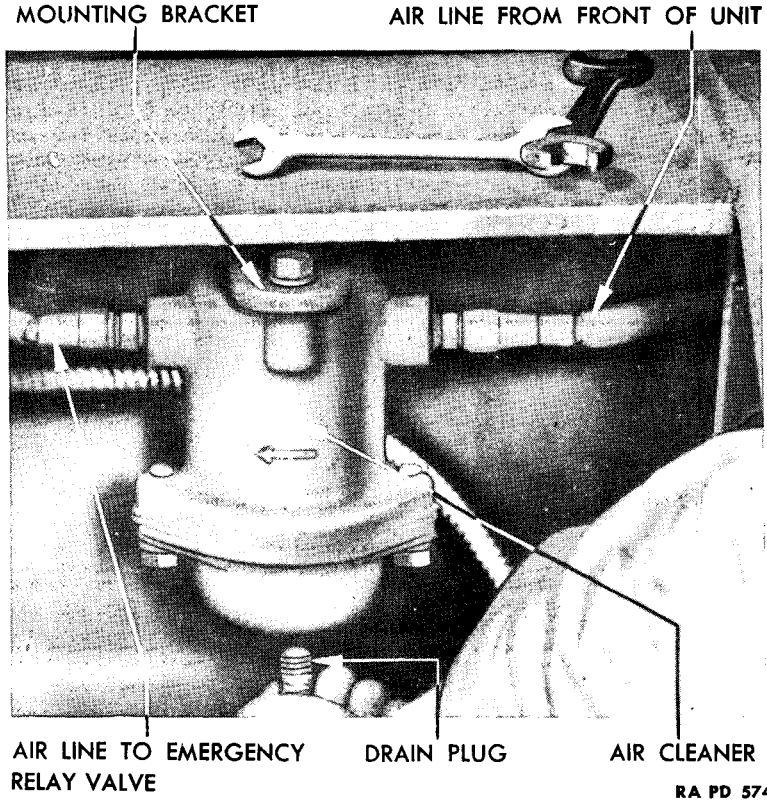


Figure 288—Draining Air Cleaner

Place end of tubing into tubing connector body, hold tubing firmly and straight into connector body, and tighten the connector nut. NOTE: *It is very important that care be exercised when bending and forming tubing to fit frame. A sharp bend will kink tubing and retard brake application and release. Keep dirt and other foreign matter out of tubing. When making a cut, use a tubing cutter, not a hacksaw. Copper dust in tubing is detrimental to functional parts of relay-emergency valve. When cutting tubing with a tube cutter, feed cut-*

ting wheel into the tubing, a very small amount with each complete rotation until the tube is cut. If the cutter is fed too rapidly, the end of tubing may become beveled inward, thus reducing the inside diameter of the tube. Make certain all lines are properly anchored to frame members, using tubing clips which are welded to frame members. When small portion of tubing becomes damaged, cut off the damaged section and replace with new, using standard 3/8-inch Westinghouse tubing union at each end of replacement tube. No attempt should be made to repair damaged 1/2-inch copper lines. Remove and replace with new. Close drain cock on reservoir. Open shut-off valves at rear of towing vehicle. Check for leakage (par. 226 d).

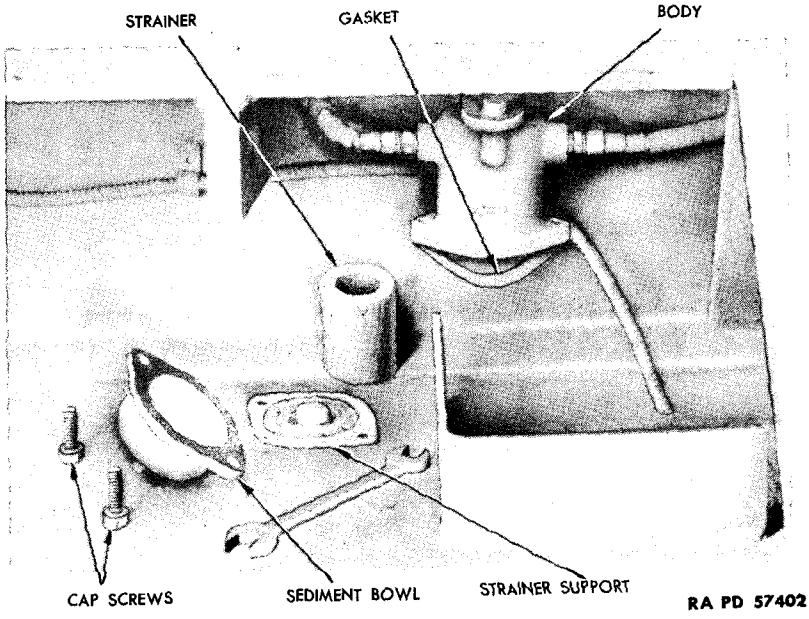


Figure 289—Air Cleaner Disassembled

d. Leakage Test. With brakes applied, cover tube connector with soapsuds. A 3-inch bubble in 10 seconds is permissible. Leakage in excess must be corrected by tightening connector body and nuts.

227. LINKAGE (figs. 284 and 291).

a. Description. Linkage consists of eight equalizer links, four equalizers, and four brake rods.

b. Removal of Equalizer Link. Pull cotter pins from equalizer link pins. Drive out both pins. Turn adjusting screw on slack adjuster in a counterclockwise direction until slack adjuster clears equalizer link. Pull equalizer link off equalizer.

BRAKE SYSTEM

RA PD 57403

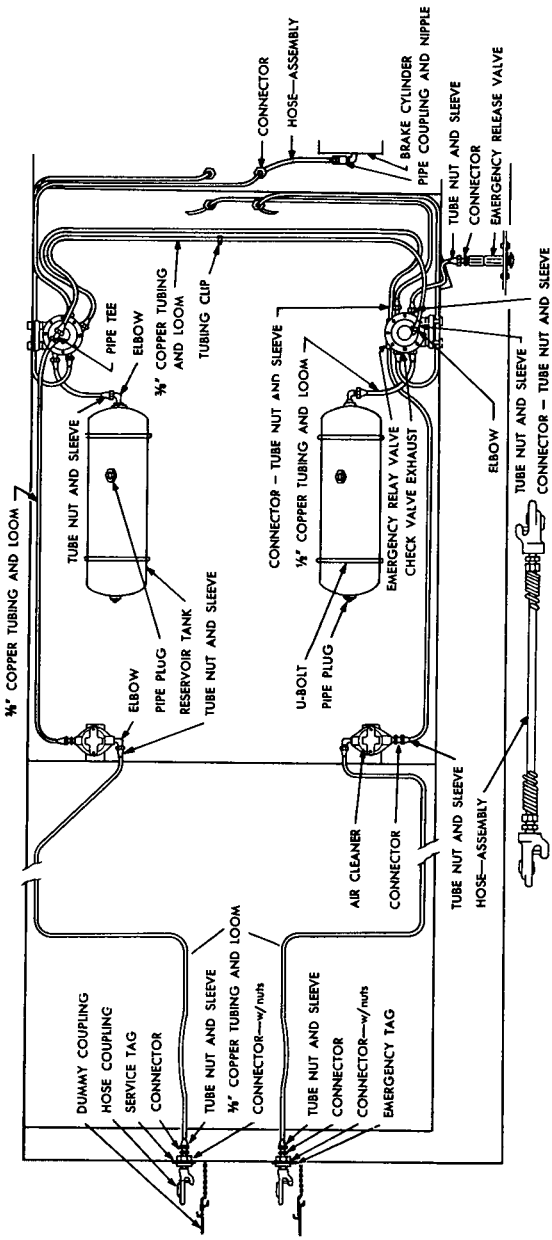


Figure 290—Brake System Diagram

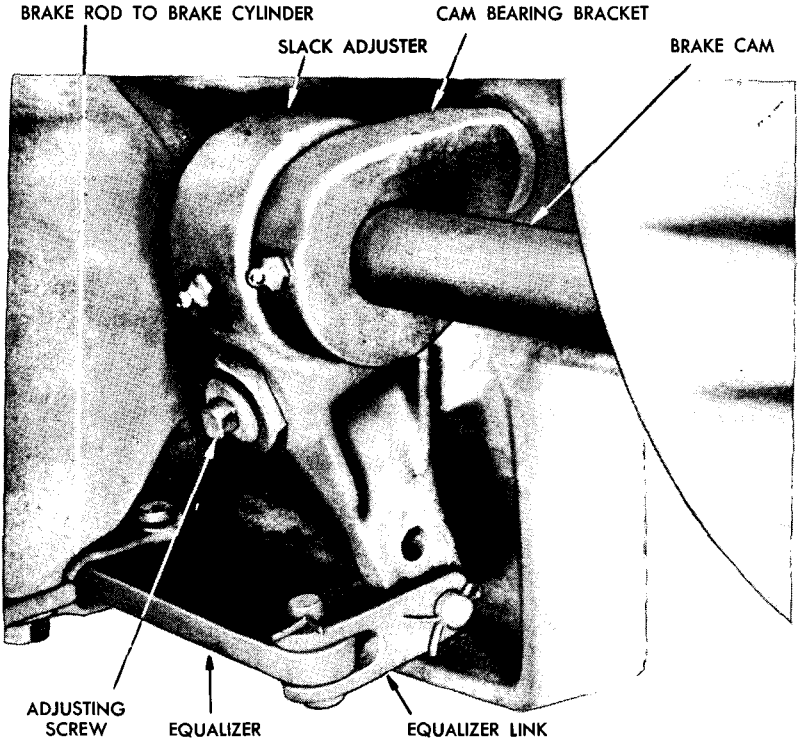


Figure 291—Brake Linkage

c. Installation of Equalizer Link. Place equalizer link in position on equalizer. Place a light film of grease over rod end pin and install rod end pin through link and equalizer. Install cotter pin in rod end pin. Turn adjusting screw on slack adjuster in a clockwise direction until upper hole in slack adjuster is in alinement with hole in equalizer link. Place a light film of grease over rod end pin and install pin through hole in equalizer link and slack adjuster (fig. 291). Give brake on wheel with the new equalizer link and the wheel opposite, a minor brake adjustment (par. 221).

d. Removal of Equalizer. Pull cotter pins from rod end pins at equalizer end of equalizer links and drive out rod end pins. Turn adjusting screw on slack adjuster in a counterclockwise direction until equalizer links clear equalizer. Remove rod end pin from brake rod and equalizer, and pull equalizer out.

e. Installation of Equalizer. Install equalizer in position on brake rod. Place a light film of grease over rod end pin and install clevis in brake rod and equalizer. Turn slack adjuster adjusting screw in a

clockwise direction until holes in equalizer links meet holes in equalizer. Secure equalizer links in equalizer, using the two rod end pins. Install cotter pins in the rod end pin and the two rod end pins. Give brakes a minor brake adjustment (par. 221).

228. SLACK ADJUSTER.

a. Description. The slack adjuster acts as a brake lever and also provides a quick and easy method of adjusting brakes. The slack adjuster is mounted on camshaft and is attached to the brake equalizer link. The air pressure in the brake cylinder moves the slack adjuster, thus expanding the shoes in the drum. The semitrailer is equipped with eight slack adjusters and they are interchangeable.

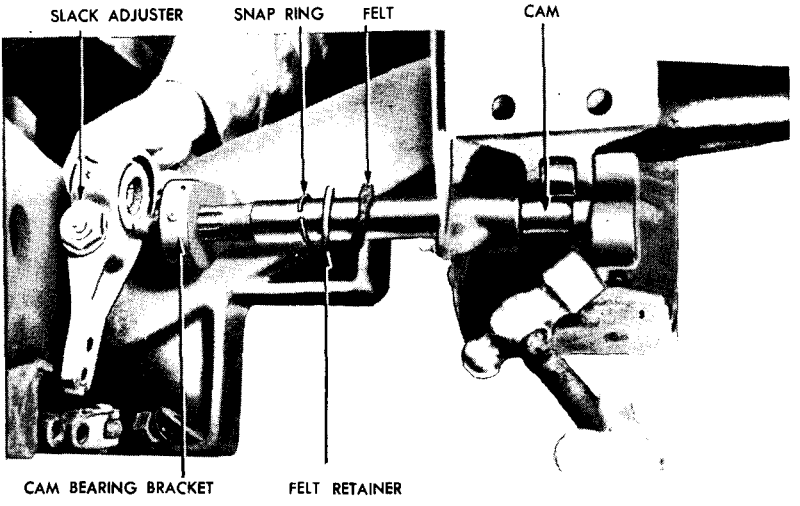


Figure 292—Removing Slack Adjuster

b. Removal (figs. 291 and 292). Remove wheel and hub assembly in one unit (par. 255). Remove cotter pin and rod end pin from equalizer link. Pry snap ring out of groove in camshaft. Tap snap ring, felt retainer and felt toward slack adjuster. Remove two lock nuts and flat washers from cam. Tap the "S" portion of cam towards the outer side of brake assembly about two inches. Tap slack adjuster off cam.

c. Installation. Coat the splined surface of camshaft with grease. Install slack adjuster on camshaft making certain the adjusting screw is facing away from trunnion axle. Tap cam through slack adjuster. Secure slack adjuster to camshaft, using flat washer and double nuts. Attach equalizer link to slack adjuster, using rod end pin and cotter pin. Give brake minor brake adjustment (par. 221).

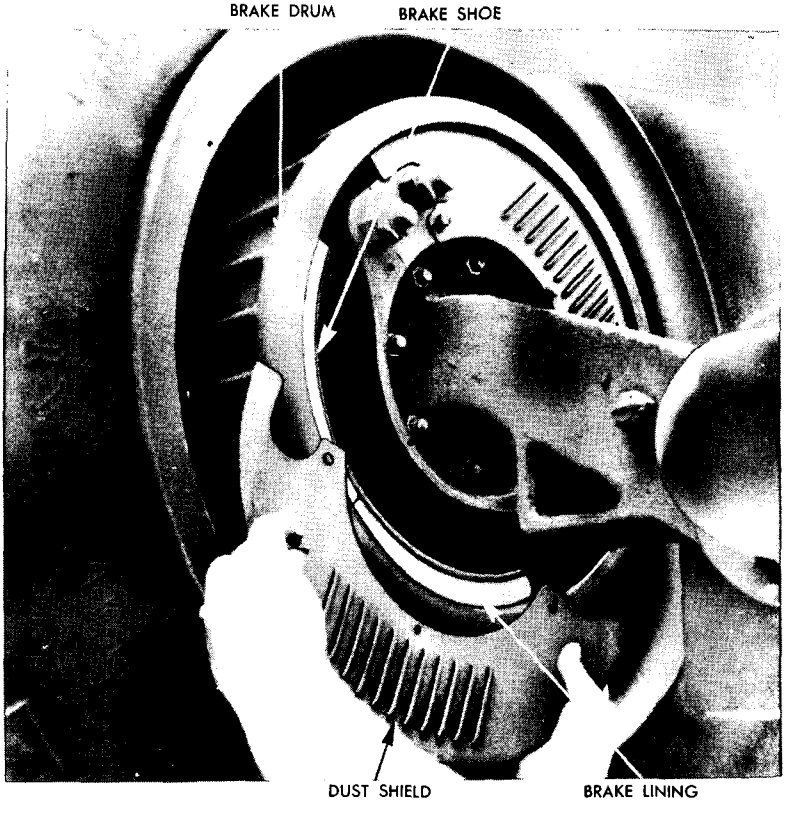


Figure 293—Removing Dust Shield for Brake Inspection

229. LINING REPLACEMENT.

a. Description. Lining is of the molded block type, ¾ inch thick and six inches wide. Two blocks are bolted to each brake shoe. All brake linings are interchangeable throughout semitrailer brakes.

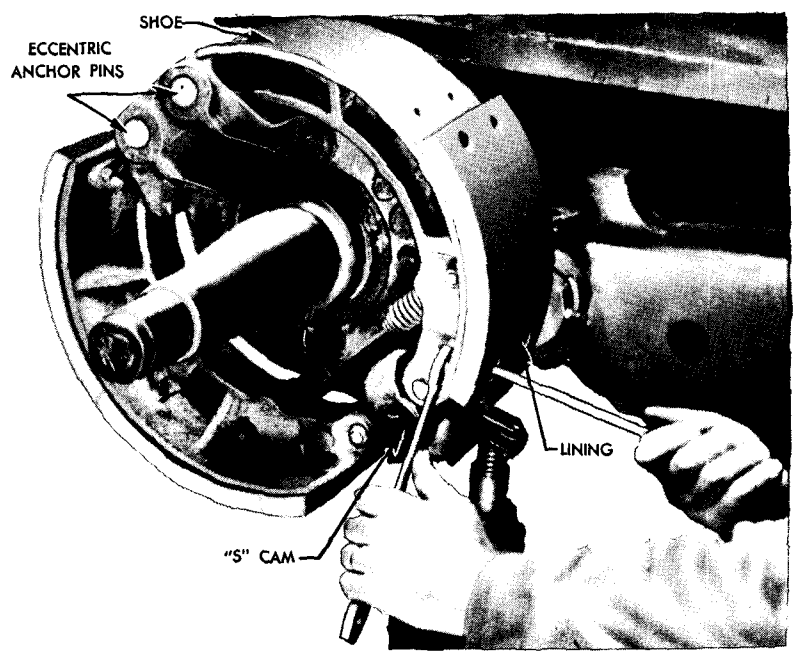
b. Inspection (fig. 293). Inspect brake shoes and linings without removing wheels from the axle, by removing the two dust shields which are bolted to brake adapter with six cap screws. Check for lining thickness (minimum thickness ¼ inch), and grease on the lining. NOTE: *It is essential that linings on all brake shoes be of same material to assure equalized braking. If lining is found to be grease-soaked, all four brake blocks on that spindle must be replaced.*

c. Removal of Lining (fig. 294). Remove the wheel and hub assemblies as one unit (par. 252). Remove the dust shields (fig. 286). Remove the screws, nuts and lock washers holding brake lining to the shoes.

d. Installation. Clean all foreign matter from the surface of brake shoes. Install the lining, making certain that the bolts holding lining to shoes are properly tightened and that lock washers are used. Before installing wheels, loosen the two anchor pins (fig. 295). Make certain that the anchor pins move freely. Lubricate the anchor pins with a light grade engine oil or penetrating oil; place grease around the "S" position of cam. Install wheel and hub assembly (par. 252 **b**). Adjust brakes (par. 222).

