TM 9-796

WAR DEPARTMENT TECH

HEAVY WRECKING TRUCK M1A1

(KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

WAR DEPARTMENT *3 MARCH 1944*

WAR DEPARTMENT TECHNICAL MANUAL

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Washington, 25, D. C., 3 March 1944

TM 9-796, Heavy Wrecking Truck M1A1 (Kenworth Model 573, Ward LaFrance Series 5), is published for the information and guidance of all concerned.

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

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HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

PART ONE—VEHICLE OPERATING INSTRUCTIONS

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, maintenance, and minor repair of this materiel.

b. In addition to a description of the Heavy Wrecking Truck M1A1, this manual contains technical information required for the identification, use, and care of the materiel. The manual is divided in two parts. Part One, section I through section VIII, gives vehicle operating instructions. Part Two, section IX through section XXXV, gives vehicle maintenance instructions to using arm personnel charged with the responsibility of doing maintenance work within their jurisdiction.

c. In all cases where the nature of the repair, modifications, or adjustment is beyond the scope of 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.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section II

DESCRIPTION AND TABULATED DATA

2. DESCRIPTION.

a. The following models of vehicles are covered by this manual:

Kenworth ..... Model 573

Ward LaFrance ..... Model 1000, Series 5

b. The Heavy Wrecking Truck M1A1 is used for towing, salvaging, and recovering heavy equipment as well as for numerous repair operations away from a base shop, where heavy hoist and winch equipment is needed. It is a wheeled vehicle powered by a 6-cylinder, water-cooled, gasoline engine. Power is delivered through a five-speed transmission and two-speed transfer case to one front and two rear axles, thus providing driving traction on all wheels. Single pneumatic tires are used on the front axle, and dual pneumatic on the rear. However, provision is made for mounting dual wheels and tires on the front axle. The vehicle is equipped with a full-power driven crane, and front and rear mounted winches.

3. SERIAL NUMBER PLATE.

a. This plate gives pertinent information, such as model, serial number, weight, fuel and oil recommendations, and publications covering the truck, and is attached to the instrument panel (fig. 6).

4. TABULATED DATA.

a. Engine.

Engine, type	Valve in head
Number of cylinders	6
Bore	4½ in.
Stroke	5¼ in.
Piston displacement	501 cu in.
Governed speed	2,400 rpm

b. Chassis.

Wheelbase	181 in.
Weight	31,200 lb
Length, over-all	280¾ in.
Width, over-all	99½ in.

DESCRIPTION AND TABULATED DATA

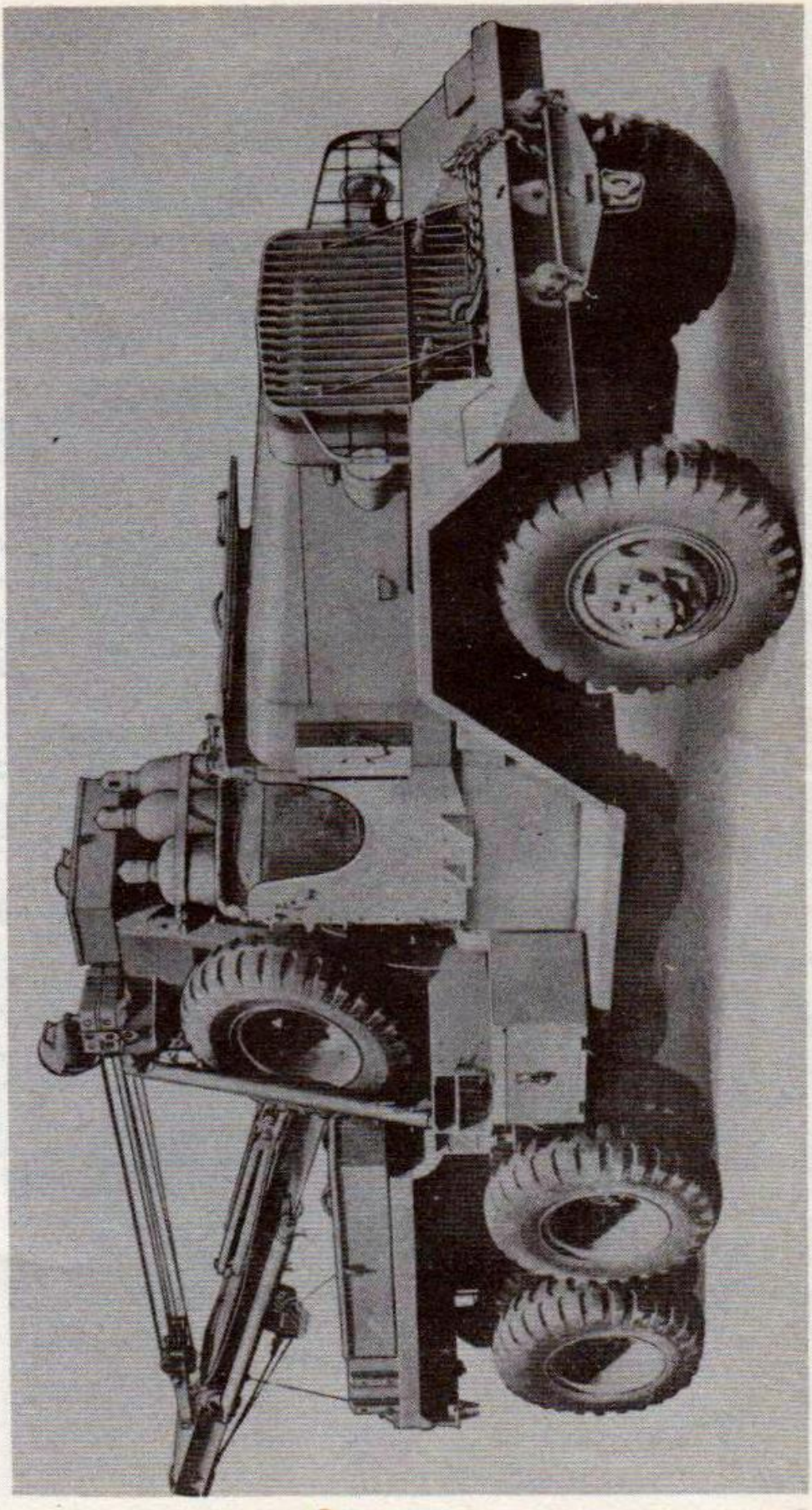

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Figure 1—Truck, Wrecking, Heavy M1A1—Right Front View

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

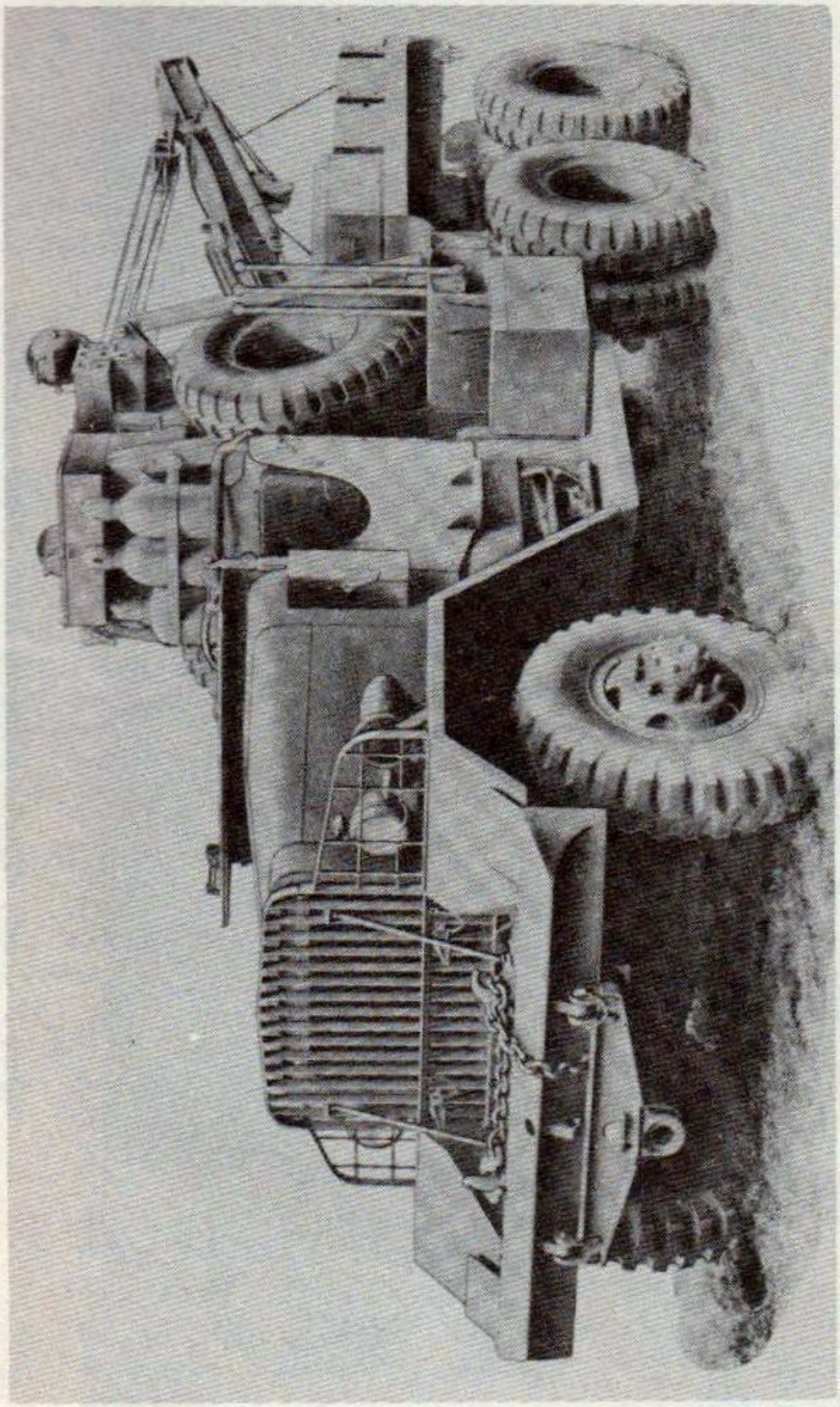

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Figure 2—Truck, Wrecking, Heavy M1A1—Left Front View

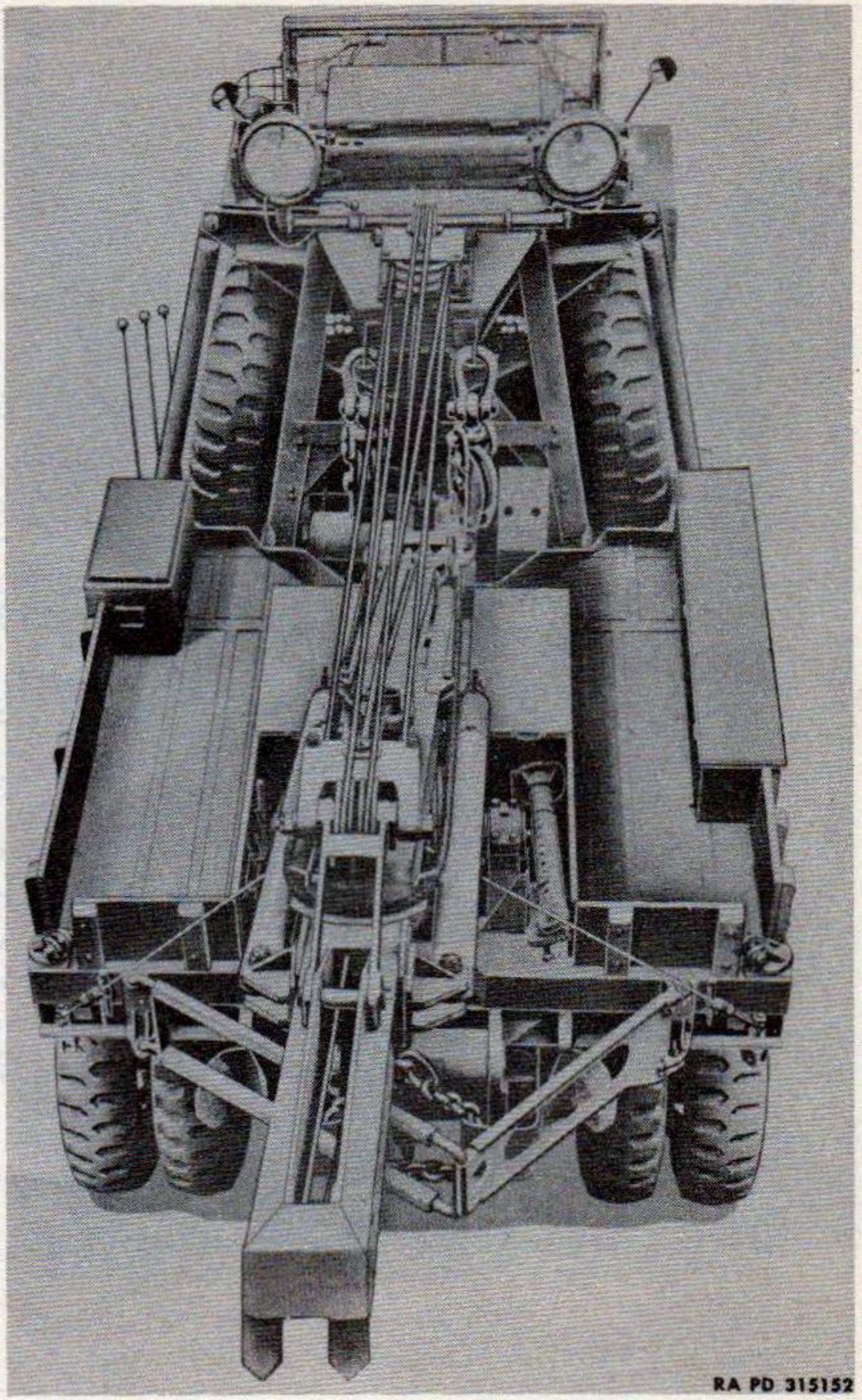

Figure 3—Truck, Wrecking, Heavy M1A1—Top View

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

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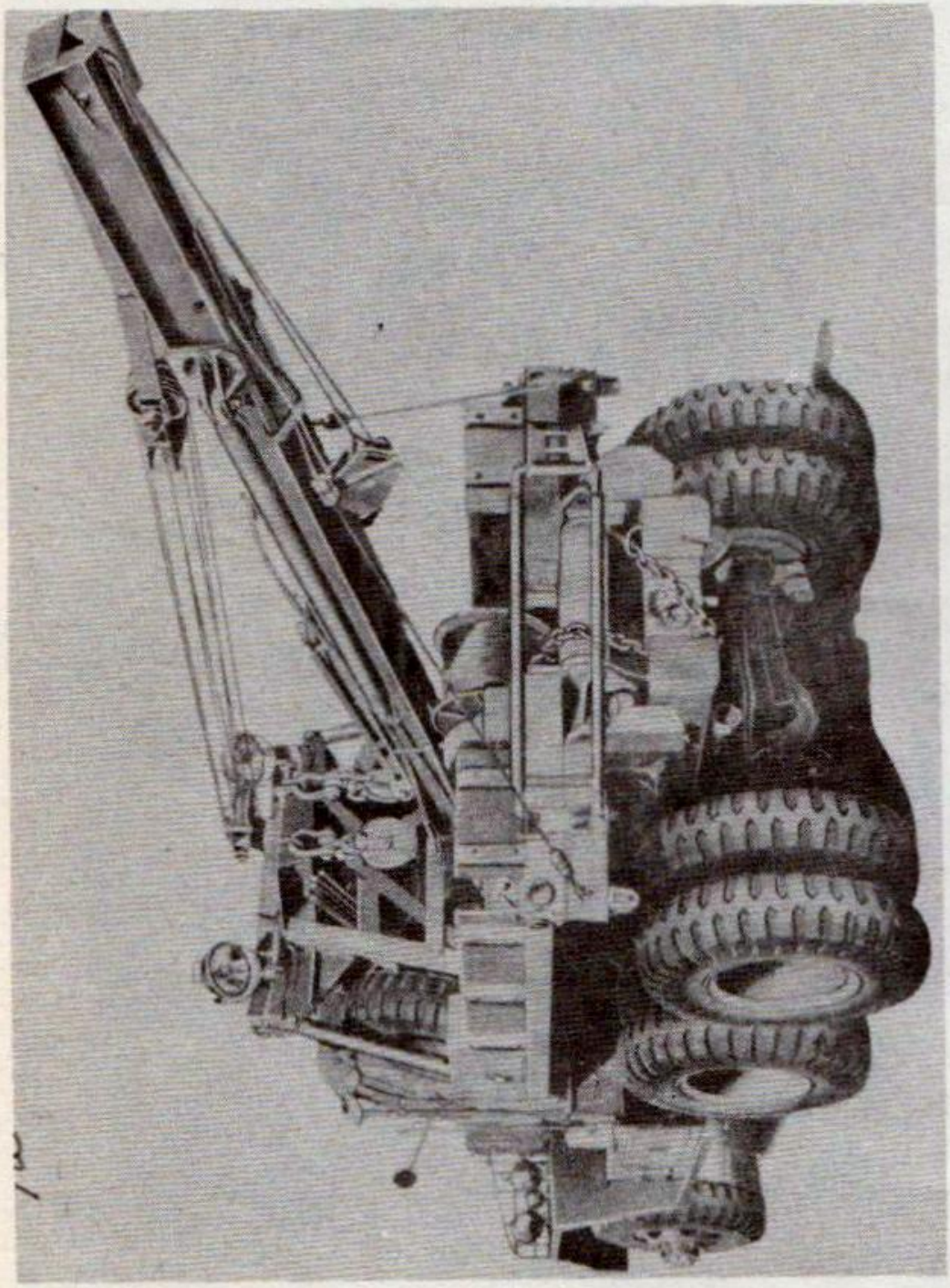

Figure 4—Truck, Wrecking, Heavy M1A1—Left Rear View

DESCRIPTION AND TABULATED DATA

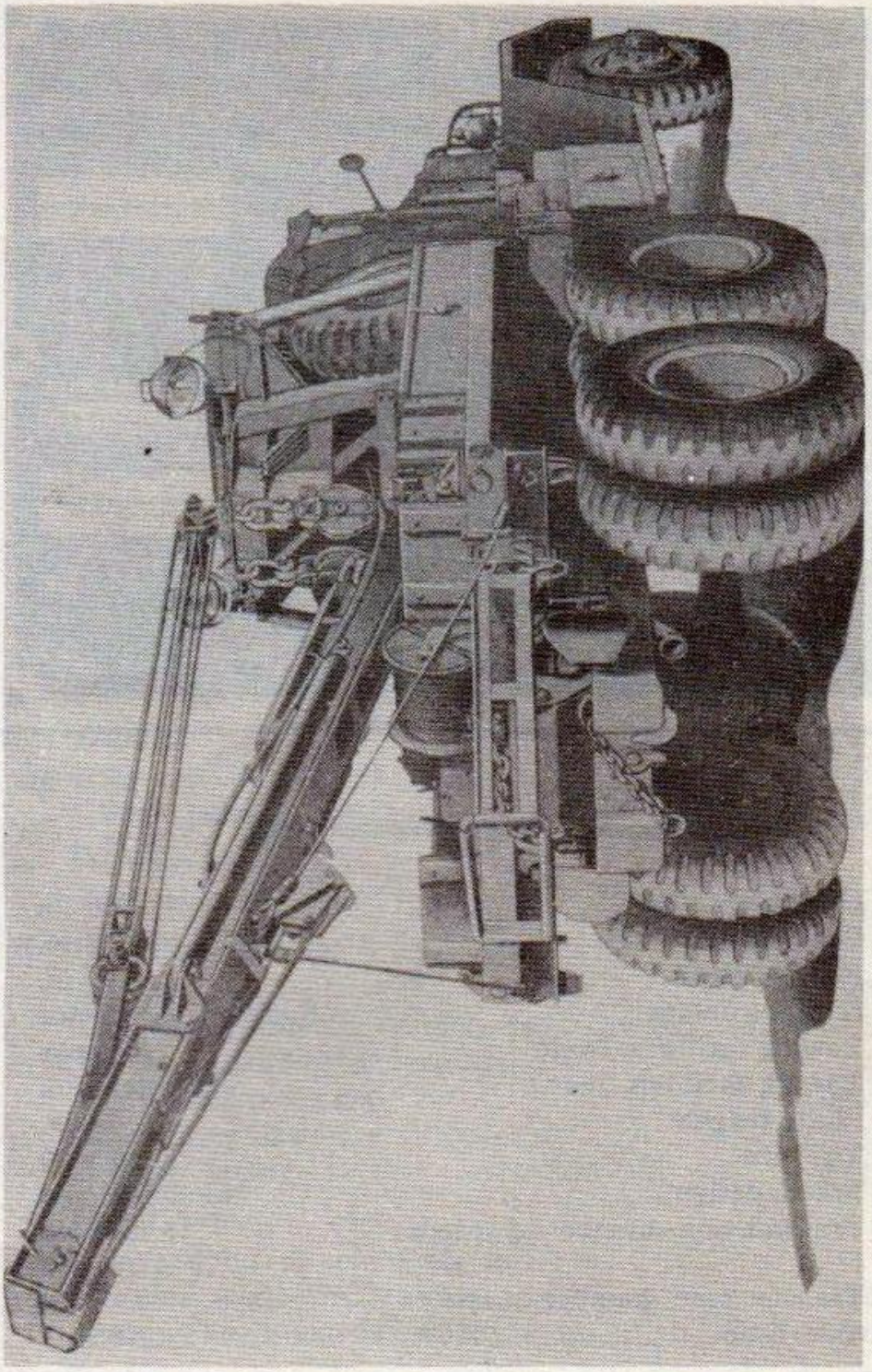

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Figure 5—Truck, Wrecking, Heavy M1A1—Right Rear View

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

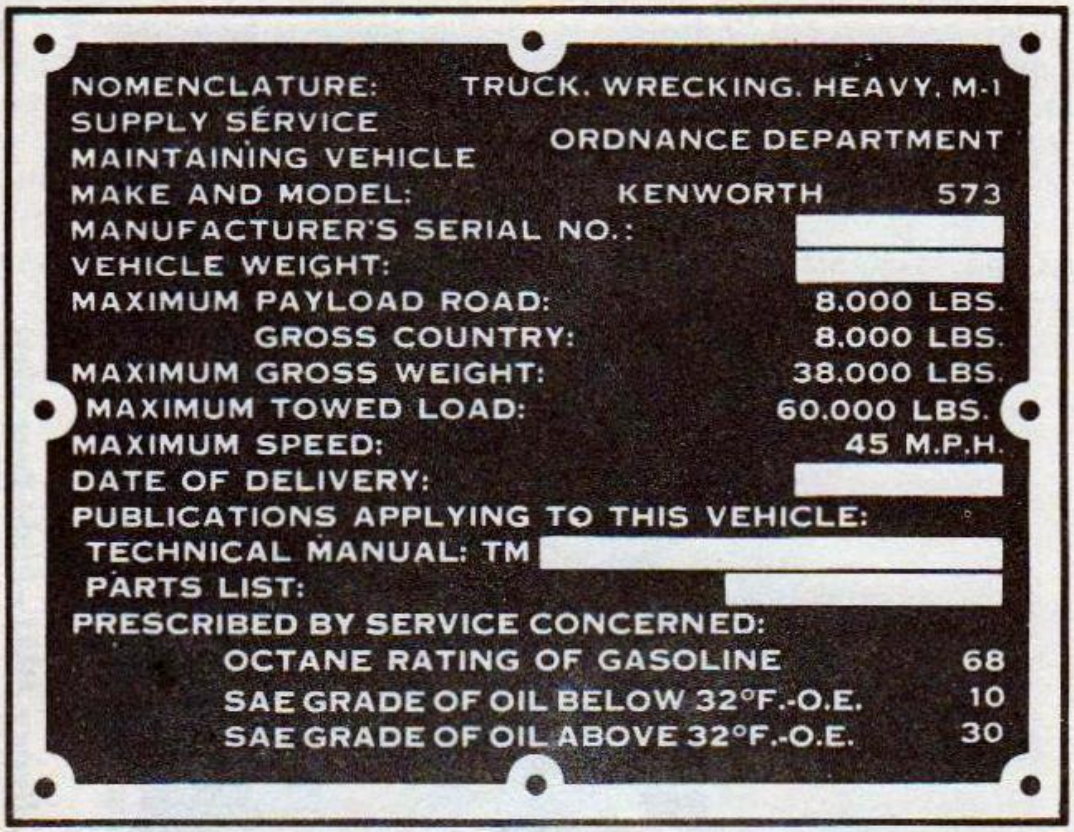

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Figure 6—Serial Number Plate

Height	117 in.
Ground clearance	11 in.
Fording depth	40 in.
Limiting factor	Fan and carburetor
Towing facilities, front	2 hooks
Towing facilities, rear	Pintle hook
Pintle height	36 in.
Tire size	11.00 x 20
Tread design	Nondirectional
Transmission—number of speeds	5 forward 1 reverse
Transfer case—number of speeds	2
Axle ratio	8.27:1

c. Performance.

Maximum speed	45 mph
Minimum turning circle (diameter)	70 ft
Angle of approach	50 deg
Angle of departure	50 deg

Maximum grade ascending ability	54 pct
Safe cruising range	250 mi

d. Capacities.

Front axle	8 qt
Rear axle	7 qt
	each axle
Engine oil refill	10 qt
(when filters are changed)	14 qt
Fuel (total, 2 tanks)	100 gal
Radiator	35 qt
Transfer case	2½ qt
Transmission	12 qt
Steering gear	3 qt

5. ADJUSTMENT SPECIFICATIONS.

a. Engine.

Cylinder head cap screws—torque pull	100 ft-lb
Exhaust manifold stud nuts—torque pull	100 ft-lb
Valve tappet clearance (hot) intake	0.013 in.
Valve tappet clearance (cold) intake	0.015 in.
Valve tappet clearance (hot) exhaust	0.018 in.
Valve tappet clearance (cold) exhaust	0.020 in.

b. Clutch.

Clutch pedal free play	1½ in.
Clutch pedal to floorboard clearance	¾ in.

c. Fuel System.

Fuel pump pressure	4½ to 5½ lb

d. Electrical System.

Voltage	12—13.5 volts
Battery, hydrometer reading—fully charged	1.275—1.300
Battery, hydrometer reading—low	1.150
Distributor point gap	0.020 in.
Spark plug gap	0.025 in.
Ignition timing	T.D.C.

e. Front Axle.

Toe-in (plus or minus 1/16 in.)	¼ in.
Turning angle—inside wheel	28 deg
Turning angle—outside wheel	25 deg

f. Brakes.

Lining clearance (at shoe center)	0.010 in.
Lining clearance parking brake	0.020 in.

g. Tires.

Inflation pressure	70 lb

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section III

DRIVING CONTROLS AND OPERATION

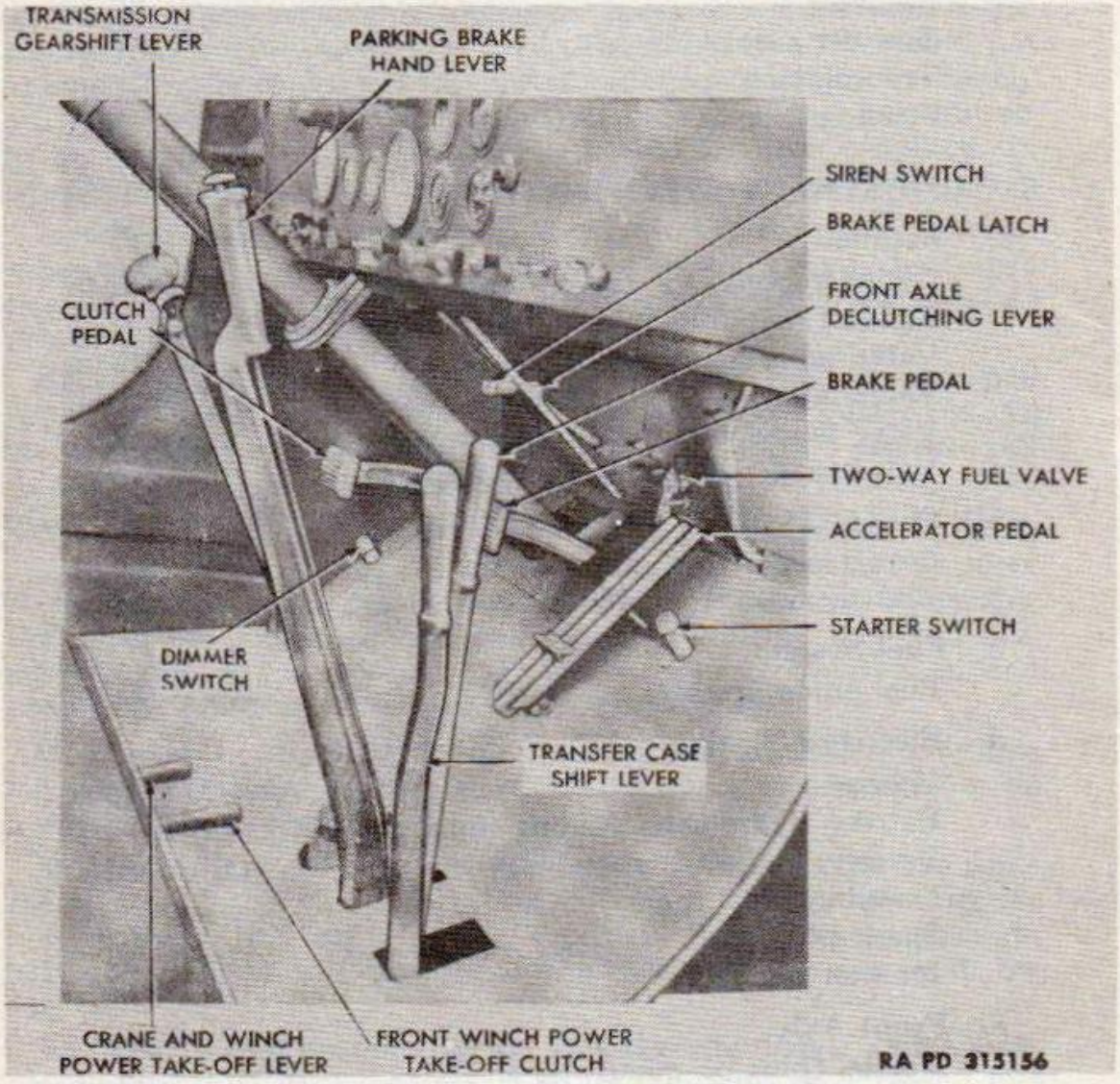

Figure 7—Driver Compartment Controls

6. INSTRUMENTS AND CONTROLS.

a. Transmission Gearshift Lever (fig. 7). This hand-operated lever is moved from the neutral position to shift the gears in the transmission into first, second, third, fourth, fifth, or reverse speeds (fig. 13). Do not move the gearshift lever when the engine is running, without first disengaging the clutch.

b. Parking Brake Lever (fig. 7). To move the parking brake lever from the released to the applied position, it is necessary to depress the button on top of the lever; when the lever is placed in position, release the button to lock it in the position desired. The parking brake is released when moved forward, and applied when pulled back. NOTE: *This parking brake lever should never be used to slow down or stop the truck. It should only be applied after the truck has come to a complete stop.*

c. Clutch Pedal (fig. 7). When this foot-operated pedal is pressed downward, the clutch is disengaged. The drive between the engine and the transmission is disconnected; the transfer case and transmission gears may be shifted with the engine running, without causing damage to the gear teeth.

d. Headlight Dimmer Switch (fig. 7). This foot switch is used to raise and lower the headlight beams for city and country driving. Press the button with the left foot to raise and lower the headlight beams.

e. Siren Switch (fig. 7). This switch, when pressed, operates the siren. The truck is equipped with two siren switches for operation either by driver or rider.

f. Service Brake Latch (fig. 7). This manually operated latch keeps the foot brake pedal depressed during heavy recovery operations.

g. Brake Pedal (fig. 7). When this foot-operated pedal is pressed downward, the brakes on each wheel are applied to slow down or bring the truck to rest. Do not drive with foot resting on this pedal as air will be applied to brake assemblies, causing the brakes to drag and the lining to wear.

h. Two-way Fuel Valve (fig. 7). This manually operated valve is for selecting the fuel tank from which the fuel supply is to be drawn. When pointer is up, the left-hand tank is connected. When pointer is turned to the right, the right-hand tank is connected.

i. Starting Switch (fig. 7). When this foot-operated switch is depressed, the starting circuit is complete and the engine is being turned over. Never depress this switch for a longer period than 30 seconds without releasing and waiting until the cranking motor has an opportunity to cool. Release switch immediately after engine is started. Do not step on it while the engine is in operation.

j. Accelerator (fig. 7). This foot-operated pedal controls the amount of fuel delivered through the carburetor to the engine and controls the road speed. Pressing down on the pedal increases the flow of fuel; when in the released position, only the fuel passing through the idle jet is delivered to the engine.

k. Transfer Case Shift Lever (fig. 7). This lever may be moved to either of three positions. In forward position, the transfer case is placed in the high range; in the center position for neutral, and to the rear for low speed range (fig. 15).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

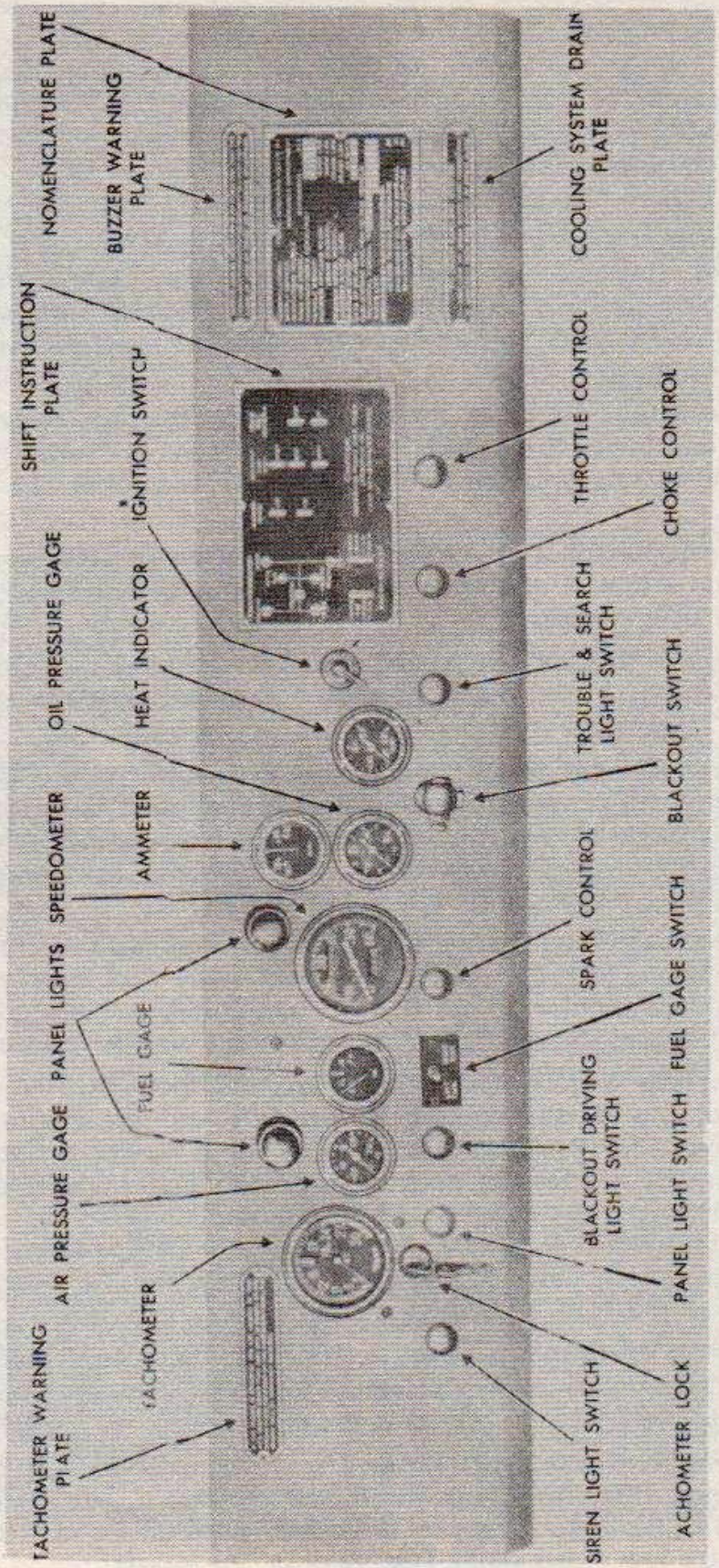

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Figure 8—Instrument Panel

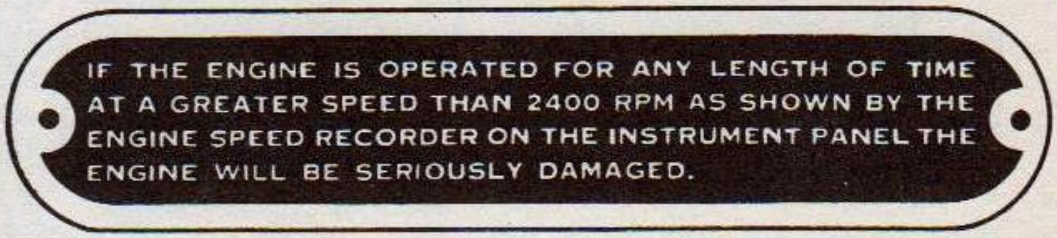
DRIVING CONTROLS AND OPERATION

l. Front Axle Declutch Lever (fig. 7). This hand-operated lever is used to engage and disengage the front axle. Moving the lever forward places the front axle in disengagement; moving the lever back engages the front axle. The driver should remember that engagement of the front axle does not increase power but merely disengages it. The front axle should never be engaged when running light on hard surfaced roads. The front axle should always be engaged before proceeding into the bad spots where added traction is required. To engage the front axle, the truck must be at a standstill or operating at a slow speed. Pull the lever from the disengaged position back as far as it will go. Slight clutch engagement may be necessary to cause shaft revolution in order to permit engagement.

m. Front Winch Clutch Lever (fig. 7). This hand control lever is used to engage and disengage the front winch clutch. When lever is moved up, the front winch clutch is engaged; when lever is moved down, the clutch is disengaged (fig. 16).

n. Transfer Case Power Take-off Lever (fig. 7). This lever controls the power take-off mounted on the transfer case through which is supplied the power to drive the front, rear, and the crane winches. Pull lever up to engage; push down to disengage (fig. 17).

o. Tachometer Warning Plate (fig. 8). This plate indicates the safe engine operating revolutions per minute to the driver.



RA PD 315158

Figure 9—Tachometer Warning Plate

p. Tachometer (fig. 8). The tachometer indicates the speed of the engine in revolutions per minute. Driving by the tachometer is a recommended practice. It provides the operator an accurate indication of when gear changes should be made, and when the engine speed has dropped below its peak performances. Constant reference to the tachometer will remind the operator of the maximum engine operating speed.

q. Air Pressure Gage (fig. 8). Observe the air pressure gage and determine whether or not the compressor is building up air pressure in the reservoirs. If the pressure fails to build up to 90 pounds after 4 minutes engine operation at a fast idle, stop the engine and investigate the reason for the failure of the compressor to build up the air pressure (fig. 10).

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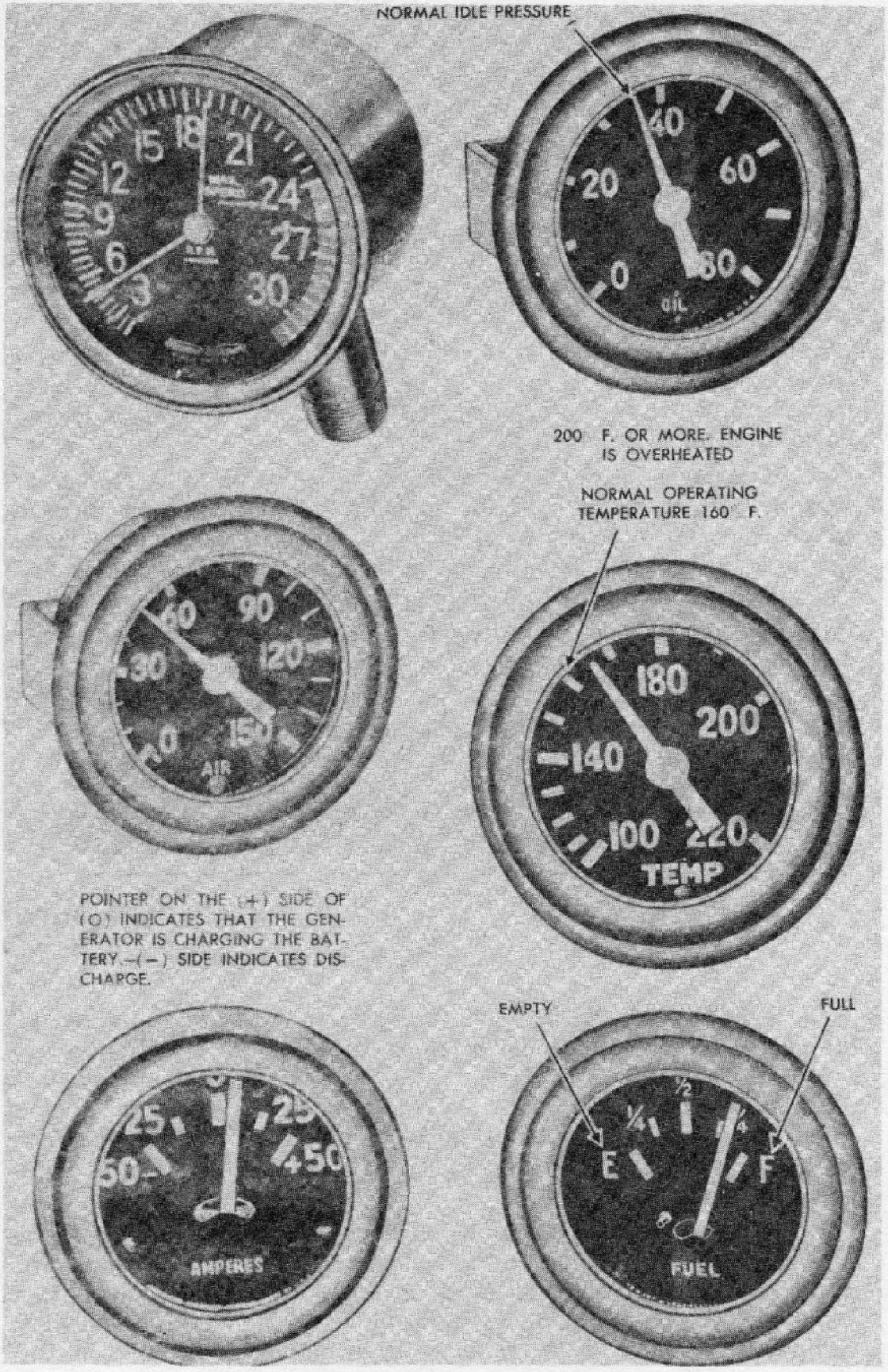

Figure 10—Instruments and Gages RA PD 315159

r. Panel Lights (fig. 8). The panel lights afford light for night reading of the instruments. They will light only when the blackout switch is pulled to the "SERVICE" position.

s. Ammeter (fig. 8). When the engine has started, observe the ammeter and determine the condition of the battery circuit. If the pointer remain at "0" or between "0" and "+ 45," the generator is functioning normally. If it continues to show discharge after the engine has been started, or the pointer is from "0" to "– 45," stop the engine and investigate. Refer to section XII, Trouble Shooting (fig. 10).

t. Oil Pressure Gage (fig. 8). When the engine has started, immediately observe the oil gage, and note if oil pressure is being built up in the engine. Normal oil pressure at idling speed is 35 pounds; at normal operating speeds 65 pounds. If the oil pressure fails to come up immediately, stop the engine and investigate. Refer to section XII, Trouble Shooting (fig. 10).

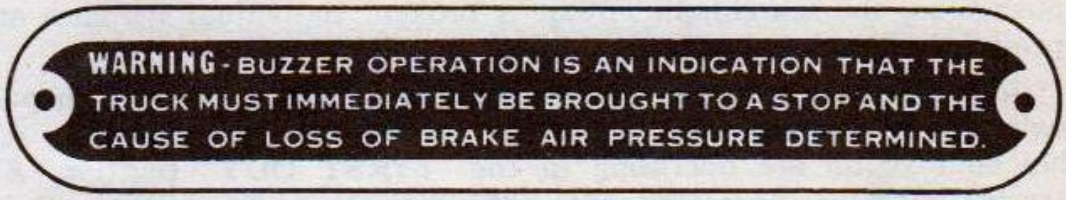

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Figure 11—Buzzer Warning Plate

u. Temperature Indicator (fig. 8). After the engine has operated for a short period, check to make sure that the engine temperature is rising in the engine cooling system. The normal operating temperature is 165°F. If indicator fails to raise to this temperature or exceeds 200°F, stop the engine immediately and investigate the cause (fig. 10).

v. Ignition Switch (fig. 8). This switch completes the circuit between the battery and the engine ignition system. This is a two position switch. When switch is turned to the right or clockwise position, it is "ON," when turned to the left, it is "OFF."

w. Shift Plate (fig. 8). This plate indicates the various lever positions for the control of the transmission, transfer case, and front axle engagement (fig. 14).

x. Chassis Name Plate (fig. 8). This plate gives the serial number, nomenclature of the truck, fuel and oil recommendations, and other pertinent information (fig. 6).

y. Buzzer Warning Plate (fig. 8). This plate explains to the operator the meaning of the warning buzzer to indicate low air pressure (fig. 11).

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z. Cooling System Plate (fig. 8). In the event of draining the cooling system, this plate indicates the points where draining is accomplished (fig. 82).

aa. Throttle Control (fig. 8). This is a push-pull type control which provides the operator with an accurate means of setting the carburetor throttle. When pulled out, this control opens the throttle, and when pushed in, it closes the throttle. Its normal running position is pushed all the way in.

bb. Choke Control (fig. 8). This push-pull type control shuts off the air to the carburetor, giving the operator a richer mixture for starting the engine when it is cold. The choke control should not be used when the engine is warm, but should be pushed in immediately after the engine starts. When choke is pulled out, the air is shut off to the carburetor; when pushed in, the choke valve is opened. In normal running position, the choke control is pushed all the way in.

cc. Searchlight Switch (fig. 8). This switch is the push-pull type. When switch is pulled out, the searchlight circuit is completed; when pushed in, the searchlight circuit is broken. Individual switches are provided at each light.

dd. Blackout Switch (fig. 8). This is a four position push-pull switch. The switch is in the "OFF" position when pushed in. All blackout lights are operating in the "FIRST OUT" position. All service lights are operating in the "SECOND OUT" position. Only the service signal light is operating in the "THIRD OUT" position.

ee. Speedometer (fig. 8). The speedometer indicates the speed of the truck in miles per hour. It is equipped with two odometers, the upper one indicating the total vehicle miles, and the lower one, the trip mileage, which may be reset to zero by pushing in and turning the set stem on the back of the speedometer.

ff. Spark Control (fig. 8). This control, when pulled out, retards the ignition timing. When pushed in, the spark is advanced to its normal running position.

gg. Fuel Gage (fig. 8). The fuel gage should be referred to while the truck is in operation, to prevent the operator from allowing the fuel supply to run low. Throwing the fuel switch from the right- to left-hand position will give the operator the fuel level in both the fuel tanks (fig. 10).

hh. Fuel Gage Switch (fig. 8). This two-way toggle switch gives the operator fuel level readings in either the right- or left-hand fuel tanks. Move switch to the "RIGHT" for the right-hand fuel tank, and to the "LEFT" for the left-hand fuel tank reading.

ii. Blackout Driving Light Switch (fig. 8). This switch is a push-pull type and when pulled out, the blackout driving light will burn, providing the blackout switch is pulled to the "ON" position.

jj Panel Light Switch (fig. 8). Pull switch out to turn panel light ON"; push switch in to turn panel lights "OFF."

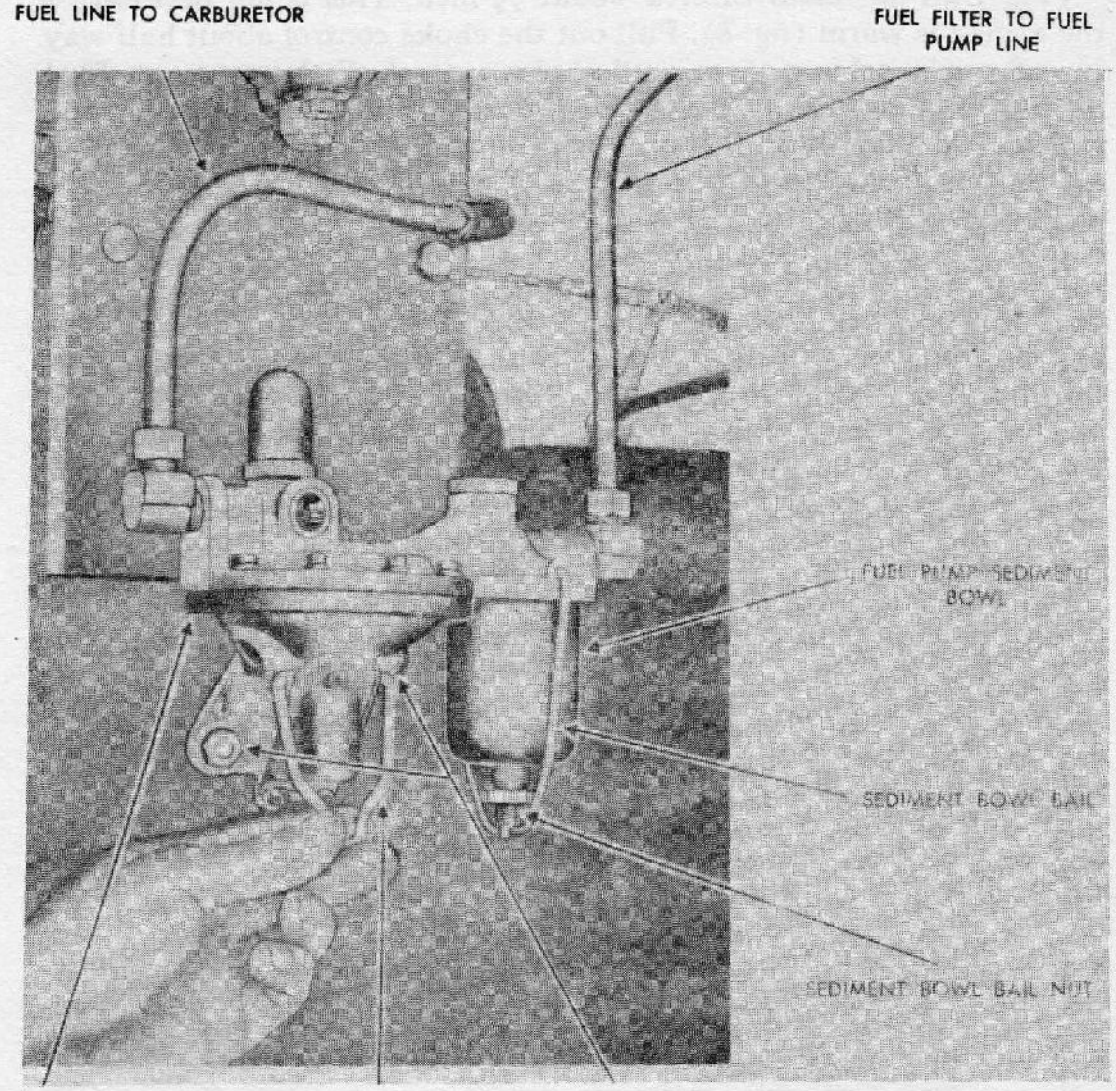

Figure 12—Fuel Pump Priming

kk. Tachometer Lock (fig. 8). This lock controls the maximum hand of the tachometer which can be reset only by means of the key.

ll. Siren Light Switch (fig. 8). Pull switch out to turn siren light "ON"; and push it in to turn light "OFF."

7. USE OF INSTRUMENTS AND CONTROLS IN VEHICULAR OPERATION.

a. Before-operation Service. Perform the services in paragraph 21 before attempting to start the engine.

b. Starting the Engine.

(1) Set the transmission control lever, the power take-off lever, and the front winch clutch lever in their neutral positions (figs. 13, 15, and 17). Pull the hand brake lever back to set the brakes (fig. 7).

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(2) Pull out hand throttle about ½ inch. This is not necessary if the engine is warm (fig. 8). Pull out the choke control about half way. In extremely cold weather, pull choke control all the way out. Push the button in as soon as the engine starts, to the best running position, and push all the way in as soon as the engine runs evenly without the aid of the choke. Do not attempt to use the choke if the engine is warm, as flooding will result (fig. 8).

(3) Turn the ignition switch to the "ON" position (fig. 8). Depress the clutch pedal, and hold it there until the engine starts (fig 7).

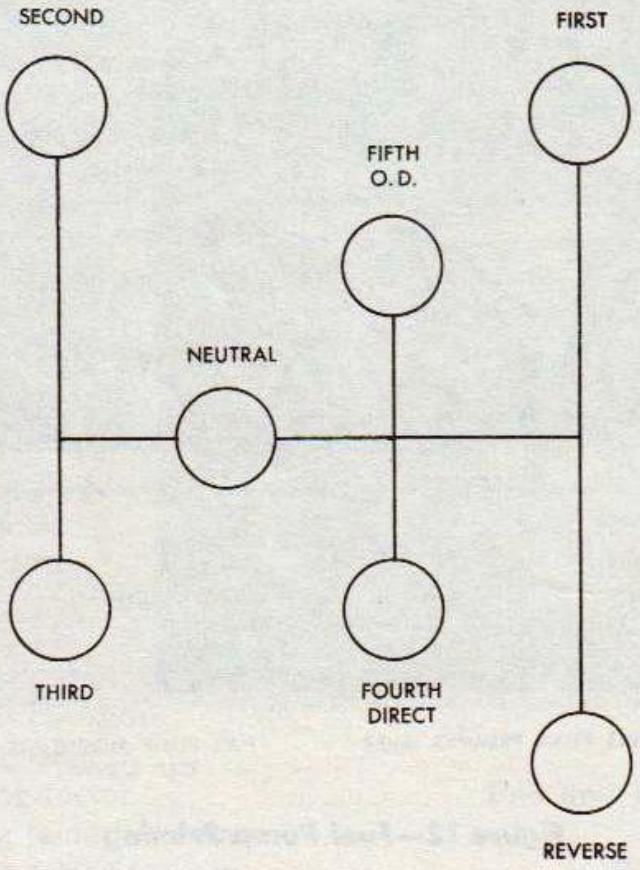

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Figure 13—Transmission Gearshift Lever Positions

Step on the starter switch (fig. 7). Release immediately when the engine starts. Do not run the cranking motor longer than 30 seconds at any one time.

(4) After the engine has started, observe the instruments, make certain that the oil gage is registering engine oil pressure, ammeter is indicating generator action, and air compressor is building up pressure in the reservoir (fig. 10). Release the engine clutch pedal, and listen for any sounds that would indicate improper condition in any unit.

DRIVING CONTROLS AND OPERATION

c. Starting the Engine After Running Out of Fuel.

(1) If the vehicle has been run until the fuel tank is empty, fill the tank. Use the fuel pump priming lever to force fuel in the bowl of the carburetor (fig. 12), thus avoiding excessive and unnecessary use of the battery and cranking motor. Operate the priming lever 30 to 40 strokes, or until the priming lever works freely, and until very little pressure is required to move it. Free movement indicates that the line, pump, and carburetor bowl are full of fuel. The engine may then be started in the normal manner.

(2) If the lever moves freely without actuating the diaphragm, crank the engine one revolution so that the fuel pump rocker arm will move off the high point on the camshaft. After that, operate the hand arm as explained in step (1) above.