230. SHOE ASSEMBLIES (figs. 296 and 297).

a. Removal. Remove wheel and hub assembly as one unit (par. 252). Remove three bolts holding anchor plate bracket to mounting

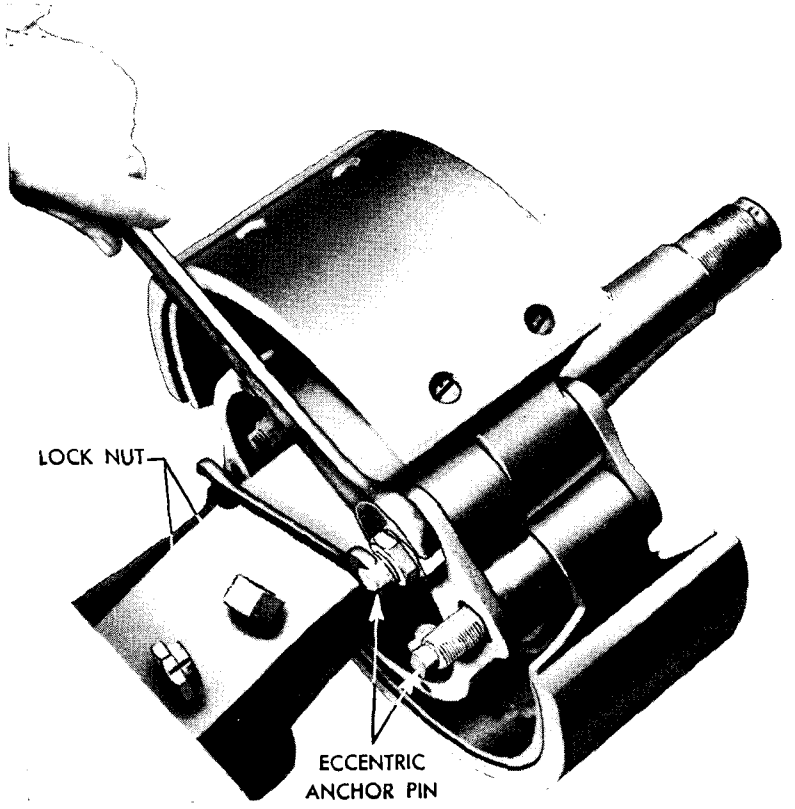


RA PD 57406

Figure 294—Removing Brake Lining

plate, and tap anchor plate bracket off eccentric anchor pins. Pull upper and lower shoe assembly off cam and anchor pins. Remove the two bolts holding spring to shoes.

b. Installation. Place a light film of grease over surface of brake anchor pins before installing shoes. Do not allow grease or oil to get on surface of brake shoes. NOTE: *When installing new shoes do not install one shoe only, instead, replace both shoes on that spindle. Brake shoes are interchangeable throughout semitrailer.* Lay the two



RA PD 57407

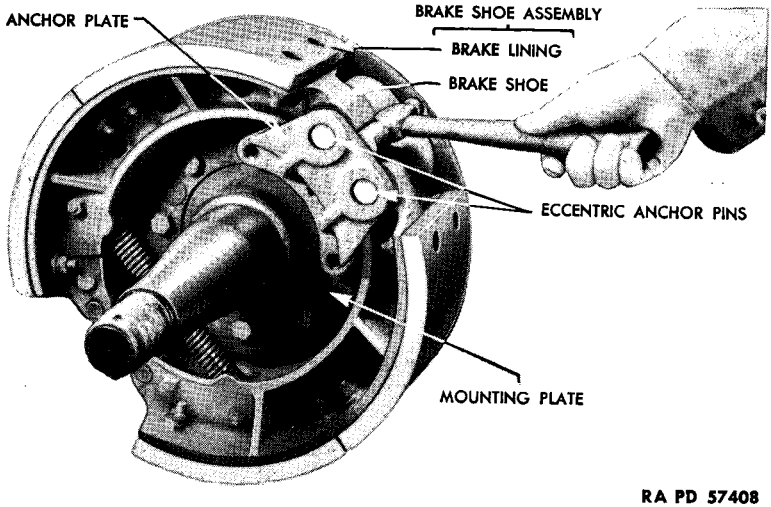
Figure 295—Removing Brake Anchor Pins

shoe assemblies on floor and install guide return spring and two bolts. Place a heavy coat of wheel bearing grease over top and bottom surface of S-cam. Place a light film of grease around anchor pins. Place brake shoes on anchor pins and S-cam. Place anchor plate in position, and install the three bolts. Turn adjusting nut on slack adjuster nut in clockwise direction to place shoes on an "O" point. Install wheel and hub assembly (par. 252 **b**). Prior to removing jacks, make a major brake adjustment (par. 222).

231. AIR RESERVOIR.

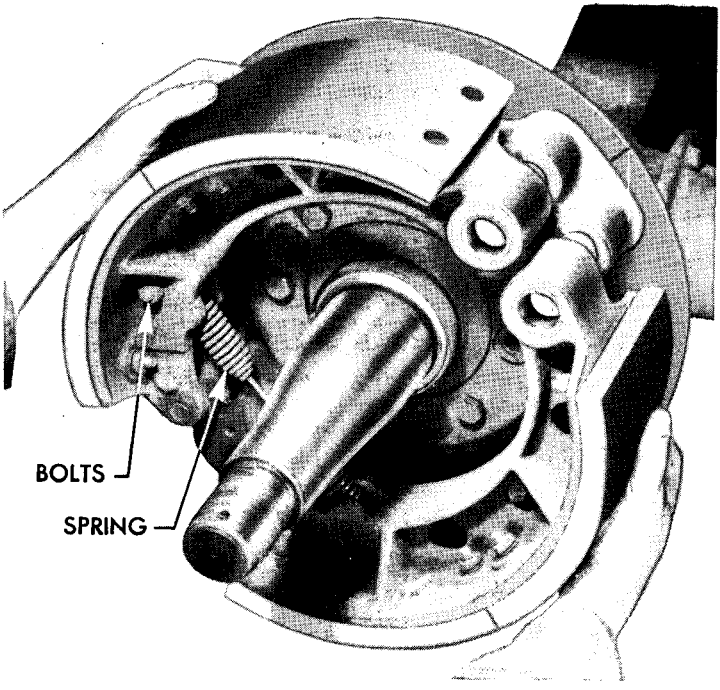
a. Description. The semitrailer is equipped with two reservoirs. They are located on the inside of main frame members toward the rear of the semitrailer on semitrailer deck. A sheet metal housing is provided to protect them from damage.

BRAKE SYSTEM



RA PD 57408

Figure 296—Removing Brake Anchor Plate



RA PD 57409

Figure 297—Removing Brake Shoes

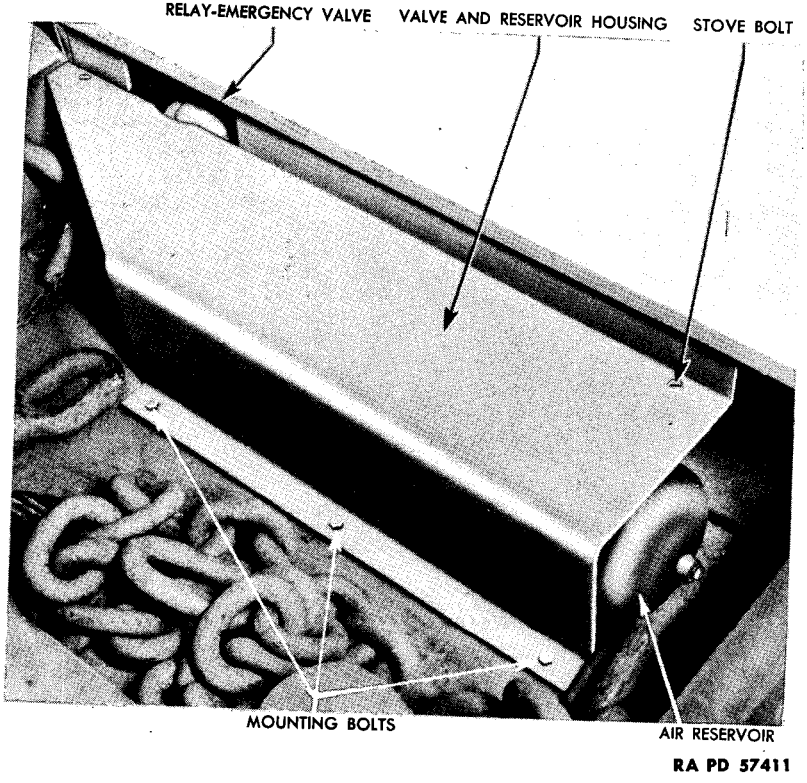


Figure 298—Relay-emergency Valve and Reservoir Housing

b. Removal. Close both air shut-off valves at towing vehicle. Remove the two stove bolts and three cap screws and lift air reservoir housing off semitrailer decking (fig. 298). Disconnect tubing at tank inlet (fig. 299). Remove the two U-bolts holding tank to frame deck and lift tank out. Remove drain cock, pipe plug and connector body.

c. Installation.

(1) Install drain cock, pipe plug and tubing connection body in tank. Open drain cock, and place in position, making certain drain cock in tank extends through hole in semitrailer decking. Connect ½-inch copper tubing to tubing connector body at tank. Secure tank to semitrailer decking, using two U-bolts, four nuts and four lock washers.

(2) Open both air valves at towing vehicles to allow air to blow out of drain cock in bottom of tank. Keep drain cock open several seconds to permit all sand, dust or other foreign matter which may have accumulated in tank, to escape. Close drain cock and check for leaks. Cover drain cock, pipe plug, and tubing connector with soapy

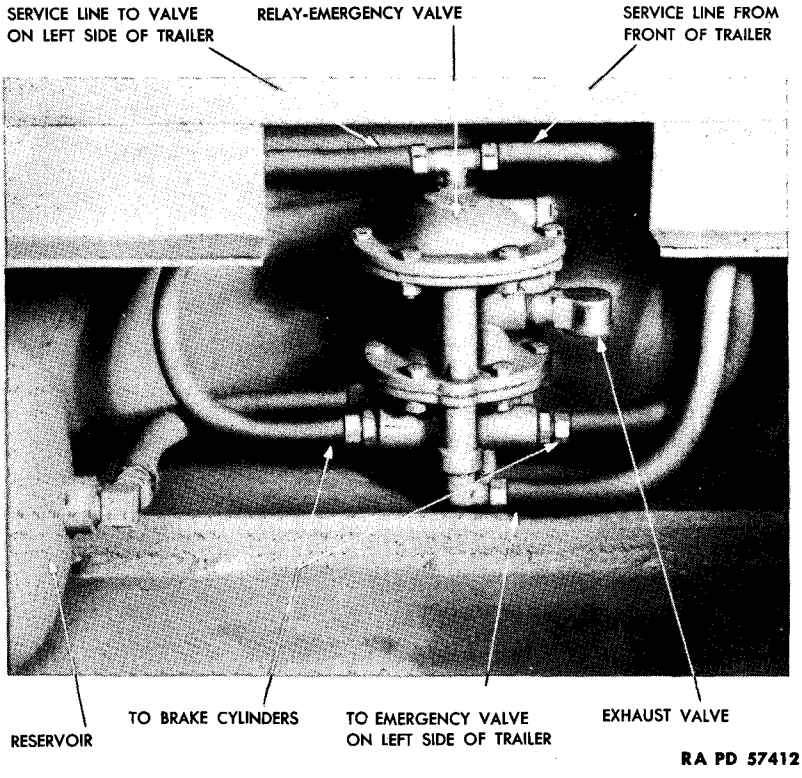


Figure 299—Relay-emergency Valve Mounted on Left Side

water. Should bubbles appear, tighten the fitting until bubbles disappear. Install housing over tank, securing it to decking with two stove bolts and three cap screws.

232. RELAY-EMERGENCY VALVE.

a. Description. The semitrailer is equipped with two relay-emergency valves. Both valves are identical in construction. One valve is mounted ahead of front wheels on right side and the other on left side under sheet metal housing. Purpose of valve is to give operator rapid control of semitrailer brakes, in both application and release. Valve is provided with emergency features which automatically apply the brakes should semitrailer break away from towing vehicle.

b. Removal (figs. 298, 299 and 300). Remove two stove bolts and three cap screws from housing and lift housing out. Close the two shut-off valves at rear of towing vehicle. Remove all tubing connector nuts from connection bodies and all other fittings. Remove the two bolts holding emergency-relay valve to semitrailer frame and

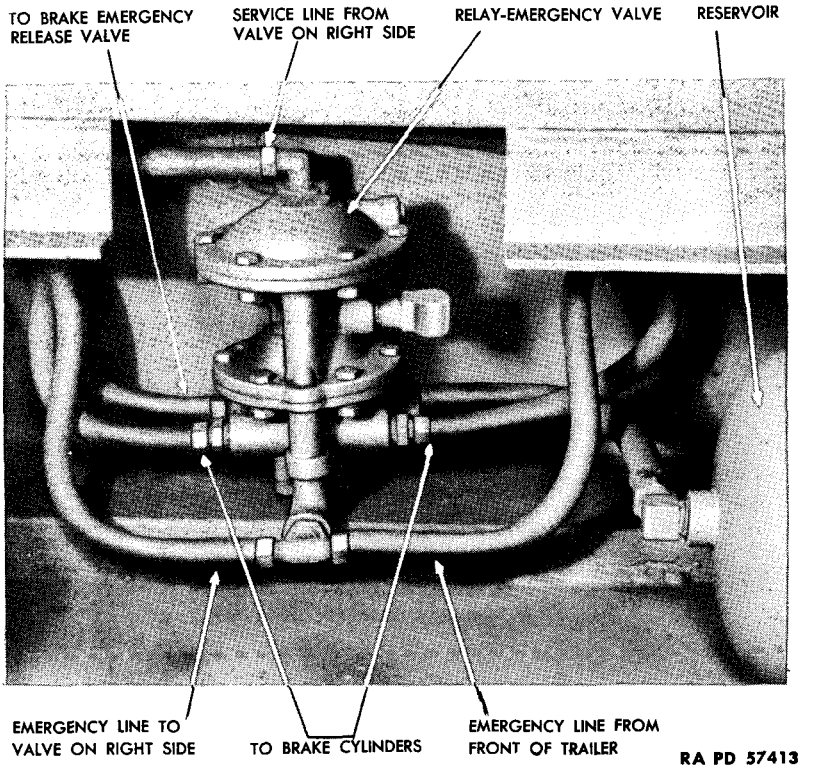


Figure 300—Relay-emergency Valve Mounted on Right Side

lift out. NOTE: *Replacement valve is furnished without fittings.* CAUTION: *When screwing "T" and "L" fittings out of relay-emergency valve, do not use wrench against the threaded portion, turn from unthreaded portion of the fittings.*

c. Installation (figs. 299 and 300). Coat the threaded portions of all valve fittings with shellac. Install fittings in valve, making certain the fittings are tight. Install the two bolts holding valve to semitrailer frame but do not tighten the bolts. Couple each air line to valve fittings. Tighten the two bolts holding valve to semitrailer frame. Open the two shut-off valves at rear of towing vehicle. With 60 pounds minimum pressure, test all valve fittings and tubing connectors with soapy water. If leaks are discovered, tighten fitting and connector nuts until leak disappears. Install housing, securing housing to deck with two stove bolts and three cap screws.

233. AIR BRAKE EMERGENCY RELEASE VALVE (figs. 299 and 301).

a. Description. This unit is equipped with one emergency air

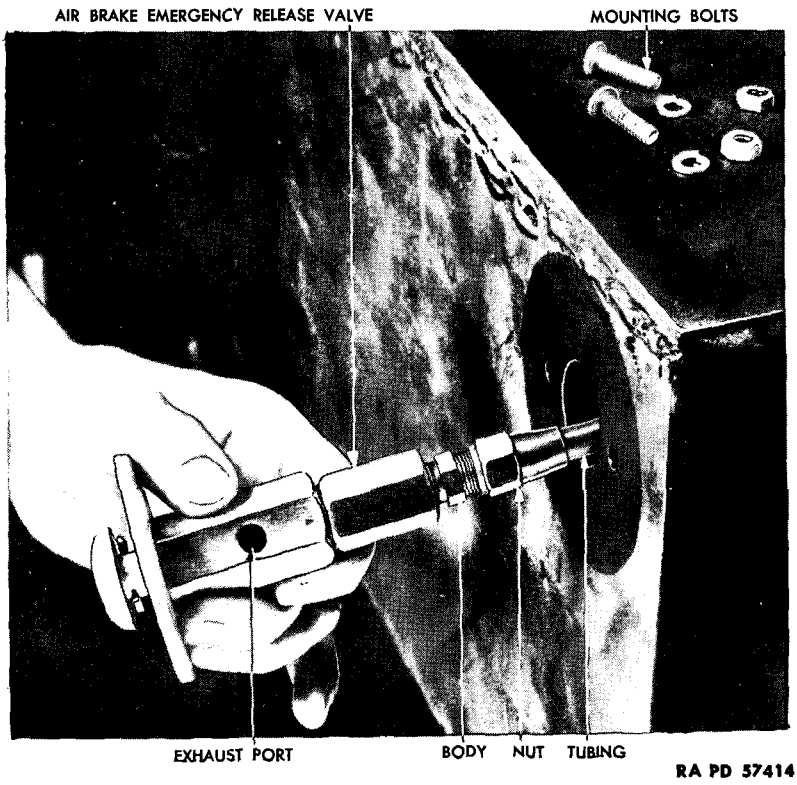


Figure 301—Removing Emergency Release Valve

release valve. It is located on the left-hand side of semitrailer on outer side of the tool compartment ahead of front tires. The purpose of this valve is to release the brake when it is necessary to move semitrailer without using towing vehicle, or should brakes fail to release at hand control of towing vehicle. When valve button is pressed, air is released from the entire brake system of both the semitrailer and towing vehicle, unless the air shut-off valves are closed at rear of towing vehicle.

b. Removal. Remove the two stove bolts and three mounting bolts holding relay-emergency valve guard to semitrailer frame assembly. Shut off the air to semitrailer brake system by closing the two shut-off valves at rear of tractor. Open drain cock at underside of reservoir. Disconnect the air line from relay-emergency valve which is mounted on left side of vehicle. Remove the two screws which hold the valves to the tool compartment and pull the valve and copper tubing assembly out of tool compartment. Remove the tube connector body and nut from end of valve.

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c. Installation. Tighten tube connector body into valve, and install tubing connector nut on connector body. Place valve and tubing assembly through hole in tool compartment with exhaust port down. Couple tube connector nut to connector body at relay-emergency valve. Install the two bolts holding valve assembly to tool compartment. Test for leaks (par. 231 c (2)). Place valve guard over tank and valve assembly, securing it to semitrailer decking by using two stove bolts and three cap screws.

Section XXXVI

ELECTRICAL SYSTEM

234. DESCRIPTION.

a. The general electrical circuit diagram (fig. 302), illustrates all of the electrical circuits used on this vehicle. All electrical units are shown in their relative positions. Each wire in the electrical system is of a distinctive color. A key to these colors will be found on the circuit diagram. The wiring consists of several lengths of conduit and wire assemblies. Removal procedure for either of the assemblies is identical.

235. TESTING LIGHTING CIRCUIT.

a. Battery and wiring system of towing vehicle will not be discussed in this section. Source of current will hereafter be considered as being the jumper cable socket at rear of towing vehicle. To locate trouble, start at the socket. The fundamental principle of trouble shooting is the elimination of one possible source of trouble after another until the trouble has been localized, as follows:

(1) Turn the light switch to the "ON" position. Place the foot brake in the "APPLIED" position. Test each light blade in socket at rear of towing vehicle with a low reading voltmeter or a test light. Assuming that there is a flow of current in each light blade, plug the jumper cable into the socket. Test the flow of current at the opposite end of jumper cable. If current flows through jumper cable it may be assumed the jumper cable is in good condition.

(2) Remove cap from light socket located in hole at front cross member of semitrailer. Cap and socket body extend through hole and project out at the top decking (fig. 305). Test each light terminal. (Light terminals are marked "SL" for stoplight, "G" for ground, "TL" for taillight, and "BK" for brake). Should current fail to flow through any of these terminals, it indicates a defective socket, or defective blade in socket which leads to the terminal. If current flows through the socket it indicates the socket is in good condition. Continue to make similar tests throughout the semitrailer until source of trouble is located. NOTE: *Terminal marked "BK" on light socket is dead.*

236. LIGHTS.

a. Description. The lighting equipment on this semitrailer includes four commercial clearance lights, four clearance blackout

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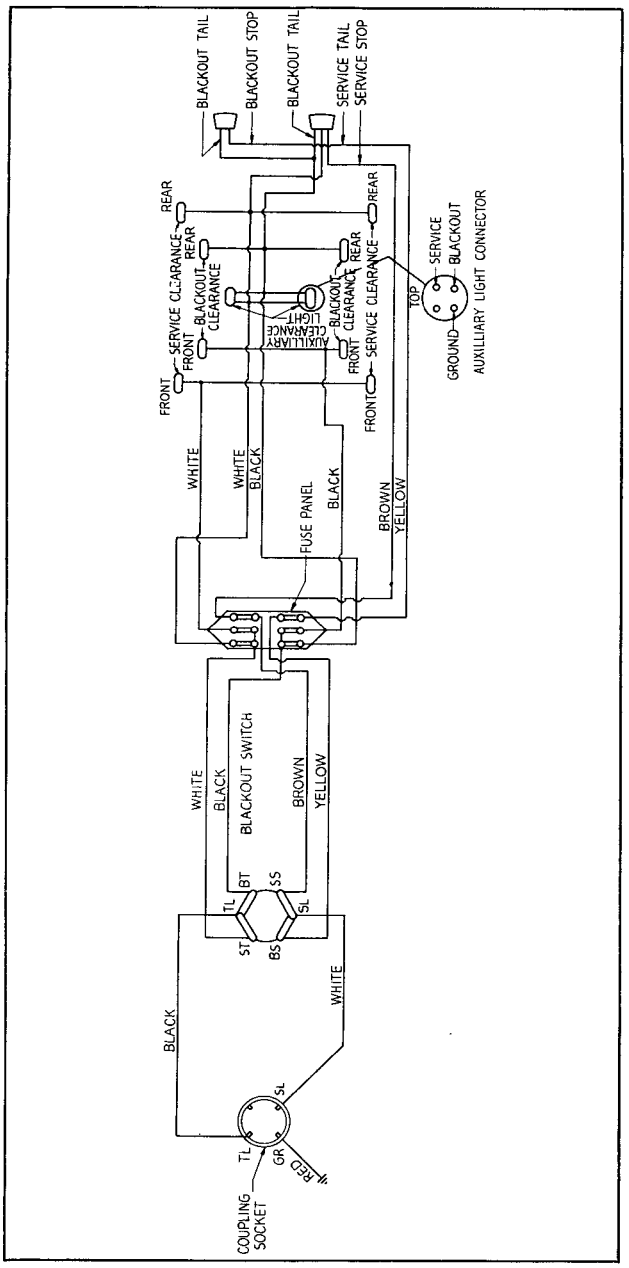

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Figure 302—Schematic Wiring Diagram

lights, one combination blackout stoplight and blackout taillight, one combination service stop and service tail blackout taillight, and two movable auxiliary clearance light assemblies. The flow of current is controlled at light switch on towing vehicle. The combination service stop and taillight and blackout taillight is mounted at the left-hand rear of the semitrailer. The combination blackout stop and blackout taillight is mounted at the right-hand rear of the semitrailer. The lens on each blackout taillight is designed to produce two beams. This design is such that when one truck is following a preceding truck at a specified safe distance, these two beams will merge into a single highly visible light. To insure the accuracy of construction necessary

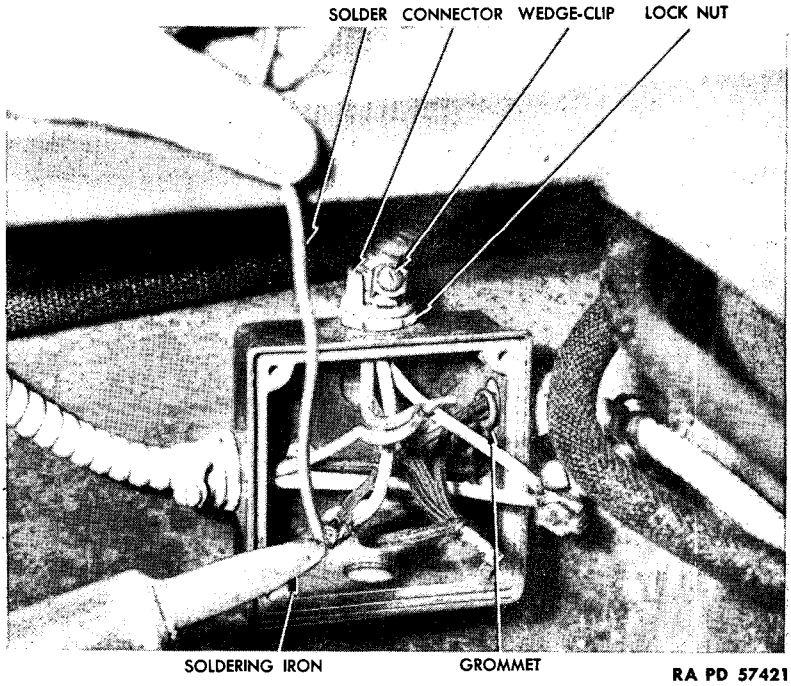

Figure 303—Removing Junction Box

to produce this effect, the lamp is soldered to the lens retainer, and the lens and filter are crimped to the retainer to form a complete unit. When the lamp is burned out, it is necessary to replace the complete sealed beam lamp-unit.

b. Taillight Sealed Beam Unit.

(1) REMOVAL. Remove the two door screws. Remove the door and pull either unit, or both units, out of light housing.

(2) INSTALLATION. Install replacement unit. Replace door, securing same with the two door screws.

c. Clearance Lights.

(1) REMOVAL. Turn the two screws holding lens housing to light assembly in a counterclockwise direction until housing is free of light backing plate. Remove housing and gasket. Pull the two lens retainer clips toward outer edge of light housing and lift lens out. Remove the four screws from backing plate. Pull out backing plate. Remove tape from soldered joint, cut wire and pull assembly out. NOTE: *Removal procedure for both amber and blackout clearance lights is identical.*

(2) INSTALLATION. Clean all foreign matter from surface of pig tail and main wire which protrudes from semitrailer body. Splice the two wires together and solder. Wrap the soldered splice with rubber tape, then with friction tape. Place rubber gasket and backing plate into position and secure them to semitrailer using four screws. Place fibre gasket in position on light base; secure housing and lens assembly to backing plate using the two screws. NOTE: *When replacing*

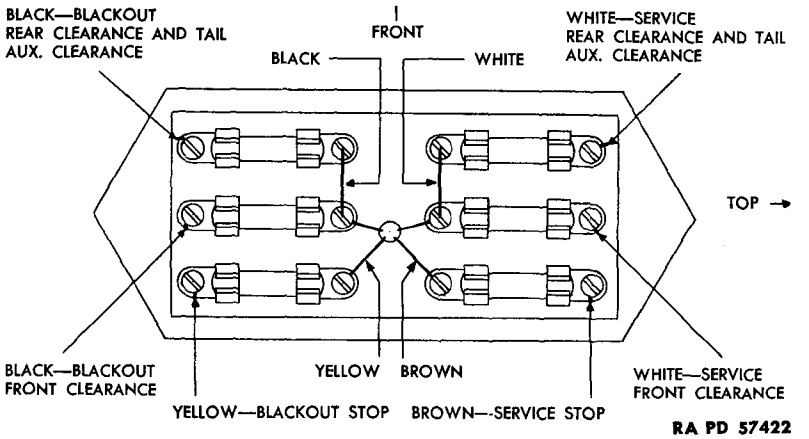

Figure 304—Fuse Panel Diagram

blackout lens make certain the arrow on lens is pointing down and that the word "BOTTOM" is at the bottom of the light.

d. Auxiliary Clearance Lights.

(1) REMOVAL. NOTE: *This unit is equipped with two amber and two blackout clearance lights. Removal procedure for both is identical.* Pry lock ring out of light body flange, remove lens and gasket, remove tape from soldered splice and melt solder using soldering iron. Remove body mounting nut and washer and pull assembly out of mounting bracket.

(2) INSTALLATION. Place light assembly through hole in mounting bracket, securing it to bracket using nut and lock washer. Clean all foreign matter from pig tail which extends from light body; also clean wire from main wire. Splice the two wires together and solder joint. Tape spliced joint with rubber tape, then with friction tape.

Paint tape with shellac. NOTE: *When installing lens in blackout light it will be noticed the lens is marked "TOP." Make certain the word "TOP" is at top of light after lens is installed.*

237. JUNCTION BOX.

a. Description. This is equipped with three junction boxes, one on top decking, one on left side of unit near front wheel, and one located on the rear cross member toward right side of unit. Removal of the three boxes is identical.

b. Removal (fig. 303). Remove four screws holding box cover plate. Remove all rubber tape and friction tape from each splice.

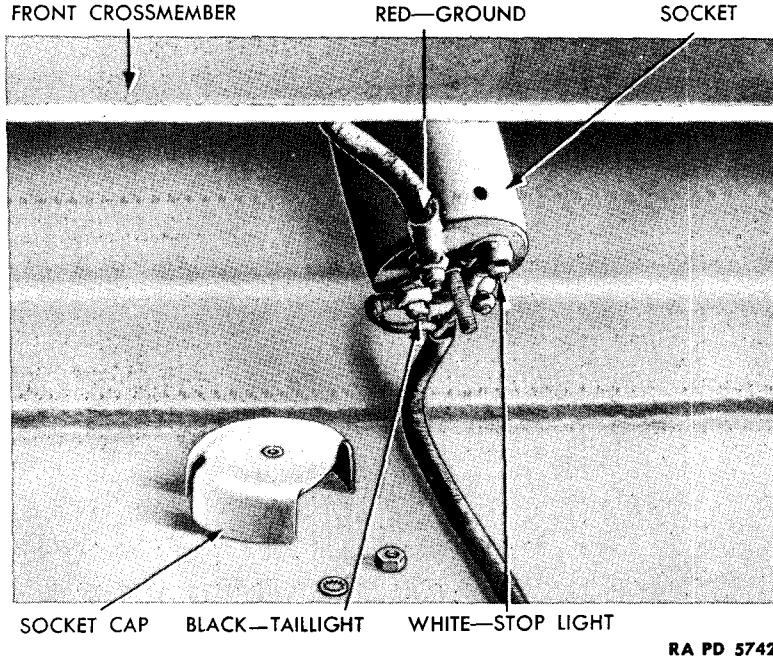

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Figure 305—Jumper Cable Light Socket—Cover Removed

Separate each splice. NOTE: *Due to the limited amount of wire which protrudes from junction box, heat each splice to melt solder and separate the wires rather than cut them.* Remove screw from wedge clip; turn housing and lock nut off junction box. Pull each wire assembly and grommet out of junction box. Remove bolt holding box to frame member and lift out box.

c. Installation. Bolt junction box to frame member making certain inlets to box are adjacent to cable assembly. Place housing assembly over cable assembly, install grommet over wire ends, and place wires and grommet in inlet. Turn housing and lock nut assem-

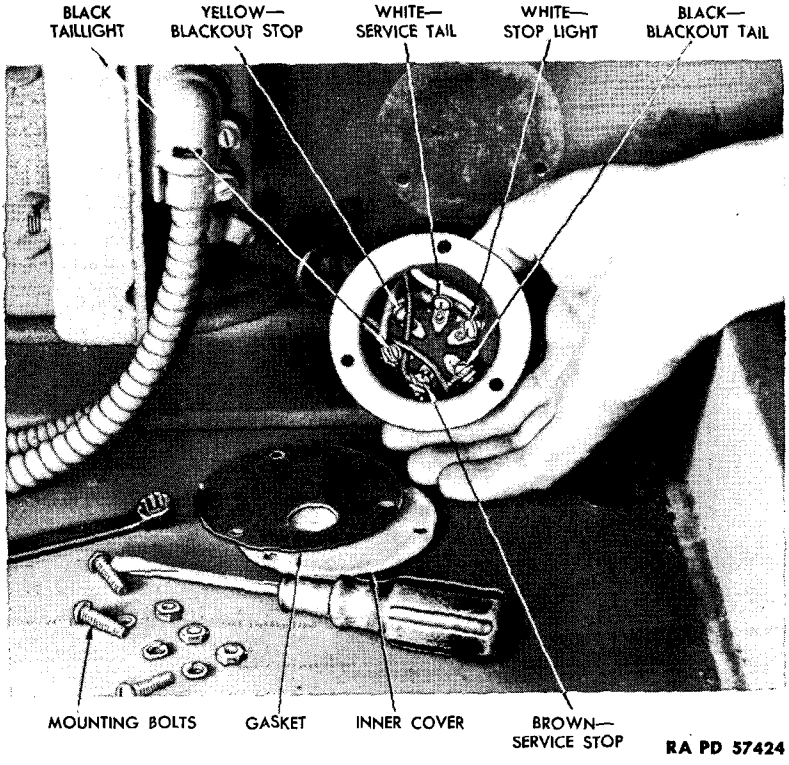

Figure 306—Removing Blackout Switch

bly down on inlets securing conduit to housing using wedge clips. Splice wires by twisting them together, matching black to black, brown to brown, etc. Solder each splice; insulate each splice using rubber tape, then friction tape. If shellac is available, give tape a coat of shellac. Fold all spliced wire into junction box and install cover plate.

238. FUSE PANEL ASSEMBLY.

a. Removal (fig. 304). Remove cotter pins from wing nut studs. Remove the two wing nuts and pull fuse panel cover off. Pull fuse out of retainer clips.

b. Installation. Install fuse into fuse clips. Place fuse panel cover on fuse panel securing cover to panel using two wing nuts and cotter pins. NOTE: *Each fuse and wire is marked as to color of wire and lights that each fuse controls. Should any of the lights fail to light, inspect and replace burned out fuses.*

239. JUMPER CABLE SOCKET.

a. Removal. Remove nut holding socket cap to body (fig. 305). Remove nuts from each terminal and lift washer, terminal cup and

wires, off terminals. Remove four bolts holding socket to semitrailer cross member and pull socket out from rear side of cross member.

b. Installation. Install socket and bolt in place with four bolts. Install wire, terminal washer, and nut on each terminal. Place socket cap in place and fasten with nut. Clean all points of contact before making connections. Tighten terminal nuts securely.

240. BLACKOUT SWITCH.

a. Removal. Remove three screws holding switch to cross member. Remove wires from each terminal. Pull each wire out of switch body. Lift switch out.

b. Installation. Place switch in position. Place wire through holes in side of switch body making certain grommet is inserted in hole in body. Connect each wire to terminals in inner side of switch (fig. 306).

Section XXXVII

SUPPORTS

241. DESCRIPTION.

a. The supports are of a combination fold-back, swing type. The support legs are fastened to the underside of the semitrailer frame at the drop section. The supports are braced laterally and longitudinally. The complete assembly consists of two major parts, strut and leg.

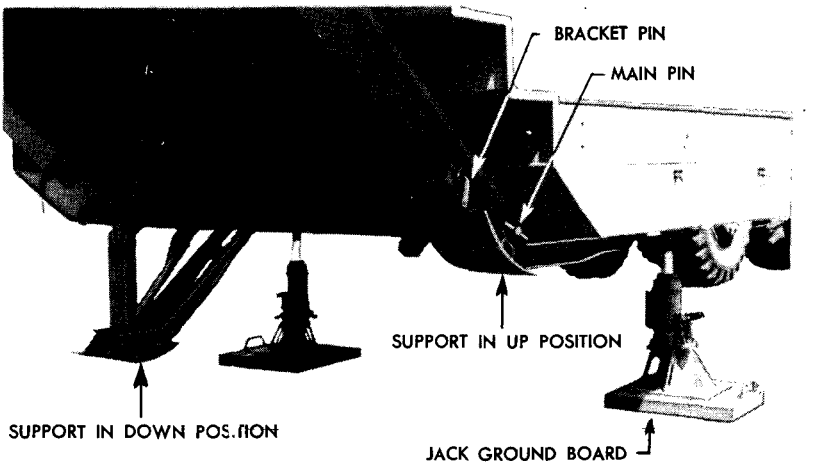

Figure 307—Semitrailer Supports

242. REMOVAL (fig. 307).

a. CAUTION: *Do not attempt to work on supports unless semitrailer is properly jacked up at front, or unless semitrailer is coupled to towing vehicle.*

(1) Place support in the "DOWN" position. Remove cotter pin from main pin assembly, and pull pin out of bracket and lower leg assembly to ground.