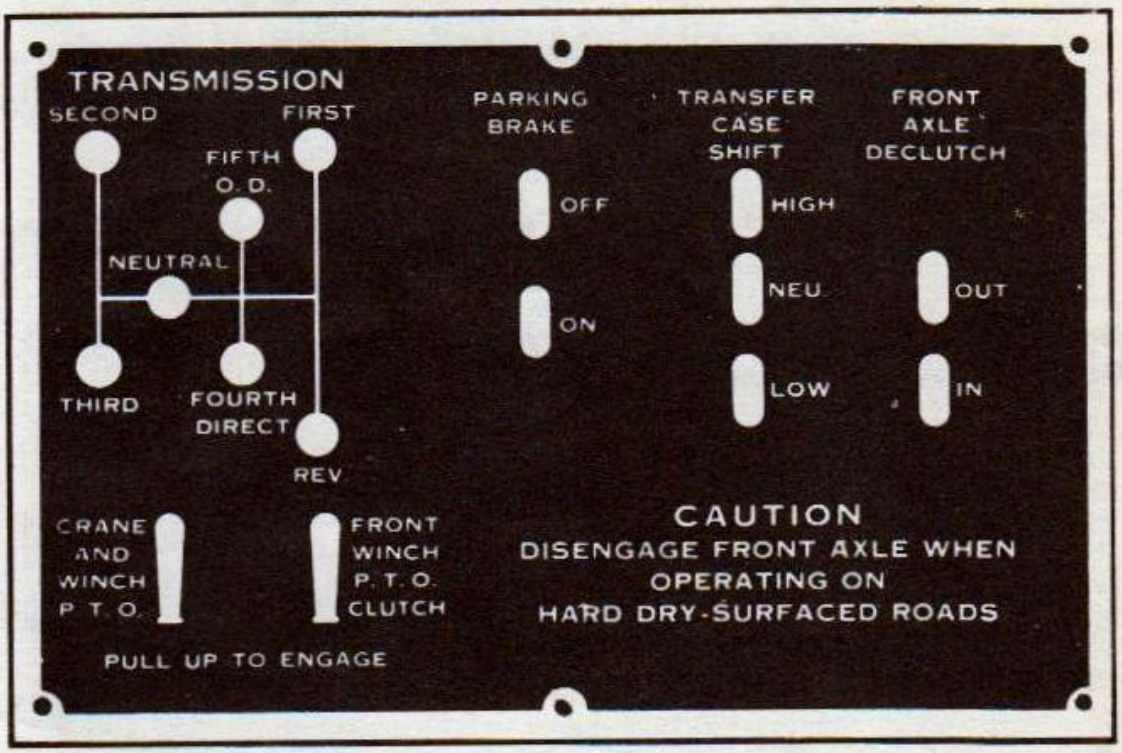

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Figure 14—Shift Diagram Plate

d. Operation of the Vehicle. To place the truck in motion after the engine is started, proceed as follows:

(1) Push the clutch pedal down to disengage the engine from the transmission. Move transmission gearshift lever as far to the right as possible with the shift lever latch depressed. Move the lever forward as far as it will go (fig. 13). Move the transfer case shift lever as far forward as it will go or as far back as possible, as indicated by road and load condition (fig. 15). Release hand brake lever, and move it as far forward as possible (fig. 7).

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(2) Depress foot accelerator to speed up engine sufficiently to pick up the load (fig. 7). Release clutch pedal slowly, and depress the accelerator pedal to prevent the engine from stalling and to pick up road speed.

(3) As the truck and road speed increases, release the accelerator pedal and depress the clutch pedal simultaneously, then move the gearshift lever through neutral and into the next higher gear.

(4) Repeat the procedure outlined under steps (2) and (3) above, until the highest gear ratio available is attained (fig. 13).

e. To Shift to a Lower Speed. Always shift to a lower speed before the engine begins to labor or the truck loses appreciable road speed. This is best accomplished by the double-clutching method (step (1) above).

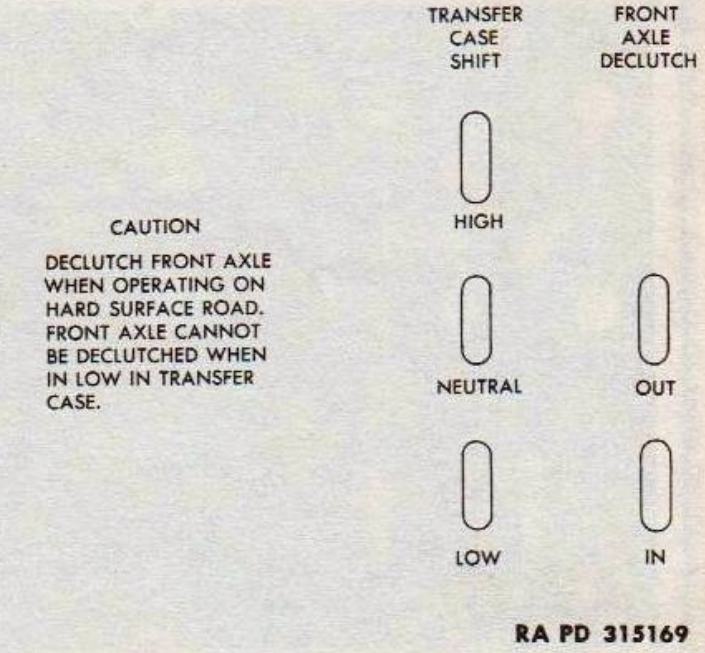

Figure 15—Transfer Case Gearshift Lever Positions

f. Driving Down Hill. In general, it is advisable to go down hill in the next lower gear than that used to ascend the same hill. Remember that the engine governor is not effective in controlling the engine speed when the engine is used as a brake in descending hills.

g. To Shift Into Reverse. Bring the truck to a complete stop before attempting to shift into reverse. Disengage the clutch. Move the gearshift lever as far to the right as possible with lever latch depressed and then to the rear as far as it will go (fig. 13). Engage the clutch, and at the same time, depress the accelerator to the desired engine speed to keep the engine from stalling.

h. Control of the Transfer Case.

(1) To shift the transfer case from the high to the low range, the truck must be at a standstill or operating at a slow speed. Engage the front axle. Move the front axle declutch shift lever as far to the

rear as possible (fig. 15). Push the clutch pedal in, and move the transfer case shift lever into neutral position. Move the transfer case shift lever as far to the rear as possible (fig. 15).

(2) If the truck is in motion before this shift from neutral to the low range is made, release the clutch pedal and accelerate the engine to double the road speed of the truck. Until the operator familiarizes himself with the operation of the truck, this shift should not be made with the truck in motion. If this shift is made with the truck in motion after the engine has been accelerated, with the clutch engaged, again push in the clutch and move the shift lever as far to the rear as possible into the low range position (fig. 15). Engage the clutch, and accelerate the engine to the desired road speed at the same time.

(3) To shift the transfer case from the low range to the high range, push in the clutch pedal, and move the shift lever forward through the neutral position into the high range as far as it will go. Make this shift slowly and without excessive pressure on the shift lever. Release the clutch, and accelerate the engine to the desired speed at the same time (fig. 15).

i. To Shift to a Lower Speed. Always shift to a lower speed before the engine begins to labor or the truck loses appreciable road speed. Shifting from a higher to a lower speed is one of the indications of good driver ability. This is best accomplished by the double-clutch method. Following is a table of maximum road speeds. A thorough knowledge of these speeds will help to determine the maximum speed at which a shift can be made to a lower speed. NOTE: *The maximum road speed permissible at which the operator can shift from fourth to third in the low range is 8 miles per hour.* Gear changes from a higher to a lower speed should be made as follows:

Transmission	Transfer Case	Maximum Road Speed Miles per Hour
First	High Range	5
Second	High Range	10
Third	High Range	20
Fourth	High Range	35
Fifth Overdrive	High Range	45
First	Low Range	1.9
Second	Low Range	3.9
Third	Low Range	8.0
Fourth	Low Range	14.0
Fifth Overdrive	Low Range	18.0

(1) Depress the clutch pedal, and release the throttle at the same instant. Move transmission gearshift lever (fig. 13) to neutral position, and at the same time accelerate the engine to governed speed with the clutch engaged.

(2) Disengage the clutch, and as the gear speeds are synchronized, shift to the next lower speed (do not apply excessive pressure to the shift lever). Engage the clutch, and depress the accelerator pedal to attain the desired road speed. Be able to know the speed of an engine

by its sound so that gearshifts can be made at the right instant when the transmission and engine speeds are synchronized. Shifting can be accomplished without gear clashing if the operator will become familiarized with the truck.

j. Driving the Vehicle in Six Wheel Drive. The transfer case shift lever and the front axle control lever are so arranged that the transfer case cannot be shifted into low range except when the front axle is engaged (figs. 14 and 15). This is done in order that any heavy work, placing a strain on the driving members, will be distributed over the three axles. The high range in the transfer case can be used with the front axle engaged or disengaged. Engage the front axle only when needed; its use is to be avoided as much as possible. Front axle engagement, wherever good traction conditions exist, causes excessive tire wear, gear failure, and high driving unit temperatures. Remember that front axle engagement does not increase power; it actually decreases it. Traction only is increased by front axle engagement. Never wait until the truck is stalled before engaging the front axle. Engage the front axle before proceeding into bad spots. CAUTION: *Bring truck to a complete stop before engaging front axle.* Keep the truck moving at an even speed. The front axle is an auxiliary traction device to be used only when conditions make its use necessary, and before stalling for lack of traction and not lack of power.

k. Front Axle Engagement and Disengagement.

(1) To engage or disengage the front axle with the transfer case in the high range, it is only necessary to move the front axle declutching lever into the desired position (fig. 15). It is not necessary to disengage the clutch, and the shift is easier to make when the truck is in motion.

(2) To disengage the front axle with the transfer case in low range, it is first necessary to shift the transfer case into neutral (fig. 15). With the front axle disengaged, the truck must then be operated in the high range as long as the front axle remains disengaged.

l. Stopping the Truck. Remove foot from accelerator pedal and apply the brake (fig. 7). Release the clutch when the vehicle speed has been reduced to engine idling speed. Move the transmission gearshift lever (fig. 18) into the neutral position. Apply the hand brake lever (fig. 7) only after the truck has come to a complete stop.

m. Stopping the Engine. After stopping the truck, allow the engine to slow down to idling speed, and turn off the ignition switch (fig. 8).

8. TOWING THE VEHICLE.

a. Towing the Vehicle to Start. There are two towing hooks mounted on top of the front bumper provided for this use. After attaching the towing cable, disengage the clutch, and move the trans-

mission lever into direct gear (fig. 18). There are towing air connections on the front of the truck to connect up the towing air hose. These connections are tagged "service" and "emergency" and must be so connected with the lines leading from the vehicle doing the towing. Open both the cut-out cocks. By opening the cut-out cocks, the compressor on the towing vehicle will build up air pressure in the reservoirs of the truck being towed. Wait until the air pressure gages on both vehicles read at least 75 pounds. If shifted into lower gear, the speed of the engine will be greater, and more power will be required to tow the truck when the clutch is engaged. When the truck is moving at 5 to 10 miles per hour, turn on the ignition switch, pull out the throttle control ½ inch, and pull out the choke control all the way. Engage the clutch slowly, and when the engine starts, release the clutch, push in the choke control to its best operating condition, push in the throttle, and use the foot accelerator to keep the engine from stalling. Signal the driver of the towing vehicle that the engine has started, and apply the service brakes to bring the vehicle to a stop. Unhook the towing cable, close the air line connections, disconnect the towing air hose, and disconnect the cable. One towing air hose is supplied with the vehicle, and the other can be procured from the vehicle equipment doing the towing.

b. Towing Disabled Vehicle.

(1) When the vehicle can be steered and operated on its own wheels, proceed as outlined in subparagraph **a** above.

(2) If the truck is in such condition that it cannot be rolled on its own wheels or no driver is available, the front end will have to be hoisted. The procedure for hoisting is as follows: Place a chain inside the bumper and around the frame side rails, and attach to the lifting hook. The second chain should be put around both sides of the front axle, and the chain tightened around the frame side rails just back of the front bumper to support the axle and spring assemblies. A tow bar is provided with the truck equipment, and can be placed on the ears attached to the front bumper and the eye end of the tow bar attached to the pintle of the towing vehicle. This will maintain a constant distance between the towing vehicle and the vehicle being towed. Place the transmission and transfer case in neutral (figs. 13 and 15). Release the parking brake, secure one towing air hose from each of the two vehicles and connect the towing air connections, service connection to service connection, and emergency connection to emergency connection. Open the cut-out cocks in the towing air connections on both vehicles, and build up air pressure in the reservoirs of both units.

c. Towing Precautions. Take the following precautions when towing a vehicle or when steering a towed vehicle:

(1) When steering the towing vehicle in a different direction, make changes in direction in such a manner that the wheels of the towed vehicle will follow in the tracks of the towing vehicle.

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(2) When entering soft or muddy terrain it is best to enter in a straight-ahead position, as it is more difficult to pull a towed vehicle when the front wheels are at an angle.

(3) Use care to prevent front wheels of towed vehicle from being entangled with the tow cable.

(4) Avoid erratic stops and starts.

Section IV

AUXILIARY EQUIPMENT AND CONTROLS

9. DESCRIPTION OF CRANE AND WINCH EQUIPMENT.

a. The front winch is power driven and has a direct pull capacity of 20,000 pounds. It is to be used for light recovery operations only,

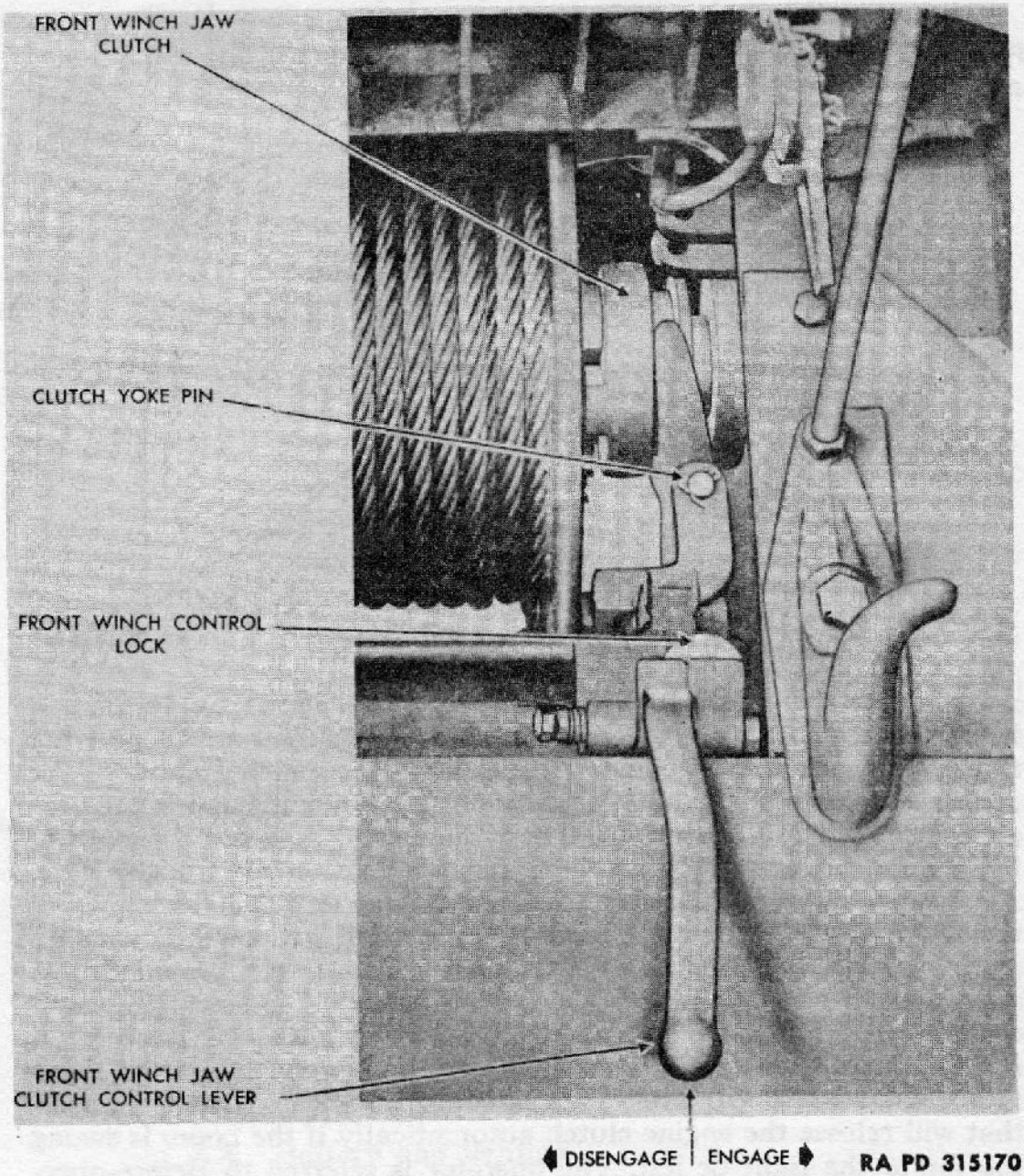

Figure 16—Front Winch Hand Clutch Control

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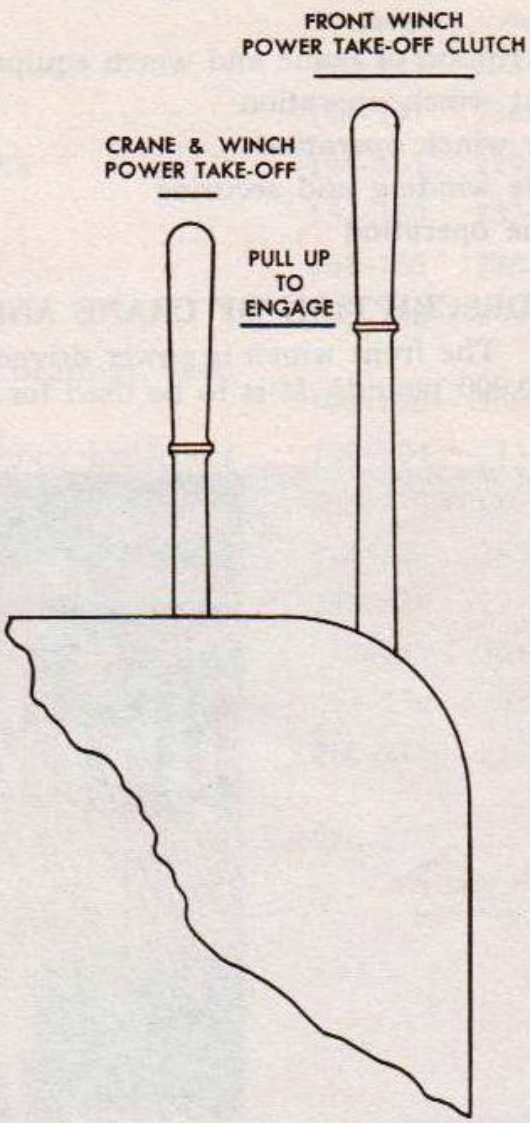

Figure 17—Power Take-off and Clutch Control

or to assist the truck in heavy recovery operations by forming a front end anchor while the rear winch is being used, or to pull the truck itself out if it becomes mired. The rear winch is also power driven and has a direct pull capacity of 47,500 pounds and is used for all heavy recovery operations. The crane is full powered direct from the engine through the power take-off mounted on the transfer case. All operations of raising and lowering a load or boom, swinging of the boom to the right or left are accomplished by powered winches and swinger. Separate gear cases and controls are provided. All operations of raising and lowering a load or boom, and swinging right or left can be done singly or in conjunction with one another. A remote throttle control is installed near the control levers for regulating recovery speed. The crane is equipped with a swinger cut-off that will release the engine clutch automatically if the boom is swung too far to the right or left. The operator is referred to Before-operation Service (par. 21).

AUXILIARY EQUIPMENT AND CONTROLS

10. FRONT WINCH OPERATION.

a. Controls.

(1) All controls for the front winch are in the driver's compartment with one exception. A hand-operated sliding jaw clutch is located on the left side of the winch assembly. It is engaged or disengaged by raising the handle, pressing down onto bumper to release locking pin, and moving to right side of vehicle to disengage or left side of vehicle to engage, depending on condition desired. When this jaw clutch is disengaged, the drum is in free wheeling; when engaged, the drum is locked in working position. It is recommended that the jaw clutch be engaged at all times in order to prevent the cable from loosening on the winch drum (fig. 16).

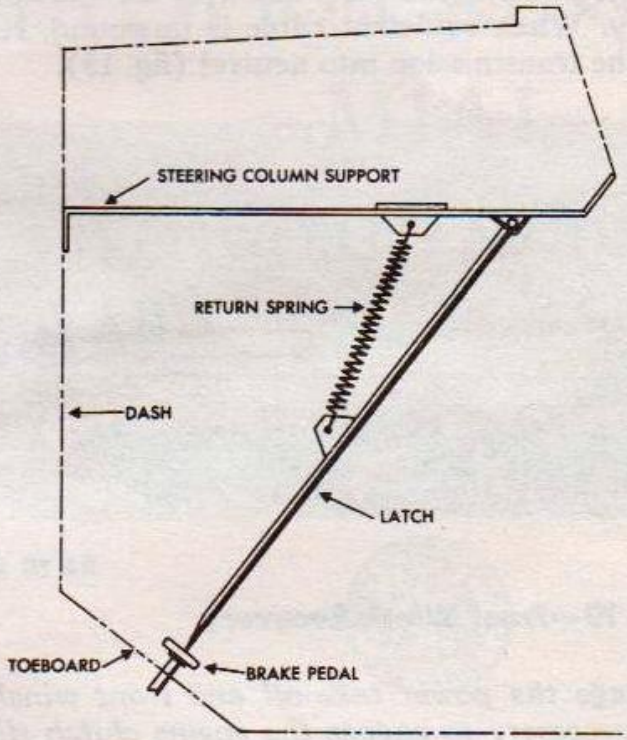

Figure 18—Service Brake Latch

(2) The controls for front winch operation consist of the power take-off lever and front winch jaw clutch lever. Both levers are pulled up for engagement and pressed down for disengagement (fig. 17).

b. Truck Positioning. Positioning the truck at the object of recovery for front winch work must be made in the proper manner. The truck must be in alinement with the object of recovery in order to insure proper winding of the cable on the winch drum. Any angularity will result in an unequal fleet angle with resultant cable scrubbing, open winding, and piling up of turns at changes in layers (par. 12). Conditions permitting, the truck should be a minimum of 60 feet from the object of recovery when two double-sheave snatch blocks are used. One single-sheave snatch block will require more distance between the truck and the object of recovery. The aline-

ment of the truck can best be made by sighting along the top of the hood when approaching the object of recovery.

c. Preparation for Recovery.

(1) Start the engine (par. 7 b). Apply the service brakes with the latch provided (fig. 18). Release the hand brake and the clutch (par. 7). Place the transmission in reverse gear (fig. 13). Shift the power take-off into gear (fig. 17). Engage the front winch jaw clutch (fig. 17) and the front winch sliding clutch (fig. 16). Engage the engine clutch momentarily to ease off the tension on the winch cable; then release the clutch.

(2) Unhook the cable chain on the front tow hook. Engage the clutch so that the operator in front can walk out with the winch cable to the object of recovery. When sufficient cable is unwound, release the engine clutch. Shift the transmission into neutral (fig. 13).

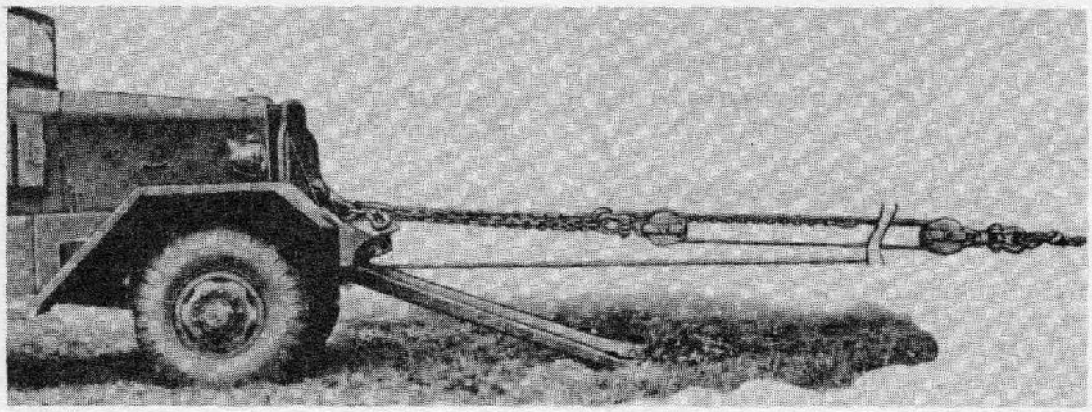

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Figure 19—Front Winch Recovery

(3) NOTE: *To engage the power take-off and front winch jaw clutch, it is frequently necessary to engage the engine clutch slightly to cause shaft rotation to permit easy engagement.*

(4) NOTE: *The operator walking out with the cable to the object of recovery should hold the cable as tight as possible to prevent the cable remaining on the drum from unwinding.*

(5) Attach the hook to object of recovery.

d. Recovery.

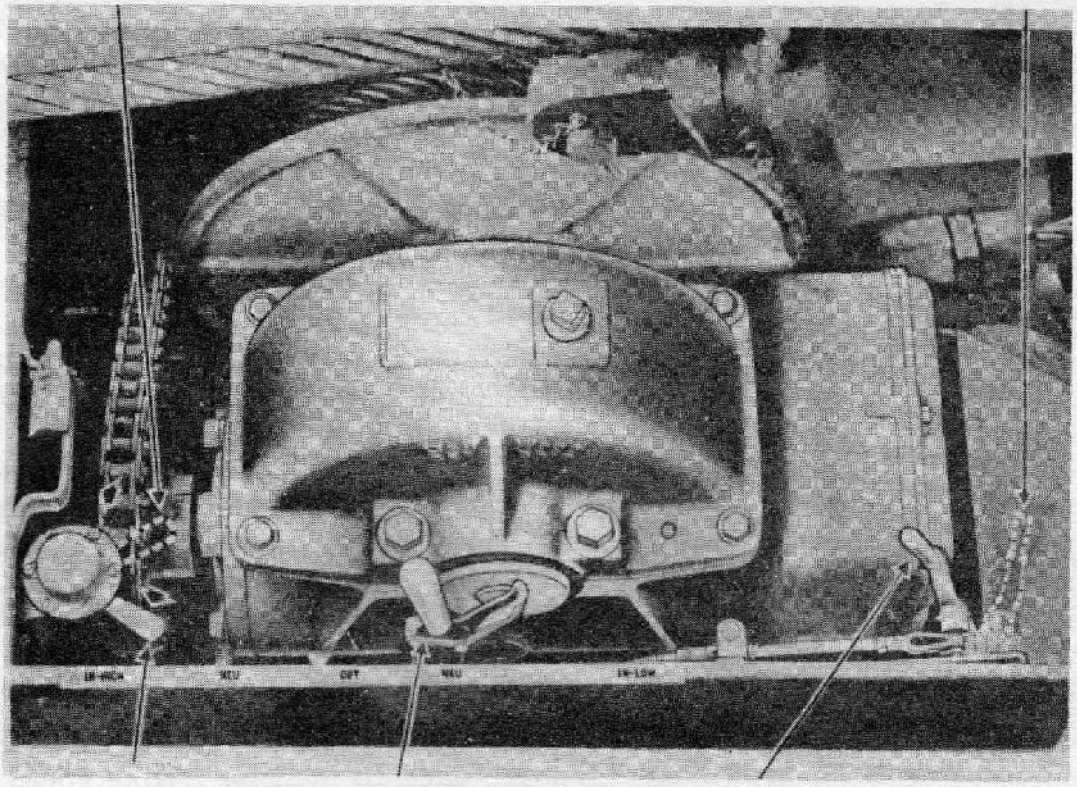
(1) Wherever possible, the snatch blocks provided with the equipment should be used to relieve the load on the cable and equipment. For light loads, use a straight line or one-part line. For medium loads, use the two-part line. For medium heavy loads, use the three-part line, and for heavy loads, use the four-part line. It is recommended, however, that all heavy work be done with the rear winch (par. 11).

(2) Start the engine (par. 7 b). Lock the service brakes with the latch provided (fig. 18). Release the hand brake, and release the

engine clutch (par. 7). Shift the transmission into a speed suitable to the load. For heavy loads, use first gear; for medium loads, use second gear, etc. Select a gear low enough so that the load can be moved safely and without jerking (fig. 13). Engage power take-off (fig. 17). Engage the front winch jaw clutch (fig. 17). Signal the ground operator that the load is ready to be moved. Engage the engine clutch carefully, at the same time stepping on the foot accelerator to keep the engine from stalling (fig. 19).

CLUTCH DISENGAGED

THROTTLE OPEN



CLUTCH ENGAGED

REAR WINCH TRANSMISSION CONTROL LEVER

THROTTLE CLOSED

RA PD 315174

Figure 20—Rear Winch Control

e. To Stop the Winch. Disengage the clutch, and release the accelerator (par. 7). Shift the transmission into neutral (fig. 13). Disengage the power take-off (fig. 17). Disengage the front winch jaw clutch (fig. 17).

11. REAR WINCH OPERATION.

a. Controls. Controls for the rear winch are located in the body of the truck. They consist of the remote control clutch valve, winch transmission shift lever, and remote engine throttle control (fig. 20).

b. Truck Positioning. Aline the truck with the object of recovery in such a manner that the cable will not be working at an angle. A

longitudinal line through the center of the truck, if extended, should bisect the object of recovery (par. 12). Conditions permitting, the vehicle should be at least 60 feet from the object of recovery when multiple sheave snatch blocks are used in line. When single snatch blocks are used, the distance between the vehicle and the object of recovery must be greater. Alinement of the vehicle is as important an operation as the actual recovery. Once the truck controls in the cab have been set, all operations of the control of the rear winch are carried on in the body of the vehicle.

c. Preparation for Recovery.

(1) Start the engine (par. 7 **b**). Lock the service brakes with the latch provided (fig. 18). Release the hand brake and release the clutch (par. 7). Shift the transmission into second gear (fig. 18). Shift the transfer case into neutral (fig. 15). Engage the power take-off (fig. 17). Engage the clutch (par. 7). Slight engagement of the clutch may be necessary to cause shaft rotation for easy engagement. This completes the operations in the vehicle cab.

(2) Swing the angle sheave support to one side for clearance (fig. 21). Open the clutch air valve to disenagage the clutch (fig. 20). Shift the winch transmission into reverse (fig. 20). Close the clutch air valve just long enough to slack the chain, then open immediately (fig. 20). NOTE: *The clutch air valve is spring-loaded and must be held open. As soon as it is released, the valve will automatically close.*

(3) Unhook the cable chain. Close clutch air valve. Carry out cable to object of recovery, having the ground operator hold the cable as tight as possible. When sufficient cable has been carried out, open clutch air valve (fig. 20). Shift winch transmission into neutral (fig. 20).

d. Recovery.

(1) Cable speed is governed by a remote control engine throttle at the winch. Move the control lever back to increase engine speed, and move forward to close the throttle (fig. 20). Snatch blocks provided with the equipment should be used to relieve the load on the cable and truck. For light loads, use a straight or one-part line; for medium loads a two-part line, medium heavy loads a three-part line and for heavy loads, use a four-part line (fig. 21).

(2) Open the air clutch valve to disengage the engine clutch. Control handle to right (fig. 20). Shift the winch transmission into low gear for heavy loads or high gear for light loads (fig. 20). Close the air clutch control valve. Control handle to the left (fig. 20). Accelerate the engine, and draw the object of recovery to the desired position.

e. Angle of Recovery (fig. 22). Angle recovery should not be made if it is at all possible to position the vehicle for straight recovery. In the event that it is impossible to position the vehicle for straight recovery, proceed as follows: Position the angle sheave supporting the body brackets. Attach one single-sheave snatch block to the

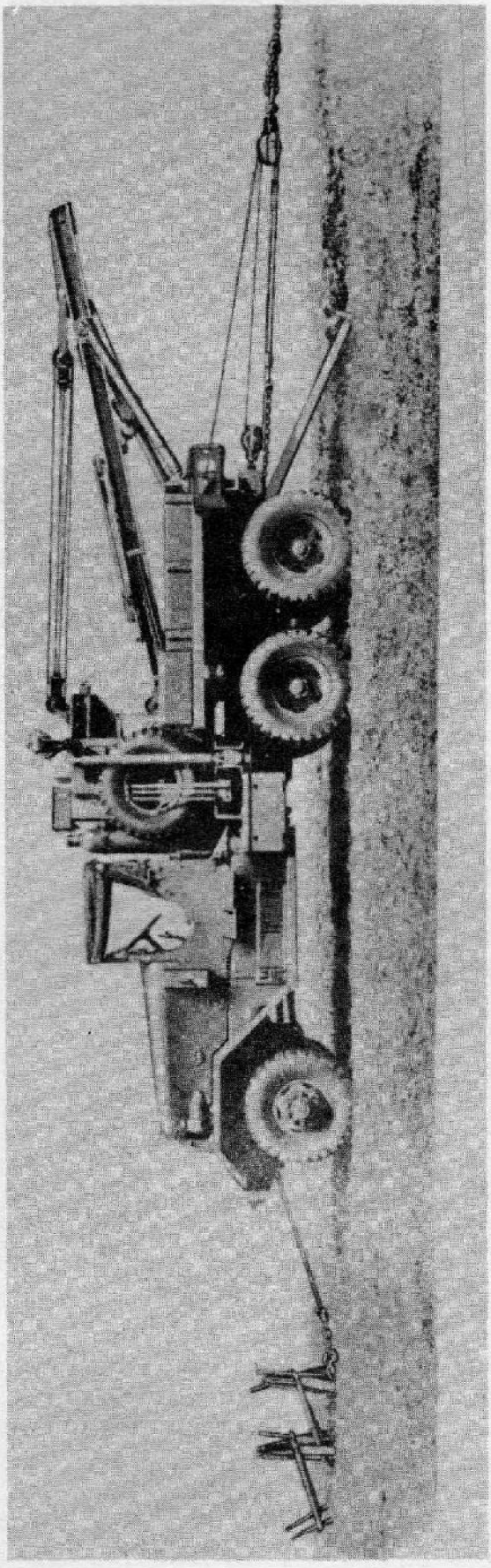


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Figure 21—Rear Winch Recovery

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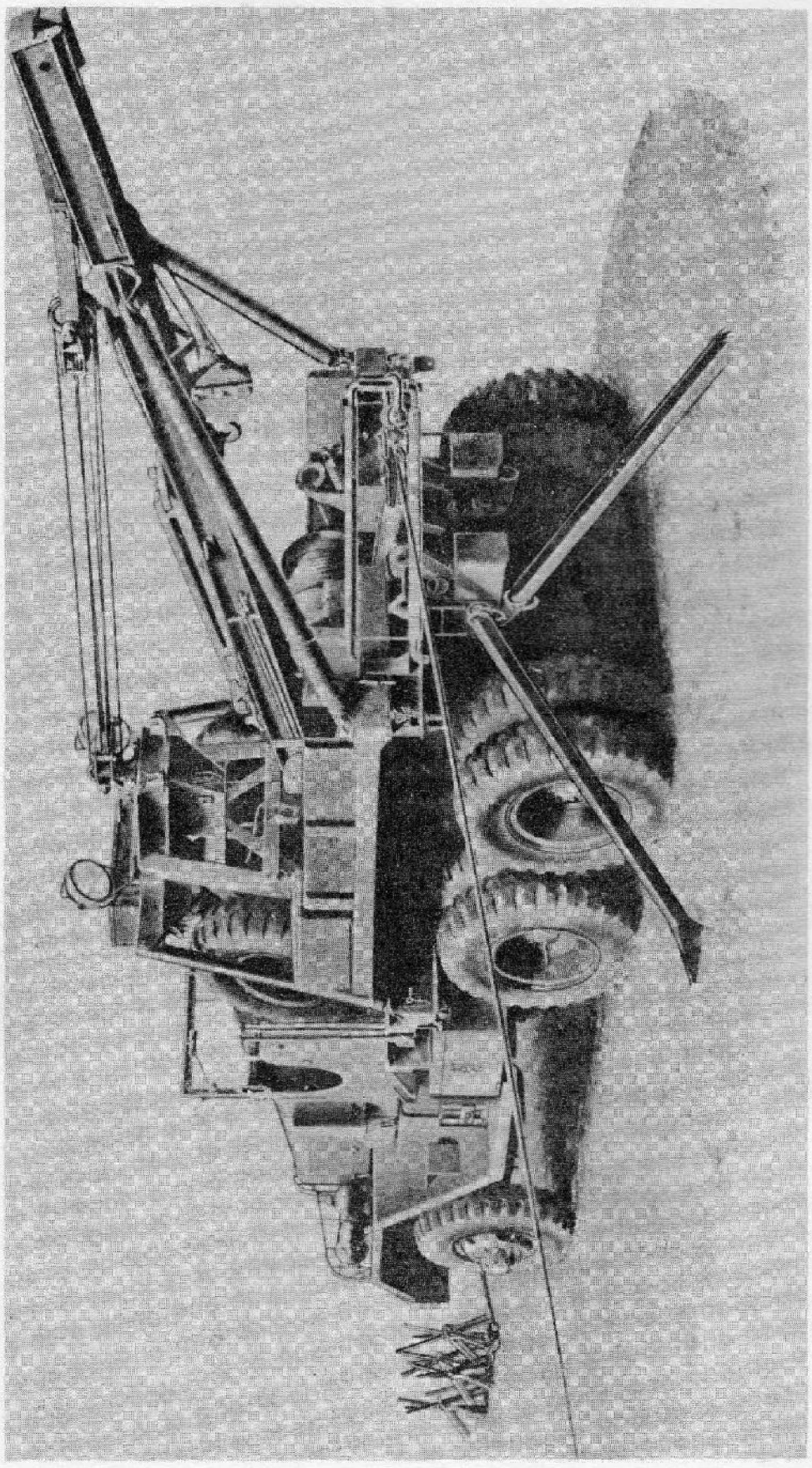

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Figure 22—Rear Winch Angle Recovery

angle support. Secure ground spades at the rear of the frame to prevent the vehicle from being pulled sideways.

f. Heavy Recovery Operation.

(1) All heavy recovery operations must be performed by the rear winch. The service brakes will not be adequate to hold the truck in position when the object of recovery is being pulled in. In order to stabilize the vehicle, attach the ground spades provided in the sockets at the rear end of the frame (fig. 21). Attach the front winch cable to a tree or utility pole. If no natural anchorage is convenient, the ground anchors should be used in series to form a suitable anchorage in place of the stationary object (fig. 21).

(2) Attach the front winch cable to the anchors, and draw cable tight. Disengage the front winch jaw clutch lever in cab (fig. 17). The anchor line for the front winch should have at least as many snatch blocks as the recovery line.

12. CABLE WINDING AND SECURING.

a. Correct Method of Winding First Layer on the Drum.

(1) Winding the first layer of cable on the winch drums should be started on the side which causes the coils on the drum to hug together. This tends to produce a uniform and closely wound first layer which tends to uniformity in successive layers. It also results in an even winding of the coils on the drum when the cable is rewound after the load has been slacked off and then picked up.

(2) When the cable is wound on a smooth drum in the wrong direction, the coils tend to spread apart, and the second layer of coils wedge themselves between the open coils causing irregular winding and damage to the cable. The proper direction of winding the first layer on a smooth drum is determined by standing behind the drum and looking along the path the cable travels and determining whether the cable is right lay or left lay. On right lay cables, the winding rotates to the right, as seen by the observer when viewed from above. Left lay cables rotate to the left.

(3) For an overwind of right lay cable, start at the left side of the drum and wind the first layer towards the right. For an underwind, start at the right and wind toward the left. For an overwind of left lay cable, start at the right and wind to the left. For an underwind, start at the left and wind to the right.

b. Fleet Angle. The fleet angle is the included angle between the cable and its position of greatest travel across the drum to a line perpendicular to the drum axis at the center line of the first sheave. Keep the fleet angle at an absolute minimum to prevent scrubbing, open winding, and piling up of turns at the end of drum at layer changes.

c. Care of New Cable. Run a new cable through its normal operating cycle several times under a light load. This gives the cable a chance to adjust itself gradually to the operating conditions.

d. Securing Cables.

(1) FRONT WINCH CABLE. Wind the cable chain around front tow hooks, and secure chain hook over tow hook. Tighten cable carefully with aid of ground operator until slack is taken up (fig. 2).

(2) CRANE WINCH CABLE. Secure lifting hook of crane into boom hook eye. Tighten cable until slack is taken up (fig. 4).

(3) REAR WINCH CABLE. Wind the cable chain around the rear bumperettes, and secure the cable hook over the bumperette. Tighten cable carefully until slack is taken up (fig. 5).

13. CRANE OPERATION.

a. Controls (fig. 23). The control levers are banked on the left-hand side of the crane frame. With the operator facing toward the rear of the truck, the right-hand lever controls the lift hook. Pulling the lever towards the operator lowers the hook; pushing the lever away from the operator raises the hook. The center lever swings the boom to the right or left. Moving the lever towards the operater swings the boom to the right, and moving it away from the operator swings the boom to the left. The left-hand lever raises and lowers the boom. To lower the boom, the lever must be pulled towards the operator; to raise the boom the lever must be pushed away from the operator. To open the engine throttle and increase engine speed, the operator pushes the throttle lever up. To close the throttle, the lever is pulled down.

b. Boom Swinger Cut-out (fig. 23). To prevent the operator from swinging the boom too far in either direction, a swinger clutch release valve is provided to release the engine clutch automatically, thereby preventing damage to the boom or crane frame. If the boom has been swung too far to the right or left so as to release the clutch, proceed as follows: Engage boom swinger hand lever for movement away from the crane frame. Open clutch engagement valve located on crane frame, and hold open until the boom has swung back. Release the clutch engagement valve. To open clutch valve, move lever to the right; to close clutch valve, move lever to the left.

c. Truck Positioning.

(1) If at all possible, recovery operations should be made with the truck level. When it is necessary to operate on a slope, level the truck as much as possible with planking or other accessible material, to prevent overloading the boom swinger gearing. The swinger is rated to handle 10,000 pounds on 8 percent maximum grade in any direction. If the load or angularity is exceeded, the swinger gear will be damaged.

(2) The swinger shear pin connecting the drive to the swinger worm shaft prevents overloading of the swinger from the driving end only. If the truck settles to one side under load due to soft ground or poor jack support, the load is then hung on the swinger worm gear, and the load may be sufficient to damage this gear.

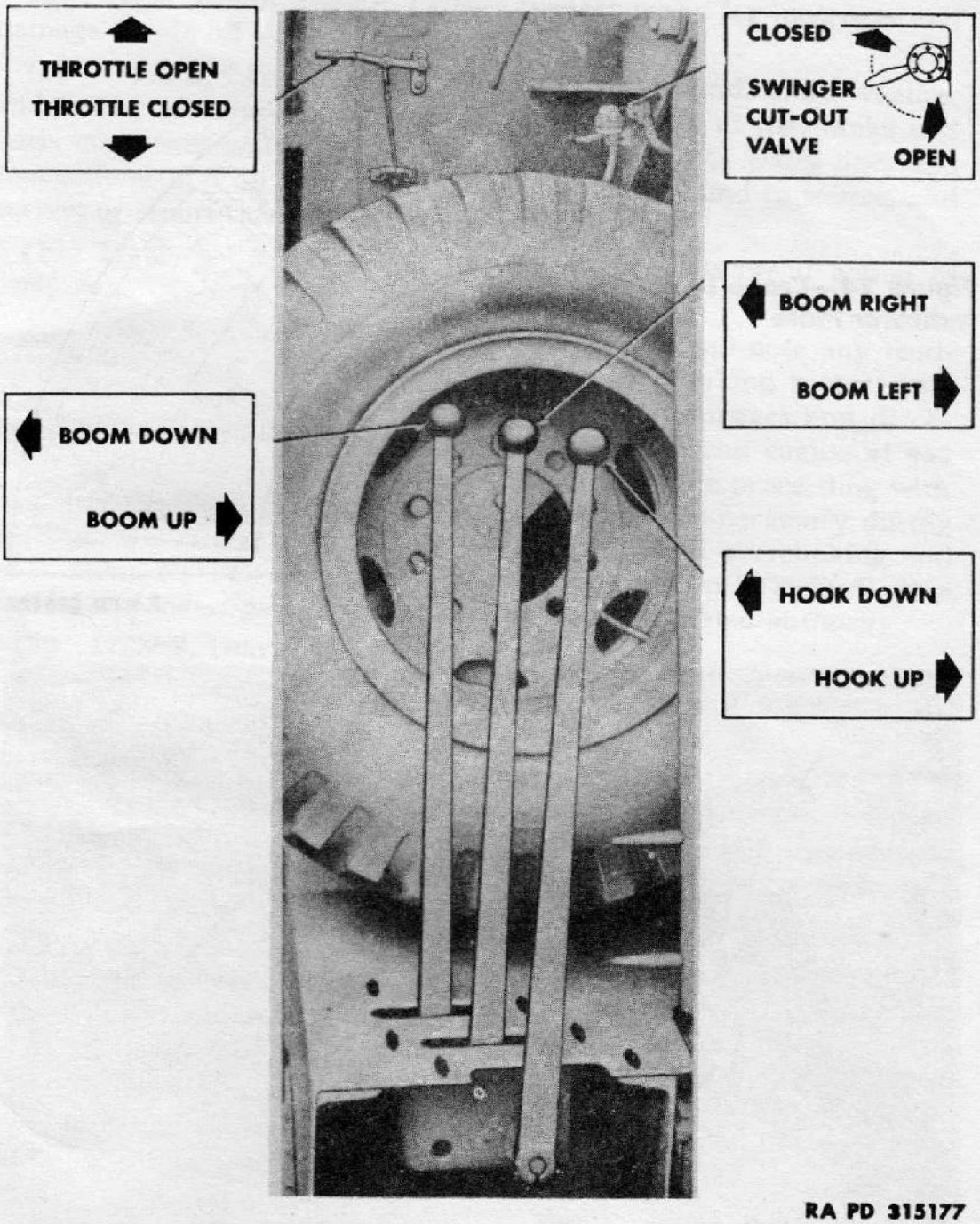

Figure 23—Crane Control Lever Positions

d. Boom and Body Jacks. Whenever loads are handled over the side or rear, always use the body jacks to give the truck stability and take the load off the truck's springs (fig. 26). Extend the crane outriggers, and lower the jacks to the ground for all swinger operations and side lifts (fig. 29). Boom jacks must always be anchored to the corners of the truck body when the load is transported, and extended to the ground for all maximum lifting operations (figs. 30, 26, and 28). Be sure all jacks rest on a firm footing. Use planking under the body, boom, and outrigger jacks when necessary, to increase

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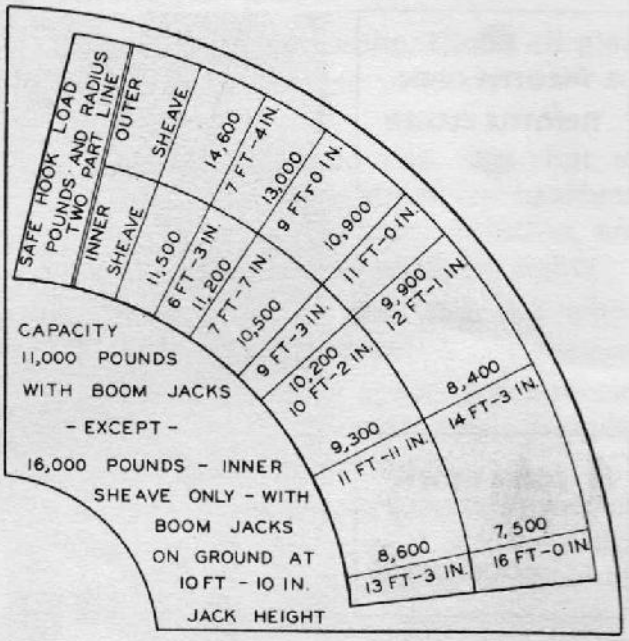

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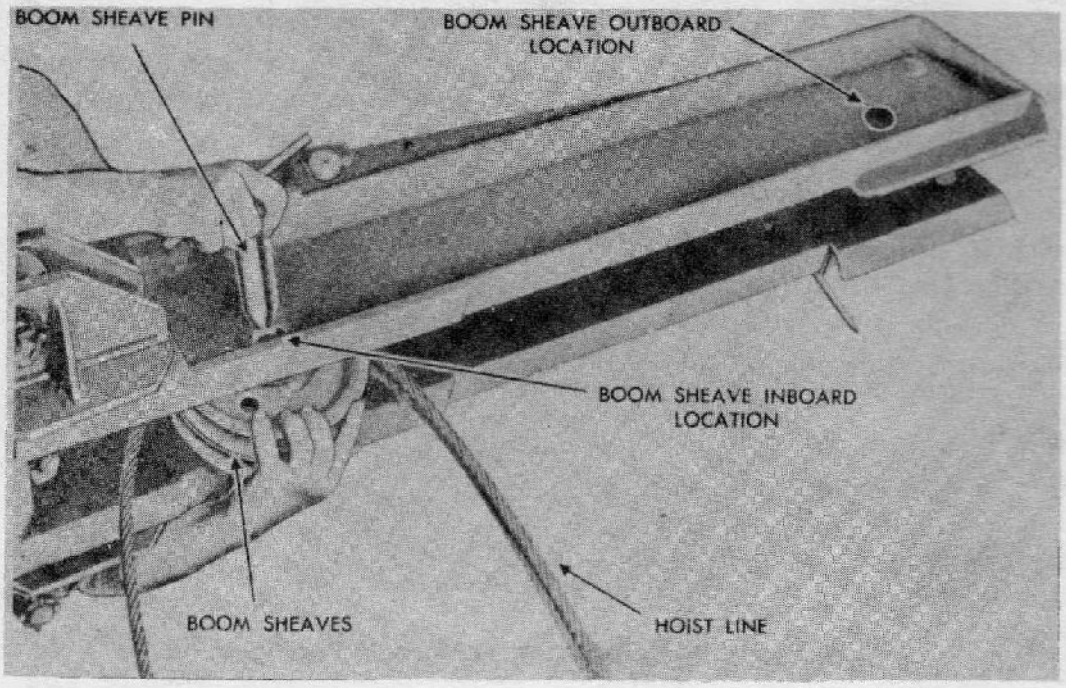
Figure 24—Crane Load Indicator Plate



RA PD 315179

Figure 25—Boom Sheave Relocation

their footing on soft ground. Body jacks must be vertical and hinge to the front and rear to prevent jack breakage if the truck should shift positions. Outrigger jacks must be extended to their maximum position when handling side loads (fig. 28).

e. Crane Capacity. The capacity of the crane varies with the boom position and the location of the hoist line sheaves. Always check

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Figure 26—Equipment Arrangement Rear Lift (1)

the weight of the load to be lifted, then consult the load indicator plate attached to the pivot end of the boom (fig. 24). Be sure that the crane will not be overloaded at the radius desired to handle the load. The maximum capacity of the crane is 11,000 pounds when the boom jacks are used, with the exception that a 16,000-pound load is permissible, using the inner sheave position only. The boom jacks must be extended to the ground and at a jack height of 10 feet, 10 inches (fig. 26).

f. Adjustment of Boom Length.

(1) Boom length adjustment consists of moving the hoist line sheave at the outer end of the boom. If it is desired to shorten the boom, lower boom to the rear winch drum (subpar. a above).

(2) Remove boom sheave pin lock pin. Remove boom sheave pin. Relocate sheaves at inner position (fig. 25). Push sheave pin through boom side member. Replace sheave pin lock pin.

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g. Permissible Lifts and Equipment Arrangement.

(1) EQUIPMENT ARRANGEMENT. Figure 26 shows the required arrangement of equipment for a rear lift of 16,000 pounds maximum. Body jacks are installed so that they hinge to front and rear to prevent damage to the jacks, should the vehicle shift positions. Boom jacks are extended to the ground. Boom hook line sheave is at inboard position. Boom is positioned to secure a 10-foot, 10-inch boom jack height. Boom sway cables are disconnected from body corners.

(2) Figure 27 shows the required arrangement of equipment for a rear lift as determined by the boom load indicator plate (fig. 24). Body jacks are hinged in position to prevent damage to the jacks should the vehicle position shift to the front or rear. Boom jacks are

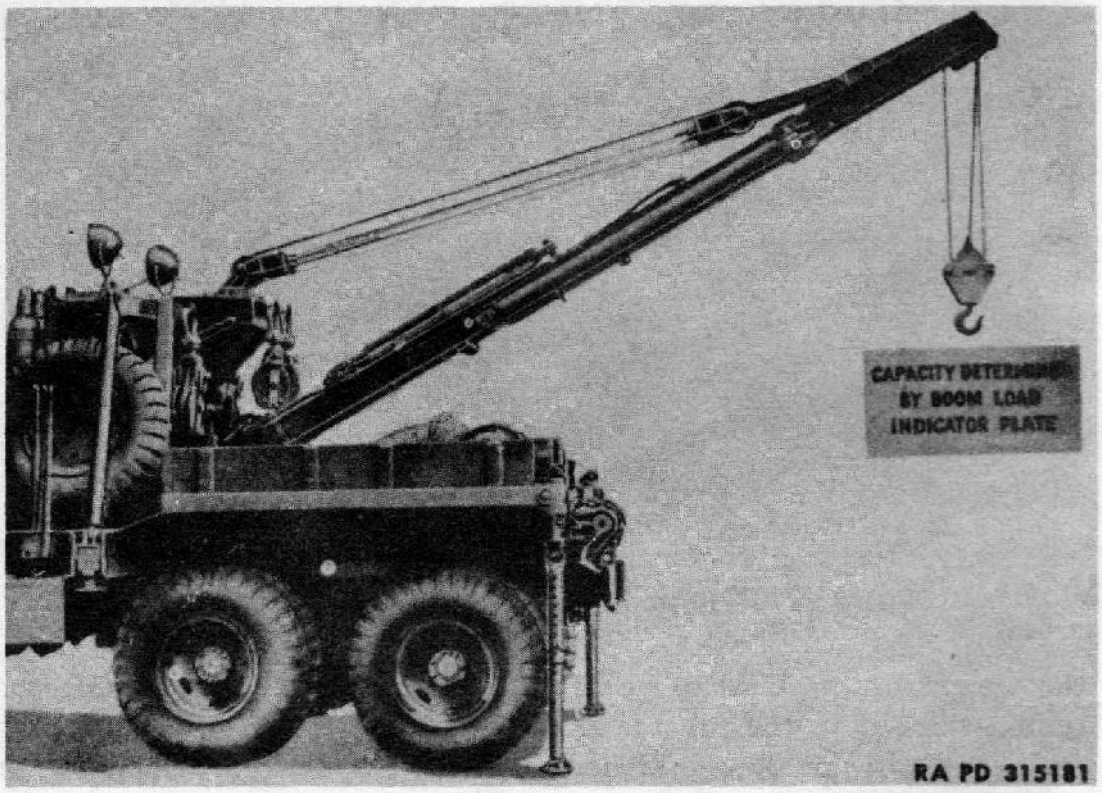

Figure 27—Equipment Arrangement Rear Lift (2)

secured to sides of boom. Boom hook line sheave can be used at varying capacities at either the inboard or outboard position as determined by the boom load indicator plate (fig. 24). Boom position is determined by inboard or outboard hook line sheave location and the load to be handled. Disconnect boom sway cables.

(3) Figure 28 shows the required arrangement of equipment for a side lift of 16,000 pounds maximum. Body jacks are hinged in position to prevent damage to the jacks should the vehicle position shift to the front or rear. Boom jacks are extended to the ground. Boom hook line sheave is at the inboard position, and the boom is positioned to secure a 10-foot, 10-inch boom jack height. Disconnect

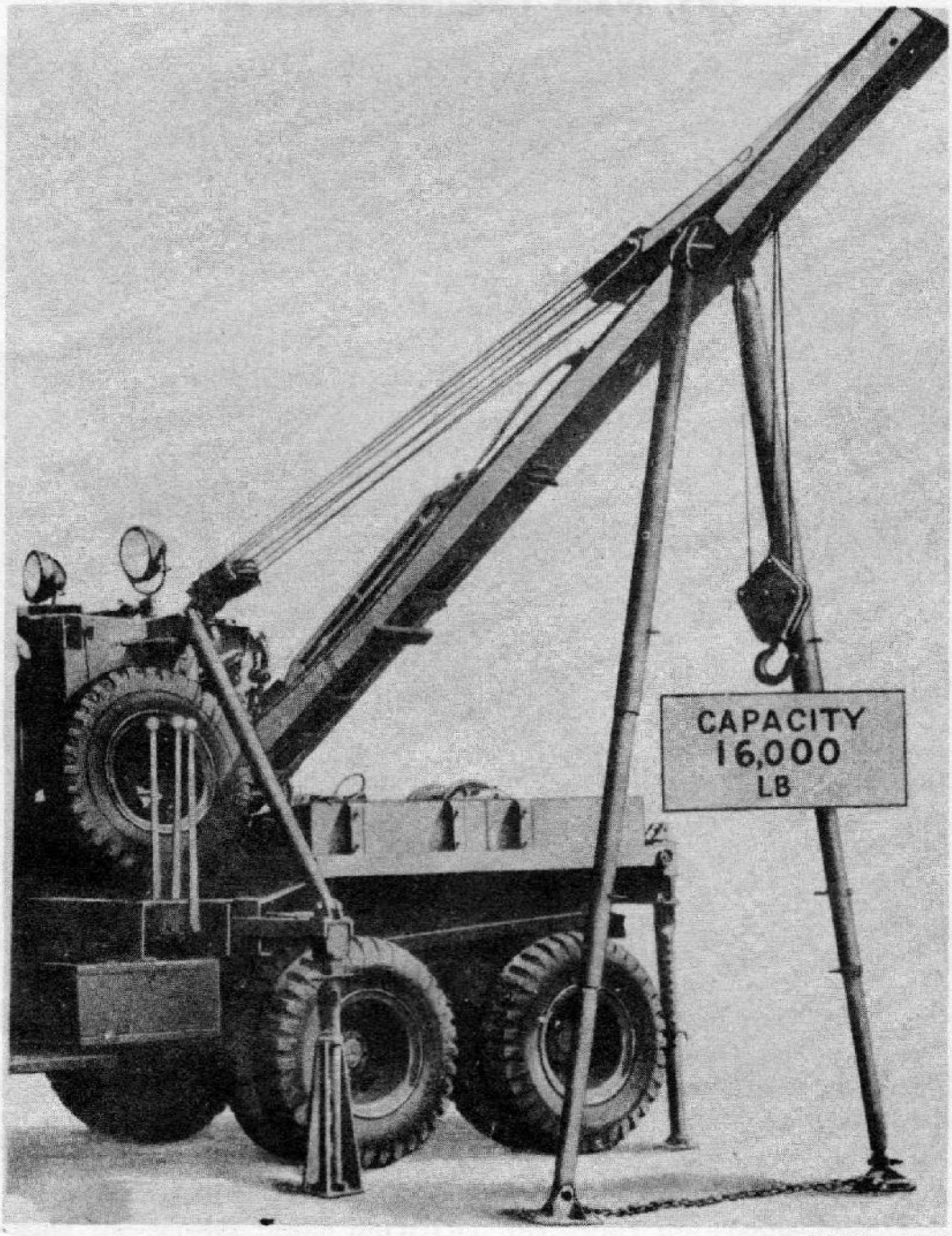

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Figure 28—Equipment Arrangement Side Lift

boom sway cables. Outriggers are extended to maximum position. Outrigger jacks are extended to the ground.

(4) Figure 29 indicates the equipment arrangement for lifting and swinging a 10,000-pound maximum load at not more than a 9-foot, 3-inch loaded radius. Body jacks are installed in position so that they are hinged to front and rear. Boom jacks are secured to boom. Boom hook line sheaves are in outboard position. Disconnect boom sway cables. Outriggers are extended to maximum position. Outrigger

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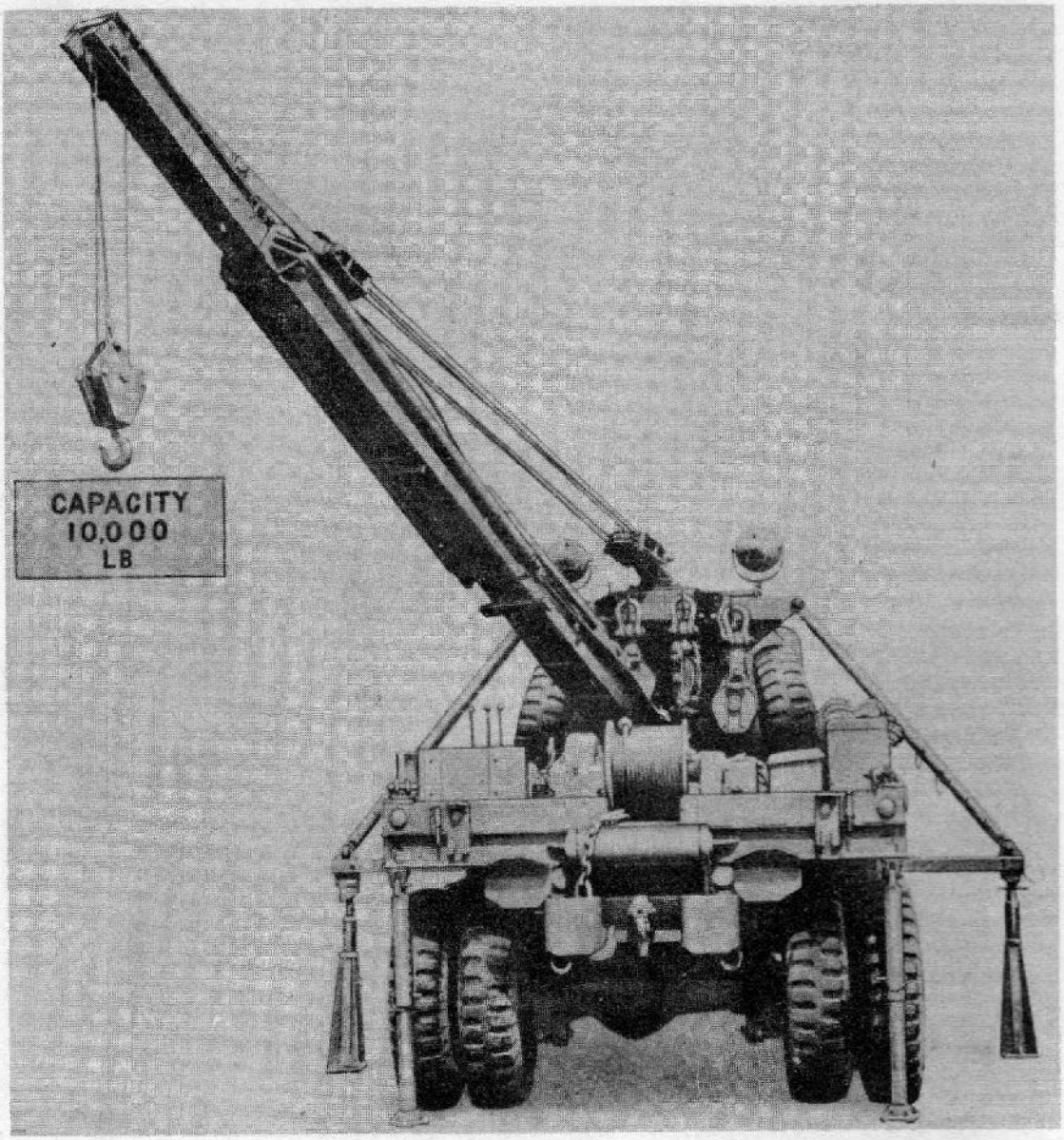

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Figure 29—Equipment Arrangement for Lift to Swing

jacks are extended to the ground. Refer to figure 25 to determine the 9-foot, 3-inch loaded radius.

(5) Figure 30 indicates the arrangement of equipment to lift and transport a 11,000-pound maximum load. Boom jacks are extended and secured to body corner swivels. Boom hook line sheaves are in inboard position. Boom sway cables are connected to body corners.

h. Recovery.

(1) Before hooking on to the load, remove the sway cables by removing the sway cable anchor pins at the body corners. NOTE: *Always center the hook directly over the load.* No attempt should be made to drag the load sideways with the hoist line, or to swing

Figure 30—Equipment Arrangement for Lift and Transport

the boom, as this will place an overload on the swinger gear or result in shearing the swinger shear pin. The following operations should be done in the cab of the truck:

(2) Release truck emergency brake. Apply the service brakes by using the service brake latch (fig. 18). Start the engine (par. 7 **b**). Place the transfer case in neutral (fig. 15). Place the truck transmission in third gear (or second gear for heavier loads) (fig. 13). Engage the power take-off (fig. 17). This completes the operations in the cab of the truck. The remainder of the operations are controlled from the operator's platform at the side of the crane.

(3) Set the engine remote control throttle lever so that the engine is operating at not more than 1,000 revolutions per minute (fig. 23). CAUTION: *Always move the crane control levers as far as possible in either direction so that the jaw clutches will be fully engaged.* Move the levers into the desired position quickly but not violently. Always return the levers to neutral manually.

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(4) To raise and lower the hook, use the right-hand lever (facing the operator) (fig. 23). To raise the hook, move the lever toward the indicator plate on the operator's platform marked "HOOK-UP" or towards the rear of the truck. To stop the hook, return the lever to neutral manually. To lower the load, move the lever to the indicator plate on the operator's platform marked "HOOK-DOWN" or towards the operator.

(5) To swing the boom to the right or left, use the center lever (fig. 23). To swing boom to the left, move the lever toward the indicator plate marked "SWING LEFT," or away from the operator. To stop the boom, return the lever to neutral manually. To swing boom to the right, move the lever toward the plate marked "SWING RIGHT," or toward the operator.

(6) To raise or lower the boom, use the left-hand lever (fig. 23). To raise the boom, move the lever toward the plate marked "BOOM-UP," or away from the operator. To stop the boom, return the lever to neutral manually. To lower the boom, move the lever toward the plate marked "BOOM-DOWN," or toward the operator.

Section V

OPERATION UNDER UNUSUAL CONDITIONS

14. DRIVING UP OR DOWN STEEP GRADES.

a. When driving down a steep grade, shift into a lower transmission gear. On exceptionally steep and long down-grades, shift the transmission to second speed so that the engine will help in slowing the vehicle down. This procedure will reduce the necessity for continuous or severe application of the brakes.

b. When driving up a long, steep grade, shift the transmission to a lower gear when vehicle speed begins to decrease, to permit driving the vehicle at the maximum possible governed speed with the least strain on engine and drive mechanism.

c. To shift to lower transmission gears with the vehicle in motion on a steep grade, use the double-clutch method (par. 7 i).

15. DRIVING IN SAND, GRAVEL, OR SOFT TERRAIN.

a. Drive slowly in loose dry sand or fresh thick gravel. Even though greater vehicle speed can be attained on certain types of sand and gravel surfaces, such surfaces are unpredictable, and great difficulty may be encountered in steering the truck. The force developed by the momentum of the truck may be great enough to cause the loose sand or gravel to roll under the tires with resulting loss of steering control.

b. Some types of road surfaces have a shoulder of fresh loose gravel or soft ground on one side of the hard driving surface. If it is necessary to drive the truck off the hard surface onto a soft surface, reduce speed as quickly as possible, as the soft shoulder will cause a violent pulling of truck in the direction of the soft surface, resulting in loss of steering control.

c. When starting the truck in loose sand or gravel, release pressure on the clutch pedal slowly so the wheels will not spin. Spinning the wheels causes them to work farther down into the soft surface. As a result, the vehicle may become mired to such an extent that it will have to be towed or winched out.

d. When the truck becomes mired in soft terrain or deep mud, use good judgment if an attempt is made to drive the truck out under its own power. If the truck is pulling through soft mud with the front axle engaged, and the driving wheels start spinning, do not race the engine or attempt to "jump" the truck out of the mud by racing engine and suddenly engaging the clutch. Racing the engine usually

results in digging the driving wheels deeper into the mud, and trying to "jump" the truck will lead to destruction of some part of the drive line such as the clutch, transmission, propeller shafts, or axles. When the truck is hopelessly mired in deep mud, tow it out with a winch or with another vehicle.

16. COLD WEATHER OPERATION.

a. Purpose. Operation of automotive equipment at subzero temperatures presents problems that demand special precautions and extra careful servicing from both operation and maintenance personnel, if poor performance and total functional failure are to be avoided.

b. Gasoline. Winter grade of gasoline is designed to reduce cold weather starting difficulties; therefore the winter grade fuel should be used in cold weather operation.

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

(1) Strain the fuel through filter paper, or any other type of strainer that will prevent the passage of water. CAUTION: *Gasoline flowing over a surface generates static electricity that will result in a spark, unless means are provided to ground the electricity. Always provide a metallic contact between the container and the tank, to assure an effective ground.*

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

(3) Add ½ pint of denatured alcohol, Grade 3, to the fuel tank each time it is filled. This will reduce the hazard of ice formation in the fuel.

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

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

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

(7) Wipe all snow or ice from dispensing equipment and from around fuel tank filler cap before removing cap to refuel vehicle.

d. Lubrication.

(1) TRANSMISSION AND DIFFERENTIAL.

(a) Universal gear lubricant, SAE 80, where specified on figures 32, 33 and 34 or War Department Lubrication Guides Nos. 544 and 544A, is suitable for temperatures as low as −20°F. If consistent temperature below 0°F is anticipated, drain the gear cases while warm and refill with Grade 75 universal gear lubricant, which is suit-

able for operation at all temperatures below 0°F. If Grade 75 universal gear lubricant is not available, SAE 80 universal gear lubricant diluted with the fuel used by the engine, in the proportion of one part fuel to six parts universal gear lubricant, may be used. Dilute make-up oil in the same proportion before it is added to gear cases.

(b) After engine has been warmed up, engage clutch and maintain engine speed at fast idle for 5 minutes, or until gears can be engaged. Put transmission in low (first) gear, and drive vehicle for 100 yards, being careful not to stall the engine. This will heat gear lubricants to the point where normal operation can be expected.

(2) CHASSIS POINTS. Lubricate chassis points with general purpose grease, No. 0.

(3) STEERING GEAR HOUSING. Drain housing, if possible, or use suction gun to remove as much lubricant as possible. Refill with universal gear lubricant, Grade 75, or, if not available, SAE 80 universal gear lubricant diluted with fuel used in the engine, in the proportion of one part fuel to six parts SAE 80 universal gear lubricant. Dilute make-up oil in the same proportion before it is added to the housing.

(4) OILCAN POINTS. For oilcan points where engine oil is prescribed for above 0°F, use light lubricating, preservative oil.

(5) PRECAUTIONS. Keep crankcase oil fluid by one of the following methods, listed in order of preference:

(a) Keep vehicle in a heated enclosure when not in use.

(b) After stopping engine, drain crankcase oil while still hot. Place warning tag in a conspicuous place in the cab to indicate crankcase is empty. Store oil in a warm place if possible; otherwise, heat oil before reinstalling.

(c) Cover entire cab and engine section with tarpaulin. Place fire pots under tarpaulin about three hours before engine is to be started. A Primus, Van Prag, or other type blowtorch, and ordinary kerosene lanterns may be used. CAUTION: *Be careful in applying flame directly to oil pan.*

(d) Dilute crankcase oil with gasoline, or with Diesel fuel in an emergency. Turn engine over several times to mix oil and diluent. After four or more hours of operation, redilute oil if vehicle is to be left standing unprotected for three or more hours. Use diluent for both original dilution and redilution as follows:

Temperature	Diluent	Quantity
0°F to −20°F	Gasoline	½ qt to each 4½ qt of engine oil
0°F to −20°F	Diesel fuel	½ qt to each 3½ qt of engine oil
Below −20°F	Gasoline	1 qt to each 5 qt of engine oil
Below −20°F	Diesel fuel	1 qt to each 4 qt of engine oil

NOTE: *Presence of diluent increases engine oil consumption. Check oil level frequently.*

e. Protection of Cooling Systems.

(1) USE ANTIFREEZE COMPOUND. Protect the system with antifreeze compound (ethylene-glycol type) for operation below +32°F. The following instructions apply to use of new antifreeze compound.

(2) CLEAN COOLING SYSTEM. Before adding antifreeze compound, clean the cooling system and completely free it from rust. If the cooling system has been cleaned recently, it may be necessary only to drain, refill with clean water, and again drain. Otherwise clean the system with cleaning compound.

(3) REPAIR LEAKS. Inspect all hose and replace if deteriorated. Inspect all hose clamps, plugs, and pet cocks and tighten if necessary. Repair all radiator leaks before adding antifreeze compound. Correct all leakage of exhaust gas or air into the cooling system.

(4) ADD ANTIFREEZE COMPOUND. When the cooling system is clean and tight, fill the system with water to about one-third capacity. Then add antifreeze compound, using the proportion of antifreeze compound to the cooling system capacity indicated in paragraph 80. Protect the system to at least 10°F below the lowest temperature expected to be experienced during the winter season.

(5) WARM THE ENGINE. After adding antifreeze compound, fill with water to slightly below the filler neck; then start and warm the engine to normal operating temperature.

(6) TEST STRENGTH OF SOLUTION. Stop the engine and check the solution with a hydrometer, adding antifreeze compound if required.

(7) INSPECT WEEKLY. In service, inspect the coolant weekly for strength and color. If rusty, drain and clean cooling system thoroughly and add new solution of the required strength.

(8) PRECAUTIONS.

(a) Antifreeze compound is the only antifreeze material authorized for ordnance materiel.

(b) It is essential that antifreeze solutions be kept clean. Use only containers and water that are free from dirt, rust, and oil.

(c) Use an accurate hydrometer. To test a hydrometer, use one part antifreeze compound to two parts water. This solution will produce a hydrometer reading of 0°F.

(d) Do not spill antifreeze compound on painted surfaces.

(9) ENGINE TEMPERATURES. A thermostat is placed in the cylinder head water outlet elbow to retard the circulation of water in the radiator until it has reached a predetermined temperature to provide faster warm-up of the engine. The temperature of the engine coolant is indicated on the thermometer on the instrument panel. Watch the thermometer. It will indicate normal temperature (160°F) after the truck has been driven a few miles. If the temperature does not rise to normal within a reasonable period of time, use a partial cover over the radiator to increase the operating temperature of the engine. When a partial cover is used over the radiator, however, watch the thermometer on the instrument panel, and do not operate the engine

at temperatures above normal (fig. 10). If the temperature of the engine is carried too high, the antifreeze solution will boil and evaporate, leaving the cooling system unprotected against freezing temperatures.

f. Electrical Systems.

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

(2) WIRING. Check, clean, and tighten all connections, especially the battery terminals. Be sure that no short circuits are present.

(3) COIL. Check coil for proper functioning by noting quality of spark.

(4) DISTRIBUTOR. Clean thoroughly, and clean or replace points. Check the points frequently. In cold weather, slightly pitted points may prevent engine from starting.

(5) SPARK PLUGS. Clean and adjust or replace, if necessary. If it is difficult to make the engine fire, reduce the gap to 0.005 inch less than that recommended for normal operation (par. 93 b). This will make ignition more effective at reduced voltages likely to prevail.

(6) TIMING. Check carefully. Be sure that the spark is not unduly advanced nor retarded.

(7) BATTERY.

(a) 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, unless a warm slave battery is available. 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.

(b) Do not add water to a battery when it has been exposed to subzero temperatures unless the battery is to be charged immediately. If water is added and the battery not put on charge, the layer of water will stay at the top and freeze before it has 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. Before every start, see that the spark plugs, wiring, and other electrical equipment are free from ice.

g. Starting and Operating Engine.

(1) INSPECT CRANKING MOTOR. Be sure that no heavy grease or dirt has been left on the cranking motor throw-out mechanism. Heavy grease or dirt is liable to 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 repairs.

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

(3) CARBURETOR AND FUEL PUMP. The carburetor, which will give no appreciable trouble at normal temperatures, is liable not to operate satisfactorily at low temperatures. Be sure the fuel pump has no leaky valves or diaphragm as this will prevent the fuel pump from delivering the amount of fuel required to start the engine at low temperatures when running speeds are reduced to between 30 and 60 revolutions per minute.

(4) AIR CLEANERS. At temperatures below 0°F do not use oil in air cleaners. The oil will congeal and prevent the easy flow of air. Wash screens in dry-cleaning solvent, dry, and replace. Ice and frost formations on the air cleaner screens can cause an abnormally high intake vacuum in the carburetor air horn hose, resulting in collapse.

(5) FUEL SYSTEM. Remove and clean sediment bulb, strainers, etc., daily. Also drain fuel tank sump daily to remove water and dirt.

h. Chassis.

(1) BRAKE BANDS. Brake bands, particularly on new vehicles, have a tendency to bind when they are very cold. Always have a blow-torch 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) EFFECT OF LOW TEMPERATURES ON METALS. 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.

17. HOT WEATHER OPERATION.

a. Lubrication Attention. Lubricate the truck for hot weather operation (par. 26). Do not use engine oil heavier than that recommended on the lubrication chart (figs. 37 and 38).

b. Cooling System.

(1) Keep the radiator filler cap tightened securely to prevent the loss of coolant. Check the fan belt tension (par. 85) (fig. 92). Keep the radiator core clean. Remove insects or other foreign material lodged between the fins of the core. To do this, direct a stream of water under pressure through the openings in the core from the engine side of the core.

(2) A thermostat is built into the cooling system to stop the flow of water during the warm-up period. Do not remove thermostat in an effort to reduce the operating temperature of the coolant, as it is

necessary to the proper functioning of the cooling system (fig. 90). Flush the cooling system to remove deposits in the engine block and radiator core and improve the efficiency of the cooling system.

18. PREVENTION OF DAMAGE BY FLOOD OR SUBMERSION.

a. General. When a vehicle has been driven through deep water heavily laden with dirt and abrasives, or completely submerged in water, certain precautions must be taken to avoid serious damage to such units as the engine clutch, transmission, transfer case, axles, universal joints, winch, steering gear, battery, fuel tank, brakes, and wheel bearings. If it is known that water, dirt, and abrasives have contaminated the various units of the vehicle, notify the proper authority at once. Each unit which has been submerged must be completely dismantled, cleaned, and lubricated.

b. Emergency Procedure.

(1) If emergency requirements make complete dismantling and cleansing of units impossible, each unit subjected to water should be inspected, cleaned, and lubricated to defer as much damage as possible, as explained in the following steps.

(2) CAUTION: *Emergency cleaning cannot be considered as assurance that further damage will not result. If the damage is great, notify the proper officer at once that complete dismantling and cleaning of affected units is necessary to avoid serious damage.*

(3) Remove filler plugs from storage battery. Check electrolyte for level and appearance. Normal level after immersion indicates little or no water has entered battery. Clean electrolyte solution, even though slightly high, indicates no absorption of excess dirt or damaging foreign material. If solution is dirty, replace battery. Test gravity (par. 106). If the battery is discharged, recharge or replace.

(4) Lubricate the truck completely (par. 25). Clean fuel filters on engine and in fuel pump (pars. 69 and 70 **a**). If fuel tank has been submerged, drain and refill. Run the engine and clean fuel filters again (fig. 78). Clean and reoil air cleaner (par. 75 **a**), ventilator air cleaner (par. 59 **d**), metering valve, and vent tube (par. 59 **b**) (fig. 64). Remove all wheel bearings, clean and repack with lubricant, and reassemble. Replace the oil seals in the wheel hubs, if they are contaminated with dirt, to avoid damage to seal surfaces and lubricant leakage (pars. 196 and 198).

(5) If the clutch has been submerged, disassemble and clean thoroughly (par. 65). Do not attempt to flush it. If the brake valves have been submerged, drain, replace them, and return others for overhaul (sec. XXVI). If the cranking motor, generator, distributor, or carburetor have been submerged, remove the units and install others (pars. 68, 92, 99, and 102).

(6) If it is known that water or dirt has entered engine, drain engine oil, fill crankcase with 5 quarts of kerosene and 5 quarts of SAE 10 engine oil, and run engine for several minutes at idling speed, with clutch released. Before draining engine oil and refilling with correct grade of fresh engine oil, remove valve cover and, if necessary,

clean chamber with same combination of kerosene and oil. If this inspection reveals a dirty condition, remove the oil pan, and clean the pan and strainer (par. 61). If water or dirt has entered engine, replace oil filters (fig. 66).

(7) If transmission, transfer case, or winch have been submerged, drain lubricant and refill, using half kerosene and half SAE 10 engine oil. Drain front and both rear axles completely, and refill with 2 gallons of flushing oil. Next, with front and both rear axles on jacks, drive all six wheels at a speed of 15 miles per hour for 5 minutes to flush the drive line units. Also run the winches and winch gear boxes to flush. Drain all units thoroughly, and refill with correct grade of lubricant (par. 25).

19. VEHICLES SUBJECTED TO SALT WATER OR SALT AIR.

a. Submersion in Salt Water. If the vehicle is submerged in salt water, electrical equipment and metal parts will be damaged to such an extent that complete rebuilding or replacement of assemblies will be necessary. If all traces of salt water can be removed at once, it may be possible to salvage certain units by immediately dismantling and thoroughly cleaning them. In all cases of submersion in salt water, notify the proper authority.

b. Vehicles Subject to Salt Air. When the vehicle is operated near bodies of salt water, keep all exposed metal surfaces painted. Salt air will attack unpainted metal surfaces and quickly cause the formation of rust. If the rust is not removed and the surface protected by a coating of paint, the metal will continue to rust away, and the paint surrounding the damaged portion, will peel off causing additional deterioration of paint and metal.

Section VI

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

20. PURPOSE.

a. To ensure mechanical efficiency, it is necessary that the vehicle be systematically inspected at intervals each day it is 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 and 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 vehicle, but not listed on W.D. Form No. 48, are covered in manual procedures under the items with which they are related. Certain items are listed on the form that do not pertain to the vehicle involved and 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 this vehicle are expanded in this manual to provide specific procedures for accomplishment of the inspections and services. These services are arranged to facilitate inspections 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 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 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 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 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.

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.

21. BEFORE-OPERATION SERVICE.

a. This inspection schedule is designed primarily as a check to see that the vehicle has not been damaged, tampered with, or sabotaged since the After-operation Service was performed. Various combat conditions may have rendered the vehicle unsafe for operation, and it is the duty of the driver to determine whether or not the vehicle is in condition to carry out any mission to which it is 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 vehicle, its accessories, or equipment, caused by tampering or sabotage, collision, falling debris, or shell fire since parking. Look in engine compartment for evidence of above conditions, and for loosened or damaged engine accessories or drive belts, loose fuel, oil or coolant lines, or disconnected control linkage.

(2) FIRE EXTINGUISHER. Examine all extinguishers to be sure they are present, in good condition, and secure. If CO_2 cylinders appear to have been used or valves opened or damaged report for exchange or refill.

(3) FUEL, OIL, AND WATER. Check supply of fuel, oil aud 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 second 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, generator, regulator, cranking motor, air compressor, oil filters, air cleaners, fan, and drive belts for looseness or damage. Be sure drive belt adjustment provides ½-inch finger-pressure deflection.

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(5) ITEM 5, AIR BRAKE TANKS. Inspect tanks for looseness and damage. Drain off water and close drain cocks.

(6) ITEM 6, LEAKS, GENERAL. Inspect on ground, under vehicle, and in engine compartment for leaks, particularly at fuel tanks and lines, crankcase and oil filters, radiator, water pump, water lines and connections, and all gear cases. Trace any leaks found to source, and correct or report them to designated authority.

(7) ITEM 8, CHOKE. When starting engine, observe if action of choke is satisfactory.

(8) ITEM 7, ENGINE WARM-UP. Start engine, and note any tendency toward hard starting. Observe action of cranking motor, particularly if it has adequate cranking speed, and engages and disengages without unusual noise. Set hand throttle to run engine at 450 to 600 revolutions per minute during warm-up while proceeding with following Before-operation Services. Reset choke as necessary during warm-up for engine to run smoothly and to avoid overchoking and oil dilution. NOTE: *If oil pressure is not indicated in 30 seconds, stop engine, and investigate or report condition to designated authority.*

(9) ITEM 9, INSTRUMENTS.

(a) Oil Pressure Gage. Normal oil pressure at idle speed is 35 pounds; at operating speeds, 55 to 65 pounds.

(b) Ammeter. Ammeter should register a high positive (+) charge for a period after starting engine, until generator restores to battery, the current used in starting. Then if battery is fully charged, reading should drop to zero or slight charge with all lights and accessories turned off.

(c) Fuel Gage. With selector switch in relative position, gage should register approximate amount of fuel in each tank. Ordinarily tanks will have been filled, and gage should read "FULL."

(d) Temperature Gage. Engine temperature should increase gradually during warm-up to normal range, 160°F to 185°F. Maximum safe temperature is 200°F. CAUTION: *Do not move vehicle until engine temperature has reached 135°F.*

(e) Tachometer. White pointer should indicate actual engine revolutions per minute at any given time engine is running. Red hand indicates and remains at highest engine revolutions per minute reached. Should not exceed 2,200 revolutions per minute.

(f) Air Pressure Gage. This gage should register 60 pounds before moving vehicle. Low pressure indicator buzzer should sound at pressures below 45 pounds and cut out at 60 pounds. Maximum governed pressure is 105 pounds.

(10) SIREN, HORN, AND WINDSHIELD WIPERS. If tactical situation permits, test siren and horn for proper operation and tone. Test wipers to see if they operate properly, and observe if blades contact glass evenly and firmly through a full stroke. Inspect for damage.

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(11) ITEM 11, GLASS AND REAR VISION MIRRORS. Clean all glass and inspect for damage. Aim rear vision mirrors properly, and see that they are secure.

(12) ITEM 12, LAMPS (LIGHTS) AND REFLECTORS. See that all lights and warning reflectors are clean. Examine them for looseness or damage. If tactical situation permits, open and close switches, and observe if lights respond properly. Include stop and blackout lights.

(13) ITEM 13, WHEEL AND FLANGE NUTS. See that all wheel mounting, and axle flange nuts are present and secure.

(14) ITEM 14, TIRES. Inspect tires including spare, for underinflation and damage. Correct pressure is 70 pounds, cool. Remove objects embedded in treads, carcasses, and between duals.

(15) ITEM 15, SPRINGS AND SUSPENSIONS. Inspect shock absorbers, and front and rear springs for looseness and damage. Look for excessive spring sag, shifted leaves, and broken rebound clips or shackles. Examine rear spring seats for excessive oil leakage.

(16) ITEM 16, STEERING LINKAGE. Inspect gear case for looseness, damage, and excessive oil leaks. See that all steering arms, rods, and connections are in good condition and secure.

(17) ITEM 17, FENDERS AND BUMPERS. Examine front fenders and running boards, and front and rear bumpers for looseness and damage.

(18) ITEM 18, TOWING CONNECTIONS. Inspect all towing devices for looseness or damage. Examine pintle to be sure it operates freely and locks securely.

(19) ITEM 19, BODY. Examine cab and top for looseness or damage. Be sure windshield operates properly and is secure, and soft top and curtains are correctly installed and securely fastened.

(20) ITEM 20, DECONTAMINATORS. Be sure the decontaminator cylinders are present, and not loose or damaged.

(21) ITEM 21, TOOLS AND EQUIPMENT. Be sure all tools and items of special equipment are present, serviceable, and properly and securely mounted or stowed.

(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 NO. 26. Driver must have his operator's permit on his person. Check to see that all vehicle and equipment manuals, Lubrication Guides, Standard Form No. 26 (Driver's Report—Accident, Motor Transportation), W.D., A.G.O. Form No. 478, MWO, and Major Unit Assembly Replacement Record, are present, legible, and properly stowed.

(24) ITEM 25, DURING OPERATION CHECK. The During-operation Services and observations start immediately, and the vehicle is then put in motion.

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22. DURING-OPERATION SERVICE.

a. While vehicle is in motion, listen for any such sounds as rattles, knocks, squeals, or hums that may indicate trouble. Look for indications of trouble in cooling system and smoke from any part of the vehicle. Be on the alert to detect any odor of overheated components or units such as generator, brakes or clutch, fuel vapor from a leak in fuel system, exhaust gas, or other signs of trouble. Each time the brakes are used, gears shifted, or vehicle turned, consider this a test, and notice any unsatisfactory or unusual performance. Watch the instruments constantly. Notice promptly any unusual instrument indications that may signify possible trouble in the system to which the instrument applies

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

(1) ITEM 27, FOOT AND HAND BRAKES. Accelerate to 5 to 8 miles per hour and bring vehicle to quick stop. Brake should operate smoothly and effectively without pulling to either side, chatter, or squeal. See that service brake latch is serviceable and securely mounted. When vehicle is stopped, hand brake should hold vehicle on a reasonable incline with reserve of ⅓ lever travel available, and latch securely in applied position.

(2) ITEM 28, CLUTCH. Clutch should not grab, chatter, or squeal during engagement, or slip when fully engaged under load. Pedal should have 1½-inch free travel before meeting resistance, and never be allowed to become less than ½ inch.

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

(4) ITEM 30, TRANSFER. Gears of transfer and declutching units and power take-off should shift smoothly, operate quietly, and not creep out of mesh during operation.

(5) ITEM 31, ENGINE AND CONTROLS. The driver must be on the alert for deficiencies in engine performance such as lack of usual power, misfiring or stalling, unusual noise or vibration, indications of overheating, or excessive exhaust smoke. Observe if engine responds to all controls without excessive looseness or binding.

(6) ITEM 32, INSTRUMENTS. During operation of the vehicle, observe if all pertinent instruments are indicating or recording the proper function of the units to which they apply. Also check speedometer to see if it is operating properly, and indicates vehicle speed, and if the odometer records the accumulating mileage.

(7) ITEM 33, STEERING GEAR. Note any indication of looseness or binding, pulling to one side, wandering, shimmy, wheel tramp, or unusual noise.

(8) ITEM 34, RUNNING GEAR. Be on the alert for any unusual operating characteristics or noise from wheels, axles, or suspension units that might indicate looseness, damage, or underinflated tires.

(9) ITEM 35, BODY AND TOWED LOAD. Note any noise or abnormal condition that might indicate shifting of body or load, loose top tarpaulin or curtains, loose or damaged doors, hardware, floor plates, or mounted body attachments. Note any sag, tilt, or weaving of towed load.

23. AT-HALT SERVICE.

a. At-halt Service 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.

b. Procedures. At-halt Service consists of investigating any deficiencies noted during operation, inspecting items listed below according to the procedures 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 fuel, oil, and coolant supply, and replenish as necessary. When refueling, use safety precautions for grounding static electricity, and allow space for expansion in filler neck. Fuel tank filler-cap vents must be open, radiator pressure cap valves must be free, and caps must be replaced securely. CAUTION: *Remove radiator cap cautiously. Do not fully remove until steam has escaped.* If engine is hot, fill slowly while engine is running at a fast idle. Investigate any unusual losses.

(2) ITEM 39, TEMPERATURES; HUBS, BRAKE DRUMS, TRANSMISSION, TRANSFER, AND AXLES. Place hand cautiously on each brake drum and wheel hub to see if it is abnormally hot. Inspect transfer case, transmission, and axle housings for overheating, and note any 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 all drive shafts and universal joints for looseness, damage, and excessive lubricant leaks. Remove any foreign matter wound around shafts or joints.

(5) ITEM 42, SPRINGS AND SUSPENSIONS. Examine all springs, shock absorbers, trunnion unit, torque rods, and mountings or connections, for looseness, damage, or excessive oil leaks.

(6) ITEM 43, STEERING LINKAGE. Examine all steering control mechanism, arms, and linkage joints for looseness or damage. Investigate any unusual condition noted during operation.

(7) ITEM 44, WHEEL AND FLANGE NUTS. See that all wheel mounting and axle flange nuts are present and secure.

(8) ITEM 45, TIRES. Inspect all tires for underinflation or damage. Remove embedded objects in treads or carcasses and from between duals. See that spare is inflated and secure in carrier.

(9) ITEM 46, LEAKS, GENERAL. Look under vehicle and within engine compartment for indications of fuel, oil, or coolant leaks. Trace any found to their source, and correct or report them to designated authority.

(10) ITEM 47, ACCESSORIES AND BELTS. Examine all accessible units for looseness or damage. Be sure drive belts have ½-inch finger pressure deflection.

(11) ITEM 48, AIR CLEANERS. If operating under extreme conditions of dust or sand, inspect all air cleaners and ventilator breather caps to be sure they are in condition to deliver clean air properly. Service as necessary.

(12) ITEM 49, FENDERS AND BUMPERS. Inspect front fenders, running boards, and all bumpers for looseness or damage.

(13) ITEM 50, TOWING CONNECTIONS. Inspect all towing devices for looseness or damage. Be sure pintle latch operates properly and locks securely.

(14) ITEM 51, BODY LOAD AND TARPAULIN. Inspect for damage and indications of looseness or shifting of cab, attachments, or equipment. Be sure top tarpaulin and curtains (when in use) are in good condition and properly fastened, and that any loaded items of special equipment are mounted or stowed securely.

(15) ITEM 52, GLASS. Clean all windshield, mirror, light, and warning reflector glass, and inspect for damage

24. AFTER-OPERATION AND WEEKLY SERVICE.

a. After-operation Service is particularly important because, at this time, the driver inspects his vehicle to detect any deficiencies that may have developed, and corrects those he is permitted to handle. He should report promptly, to the designated individual in authority the results of his inspection. If this schedule is performed thoroughly, the vehicle 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 the vehicle is in the same condition in which it was 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, the procedures for which are indicated in step *(b)* of each applicable item.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

(1) ITEM 55, ENGINE OPERATION. Test engine for satisfactory performance 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.

(2) ITEM 56, INSTRUMENTS. Before stopping engine, check all pertinent instruments to be sure they continue to indicate or record the proper operation of the units to which they apply. Investigate or report any unusual operation of any instrument noticed during operation.

(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 any appreciable amount of coolant is necessary, have antifreeze value checked, and add a sufficient amount to protect cooling system against freezing. Use care in removing pressure radiator cap. Do not entirely remove until steam has escaped, and do not add coolant while engine is too hot. Fill all spare fuel, oil, and water cans if supply has been used.

(4) ITEM 57, SIREN, HORN, AND WINDSHIELD WIPERS. If tactical situation permits, test siren and horn. Inspect windshield wiper blades and arms for damage and loose mounting. Test for proper operation.

(5) ITEM 58, GLASS AND REAR-VISION MIRRORS. Clean all windshield and mirror glass, and inspect for looseness or damage.

(6) ITEM 59, LAMPS (LIGHTS) AND REFLECTORS. Inspect all lights for looseness or damage. If tactical situation permits, test all lights and switches for proper operation. Clean lenses.

(7) ITEM 60, FIRE EXTINGUISHERS. Inspect for looseness or damage and full charge. If extinguisher has been in use or valves opened, report for refill or exchange.

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

(9) ITEM 62, *BATTERY.

(a) Inspect battery to be sure it is clean, secure, and not leaking. See that cell caps are fingertight.

(b) Weekly. Clean dirt from top of battery. If terminal connections or posts are corroded, clean them thoroughly and apply fresh, thin coating of grease. Tighten terminal bolts if loose. Check level of electrolyte, and add water if required. (During freezing weather, do not add water until just before operation.) Battery should be secure, not bulging, or leaking electrolyte; battery carrier should be secure, clean, free of rust, and well painted. Tighten mountings cautiously. Report any defects.

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

(10) ITEM 63, ACCESSORIES AND BELTS (fig. 92). Inspect units such as carburetor, generator, cranking motor, fan, water pump, compressor, distributor, regulator unit, and oil filters, for looseness, damage, or leaks. Check condition and adjustment of drive belts. Belts should have ½-inch finger pressure deflection. Investigate, and correct or report any deficiencies of accessory units or drives noted during operation.

(11) ITEM 64, ELECTRICAL WIRING. Inspect all ignition wiring for looseness or damage; wipe off excessive grease or moisture. Also make an inspection of all accessible low voltage wiring and connections for looseness or damage, and be sure all wiring is supported, so as not to chafe against other vehicle parts.

(12) ITEM 65, *AIR CLEANER AND BREATHER CAP (fig. 85).

(a) Inspect air cleaner and breather cap for looseness or damage. Examine oil in reservoirs for correct level and excessive dirt. When operating in sandy or dusty conditions, clean and service air cleaner and breather cap as often as necessary.

(b) Weekly. Remove air cleaner and breather reservoirs and elements, wash in dry-cleaning solvent, refill reservoirs with clean oil, and reinstall securely. Be sure all gaskets seal properly, and that joints and connections are secure.

(13) ITEM 66, *FUEL FILTER (fig. 83).

(a) Inspect fuel filter for looseness, damage, and fuel leaks.

(b) Weekly. Remove sediment bowl drain plug, and drain off all accumulated dirt and water. If draining of fuel pump sediment bowl shows excessive dirt or water, remove and clean element in dry-cleaning solvent. When excessive water is present, report to higher echelon for draining of fuel tanks.

(14) ITEM 67, ENGINE CONTROLS. Examine all engine operating control linkage for looseness, damage, excessive wear, and adequate lubrication.

(15) ITEM 68, *TIRES.

(a) Examine all tires, including spares, for damage and excessive wear. Remove all embedded foreign matter, such as nails, glass, or stones, from treads and carcasses and from between duals. Check for low pressure, proper position of valve stems, and presence of valve caps. Inflate to maximum pressure of 70 pounds with cool tires as needed.

(b) Weekly. Replace badly worn or otherwise unserviceable tires. Serviceable tires which show abnormal wear should be relocated to other wheels to even wear. Apparent mechanical deficiencies causing such wear should be reported for attention by higher echelon.

(16) ITEM 69, SPRINGS AND SUSPENSIONS. Inspect front springs and shock absorbers, rear springs and seats, torque rods, mountings, and connections for looseness and damage. Check springs for abnormal sag, and shocks and spring seats for excessive oil leakage.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

(17) ITEM 70, STEERING LINKAGE. Inspect for bent, loose, or inadequately lubricated parts. Investigate irregularities noted during operation.

(18) ITEM 71, PROPELLER SHAFTS. Inspect all drive shafts and universal joints for looseness or damage and excessive oil leaks. Remove any foreign material wound around shafts or joints.

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

(a) See that all axle housing and transfer case vents are present, in good condition, and clean. Inspect for indications of excessive lubricant leakage from vents.

(b) Weekly. Remove vents and clean out passages. Reinstall securely.

(20) ITEM 73, LEAKS, GENERAL. Look in engine compartment and under vehicle for indications of fuel, engine oil, coolant, or gear oil leaks.

(21) ITEM 74, GEAR OIL LEVELS. Check gear oil levels in differentials, transfer case, transmission, and steering gear housing, and report if low. Correct levels are from lower edge of filler hole to ½ inch below when cool.

(22) ITEM 75, *AIR BRAKE TANKS.

(a) Inspect tanks and lines for looseness or damage. Open reservoir drain cocks, and drain off all accumulated water.

(b) Weekly. Tighten tank mountings and line connections. Clean air line rubber hose of all grease or oil.

(23) ITEM 76, FENDERS AND BUMPERS. Examine for looseness and damage.

(24) ITEM 77, TOWING CONNECTIONS. Inspect towing hooks or shackles, whiffletree, and pintle hooks for looseness, excessive wear, or damage.

(25) ITEM 78, BODY, LOAD, AND TARPAULIN. Inspect body carefully for damage or loose parts. Examine top tarpaulin and side curtains for worn spots or other damage, and see that they are secure. Load must be secure and properly stowed.

(26) ITEM 79, *WINCHES (FRONT AND REAR).

(a) Examine winch assembly for looseness or damage and excessive oil leaks at worm gear housing. See that winch drive shaft shear pins are in good condition and secure. Be sure sliding clutch operates freely and locks securely (air clutch rear winch). Examine rear winch drive chains and sprockets for looseness, damage, and adequate lubrication.

(b) Weekly. If vehicle has been operated in deep water, sample lubricant for contamination. If water is present, report condition. 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 1 or 2 inches, brake needs adjusting. If winch cable is dry or wound unevenly, unwind entire length, clean with a thin oil or kerosene, rewind evenly on winch drum applying a thin coat of engine oil while winding, and fasten cable chain and hook securely. NOTE: *Clean used oil is satisfactory*

(27) ITEM 82, *TIGHTENING.

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

(b) Weekly. Tighten wheel mounting and axle flange nuts and cap screws; spring U-bolts, eyebolts, shackels and rebound clips; universal joint companion flanges; engine mountings, transfer case mountings; steering arms, towing connections, or any other mounting or assembly nuts or screws that inspection or experience indicates are necessary on a weekly or mileage basis.

(28) ITEM 83, *LUBRICATE AS NEEDED.

(a) Lubricate all items, such as shackles, hinges, latches, control linkage frictional joints, or any point where inspection has indicated oilcan or hand greasing is needed.

(b) Weekly. Lubricate all points of the vehicle indicated on the Lubrication Guide as needing lubrication on a weekly or a mileage basis.

(29) ITEM 84, *CLEAN ENGINE AND VEHICLE.

(a) Clean dirt and grease or oil drippings from inside cab, engine compartment, and exterior of engine. Wipe off excess dirt and grease from entire vehicle

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

(30) ITEM 85, *TOOLS AND EQUIPMENT.

(a) Daily.

1. Tools and standard equipment. Check On Vehicle Stowage Lists, to be sure all items are present, serviceable, and properly and securely mounted or stowed.

2. Crane and boom winches and swinger. Inspect A-frame, outrigging, sheaves, cables, braces, and all crane control levers and operating linkage for looseness, damage, excessive wear, and adequate lubrication. See that boom cable winch and swinger are securely mounted and not leaking excessive lubricant; that drive chains and sprockets are in good condition, well lubricated, and not excessively worn.

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(b) Weekly.

1. Tools and standard equipment. Clean on-vehicle tools and equipment. See that tools with cutting edges are sharp and protected, and mount or stow all items properly and securely. Close stowage box covers and fasteners.

2. Crane and boom, winches and swinger. Clean all excessive dirt and grease from above equipment. Test all operating controls for free operation, and examine air clutch piping and connections for looseness or damage. Check lubricant levels in all gear cases, and report if low. Examine cables for worn strands and clean cables. As they are rewound, apply a film of engine oil. Be sure all shear pins are in place and serviceable. Examine drive chains to be sure they are not too slack and that tighteners are securely locked. Chains should have no appreciable deflection between sprockets. See that all assembly and mounting nuts or screws are present and secure. Look for broken frame welds or loose rivets. See that all loose crane attachments, braces, jacks, blocks, sheaves, etc., are properly and securely stowed.

Section VII

LUBRICATION

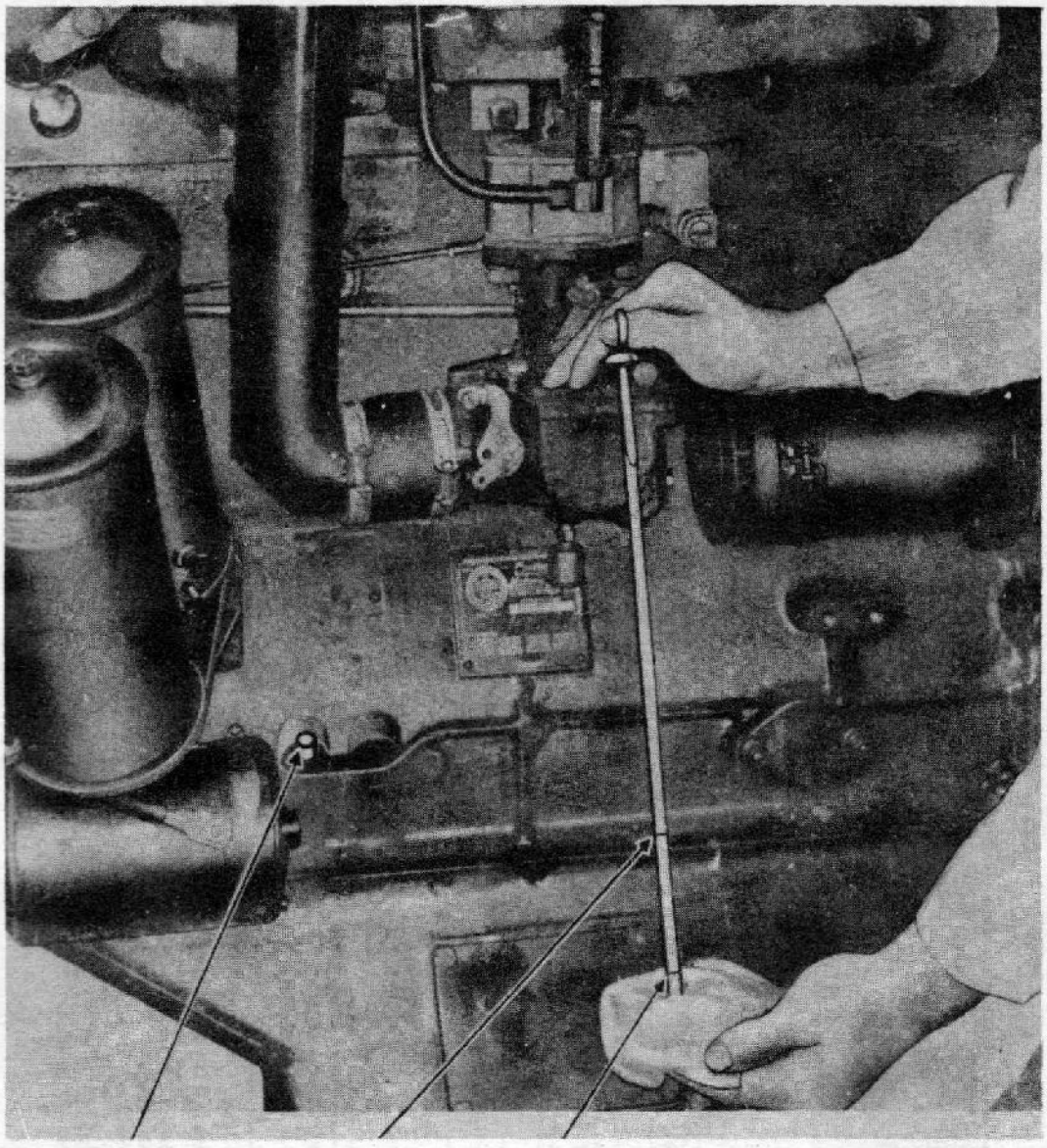
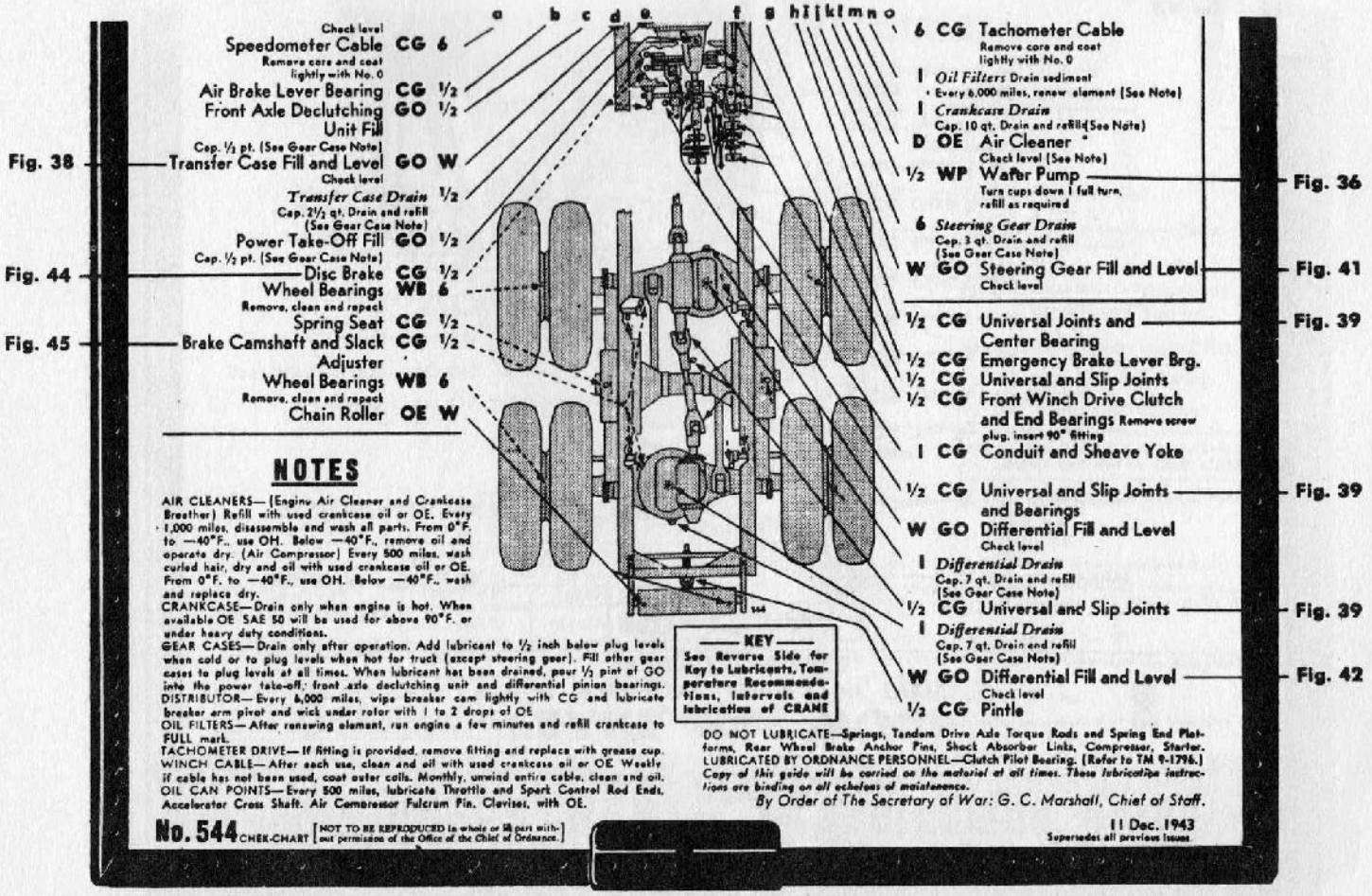


Figure 31—Oil Level Gage

25. LUBRICATION GUIDE.

a. War Department Lubrication Guide No. 544 and No. 544A (figs. 32, 33, and 34) prescribes first and second echelon lubrication maintenance. The figure references around the border of these illustrations refer to localized lubrication illustrations that facilitate location of lubrication points.