(2) Remove cotter pin from bracket pin and pull pin out of brackets, placing support strut in the "DOWN" position. Loosen set screw at top of support strut and drive hinge pin out. Place screwdriver in slot of lock rings at the two hinge pins and pry lock ring off hinge pins. Drive out the hinge pins and remove leg assembly.

SUPPORTS

243. INSTALLATION.

a. Place support leg in position under semitrailer with leg and foot assembly toward front of unit. Raise rear end of leg assembly and fasten leg to brackets using pins and lock ring. Place strut assembly between mounting bracket. Place a light film of grease over hinge pin and install pin through support strut and mounting bracket. Secure hinge pin to strut, using set screws and lock nut. Fasten strut brace, using hinge pin and lock ring.

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Section XXXVIII

TRUNNION AXLE

244. DESCRIPTION.

a. The unit is equipped with four trunnion type axles which oscillate on a spindle at each end of the walking beam, thus permitting the wheels to oscillate in transverse and longitudinal directions. This construction allows one wheel to pass over a 9-inch obstacle with the other three wheels remaining on the ground.

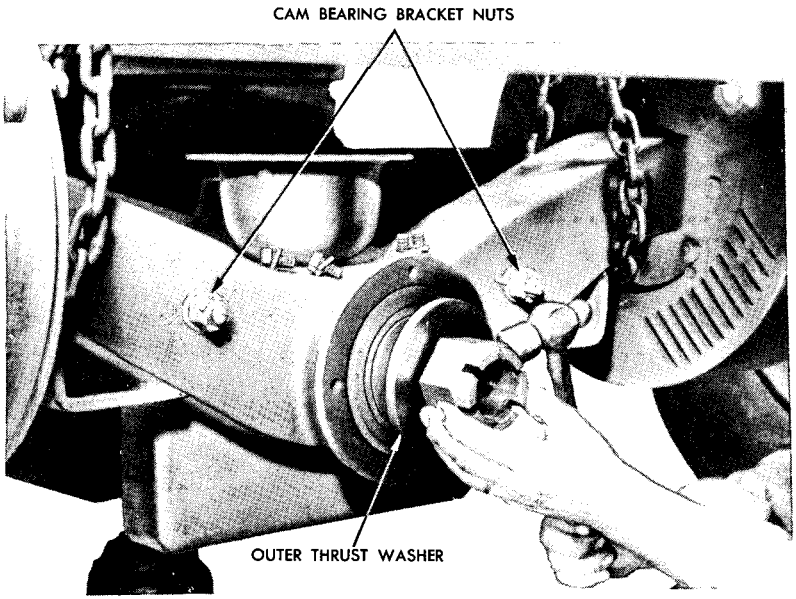

Figure 308—Removing Trunnion Axle Nut

245. REMOVAL.

a. Remove Trunnion Axle. Erect crane and hoist assembly (par. 10); place hoist in hoist pocket. Hoist pocket is located between the front and rear wheels on the right and left side of main frame. Using two ground boards, two jack pedestals, and two 20-ton hydraulic jacks, jack semitrailer frame until wheels clear ground. Place two jacks under walking beam to prevent walking beam from moving. Remove the inner and outer wheel and hub assembly from trunnion

axle (par. 252). Move crane and hoist assembly so that the trolley hoist is directly over trunnion axle. Fasten chain to hoist with the two ends straddling the frame side rail. Fasten chain to trunnion axle at both ends. Pull cotter pin and rod end pins from the two equalizer links which control the brakes on trunnion axle (fig. 291). Remove the four cap screws holding cap to trunnion axle. Remove cotter pin from nut and remove nut and thrust washer (fig. 308). Pull trunnion axle off walking beam (fig. 309). Install axle nut on the two axle spindles and walking beam spindle to prevent threads from becoming damaged through handling.

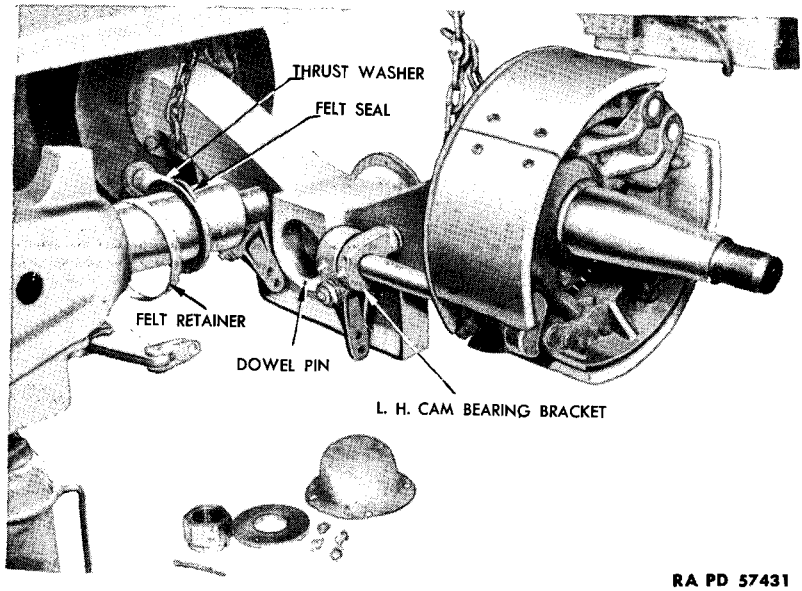

Figure 309—Trunnion Axle Removed

b. Remove Brake Assembly.

(1) Remove lock nuts and flat washer from the two camshafts and tap slack adjusters off cam. Mark an "L" on the left-hand brake assembly, and an "R" on the right-hand assembly for identification when installing. Remove eight bolts holding brake adapter mounting plate to axle flange on both sides. Lift the complete assembly off axle (fig. 310).

(2) Remove the cotter pin, nut and flat washer from the two bearing brackets, and drive brackets out of trunnion axle (fig. 311).

246. INSTALLATION.

a. Brake Assembly.

(1) Place the right-hand and left-hand cam bearing brackets into cam bearing bracket holes in trunnion axle. Cam bearing brackets are

furnished in right- and left-hand brackets. Cam bearing bracket illustrated in figure 311 is of the right-hand type.

(2) Install washer and nut, but do not tighten nut. Install brake assembly onto the trunnion axle spindle. Make certain you place the assembly marked "L" on the left side, and the assembly marked "R" on the right side. These markings "L" and "R" are made on brake assemblies at the time of disassembly.

(3) Place the cam through cam bracket. Install the eight bolts holding brake assembly to axle collar. Successively tighten opposite

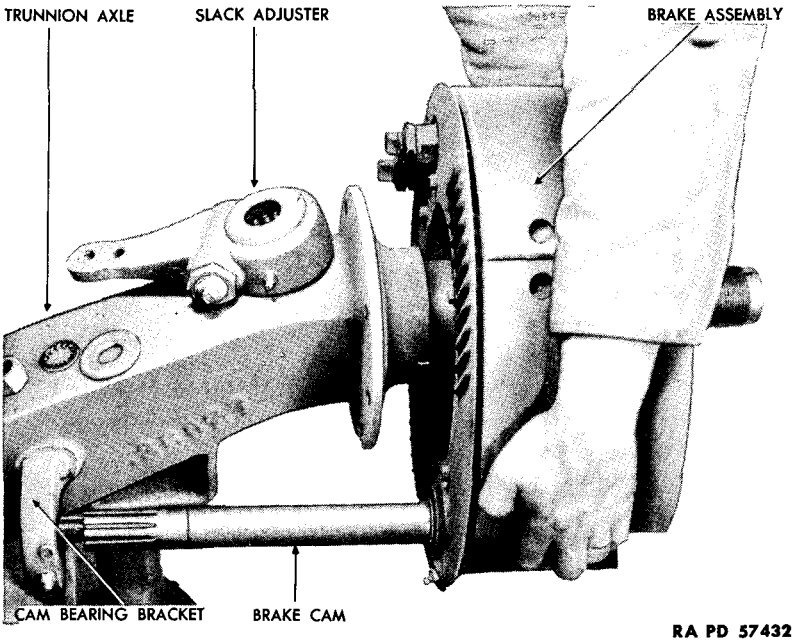

Figure 310—Removing Internal Brake Assembly

nuts to bring brake mounting plate up evenly, and prevent cocking of adapter on brake mounting flange.

(4) Place bearing over cam, and tap the bearing into the cam bearing bracket. Place slack adjuster on cam (fig. 309). Install flat washer, and double lock nuts, and tighten nut. CAUTION: *Try moving slack adjuster by hand. Make certain it moves freely.* If there is any bind felt between slack adjuster and cam bracket, tap cam bracket until bind is eliminated. Tighten nut on cam bearing bracket.

b. Install Trunnion Axle. Place felt retainer over spindle. Place inner thrust washer on spindle and felt seal next to thrust washer. Install dowel pin in trunnion axle. Clean all dust and other foreign matter from walking beam spindle, and place a light film of grease over its surface. Place trunnion axle on walking beam spindle, making

TRUNNION AXLE

certain dowel pin hole in trunnion axle meets and fits into dowel pin in thrust washer (fig. 309).

(1) Place a light film of grease over inner surface of outer thrust washer and install thrust washer over spindle. Install nut and tighten by turning nut in a clockwise direction. After nut has been tightened, release the nut ½ turn and install cotter pin. Place small amount of grease into hub cap and secure hub cap to trunnion axle, using four cap screws and lock washers.

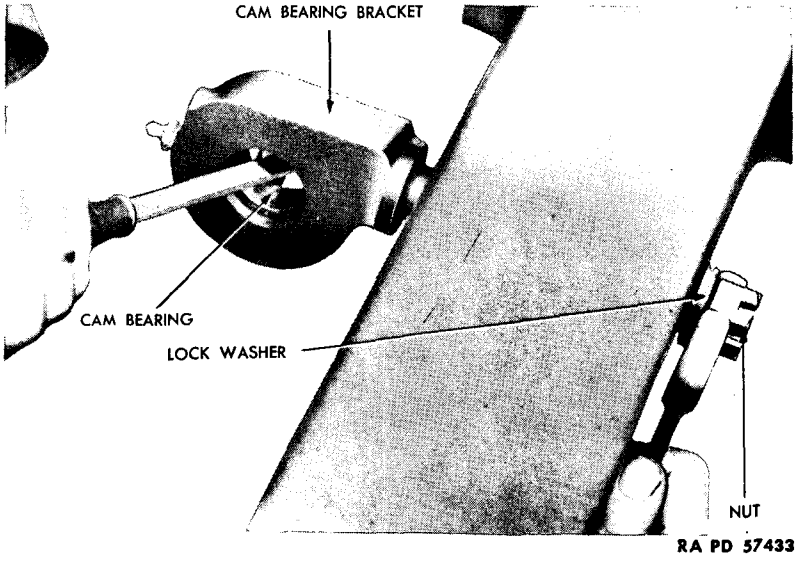

Figure 311—Removing Cam Bearing Bracket

(2) Connect the two equalizer links to the slack adjuster, using two rod end pins and two cotter pins. Install the two wheel and tire assemblies (par. 252 **b**).

(3) Prior to placing unit into operation, lubricate the trunnion axle by means of lubrication fitting. Place several drops of oil on rod end pins in equalizer link, and give brakes on trunnion axle a minor brake adjustment (par. 221).

Section XXXIX

WALKING BEAM

247. DESCRIPTION.

a. The semitrailer is equipped with two walking beams, one on the right side and one on the left side. They are hinged to the side rails by a mounting bracket and a trunnion shaft permitting the walking beam to move in a longitudinal direction. Brake cylinders are housed in the hollow section on the walking beam to furnish maximum protection to these vital parts. Removal and installation procedures of either of the two walking beams is identical. Both walking beams are identical in construction and are interchangeable.

248. REMOVAL (fig. 312).

a. Remove Trunnion Axle. Remove the two trunnion axles from both ends of rocker beam (par. 245). Remove brake cylinder carrier assembly (par. 223 **b**).

b. Remove Shifting Screw.

(1) Place two jacks under walking beam about three feet apart, one on the outer side and the other on the inner side. Remove the four screws holding felt dust cover to trunnion beam mounting bracket (fig. 313). Loosen shifting screw locking bolt (fig. 26). Remove the screw holding weather strip mounting plate at end, and both sides, of trunnion mounting bracket. Remove the cotter pin located on inner side of shifting bracket. Loosen pinch bolt in special nut located on inner side of shifting bracket, and pull cotter pin out of special nut.

(2) Remove the four screws holding boot and shifting screw guard to cross member. Loosen the clamp, holding boot to shifting bracket, and pull boot off shifting screw. Turn shifting screw out of trunnion shaft. NOTE: *This is a two-man operation.* With one man holding special nut from turning (fig. 314), the second man turns shifting screw out of the shifting bracket and trunnion shaft (fig. 315).

(3) Remove the cap screws holding shifting screw bracket to walking beam, and lift the bracket out. Remove the special nut, bronze washer, spacer, and felt washer from shifting bracket (fig. 312).

c. Remove Trunnion Shaft. Remove the four nuts holding inner trunnion shaft mounting bracket cap, and tap cap off the trunnion

shaft. Remove two outer bolts holding outer trunnion shaft mounting bracket cap to mounting bracket (fig. 316). Lower the two jacks under rocking beam, and pull dowel pin out of trunnion shaft (fig. 317). Pull trunnion shaft out of walking beam.

d. Remove Walking Beam. Lower the two jacks. Lift walking beam out.

249. INSTALLATION.

a. Installing Brake Carrier Assembly. Place rocker beam on floor with hollow section up. Lay brake cylinder carrier assembly on top of rocker beam making certain the air ports in brake cylinder are facing toward the side that has the five bolt holes for attaching shifting screw bracket.

b. Mount Walking Beam. Place walking beam directly under semitrailer side rail, making certain the holes, which hold shifting bracket to rocker beam, are toward center of semitrailer. Couple portable trolley hoist to rocker beam using a spread chain straddling the semitrailer side rail. NOTE: *When coupling chain to rocker beam place chain in such a manner as not to cause chain to bind between walking beam and under side of semitrailer side rail.*

c. Install Trunnion Shaft. Place a film of grease over surface of trunnion shaft and place trunnion shaft through walking beam making certain the oil and dowel pin hole in trunnion shaft is toward the outer side of semitrailer and toward the top. Hoist walking beam approximately one inch from trunnion shaft mounting bracket. Install the dowel pin (fig. 318). CAUTION: *The trunnion shaft is equipped with two holes. Make certain the dowel pin is installed in hole that is toward center of semitrailer.* The hole toward outer side of trunnion shaft is an oil hole.

d. Bolt Trunnion Shaft in Position. Continue hoisting walking beam until dowel pin in trunnion shaft enters hole in trunnion shaft mounting bracket. Place outer trunnion shaft mounting bracket cap over trunnion shaft making certain the two screw holes that hold dust felt cover to assembly are toward the outer side of semitrailer. Secure cap using the two bolts, nuts, and lock washers. Place inner trunnion shaft mounting bracket cap over trunnion shaft, securing cap to mounting bracket with four nuts and lock washers.

e. Install Shifting Screw.

(1) Bolt the shifting bracket to inner side of rocker beam using five cap screws and lock washers. Place shifting screw through hole in trunnion shaft making certain spacer and bronze washer are placed over shifting screw prior to installation (fig. 312). NOTE: *Inner and outer bronze washers, spacers, and special locking nuts are interchangeable throughout the semitrailer.*

(2) Place spacer and bronze washer over inner end of shifting screw. Hold the special inner nut in place through space between trunnion shaft mounting bracket and trunnion bracket with the machined surface toward rocker beam. Turn shifting screw slowly in a clockwise direction. Continue turning shifting screw through shifting

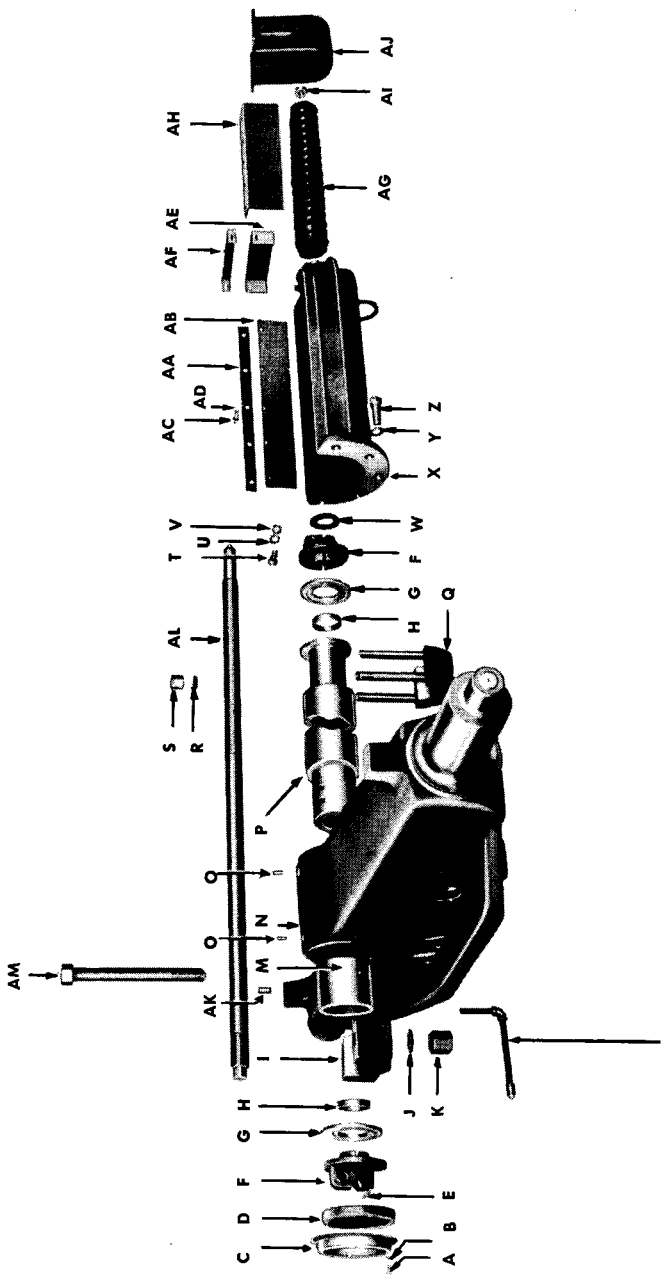

Figure 312—Walking Beam and Shifting Screw Assembly—Exploded View

A 1/4 INCH ROUND HEAD SLOTTED SCREW
B 1/4 INCH LOCK WASHER
C DUST FELT COVER
D DUST FELT
E 3/16 INCH x 2 1/2 INCH COTTER PIN
F SPECIAL NUT
G TRUNNION SHAFT WASHER
H SPACER
I OUTSIDE TRUNNION SHAFT CAP
J LOCK WASHER
K CAP BOLT NUT
L WALKING BEAM BUSHING LUBRICATION LINE
M WALKING BEAM BUSHING
N WALKING BEAM (ROCKER ARM)
O BUSHING DOWEL PIN
P TRUNNION SHAFT
Q TRUNNION SHAFT CAP AND STUDS
R LOCK WASHER
S NUT
T 7/16 INCH CAP SCREW
U 7/16 INCH LOCK WASHER
V 7/16 INCH CASTELLATED NUT
W FELT WASHER
X SHIFTING BRACKET
Y 3/4 INCH LOCK WASHER
Z 3/4 INCH CAP SCREW
AA SIDE WEATHER STRIP MOUNTING PLATE
AB SIDE WEATHER STRIP
AC 5/16 INCH CAP SCREW
AD 5/16 INCH LOCK WASHER
AE END WEATHER STRIP
AF END WEATHER STRIP MOUNTING PLATE
AG SHIFTING SCREW RUBBER BOOT
AH PROTECTION PLATE
AI RETAINER COLLAR
AJ U-BRACKET
AK TRUNNION SHAFT DOWEL PIN
AL WALKING BEAM SHIFTING SCREW
AM TRUNNION SHAFT CAP NUT