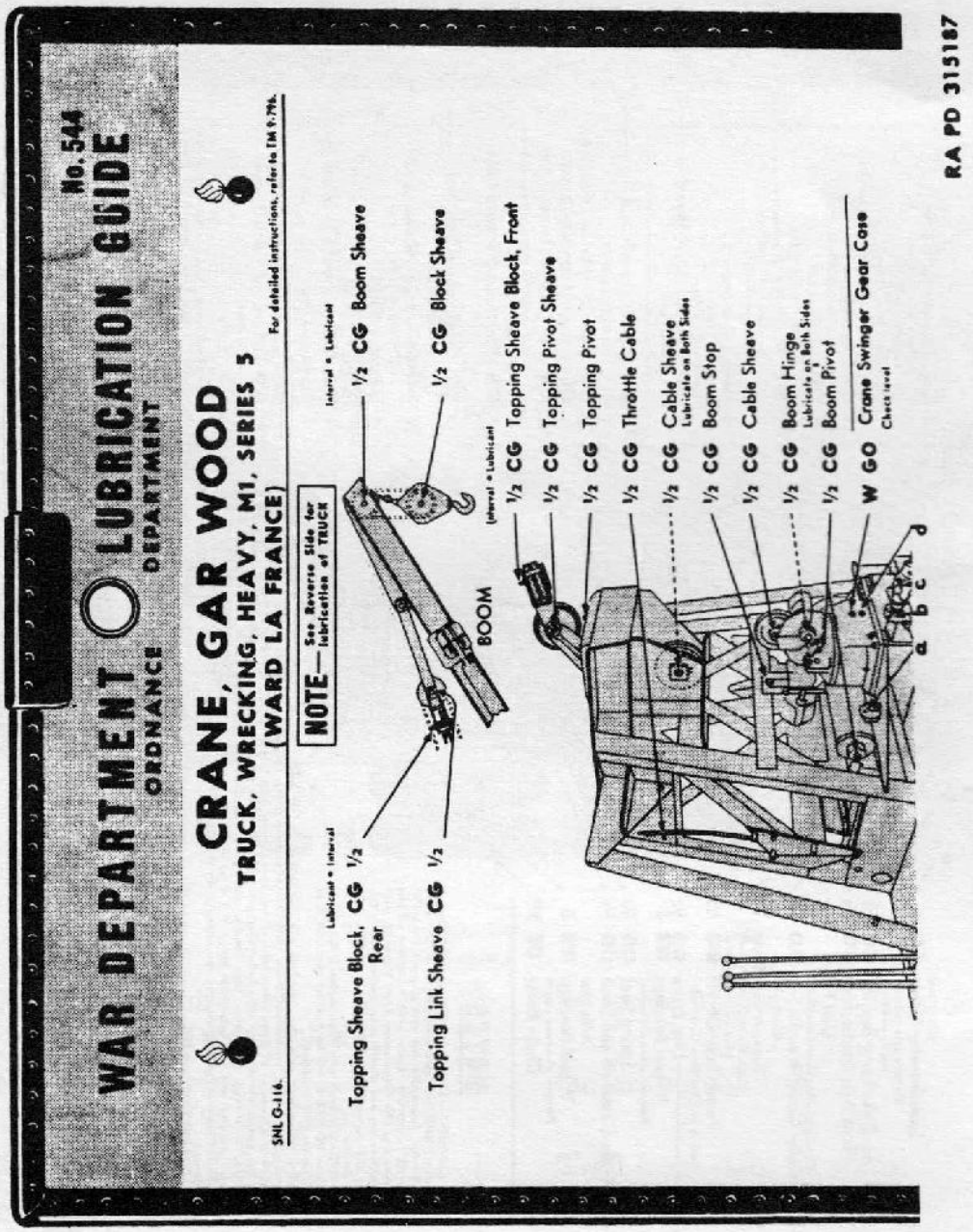
HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)



RA PD 315186B

Figure 32—Chassis Lubrication Chart

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)



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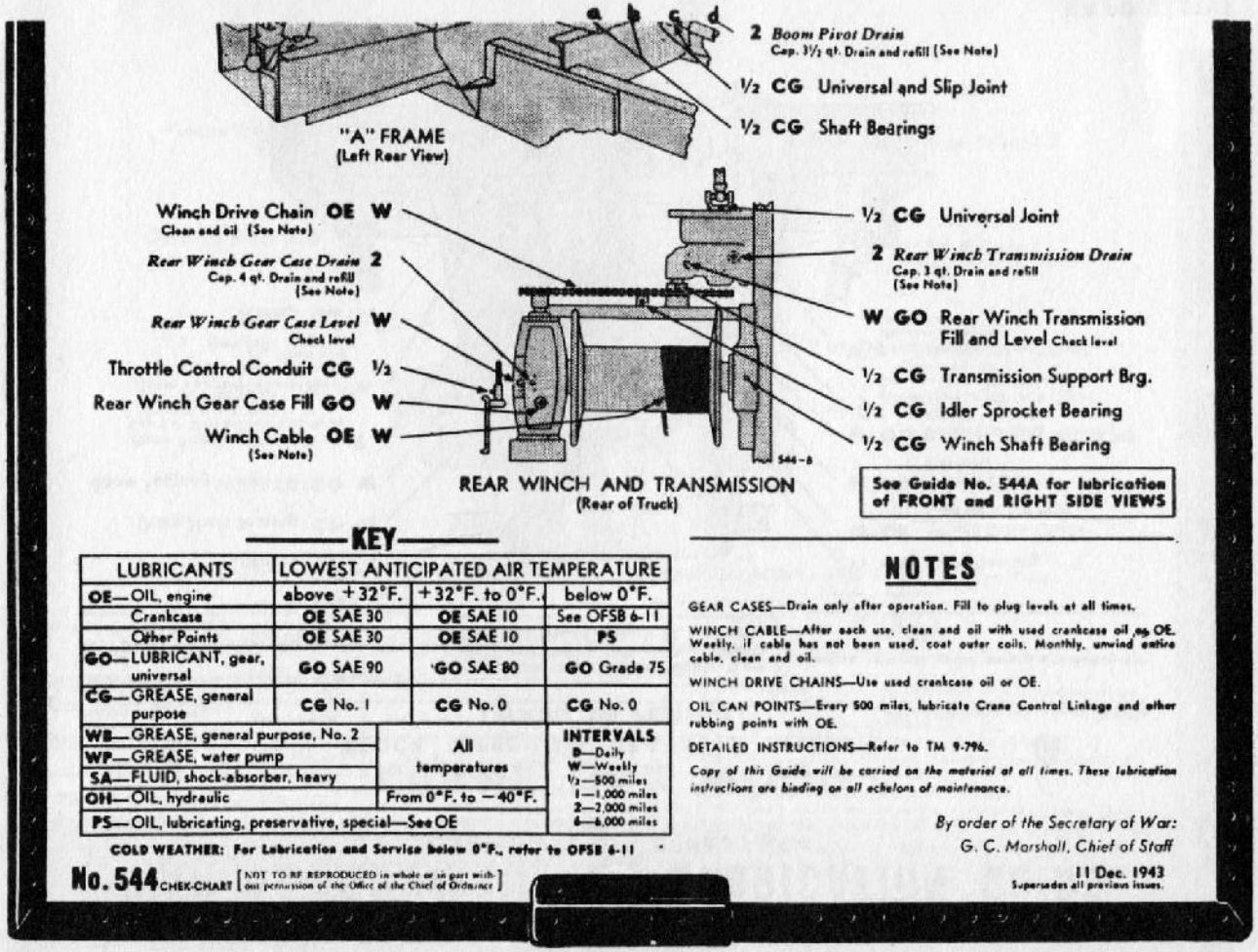

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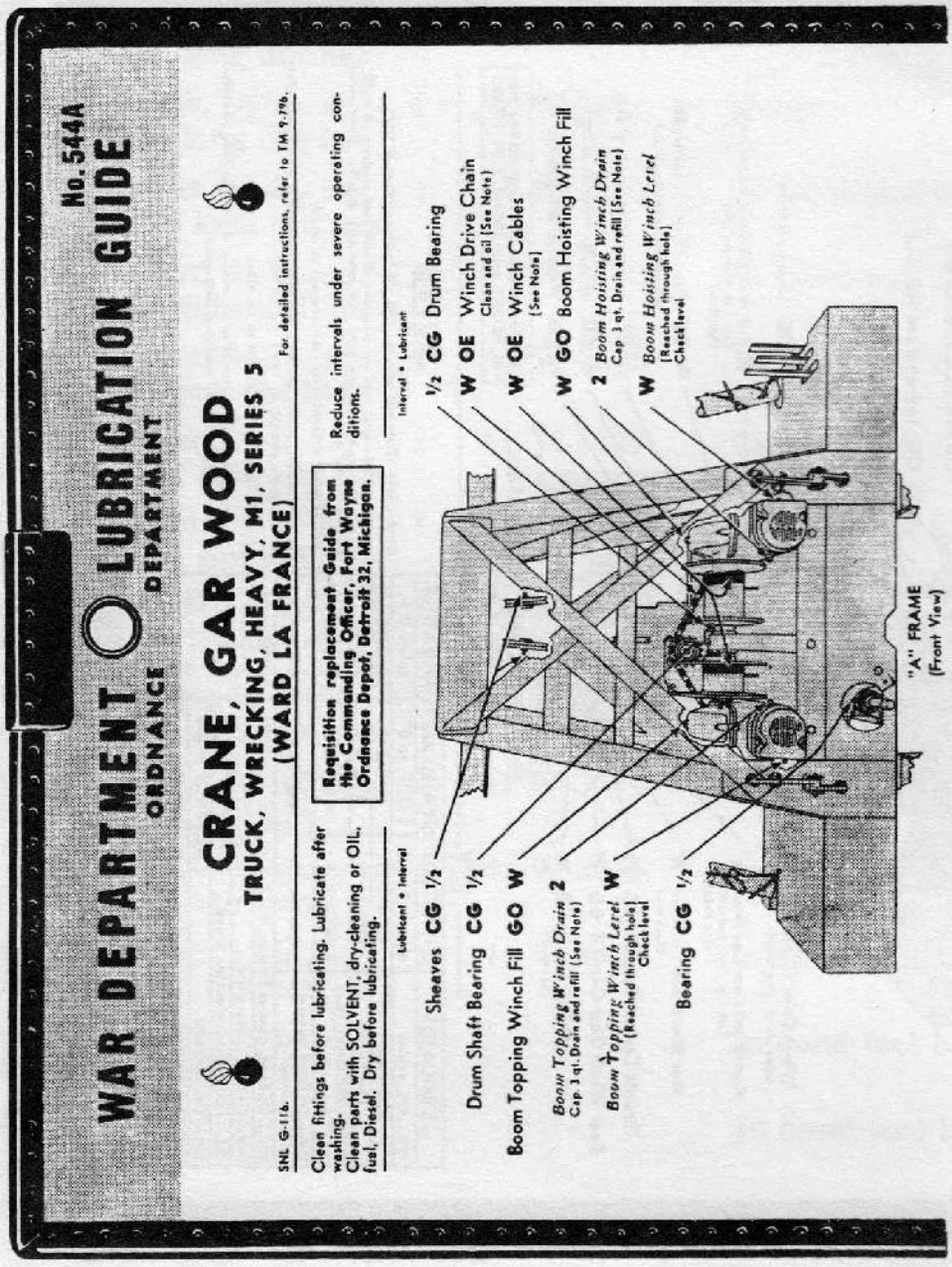
Figure 33—Crane Lubrication Chart

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)



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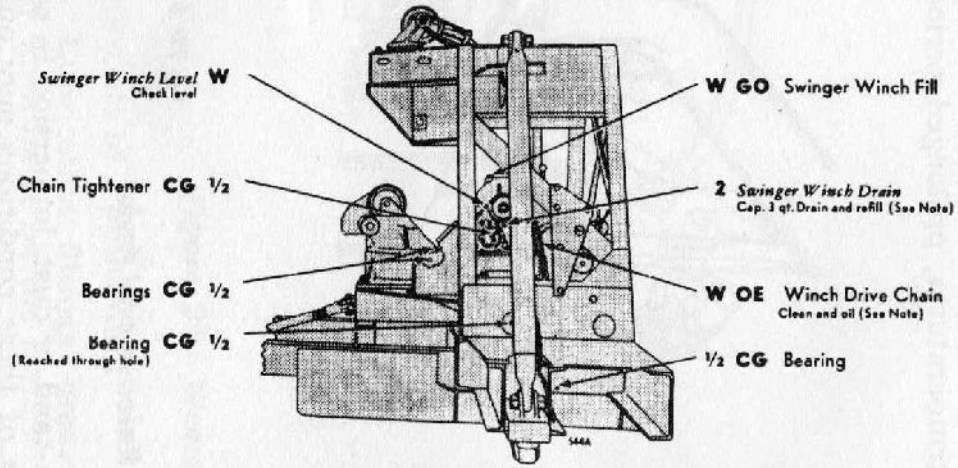

"A" FRAME
(Right Side View)

[See Guide No. 544 for lubrication of TRUCK, REAR WINCH AND TRANSMISSION, BOOM and "A" FRAME Left Rear View]

KEY

LUBRICANTS	LOWEST ANTICIPATED AIR TEMPERATURE		
	above +32°F.	+32°F. to 0°F.	below 0°F.
OE—OIL, engine	OE SAE 30	OE SAE 10	PS
GO—LUBRICANT, gear universal	GO SAE 90	GO SAE 80	GO Grade 75
CG—GREASE, general purpose	CG No. 1	CG No. 0	CG No. 0
PS—OIL, lubricating, preservative, special—See OE			INTERVALS W—Weekly ½—500 miles 2—2,000 miles

COLD WEATHER: For Lubrication and Service below 0°F., refer to OFSB 6-11.

NOTES

GEAR CASES — Drain only after operation. Fill to plug levels at all times.
WINCH CABLES—After each use, clean and oil with used crankcase oil or OE. Weekly, if cable has not been used, coat outer coils. Monthly, unwind entire cable, clean and oil.
WINCH DRIVE CHAINS — Use used crankcase oil or OE.
OIL CAN POINTS — Every 500 miles, lubricate Crane Control Linkage and other rubbing points with OE.
DETAILED INSTRUCTIONS—Refer to TM 9-796.
Copy of this Guide will be carried on the materiel at all times. These lubrication instructions are binding on all echelons of maintenance.

By order of the Secretary of War:
G. C. Marshall, Chief of Staff.

11 Dec. 1943
Supersedes all previous issues.

No. 544A CHEK-CHART

RA PD 315191B

Figure 34—Additional Crane Lubrication Chart

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

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 materiel is received without a Guide, the using arm shall immediately requisition a replacement from the Commanding Officer, Fort Wayne Ordnance Depot, Detroit 32, Michigan.

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 operating conditions. Reduce these intervals under extreme conditions such as excessively high or low temperatures, prolonged periods of

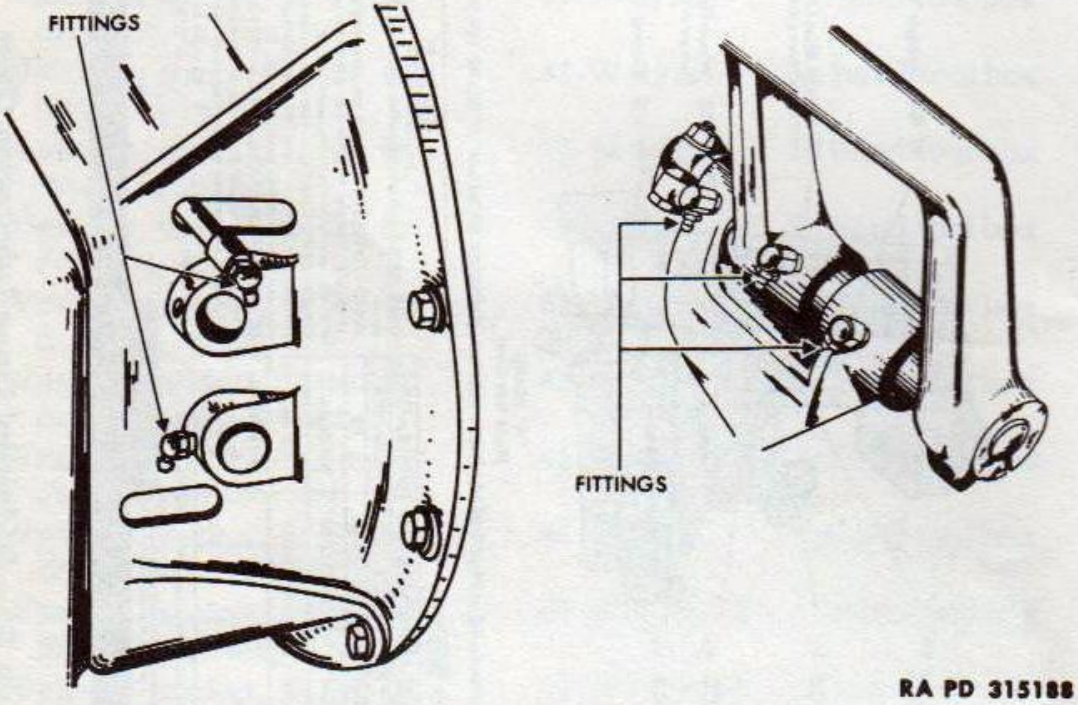

Figure 35—Clutch Release and Pedal

high speed, continued operation in sand or dust, immersion in water, or exposure to moisture. Any one of these conditions may quickly destroy the protective qualities of the lubricant and require servicing in order to prevent malfunctioning or damage to 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 changeover periods. Be especially observant when starting the engine. Sluggish starting is an indication that lubricants are thickening 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.

26. 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 ensure a proper distribution of the lubricant.

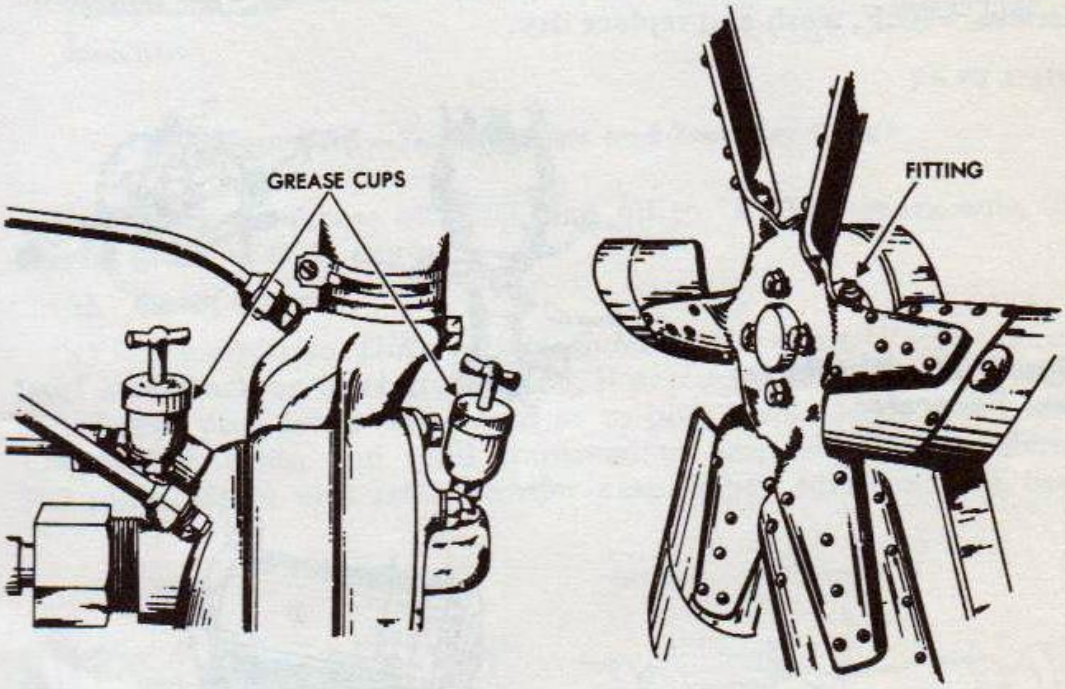

Figure 36—Water Pump and Fan

b. Points of Application.

(1) Lubrication fittings, grease cups, oilers, and oilholes are readily identifiable on the materiel by a red circle. Wipe clean such lubricators and the surrounding surface before lubricant is applied.

(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. Cleaning. Use SOLVENT, dry-cleaning, or OIL, fuel, Diesel, to clean or wash all parts. Use of gasoline for this purpose is prohibited. After washing, dry all parts thoroughly before applying lubricant.

d. Lubrication Notes on Individual Units and Parts. The following instructions supplement those notes on the Lubrication Guide which pertain to lubrication and service of individual units and parts.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

(1) AIR CLEANERS.

(a) Oil Bath Type. Daily, check level and refill engine air cleaner oil reservoir to bead level with used crankcase oil or OIL, engine, SAE 30 above +32°F or SAE 10 from +32°F to 0°F. From 0°F to −40°F, use OIL, hydraulic. Below −40°F, remove oil and operate dry. Every 1,000 miles (daily under extreme dust conditions), remove air cleaner and wash all parts.

(b) Element Type. Every 500 miles, wash element, dry, and reoil with used crankcase oil or OIL, engine, SAE 30 above +32°F or SAE 10 for +32°F to 0°F. From 0°F to −40°F, use OIL, hydraulic. Below −40°F, wash and replace dry.

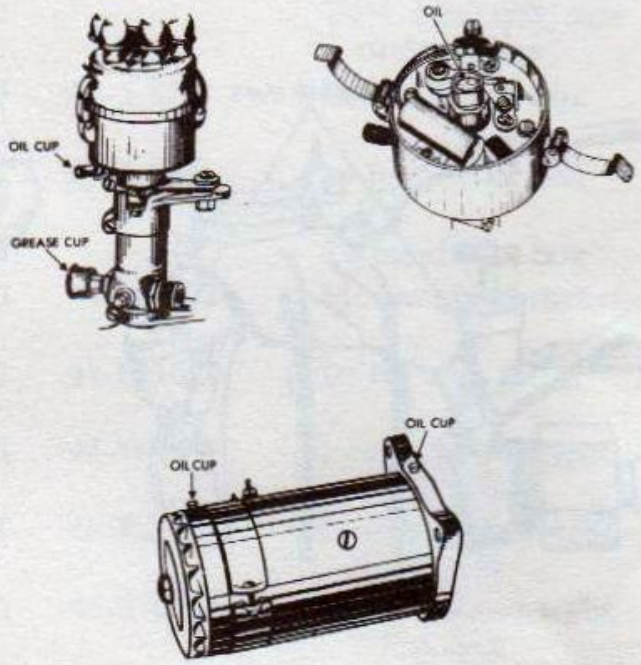

Figure 37—Distributor and Generator

RA PD 315190

(2) VENTS. Vents will be kept clean at all times. Inspect each time oil is checked and each time truck is operated under extremely dirty or muddy conditions.

(3) CRANKCASE. Daily, check level and refill to "FULL" mark with OIL, engine, SAE 30 above +32°F or SAE 10 for +32°F to 0°F. Below 0°F, refer to OFSB 6-11. Every 1,000 miles, remove drain plug from bottom of crankcase, and completely drain case. Drain only when engine is hot. After thoroughly draining, replace drain plug, and refill crankcase to "FULL" mark on gage with correct lubricant to meet temperature requirements. Run engine a few minutes and recheck oil level. Be sure pressure gage indicates oil is circulating.

(4) OIL FILTERS. Every 1,000 miles, remove drain plug from oil filter to drain sediment. Every 6,000 miles, or more often if filter becomes clogged, remove filter element, clean inside of case, and install new element. After renewing element, run engine a few min-

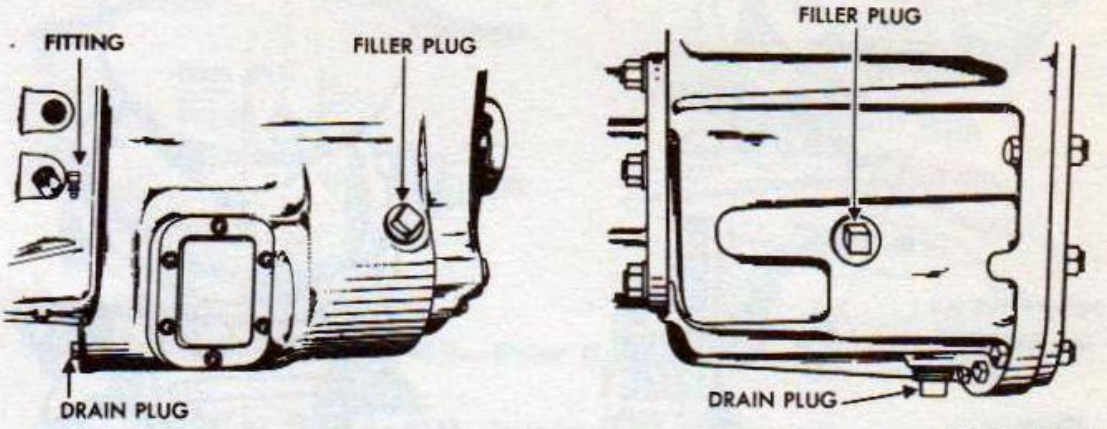

Figure 38—Transmission and Transfer Case

utes, recheck crankcase oil level, and fill to "FULL" mark with the correct grade of OIL, engine.

(5) GEAR CASES.

(a) Transmission, Differentials, and Transfer Case. Weekly, check level with truck on level ground and, if necessary, add lubricant to ½ inch below plug levels when cold or to plug levels when hot. Every 1,000 miles, drain and refill transmission and differentials. Every 500 miles, drain and refill transfer case. When lubricant has been

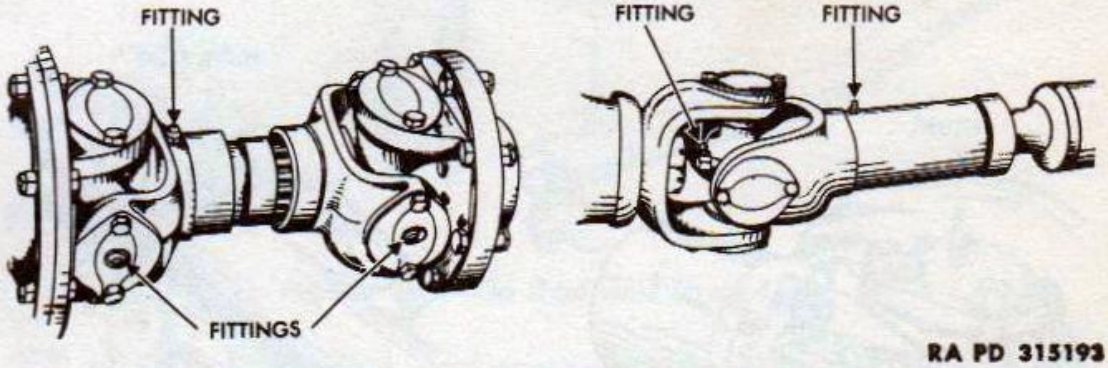

Figure 39—Universal Joints, Slip Joints, and Bearings

drained, pour ½ pint of recommended lubricant into power take-off, front axle declutching unit, and differential pinion bearings. Drain only after operation when gear lubricant is warm. Refill with LUBRICANT, gear, universal, SAE 90 above +32°F, SAE 80 from +32°F to 0°F, or grade 75 below 0°F.

(b) Winch Gear Case and Steering Gear. Weekly, check level with truck on level ground and, if necessary, fill to plug level at all times. Every 2,000 miles, drain and refill winch gear case. Every 6,000 miles, drain and refill steering gear. Drain only after operation, when gear lubricant is warm. Refill with LUBRICANT, gear, uni-

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

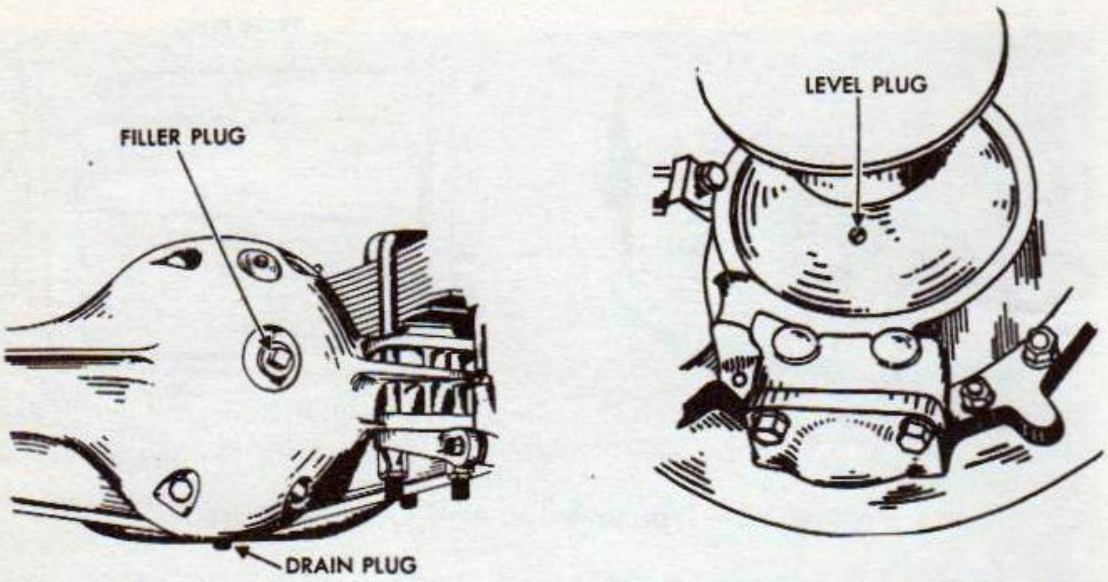

Figure 40—Front Axle

versal, SAE 90 above +32°F, SAE 80 from +32°F to 0°F, or grade 75 below 0°F.

(6) UNIVERSAL JOINTS (FRONT WHEELS). To fill, place truck on level ground. Remove the inspection plug in rear of joint, and fill through fitting to level of inspection plug hole. Remove fitting and replace plug. CAUTION: *Do not overfill.*

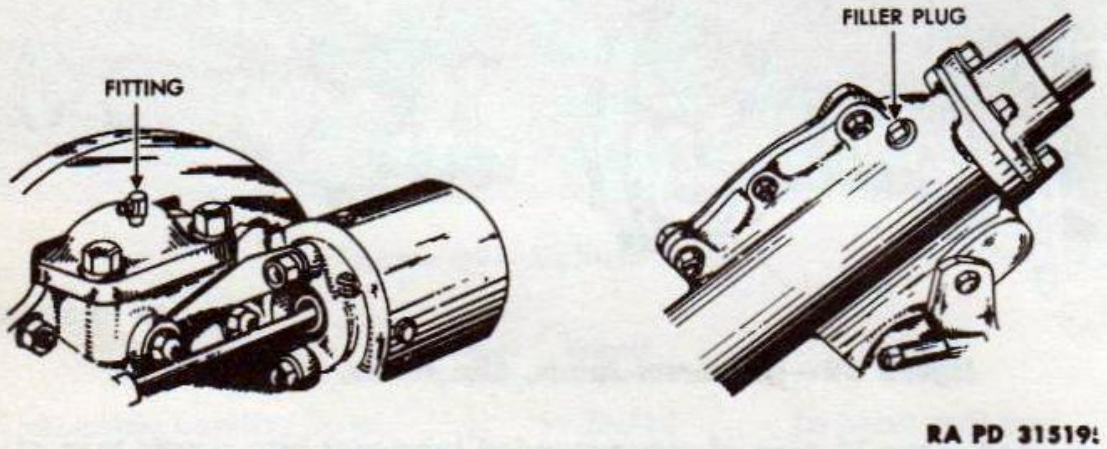

Figure 41—Steering Knuckle and Steering Gear

(7) UNIVERSAL JOINTS AND SLIP JOINTS (EXCEPT WINCH DRIVE SHAFT UNITS). Use GREASE, general purpose, No. 1 above +32°F or No. 0 below +32°F. Apply grease to universal joint until it overflows at the relief valve and to the slip joint until lubricant is forced from end of slip joint.

(8) DISTRIBUTOR. Every 1,000 miles, lubricate distributor shaft with six to eight drops of OIL, engine, SAE 30 above +32°F, SAE

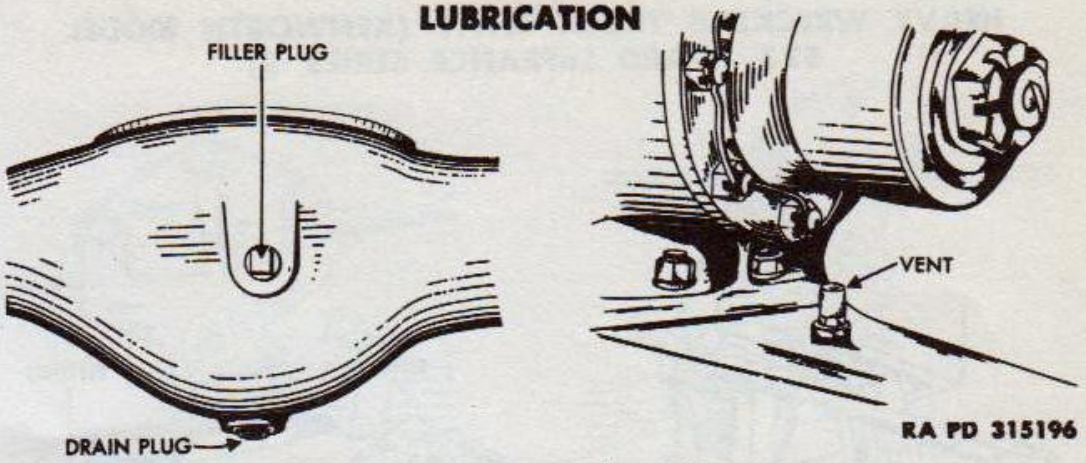

Figure 42—Rear Axle and Vent

10 for +32°F to 0°F, or OIL, lubricating, preservative, special, below 0°F. Every 6,000 miles, wipe the distributor breaker cam lightly with GREASE, general purpose, No. 1 above +32°F or No. 0 below +32°F. Also lubricate the breaker arm pivot, and wick under rotor with one to two drops of OIL, engine, SAE 30 above +32°F, SAE 10 for +32°F to 0°F, or OIL, lubricating, preservative, special, below 0°F.

(9) WINCH CABLE. After each use, clean and oil with used crankcase oil or OIL, engine, SAE 30 above +32°F, SAE 10 for +32°F to

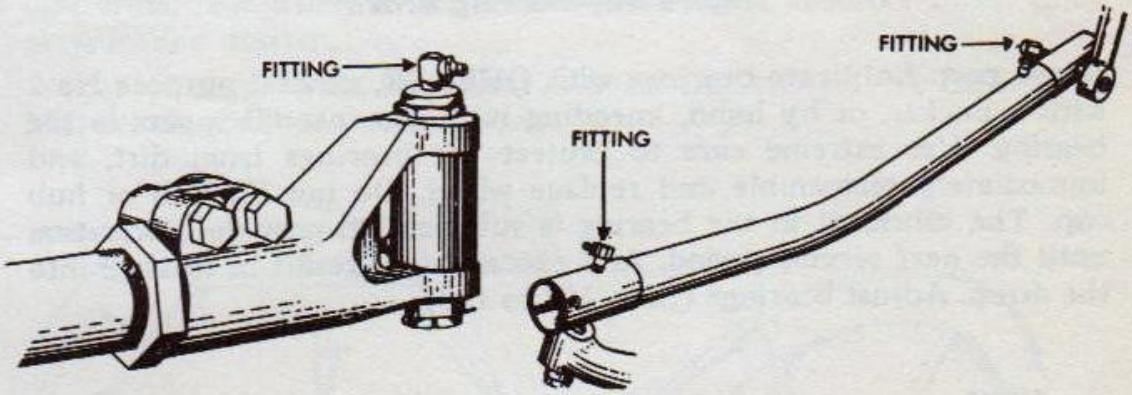

Figure 43—Tie Rod and Drag Link

0°F, or OIL, lubricating, preservative, special, below 0°F. Weekly, if cable has not been used, coat outer coils. Monthly, unwind entire cable, clean and oil.

(10) WINCH DRIVE CHAINS. Weekly, clean and oil with used crankcase oil or OIL, engine, SAE 30 above +32°F, SAE 10 for +32°F to 0°F, or OIL, lubricating, preservative, special, below 0°F.

(11) WHEEL BEARINGS. Remove bearing cone assemblies from hub. Wash bearings, cones, spindle, and inside of hub; dry thoroughly. Do not use compressed air. Inspect bearing races, and replace if damaged. Wet the spindle, inside of hub, and hub cap with GREASE, general purpose No. 2, to a maximum thickness of $\frac{1}{16}$ inch only to

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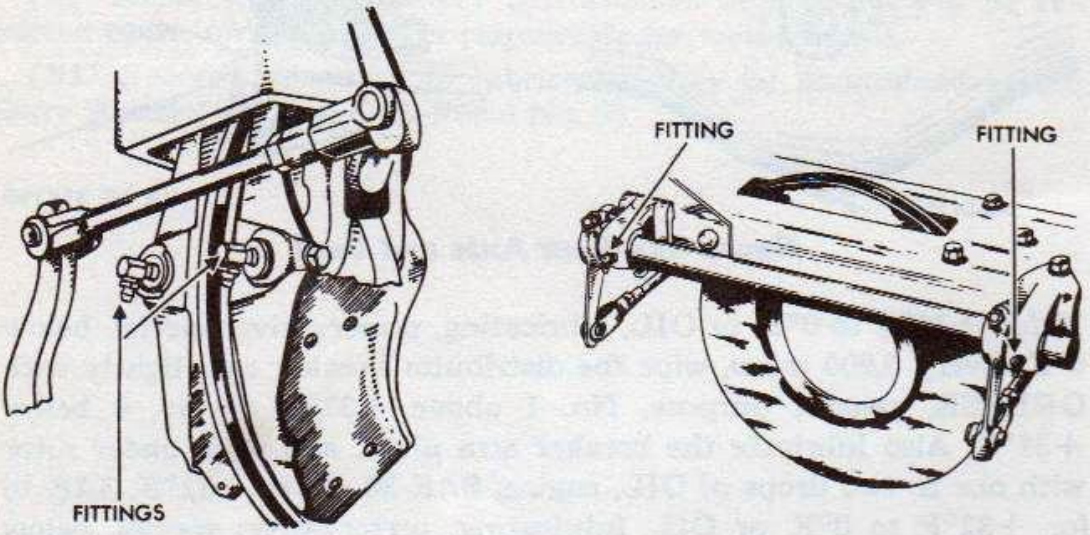

Figure 44—Parking Brake

retard rust. 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 the bearings from dirt, and immediately reassemble and replace wheel. Do not fill hub or hub cap. The lubricant in the bearing is sufficient to provide lubrication until the next service period. Any excess might result in leakage into the drum. Adjust bearings (pars. 196 to 198).

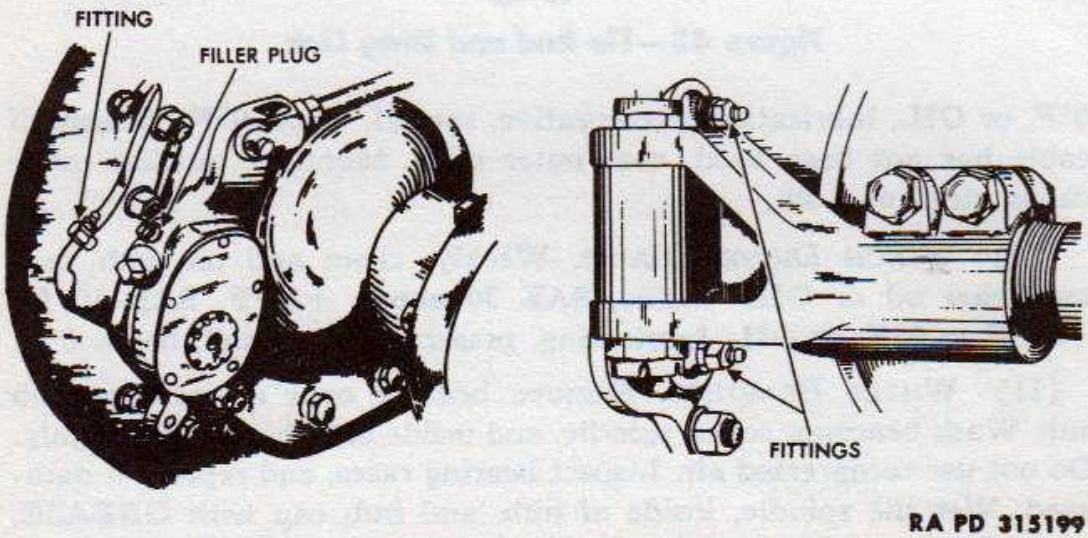

Figure 45—Brake Camshaft and Shoes

LUBRICATION

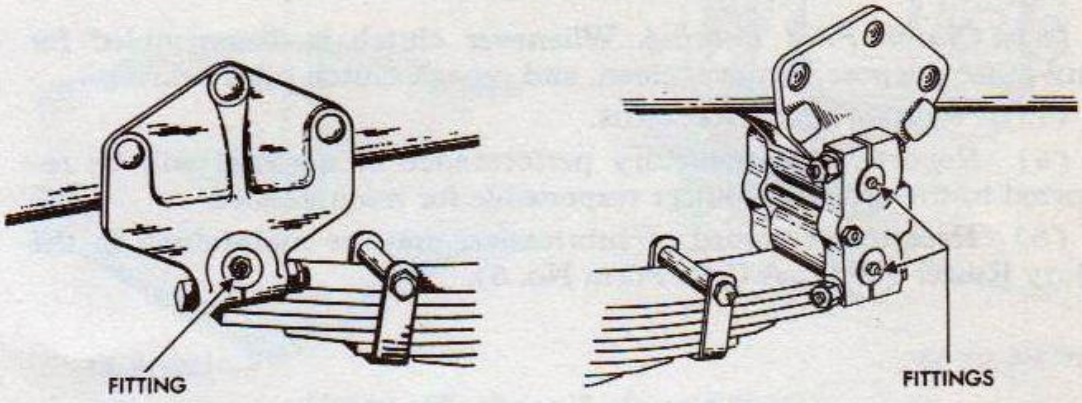

Figure 46—Front Spring

(12) OILCAN POINTS. Every 500 miles, lubricate throttle and spark control rod ends, accelerator cross shaft, air compressor fulcrum pin, clevises, crane control linkage with OIL, engine, SAE 30 above +32°F, SAE 10 +32°F to 0°F, OIL, lubricating, preservative, special, below 0°F.

(13) POINTS NOT TO BE LUBRICATED. The following items are not lubricated: Springs, tandem drive axle torque rods and spring end platforms, rear wheel brake anchor pins, shock absorber links, compressor, and starter.

(14) POINT TO BE SERVICED AND/OR LUBRICATED BY ORDNANCE MAINTENANCE PERSONNEL ONLY.

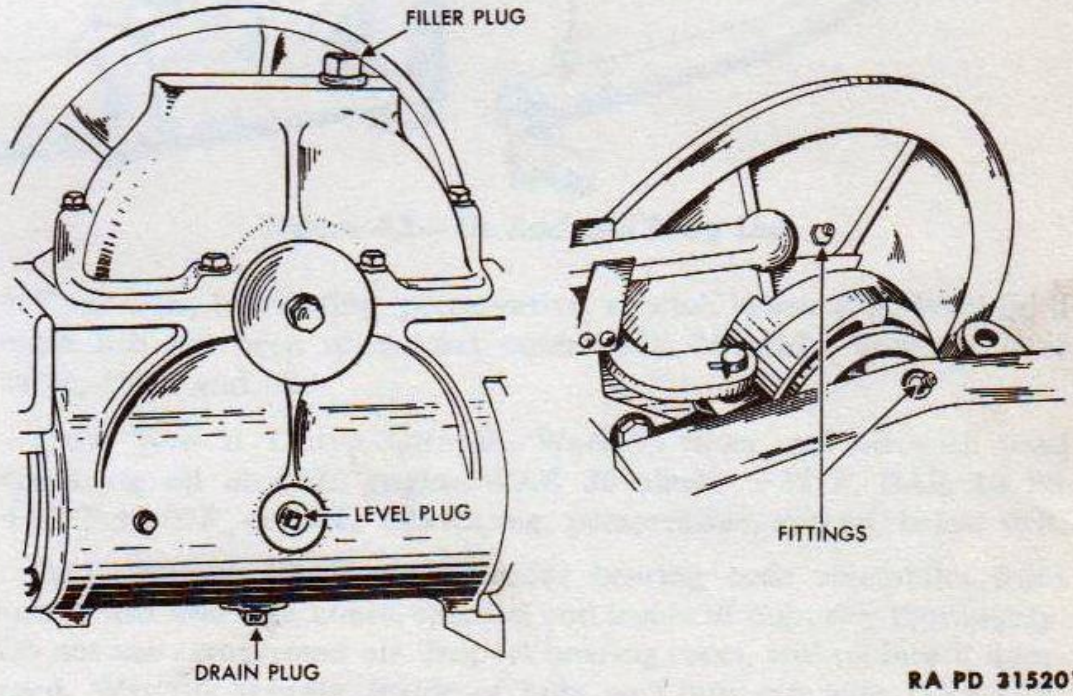

Figure 47—Front Winch

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(a) Clutch Pilot Bearing. Whenever clutch is disassembled for any other purpose, remove, clean, and repack clutch pilot bearing.

(15) REPORTS AND RECORDS.

(a) Reports. Unsatisfactory performance of materiel will be reported to the ordnance officer responsible for maintenance.

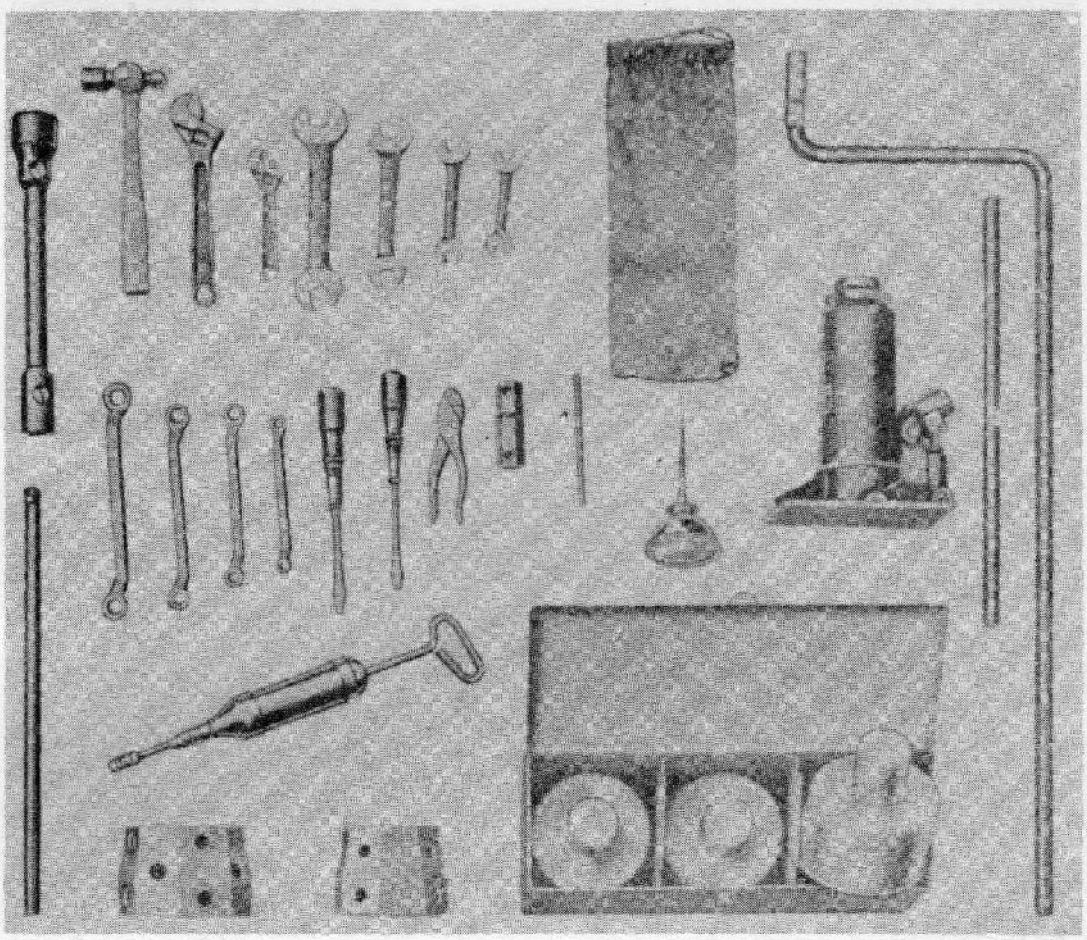
(b) Records. A record of lubrication may be maintained in the Duty Roster (W.D., A.G.O. Form No. 6).

Section VIII

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE

27. VEHICLE TOOLS.

a. Purpose. The lists in paragraphs 27 and 28 are for information only and must not be used as a basis for requisition.



RA PD 315202

Figure 48—Vehicle Tools

b. Vehicle Tools.