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Legend for Figure 312—Walking Beam and Shifting Screw Assembly—Exploded View

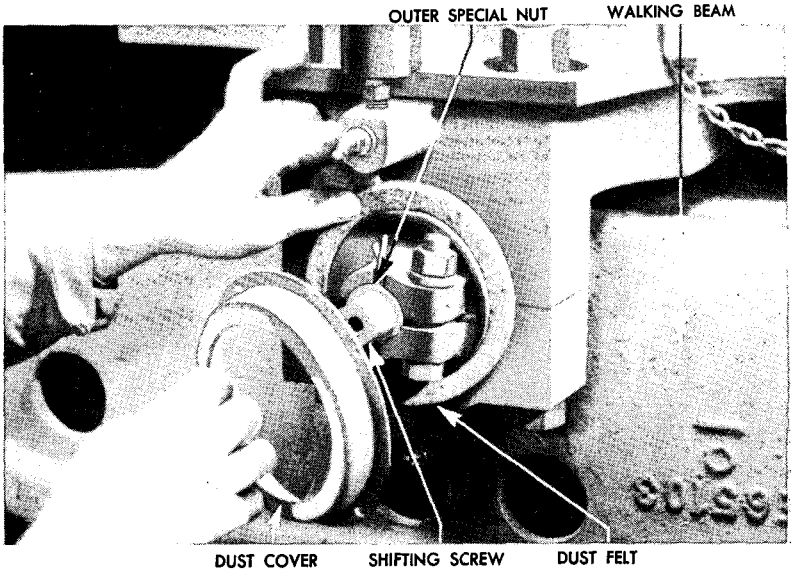

Figure 313—Removing Dust Cover and Dust Felt

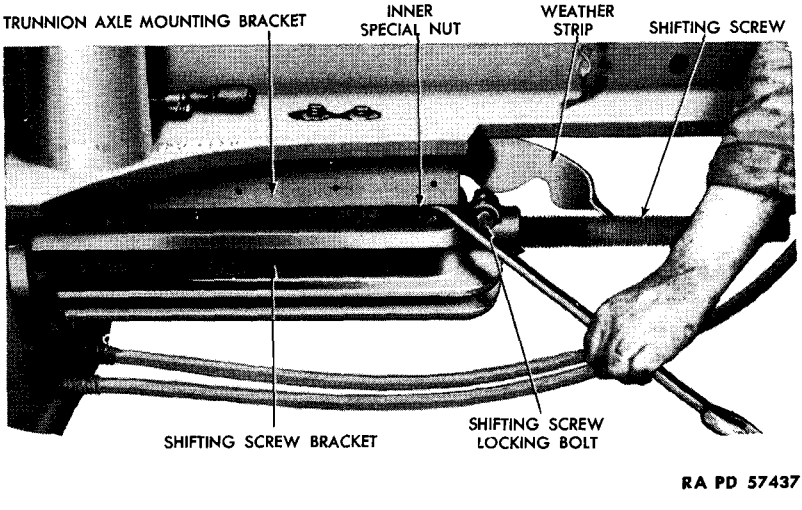

Figure 314—Holding Special Nut

WALKING BEAM

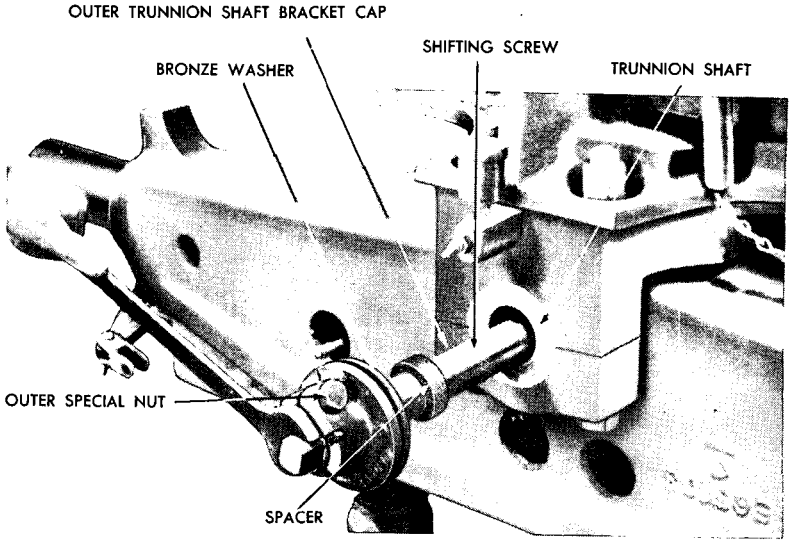

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Figure 315—Removing Shifting Screw

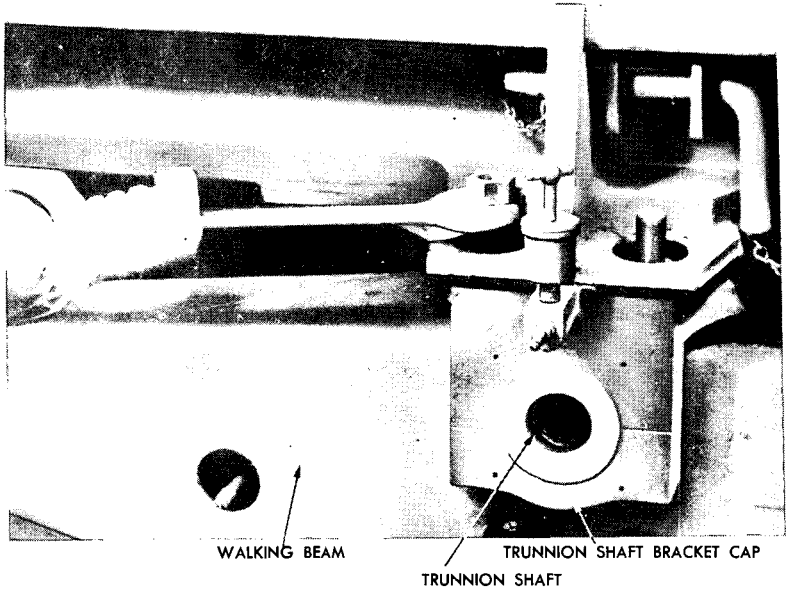


Figure 316—Removing Trunnion Shaft Bracket Cap

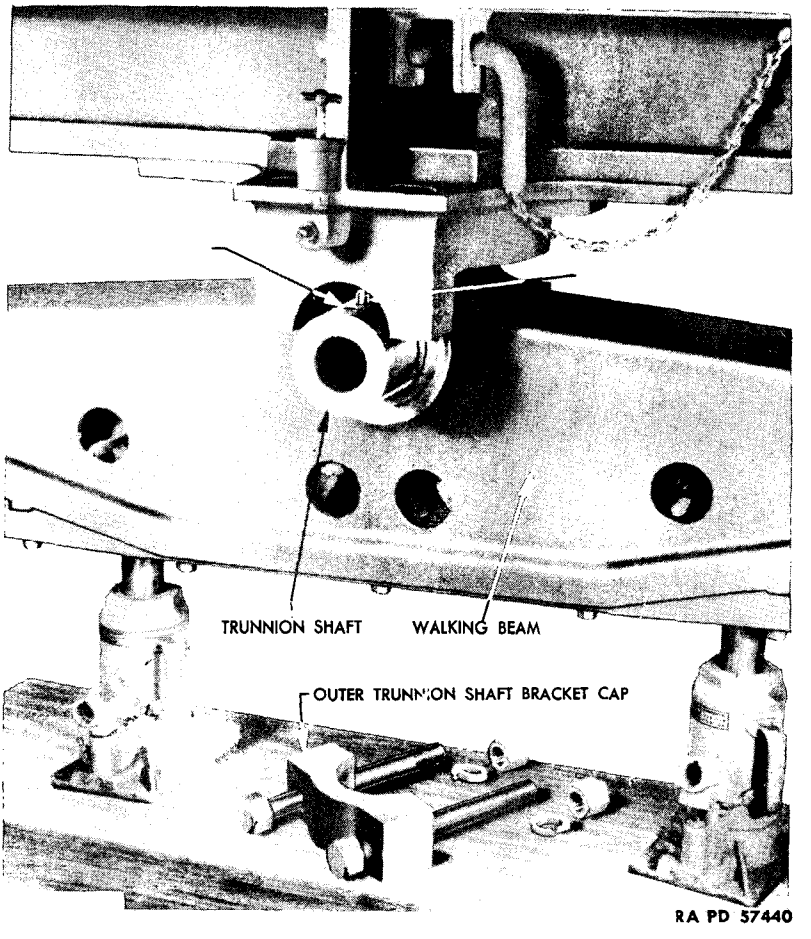


Figure 317—Trunnion Shaft and Walking Beam

screw bracket until it extends through shifting bracket about 15 inches. Place rubber boot over shifting screw. Install boot retainer collar over end of shifting screw. Continue turning the shifting screw until end of screw contacts center of U-bracket. Turn inner special nut until slot in nut is in alinement with cotter pin hole in shifting screw, and install cotter pin.

(3) Install the side and end weather strips, securing them to trunnion shaft mounting bracket with plates and cap screws. Place dust felt in position over outer end of trunnion shaft, securing it to trunnion shaft mounting bracket with felt dust cover and four screws (fig. 313).

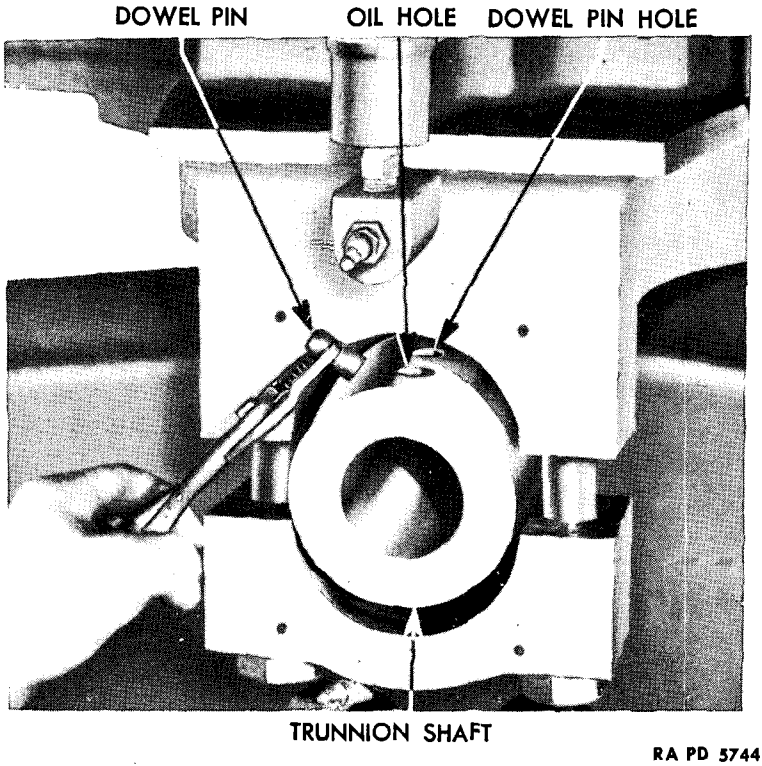


Figure 318—Installing Dowel Pin in Trunnion Shaft

(4) Prior to tightening shifting screw locking bolt, check adjustment of walking beam on trunnion axle (par. 250). Prior to placing semitrailer into operation, lubricate trunnion shaft, trunnion axle and linkage.

f. Install Trunnion Axles. Install trunnion axles (par. 246 **b**). Couple equalizer links and give minor adjustment (par. 221).

250. ADJUSTMENT.

a. Place jack ground board, jack pedestal and hydraulic jack at rear of semitrailer frame and raise the frame an inch or two to relieve part of weight off front and rear wheel assemblies.

b. Loosen the shifting screw locking bolt (fig. 26), with shifting screw wrench. Turn screw in a clockwise direction until stop is reached. Turn screw in a counterclockwise direction about ½ turn, or until there is $\frac{1}{32}$-inch clearance between outer side of walking beam at bushing and trunnion shaft mounting bracket. Check clearance by inserting feeler gage between these two points.

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Section XL

WHEELS, HUBS, AND TIRES

251. DESCRIPTION.

a. Description. The vehicle is equipped with eight wheels, hubs, and tires. The axle and wheels are equipped with heavy duty tapered roller bearings. Simple adjustments of the bearings are made through

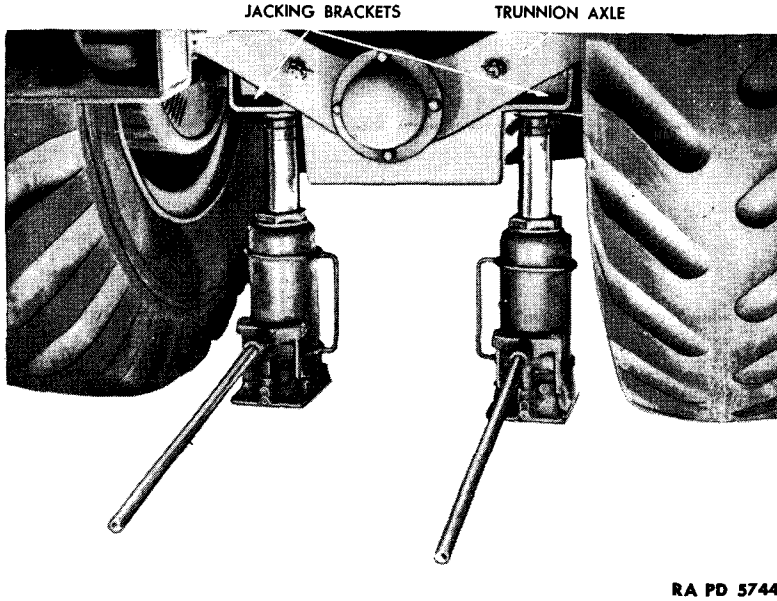


Figure 319—Trunnion Axle Jacking Brackets

the castellated nut and D-washer. The wheels are of the ten-stud, demountable, ventilated steel disk type. All maintenance procedure on either of the wheel and hub assemblies is identical, except when removing the two inner rear wheels. When removing the inner rear wheels remove the idler pulley carrier assembly. All wheels and bear-

ings are interchangeable. The hubs are interchangeable from front to rear, but not from right to left. The wheel and hub can be removed as one assembly.

252. WHEEL AND HUB ASSEMBLY.

a. Removal.

(1) Place two 20-ton jacks under trunnion axle and raise semitrailer high enough to permit turning of wheel. NOTE: *Trunnion axle is provided with two jacking brackets. Place jack cap under jacking brackets to prevent slippage* (fig. 319). If jacks are used in soft soil or sand, place jack ground board under jack. Remove the two bolts and pin holding idler pulley carrier assembly to rear cross member and second member (fig. 320), and lift idler pulley carrier out.

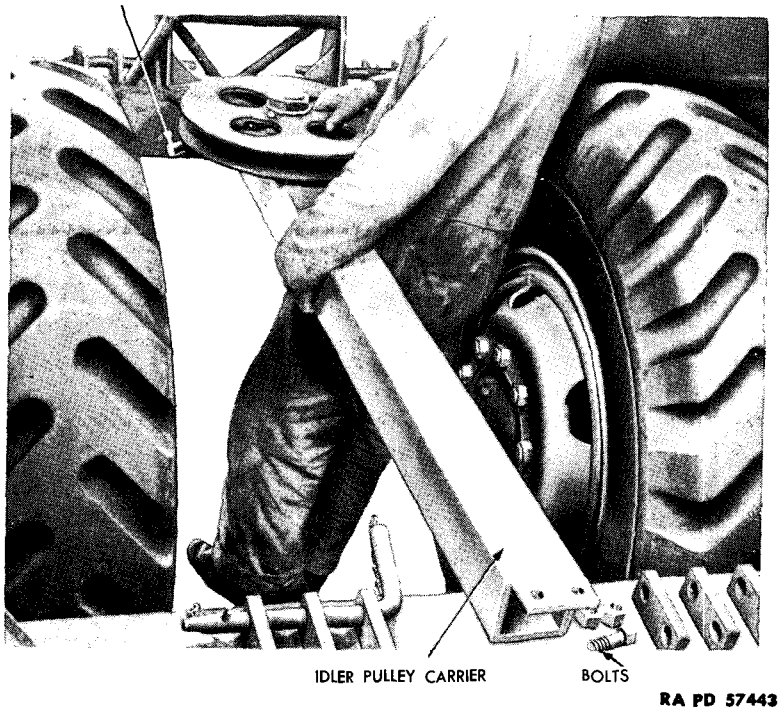


Figure 320—Removing Idler Pulley Carrier

(2) Erect crane and hoist assembly (par. 10). Place hoist assembly in hoist pocket adjacent to the wheel assembly which is to be removed. Place tire tongs into hook on chain hoist, and fasten tongs to tire.

(3) Remove the four screws holding hub cap to hub assembly.

(4) Pull cotter pin from axle nut (fig. 321). Remove axle nut with axle nut wrench by turning in a counterclockwise direction. Place screwdriver under D-washer and work washer off axle spindle.

(5) Place screwdriver under outer bearing and work bearing off spindle.

(6) Take a slight pull on chain hoist, grasp the wheel firmly and pull the assembly off axle (fig. 322).

(7) Pull inner bearing, compression ring, and felt, off spindle (fig. 323).

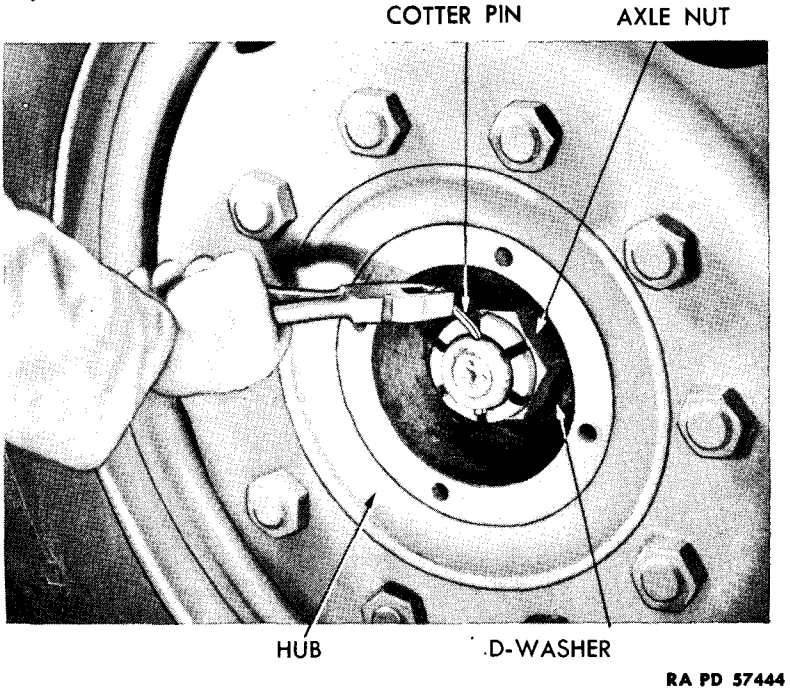
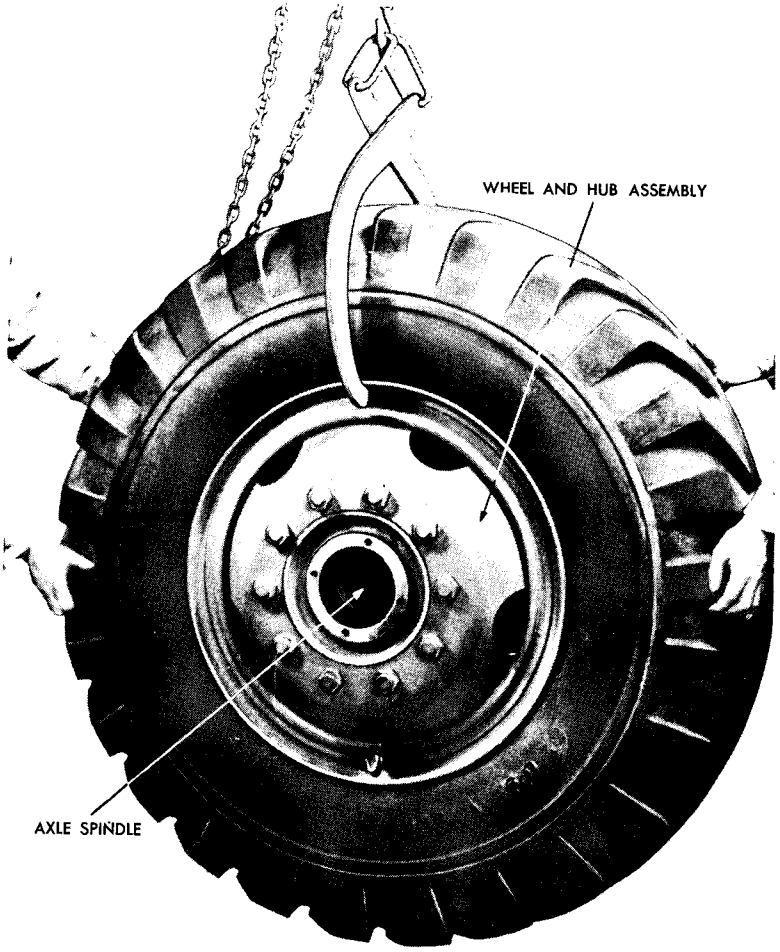


Figure 321—Removing Axle Cotter Pin

b. Installation.

(1) Before installing wheel and hub assembly wash the inner and outer bearings in dry-cleaning solvent. Use a stiff brush to remove all hardened grease. Wash inside of hub. Inspect the cups in hub for cracks, chipped surface, and pits. Inspect bearings for chipped rollers, pits, and excessive wear. Clean all foreign matter from inside of brake drum.

(2) Hand-pack bearing with general purpose grease No. 2, U. S. Army Specification 2-108. Knead the lubricant in between rollers. Coat the outer surface of roller cage and bearing cone. Coat the inside surface of hub and bearing cups with a film of grease not exceeding ⅛ inch thick. Coat trunnion axle and hub cap with light film of

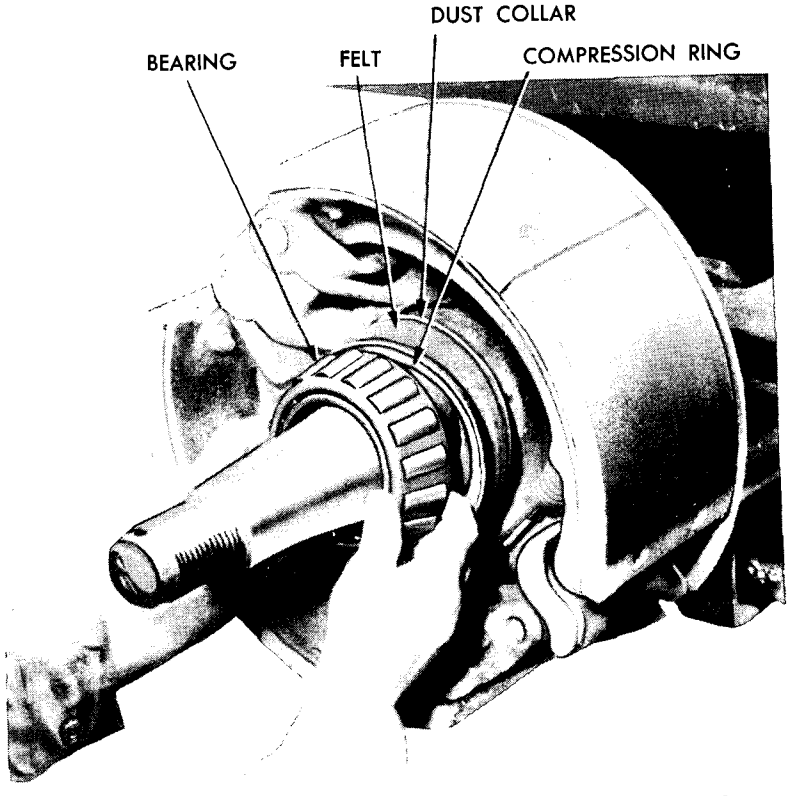


RA PD 57445

Figure 322—Removing Wheel and Hub Assembly as One Unit

grease. CAUTION: *Do not pack the space between the two bearing cups. Excess grease in hub will cause grease to run out on brake drum.*

(3) NOTE: *Do not install wheel on axle spindle with felt retainer and compression ring on axle spindle.* Place inner bearing in hub. Insert compression ring next to inner bearing with its flanged side toward the inside of hub. Place the felt grease retainer next to compression ring. Place the dust collar on the axle spindle, locking it in position by means of the metal dowel which fits into slot on spindle flange and into hole in dust collar (figs. 323 and 324).



RA PD 57446

Figure 323—Removing Inner Hub Bearing from Trunnion Spindle

(4) Suspend wheel and hub assembly from crane and hoist. Shove hub on spindle, making certain not to disturb the setting of inner bearing, felt, and dust collar.

(5) Install outer bearing, forcing it back into hub as far as possible. Place the D-washer over spindle next to outer bearing (fig. 325). Place axle nut on spindle and turn in a clockwise direction until nut is tight. Remove crane and hoist. Adjust wheel bearings (par. 253 b). Remove jacks and jack ground boards.

253. HUB BEARING ADJUSTMENT.

a. Check for Loose Wheel Bearings.

(1) Check to make sure brakes are in fully released position, and that wheel stud nuts are tight.

(2) Jack up axle to free the wheel to be worked on. Check end adjustment by lifting with a crowbar between tire and floor. Should the wheel feel loose, adjust bearing (par. 253 b).

b. Adjustment. Remove the four screws holding hub cap to hub. Pull cotter pin from axle nut. With the wheel bearing wrench draw up the axle nut tightly against D-washer and turn the wheel back and forth until a slight bind is felt and the wheel turns with slight difficulty. Back off on axle nut about ½ turn. Install cotter pin and hub cap.

254. WHEELS.

a. The outer and inner wheel assemblies are removed from vehicle without the use of crane and hoist assembly which is furnished with this vehicle. The crane and hoist are used only on inner wheel assemblies when it becomes necessary to hoist wheel out from between side

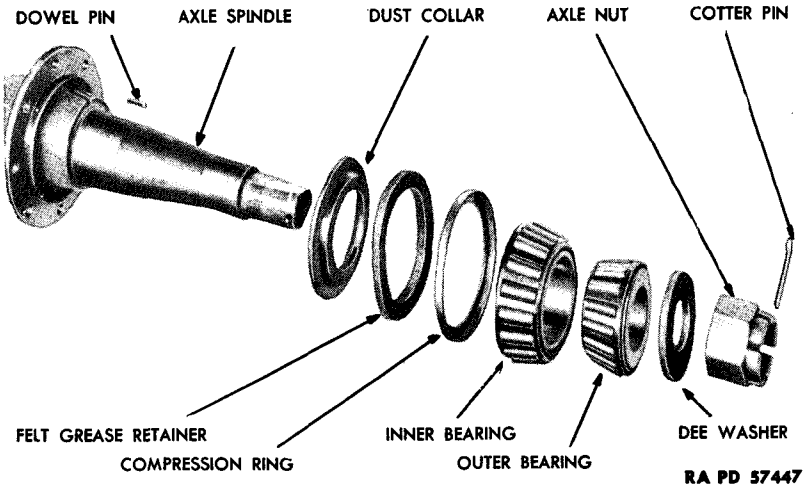


Figure 324—Assembly Sequence of Hub Inner Parts

rail members to change tires. The following removal and installation instructions are devoted to maintenance of inner rear wheels.

b. Removal.

(1) Remove the two bolts and one pin holding idler pulley carrier assembly to rear cross member and remove idler pulley carrier (fig. 320).

(2) Erect hoist and crane assembly (par. 10). NOTE: *Prior to installing hoist into hoist pocket, place a light film of grease over inner surface of hoist pocket to aid in swinging crane more freely.*

(3) Place hoist and crane assembly in hoist pocket adjacent to wheel which is to be removed. Fasten tire tongs to tire and take a slight strain on hoist.

(4) Remove 10 wheel stud nuts holding wheel to hub assembly (fig. 326). Pull wheel off hub studs. Hoist wheel high enough to clear semitrailer side rail. Push hoist around toward outside of semitrailer

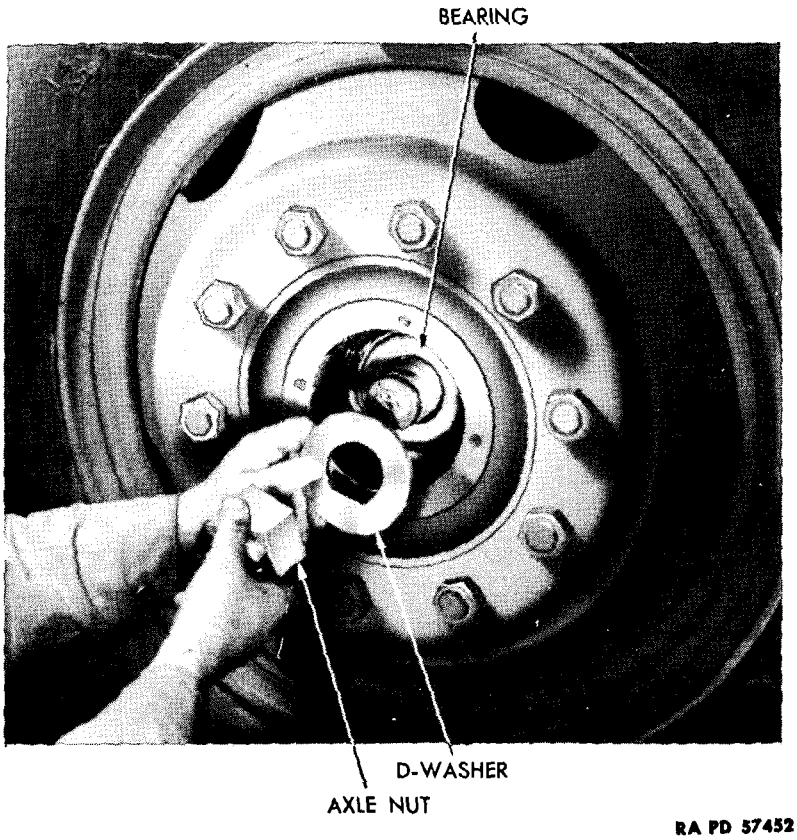


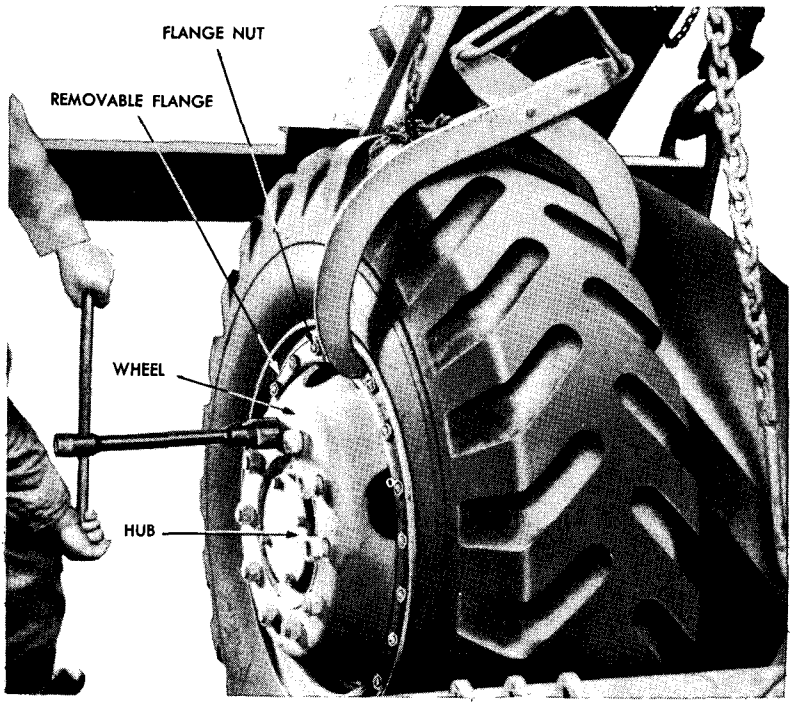
Figure 325—Installing Outer Bearing and D-washer

and lower tire and wheel to ground (fig. 327). CAUTION: *Do not remove the 20 nuts holding removable flange to wheel. Tire will blow out and cause serious injury.*

c. Installation.

(1) Erect hoist and crane assembly (par. 10). Place hoist and crane assembly in pocket adjacent to hub on which wheel is to be installed.

(2) Hoist wheel into position over wheel studs in hub. Install and draw up stud nuts, applying pressure evenly on all nuts by progressively tightening opposite nuts until all nuts are tight. NOTE: *All studs and nuts are marked with the letters "L" or "R" which indicate right and left. Studs and nuts are not interchangeable. Wheels are interchangeable.*



RA PD 57448

Figure 326—Removing Rear Inner Tire and Wheel Assembly

255. HUB AND DRUM ASSEMBLY.

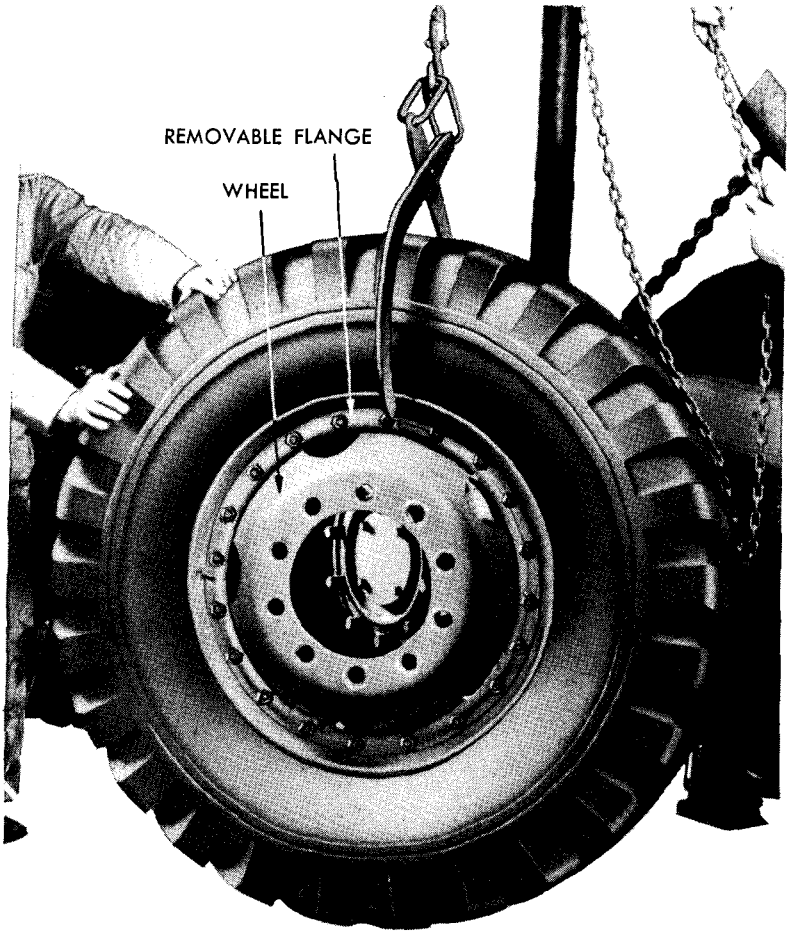
a. Removal.