	Number Carried	Federal Stock No.	Where Carried
AXE, handled, chopping, single bit, 5-lb	1	41-A-1279	Mounted in bracket
BAR, pry, 7/8 x 30-in. dia.	2	41-B-282	Long tool box right-hand side
BAR, cross, handle, 7/32-in. dia., 4 in. long	1	41-B-153	In hand tool box

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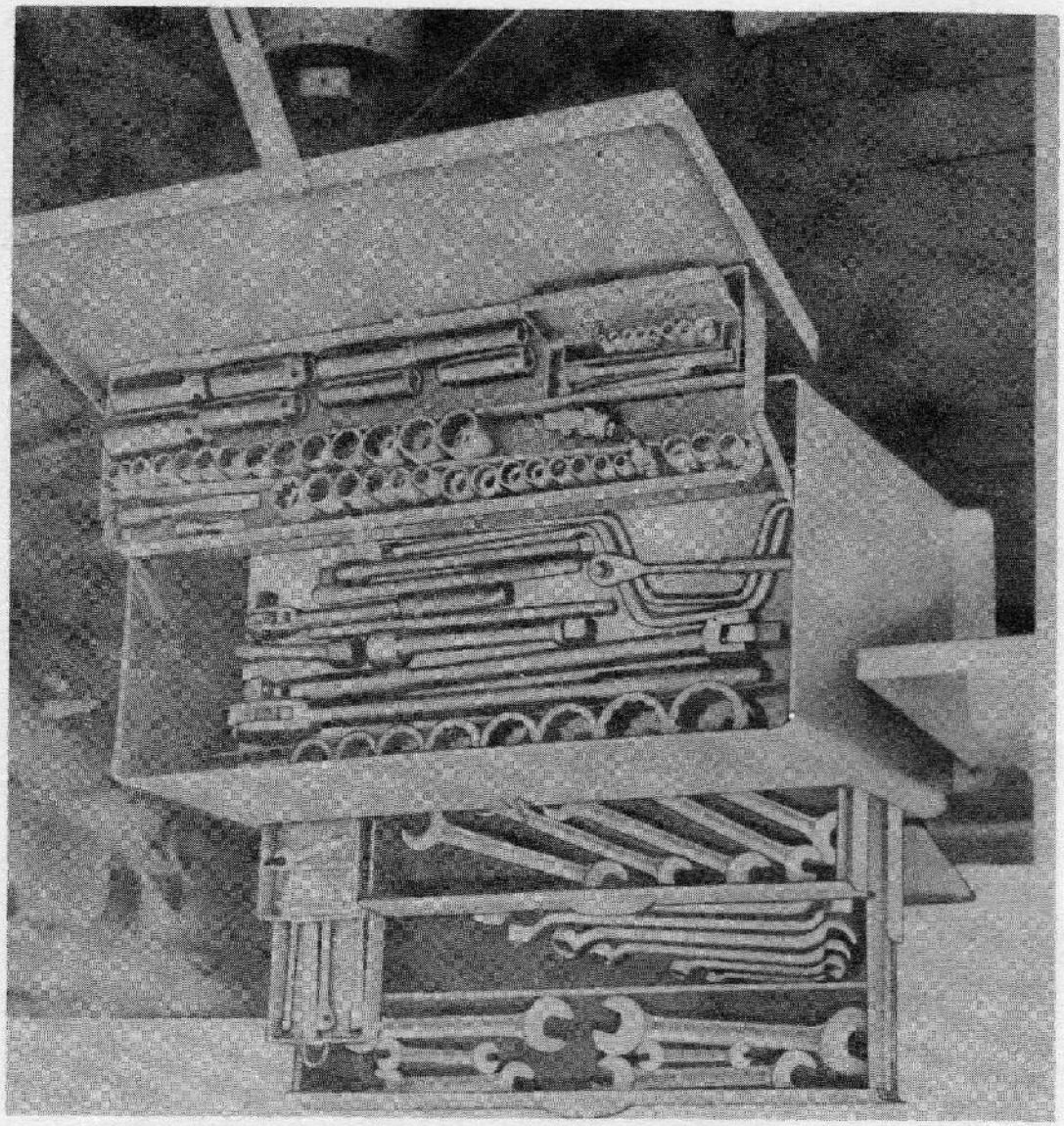

RA PD 315203

Figure 49—Vehicle Tools

	Number Carried	Federal Stock No.	Where Carried
BAR, cross, handle, 3/8-in. dia., 7 in. long	1	41-B-312	In hand tool box
BAR, cross, handle, 1/2-in. dia., 11 in. long	1	41-B-155	In hand tool box
BAR, cross, handle, 3/4-in. dia., 18 in. long	1	41-B-157	In hand tool box
BAR, crow, pinch point, 42-in.	2		Long tool box, right-hand side
BAR, crow, pinch point, 5-ft	2	41-B-175	Mounted on boom

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE

	Number Carried	Federal Stock No.	Where Carried
BAR, socket, extension, 3/8-in. sq drive, 6 in. long	1	41-B-312	In hand tool box
BAR, socket, extension, 3/8-in. sq drive, 12 in. long	1	41-B-305-500	In hand tool box
BAR, socket extension, 1/2-in. sq drive, 5 in. long	1	41-B-311-200	In hand tool box
BAR, socket extension, 1/2-in. sq drive, 10 in. long	1	41-B-309	In hand tool box
BAR, socket extension, 3/4-in. sq drive, 8 1/2 in. long	1	41-B-309-20	In hand tool box
BIT, screwdriver attachment, 11/16- x 1/16- x 1 in. long, 1/2-in. sq drive	1	41-B-644	In hand tool box
BIT, screwdriver attachment, 15/16- x 7/64- x 1 1/2 in. long, 1/2-in. sq drive	1	41-B-648	In hand tool box
BLADE, hacksaw, 12-in.	12	41-B-1165	Tool box, right-hand side
CHISEL, blacksmith, 1 3/4 in., with handle	1		Long tool box right-hand side
CHISEL, 1-in. cut, 24 in. long	2		Long tool box right-hand side
CLIPPER, bolt, 5/8-in. capacity	1	41-C-2283	Long tool box right-hand side
CUTTERS, diagonal	1	41-P-1714	Long tool box right-hand side
FILE, 3 square smooth, 6-in.	1	41-F-1572	Long tool box right-hand side
FRAME, hacksaw, adjustable, 8 in. to 12 in., w/handle	1	41-F-3394	Long tool box right-hand side
GUN, lubricating, pressure	1	41-G-1330-60	Tool box, left side under crane
HAMMER, claw	1	41-H-198	Long tool box right-hand side
HANDLE, hinged offset, 1/4-in. sq drive, 5 in. long	1	41-H-1502-75	In hand tool box
HANDLE, hinged offset, 3/8-in. sq drive, 8 in. long	1	41-H-1502-85	In hand tool box
HANDLE, hinged offset, 1/2-in. sq drive, 15 in. long	1	41-H-1502-100	In hand tool box
HANDLE, hinged offset, 3/4-in. sq drive, 19 in. long	1	41-H-1504-25	In hand tool box
HANDLE, mattock	1	41-H-1286	Mounted in bracket
HANDLE, ratchet, reversible, 3/8-in. sq drive, 7 in. long	1	41-H-1504-560	In hand tool box

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	Number Carried	Federal Stock No.	Where Carried
HANDLE, ratchet, reversible, ½-in. sq drive, 10 in. long	1	41-H-1505	In hand tool box
HANDLE, ratchet, reversible, ¾-in. sq drive, 20 in. long	1	41-H-1506	In hand tool box
HANDLE, socket wrench, speeder, ⅜-in. sq drive, 18 in. long	1	41-H-1507-95	In hand tool box
HANDLE, socket wrench, speeder, 17 in. long	1	41-H-1508	In hand tool box
HANDLE, spark plug wrench	1		In kit bag
HANDLE, wheel wrench	1		Tool box left side under crane
JOINT, universal, ⅜-in. sq drive	1	41-J-378	In hand tool box
JOINT, universal, ½-in. sq drive	1	41-J-380	In hand tool box
KEY, release	1		In hand tool box
MATTOCK, pick M1, w/out handle	1	41-M-722	Mounted in bracket
PLIERS, combination, slip joint, 6-in.	1	41-P-1650	In kit bag
PLIERS, heavy duty, 10 in.	1	41-P-1777	Long tool box right-hand side
PUNCH, blacksmith, ⅜-in. point (set)	1	41-P-3117	Long tool box right-hand side
SAW, crosscut, 54-in. w/handles	1	41-S-143	Long tool box right-hand side
SAW, crosscut, 24 in. long, 8 points per inch	1	41-S-185	Long tool box right-hand side.
SCREWDRIVER, common, 6-in. blade	1	41-S-1104	Long tool box right-hand side
SCREWDRIVER, common, 12-in. blade	1	41-S-1110	Long tool box right-hand side
SCREWDRIVER, common, 18-in. blade	1	41-S-1116	Long tool box right-hand side
SCREWDRIVER, machinist's, 5-in. blade	1	41-S-1385	In kit bag
SHOVEL, short handle	2	41-S-1372	Mounted in bracket
SLEDGE, blacksmith's, double face, 10-lb	2	41-S-3726	Mounted in bracket
WRENCH, adjustable, automobile type, 12-in.	1	41-W-448	In kit bag
WRENCH, adjustable, automobile type, 15-in.	1	41-W-450	In kit bag

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE

	Number Carried	Federal Stock No.	Where Carried
WRENCH, adjustable, crescent type, 18 in. long	1	41-W-490	Long tool box right-hand side
WRENCH, box, dbl head, dbl hex, short dbl offset, 3/8- x 7/16-in.	1	41-W-620	In hand tool box
WRENCH, box, dbl head, dbl hex, short dbl offset, 1/2- x 9/16-in.	1	41-W-622	In hand tool box
WRENCH, box, dbl head, dbl hex, short dbl offset, 5/8- x 11/16-in.	1	41-W-624	In hand tool box
WRENCH, box, dbl head, dbl hex, long dbl offset, 3/4- x 25/32-in.	1	41-W-603-25	In hand tool box
WRENCH, box, dbl head, dbl hex, long dbl offset, 13/16- x 7/8-in.	1	41-W-605	In hand tool box
WRENCH, box, dbl head, dbl hex, long dbl offset, 15/16- x 1-in.	1	41-W-608	In hand tool box
WRENCH, engineer's, open-end (tappet) 1/2- x 9/16-in.	2	41-W-3576	In hand tool box
WRENCH, engineer's, open-end (tappet) 5/8- x 11/16-in.	2	41-W-3580	In hand tool box
WRENCH, engineer's, open-end (tappet) 3/4- x 7/8-in.	2	41-W-3584	In hand tool box
WRENCH, engineer's, open-end, 3/16- x 7/32-in.	1	41-W-965	In hand tool box
WRENCH, engineer's, open-end, 1/4- x 9/32-in.	1	41-W-966	In hand tool box
WRENCH, engineer's, open-end, 5/16- x 11/32-in.	1	41-W-967	In hand tool box
WRENCH, engineer's, open-end, 5/16- x 3/8-in.	1	41-W-990	In hand tool box
WRENCH, engineer's, open-end, 3/8- x 7/16-in.	1	41-W-991	In hand tool box
WRENCH, engineer's, open-end, 7/16- x 1/2-in.	1	41-W-1000	In hand tool box
WRENCH, engineer's, open-end, 1/2- x 19/32-in.	1	41-W-1003	In kit bag
WRENCH, engineer's, open-end, 9/16- x 5/8-in.	1	41-W-1005	In hand tool box
WRENCH, engineer's, open-end, 9/16- x 11/16-in.	1	41-W-1005-5	In kit bag
WRENCH, engineer's, open-end, 5/8- x 25/32-in.	1	41-W-1008-10	In kit bag

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	Number Carried	Federal Stock No.	Where Carried
WRENCH, engineer's, open-end, 11/16- x 7/8-in.	1	41-W-1011-40	In hand tool box
WRENCH, engineer's, open-end, 3/4- x 13/16-in.	1	41-W-1017	In hand tool box
WRENCH, engineer's, open-end, 3/4- x 7/8-in.	1	41-W-1012-5	In kit bag
WRENCH, engineer's, open-end, 15/16- x 1-in.	1	41-W-1021	In hand tool box
WRENCH, pipe adjustable 18-in.	1	41-W-1664	Long tool box right-hand side
WRENCH, socket, 1/4-in. sq drive, 3/16-in. hex	1	41-W-2970	In hand tool box
WRENCH, socket, 1/4-in. sq drive, 7/32-in. hex	1	41-W-2971	In hand tool box
WRENCH, socket, 1/4-in. sq drive, 1/4-in. hex	1	41-W-2972	In hand tool box
WRENCH, socket, 1/4-in. sq drive, 9/32-in. hex	1	41-W-2973-100	In hand tool box
WRENCH, socket, 1/4-in. sq drive, 5/16-in. dbl hex	1	41-W-2974	In hand tool box
WRENCH, socket, 1/4-in. sq drive, 11/32-in. dbl hex	1	41-W-2975	In hand tool box
WRENCH, socket, 1/4-in. sq drive, 3/8-in. dbl hex	1	41-W-2976	In hand tool box
WRENCH, socket, 1/4-in. sq drive, 7/16-in. dbl hex	1	41-W-2977	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 5/16-in. single hex	1	41-W-2999-25	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 3/8-in. dbl hex	1	41-W-2999-50	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 7/16-in. dbl hex	1	41-W-2999-75	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 1/2-in. dbl hex	1	41-W-2999-100	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 9/16-in. dbl hex	1	41-W-2999-125	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 5/8-in. dbl hex	1	41-W-2999-175	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 11/16-in. dbl hex	1	41-W-2999-225	In hand tool box
WRENCH, socket, 3/8-in. sq drive, 3/4-in. dbl hex	1	41-W-2999-250	In hand tool box
WRENCH, socket, universal joint, 3/8-in. sq drive, 1/2-in. dbl hex	1	41-W-2999-120	In hand tool box

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE

	Number Carried	Federal Stock No.	Where Carried
WRENCH, socket, universal joint, 3/8-in. sq drive, 9/16-dbl hex	1	41-W-2999-145	In hand tool box
WRENCH, socket, universal joint, 3/8-in. sq drive, 5/8-in. dbl hex	1	41-W-2999-210	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 7/16-in. dbl hex	1	41-W-3005	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 1/2-in. dbl hex	1	41-W-3007	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 9/16-in. dbl hex	1	41-W-3009	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 19/32-in. dbl hex	1	41-W-3011	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 5/8-in. dbl hex	1	41-W-3013	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 11/16-in. dbl hex	1	41-W-3015	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 3/4-in. dbl hex	1	41-W-3017	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 25/32-in. dbl hex	1	41-W-3019	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 13/16-in. dbl hex	1	41-W-3021	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 7/8-in. dbl hex	1	41-W-3023	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 15/16-in. dbl hex	1	41-W-3025	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 1-in. dbl hex	1	41-W-3027	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 1 1/16-in. dbl hex	1	41-W-3029	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 3/8-in. dbl sq	1	41-W-3001-200	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 7/16-in. dbl sq	1	41-W-3001-300	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 1/2-in. dbl sq	1	41-W-3001-325	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 9/16-in. dbl sq	1	41-W-3001-350	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 5/8-in. dbl sq	1	41-W-3001-375	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 3/4-in. dbl sq	1	41-W-3001-450	In hand tool box

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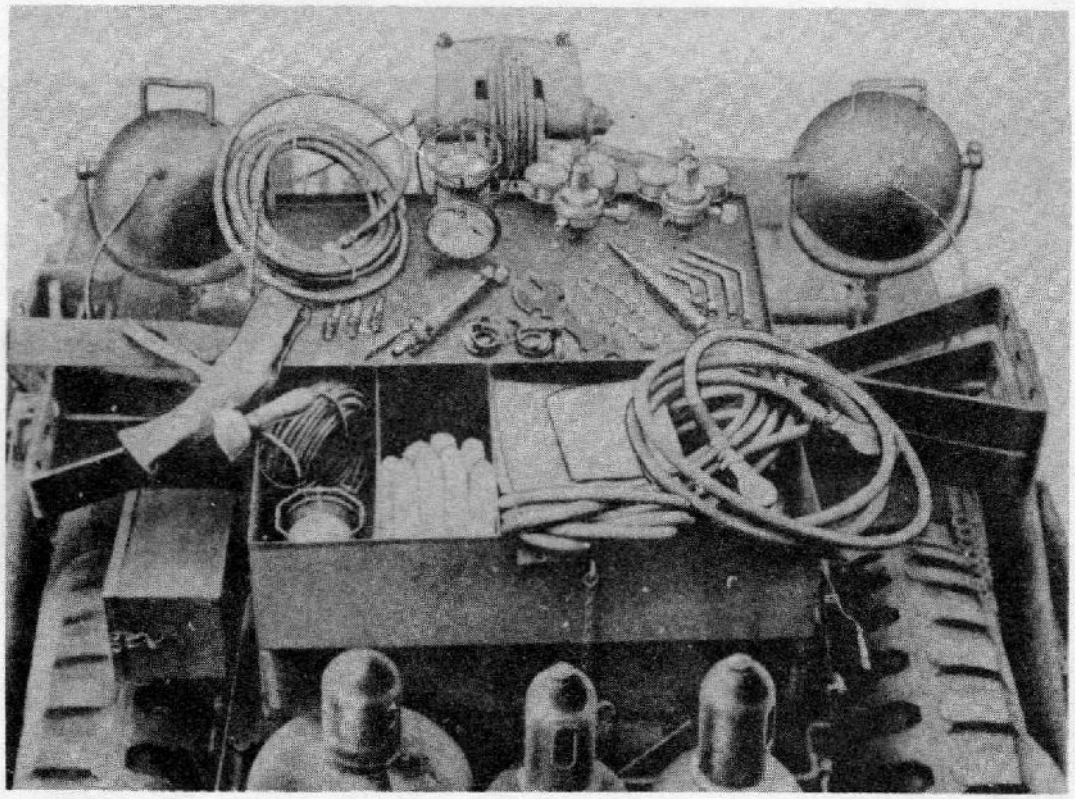
	Number Carried	Federal Stock No.	Where Carried
WRENCH, socket, 1/2-in. sq drive, 1/2-in. long dbl hex	1	41-W-3320	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 9/16-in. long dbl hex	1	41-W-3321	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 5/8-in. long dbl hex	1	41-W-3322	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 3/4-in. long dbl hex	1	41-W-3324	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 13/16-in. long dbl hex	1	41-W-3325	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 7/8-in. long dbl hex	1	41-W-3326	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 1-in. long dbl hex	1	41-W-3328	In hand tool box
WRENCH, socket, 1/2-in. sq drive, 1 1/8-in. long dbl hex	1	41-W-3329	In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 1/8-in. dbl hex	1	41-W-3036	In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 1/4-in. dbl hex	1	41-W-3038	In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 3/8-in. dbl hex	1	41-W-3042	In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 7/16-in. dbl hex	1	41-W-3044	In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 1/2-in. dbl hex	1	41-W-3046	In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 5/8-in. dbl hex	1	41-W-3048	In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 3/4-in. dbl hex	1		In hand tool box
WRENCH, socket, 3/4-in. sq drive, 1 13/16-in. dbl hex	1		In hand tool box
WRENCH, spark plug	1		Tool box left side under crane
WRENCH, wheel bearing, front	1		Tool box left side under crane
WRENCH, wheel bearing, rear	1		Tool box left side under crane
WRENCH, wheel	1		Tool box left side under crane

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE



RA PD 315204

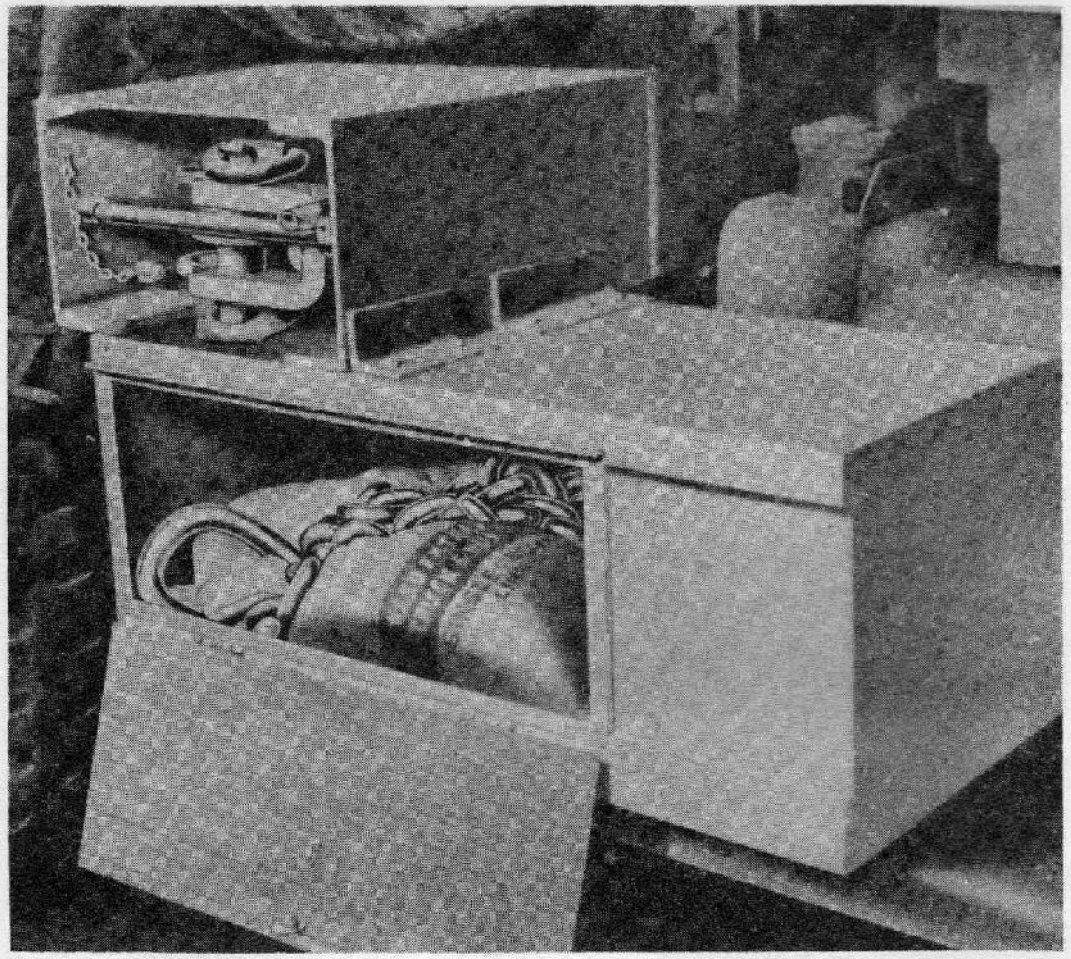
Figure 50—Vehicle Equipment (1)

28. VEHICLE EQUIPMENT AND VEHICLE SPARE PARTS.

a. Vehicle Equipment.

	Number Carried	Where Carried
AMMUNITION, cal. .30 rds. (carbine M1)	640	75 rounds on each individual —490 rounds in lower right equipment compartment
ANCHOR, Holmes type, 2 row	2	Mounted on crane
APPARATUS, decontaminating, 1½ qt, M2	3	
ARMAMENT, carbine, cal. .30 M1	2	In universal brackets, 1 on left side of front seat, 2 on right side of front seat
BAG, canvas, field, O.D. M1936	2	
BINOCULAR, M3, complete, composed of: 1 BINOCULAR, M3 1 CASE, carrying, M17	1	On individual
BLOCK, rope, double for 1-in. rope	1	Tool box—rear body
BLOCK, rope, single, for 1-in. rope	1	Tool box—rear body

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)



RA PD 315205

Figure 51—Vehicle Equipment (2)

	Number Carried	Where Carried
BLOCK, snatch, double 8 in. x ¾ in. (w/shackle)	2	In crane channels right side
BLOCK, snatch, single 8 in. x ¾ in. (w/shackle)	2	On crane column
BUCKET, canvas, folding 10-qt	1	Tool box—top of crane
BUCKET, canvas, folding 18-qt	1	Tool box—top of crane
CABLE, tow	1	Mounted on boom
CAN, oil, ⅓-pt, trade capacity	1	Bracket, right side engine compartment
CANTEEN, M1910, w/cup and cover, M1910	2	On individual
CHAIN, tire, non-skid, 11:00 x 20 H.D. Type TS	3 pr.	Tool box—right side under crane

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE

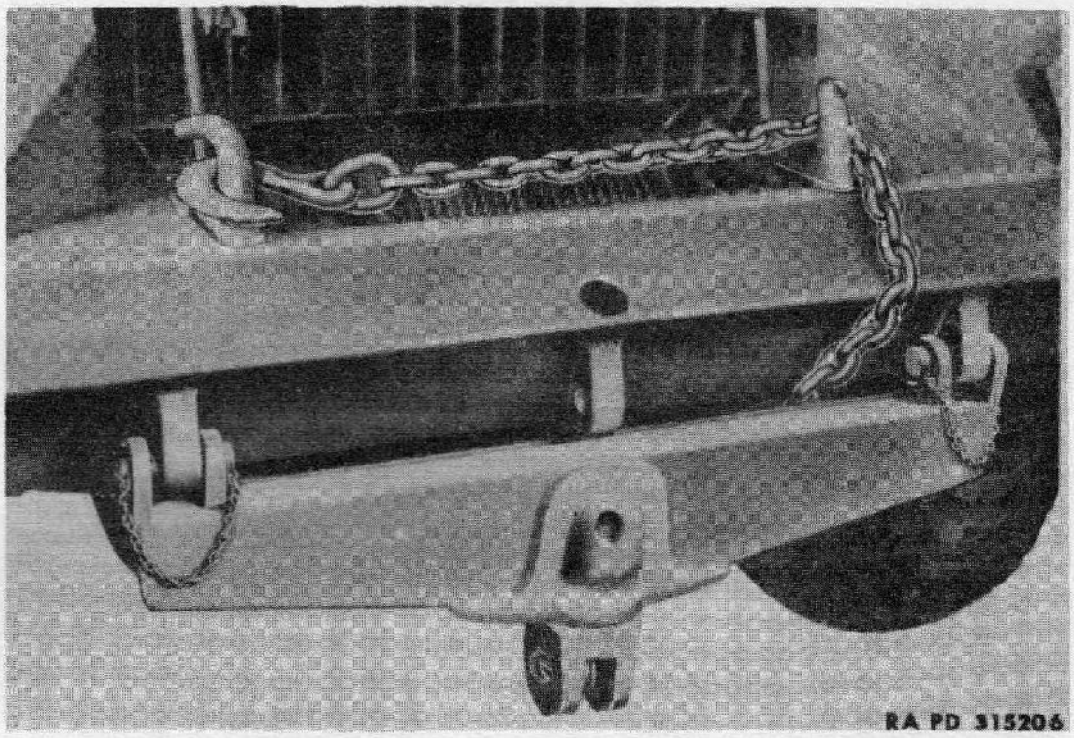
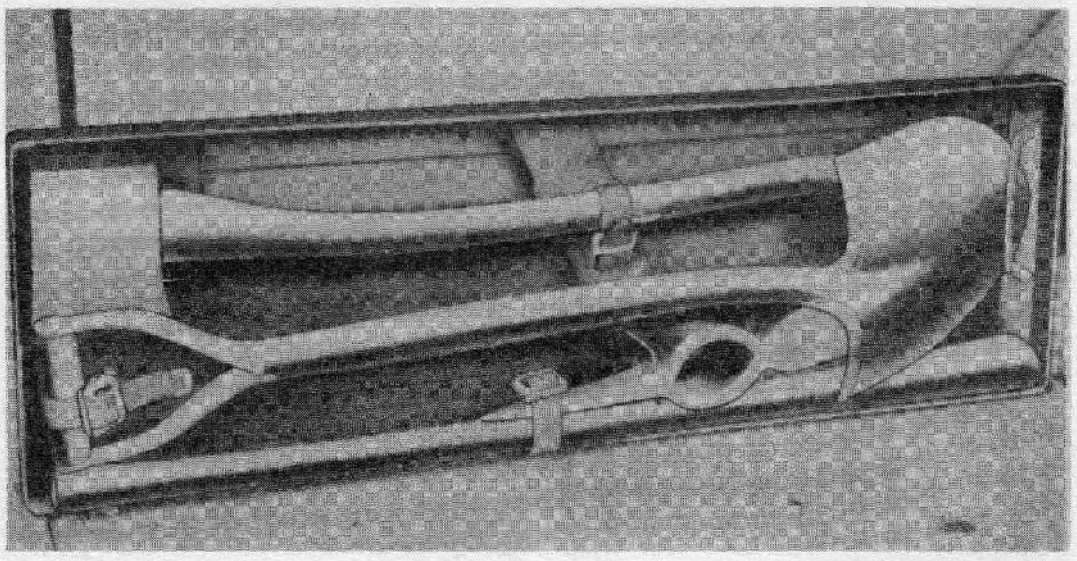


Figure 52—Vehicle Equipment (3)



RA PD 315207

Figure 53—Vehicle Equipment (4)

	Number Carried	Where Carried
CHAIN, tow, 12 ft. x ¾ in. w/pear link at both ends—grab hook at one end	2	Tool box—right side under crane
CONTAINER, water, 5-gal (QMC Standard)	1	Mounted on left side cowl

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

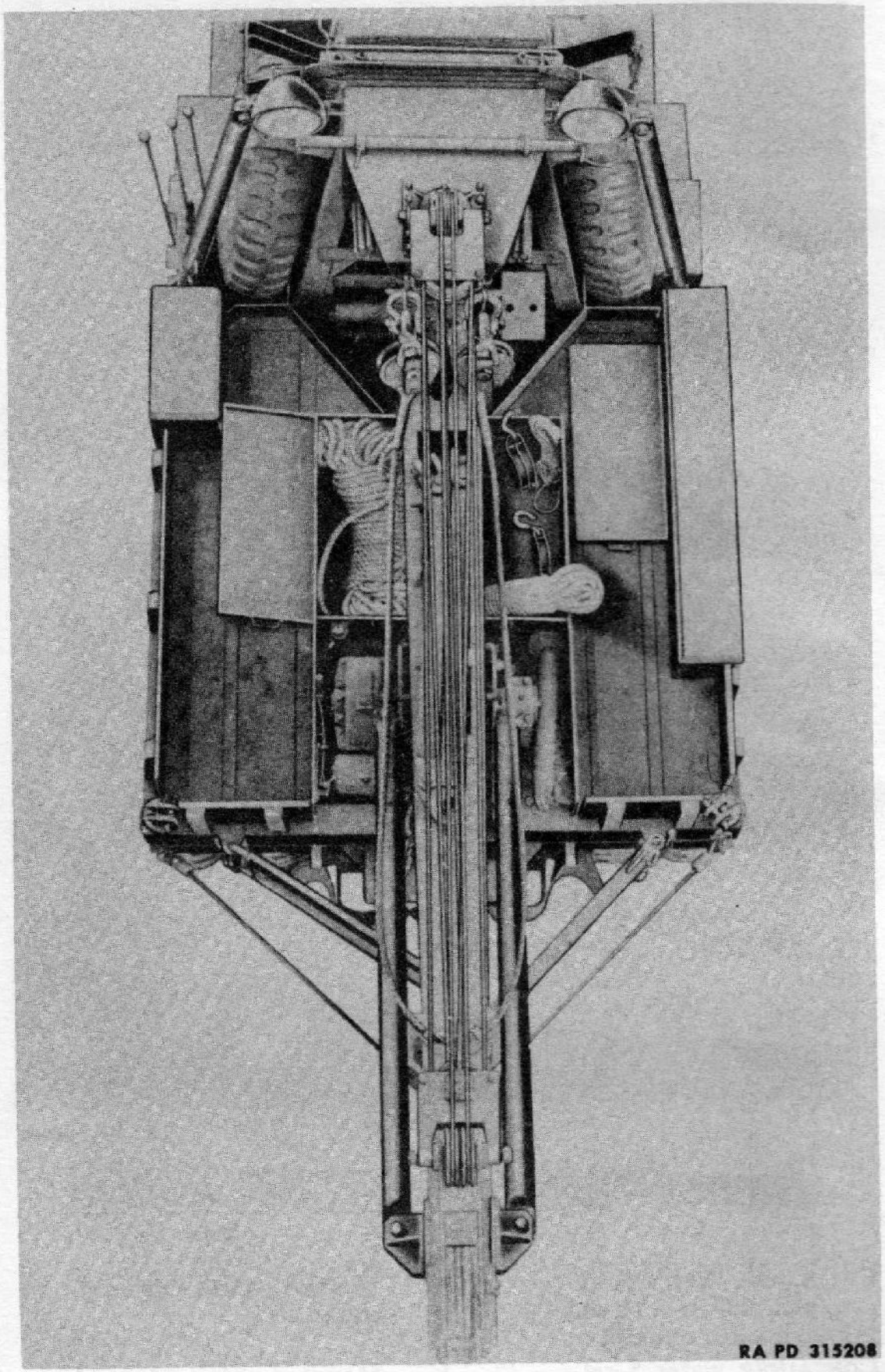
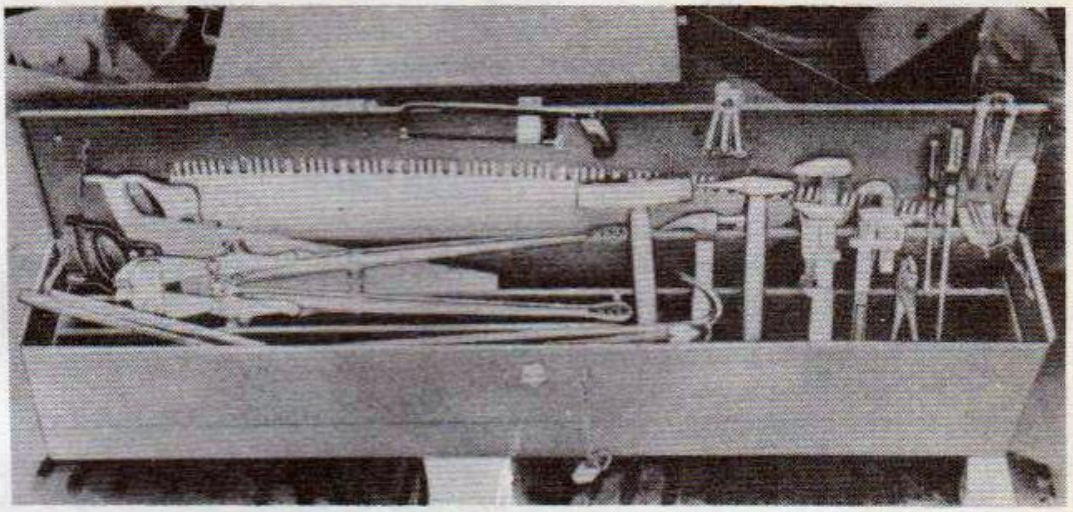


Figure 54—Vehicle Equipment (5)

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE



RA PD 315209

Figure 55—Vehicle Equipment (6)

	Number Carried	Where Carried
CRANK, starting	1	Loose in cab—behind seats
CUTTING and WELDING EQUIPMENT, consists of:	1	
GOGGLES, welder's, pair	1	Tool box—top of crane
HOSE, welding, 50-ft. coil	2	Tool box—top of crane
LIGHTER, spark	1	Tool box—top of crane
MIXER, welding gas	1	Tool box—top of crane
REGULATOR, acetylene	1	Tool box—top of crane
REGULATOR, oxygen	1	Tool box—top of crane
TANK, acetylene, 285 cu ft	1	Bracket on front of crane
TANKS, oxygen, 220 cu ft	2	Bracket on front of crane
TIP, cutting No. 1	1	Tool box—top of crane
TIP, cutting No. 3	1	Tool box—top of crane
TIP, welding, 2-in.	1	Tool box—top of crane
TIP, welding, 4-in.	1	Tool box—top of crane
TIP, welding, 6-in.	1	Tool box—top of crane
TIP, welding, 8-in.	1	Tool box—top of crane
TORCH, cutting	1	Tool box—top of crane
TORCH, welding	1	Tool box—top of crane
WRENCH, oxy-acetylene torch	1	Tool box—top of crane
EXTINGHISHER, fire, hand 2-lb, CO_2	3	1—On crane 2—On rear of cab
EXTINGHISHER, fire, hand, vaporizing, liquid CCL_4	1	Right front corner of cab
FITTING, wire rope, ¾-in. clevis type (electroline fiege)	6	Tool box—left side under crane

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

	Number Carried	Where Carried
FITTING, wire rope, 5/8-in. clevis type (electroline fiege)	6	Tool box—left side under crane
FLAG Set, M238 Composed of:	1	In cab
FLAG, M273 (Red)	1	
FLAG, M274 (Orange)	1	
FLAG, M275 (Green)	1	
FLAGSTAFF, M6270	3	
CASE CS, 90	1	
FLARE, truck, kerosene, 40-oz, 12 hr (in kit, 3 flares in box)	6	1 box—mounted on right side cowl
FLASHLIGHT (Specification 17-197)	2	On individual
GAGE, tire pressure	1	Tool box—left side under crane
GLOVES, asbestos (pair)	1	Tool box—top of crane
HOLDER, oilcan	1	Right side engine compartment
HOOK, boom cable	1	Tool box—left side under crane
HOSE, air inflating, assembly, 20 ft long	1	Tool box—top of crane
HOSE, air trailer, 13½ ft long	1	Tool box top of crane
JACKS, body	2	Mounted in truck body
JACK, hydraulic, 8-ton (with handle)	2	Tool box—left side under crane
JACK, hydraulic, 30-ton (with handle)	1	Tool box—left side under crane
KIT, first aid (24-unit)	1	
LAMP, trouble, 12-volt, 50-ft cord with bulb and connector	1	Tool box—top of crane
LANTERN, electric, portable (6-volt with battery)	2	Tool box—top of crane
LUBRICATION GUIDE, War Department	1	Holder—under passenger seat
MANUAL, spare parts, illustrated, for vehicle	1	Tool box—top of crane
MANUAL, technical, for operator	1	Tool box—top of crane
NET, camouflage, 45 ft x 45 ft	1	In body
PADLOCKS (2 keys for 6 locks)	6	One on each tool compartment
PLATES, ground (for boom legs) chained together	2	Tool box—right side under crane

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE

	Number Carried	Where Carried
PULLEY, attachment directional, assembly	1	In brackets at rear of body
ROLL, blanket	2	In body
ROPE, war sisal, 1 in. x 300 ft	1	Tool box—rear body
ROPE, war sisal, 3 strand 3/8 in. x 50 ft	1	Tool box—rear under floor
ROPE, war sisal, 3 strand 3/4 in. x 100 ft	1	Tool box—rear under floor
SHACKLE, round pin, anchor	2	Tool box—left side under crane
SPADE and LEG	2	Mounted under body
STAKES, anchor	14	Mounted in crane
TAPE, friction, 3/4 in. wide, 30 ft roll	1	In spare parts kit
TOWBAR and WHIFFLETREE, assembly, consists of:	1	
ASSEMBLY, main tow bar	1	Mounted on boom
AUXILIARY, leg assembly —tow	1	Mounted on boom
CLEVIS, tow (for light tank)	2	Tool box—left side under crane
CLEVIS, tow (for medium tank)	2	Mounted on boom
PIN, clevis	2	Mounted on boom
PIN, whiffletree connector assembly, whiffletree to towbar	1	Mounted in whiffletree
PIN, whiffletree, to tank	4	2 mounted in whiffletree, 2 on tool box—left side under crane
PIN, auxiliary leg	1	Mounted on boom
WHIFFLETREE, assembly	1	In body
TUBE, flexible nozzle	1	Tool box—top of crane
TYPE "C", 2 days' rations for 2 men	24 cans	Upper right equipment compartment
TYPE "D", 1 day's rations for 2 men	2 bars	Upper right equipment compartment
b. Vehicle Spare Parts.		
BELT, fan	1	In spare parts kit
BLADE, windshield wiper	1	In spare parts kit
CAPS, tire valve, screwdriver type	5	In spare parts kit
CORE, valve	5	In spare parts kit

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

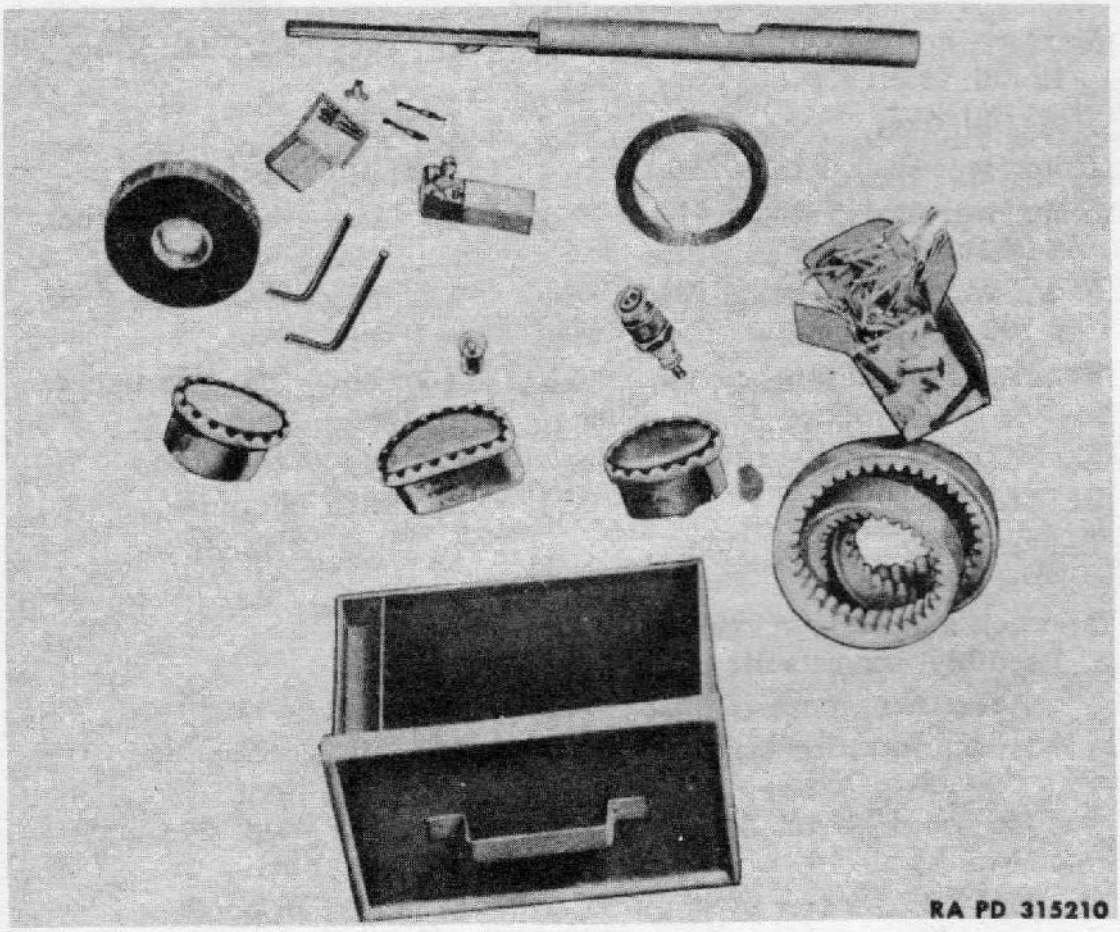


Figure 56—Vehicle Spare Parts

	Number Carried	Where Carried
KIT, spare parts	1	Right side crane frame
LAMPS, auto-miniature, set	1	In spare parts kit
PINS, cotter, split, steel, assorted box	1	In spare parts kit
PINS, shear, boom swinger	2	Long tool box—right-hand side
PINS, shear, front winch	6	Long tool box—right-hand side
PINS, shear, rear winch	6	Long tool box—right-hand side
PLUG, spark, with gasket	2	In spare parts kit
PLUG, split, hollow, bronze, fitting, wire rope, 5/8-in.	10	In spare parts kit
PLUG, split, hollow, bronze, fitting, wire rope, 3/4-in.	10	In spare parts kit
WIRE, iron, coil, 22 gage, 1/4 lb	1	In spare parts kit

PART TWO—VEHICLE MAINTENANCE INSTRUCTIONS

Section IX

NEW VEHICLE RUN-IN TEST AND RECORD OF MODIFICATIONS

29. PURPOSE OF RUN-IN TEST.

a. 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, paragraph 25, table III, according to procedures in paragraph 31 below.

30. CORRECTION OF DEFICIENCIES.

a. Deficiencies disclosed during the course of the run-in test will be treated as follows:

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

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

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

31. RUN-IN TEST PROCEDURES.

a. Preliminary Service.

(1) FIRE EXTINGUISHER. See that all four extinguishers are present, and in good condition. Test all but CO_2 extinguishers for proper operation, and mount all cylinders securely. If CO_2 extinguisher valves appear to have been opened or damaged, report to proper authority, for refill or exchange.

(2) FUEL, OIL, AND WATER. Fill fuel tanks. Check engine crankcase and coolant supply, and 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 or steering wheel concerning engine oil in crankcase, follow instructions on tag before driving the vehicle.*

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

(3) FUEL FILTER. Inspect filter for leaks, damage, and secure mounting and connections. Drain filter sediment bowl. If an appreciable amount of dirt or water is evident, inspect element, and change if necessary, according to instructions in Lubrication Guide, paragraph 26.

(4) BATTERY. Make a hydrometer and voltage test of battery; if necessary bring electrolyte to correct level (1/2 in. above plates), with distilled or clean water.

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

(6) AIR CLEANERS AND BREATHER CAP. Examine carburetor, air compressor air cleaners, and crankcase breather cap to see if they are in good condition and secure. Remove elements, wash thoroughly in dry-cleaning solvent, and reoil. Fill reservoirs to bead level with fresh oil and reinstall securely. Be sure all gaskets are in good condition and that duct 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, air compressor, heater, and defroster, are securely mounted. Make sure engine fan belt is properly adjusted to have 1/2-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 70 pounds when cool; that stems are in correct position, and all valve caps are present and fingertight. Remove objects lodged in treads, carcasses, and between duals; inspect for damage. See that spares are secure in carriers.

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

(11) FENDERS AND BUMPERS. Inspect fenders and running boards, splash guards, brush guards, and bumpers for looseness and damage.

(12) TOWING CONNECTIONS. Examine all towing shackles, whiffletree, and pintle hook for looseness and damage. See that pintle latch operates properly and locks securely.

(13) BODY. See that all body mountings are secure. Inspect attachments, hardware, glass, seats, storage boxes and compartments, cab soft top and curtains, and frame to see if they are in good condition and secure.

(14) WINCHES AND CRANE.

(a) Winches. Inspect front and rear recovery winches and crane topping and hoisting winches to see if they are in good condition, correctly assembled, securely mounted, and if there are any excessive oil leaks at seals or gaskets. Examine drive chain, sprockets, and tighteners (except front winch), for looseness or damage, and be sure tension adjustment is satisfactory. Rear winch drive chain should

have not more than ¼-inch deflection between sprockets, and crane winch chains should have no slack. Inspect all cables for damage. While cables are unwound from drums, clean them thoroughly, and as they are rewound evenly and tightly, apply a film of engine oil. Examine rear and crane winch transmissions and swinger gear case for looseness, damage, and leaks. Test all transmission, clutch, and throttle controls as applied to the different winch units to be sure they operate, and that mechanism responds properly. Be sure safety brakes function satisfactorily.

(b) Crane. Inspect crane A-frame, boom and topping assemblies, and all attachments, brackets, braces, and jacks, to see if they are in good condition, correctly assembled, and secure. Examine all guide and block sheaves for looseness or damage, and see that crane pivot, brace assembly, and lock pins are in place and secure. Look particularly for broken frame and superstructure assembly welds. Be sure all topping and lifting cables are in correct position in sheaves and that sheaves revolve freely.

(15) LUBRICATE. Perform a complete lubrication of the vehicle, and crane equipment, covering all intervals, according to the instructions on the Lubrication Guide, paragraph 26, except gear cases, wheel bearings, and other units covered in preceding procedures. Check all gear case oil levels, including winch transmissions and swinger, 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 shock absorbers, front and rear springs, rear bogie suspension spring seats, and torque rods to see if all are in good condition, correctly assembled, secure, and not leaking excessively.

(17) STEERING LINKAGE. See that all steering arms, rods, and connections are in good condition and secure. Be sure that gear case is securely mounted and not leaking excessively.

(18) PROPELLER SHAFTS. Inspect all shafts and universal joints to see if they are in good condition, correctly assembled, alined, secure, and not leaking excessively at seals.

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

(20) CHOKE. Examine choke to be sure it opens and closes fully in response to operation of choke button.

(21) ENGINE WARM-UP. Start engine, and note if cranking motor action is satisfactory, and has any tendency toward hard 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 Gage. Immediately after engine starts, observe if oil pressure is satisfactory. Normal pressure at idle speed is 35 pounds, and

at operating speeds, 55 to 65 pounds, when hot. Stop engine if oil pressure fails to register immediately.

(b) Ammeter. Ammeter should show a slight positive (+) charge. High charge may be indicated until generator restores to battery the current used in starting. If battery is low or electrical load heavy, a high charge may continue after starting current is restored.

(c) Temperature Gage. Engine temperature should rise gradually during warm-up period, to normal operating range, 165°F.

(d) Tachometer. Tachometer should indicate the engine revolutions per minute. Red pointer should rise to, and remain at highest engine speed attained. CAUTION: *Tachometer should not exceed 2,400 revolutions per minute.*

(e) Fuel Gage and Selector Switch. With selector switch in relative position, fuel gage should register "FULL" if tanks have been filled.

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

(24) HORN AND WINDSHIELD WIPERS. See that these items are in good condition and secure. If tactical situation permits, test horn 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). Clean lenses, and inspect all units for looseness and damage. If tactical situation permits, open and close all light switches to see if lights respond properly.

(27) TOOLS AND EQUIPMENT. Check On-vehicle Stowage Lists (pars. 27 and 28) (figs. 48 to 56), to be sure all tool and equipment items are present, and see that they are serviceable, and securely mounted or stowed.

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

b. Run-in Test. Perform the following steps (1) to (8) 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 maximums 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, tem-

perature, fuel, and air pressure 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 records total accumulating and trip 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 pedal pressure is released, and that there is not an excessive drop in air pressure when brakes are applied. 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 1½-inch free travel before meeting resistance. CAUTION: *Do not ride clutch pedal at any time. 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.

(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 NOISE. 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) LEAKS AND OVERHEATING. NOTE: *Halt vehicle at 10-mile intervals for substeps (a) to (c) below.*

(a) Air Brake System Leaks. Stop engine with air pressure at governed maximum (105 lb), and with brakes applied. There should not be a noticeable drop in pressure in 1 minute.

(b) 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.

(c) Leaks. With the engine running, and fuel, engine oil, and cooling systems under pressure, look within engine compartment and under vehicle for indications of leaks.

c. Vehicle Publications and Reports.

(1) PUBLICATIONS. See that vehicle technical manuals, Lubrication Guide, Standard Form No. 26 (Driver's Report—Accident, Motor

Transportation) and W.D., A.G.O. Form No. 478 (MWO and Major Unit Assembly Replacement Record), are in the vehicle, legible, and properly stowed. NOTE: *U.S.A. registration number and vehicle nomenclature must be filled in on Form No. 478, for new vehicles.*

(2) REPORTS. Upon completion of the run-in test, correct or report any deficiencies noted. Report general condition of the vehicle to designated individual in authority.

32. MWO AND MAJOR UNIT ASSEMBLY REPLACEMENT RECORD.

a. 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 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.

b. 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, and 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.

c. 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 A.G.O. Form No. 478.

Section X

SECOND ECHELON PREVENTIVE MAINTENANCE

33. 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 frequency of the preventive maintenance services outlined herein is considered a minimum requirement for normal operation of vehicles. Under unusual operating conditions, such as extreme temperatures, and 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 step (4) below, or the specific procedures in step (5) below which follow, are required for the correct performance of a preventive maintenance service, or for correction of a deficiency, other sections of this 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 mechanic 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 if 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.

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 this 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 fluid and dry them thoroughly. Take care to keep the parts clean until reassembled, and be certain to keep cleaning fluid away from rubber or other material that it would damage. Clean the protective grease coating from new parts since this material is usually not 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 been 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 or cleaning the oil filter or 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 (6-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 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 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 5 miles and not over 10 miles.*

Before-operation Service. Perform the Before-operation Service as described in paragraph 21.

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 lb) 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 below 60

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MAINTENANCE	
6,000 Mile	1,000 Mile

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

3	3

Dash Instruments and Gages.

OIL PRESSURE GAGE. Oil pressure should be 55 to 60 pounds at operating speeds, and 30 pounds at idle speed. CAUTION: *Stop engine if oil pressure is too low for safe engine operation at any speed.*

AMMETER. Ammeter should register a high positive (+) charge until generator restores to battery, the current used in starting. Return to zero or slight charge, if battery is fully charged and with all lights and accessories turned off.

ENGINE TEMPERATURE GAGE. Temperature should increase gradually during the warm-up period to normal operating range, 160°F to 185°F. Maximum safe operating temperature is 200°F. CAUTION: *Do not move vehicle until engine temperature has reached 135°F.*

TACHOMETER. Free hand should register engine speed in revolutions per minute, and locking hand should record the accumulating revolutions.

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

FUEL GAGE. With ignition switch "ON," and selector switch in relative position, gage should register the approximate amount of fuel in each tank.

4	4

Siren, Horn, Mirrors, and Windshield Wipers. If tactical situation permits, test siren and horn for proper operation and tone. Examine rear vision mirrors 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.

5	5

Brakes (Service and Parking). Operate brakes at various speeds during road test.

SERVICE BRAKES. Apply foot pedal sufficiently to stop vehicle in minimum distance, and observe their effectiveness, any pull to one side, unusual noise, or chatter. Pedal should depress with little effort, and should return to off position when released.

PARKING BRAKE. Stop vehicle on reasonable incline; apply parking brake, and observe if it holds vehicle effectively; that lever has at least ½ travel in reserve, and that ratchet and pawl latch the applied brake assembly.

6	6

Clutch (Free Travel, Drag, Noise, Chatter, Grab, Slip). Pedal free travel should be 1½ inch before meet-

MAINTENANCE	
6,000 Mile	1,000 Mile
		ing 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 clashing. Note any unusual noise when pedal is depressed 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, Vibration, Noise).** Levers should move into each gear range position easily and quietly. Test declutching lever to see that front axle engages properly. Note any vibration that may indicate loose mountings or noise that may indicate damaged, excessively worn, or inadequately lubricated parts.
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 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.
9	9	**Engine.** Observe engine operating characteristics, as follows: IDLE. Engine should idle smoothly without stalling. 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 or heavy accumulation of carbon. GOVERNED SPEED. With the vehicle in a low gear, slowly depress the accelerator to the toeboard, and by observing the speedometer reading, see if 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 2,400 revolutions per minute.
10	10	**Unusual Noises (Attachments, Cab, Body, Wheels).** Be on the 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.
12	12	**Air Brake System Leaks.** With the air pressure at the governed maximum and the brakes applied, stop the

MAINTENANCE	
6,000 Mile	1,000 Mile

engine. There should not be a noticeable drop in pressure within 1 minute. If any pressure drop occurs during this check, test the air brake system for leaks by the soapsuds method.

13 | 13 **Temperatures (Brake Drums, Hubs, Axles, Transmission, Transfer).** Place hand cautiously on all brake drums and wheel hubs to see if they are abnormally hot. Inspect axle housings, transmission, and transfer case for indications of overheating.

14 | 14 **Leaks (Engine Oil, Water, Fuel).** Look in engine compartment, and under vehicle for indications of engine oil, coolant, or fuel leaks. Trace any leaks to their source, and correct or report them to designated authority.

MAINTENANCE OPERATIONS

Raise Vehicle—Block Safely

16 | 16 **Gear Oil Level and Leaks (Axles, Transmission, and Transfer).** Remove filler plugs in front and rear axles, transmission, and transfer case, and check lubricant levels. Proper level is from lower edge of filler hole to ½ inch below when cool. Allow sufficient time for foaming to subside before checking levels. Note condition of lubricant. If an oil change is due in any of these units, or condition of lubricant indicates an oil change is necessary, drain and refill units with fresh specified oil. Note any indications of excessive lubricant leaks at oil seals or gaskets.

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. Listen for any unusual noise that might indicate damaged, loose, or excessively worn unit parts. Also observe al. propeller

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MAINTENANCE	
6,000 Mile	1,000 Mile
		shafts and wheels for vibrations and run-out, 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 Head and Gasket.** Examine for cracks, and indication of compression, oil or water leaks around cap screws and gaskets. CAUTION: *Cylinder heads should not be tightened unless looseness or leaks are indicated.* If tightening is necessary, it must be done with a torque wrench, in the proper sequence (fig. 65), and to 90 to 100 foot-pounds tension. NOTE: *Valve tappets must always be readjusted after cylinder head tightening.*
	19	**Valve Mechanism (Clearances, Cover, Gaskets).** Adjust tappet clearances only when necessary as indicated by valve noise or faulty engine performance. Correct clearances, with engine hot and running, are: intake, 0.013 inch; exhaust, 0.018 inch.
19		ADJUST. Set valve stem clearances to above specifications. See if valve stems, tappets, tappet cluster brackets, springs, seats, and locks are in good condition, correctly assembled, and secure. Inspect valve covers to be sure they are in good condition. Reinstall them securely, using new gaskets if necessary.
22	22	**Battery (Cables, Hold-down Clamps, Carrier, Record Gravity, and Voltage).** Inspect battery case for cracks and leaks. Clean top of battery. Inspect cables, terminals, bolts, posts, straps and hold-downs for good condition. Test specific gravity and voltage and record on W. D., A.G.O. Form No 461. Specific gravity readings below 1.225 at normal temperatures indicate battery should be recharged or replaced. For freezing temperatures, see specifications, paragraph 106. Electrolyte level should be above top of plates and may extend 3/8 inch above plates.
22		Perform high-rate discharge test according to instructions for "condition" test which accompany test instrument and record voltage on W. D., A.G.O. Form No. 461. Cell variation should not be more than 30 percent. NOTE: *Specific gravity must be above 1.225 to make this test.*
22	22	Bring electrolyte to proper level by adding distilled or clean water. Clean entire battery and carrier. Repaint

MAINTENANCE	
6,000 Mile	1,000 Mile
	20
20	
21	
23	23
24	24
25	25

carrier if corroded. Clean battery cable terminals and terminal bolts, and tighten hold-down clamps carefully to avoid damage to battery.

Spark Plugs (Gaps, Deposits). Without removal, wipe off plugs and examine insulators for damage or indications of compression leaks.

Remove and examine all plugs to see if they are in good condition. Pay particular attention to broken insulators, excessive carbon or oxide deposits, and to electrodes burned thin. Clean plugs thoroughly. If plug cleaner is not available, install new or reconditioned plugs. NOTE: *Do not install plugs until Item 21 has been performed.* Set plug gaps to 0.025 inch by bending only grounded electrodes. Tighten to 26 to 32 foot-pounds.

Compression Test. Test compression with all spark plugs removed and throttle wide open. Normal compression at cranking speed is 105 pounds. Allowable variation between cylinders is 10 pounds. Record compression pressures in space provided on back of Form No. 461.

Crankcase (Leaks, Oil Level). With engine idling examine crankcase, valve covers, timing-gear cover, and clutch housing for oil leaks. Stop engine and after oil has drained into crankcase, check to see if it is up to proper level. If an oil change is due, or condition of oil indicates the necessity, drain crankcase and refill to correct level with fresh specified oil. Same procedure applies to auxiliary air compressor. NOTE: *Do not start engine again until Item 24 has been performed.*

Oil Filters and Lines. Inspect filters and external engine oil lines to see if they are in good condition, secure, and not leaking. Remove filter body drain plugs and drain off contents. Remove filter cartridge and check condition. If cartridge change is due, or condition indicates the necessity, replace with new cartridge, being sure gaskets are in place, and tighten covers and drain plugs securely. CAUTION: *Start engine momentarily until oil pressure is indicated. Stop engine, check oil level in crankcase, and add as necessary to bring to running mark.*

Radiator (Core, Shell, Mountings, Hose, Cap and Gasket, Antifreeze Record, Overflow Pipe). Inspect 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 it is so contaminated that cooling system should be cleaned. If cleaning is necessary, proceed only

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MAINTENANCE	
6,000 Mile	1,000 Mile
	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 (par. 80 e), 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, Fan, and Shroud.** 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). See that shroud is in good condition, secure, and not interfering with fan blades.
		TIGHTEN. Carefully tighten water pump, fan assembly, and mounting nuts or screws. Tighten water pump packing gland nuts until they are just snug. CAUTION: *Overtightening of packing gland nuts will cause premature packing and shaft wear, and will result in leaks.*
27	27	**Generator, Starter, 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.
27		Remove generator and cranking motor inspection covers. 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; 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); place over end of suitable sized piece of wood and again blow out with air.
27		TIGHTEN. Carefully tighten cranking motor mounting bolts securely.
28	28	**Air Compressor (Unloader Valve, Governor, Lines).** Examine the air compressor to see that it is in good condition, properly alined with its drive pulleys, and secure. Check unloader valve for satisfactory valve clearance. Be sure the governor is in good condition and secure; that the compressor water and air lines within engine compartment are in good condition and

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MAINTENANCE		
6,000 Mile	1,000 Mile	
		secure, and that water lines do not leak.
		CLEAN. Clean governor hair air strainer in dry-cleaning solvent; dry, apply thin film of engine oil to strainer, and reinstall.
28		SPECIAL LUBRICATION. Apply a few drops of engine oil on the unloader valve fulcrum pin. Apply a few drops of kerosene or dry-cleaning solvent on upper valve stem of governor.
		ADJUST. Unloader valve clearances of 0.010 inch to 0.015 inch must be adjusted.
29	29	**Drive Belts and Pulleys.** Examine all drive belts for evidence of fraying condition, excessive wear, and deterioration. Inspect all drive pulleys and hubs to see if they are in good condition and securely mounted.
		ADJUST. Set adjustment so that drive belts have ½-inch finger pressure deflection.
30	30	**Tachometer Drive and Adapter.** Be sure these items are in good condition, correctly assembled, and secure. Inspect the flexible drive shaft for kinks; inspect connection for indications of oil leaks.
31	31	**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 0.020 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 remember condenser if points are burned, as burned points may be caused by a defective condenser. When cleaning points, use fine file or flint paper 2/0 (never use emery), and blow out filing with compressed air.
		SHAFT. Place hand on shaft to test for excessive wear in shaft or bushings.
		CENTRIFUGAL ADVANCE. Install rotor on shaft, and test distributor governor by finger force for normal range of

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MAINTENANCE	
6,000 Mile	1,000 Mile
31	31
31	
32	32
33	33
33	
34	34
35	35
36	36
37	37
38	38

movement permitted by mechanism. Note if it will return to original position when released without binding.

SPECIAL LUBRICATION. Lubricate cam surfaces, breaker arm pin, and wick according to Lubrication Guide instructions.

ADJUST. Set breaker point gaps to 0.020 inch.

Coil and Wiring. Inspect coil, 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.

Manifolds. Examine exhaust and intake manifolds for loose mountings and leaking gaskets.

TIGHTEN. Tighten carburetor flange, intake and exhaust manifold, assembly, and exhaust pipe mounting nuts securely.

Air Cleaner (Carburetor). Examine all gaskets, clamps, and connecting lines for damage or looseness. Drain, clean element, and refill oil reservoir. Tighten all clamp and mounting bolts.

Crankcase Breather. Examine ventilator breather cap, lines, and valve to see if they are in good condition, and securely mounted and connected. Remove element from breather cap. Wash in dry-cleaning solvent, dry, dip in engine oil, and reinstall securely. Remove and thoroughly clean vent lines and valve; wash in dry-cleaning solvent and reinstall securely.

Carburetor (Choke, Throttle, Linkage, and Governor). Make sure these items 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.

Fuel Filter and Lines. Examine filter to see if it is in good condition, securely mounted and connected, and not leaking.

CLEAN. Close fuel shut-off valve, and remove filter sediment bowl and element. Wash clean in dry-cleaning solvent, and reassemble securely, being sure gaskets are in place. CAUTION: *If element cannot be cleaned by washing, replace unit. Do not scrape element to clean.* Turn on fuel supply and recheck for leaks.

Fuel Pump (Pressure). Inspect pump to see if it is in good condition, securely mounted, and not leaking.

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6,000 Mile	1,000 Mile	
		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. After starting engine in Item 39, see that pressure is satisfactory, which should be 2 pounds minimum and 2½ pounds maximum at idle speed.
39	39	**Starter (Action, Noise, Speed).** Start the engine and observe if general action of cranking motor is satisfactory. Particularly note if it engages and operates properly without excessive noise, has adequate cranking speed, and if the engine starts readily. Also, as soon as engine starts, note whether 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 to designated authority.
41	41	**Ignition Timing (Advance).** With engine running, and a neon timing light connected, observe if ignition timing is correct. Note whether automatic controls advance the timing as engine is accelerated gradually.
41		ADJUST. Adjust ignition timing to specifications in paragraph 92.
42	42	**Engine Idle and Vacuum Test.** Inspect as follows: ADJUST. Connect a vacuum gage to intake manifold, adjust engine to its normal idle speed by means of throttle stop screw, and 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 the pointer should be steady. A badly fluctuating needle 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 2 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 carburetor, air

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MAINTENANCE	
6,000 Mile	1,000 Mile
		cleaner, or exhaust. NOTE: *Above readings apply to sea level. There will be approximately a 1-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.*
47	47	**Tires and Rims (Valve Stems and Caps, Condition, Direction, Matching Spare Carrier).** Inspect 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 otherwise 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 nondirectional 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 mounted so that "V" 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. Be sure that spare tire carrier is in good condition and secure.
		RIMS. All rims and their lock rings or flanges must be in good condition and secure.
	47	TIGHTEN. Tighten all wheel rim flange or lug nuts securely.
47		SERVE. With tires properly inflated to 70 pounds (cool), check over-all circumference of all tires including spares.

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MAINTENANCE	
6,000 Mile	1,000 Mile

Select tires to be mounted on duals or on driving axles, so they will not have differences in over-all circumference exceeding the 3/4-inch limits specified in current directives and bulletins. Mount all dual tires with the larger tire outside. The valve stem on inner wheels should point out, and the valve stem on outer wheel should point in. All stems should be opposite each other. Spares must be matched properly and mounted for use on one of the road wheels at intervals not exceeding 90 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).** Inspect and service as follows: Remove rear wheels and drums. NOTE: *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.*

DRUMS AND SUPPORTS. Clean dirt and grease from drums and supports (dust shields), 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. Observe cams and shafts to determine if they 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 hubs to drum nuts securely.

49 — **Rear Brake Shoes (Linings, Anchors, Springs).** Examine linings through inspection holes to see if they are so worn rivet 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 Item 52 below for 6,000-mile service.

ADJUST. Adjust shoes by minor method if necessary.

49 — Remove rear wheels and inspect linings to see if they 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

MAINTENANCE	
6,000 Mile	1,000 Mile
		position. Thickness of lining at most worn point should be enough for at least 1,000 miles of service before rivet 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 171. Adjust slack adjusters so diaphragm push-rod travel is at minimum, approximately 3/4 inch, and drum to lining clearance is 0.016 inch.
50	50	**Torque Rods.** Inspect upper and lower torque rods and mounting brackets to see if they are in good condition, evenly adjusted, and securely connected. If rubber bushings are hard or cracked, apply a coating of hydraulic brake fluid to surfaces.
51	51	**Rear Spring, Seat, and Bushings.** Inspect rear spring seats to see if they are in good condition, secure, and not leaking excessive lubricant.
51		ADJUST. Check adjustment of rear spring seat bearings which should be free to oscillate without any end play.
51		SPECIAL LUBRICATION. Remove seat cap, and lubricate until grease appears at outside of outer bearing. Fill cap with grease before reinstalling.
52	52	**Rear Wheels (Bearings, Seals, Drive Flanges, and Nuts).** Inspect and service as follows:
	52	WHEELS. Inspect 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 for lubricant leaks.
		DRIVE FLANGES AND NUTS. Note if they are in good condition and if nuts are tightened securely.
52		CLEAN. Disassemble rear wheel bearings and oil seals. Clean thoroughly in dry-cleaning solvent, and examine bearing cups and cones to see if they are in good condition; if machined surfaces 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 reinstalled, lubricate bearings according to Lubrication Guide (par. 26).
52		ADJUST. After lubricating wheel bearings, reassemble hub and drum assemblies into place, and adjust wheel bearings correctly according to paragraph 195.
	53	**Front Brakes (Drums, Supports, Cams and Shafts, Hose, Air Chambers, Push Rods and Seals, Slack**

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MAINTENANCE		
6,000 Mile	1,000 Mile	
		Adjusters). Inspect brake hose, chambers, push rods and seals, and slack adjusters to see if they are in good condition, correctly assembled, and secure.
53		Remove front wheels; inspect and service as follows:
		DRUMS AND SUPPORTS. Clean and inspect in same manner as in Item 48.
		CAMS AND SHAFTS. Inspect in same manner as in Item 48.
	54	**Front Brake Shoes (Linings, Anchors, Springs).** Inspect in same manner as in Item 49.
		ADJUST. Adjust by minor method if necessary.
54		With front wheels and drums removed, inspect shoes, linings, anchors, and springs in same manner as in Item 49 at 6,000-mile service.
		CLEAN. Clean in same manner as in Item 49.
54	54	ADJUST. Adjust in same manner as in Item 49 after subsequent related items to 60 inclusive are completed.
55	55	**Steering Knuckles (Joints, Bearings, Seals).** Inspect to see if knuckle housings are in good condition. Look particularly for cracks around steering arms. See if outside knuckle felt seals and seal flanges are in good condition and secure. Remove lubrication plug, and examine sample of lubricant to see if it appears to be contaminated.
55		CLEAN. Remove constant velocity universal joint assembly. Wash thoroughly in dry-cleaning solvent, and without disassembly of universal joint, inspect parts to see if they are in good condition and not excessively worn. Pay particular attention to universal joint washers, balls, cage, races, axle splines, flanges, and pivot bearings.
55		SPECIAL LUBRICATION. Pack new lubricant well into constant velocity universal joint until it fills all space between balls, cages, and races. Reassemble steering knuckle, taking care to replace any unserviceable lubricant retainer seals, boots, or gaskets.
55		ADJUST. Use every precaution to reinstall shims and spacers in the original position from which they were removed at disassembly to ensure correct pivot bearing and axle end play adjustment.
56	56	**Front Springs (Clips, Leaves, U-bolts, Hangers, and Shackles).** Make sure they 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

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MAINTENANCE	
6,000 Mile	1,000 Mile
		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).** Make sure these items are in good condition, correctly and securely assembled and mounted. Observe 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 is in good adjustment.
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.*
58	58	**Front Shock Absorbers and Links.** Inspect for damage, looseness, and lubricant leaks.
58		SERVE. Disconnect arm, remove plug, and work up and down several times while refilling, then reconnect arm.
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 as the drive flanges are removed, so that the end play adjustment may be made conveniently when reassembling.
60		SPECIAL LUBRICATION. Apply in same manner as described in Item 52.
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 Shafts (Joints, Alinement, Seals, and Flanges).** Make sure these items are in good con-

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MAINTENANCE		
6,000 Mile	1,000 Mile	
		dition, correctly and securely assembled and mounted. Note if the universal joints are properly alined with each other and are not excessively worn. Be sure that the slip joint is free, not excessively worn, and well lubricated. Make sure 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, Ground Strap, Side Pans).** These items should be in good condition and securely mounted and connected. Be sure to examine both front and rear engine mountings. On rubber mountings, make sure that rubber is not separating from its metal backing. If mounting bolts are loose, tighten them properly, taking care not to overtighten. Remove oil or grease from rubber mountings. Apply a film of brake fluid if rubber is hard or cracking.
64	64	**Hand Brake (Ratchet and Pawl, Linkage, Disk, and Lining).** Examine to make sure ratchet, pawl, and linkage are in good condition, secure, and not excessively worn. Be sure that disk is not scored or oily, and that lining is not oil-soaked or worn too thin.
64		ADJUST. Set clearance between brake disk and lining to 0.020 inch when brake lever is released.
65	65	**Clutch Pedal (Free Travel, Linkage, Return Spring).** Check pedal free travel, which should be 1½ inches before meeting resistance. Examine to make sure pedal is securely mounted to shaft, and clutch operating linkage is in good condition, secure, and not excessively worn at friction joints. Note if return spring has proper tension to bring pedal to correct released position.
65		ADJUST. Adjust plate so that clutch pedal has 1½- to 1⅝-inch free travel and ¾-inch toeboard clearance. CAUTION: *No pedal adjustment should be made except for toeboard clearance.* For correct procedure, see paragraph 66.
66	66	**Brake Pedal.** Inspect to be sure pedal and linkage is secure and not damaged, and that application valve closes fully when pedal pressure is released.
69	69	**Air Brake Application Valve.** Make sure application valve and linkage are in good condition, correctly assembled, and secure.
70	70	**Air Brake Reservoirs.** Inspect for damage and loose mounting. Drain condensate.
71	71	**Transmission (Mountings, Seals, Linkage).** Note if transmission case is in good condition and securely

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MAINTENANCE		
6,000 Mile	1,000 Mile	
		mounted. Inspect for lubricant leaks at seals and gaskets. Examine control linkage and shift mechanism for damage or excessive wear.
72	72	**Transfer (Mountings, Linkage, Seals, Vent).** Make sure case is in good condition and securely mounted. Be sure that transmission power take-off, declutching control linkage, and shift mechanism are securely connected and not damaged. Notice if 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.
75	75	**Rear Axles (Pinion End Play, Seals, Vent, and Alinement).** Inspect in the same manner as in Item 61 for front axle.
76	76	**Rear Air Brakes (Chambers, Rods, Seals, and Slack Adjusters).** See if all items are in good condition, securely connected, and mounted. Examine rods for excessive wear, and seals for lubricant leaks.
77	77	**Rear Springs (Clips, Leaves, U-bolts).** Inspect and tighten in same manner as in Item 56.
79	79	**Cab and Body Mountings.** Note if they are all in good condition and secure. On cab mountings using coil springs, be sure springs are in good condition and properly compressed. These springs should be neither loose nor compressed until solid.
		TIGHTEN. Tighten cab and body 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 frame, 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 the vehicle, to see if they are in good condition, properly supported, connected, and secure.
82	82	**Fuel Tank, Fittings, and Lines.** Inspect fuel tank to see if it is in good condition and securely mounted.

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MAINTENANCE	
6,000 Mile	1,000 Mile
	Examine cap for defective gasket or plugged vent. See that filler neck is in good condition and that cap fits securely.
82	Remove fuel tank drain plug, and drain off accumulated water and dirt in bottom of tank. Drain only until fuel runs clear. Use necessary precautions against fire.
83	83 **Brake Lines (Fittings and Hose).** Examine all air lines, fittings (including winch clutch system), and air brake hose under vehicle to see if they are in good condition, securely connected, and supported so that lines or hose will not chafe against other vehicle parts.
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 tail pipe 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 and not clogged.
85	85 **Vehicle Lubrication.** Lubricate all points of vehicle in accordance with instructions in section VII. See that only clean lubricant is used. Replace missing or damaged lubrication fittings, vents, or plugs. Wipe off excess lubricant. Parts or assemblies that have already been lubricated while disassembled for inspection, gear cases which have been drained and refilled as mandatory items, and those parts that have been indicated in the procedures, may be omitted from the general lubrication of the vehicle.
	LOWER VEHICLE TO GROUND
86	86 **Toe-in and Turning Stops.** Toe-in limits should be ¼ inch, plus or minus 1/16 inch. See that turning stops are secure and not damaged. If tires have rubbed against frame or chassis, report for check of turning angle by higher echelon.
87	87 **Front Winch (Clutch, Brakes, Drive, Shear Pins, Cable, Guides).** Observe whether all items are in good condition, correctly assembled, and secure. See that clutch moves freely and lever latches securely. Test the drum brake, which should hold drum from spinning when cable is unwound. Test automatic safety brake. Set truck at the top of a steep bank. Start pulling a 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

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MAINTENANCE	
6,000 Mile	1,000 Mile
		engine clutch. If vehicle does not stop, or drifts more than 1 or 2 inches, brake needs adjusting (par. 256). When lining is worn to rivet heads, or if it 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. On center mounted winch, make sure sprockets and drive chains are in good condition, adequately lubricated, and chains not too slack. Inspect cable to see that it is in good condition, evenly wound, and note whether cable chain and hook are securely attached. Lubricate winch clutch, shaft on which it slides, and operating arm, moving the clutch back and forth to be sure it is free.
87		CLEAN AND SERVE. Unwind cable and inspect for broken or frayed strands, and for flat or rusty spots. Clean entire length of cable, and as cable is rewound evenly and tightly on drum, apply a thin film of engine oil. Sample oil in worm gear housing and transmission for contamination. If oil change is due or condition of oil warrants, drain and refill with specified oil (par. 26).
87	87	**Rear Winch (Air Clutch, Transmission, Throttle, Controls, Drive, Shear Pin, Safety Brake).** Make sure all items are in good condition, correctly and securely assembled or mounted; that air clutch, transmission, and throttle controls operate properly; that drive chain and sprockets are not excessively loose or worn; that shear pin is serviceable, and secure. Test operation of all controls and shift mechanism.
87		ADJUST. Adjust drive chain to ¼-inch maximum deflection between sprockets (par. 253 **b** (3) and fig. 176). Remove safety brake cover and check band adjustment (par. 256 **b** and fig. 179).
87		SPECIAL LUBRICATION. Check level of oil in winch worm gear and transmission housings, and examine oil for contamination. If an oil change is due or condition warrants, drain and refill to correct level. See Lubrication Guide (par. 25).
87	87	CLEAN AND SERVE. Unwind cable, and inspect for broken or frayed strands, and for flat or rusty spots.

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MAINTENANCE		
6,000 Mile	1,000 Mile	
90	90	Clean entire length of cable, and as cable is rewound evenly and tightly on drum, apply a thin film of engine oil.
90	90	**Crane (Frame, Boom, Winches, Air Clutch, Throttle Controls, Transmission, Swinger, Drives, Shear Pins, Cables, Sheaves).**
90	90	FRAME. Inspect A-frame and all brackets and braces to see if they are in good condition and securely assembled and mounted. Look particularly for broken assembly welds.
90		TIGHTEN. Draw up all assembly and mounting nuts or screws securely.
90	90	BOOM. Examine boom and topping assembly for looseness and damage. See that all assembly links, link pins, and lock pins are present and secure.
		WINCHES AND SWINGER. Inspect topping and swinger winches to see if they are in good condition and correctly and securely assembled and mounted; that air clutch, transmission, and throttle controls operate without looseness or binding, and that control linkage is not excessively worn. Make an operating test of all winch, boom, transmission, clutch, and swinger housings for leaks at seals or gaskets.
90		SPECIAL LUBRICATION. Check level of oil in winches, transmission, and swinger gear cases, and examine oil for contamination. If an oil change is due or condition warrants, drain and refill to correct level. See Lubrication Guide (par. 25).
90		TIGHTEN. Tighten loose winch, winch transmission, and swinger assembly mounting nuts or screws securely.
90	90	DRIVES. Inspect all winch drive chains, sprockets, and chain tighteners for good condition. Make sure that they are clean, securely assembled and mounted, and not excessively worn. Check tension of drive chains, and make sure there is no appreciable slack. Sprocket hub shear pins must be serviceable and secure.
90		ADJUST. Set drive chain tighteners so that all slack is removed from chains.
90	90	CABLES. Inspect all boom and winch cables (unwind winch cables), for broken or frayed strands, and for flat or rusty spots.
		CLEAN AND SERVE. Clean entire length of all cables, and apply a film of engine oil. Rewind winch cables evenly and tightly on drums, and secure them properly.
90	90	SHEAVES. Inspect all mounted guide or block sheaves to see if they are in good condition, securely assembled

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
		and mounted, and not excessively worn. Be sure all assembly and lock pins are in place, in good condition, not excessively worn, and well lubricated.
89	89	**Truck to Trailer Brake Connections.** Examine hose to see if they are in good condition, properly supported, and if connecting fittings are in good condition, and not excessively worn.
91	91	**Lamps (Lights) (Head, Tail, Spot, Body, Stop, and Blackout).** Operate all switches and note if lights respond. Include stop and blackout lights. Observe if foot switch controls headlight beams properly, and if beams are aimed so as not to blind oncoming traffic. Examine all lights to see if they are in good condition, securely mounted, and if lenses are dirty.
91		ADJUST. Adjust lamp-unit beams.
92	92	**Safety Reflectors.** Observe if reflectors are all in good condition, clean, and secure.
93	93	**Front Bumper, Tow Hooks, Brush Guards, and Grille.** See if they are in good condition, secure, and that radiator grille is not obstructed.
94	94	**Hood and Fasteners.** Inspect hood to see if it is in good condition, that hinges and fasteners operate properly, and fasteners hold hood securely.
95	95	**Front Fenders and Running Boards.** Examine fenders and running boards to see if they are in good condition and securely mounted.
96	96	**Cab (Hardware, Windshield, Glass, Top and Frame, Curtains, Seats, and Floor Plates).** Examine all applicable items to see if they are in good condition, correctly assembled, clean, and secure.
		TIGHTEN. Draw up all loose assembly mounting nuts and screws securely.
97	97	**Heater and Defroster.** Inspect heater assembly to be sure it is in good condition, secure, and not leaking. See that defroster ducts are properly connected and supported. Blow out heater core air passages, and apply a few drops of engine oil to heater fan bearings.
98	98	**Circuit Breakers.** Observe if breakers are in good condition, clean, dry, and securely connected and mounted.
100	100	**Body (Attachments, Floor, Stowage, Boxes and Compartments, and Control Platforms).** Examine above items to see if they are in good condition and correctly and securely assembled and mounted.
101	101	**Pintle Hook and Chain Roller.** Inspect these units to see if they are in good condition and secure. Be sure

MAINTENANCE	
6,000 Mile	1,000 Mile
		pintle latch operates properly and locks securely, and that rear chain roller rotates freely.
103	103	**Paint and Markings.** Examine paint of entire vehicle 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 Noise Suppression.** Inspect all suppressors, condensers, filters, bond straps, and toothed lock washers to see if they are in good condition, clean, and that all mountings and connections are secure. NOTE: *Any irregularities except cleaning, tightening, or unit replacements, must be referred to signal corps personnel for attention.*

TOOLS AND EQUIPMENT

131	131	**Tools (Vehicle, Pioneer, and Wrecking).** Inspect all tools and standard and special equipment to be sure all items are present (See On Vehicle Stowage Lists, pars. 27 and 28, figs. 48 to 56 inclusive). Be sure all items are in good condition, clean, and well lubricated where necessary. Be sure that tools with cutting edges are sharp and protected, and that all items are correctly and securely mounted or stowed. Tools or equipment mounted on outside of vehicle should be painted or otherwise treated to prevent rust, glare, or reflections, and tool box and compartment covers must be closed and fastened.
132	132	**Fire Extinguisher.** See if all units 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	**Decontaminator.** See if they are in good condition, securely mounted, and fully charged. Make the latter check by removing filler plug. NOTE: *This solution must be replaced every 3 months as it deteriorates.*
134	134	**First Aid Kit (if specified).** See if kit is in good condition, and that all of the items are present and properly packed. Report any deficiencies immediately to designated authority.
135	135	**Publications and Form No. 26.** See that all vehicle and equipment manuals, Lubrication Guides, Standard Form No. 26 (Driver's Report—Accident, Motor Transporta-

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MAINTENANCE	
6,000 Mile	1,000 Mile
		tion) W. D., A.G.O. Form No. 478 (MWO and Major Unit Assembly Replacement Record), are 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.
139	139	**Fuel and Water Cans and Brackets.** Observe if they are in good condition and secure. Note if the caps fit tightly and are secured to the can with a chain, and if cans are leaking.
141	141	**Modifications (MWO's Completed).** Inspect vehicle to determine if all Modification Work Orders have been completed. Enter MWO's, and Major Unit Assembly Replacement Records made at time of this service on Form No. 478.
142	142	**Final Road Test.** Make a final road test, rechecking Items 2 to 14 inclusive, and all gear oil levels. Confine the road test to minimum distance necessary for satisfactory observations. NOTE: *Correct or report all deficiencies noticed during road test.*

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Section XI

ORGANIZATION TOOLS AND EQUIPMENT

34. TOOLS.

a. Standard Tools and Equipment. Common hand tools and equipment available to second echelon are listed in SNL N-19.

b. Special Tools. There are no special tools required for second echelon maintenance on this vehicle.

Section XII

TROUBLE SHOOTING

35. INTRODUCTION.

a. Trouble shooting for the entire vehicle is given in this section.

b. The material in this section applies to operation of the vehicle under normal conditions. If extreme conditions are encountered, it is assumed the operator of the vehicle has followed the instructions in section V.

c. It may be difficult at times to determine the exact cause of engine trouble because of the number of sources to which the symptom may be attributed. The quickest method is to eliminate successively the possible causes, starting with the most probable cause. The following are the most common troubles and their probable causes:

36. ENGINE.

a. Engine Refuses to Rotate.

(1) BATTERY DEAD. Check with hydrometer, and if gravity is below 1.225 change battery or recharge.

(2) DEFECTIVE CRANKING MOTOR. Replace cranking motor (par. 99).

(3) CORRODED OR LOOSE BATTERY TERMINALS. Clean and tighten.

(4) DEFECTIVE STARTER SWITCH. Replace switch (par. 100).

(5) BROKEN STARTER SPRING OR BOLT. Replace cranking motor (par. 99).

(6) WATER IN CYLINDERS. Replace faulty head gasket (par. 54).

(7) CRACKED CYLINDER HEAD OR CYLINDER BLOCK. Remove spark plugs, and inspect for any indication of water. Notify ordnance maintenance personnel.

b. Engine Rotates but Will Not Start.

(1) FAULTY IGNITION SYSTEM. Inspect system to determine if the coil is delivering current to spark plugs. Disconnect one spark plug wire from spark plug, and hold terminal ¼ inch from spark plug or positive ground while turning engine with cranking motor. If no current is available at spark plugs, inspect ignition switch, ignition coil, and distributor for loose or broken wire leads; inspect distributor points for opening, closing, proper clearance, and excessive pitting or burning (par. 91). Inspect distributor and high tension wiring for dampness; inspect distributor cap for cracks and corrosion; inspect coil and condenser. Replace items as necessary.

(2) FAULTY FUEL SYSTEM. Examine the fuel supply; and replenish if necessary. Disconnect fuel line at carburetor, and operate fuel pump by hand (par. 7 c). If no fuel is being delivered to carburetor, check for plugged lines, loose fittings, and dirty fuel filter (par. 70). Check fuel pressure. Inspect two-way fuel valve for positioning to full right or left positions.

c. ENGINE STARTS BUT STOPS. Inspect fuel pump. Pressure is normally 4 to 5 pounds, and if low, replace fuel pump (par. 69). Inspect for plugged fuel lines, and clean fuel filter (par. 70). Clean screen in carburetor bowl.

d. Engine Does Not Develop Full Power.

(1) IGNITION TIMING TOO SLOW OR FAST. Reset timing (par. 92 c).

(2) SPARK PLUGS NOT FIRING. Replace plugs or wiring.

(3) PITTED OR BURNED DISTRIBUTOR POINTS. Replace points (par. 91).

(4) BAD IGNITION COIL OR CONDENSER. Replace (pars. 94 and 90).

(5) USE OF IMPROPER FUEL. Refill with proper fuel.

(6) AIR LEAKS AT INTAKE MANIFOLD OR CARBURETOR. Replace gaskets (par. 58). This can be determined by running engine at 800 revolutions per minute, and applying small amount of oil at manifold and carburetor flanges. If oil is sucked in, there is evidence of a leak.

(7) DIRTY CARBURETOR OR FUEL FILTER. Clean carburetor and filter (pars. 68 and 70).

(8) VALVES BURNED OR IMPROPERLY ADJUSTED. Replace head or adjust valves (pars. 54 and 55).

(9) WEAK VALVE SPRINGS. Replace by ordnance maintenance personnel.

(10) FAULTY GOVERNOR. Replace.

e. Engine Misfires.

(1) FAULTY IGNITION SYSTEM (sec. XVIII).

(2) DIRT OR WATER IN CARBURETOR OR FUEL FILTER (pars. 68 and 70).

(3) LOW COMPRESSION. Check with vacuum and compression gages. Notify ordnance maintenance personnel.

f. Excessive Oil Consumption.

(1) LOW OIL VISCOSITY. Change oil to recommended viscosity

(2) EXCESSIVE ENGINE TEMPERATURE. Service cooling system (par. 80).

(3) LEAKY GASKETS. Replace oil pan and rocker cover gaskets (pars. 61 and 54).

(4) LOOSE OIL LINE CONNECTIONS. Tighten connections.

(5) WORN OR BROKEN PISTON RINGS. Notify ordnance maintenance personnel.

g. Overheating.

(1) COOLANT LOW. Replenish.

(2) RESTRICTED FLOW OF WATER. Flush cooling system (par. 80).

(3) FAULTY THERMOSTAT. Replace (par. 82).

(4) IMPROPER IGNITION TIMING. Reset timing (par. 92 c).

(5) BROKEN OR WORN FAN BELT. Replace fan belt (par. 84).

h. Engine Will Not Stop.

(1) FAULTY IGNITION SWITCH. Replace switch (par. 95).

(2) MOTOR OVERHEATED. If motor fails to stop when ignition key is in "OFF" position, depress clutch, and shift transmission into fifth gear with transfer case in high. Apply brakes and, with throttle closed, gradually engage clutch until motor stalls. Replace ignition switch. Service cooling system (par. 80).

i. Tachometer Inoperative.

(1) BROKEN OR KINKED CABLE. Replace cable.

(2) FAULTY TACHOMETER HEAD. Replace head (par. 234).

j. Low or No Oil Pressure.

(1) LACK OF OIL IN CRANKCASE. Replenish oil supply.

(2) LOOSE OIL LINE CONNECTION. Remove inspection plate on right side of crankcase, and examine oil lines and fitting. Tighten oil connections.

(3) DIRTY OIL SCREEN. Remove and clean (par. 61).

(4) PLUGGED OIL PRESSURE RELIEF VALVE. Remove and clean.

(5) BURNED OR WORN-OUT BEARING IN MOTOR. Notify ordnance maintenance personnel.

(6) OVERHEATING OF MOTOR. Flush cooling system (par. 80). Reset ignition timing (par. 92 c).

(7) VISCOSITY OF OIL TOO LOW. Drain and refill crankcase (par. 26).

(8) OIL GAGE LINE PLUGGED OR BROKEN. Replace flexible oil line.

(9) FAULTY OIL GAGE. Replace (par. 236).

37. CLUTCH.

a. Slipping.

(1) IMPROPER ADJUSTMENT. Adjust pressure plate and clutch linkage (par. 66).

(2) WEAK SPRING. Replace clutch (par. 65).

(3) WORN LINING. Replace clutch disk (par. 65).

(4) LINING OIL-SOAKED. Replace clutch disk (par. 65).

(5) LINED PLATE STICKING. Replace clutch disk (par. 65).

b. Grabbing.

(1) OIL ON LINING. Replace clutch disk (par. 65).

(2) LINED PLATE STICKING. Replace clutch disk (par. 65).

(3) WORN SPLINE ON CLUTCH GEAR. Notify ordnance maintenance personnel.

(4) LOOSE ENGINE MOUNTING. Tighten motor support bolts.

c. Rattling.

(1) WEAK RETRACTOR SPRINGS. Replace clutch (par. 65).

(2) LOOSE FLYWHEEL RING BOLTS. Remove transmission and tighten flywheel bolts (par. 65).

(3) POORLY CENTERED RELEASE YOKE. Aline.

d. Dragging.

(1) EXCESSIVE PEDAL CLEARANCE. Adjust clutch linkage (par. 66).

(2) INCORRECT PRESSURE PLATE ADJUSTMENT. Adjust clutch (par. 66).

(3) WARPED OR CRACKED DRIVEN PLATE. Replace pressure plate assembly (par. 65).

(4) EXCESSIVE DIRT IN CLUTCH ASSEMBLY. Remove and clean (par. 65).

38. FUEL SYSTEM.

a. Fuel Does Not Reach Carburetor.

(1) LACK OF FUEL SUPPLY. Replenish.

(2) PLUGGED FUEL LINE. Disconnect at carburetor and operate fuel pump by hand (par. 7 c).

(3) LOOSE FITTINGS AND DIRTY FUEL FILTER. Clean and tighten lines (pars. 74 and 70).

(4) LOW FUEL PUMP PRESSURE. Should be normally 4 to 5 pounds. If low, change fuel pump (par. 69).

(5) DIRTY CARBURETOR SCREEN. Clean screen in carburetor bowl (par. 68).

(6) DIRTY FUEL TANK CAP VENTS. Clean vents.

b. Fuel Does Not Reach Cylinders.

(1) CARBURETOR STRAINER PLUGGED. Clean and service (par. 68).

(2) CARBURETOR JETS PLUGGED. Remove and service (par. 68).

(3) THROTTLE NOT OPENING. Service and replace (par. 73).

(4) CHOKE CONTROL NOT OPERATING. Service and replace (par. 73).

(5) LEAKY MANIFOLD AND CARBURETOR GASKETS. Replace gaskets (pars. 58 and 68).

TROUBLE SHOOTING

39. IGNITION SYSTEM.

a. No Spark to Plugs.

(1) GENERAL. The ammeter on the instrument panel will prove a valuable aid in localizing a defect in the circuit which results in no spark. If the ammeter shows no discharge, it is an indication that the primary circuit is interrupted and the current is not permitted to complete the circuit to the battery.

(2) IGNITION SWITCH IS DEFECTIVE. Replace switch (par. 95).

(3) LOOSE CONNECTIONS FROM STARTER SWITCH TO AMMETER. Tighten connections.

(4) LOOSE CONNECTIONS FROM AMMETER TO IGNITION SWITCH. Tighten connections.

(5) DISTRIBUTOR POINTS IN DISTRIBUTOR ARE NOT OPENING OR CLOSING. Replace or reset (par. 91).

(6) DISTRIBUTOR POINTS ARE EXCESSIVELY BURNED OR PITTED. Service or replace (par. 91).

(7) PRIMARY WIRE FROM IGNITION SWITCH TO COIL AND FROM COIL TO DISTRIBUTOR MAY BE BROKEN OR CONNECTIONS LOOSE. Tighten or replace (par. 136).

(8) DEFECTIVE IGNITION COIL. Replace coil (par. 94).

(9) NORMAL AMMETER READING. Needle operates between 2 and 5 amperes discharge while cranking motor is cranking the engine. When ammeter reading is normal with slight oscillation, it indicates that the primary circuit is complete, therefore, checking should be confined to the secondary circuit.

(10) HIGH TENSION WIRE FROM COIL TO DISTRIBUTOR BROKEN OR GROUNDED. Replace wire.

(11) DEFECTIVE IGNITION COIL. Replace coil (par. 94).

(12) DEFECTIVE CONDENSER. Replace condenser (par. 90).

(13) DEFECTIVE DISTRIBUTOR ROTOR. Replace rotor.

(14) DEFECTIVE DISTRIBUTOR CAP. Replace cap (par. 96).

(15) CORRODED HIGH TENSION TERMINALS EITHER AT COIL OR DISTRIBUTOR CAP. Clean terminals.

(16) DAMPNESS IN DISTRIBUTOR. Dry out or replace (par. 92).

(17) HIGH TENSION WIRING MAY BE WET. Dry out or replace (par. 96).

(18) AMMETER INDICATES ABNORMAL DISCHARGE. More than 2 to 5 amperes. This condition is an indication that a short exists in the primary circuit. This can occur in the ammeter, the ignition coil, or the distributor.

(19) WIRE FROM AMMETER TO IGNITION SWITCH AND FROM IGNITION SWITCH TO IGNITION COIL SHORTED OR GROUNDED. Replace (par. 136).

(20) PRIMARY WINDING IN IGNITION COIL SHORTED. Replace coil (par. 94).

(21) DISTRIBUTOR POINTS MAY NOT BE OPENING. Reset or replace (par. 91).

(22) CONDENSER SHORTED OR GROUNDED. Replace condenser (par. 90).

(23) DISTRIBUTOR ARM GROUNDED. Replace arm (par. 91).

b. Spark Test Indicates Weak Spark.

(1) DISTRIBUTOR POINTS BURNED OR BADLY PITTED. Replace (par. 91).

(2) LOOSE ELECTRICAL CONNECTIONS THROUGHOUT THE CIRCUIT CAUSING HIGH RESISTANCE. Tighten.

(3) HIGH TENSION WIRES DEFECTIVE OR WET. Replace or dry (par. 96).

(4) WEAK IGNITION COIL. Replace coil (par. 94).

(5) WEAK DISTRIBUTOR CONDENSER. Replace condenser (par. 90).

(6) DEFECTIVE DISTRIBUTOR CAP. Replace cap (par. 96).

(7) DEFECTIVE DISTRIBUTOR ROTOR. Replace rotor.

c. Faulty Spark Plugs.

(1) WRONG TYPE PLUG USED. Replace with correct spark plug.

(2) SPARK PLUGS DIRTY. Clean and reset (par. 93).

(3) SPARK PLUG GAP TOO GREAT. Reset (par. 93).

(4) PORCELAIN CRACKED. Replace.

40. GENERATING SYSTEM.

a. Testing Procedure.

(1) GENERATOR. If the truck ammeter does not show charge, the generator, regulator, or wiring may be at fault. Therefore, it is necessary to make several tests to determine the source of trouble. These tests can be made without disconnecting any of the leads from the generator to the regulator or without removing the generator or regulator cover. A preliminary test without removal of the units from the vehicle requires a minimum of time and effort. The source of trouble can definitely be determined without removing any units from the vehicle. If the wires are moved or disconnected, or the regulator and generator covers removed, the true source of trouble may not be immediately determined due to temporary correction having been made through movement of parts or wires.

(2) The method of procedure is as follows: Connect voltmeter between ground and the "A" terminal of the regulator. With engine speed at 1,200 revolutions per minute, note voltmeter reading. If reading is only 3 or 4 volts, look for an open field circuit. This can be either in the regulator, generator, or in the field wire connecting them. To determine the location of the open circuit, connect a jumper lead to the ground, and hold the other end on the "F" terminal of the regulator. Take a reading on the voltmeter. If the reading immediately increases to 12 volts or more, the trouble will be found in the regulator. If no change is noted in the voltage reading when the jumper is connected to the "F" terminal of the regulator, move jumper to the "F" terminal of the generator and ground. If the voltage reading is still

only 3 or 4 volts, this eliminates the possibility that the wire from the "F" terminal on the generator to the "F" terminal on the regulator is open. The trouble will then be found in the generator. If no voltage reading is noted, it is an indication that there is a ground in the generator, that the brushes are sticking, that a brush spring is broken, that the commutator is dirty, or that the armature is shorted or grounded. To eliminate the regulator and the wire as being the source of trouble, disconnect the "A" and "F" wires at the generator, and make a voltage test at the generator.

(3) If the trouble in the generator is not readily located, slow the engine to an idling speed. Disconnect the battery connection from the "B" terminal on the regulator, and hook in a test ammeter in series between the wire disconnected and the "B" terminal. Increase the speed of the engine slightly above idling. Disconnect the test ammeter lead at "B" on the regulator, and hold for a few moments on the "A" terminal of the regulator. This bypasses the relay so that the battery current flows to the generator. Note the reading on the ammeter. If the average reading is high on the discharge side, but the needle fluctuates through several divisions of the scale, a shorted armature is indicated. If the discharge reading is high, but the needle does not fluctuate, the generator is very likely grounded internally. In either case, the generator must be removed for repair (par. 102).

(4) REGULATOR. In the event the truck ammeter fails to show charge, the following conditions should be inspected and corrected if necessary, before any work is performed on the regulator.

(a) Wiring from generator to regulator connected to proper terminals on each unit.

(b) Loose connections or poorly soldered terminals in charging circuit wiring.

(c) Generator performance according to specifications, exclusive of regulator.

(d) Battery condition according to manufacturer's specifications.

(5) To check the regulator for proper operation, the following procedure should be followed:

(a) Disconnect truck ammeter wire from regulator "B" terminal. Using a test ammeter, connect one lead to the regulator "B" terminal and the other to the truck ammeter lead removed from the regulator "B" terminal.

(b) Using a test voltmeter, connect one lead to the regulator "B" terminal on the regulator side of the ammeter connection. Connect the other lead of the voltmeter to a positive ground.

(c) Test the battery for specific gravity. This reading should be between 1.270 and 1.280. If the battery is in a low condition, it should be replaced with a fully charged battery for testing purposes.

(d) Start the engine and set the throttle for an engine speed of between 1,500 and 1,800 revolutions per minute. Run the engine for 15 to 20 minutes with the hood up so that the units will be warm.

(e) With a generator charge of 10 amperes, the voltmeter should show a reading according to the specification figures given for the

regulator under test. With readings according to these figures, the voltage regulator unit can be passed as operating correctly.

(f) To test the current regulator, make the same meter connections as noted above. Turn on all of the vehicle lights.

(g) If the current regulator is operating correctly, the test ammeter will show a reading of 17 amperes, within allowable variations of plus or minus 5 percent. If the unit does not operate according to specifications, it should be removed from the truck, inspected, and reconditioned according to specifications. Replace regulator (par. 103).

(6) FULLY CHARGED BATTERY AND LOW CHARGING RATE. These terms indicate the generator and voltage regulator units are functioning properly. To verify, turn off the ignition switch and operate starter for 30 seconds. Then start the motor, and the charging rate should increase.

(7) FULLY CHARGED BATTERY AND HIGH CHARGING RATE. Replace voltage regulator or generator (pars. 102 and 103).

(8) LOW BATTERY AND LOW OR NO CHARGING RATE. Replace generator or regulator (pars. 102 and 103).

41. STARTING SYSTEM.

a. Cranking Motor Will Not Operate.

(1) TEST. Connect a voltmeter between the cranking motor terminal and the ground. Step on the starter switch, and watch the voltmeter reading. If the voltage reading is 12 volts or more, the trouble will be found in the cranking motor. Replace cranking motor (par. 99). If the voltmeter hand remains at zero, there is trouble at some other source than the cranking motor. Check the following:

(2) DEAD BATTERY. Recharge battery.

(3) POOR BATTERY GROUND. Tighten ground strap connections and terminals.

(4) LOOSE CABLE CONNECTIONS. Inspect all battery cable terminals to see that they are properly soldered and have tight connections.

(5) BURNED STARTER SWITCH. Replace starter switch (par. 100).

(6) GROUNDED CIRCUIT. Inspect battery cable insulation.

(7) GROUNDED CRANKING MOTOR. Replace cranking motor (par. 99).

(8) CRANKING MOTOR GEAR LODGED IN THE FLYWHEEL. Remove cranking motor, rotate drive pinion away from housing, and reinstall (par. 99).

42. LIGHTING SYSTEM.

a. All Lights Will Not Burn.

(1) DEAD BATTERY. Recharge or replace.

(2) LOOSE OR CORRODED TERMINALS. Clean and tighten.

(3) LOOSE CONNECTIONS. Tighten all connections at starter switch, light switch, ammeter, and junction block.

(4) SHORT CIRCUITS. Examine battery cables and all wiring for bare or worn spots. Replace, if necessary.

(5) LAMPS BURNED OUT. If ground cable is loose, or if there is a loose connection at ammeter while vehicle is being operated with lights on, it will burn out the lamps.

(6) CIRCUIT BREAKER OPENED. If short circuit occurs, circuit breaker on light switch will open to prevent damage to wiring. To close the points on the circuit breaker, allow circuit breaker to cool and close by hand to complete the circuit. Inspect wiring for bare or worn spots, and replace if necessary.

b. Lights Dim.

(1) DISCHARGED BATTERY. Recharge or change.

(2) LOOSE OR CORRODED TERMINALS. Clean and tighten battery terminals and ground strap. Tighten all connections at light switch, ammeter, starter switch, and junction block.

c. One or More Lamp-units Burn Out Continually.

(1) GROUND STRAP LOOSE OR BROKEN. Tighten or replace cable.

(2) HIGH BATTERY VOLTAGE. Inspect generator and regulator. Replace (pars. 102 and 103).

d. Individual Lights or Circuits Inoperative.

(1) LAMP BURNED OUT. Replace.

(2) LOOSE CONNECTIONS. Tighten connections at light and switch.

(3) BROKEN OR GROUNDED WIRE LEADS. Replace.

(4) SWITCH BURNED OUT. Replace.

43. TRANSMISSION.

a. General. Noise which seems to originate in the transmission is frequently found to be caused by some other part of the chassis driving mechanism. These noises may originate in the engine, the propeller shafting, the rear axle, or in the parking brake disk. It is, in turn, reflected into the transmission which merely acts as a sound box for the noise. Therefore, before any service work is done on the transmission, a thorough check should be made to endeavor to isolate the noise at its actual source. After investigating and eliminating other causes, the following may apply:

b. Transmission Noisy.

(1) LUBRICANT NOT OF PROPER VISCOSITY. Drain and refill (par. 26).

(2) INSUFFICIENT LUBRICANT. Drain and refill (par. 26).

(3) TRANSMISSION OUT OF ALINEMENT WITH CLUTCH HOUSING. Notify ordnance maintenance personnel.

(4) TRANSMISSION LOOSE ON CLUTCH HOUSING. Remove transmission, and tighten clutch housing bolts.

(5) CLUTCH HOUSING LOOSE ON ENGINE. Tighten clutch housing bolts.

(6) GEARS WORN EXCESSIVELY. Notify ordnance maintenance personnel.

(7) MAINSHAFT GEARS LOOSE ON SPLINE SHAFT. Notify ordnance maintenance personnel.

(8) COUNTERSHAFT GEARS LOOSE ON SHAFT. Notify ordnance maintenance personnel.

(9) WORN BUSHINGS IN GEARS. Notify ordnance maintenance personnel.

(10) WORN BEARINGS ON SHAFTS. Notify ordnance maintenance personnel.

(11) MAIN DRIVE GEAR WORN OR OUT OF ALINEMENT. Notify ordnance maintenance personnel.

c. Transmission Hopping Out of Gear.

(1) WEAKENED SHIFT POPPET SPRINGS. Notify ordnance maintenance personnel.

(2) GEARS ONLY PARTIALLY ENGAGED. Notify ordnance maintenance personnel.

(3) WORN GEAR BUSHINGS. Notify ordnance maintenance personnel.

(4) TRANSMISSION OUT OF ALINEMENT. Notify ordnance maintenance personnel.

(5) TAPERED GEAR TEETH FROM IMPROPER SHIFTING. Notify ordnance maintenance personnel.

(6) WORN BEARINGS, CAUSING SHAFT MISALINEMENT. Notify ordnance maintenance personnel.

d. Lubricant Leaks.

(1) WORN OR DAMAGED OIL SEALS. Notify ordnance maintenance personnel.

(2) DAMAGED GASKETS. Notify ordnance maintenance personnel.

(3) CAP SCREWS OR NUTS LOOSE. Tighten both inspection plates on side of transmission and oil seal retaining cap screws.

(4) LOOSE DRAIN PLUG. Tighten.

44. TRANSFER CASE.

a. General. The transfer case is frequently blamed for noise that originates elsewhere in the chassis for which the transfer case is merely acting as a sound box. Before doing any work on the transfer case, remove all doubt that the noise actually exists in this unit.

b. Noise in Transfer Case.

(1) WORN BEARINGS. Notify ordnance maintenance personnel.

(2) FAULTY GEARING. Notify ordnance maintenance personnel.

(3) IMPROPER LUBRICANT. Drain and refill (par. 26).

(4) LOW LUBRICANT LEVEL. Drain and refill (par. 26).

(5) MISALINEMENT. Notify ordnance maintenance personnel.

(6) LOOSE BRAKE DISK. Tighten cap screws and nuts.

c. Slips Out of Gear.

(1) SHIFT ROD POPPET SPRING WEAKENED OR BROKEN. Notify ordnance maintenance personnel.

(2) SHIFT ROD POPPET BALL STICKING. Notify ordnance maintenance personnel.

(3) PARTIAL GEAR ENGAGEMENT. Check all pull rods for wear and improper adjustment (par. 147).

(4) WORN OR LOOSE BEARINGS. Notify ordnance maintenance personnel.

d. Lubricant Leaks.

(1) WORN OR DAMAGED OIL SEALS. Notify ordnance maintenance personnel.

(2) DAMAGED GASKETS. Notify ordnance maintenance personnel.

(3) CAP SCREWS OR NUTS LOOSE. Tighten all cap screws and nuts.

45. PROPELLER SHAFTS.

a. Constant Vibration in Time with Propeller Shaft Rotation.

(1) PROPELLER SHAFT IMPROPERLY ASSEMBLED. Remove and assemble correctly (par. 150).

(2) DRY BEARINGS. Lubricate (par. 26).

(3) WORN NEEDLE BEARINGS. Replace worn bearings (par. 150).

(4) LOOSE FLANGE BOLTS AND NUTS. Tighten all bolts and nuts on flanges.

b. Sharp Click Upon Starting Forward or Reversing.

(1) LOOSE COMPANION FLANGE OR END YOKE. Remove drive shaft and tighten retaining nut.

c. Excessive Oil Leaking.

(1) WORN OR DAMAGED OIL SEALS. Replace oil seals.

46. FRONT AXLE.

a. Lubricant Leaks.

(1) WORN OR DAMAGED OIL SEALS. Replace oil seals (par. 159).

(2) LOOSE STUD NUTS AND CAP SCREWS. Tighten all cap screws and nuts.

(3) LUBRICANT LEVEL CARRIED TOO HIGH. Drain to proper level.

(4) BREATHERS PLUGGED WITH DIRT. Clean or replace breather.

b. Hard Steering.

(1) LACK OF LUBRICATION. Lubricate.

(2) ADJUSTMENTS TOO TIGHT IN STEERING GEAR OR LINKAGE. Notify ordnance maintenance personnel.

(3) IMPROPER TOE-IN. Check and set to proper toe-in (par. 155).

(4) TIRES IMPROPERLY INFLATED. Inflate tires to 70 pounds.

(5) ERROR IN ROLLING RADIUS. Check for excessively worn tires, and replace if necessary.

(6) EXCESSIVE CASTER. Notify ordnance maintenance personnel.

c. Wandering.

(1) LOOSE STEERING GEAR OR LINKAGE. Tighten steering linkage.

(2) TIRE INFLATION UNEQUAL. Inflate all tires to 70 pounds.

(3) TIRE SIZES UNEQUAL. Examine for excessive wear. Change if necessary

(4) AXLE SHIFTED ON SPRINGS. Place axle in position and tighten U-bolt nuts.

(5) LOOSE BEARING ADJUSTMENTS. Adjust front wheel bearings (par. 195).

(6) TOO LITTLE CASTER. Notify ordnance maintenance personnel.

(7) TOO MUCH OR TOO LITTLE CAMBER. Notify ordnance maintenance personnel.

(8) TOO MUCH OR TOO LITTLE TOE-IN. Adjust toe-in (par. 155).

(9) BROKEN SPRINGS. Replace (pars. 201 and 202).

(10) BENT OR DEFLECTED AXLE CENTER MEMBER. Notify ordnance maintenance personnel.

d. Uneven Tire Wear.

(1) LOW INFLATION PRESSURE. Inflate all tires to 70 pounds.

(2) EXCESSIVE CAMBER. Notify ordnance maintenance personnel.

(3) WHEELS OUT OF BALANCE. Notify ordnance maintenance personnel.

(4) INCORRECT ALINEMENT. Inspect and set to proper toe-in (par. 155).

e. Low Speed Shimmy (Generally exists below 30 mph).

(1) INCORRECT TIRE PRESSURE. Inflate all tires to 70 pounds.

(2) LOOSE BEARING ADJUSTMENTS. Adjust front wheel bearings (par. 195).

(3) TOO MUCH CASTER. Notify ordnance maintenance personnel.

(4) STEERING GEAR LOOSE. Tighten steering gear to frame channel, bolts, and nuts.

(5) TIE ROD OR DRAG LINK ENDS LOOSE. Tighten tie rod and drag links (par. 209).

(6) STEERING ARMS LOOSE. Tighten steering arms (par. 210).

f. High Speed Wheel Tramp. Wheel tramp generally takes place above 30 miles per hour.

(1) WHEELS OUT OF BALANCE. Notify ordnance maintenance personnel.

(2) SHOCK ABSORBERS INOPERATIVE. Replace shock absorbers (par. 204).

g. Backlash.

(1) LOOSE AXLE FLANGES. Tighten axle flange nuts.

(2) EXCESSIVE AXLE SHAFT SPLINE LOOSENESS. Replace axle shaft (par. 159).

(3) EXCESSIVE CLEARANCE IN STEERING UNIVERSAL JOINTS. Notify ordnance maintenance personnel.

(4) EXCESSIVE CLEARANCE IN PROPELLER SHAFT JOINTS. Replace worn universal joints (par. 150).

(5) LOOSE UNIVERSAL JOINT YOKES. Remove drive shaft and tighten retaining nut (par. 150).

(6) EXCESSIVE BEVEL GEAR AND PINION CLEARANCE. Notify ordnance maintenance personnel.

h. Constant Hum.

(1) DRIVE UNIT OUT OF ADJUSTMENT. Notify ordnance maintenance personnel.

(2) WORN OR LOOSE BEARINGS. Notify ordnance maintenance personnel.

i. Coasting Hum.

(1) PINION SET TOO FAR OUT. Notify ordnance maintenance personnel.

(2) LOOSE PINION ADJUSTMENT. Notify ordnance maintenance personnel.

(3) WORN OR LOOSE BEARINGS. Notify ordnance maintenance personnel.

j. Pulling Hum.

(1) WORN OR LOOSE BEARINGS. Notify ordnance maintenance personnel.

(2) PINION SET TOO FAR IN. Notify ordnance maintenance personnel.

47. REAR AXLE.

a. Lubricant Leaks.

(1) WORN OR DAMAGED OIL SEALS. Replace worn or damaged seals (par. 198).

(2) LOOSE STUD NUTS AND CAP SCREWS. Tighten all nuts and bolts.

(3) DAMAGED GASKETS. Notify ordnance maintenance personnel.

(4) LUBRICANT LEVEL CARRIED TOO HIGH. Drain to proper level (par. 26).

(5) BREATHERS OBSTRUCTED. Remove breather; clean or replace (par. 26).

b. Backlash.

(1) LOOSE AXLE FLANGES. Tighten axle flange nuts (par. 162).

(2) EXCESSIVE AXLE SHAFT SPLINE LOOSENESS. Replace worn axles (par. 163).

(3) EXCESSIVE CLEARANCE IN THE PROPELLER SHAFT JOINTS. Replace worn universal joints (par. 150).

(4) LOOSE UNIVERSAL JOINT YOKES. Remove drive shaft and tighten retaining nut (par. 150).

(5) EXCESSIVE BEVEL GEAR AND PINION CLEARANCE. Notify ordnance maintenance personnel.

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c. Constant Hum.

(1) DRIVING UNITS OUT OF ADJUSTMENT. Notify ordnance maintenance personnel.

(2) WORN OR LOOSE BEARINGS. Notify ordnance maintenance personnel.

d. Coasting Hum.

(1) PINION SET TOO FAR OUT. Notify ordnance maintenance personnel.

(2) LOOSE PINION ADJUSTMENT. Notify ordnance maintenance personnel.

(3) WORN OR LOOSE BEARINGS. Notify ordnance maintenance personnel.

e. Pulling Hum.

(1) WORN OR LOOSE BEARINGS. Notify ordnance maintenance personnel.

(2) PINION SET TOO FAR IN. Notify ordnance maintenance personnel.

(3) LOOSE PINION ADJUSTMENT. Notify ordnance maintenance personnel.

48. BRAKE SYSTEM.

a. Slow Pressure Build-up in Reservoirs.

(1) LEAKING APPLICATION OR BRAKE VALVE. Replace valve (par. 182).

(2) LEAKING COMPRESSOR DISCHARGE VALVE. Replace compressor (par. 178).

(3) LEAKING LINES OR CONNECTIONS. Tighten all air line connections.

(4) NO CLEARANCE ON UNLOADER VALVES. Replace compressor (par. 178).

(5) DIRTY AIR CLEANER. Remove and service compressor air cleaner (par. 178 a).

(6) WORN PISTON AND RINGS, CARBON IN DISCHARGE LINE. Replace compressor or discharge line (par. 178).

b. Quick Loss of Reservoir Pressure When Motor is Stopped.

(1) WORN AND LEAKING COMPRESSOR DISCHARGE VALVES. Replace compressor.

(2) TUBING OR CONNECTIONS LEAKING. Replace damaged tubing, tighten all air line connections.

(3) LEAKING VALVES. Replace worn or damaged valves.

(4) LEAKING GOVERNOR. Replace governor (par. 179).

c. Compressor Not Unloading.

(1) BROKEN UNLOADER DIAPHRAGM. Replace compressor (par. 178).

(2) TOO MUCH CLEARANCE ON UNLOADER VALVES. Adjust valve clearance (par. 178).

(3) RESTRICTION IN LINE FROM GOVERNOR TO UNLOADER. Remove and clean governor line.

(4) GOVERNOR NOT OPERATING. Replace governor (par. 179).

d. Slow Brake Application.

(1) LOW BRAKE LINE PRESSURE. Replace governor or brake valve.

(2) BRAKE CHAMBER PUSH ROD TRAVEL EXCESSIVE. Adjust service brakes (pars. 169 and 171).

(3) RESTRICTION IN LINE. Remove and clean air lines.

(4) LEAKING BRAKE CHAMBER DIAPHGRAM. Replace brake chamber (par. 175).

(5) BRAKE LINING OR DRUM CONDITION. Reline brakes. Replace worn brake drums (pars. 168, 170, 172, and 173).

(6) LEAKING BRAKE VALVE DIAPHRAGMS. Replace valve.

(7) IMPROPER ADJUSTMENT OF BRAKE PULL ROD. Adjust pull rod, or replace if necessary.

e. Slow Brake Release.

(1) BRAKE VALVE LEVER NOT RETURNING FULLY TO STOP. Inspect adjustment of pull rod and free up clevis pins; replace return spring.

(2) BINDING CAM OR CAMSHAFTS. Remove brake drums and free up camshaft.

(3) RELAY VALVE OR QUICK RELEASE VALVE DAMAGED OR WORN. Replace necessary valves (pars. 184 and 185).

(4) RESTRICTION IN TUBING OR HOSE. Remove, clean, or replace air lines.

(5) IMPROPER SEATING OF VALVES. Replace necessary valves.

f. Inefficient Brakes.

(1) LOW BRAKE LINE PRESSURE. Check air pressure and governor setting.

(2) EXCESSIVE PUSH ROD TRAVEL ON BRAKE CHAMBERS. Adjust all brakes (pars. 169 and 171).

(3) POOR LINING AND DRUM CONDITION. Remove brake drums; replace worn lining and brake drums (pars. 168, 170, 172, and 173).

(4) BRAKE CHAMBER DIAPHRAGM LEAKING. Replace damaged or worn chamber (par. 175).

49. FRONT SPRINGS.

a. Hard Riding.

(1) INSUFFICIENT LUBRICATION. Lubricate (par. 26).

(2) BOLTS IN SHACKLES OR BRACKETS FROZEN. Remove and free up shackle bolts (par. 201).

(3) LOOSE SPRING CLIPS OR U-BOLTS. Tighten clips and U-bolts.

b. Overflexibility.

(1) OVERLUBRICATED. Clean spring with dry-cleaning solvent.

(2) SHOCK ABSORBERS INOPERATIVE. Service or replace shock absorbers (par. 204).

(3) REBOUND CLIPS BROKEN. Replace springs.

50. STEERING GEAR.

a. Hard Steering.

(1) LACK OF LUBRICATION. Lubricate (par. 26).

(2) WORN STEERING GEAR PARTS. Replace worn or damaged gear (par. 207).