(1) JACKING TRAILER. NOTE: *Make certain brakes are in the full released position.* Place two 20-ton jacks under trunnion axle and raise semitrailer high enough to permit turning of wheel (fig. 319). If jacks are used on soft ground or sand, place jacks on ground board.

(2) REMOVE WHEEL AND TIRE ASSEMBLY (par. 254). Remove four hub cap screws and hub cap. Pull cotter pin from axle nut (fig. 321), and remove axle nut by turning in a counterclockwise direction with axle nut wrench.

(3) Work D-washer and outer bearing from hub by pulling out on hub with a short jerking motion. Pull hub off axle spindle (fig. 328).

(4) Pull inner bearing, compression ring and felt grease retainer off axle spindle (fig. 323).



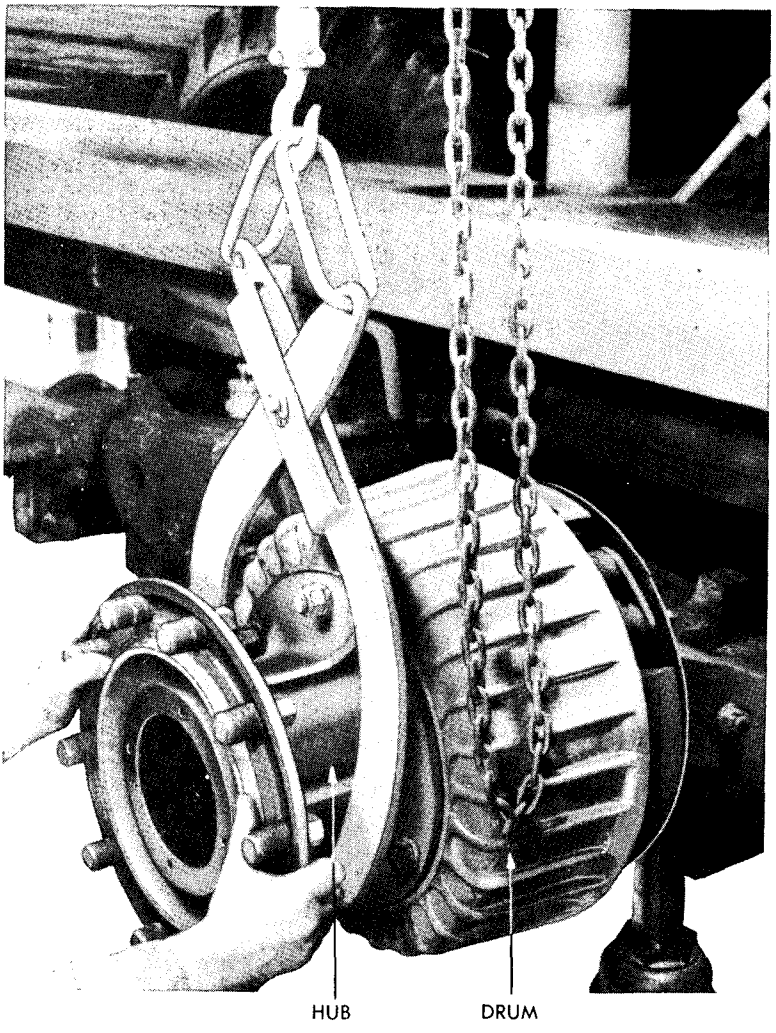
RA PD 57449

Figure 327—Lifting Rear Inner Tire and Wheel Assembly

b. Removing Drum from Hub. Place hub on its side, remove the six bolts holding drum to hub flange and lift drum off hub (fig. 329).

c. Installing Drum on Hub. Place hub on outer end with flange up. Remove all dust, rust, and other foreign matter from surface of drum pilot. Place drum over drum pilot and install the six bolts, lock washers, and nuts. Successively tighten opposite nuts to bring drum down evenly, to prevent its cocking on hub pilot.

d. Installation. Installation of hub and drum assembly is the same as installation of wheel and hub assembly (par. 252 **b**).



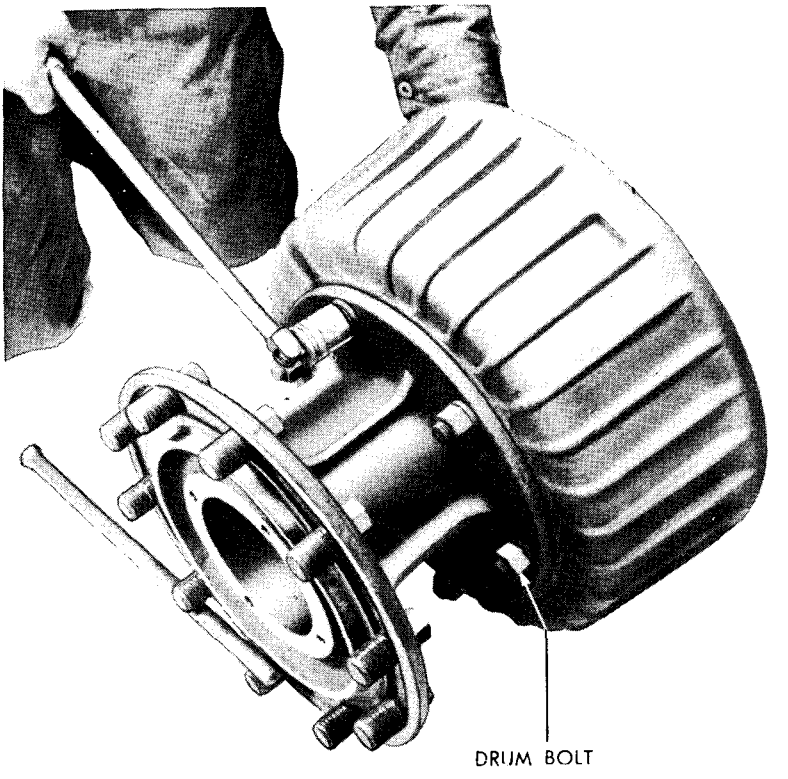
RA PD 57450

Figure 328—Removing Hub and Drum Assembly

(1) Adjust wheel bearings (par. 253 b).
(2) Install wheel (par. 254 c).

256. TIRES.

a. Description. The pneumatic type tires are held to wheel by removable flange bolted to wheel. Tires are interchangeable throughout trailer. Tire pressure in all tires must be 90 pounds.

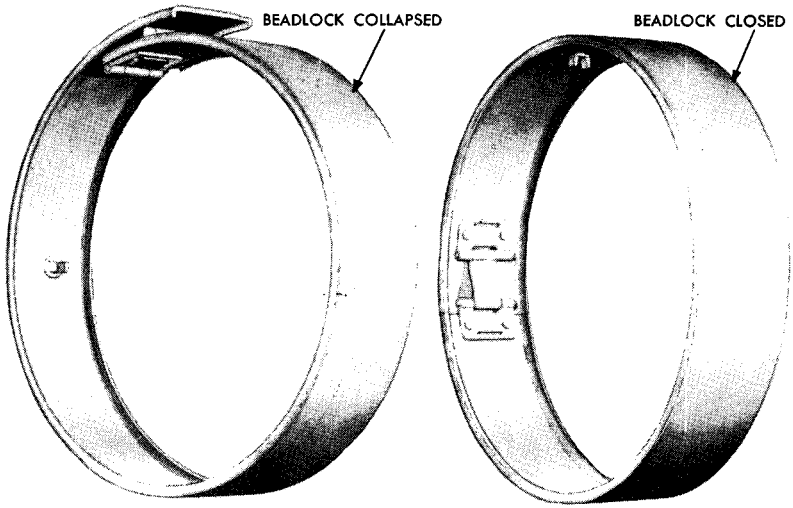


RA PD 57451

Figure 329—Removing Drum from Hub

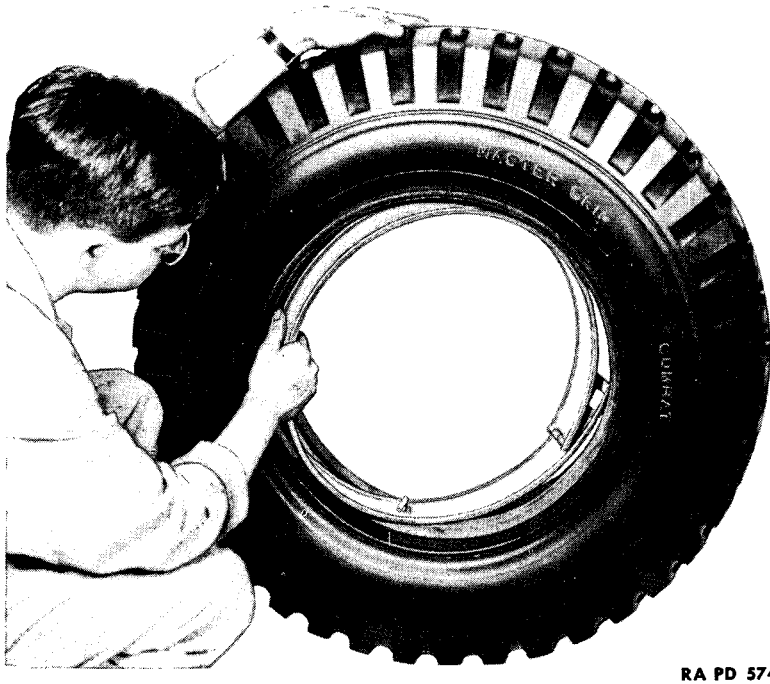
b. Removal. Remove wheel and tire assembly from hub (par. 254). Place wheel and tire assembly on ground with removable flange up. CAUTION: *Deflate tire before removing nuts holding removable flange.* Remove valve core to permit all air to escape. Remove the 20 nuts holding removable flange to wheel. Lift removable flange off wheel and studs. Lift side of tire opposite valve off ground at about a 45-degree angle. Tap wheel lightly with sledge hammer, driving wheel free of tire. Place tire tool between bead lock, collapsing bead lock. Turn bead lock crosswise to tire and pull bead lock out of tire.

c. Installation. Remove sand, gravel, and other foreign matter from inside tire. Place completely deflated tube in tire. Inflate tube with sufficient air to spread tire bead. Collapse bead lock (fig. 330). Hold tire in vertical position and insert bead lock in tire (fig. 331). Rotate bead lock to position, and snap it into its original shape (fig. 332). Remove valve core to completely deflate tube. Apply tire assem-



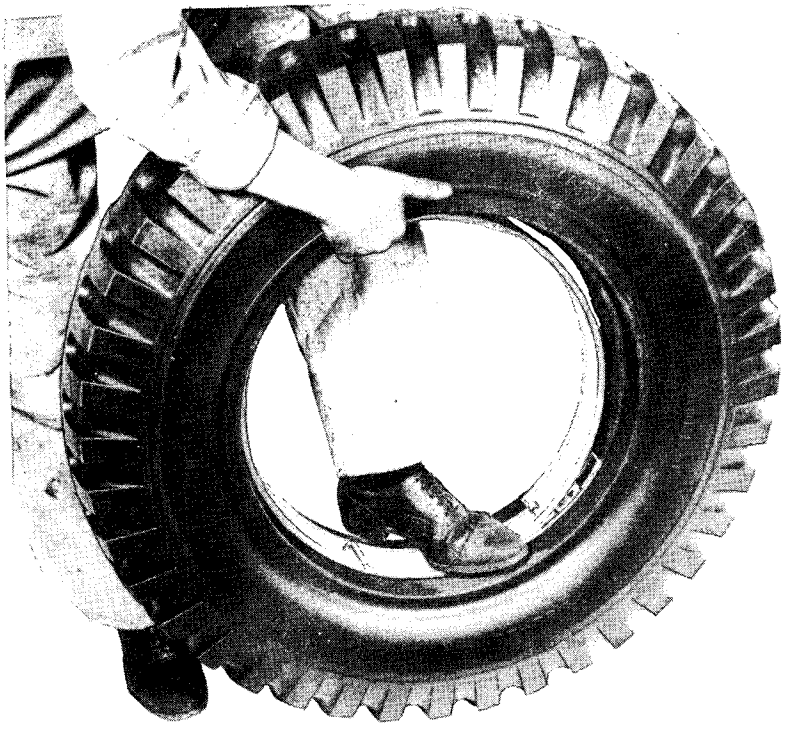
RA PD 57453

Figure 330—Bead Lock Collapsed and Closed



RA PD 57454

Figure 331—Installing Bead Lock



RA PD 57455

Figure 332—Locking Bead Lock

bly to the wheel with the valve stem toward removable flange side of wheel (fig. 333). Install removable flange so that holes are in proper alinement. Place crowbar between wheel and removable flange and pry down. Install the 20 nuts, screwing them down by hand (fig. 334). Then, with wrench, screw down one nut fairly tight. Tighten stud nut directly opposite. Tighten stud nut midway beween these two and the one directly opposite. Continue tightening remainder of stud nuts around flange. Install valve core. Inflate tire to 90 pounds pressure. Check stud nuts once more to make certain they are tight.

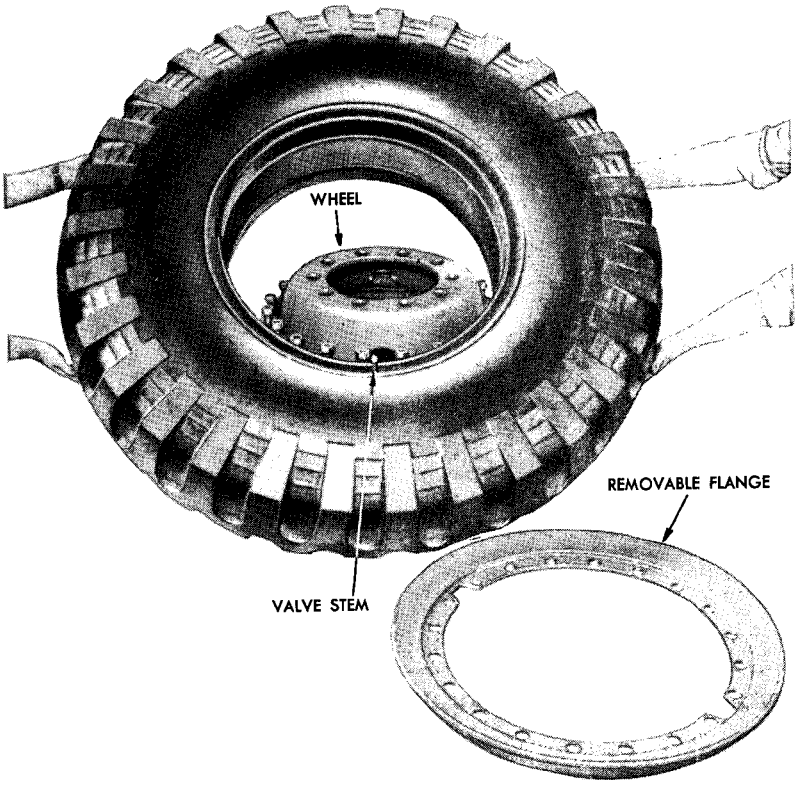


Figure 333—Mounting Tire on Wheel

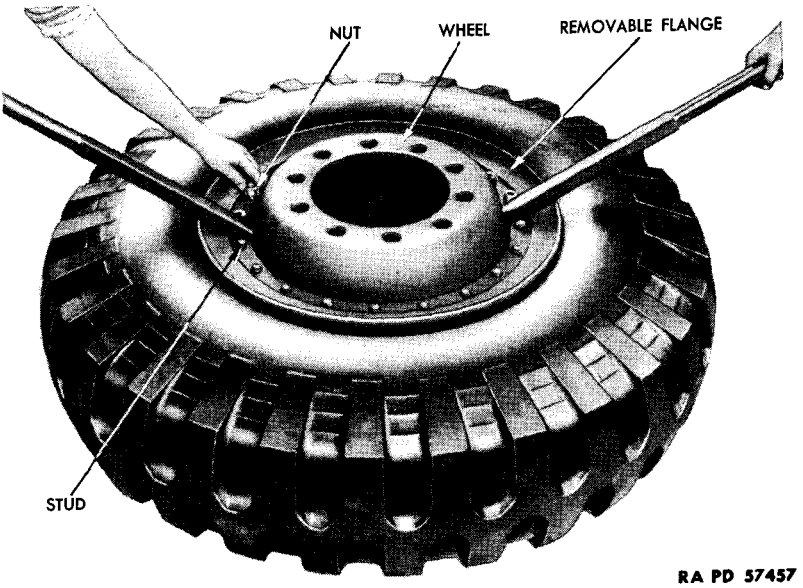


Figure 334—Installing Removable Flange

PART FOUR—SHIPMENT AND TEMPORARY STORAGE

Section XLI

SHIPMENT AND TEMPORARY STORAGE

257. GENERAL INSTRUCTIONS.

a. Preparation for domestic shipment of the vehicles is the same as preparation for temporary storage or bivouac. Preparation for shipment by rail includes instructions for loading and unloading the vehicles, blocking necessary to secure the vehicles on freight cars, number of vehicles per freight car, clearance, weight, and other information necessary to properly prepare the vehicles for rail shipment. For more detailed information, and for preparation for indefinite storage, refer to AR 850-18.