(3) IMPROPER ADJUSTMENT. Notify ordnance maintenance personnel.

b. Road Shock.

(1) STEERING LINKAGE TOO TIGHT. Adjust drag link and tie rod ends (par. 209).

c. Excessive Drag in Steering Gear.

(1) INADEQUATE LUBRICATION. Lubricate (par. 26).

(2) IMPROPER LUBRICANT. Drain and refill (par. 26).

(3) GEAR ADJUSTED TOO TIGHT. Notify ordnance maintenance personnel.

d. Catch or Roughness Felt in Steering Wheel.

(1) CHIPPED CAM. Replace steering gear (par. 207).

(2) FAULTY CAM BEARINGS. Replace steering gear (par. 207).

(3) DAMAGED LEVER SHAFT STUDS. Replace steering gear (par. 207).

e. Rattle in Steering Gear.

(1) IMPROPERLY ASSEMBLED JACKET TUBE BEARING. Replace steering gear (par. 207).

(2) BROKEN JACKET TUBE BEARING. Replace steering gear (par. 207).

Section XIII

ENGINE

51. DESCRIPTION AND TABULATED DATA (figs. 57 and 58).

a. A 6-cylinder valve-in-head gasoline engine of conventional design is used. Its construction is of the unit power plant type, with the cylinder block and crankcase cast as one unit.

b. Relation of Parts.

(1) The terms "front" and "rear" of an engine, designating the relative position of component parts, follow the common usage of those terms as applied to engines, viz:

(a) "Front" designates the timing gear end.

(b) "Rear" designates the flywheel end.

(c) "Right" or "Left" is applied when the engine is viewed from the flywheel end.

c. Data.

Manufacturer	Continental
Model	22-R
Type	Valve-in-head
No. cylinders	6
Bore	4½ in.
Stroke	5¼ in.
Piston displacement (cu in.)	501
Governed speed	2,400 rpm
Compression ratio	5.23:1
Firing order	1-5-3-6-2-4
SAE hp	48.6
Brake hp	145 at 2,400 rpm
Torque	372 ft-lb
Normal oil pressure (idle)	10 to 15 lb
Normal oil pressure (operating rpm)	40 to 45 lb
Spark plug gap	0.025 in.

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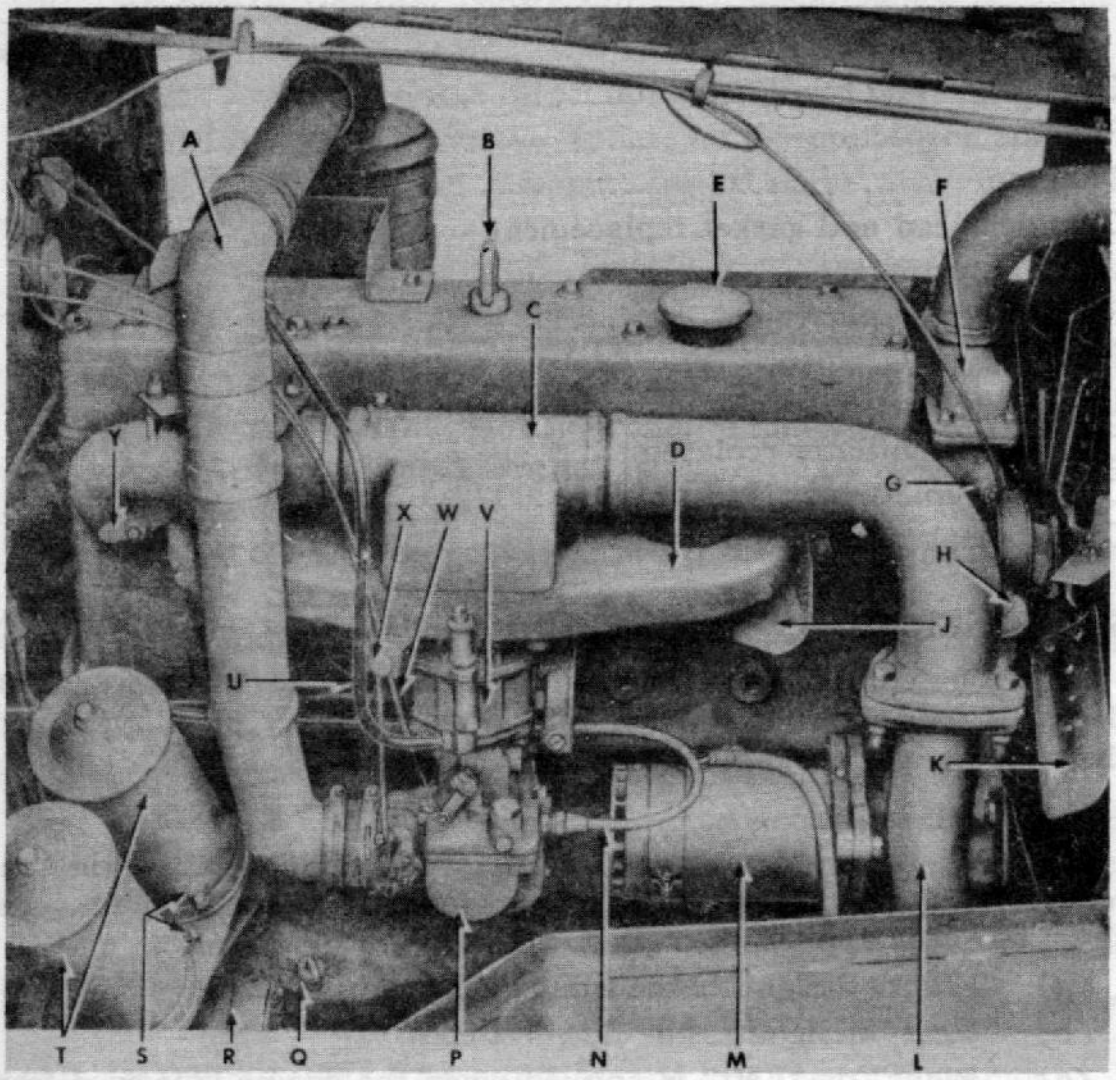
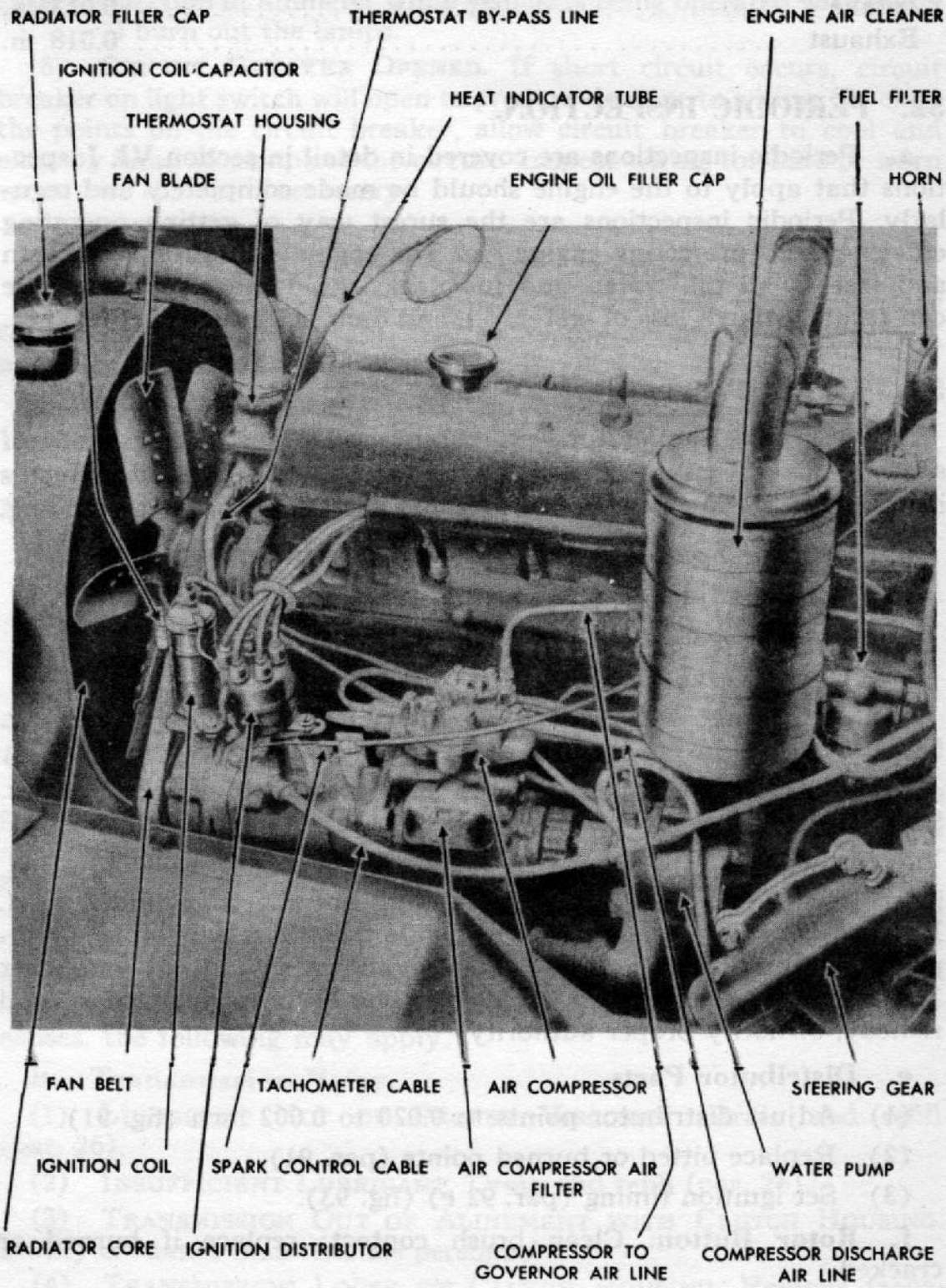


A—ENGINE AIR CLEANER TUBE
B—ENGINE LIFTING EYE
C—EXHAUST MANIFOLD
D—INTAKE MANIFOLD
E—ENGINE OIL FILLER CAP
F—THERMOSTAT HOUSING
G—HEAT INDICATOR CONNECTION
H—CRANKCASE VENTILATOR VENT CAP
J—AIR DEFLECTOR
K—FAN
L—EXHAUST PIPE
M—GENERATOR
N—FUEL LINE
P—CARBURETOR
Q—ENGINE OIL LEVEL INDICATOR
R—CRANKING MOTOR
S—OIL FILTER DRAIN PLUG
T—OIL FILTERS
U—CRANKCASE VENTILATOR VENT LINE
V—ENGINE GOVERNOR
W—HAND THROTTLE CONTROL CABLE
X—CHOKE CONTROL CABLE
Y—MANIFOLD CRAB

RA PD 315211

Figure 57—Engine Installed—Right Side

ENGINE



RA PD 315212

Figure 58—Engine Installed—Left Side

Distributor point gap	0.020 to 0.002 in.
Valve tappet clearance (hot)	
Intake	0.013 in.
Exhaust	0.018 in.

52. PERIODIC INSPECTION.

a. Periodic inspections are covered in detail in section VI. Inspections that apply to the engine should be made completely and regularly. Periodic inspections are the surest way of getting operating efficiency and protecting engine life. The engine should be kept clean and free of all oil, water, and fuel leaks, as damage to the engine can result through loss of water, oil, and danger through fuel leakage.

53. TUNE-UP.

a. General. Engine tune-up consists of a systematic series of adjustments to ensure efficient engine operation. Make adjustments in order of steps given below to avoid hit-and-miss engine tuning.

b. Remove Spark Plugs.

(1) Clean, adjust, and replace burned or fouled plugs.

(2) Adjust spark plug gaps to 0.025 inch (fig. 94).

c. Adjust Valve Tappets.

(1) Set intake valves at 0.015 inch clearance when cold (par. 55).

(2) Set exhaust valves at 0.020 inch clearance when cold (par. 55 **b**) (fig. 61).

d. Compression Test. After valve tappets have been adjusted, insert compression gage into spark plug opening in cylinder head. Rotate motor with cranking motor while throttle is wide open. Compression should be 105 pounds. The cylinders should not vary over 10 pounds in compression. If greater variation occurs, locate and remedy, or notify proper authority.

e. Distributor Parts.

(1) Adjust distributor points to 0.020 to 0.002 inch (fig. 91).

(2) Replace pitted or burned points (par. 91).

(3) Set ignition timing (par. 92 **c**) (fig. 93).

f. Rotor Button. Clean brush contact; replace if burned or cracked.

g. Distributor Cap. Examine distributor cap for cracks, corrosion in wire sockets, burning, or dampness. Dry-clean or replace as necessary.

h. Plug Wiring. Examine plug wires for corrosion, and bare or chafed covering. Replace as necessary (par. 96).

i. Coil and Condenser.

(1) Test coil; replace if weak.

(2) Test condenser; replace if necessary (par. 90) (fig. 90).

(3) Tighten coil and condenser connections.

j. Carburetor. Clean carburetor screen (par. 68). Drain carburetor bowl (par. 68).

k. Fuel Filter. Service fuel filter (par. 70) (fig. 78).

l. Wiring. Tighten all connections on starter switch, ammeter, battery, and ignition switch.

m. Final.

(1) Start motor and warm up to operating temperature.

(2) Reset valves 0.013-inch intake, 0.018-inch exhaust (fig. 61).

(3) Reset ignition timing (par. 92 c) (fig. 93).

(4) Adjust carburetor idle speed (par. 68).

54. CYLINDER HEAD AND GASKET REPLACEMENT.

a. Removal.

(1) Drain cooling system (fig. 83). Loosen radiator filler cap to facilitate draining. To remove hood, remove two center hood hinge bearing screws. Remove upper radiator bonding strap cap screw, nut, and lock washer. Disconnect radiator tie rod at both ends. Remove temperature indicator cable tubing clips. Lift off engine hood.

(2) Remove engine air cleaner (par. 75). Remove upper radiator hose connection. Remove temperature indicator cable at thermostat housing (fig. 57). Disconnect thermostat bypass line. Loosen cylinder head water manifold hose connection. Remove spark plug wiring cable tube, and remove wires from spark plugs. Remove exhaust and intake manifold assembly (par. 58) (fig. 63).

(3) To remove rocker arm cover, remove rocker arm cover cap screws. Place bar through engine lifting eye and remove (turn counterclockwise). Lift off rocker cover. To remove rocker arm assemblies, remove 12 rocker arm cap screws and lock washers. Disconnect rocker arm shaft oil line and tubing clip. Lift off rocker arm assemblies. CAUTION: *Do not misplace valve stem buttons (fig. 62).* Lift out valve push rods (par. 57) (fig. 62).

(4) Remove 16 cylinder head cap screws. Replace engine lifting eye, place long bar through loop, and lift off cylinder head assembly. Remove old cylinder head gasket.

b. Carbon Removal. Loosen carbon from cylinder head, block, and tops of pistons with a stiff wire brush and carbon scraper. Thoroughly clean loose carbon from cylinder walls, tops of pistons, head, and block surfaces. Inspect for cracked and damaged surfaces.

c. Installation.

(1) Install new cylinder head gasket on head locating dowels, and place thin coat of engine oil on top of gasket. Replace head on cylin-

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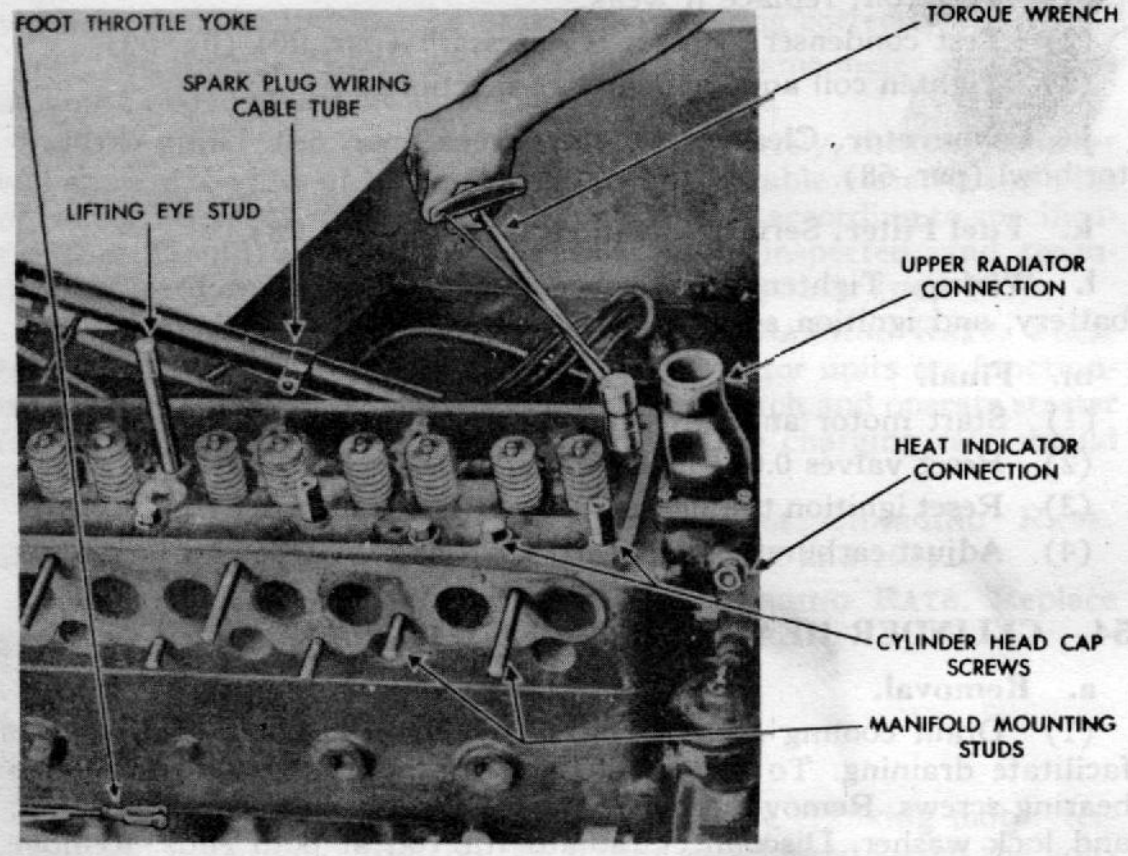

Figure 59—Tightening Cylinder Head, Using Torque Wrench (41-W-3630)

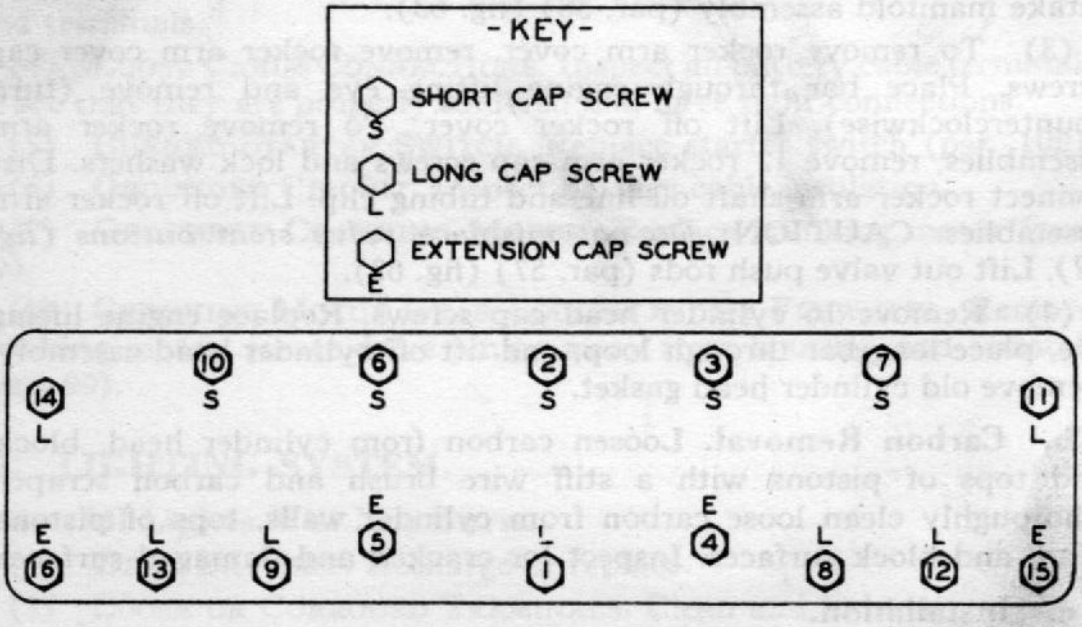

Figure 60—Cylinder Head Tightening Sequence

der block, and remove lifting eye. Replace cylinder head cap screws and flat washers; tighten down to a tension of 90 to 100 foot-pounds. Tighten down in sequence shown in figures 59 and 60.

(2) Install push rods (par. 57) (fig. 62). Install rocker arms, shafts, and shaft support brackets as an assembly. Connect rocker arm shaft oil pressure line, and install tubing clip.

(3) Install cylinder head water manifold and upper radiator hose connections. Connect thermostat bypass line. Install temperature indicator cable. Close radiator drain cock, and fill radiator with clean fresh water. Install radiator filler cap (fig. 83).

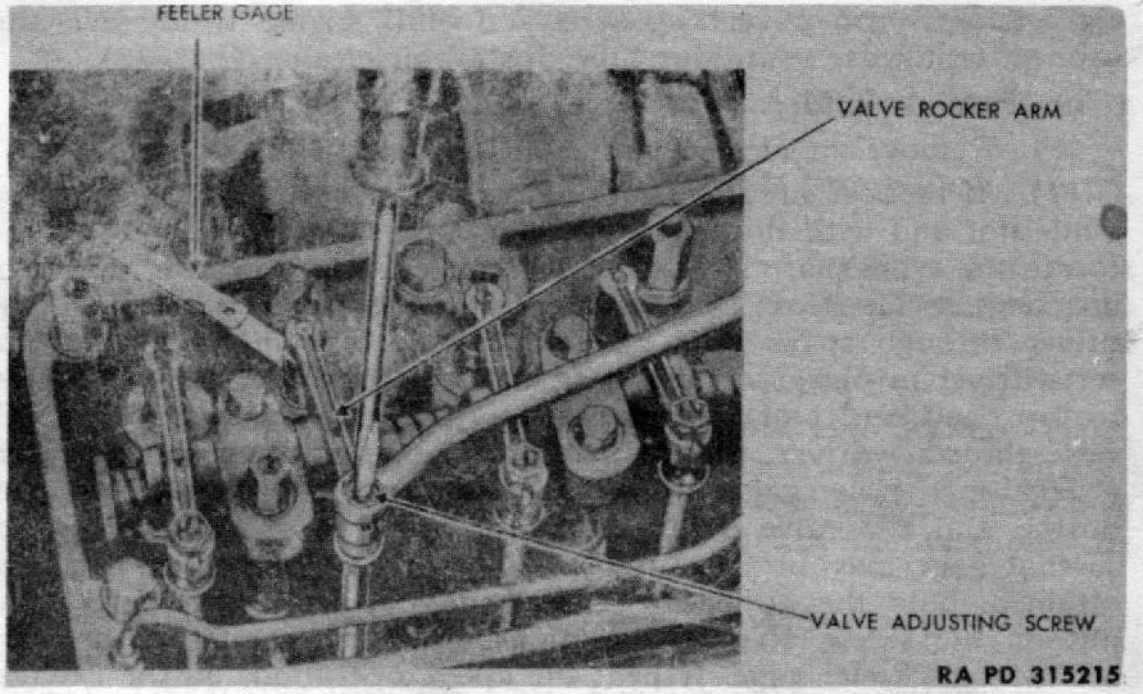

Figure 61—Gaging Valve Clearance Adjustment, Using Gage (41-G-400)

(4) Install exhaust and intake manifold assembly (par. 58) (fig. 63). Install spark plug wiring cable tube, and connect wires to spark plug terminals. Install engine hood, hinge bearings, hinge and screws, and connect radiator tie rod. Install upper radiator bonding strap.

(5) Adjust valve tappet clearance (par. 55) (fig. 61). Start engine and warm up for 15 minutes; then recheck tension of cylinder head hold-down cap screws (fig. 59). Recheck valve tappet clearance. Install rocker arm cover and cover cap screws. Install engine lifting eye. Connect crankcase ventilator tube to rocker arm cover elbow. Install air cleaner (par. 75).

55. VALVE ADJUSTMENT.

a. Engine Hot.

(1) Remove air cleaner (par. 75). Remove eight rocker arm cover cap screws. Place bar through engine lifting eye, turn counterclockwise, and remove eye. Lift off rocker arm cover.

(2) Adjust valve tappets with the engine running and showing 140°F. The intake valve tappets are adjusted to 0.013-inch clearance and the exhaust to 0.018-inch clearance. Clearance is adjusted by turning the adjusting screw counterclockwise to increase the clearance, and clockwise to decrease (fig. 61). When the proper clearance has been secured, hold the adjusting screw in position and tighten lock nut. Insert a 0.013-inch or 0.018-inch feeler gage (41-G-400) between the valve stem button and the valve actuating ball socket to determine clearance (fig. 61).

(3) Place rocker cover in position using a new gasket, and install eight rocker arm cover cap screws. Install engine lifting eye and connect crankcase ventilator tube. Install air cleaner (par. 75).

b. Engine Cold.

(1) Remove air cleaner and cover (subpar. **a** (1) above).

(2) If tactical situation does not permit the valves to be adjusted while hot and with the engine running, insert the starting crank and rotate the crankshaft until the No. 1 piston is at top dead center of its compression stroke. To locate position of piston, insert a screwdriver through spark plug opening in side of cylinder head. Hold screwdriver in place while turning crankshaft. When the piston rises to top dead center of the compression stroke in the cylinder, it will raise the screwdriver, thus indicating highest point of stroke. Insert a 0.020-inch feeler gage (41-G-400) between the exhaust valve stem button and the valve actuating ball socket (fig. 61). Set clearance so that gage may be just inserted. When proper clearance has been attained, hold the adjusting screw firmly in place and tighten the nut on the screw. Repeat operations on the intake valve, and use a 0.015-inch feeler gage. Repeat the above operations on the exhaust and intake valves on remaining five cylinders in their firing order. The firing order of this engine is 1-5-3-6-2-4. Tighten down lock nut; recheck clearance (fig. 61).

56. ROCKER ARM REPLACEMENT.

a. Removal.

(1) Remove air cleaner (par. 75). To remove the rocker arm cover, disconnect the crankcase ventilator tube. Remove eight rocker arm cover cap screws. Remove engine lifting eye. Lift off rocker arm cover.

(2) Remove 12 rocker arm cap screws and lock washers. Disconnect rocker arm shaft oil line and tubing clip. Lift off rocker arm assemblies. CAUTION: *Do not misplace valve stem actuating button (fig. 62).*

b. Inspection. Inspect arms for bushing wear, looseness, broken springs, and worn contacting surfaces.

c. Installation.

(1) Set rocker arm assemblies in position (fig. 61). Install 12 rocker arm bracket cap screws and lock washers. Connect rocker shaft oil line and clip.

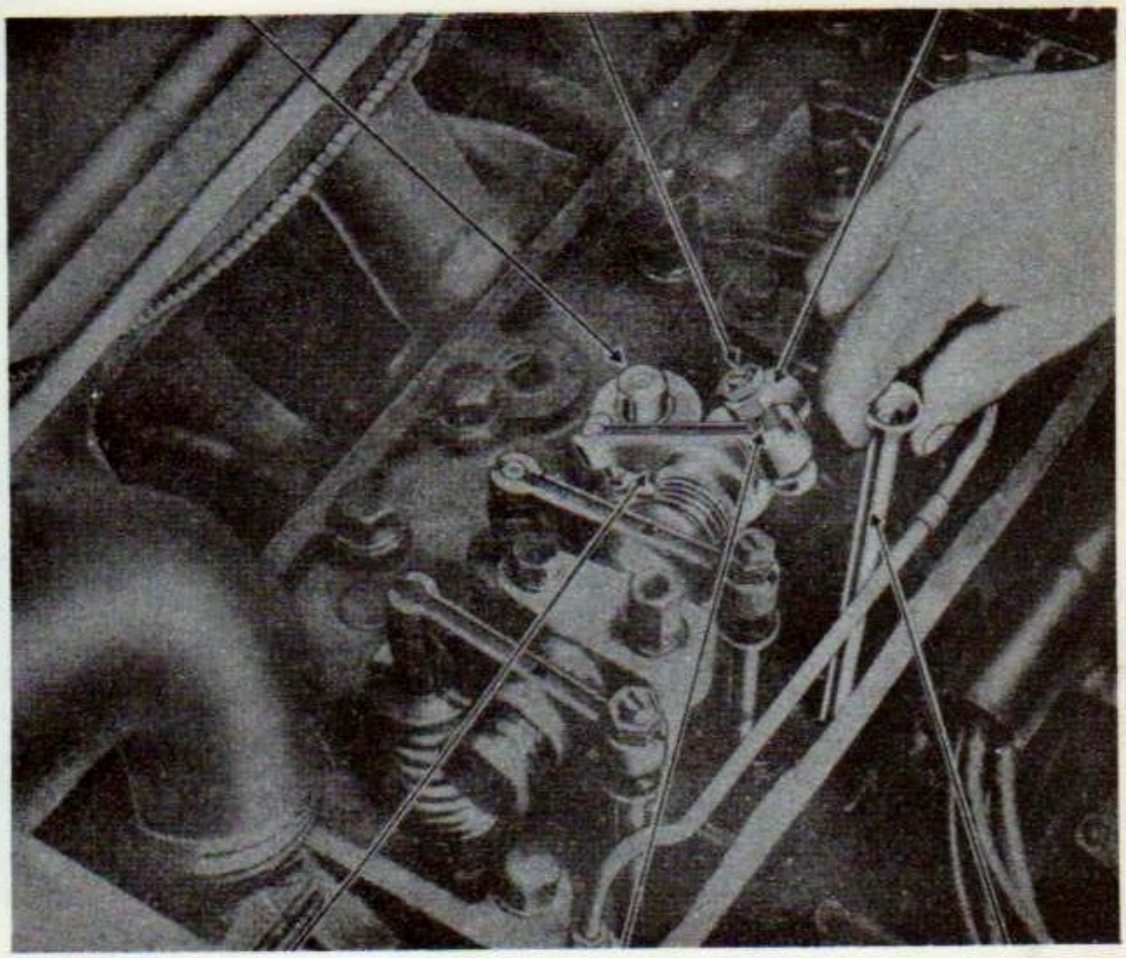

Figure 62—Removing Valve Push Rod

(2) Readjust valves (par. 55).

(3) Set rocker arm cover in position using a new gasket. Install eight cover cap screws. Connect ventilator line. Install lifting eye. Install air cleaner (par. 75).

57. PUSH ROD REPLACEMENT.

a. Removal.

(1) Remove air cleaner (par. 75). Remove rocker arm crankcase ventilator tube. Remove rocker arm cover cap screws. Remove engine lifting eye. Lift off rocker arm cover.

(2) Loosen valve adjusting screw lock nuts, and turn screw into rocker arm as far as possible (fig. 61). Remove valve actuating button from end of rocker arm, and move rocker arm to side to clear valve stem, spring, and push rod. Lift push rod out of engine (fig. 62).

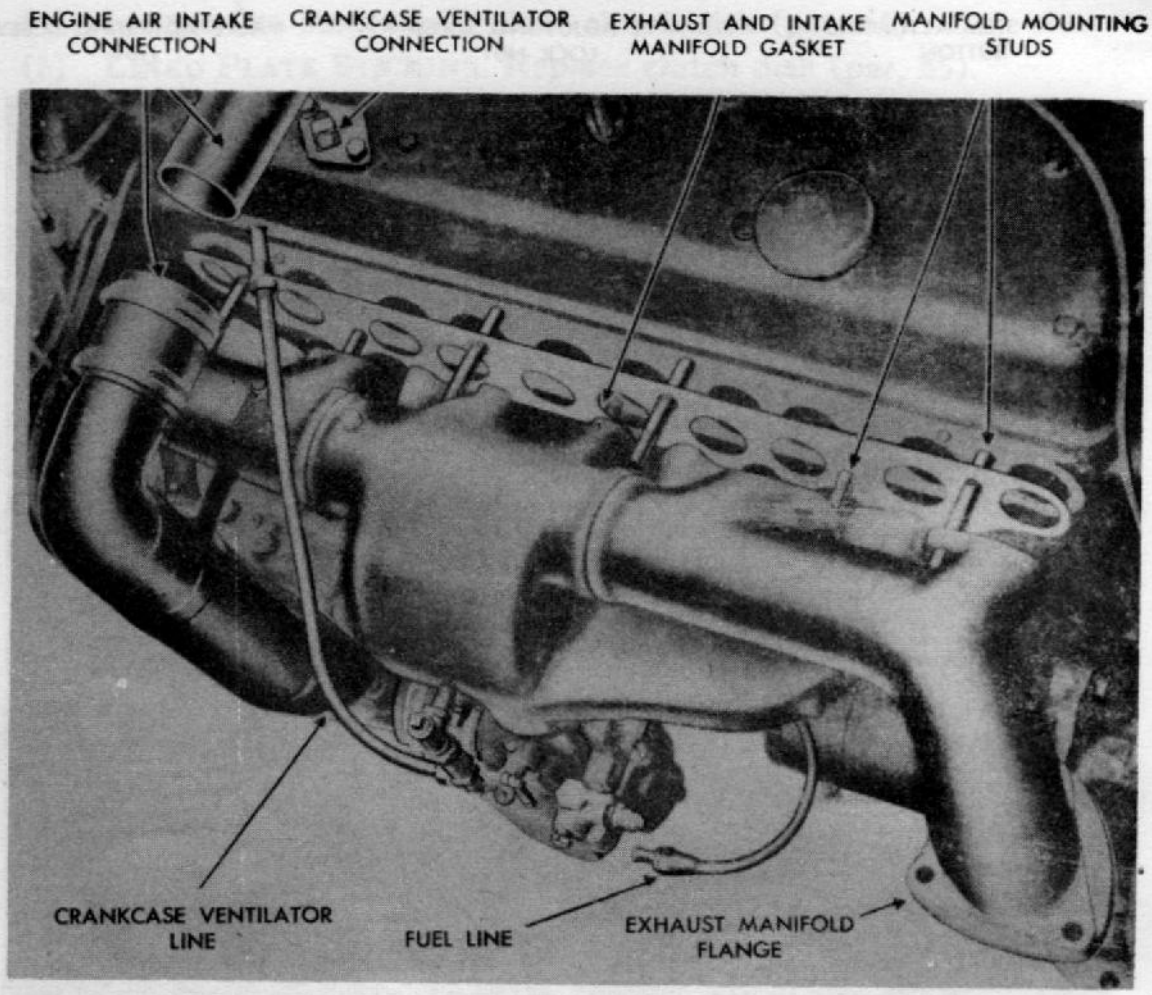

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Figure 63—Exhaust and Intake Manifold Gasket Replacement

b. Installation.

(1) Set push rod in cam follower. Install valve actuating button on end of rocker arm. Rotate rocker arm counterclockwise, and slide back over valve stem and push rod. Run in valve adjusting screw and adjust valve (par. 55).

(2) Replace rocker arm cover gasket. Install rocker cover and cap screw. Install engine lifting eye. Hook up rocker arm cover crankcase ventilator tube. Install air cleaner (par. 75).

58. INTAKE, EXHAUST MANIFOLD, AND GASKET REPLACEMENT.

a. Disassembly.

(1) Loosen hose clamp at top of air cleaner vertical tube. Remove three exhaust pipe flange bolts, nuts, and flat washers. Disconnect crankcase vent tube at rocker arm cover (fig. 63). Disconnect fuel line at carburetor. Disconnect hand throttle and choke control cable

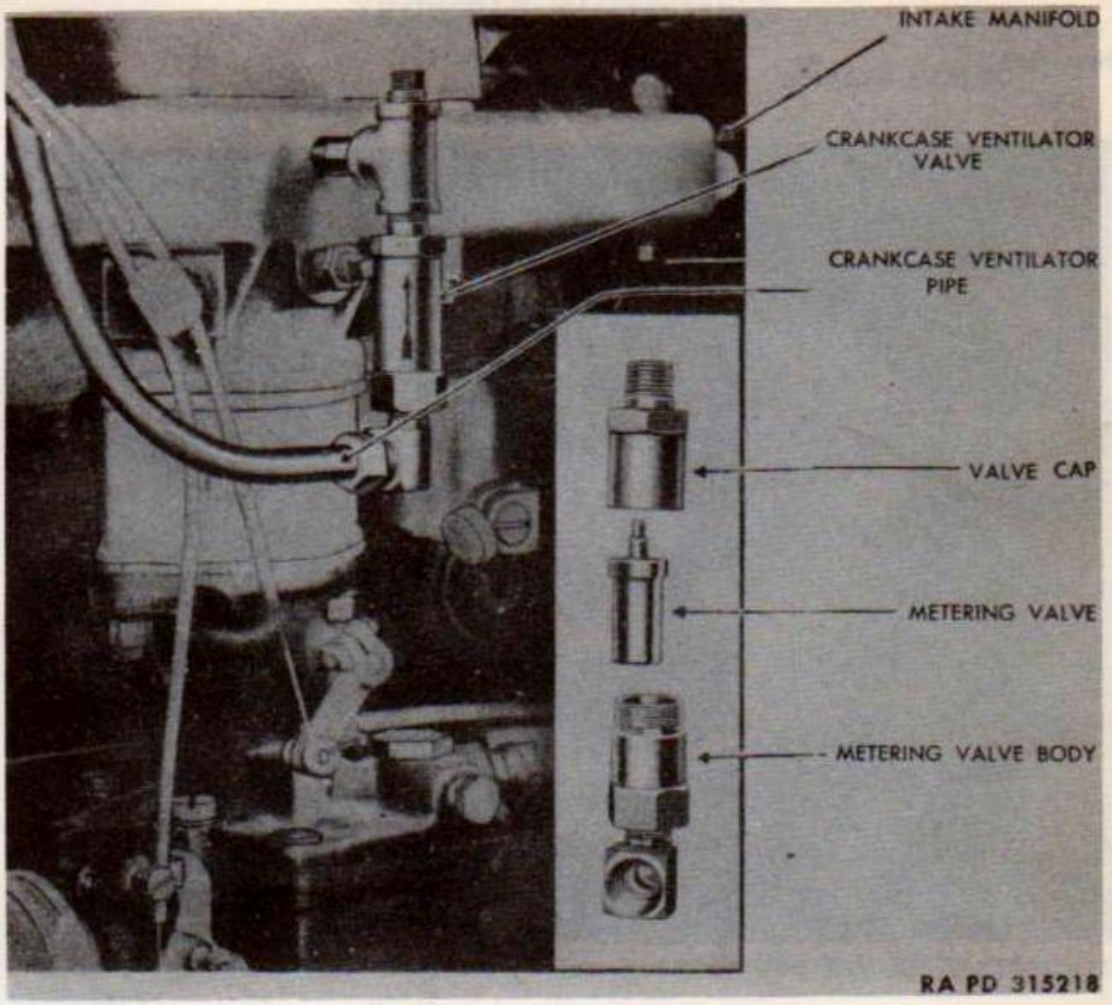

Figure 64—Crankcase Ventilating Valve

at carburetor. Remove throttle rod cotter pin and clevis pin at carburetor.

(2) Remove exhaust and intake manifold stud nuts, flat washers, and crabs from manifold studs. Lift off intake manifold heat deflector. Lift off exhaust and intake manifold with carburetor vent line, valve, and air cleaner tube assemblies (fig. 63). Remove carburetor.

b. Inspection. Using a scraper, remove exhaust and intake manifold gasket, and clean face of cylinder head and manifolds. Inspect manifold and mounting surfaces for cracks and warpage.

c. Assembly.

(1) Install new gasket on manifold studs, and place manifold as an assembly in position. Install manifold crabs, flat washers, and stud nuts, and tighten to 90 to 100 foot-pounds (fig. 63).

(2) Install carburetor (par. 68). Hook up hand throttle and choke controls at carburetor. Connect crankcase vent tube to rocker arm cover. Install exhaust pipe flange, bolts, flat washers, and nuts. Connect engine air cleaner tube (fig. 63).

d. Testing. Warm up engine, and check tightness of exhaust manifold stud nuts.

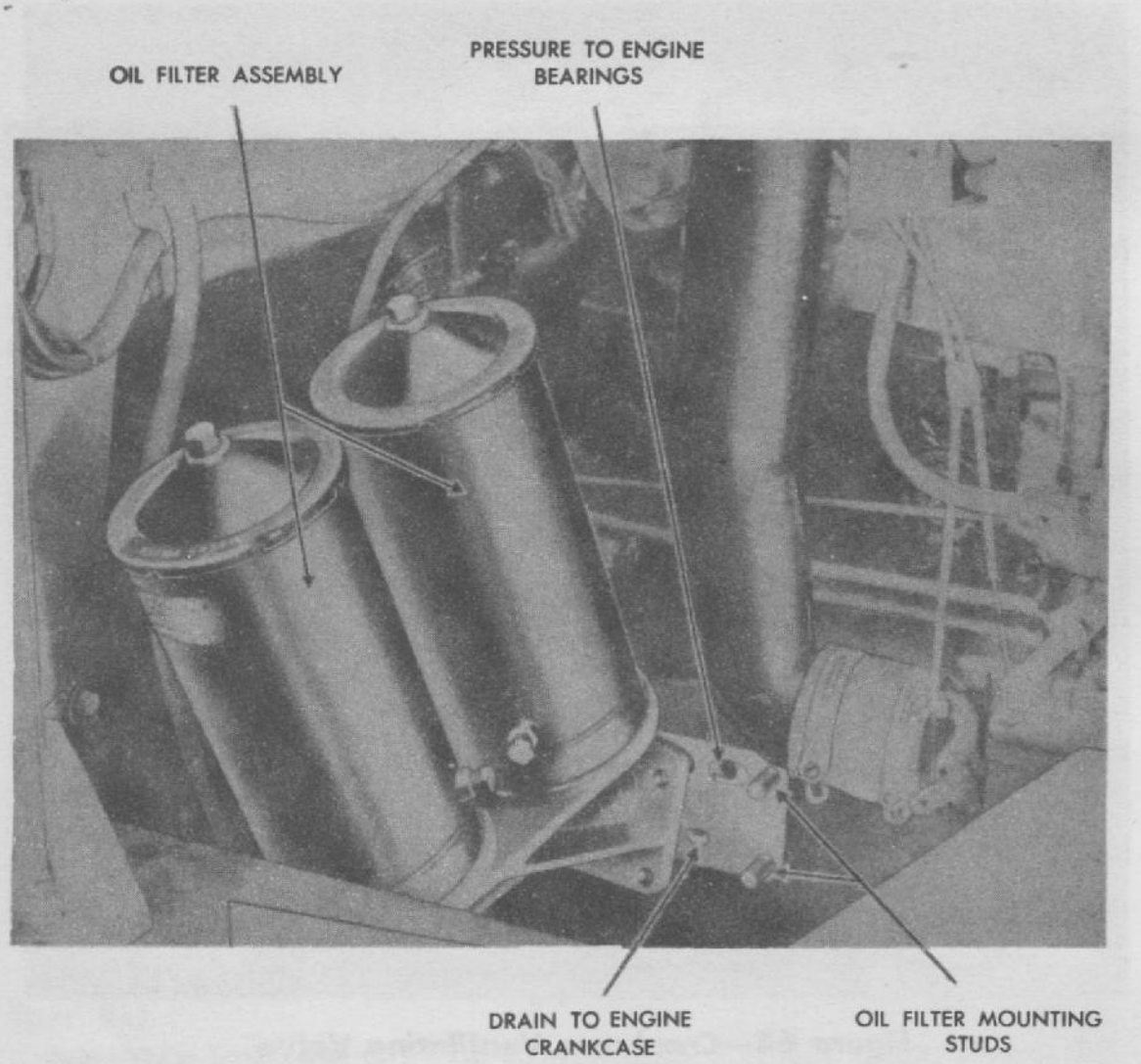

Figure 65—Removing Oil Filter

59. CRANKCASE VENTILATOR REPLACEMENT.

a. Removal. Disconnect crankcase ventilator tube at metering valve. Remove metering valve at manifold elbow (fig. 64).

b. Service. Clamp lower end of metering valve in vise and unscrew cap. Lift out valve, and clean all parts in dry-cleaning solvent. Assemble valve in body with pintle up and install cap (fig. 64).

c. Installation. Install metering valve in manifold elbow and connect ventilator tube.

d. Ventilator Air Cleaner Service. Remove wing nut and lift out screen. Wash screen in dry-cleaning solvent, and dry with compressed air. Fill oil reservoir to the level mark with fresh engine oil.

60. OIL FILTER REPLACEMENT AND SERVICE.

a. Removal. Remove cranking motor (par. 99). Remove four stud nuts and lock washers holding filter to engine crankcase. Pull

Figure 66—Oil Filter Service

filter toward frame side rail. Tilt top of filter upwards to clear frame channel and lift off (fig. 65).

b. Service.

(1) Remove two nuts from filter covers, and lift off cover and nut assemblies. Lift filter elements off center pipe. Remove filter shell plugs and drain (fig. 66). Replace plugs.

(2) Replace filtering elements, and place new gaskets in covers (fig. 66). Install covers and tighten nuts securely.

c. Installation.

(1) Renew filter base gasket with thin coating of gasket cement. Set filter on crankcase mounting studs, and install lock washers and nuts. Install cranking motor (par. 99).

(2) Run engine for several minutes and check oil pressure gage.

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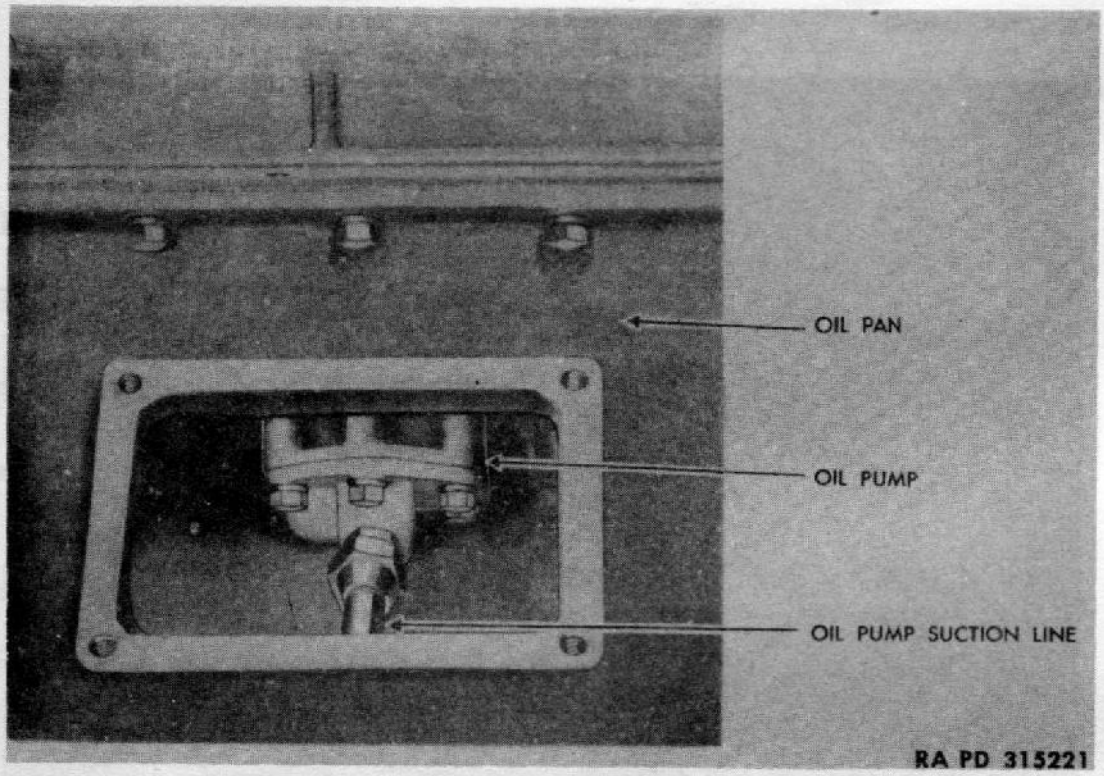

Figure 67—Location of Oil Suction Line

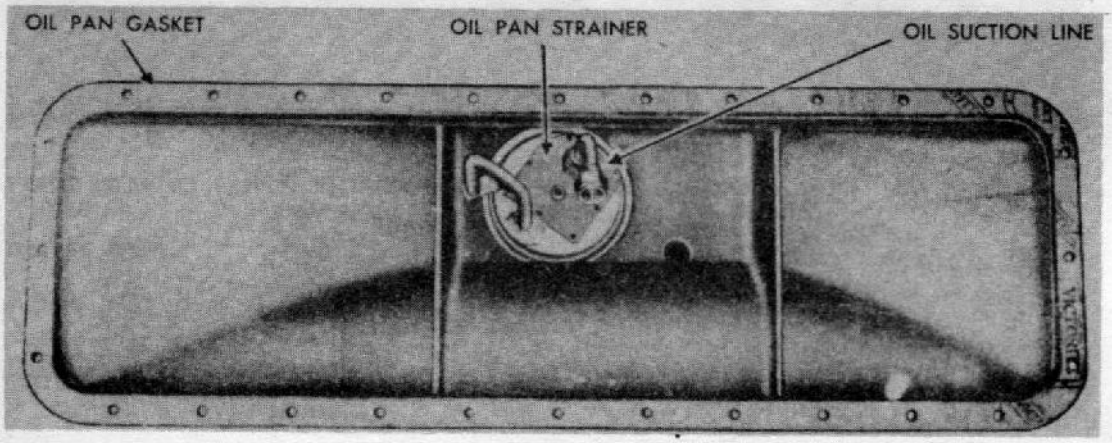

Figure 68—Oil Pan Service

Stop engine and inspect oil level in crankcase. Bring up oil level to "FULL" mark on bayonet gage (fig. 31). Inspect for oil leakage.

61. OIL PAN REPLACEMENT AND SERVICE.

a. Removal.

(1) Remove drain plug from bottom of pan and drain oil. Remove four inspection plate cap screws and copper gaskets. Lift off plate and gasket. Disconnect oil suction screen line (fig. 67).

(2) Remove 28 oil pan to crankcase cap screws and lock washers. Lower oil pan to ground.

b. Service. Scrape and clean all gasket surfaces. Remove oil suction screen. Clean interior of oil pan with dry-cleaning solvent. Wash out oil suction screen with dry-cleaning solvent and install. Replace pan gasket, coating pan side of gasket with thin coating of joint and thread compound, type B (fig. 68).

c. Installation.

(1) Set oil pan in position, and install lock washers and cap screws. Tighten securely. Through inspection hole connect oil pump suction line (fig. 67). Replace inspection cover gasket, coating pan side of gasket with joint and thread compound, type B. Replace inspection cover with copper gaskets under heads of cap screws.

(2) Install drain plug and fill crankcase with fresh oil (10 qt). Service filters at the same time oil pan suction screen is serviced (par. 60 **b**).

(3) Start engine and run at fast idle for several minutes; then stop the engine and recheck oil level (fig. 31). Upon starting engine, immediately check oil pressure gage to be sure that oil is circulating and pump is building up pressure (fig. 10). If filters are changed at the same time pan is serviced, 14 quarts of fresh oil will be required to bring oil level up to "FULL" mark on bayonet gage (fig. 31). Inspect for oil leaks at oil pan and inspection cover.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XIV

ENGINE REMOVAL AND INSTALLATION

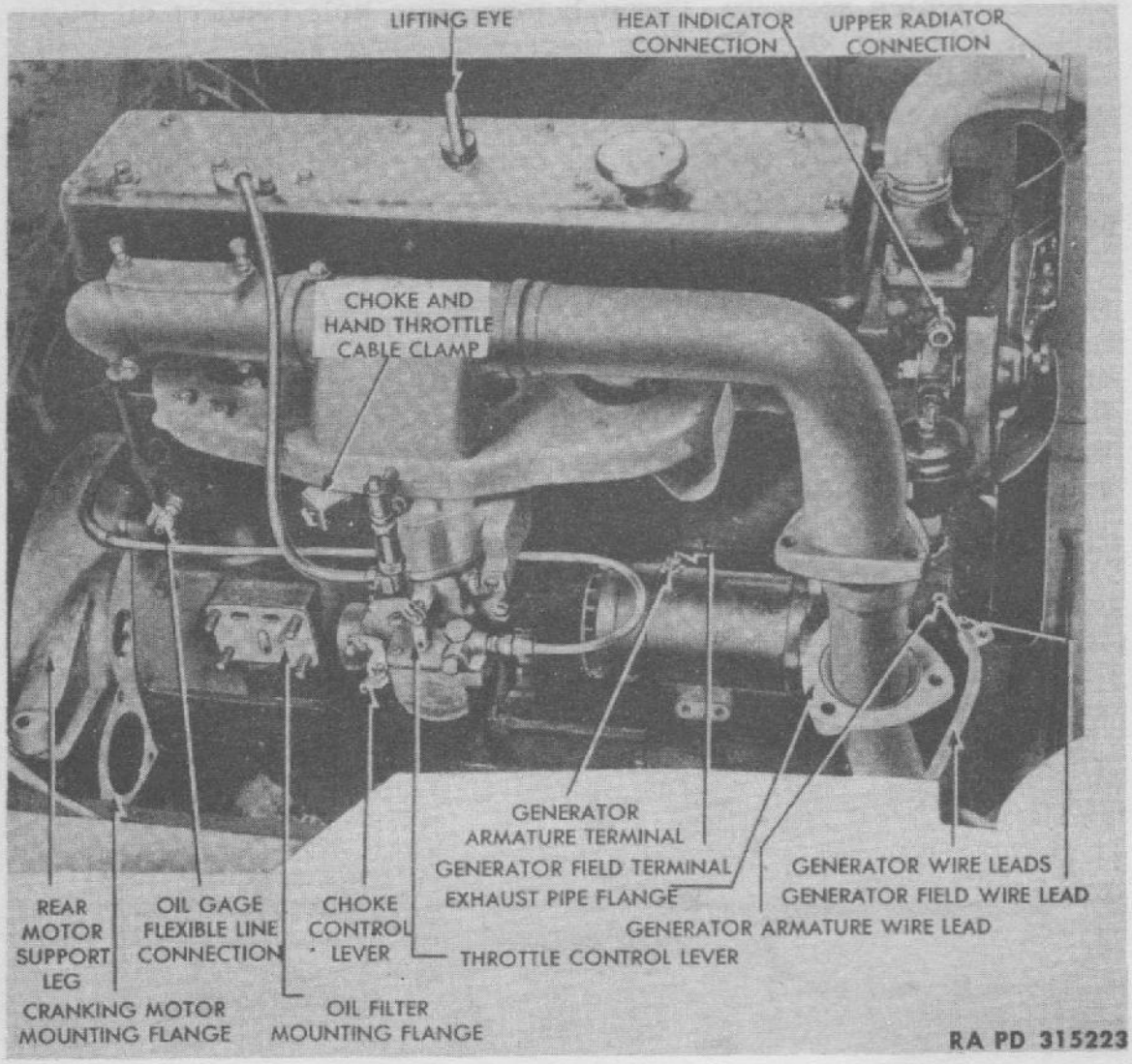

Figure 69—Engine Removal—Side

62. REMOVAL.

a. Disassembly.

(1) Drain engine crankcase oil. Disconnect battery terminals (fig. 103). Drain the air reservoirs. Remove radiator brush guard cap screws, nuts, flat washers, and lock washers. Remove radiator brush guard braces. Disconnect towing air connection air lines and lift off brush guard. Remove radiator assembly (par. 81 **a**) with the exception that it is not necessary to remove the fan assembly prior to radiator removal (fig. 86). Remove engine air cleaner (par. 75).