258. PREPARATION FOR TEMPORARY STORAGE OR DOMESTIC SHIPMENT.

a. Vehicles to be prepared for temporary storage or domestic shipment are those ready for immediate service, but not used for less than thirty days. If vehicles are to be indefinitely stored after shipment by rail, they will be prepared for such storage at their destination.

b. If the vehicles are to be temporarily stored or bivouacked, take the following precautions:

(1) LUBRICATION. Lubricate the vehicles completely (par. 30).

(2) COOLING SYSTEM. If freezing temperature may normally be expected during the limited storage or shipment period, test the coolant with a hydrometer and add the proper quantity of antifreeze compound, to afford protection from freezing at the lowest temperature anticipated during the storage or shipping period. Completely inspect the cooling system for leaks.

(3) BATTERY. Check battery and terminals for corrosion and if necessary, clean and thoroughly service battery (par. 127).

(4) TIRES. Clean, inspect, and properly inflate all tires. Replace with serviceable tires, all tires requiring retreading or repairing. Do not store vehicles on floors, cinders, or other surfaces which are soaked with oil or grease. Wash off immediately any oil, grease, gasoline, or kerosene which comes in contact with the tires under any circumstances.

(5) ROAD TEST. The preparation for limited storage will include a road test of at least five miles, after the battery, cooling system, lubrication, and tire services have been made, to check on general condition of the vehicles. Correct any defects noted in the vehicle

operation, before the vehicles are stored, or note on a tag attached to the steering wheel, stating the repairs needed, or describing the condition present. A written report of these items will then be made to the officer in charge.

(6) FUEL IN TANKS. It is not necessary to remove the fuel from the tanks for shipment within the United States, nor to label the tanks under Interstate Commerce Commission Regulations. Leave fuel in the tanks except when storing in locations where Fire Ordinances, or other local regulations, require removal of all gasoline before storage.

(7) EXTERIOR OF VEHICLE. Remove rust appearing on any part of vehicle exterior with sandpaper. Repaint painted surfaces whenever necessary to protect wood or metal from deterioration. Exposed polished metal surfaces which are susceptible to rust, such as winch cables and chains, should be coated with a protective medium grade lubricating oil. Close firmly all cab doors, windows, and windshields. Leave rubber mats, such as floor mats, where provided, in an unrolled position on the floor, and not rolled or curled up. Equipment, such as Pioneer and truck tools, tire chains, and fire extinguishers, will remain in place in the vehicle.

(8) INSPECTION. Make a systematic inspection just before shipment or temporary storage, to insure all above steps have been covered, and that the vehicles are ready for operation on call. Make a list of all missing or damaged items and attach it to the steering wheel. Refer to Before-operation Service (par. 25).

(9) ENGINE. To prepare the engine for storage, remove the air cleaner from the carburetor. Start the engine and set the throttle to run the engine at a fast idle. Pour one pint of medium grade, preservative lubricating oil, Ordnance Department Specification AXS-674, of the latest issue in effect, into the carburetor throat, being careful not to choke the engine. Turn off the ignition switch as quickly as possible after the oil has been poured into the carburetor. With the engine switch off, open the throttle wide, and turn the engine five complete revolutions by means of the cranking motor. If the engine cannot be turned by the cranking motor with the switch off, turn it by hand, or disconnect the high-tension lead and ground it before turning the engine by means of the cranking motor. Then reinstall the air cleaner.

(10) BRAKES. Release brakes and chock the wheels or tracks.

c. Inspections in Limited Storage.

(1) Vehicles in limited storage will be inspected weekly for condition of tires and battery. If water is added when freezing weather is anticipated, recharge the battery with a portable charger or remove the battery for charging. Do not attempt to charge the battery by running the engine. If freezing temperature is expected, add the proper quantity of antifreeze compound to cooling system to afford protection from freezing.

SHIPMENT AND TEMPORARY STORAGE

259. LOADING AND BLOCKING FOR RAIL SHIPMENT.

a. Preparation. In addition to the preparation described in paragraph 258, when ordnance vehicles are prepared for domestic shipment, the following preparations and precautions will be taken:

(1) EXTERIOR. Cover the body of the truck tractor with a canvas cover supplied as an accessory.

(2) TIRES. Inflate pneumatic tires from 5 to 10 pounds above normal pressure.

(3) BATTERY. Disconnect the battery to prevent its discharge by vandalism or accident. This may be accomplished by disconnecting the positive lead, taping the end of the lead, and tying it back away from the battery.

(4) BRAKES. The brakes must be applied and the transmission placed in low gear, after the vehicle has been placed in position with a brake wheel clearance of at least 6 inches ("A," fig. 335). The vehicles will be located on the car in such a manner as to prevent the car from carrying an unbalanced load.

(5) SHIFTING TRAILER ROCKER BEAM. Move semitrailer wheels to their innermost position (par. 5) before loading it on a flat car.

(6) PLACARDING. All cars containing ordnance vehicles must be placarded "DO NOT HUMP."

b. Facilities for Loading. Whenever possible, load and unload vehicles from open cars under their own power, using permanent end ramps and spanning platforms. Movement from one flat car to another along the length of the train is made possible by cross-over plates or spanning platforms. If no permanent end ramp is available, an improvised ramp can be made from railroad ties.

c. Securing Vehicles (Tractor).

(1) METHOD 1 (fig. 335). Locate eight blocks "B," one to the front, and one to the rear of each front wheel, to the front of each forward rear wheel, and to the rear of each rearward rear wheel. Nail the heel of each block to the car floor, using five 40-penny nails to each block. That portion of the block under the wheel will be toenailed to the car floor with two 40-penny nails to each block. Locate two cleats "D" against the outside face of each wheel. Nail the lower cleat to the car floor with three 40-penny nails and the top cleat to the cleat below with three 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "C" through the bumper lug on the front of the vehicle and through stake pockets on opposite sides of the freight car. Pass also the same number of strands of wire through the pintle hook on the rear of the vehicle and then attach to stake pockets on opposite sides of the freight car. Tighten all wires enough to remove slack.

(2) METHOD 2 (fig. 335). Locate four blocks "G," one to the front and one to the rear of the front wheels, one to the front of the forward

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

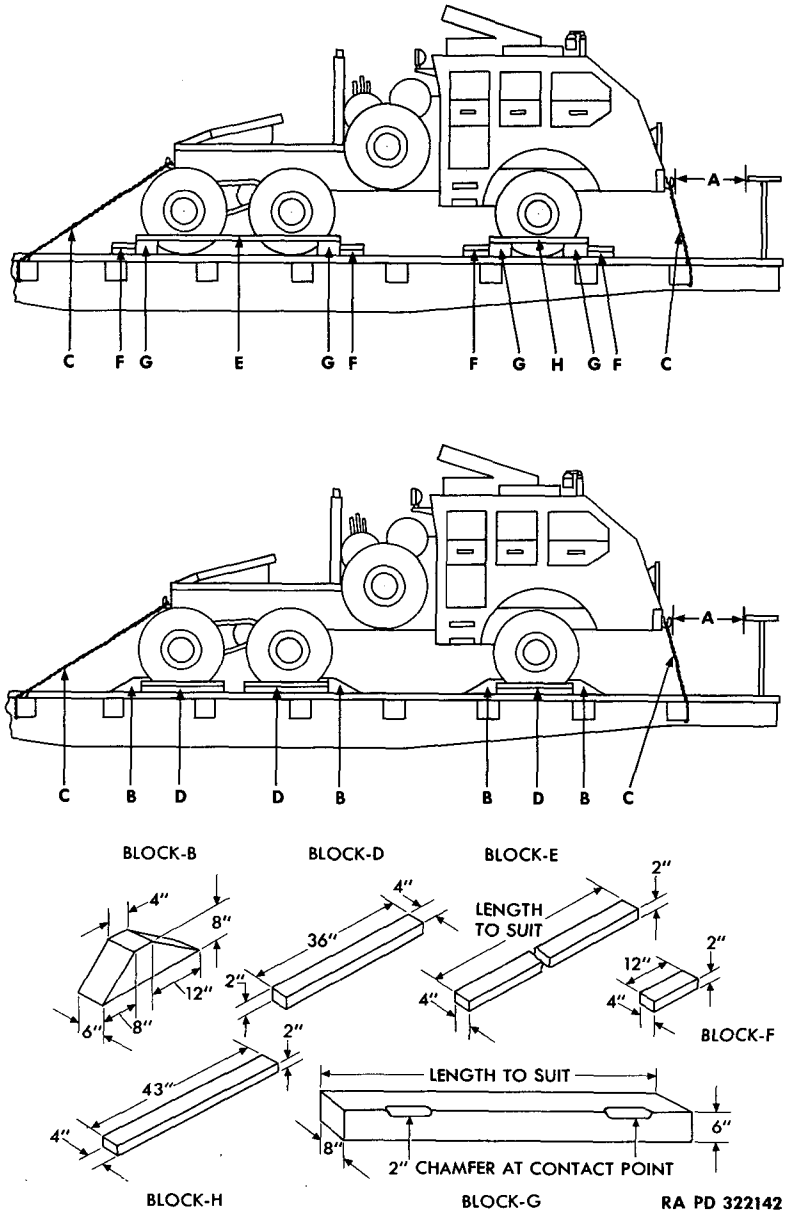


Figure 335—Blocking Requirements—Tractor Truck

SHIPMENT AND TEMPORARY STORAGE

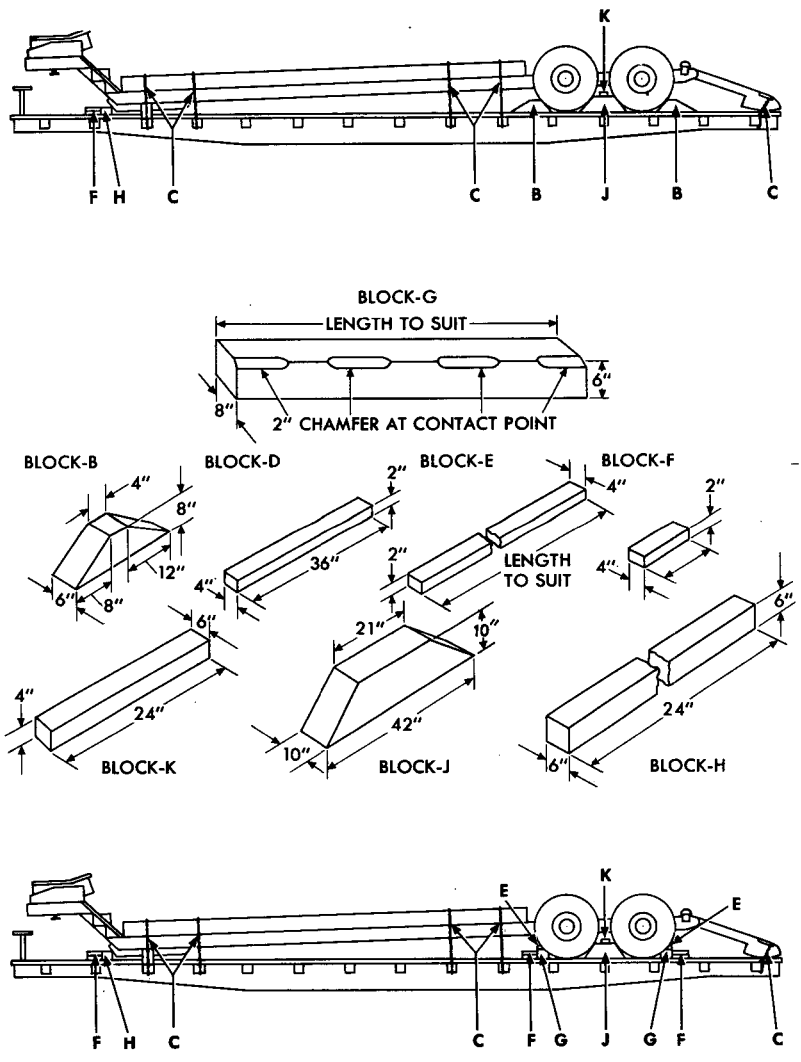


Figure 336—Blocking Requirements—Semitrailer

rear wheels and one to the rear of the rearward rear wheels. These blocks are to be at least 8 inches wider than the over-all width of the vehicle at the car floor. Locate 16 cleats "F" against blocks "G" to the front and to the rear of each blocked wheel. Nail the lower cleat to the car floor with five 40-penny nails and the top cleat to the cleat below with five 40-penny nails. Position two cleats "H" one over two blocks "G" and against the outside of each front blocked wheel. Nail each end of cleats "H" to the top of each block "G" with two 40-penny nails. In the same manner, fasten two cleats "E" over the blocks for the rear wheels. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "C" through the bumper lugs on the front of the vehicle, and then through stake pockets on opposite sides of the freight car. Pass also the same number of strands of wire through the pintle hook on the rear of the vehicle, and then attach to stake pockets on opposite sides of the freight car. Tighten all wires enough to remove slack.

d. Securing Vehicles (Semitrailer).

(1) METHOD 1 (fig. 336). Locate four blocks "J," one between each tandem set of wheels. Toe-nail blocks "J" securely to the floor of the freight car with 40-penny nails. Position two cleats "K," on top of each set of blocks "J." Nail the cleats to the blocks with 40-penny nails. Locate eight blocks "B," one to the front of each forward wheel and one to the back of each rearward wheel. Nail the heel of each block to the car floor with five 40-penny nails, and toe-nail the portion of each block under the tire to the car floor with two 40-penny nails. Position block "H" against forward end of semitrailer. Locate eight cleats "F" against block "H," in pairs, one on top of the other, equally spaced across the car floor. Nail lower cleats to the car floor with five 40-penny nails, then nail top cleat "F" to lower cleat "F" with five 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire ("C," fig. 336) through the handles on the permanent skids, and pass through the stake pockets. Also pass the same number of strands of wire across the bed of the semitrailer at four points (fig. 336). Fasten the wire to opposite stake pockets. Tighten guy wires enough to remove the slack.

(2) METHOD 2 (fig. 336). The second method varies from the first only in the blocking of the wheels. Secure the four blocks "J" and two cleats "K" as described in step (1) above. Place two blocks "G" one to the front of the forward wheels and one to the back of the rearward wheels. Locate 16 cleats "F," 8 to the front and 8 to the rear of the wheels. Locate the cleats "F" against the blocks "G," in pairs, one on top of the other, equally spaced across the car floor. Nail lower cleats to the car floor with five 40-penny nails, then nail top cleat "F" to lower cleat "F" with five 40-penny nails. Position two cleats "E" on top of blocks "G," between the tires. Nail the cleats to blocks "G." Complete the securing of the vehicle by following step (1) above.

SHIPMENT AND TEMPORARY STORAGE

e. Shipping Data.

	Truck	Semitrailer
Over-all length	25 ft 4 in.	44 ft 2 in.
Over-all width	10 ft 10¾ in.	12 ft 6 in.
Height	11 ft 5 in.	8 ft 9 in.
Shipping weight	42,000 lb	36,100 lb
Approximate floor area	275.8 sq ft	552.5 sq ft
Approximate volume	3184.1 cu ft	4834.4 cu ft
Bearing pressure (lb per sq ft)	152.3	65.3

REFERENCES

PUBLICATION INDEXES.

The following publications indexes should be consulted frequently for latest changes to or revisions of the publications given in this list of references and for new publications relating to materiel covered in this manual:

Ordnance publications for supply index (Index to SNL's)	ASF Cat. ORD-2 OPSI
Index to ordnance catalog (explains SNL system)	ASF Cat. ORD-1 IOC
Index to ordnance publications (lists FM's, TM's, TC's and TB's of interest to Ordnance personnel, MWO's (FSMWO's), BSD, S of SR's OSSC's and OFSB's. Includes alphabetical listing of Ordnance major items with publications pertaining thereto)	OFSB 1-1
List of publications for training (lists MR's, MTP's, T/BA's, T/A's, and FM's, TM's, and TR's concerning training)	FM 21-6
List of training films, film strips and film bulletins (lists TF's, FS's and FB's by serial number and subject)	FM 21-7
Military training aids (lists graphic training aids, models and displays)	FM 21-8

STANDARD NOMENCLATURE LISTS.

Truck, trailer, 40-ton, tank recovery, M25 (T21) (composed of Truck Tractor, M26 (T25); Trailer, M15, (T28)	SNL G-160
Cleaning, preserving and lubrication materials, recoil fluids, special oils and miscellaneous related items	SNL K-1
Soldering, brazing and welding materials, gases and related items	SNL K-2
Tool Sets—motor transport	SNL N-19

EXPLANATORY PUBLICATIONS.

General.

Military motor vehicles	AR 850-15
Standard military motor vehicles	TM 9-2800
Drivers selection and training	TM 21-300
Precautions in handling gasoline	AR 850-20

REFERENCES

Related Technical Manuals.

Ordnance maintenance: Engine for tractor truck M26, component of 40-ton tank transporter trailer truck M25	TM 9-1767A
Ordnance maintenance: Power train for tractor truck M26, component of 40-ton tank transporter trailer truck M25	TM 9-1767B
Ordnance maintenance: Body, chassis and winches for tractor truck M26, component of 40-ton tank transporter trailer truck M25	TM 9-1767C
Ordnance maintenance: Semitrailer M15, component of 40-ton tank transporter trailer truck M25	TM 9-1767D
Ordnance maintenance: Electrical equipment (Auto-Lite)	TM 9-1825B
Ordnance maintenance: Carburetors (Zenith)	TM 9-1826C
Ordnance maintenance: Power brake systems (Bendix-Westinghouse)	TM 9-1827A
Ordnance maintenance: Fuel pumps	TM 9-1828A
Maintenance and care of pneumatic tires and rubber treads	TM 31-200

Automotive Materiel.

The motor vehicle	TM 10-510
Automotive electricity	TM 10-580
Electrical fundamentals	TM 1-455
Fuels and carburetion	TM 10-550
The internal combustion engine	TM 10-570

Care and Preservation.

Cleaning, preserving, lubricating, and welding materials and similar items issued by the Ordnance Department	TM 9-850
Explosives and demolitions	FM 5-25
Basic maintenance manual	TM 38-250
Product guide	OFSB 6-2
Motor vehicle inspections and preventive maintenance services	TM 9-2810

Decontamination.

Chemical decontamination materials and equipment	TM 3-220
Decontamination of armored force vehicles	FM 17-59
Defense against chemical attack	FM 21-40

40-TON TANK TRANSPORTER TRUCK-TRAILER M25

Storage and Shipment.

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
Ordnance field service storage and shipment chart, group G—major items	OSSC-G

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