ENGINE REMOVAL AND INSTALLATION

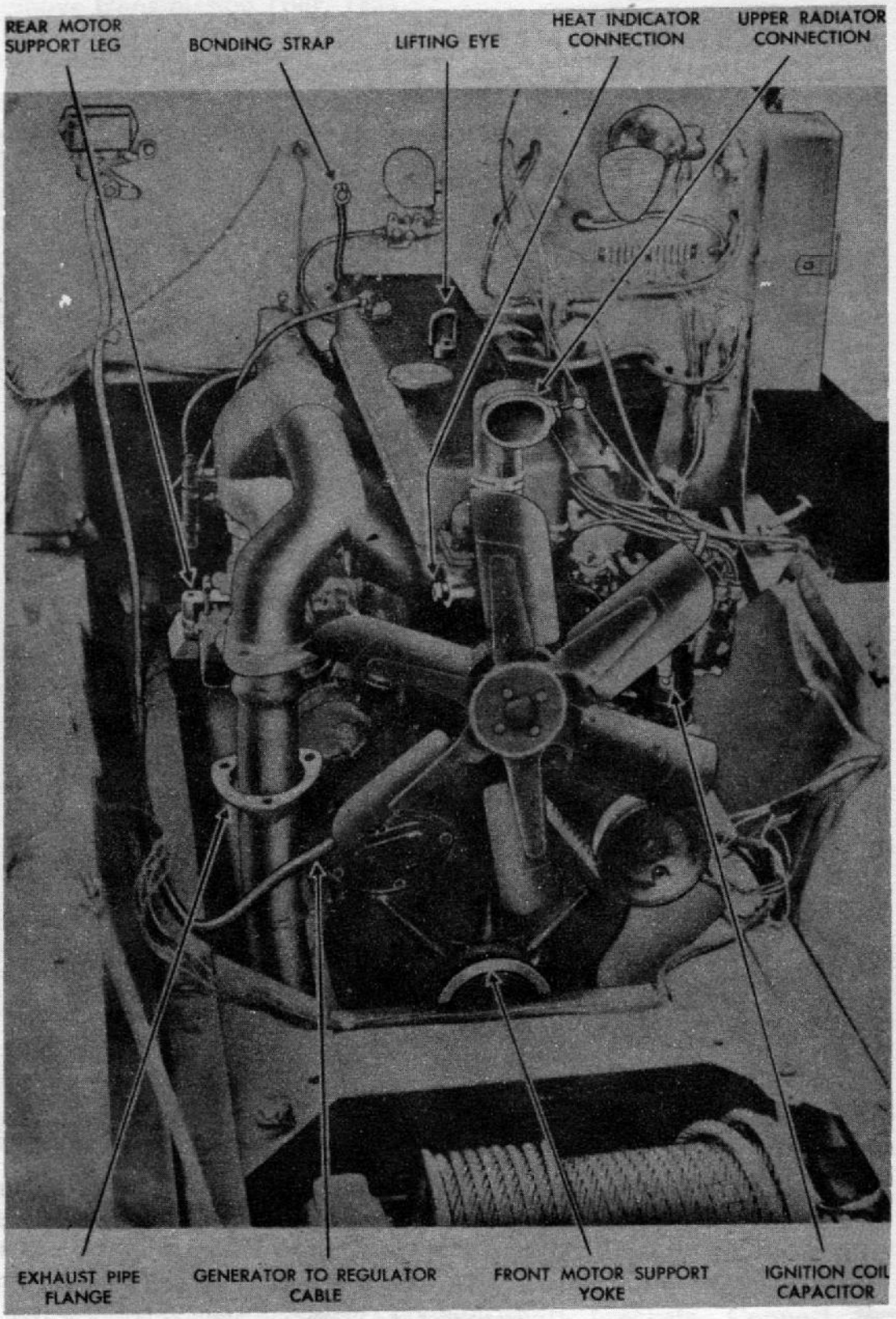

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Figure 70—Engine Removal—Front

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

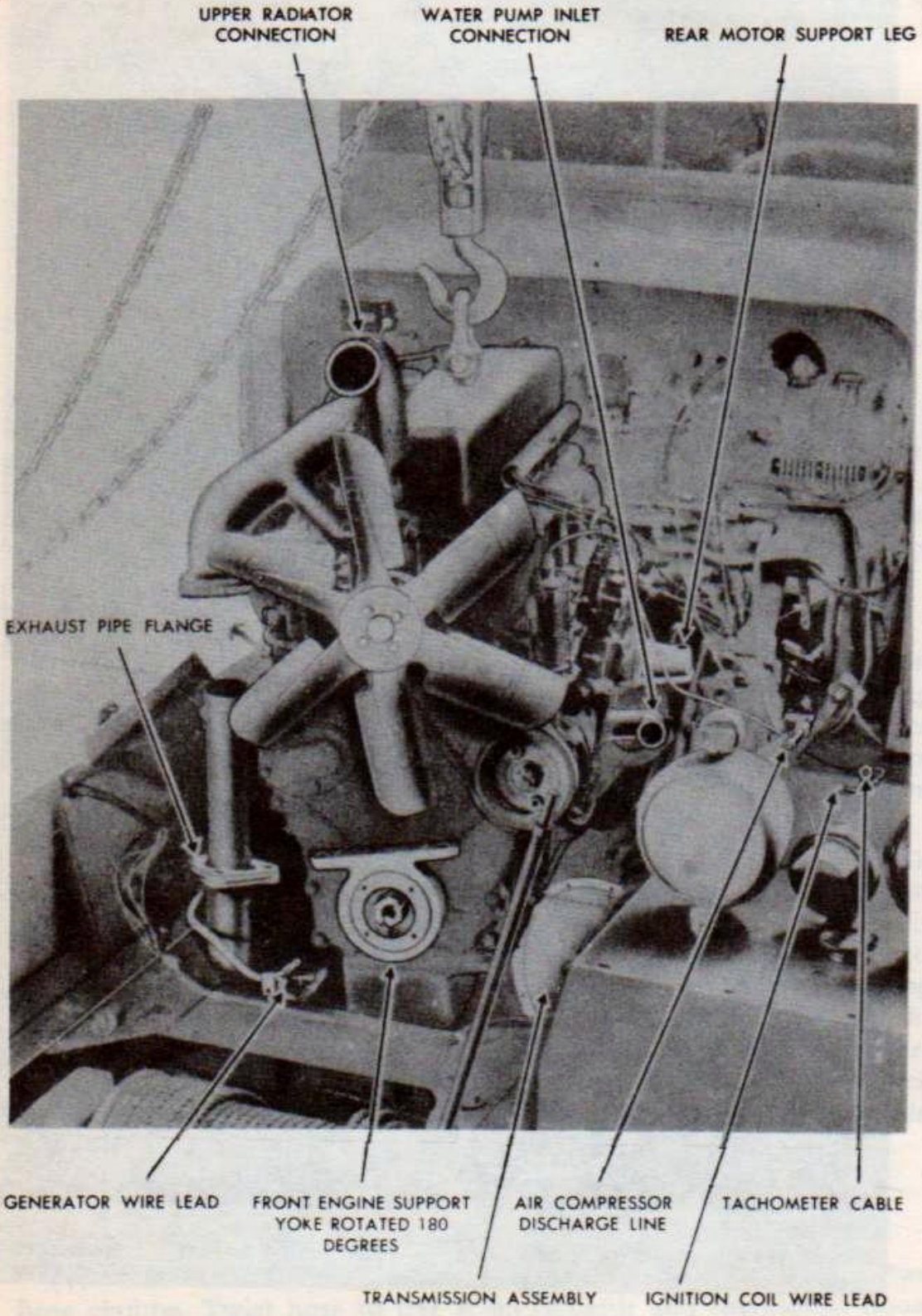

Figure 71—Engine Replacement—Lifting

Remove oil filter and cranking motor (pars. 60 and 99) (fig. 65). Remove transmission (par. 142).

(2) Disconnect tachometer cable (fig. 71). Disconnect spark, choke, and throttle hand control cables (fig. 69). Disconnect temperature indicator at thermostat housing (fig. 70). Bend cable back carefully to avoid sharp kinks, and place on cowl. Remove engine to dash board bonding strap at valve cover cap screw (fig. 70). Disconnect air compressor discharge line (fig. 71). Remove compressor to governor air line. Disconnect switch to ignition coil and generator wires (fig. 71).

(3) Disconnect flexible fuel line at fuel filter. Disconnect oil pressure flexible line. Remove accelerator cross shaft bracket at engine flywheel housing. Remove fuel pump (par. 69 b).

(4) Remove rear motor support bolt, cotter pins, nuts, spring caps, and spring (fig. 74). Remove front motor support yoke cap screws, lock nuts, and nuts.

b. Lifting.

(1) Place chain fall directly over engine lifting eye, securing hook and eye together by means of a 7/8-inch round pin shackle from the truck equipment (fig. 71).

(2) Raise engine directly upwards, and move front of engine toward left-hand side of truck in order to permit the left-hand motor leg clearance at the steering gear. As engine is raised and as soon as clearance permits, turn the front motor support yoke face upwards (fig. 71).

63. INSTALLATION.

a. Lifting.

(1) Secure a chain fall to the engine lifting eye by means of a 7/8-inch round pin shackle from the truck equipment (fig. 71).

(2) Raise the engine and place in the truck frame with the right side of the engine swung towards the left side of the truck (fig. 71). The front motor support yoke must have its mounting face turned upwards, and as the engine is positioned into its frame mounting, the yoke should then be turned with the mounting face down (fig. 71).

b. Assembly.

(1) Install the front and rear motor support bolts, spring and spring caps, nuts, and cotter pins. The rear motor support bolts should be pulled down until the face of the nut is flush with the top of the motor support bolts and the cotter pins installed. Tighten the front motor support bolts securely.

(2) Install the accelerator cross shaft brackets. Connect the flexible fuel line to fuel filter. Connect choke, throttle, and control cables (fig. 69). Connect oil filter pressure gage flexible line. Connect air pressure governor line. Connect air compressor discharge line (fig. 58). Connect switch to ignition coil, and regulator to generator wires. Connect spark control cable (fig. 58). Connect tachometer cable, and

install engine bonding strap at valve cover. Connect temperature indicator tube (fig. 58).

(3) Install transmission (par. 143). Install oil filter (par. 60 **c**). Install cranking motor (par. 99 **b**). Install radiator (par. 81 **b**). Replace radiator brush guard, and install eleven ¼-inch, two ½-inch, and one ⅜-inch cap screws, flat washers, and nuts. Install radiator brush guard braces. Install air cleaner (par. 75). Close drain cock and fill radiator (fig. 83).

(4) Connect battery terminals (fig. 103). Fill engine crankcase. Start engine and run at a fast idle for 10 minutes. Inspect for oil leaks and oil pressure registering on oil pressure gage (fig. 10). Check engine temperature (fig. 10). When engine is thoroughly warm, tune engine complete (par. 53). Stop engine, and check crankcase oil level (fig. 31).

Section XV

CLUTCH

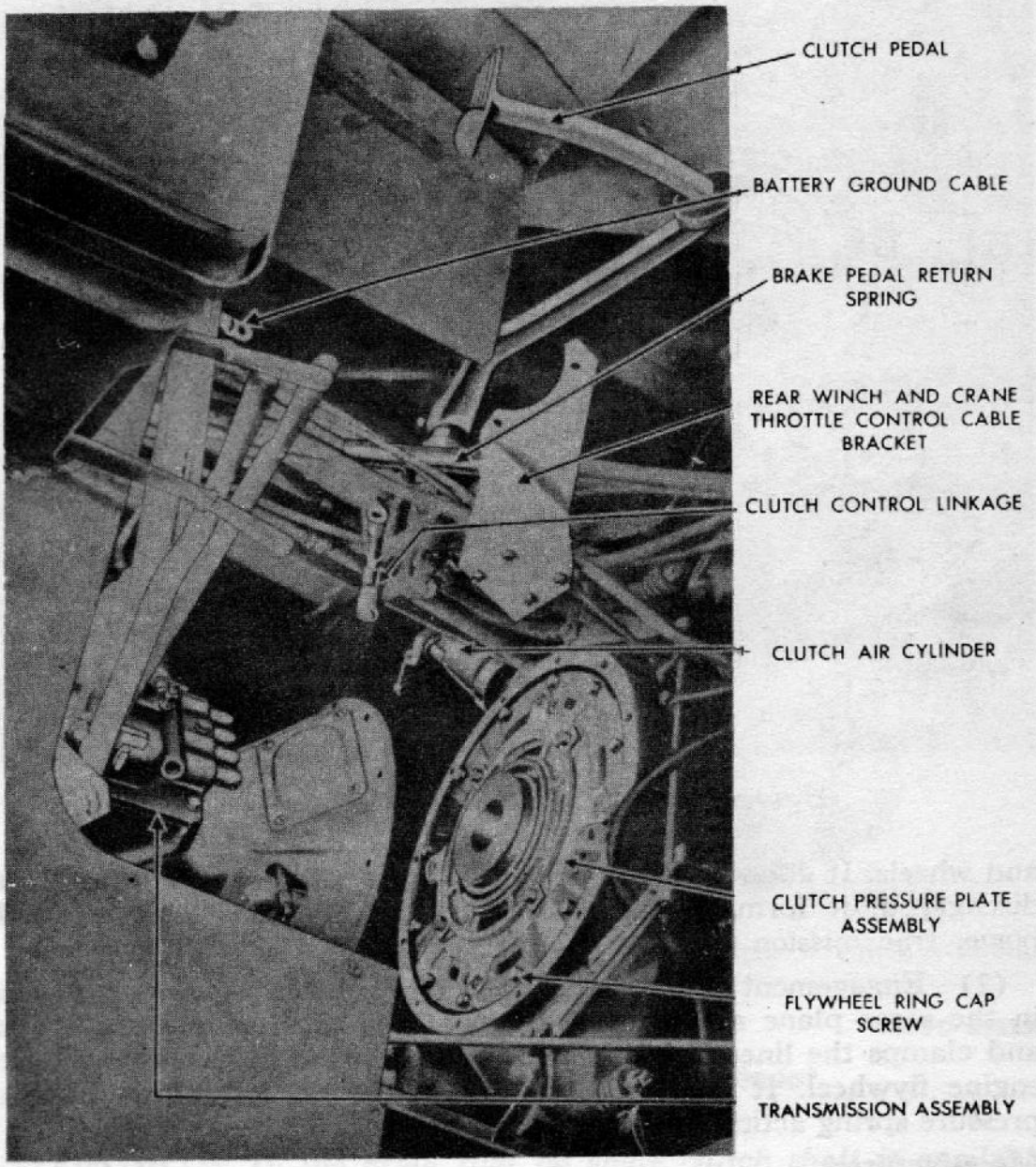

Figure 72—Clutch Removal

64. DESCRIPTION AND TABULATED DATA.

a. Description.

(1) The clutch serves as a means of supplying engine power to the power transmission system of the truck, consisting of the transmission, propeller shafts, transfer case, axle driving units, axle shafts,

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

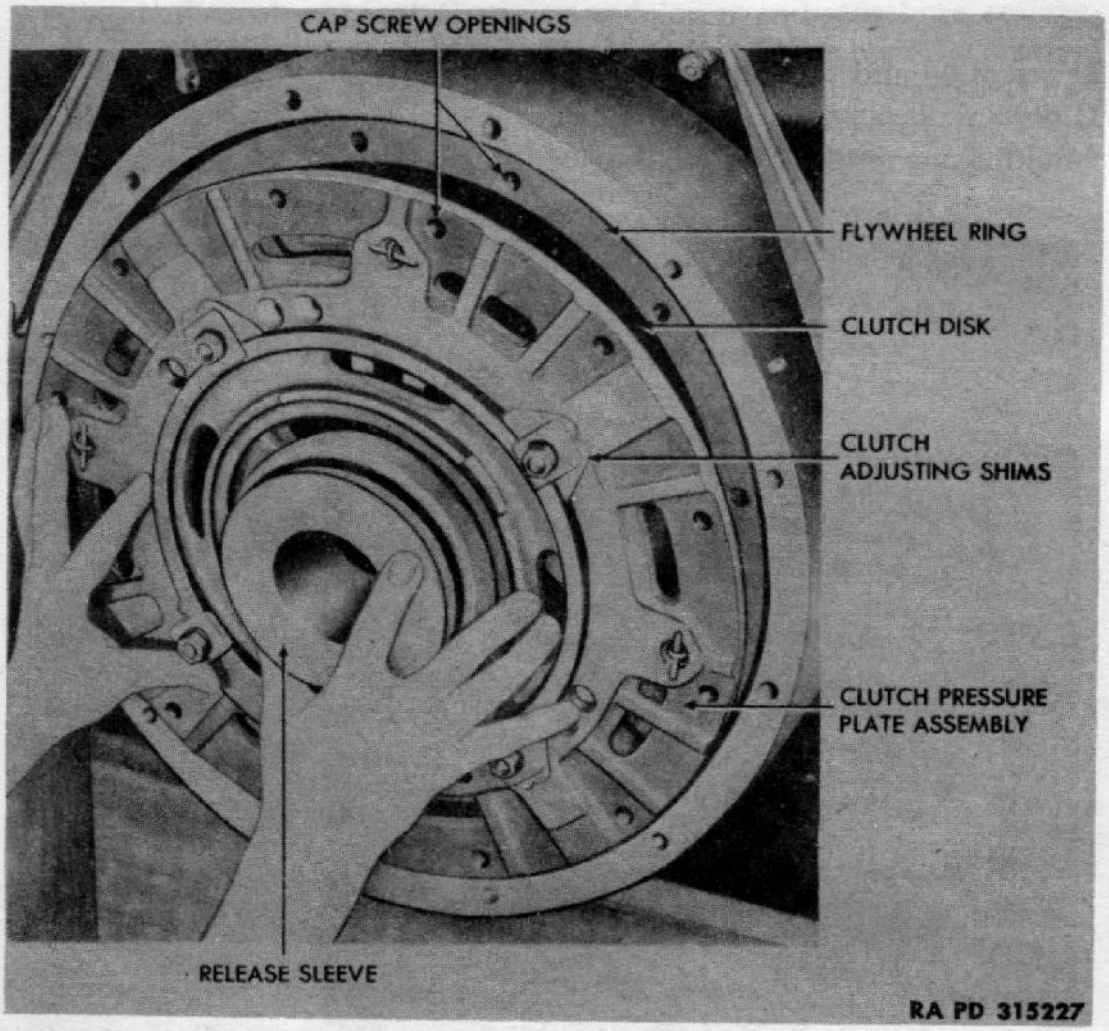

Figure 73—Replacing Clutch Assembly

and wheels. It allows the engine to pick up the load gradually. When disengaged, it forms a disconnecting link between the engine and power transmission group.

(2) Engagement is obtained from a pressure plate which moves in the same plane as the flywheel face. The pressure plate contacts and clamps the lined driven disk between the pressure plate and the engine flywheel. It is held in this tightly engaged position by the pressure spring acting upon the hinged levers.

Manufacturer	W. C. Lipe
Sizes	14 in.
Type	Single-plate, dry disk
Pressure spring	Helical
Number used	1
Facing O.D.	13 7/8 in.
Facing I.D.	7 1/4 in.
Facing thickness	1/8 in.
Spring tension at 1 1/4 in.	525 to 575 lb

65. CLUTCH REPLACEMENT.

a. Removal. Remove transmission (par. 142). Remove 12 clutch flywheel ring screws and lock washers, and lift clutch assembly out of flywheel (fig. 72). Lift out clutch lined plate (fig. 73). Inspect clutch shaft pilot bearing for free rotation, excessive looseness, and roughness. Replace if necessary.

b. Installation.

(1) Set lined plate into flywheel, place clutch assembly into position, and install the flywheel ring bolts (fig. 73).

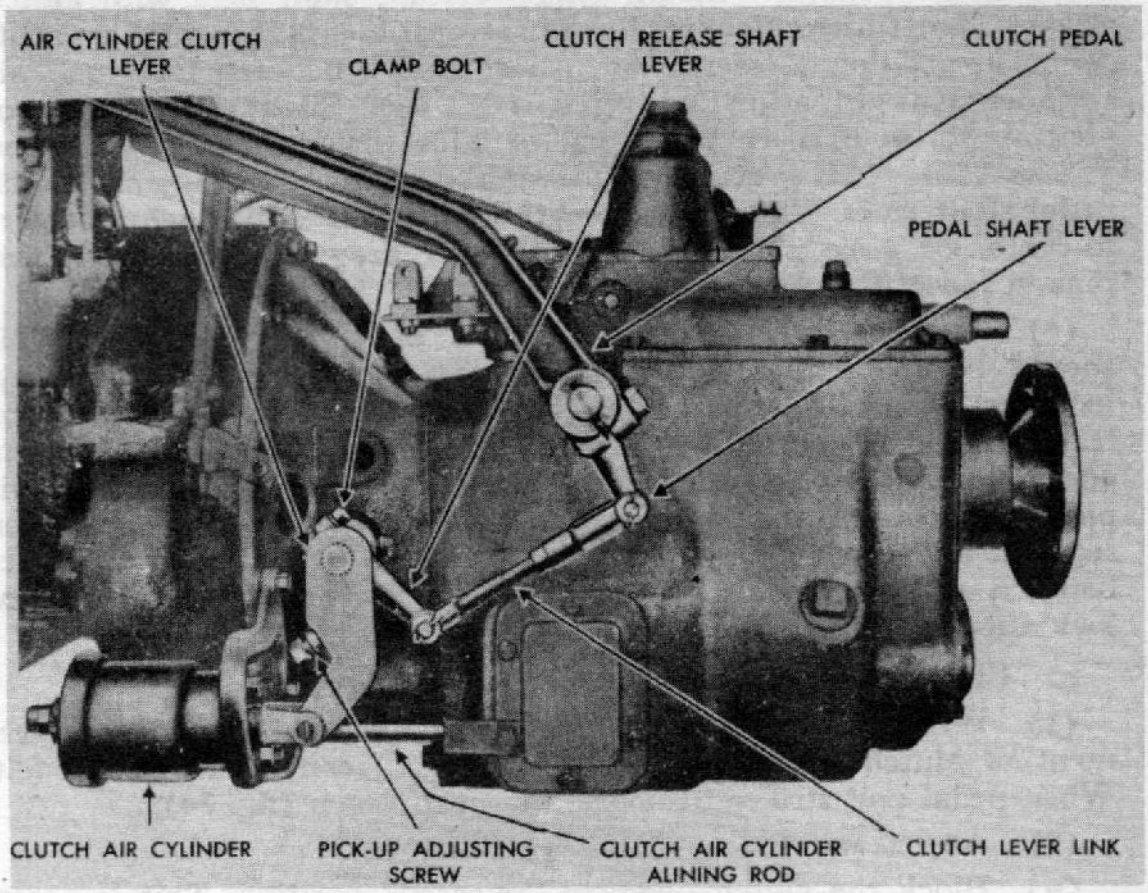

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Figure 74—Clutch Linkage Adjustment

(2) NOTE: *In the event that no spare clutch shaft is available to aline spline in center of clutch lined plate, leave the clutch flywheel ring bolts loose (fig. 72). Only three threads of the flywheel ring bolts should have entered the flywheel.* Remove the clutch inspection cover after the transmission has been installed and the lined clutch plate positioned by the clutch gear spline. Tighten the flywheel ring bolts through the inspection hole.

(3) Install transmission (par. 143). Lubricate controls and linkage through lubricant fittings (par. 26).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

66. MAINTENANCE AND ADJUSTMENT.

a. Linkage Replacement and Adjustment.

(1) REMOVAL. Remove cotter and clevis pins from connecting link yokes and clutch air cylinder (fig. 74). Remove clutch release shaft lever clamp bolt nut and lock washer. Move arm out of air cylinder yoke, and pry off clutch shaft. Remove clutch pedal lever clamping cap screw, nut, and lock washer, and pry off shaft.

(2) INSPECTION. Inspect for worn yokes, yoke pins, and shaft and yoke splines.

(3) INSTALLATION. Install clutch release shaft arm with clutch release shaft turned clockwise as far as possible, placing arm on shaft spline in position to allow 1/16-inch clearance between lever and air cylinder pick-up adjusting screw (fig. 74). Slight adjustment of pick-up screw may be necessary to allow lever to enter spline on release shaft. Using connecting link rod as a guide, install clutch pedal shaft lever. The normal length of this rod is 6 3/4 inches center-to-center of yoke pin holes. Install lever draw bolts. Install clevis pins in rod but do not key.

(4) ADJUSTMENT. Measure amount of pedal free play. This should be 1 1/2 inches to 1 5/8 inches. To increase pedal free play, lengthen connecting link; to decrease, shorten link. To adjust rod length, back off lock nut and turn clevis yoke clockwise to shorten, and counterclockwise to lengthen. Secure lock nut, and install clevis pins and cotter pins. After correct linkage adjustment has been secured, set clutch air cylinder pick-up screw at 1 1/16-inch clearance between screw and clutch release shaft lever. Secure pick-up screw lock nut (fig. 74).

b. Clutch Adjustment.

(1) WHEN TO ADJUST. Adjust the clutch when 3/4 inch free movement of clutch pedal, with clutch engaged, can no longer be felt. When pedal pad strikes toeboard, readjust clutch (fig. 74).

(2) ADJUSTMENT.

(a) Block the clutch pedal in "released" position. This is necessary because otherwise the adjusting straps and studs may become bent, or the threads of the stud or nut become stripped. Back off the adjusting nuts five full turns. There are four adjusting strap nuts on the flywheel ring (fig. 72).

(b) Engage the clutch by removing the block. This will permit the adjusting plate to move out of contact with the adjusting shims (fig. 73). Remove one shim from under each adjusting strap, using sharp-nosed pliers, or inserting cotter pin puller in small hole (fig. 75). Be sure no portion of shim is torn off and remains under corner of adjusting plate; also that the same number of shims are removed from under each strap. Count shims to be sure equal number of shims remain under each strap (fig. 75).

(c) Release the clutch by blocking pedal in released position. Tighten all adjusting strap nuts (fig. 73).

CLUTCH

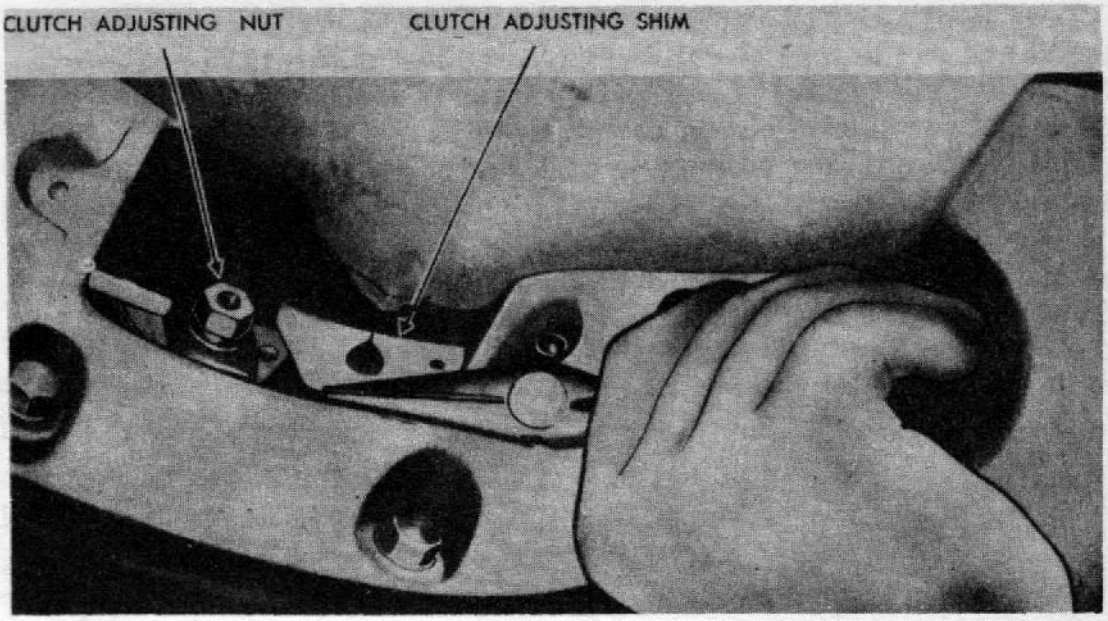

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Figure 75—Removing Clutch Adjusting Shim

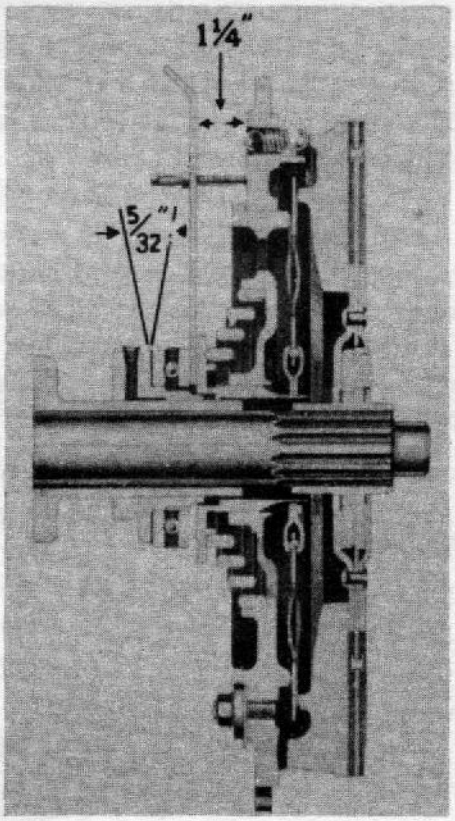

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Figure 76—Gaging Clutch Height

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(d) Measure the distance from machined surface which contacts the shims to the face of clutch sleeve, against which the release bearing acts. This can best be done by means of a straightedge and scale, or with two scales, holding the straightedge in place by pushing the release bearing into contact with the straightedge. This dimension should be 1¼ inches (fig. 76).

(e) When the distance from the machined surface supporting the shims to the face of the clutch sleeve is correct, check the distance from the release bearing to the clutch sleeve. This should not be less than ⅛ inch and not more than 5/32 inch. It may be necessary to readjust the pedal linkage to obtain the proper clearance of ⅛ inch or 5/32 inch (subpar. a (4) above) (fig. 76).

Section XVI

FUEL, AIR INTAKE, AND EXHAUST SYSTEMS

67. DESCRIPTION AND TABULATED DATA.

a. Description.

(1) The fuel system on this truck consists of the controls, fuel gages, fuel tanks, fuel lines, fuel pump, governor, and carburetor. The fuel stored in the fuel tank is drawn through the lines by the pump and forced into the carburetor, where it is mixed with clean air coming through the air cleaner in the proper quantities before being delivered to the engine manifold.

(2) This carburetor is the plain tube, updraft type with a fixed main jet and a vacuum-controlled accelerating pump. The fuel pump is of the diaphragm type, attached to the engine block, and is mechanically operated through a lever arm which contacts an eccentric on the engine camshaft. The governor is of the velocity type. It is mounted between the engine intake manifold and the carburetor.

b. Tabulated Data.

Fuel capacity	100 gal
Carburetor type	Updraft
Carburetor size	2 in.
Governor type	Velocity
Fuel pump type	Diaphragm
Location	Left side engine
Fuel filter type	Edge
Location	Left side engine

68. CARBURETOR REPLACEMENT AND SERVICE.

a. Adjustment.

(1) Warm up the engine until the intake manifold is warm to the hand. Close the hand throttle until the minimum steady idle speed is obtained. Then slowly turn the idle adjusting screw to right or left until the engine runs steadily and as fast as the throttle will permit.

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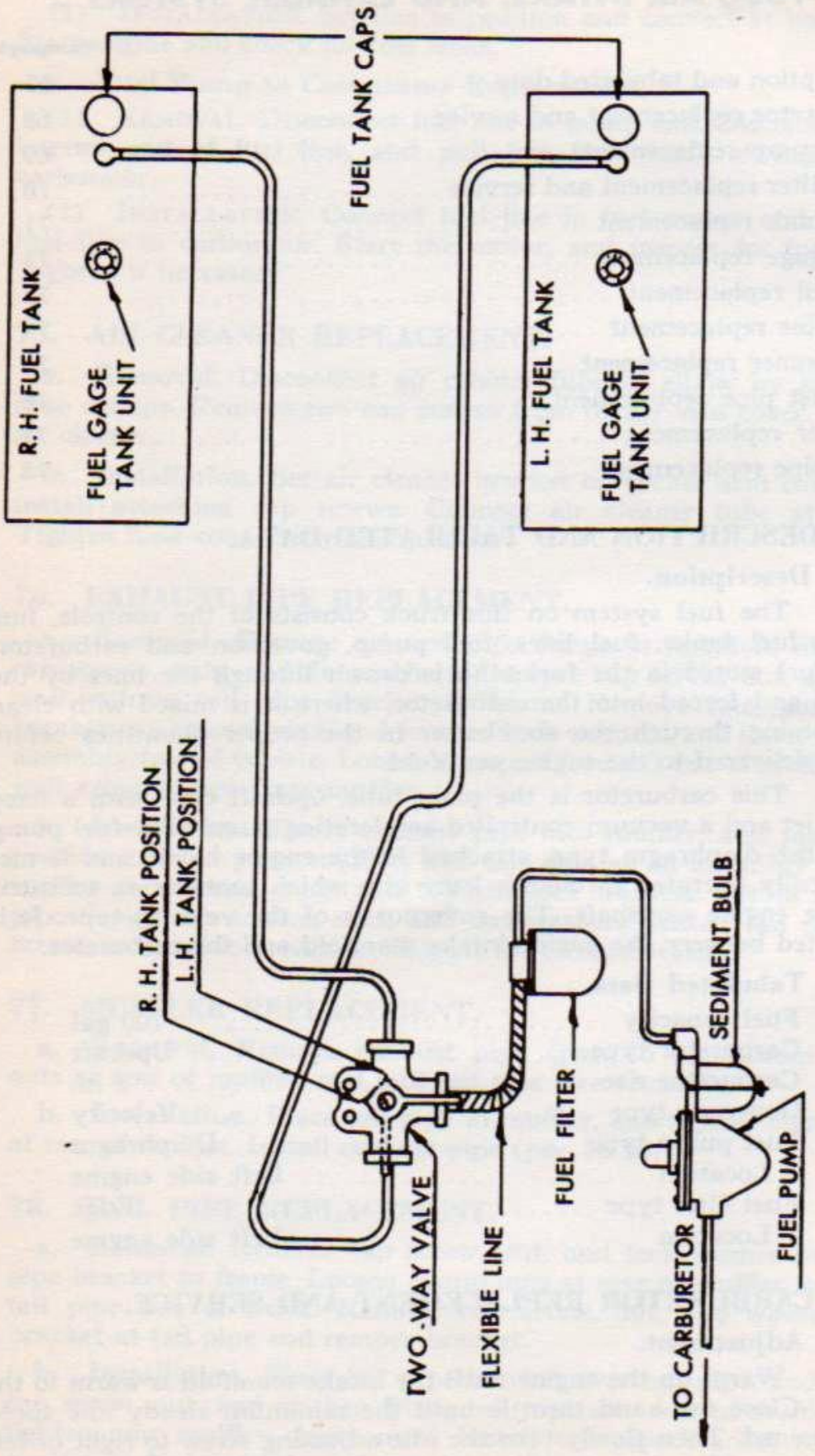

Figure 77—Fuel System Diagram

(2) If, after adjusting the idle screw, the engine runs too fast, turn the throttle stop screw until the correct idling speed is obtained.

b. Removal.

(1) Disconnect fuel line. Remove hand throttle swivel. Disconnect choke control at operating lever and bracket. Remove throttle rod cotter and clevis pins, and loosen air cleaner hose connection at carburetor.

(2) Remove carburetor to manifold stud nuts and lock washers. Remove carburetor from manifold studs.

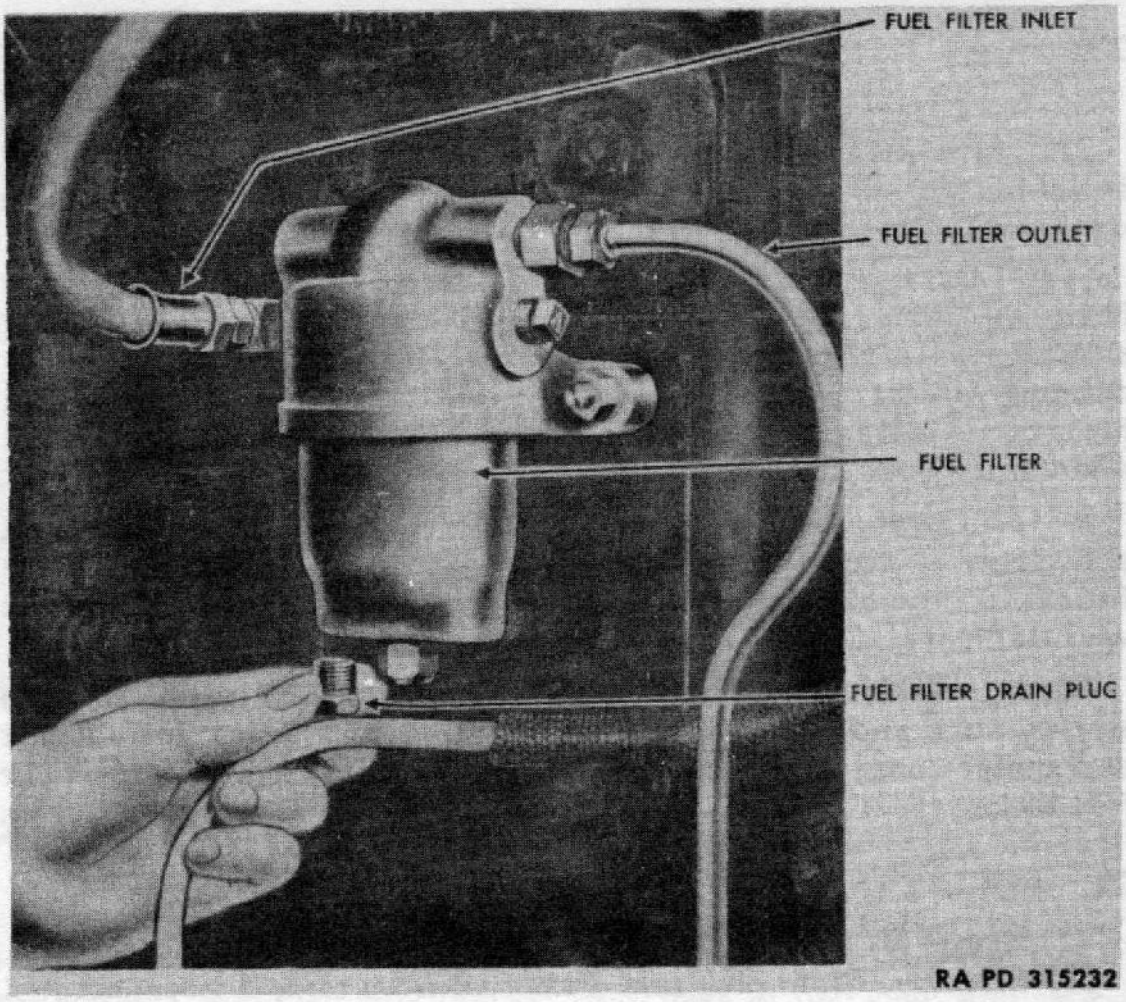

Figure 78—Draining Fuel Filter

c. Installation. Using new gaskets between governor and manifold and carburetor and governor, set carburetor on studs, and install lock washers and stud nuts. Hook up choke and hand throttle controls. Connect fuel line and install accelerator rod. Connect air cleaner tube. Inspect for fuel leaks, and lubricate linkage.

69. FUEL PUMP REPLACEMENT.

a. Periodic Inspection. The fuel pump is located on the left side of the engine. Inspect the fuel pump for loose fuel line connections and for water accumulation in sediment bulb. Clean and replace with new gasket (fig. 12).

b. Removal. Disconnect fuel pump inlet and outlet lines at pump. Remove two cap screws at mounting flange (fig. 12). Lift fuel pump from engine crankcase.

c. Installation. Using new gasket between fuel pump and crankcase, set fuel pump in position, and install cap screws in mounting flange. Connect fuel pump inlet and outlet lines, using a 3/4-inch wrench on coupling elbow and a 5/8-inch wrench on coupling nut. Start engine. Inspect for fuel and oil leaks.

70. FUEL FILTER REPLACEMENT AND SERVICE.

a. Service.

(1) DRAINING. Remove drain plug and filter bowl each time truck is lubricated or monthly inspection is made. Drain accumulated water and dirt from bowl (fig. 78).

(2) ELEMENT CLEANING. Remove filter bowl nut, and pull filter bowl off filter. Turn element knurled nut counterclockwise until element can be removed from stud. Wash element thoroughly in dry-cleaning solvent. Install filter element on stud, and turn knurled nut fingertight. Install new gasket on filter bowl, place bowl over stud, and tighten bowl nut (fig. 78).

b. Removal. Remove inlet and outlet connections, holding union and elbow to prevent rotation with a 3/4-inch wrench, and turn line fittings counterclockwise. Remove two cap screws, nuts, and lock washers holding filter to bracket.

c. Installation. Set filter in position on bracket. Install two cap screws, nuts, and lock washers holding filter to bracket. Install inlet and outlet connections (subpar. **b** above). Start engine. Inspect for fuel leaks.

71. FUEL TANK REPLACEMENT.

a. Removal.

(1) Remove drain plug and drain fuel from tank. Disconnect fuel line. Remove pioneer tools. Remove cap screws, lock nuts, and nuts securing the pioneer tool bracket to vehicle. Remove under-body tool box (par. 226). Remove tank front hold-down straps. Remove fuel tank rear hold-down bolt (outer only), and loosen inner rear hold-down bolt (fig. 79).

(2) Disconnect battery; then disconnect fuel gage wire (fig. 103). Remove running board (par. 223). Tilt fuel tank out at top and lift out (fig. 79).

b. Installation. Set bottom of fuel tank on supports with top tilted out. Install front strap and rear hold-down bolts (fig. 79). Install fuel line, and connect fuel gage wire and battery. Replace running board, tool box, and pioneer tool bracket (pars. 223 and 226). Install drain plug. Fill tank with fuel. Inspect for fuel leaks.

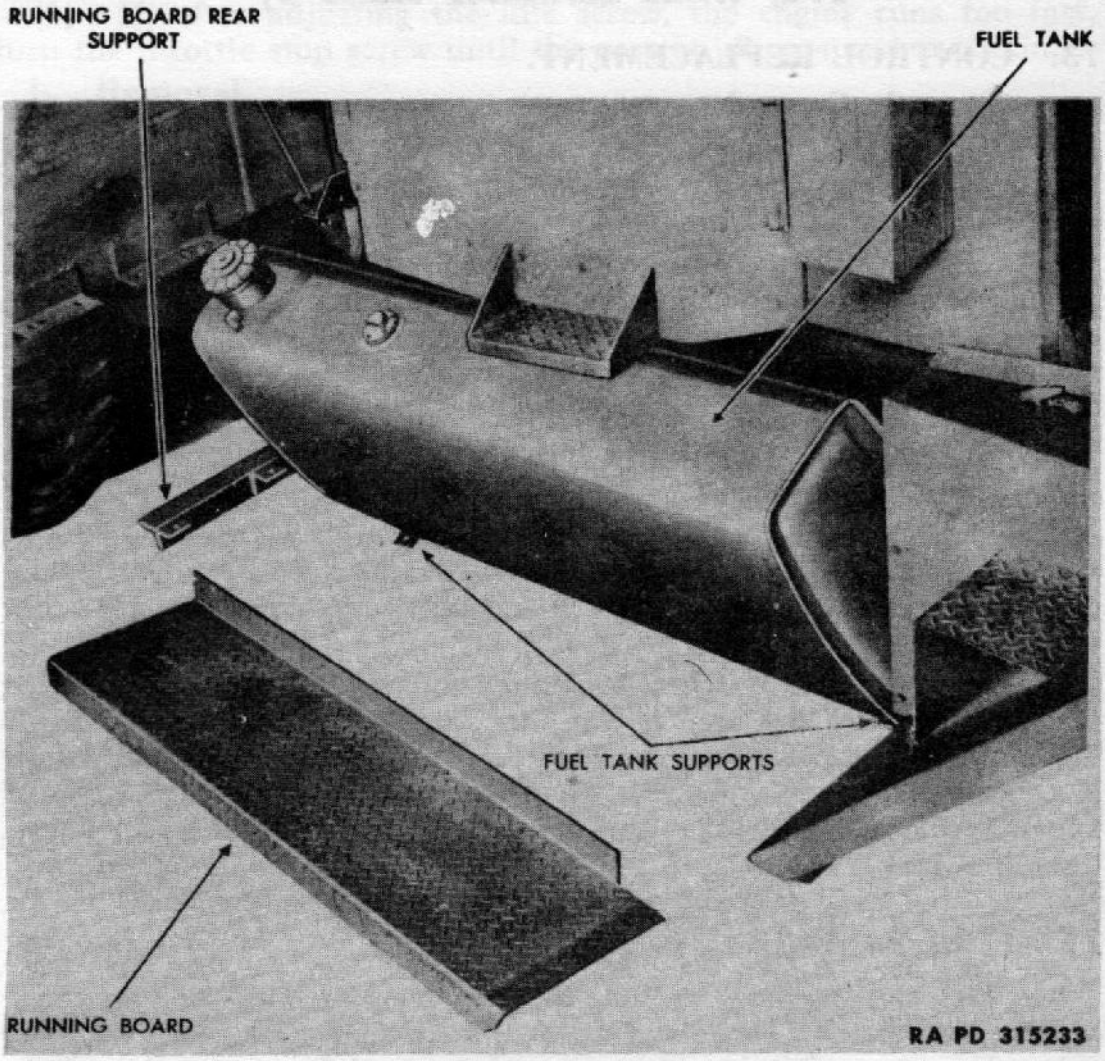

Figure 79—Fuel Tank Removal

72. FUEL GAGE REPLACEMENT.

a. Instrument Panel Unit.

(1) REMOVAL. Disconnect the battery (fig. 103). Remove nuts and lock washers attaching resistor and switch wire to gage. Remove nuts, lock washers, and clamping bracket from back of fuel gage, and slide gage through front face of instrument panel (fig. 176).

(2) INSTALLATION. Position gage through front face of instrument panel, and connect yellow lead and resistor to center terminal on gage. Install nuts and lock washers. Connect red switch lead to upper terminal (fig. 176).

b. Tank Unit Replacement.

(1) REMOVAL. Remove fuel tank (par. 71 **a**). Remove five screws retaining gas gage unit to tank. Lift out tank unit (fig. 79).

(2) INSTALLATION. Clean fuel tank and gage gasket surfaces. Place new gasket coated with joint and thread compound, type B, on tank, and install tank unit. Install retaining screws. Install gas tank (par. 71 **b**). Connect fuel gage wire lead and battery. Inspect for fuel leaks.

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73. CONTROL REPLACEMENT.

a. Throttle Control.

(1) REMOVAL. Loosen carburetor throttle arm swivel nut and loosen cable clamping nut. Remove nut attaching control to instrument panel, and pull cable from vehicle.

(2) INSTALLATION. Run control through instrument panel, and install lock washer and nut on cable. Thread cable through dash, cable clamping bracket, and control wire through arm swivel. Tighten nut on back of instrument panel and cable clamping nut. With control button pushed all the way in, turn throttle arm clockwise until it interferes with arm clamping nut, then tighten swivel nut.

b. Choke Control.

(1) REMOVAL. Loosen swivel screw and cable clamping screw at carburetor. Loosen cable clamping screw at manifold. Remove control nut from back of instrument panel, and pull control out through front of panel.

(2) INSTALLATION. Install choke control through instrument panel, and install lock washer and nut on control cable. Thread cable through dash, upper and lower cable clamps, and wire through choke lever swivel. Tighten clamping screws and control nut at instrument panel. With button clear in and choke lever turned counterclockwise, tighten swivel screw.

74. FUEL LINE REPLACEMENT.

a. Two-way Valve to Left-hand Fuel Tank.

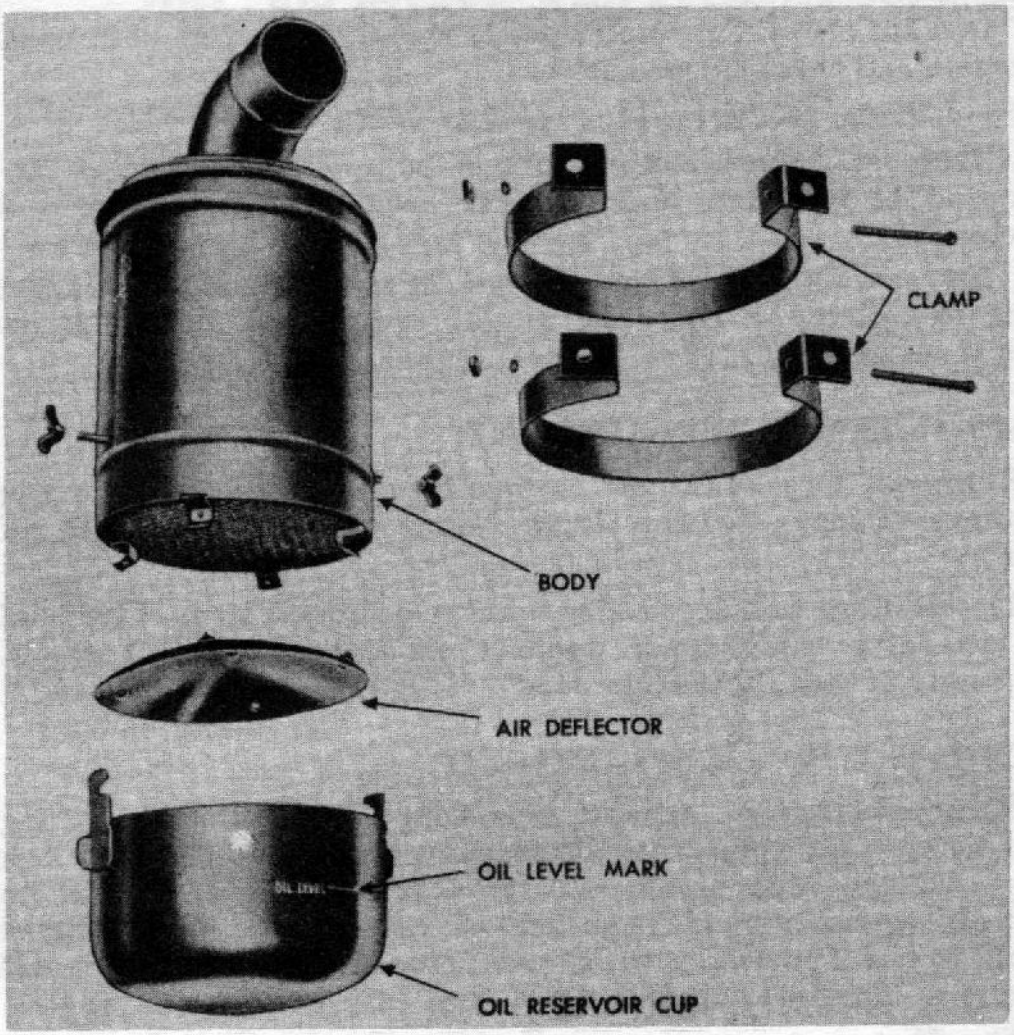
(1) REMOVAL. Disconnect fuel line at fuel tank and two-way valve. Remove two tubing line clips. Loosen clutch pedal draw bolt, and slide clutch pedal on shaft as far to the left of the vehicle as possible, to permit removal of the line from under the clutch pedal. Disconnect fuel valve to fuel filter flexible line. Remove left-hand fuel tank (par. 71 a). Remove line through fuel tank bracket opening.

(2) INSTALLATION. Set fuel line in position. Move clutch pedal into normal position and tighten draw bolt. Connect fuel line to the two-way valve and the fuel tank, and connect fuel filter flexible line. Install tubing clips, and install fuel tank and tool box (par. 71). Start engine, run for several minutes with fuel valve turned to left-hand tank position, and check for fuel leaks.

b. Two-way Valve to Right-hand Fuel Tank.

(1) REMOVAL. Disconnect fuel line at fuel tank and two-way valve. Remove two tubing line clips. Disconnect battery and fuel gage wire at tank unit. Move fuel tank end of line towards transfer case. Lift front end of fuel line over engine and air cleaner connection, and pull fuel line directly forward.

(2) INSTALLATION. Enter fuel line under toeboard and run back to tank. Hook up tank end. Connect fuel gage wire and battery. Connect fuel line at two-way valve. Install tubing clips. Turn fuel valve to right-hand tank, start engine, and check for fuel leaks.



RA PD 315234

Figure 80—Air Cleaner Disassembled

c. Flexible Fuel Line Replacement.

(1) REMOVAL. This flexible fuel line runs from the two-way valve to the filter. Always use two wrenches to connect or disconnect flexible line at both ends, to prevent placing a twist in the flexible line. Hold the 3/4-inch wrench in the same position as it is placed on the nut, and turn the union out of the valve or filter. In this way, no preload is placed on the flexible line. After disconnecting both ends, remove from vehicle.

(2) INSTALLATION. Set flexible fuel line in position and tighten both unions finger-tight into the two-way fuel valve and fuel filter. Using two wrenches, place the 3/4-inch wrench on the nut and maintain its position. At the same time, turn the union into the valve or filter using a 5/8-inch wrench. CAUTION: *Make sure that there is no twist or preload on the line.*

d. Fuel Filter to Fuel Pump Line Replacement.

(1) REMOVAL. Disconnect line at both ends and lift from vehicle.

(2) INSTALLATION. Set line in position and connect at both ends. Start engine and check for fuel leaks.

e. Fuel Pump to Carburetor Replacement.

(1) REMOVAL. Disconnect fuel line at pump end. Disconnect carburetor end of fuel line, and pull line from back of engine and carburetor.

(2) INSTALLATION. Connect fuel line in fuel pump, and connect fuel line to carburetor. Start the motor, and inspect for fuel leaks. Tighten if necessary.

75. AIR CLEANER REPLACEMENT.

a. Removal. Disconnect air cleaner tube at elbow by loosening hose clamps. Remove two cap screws from rocker arm cover. Lift off air cleaner.

b. Installation. Set air cleaner bracket on rocker arm cover, and install attaching cap screws. Connect air cleaner tube at elbow. Tighten hose connection clamp screw.

76. EXHAUST PIPE REPLACEMENT.

a. Removal. Remove exhaust pipe flange to manifold attaching cap screws, nuts, and flat washers. Remove cap screw, nut, and lock washer from tail pipe bracket at frame. Remove four muffler to bracket cap screws, nuts, and toothed lock washers, and lower exhaust assembly free of vehicle. Loosen clamp at forward end of muffler, and pull exhaust pipe from muffler.

b. Installation. Insert exhaust pipe into muffler, and place into position exhaust pipe, muffler, and tail pipe as an assembly. Install muffler cap screws, nuts, and toothed lock washers. Install exhaust pipe flange cap screws, nuts, and flat washers. Install tail pipe cap screw, nut, and lock washer. Inspect for exhaust leaks.

77. MUFFLER REPLACEMENT.

a. Removal. Remove exhaust pipe (par. 76 **a**). Loosen clamp nuts at rear of muffler, and pull tail pipe free of muffler.

b. Installation. Place tail pipe in muffler, and tighten clamp nuts at rear of muffler. Install exhaust pipe (par. 76 **b**).

78. TAIL PIPE REPLACEMENT.

a. Removal. Remove cap screw, nut, and lock washer from tail pipe bracket to frame. Loosen clamp nuts at rear of muffler, and pull tail pipe free of truck. Remove cap screw, nut, and washer from bracket at tail pipe and remove bracket.

b. Installation. Place tail pipe bracket over tail pipe, and install cap screw, nut, and washer. Place tail pipe into rear of muffler, and tighten rear muffler clamp nuts. Install tail pipe bracket to frame cap screw, lock washer, and nut.

Section XVII

COOLING SYSTEM

79. DESCRIPTION.

a. Cooling system consists of radiator and hose connections, water pump, fan assembly and belt, thermostat, and secondarily the water passages within the engine itself. Cooling water is drawn from the bottom of the radiator by action of the water pump and is forced by the water pump into engine water jackets. Water is then returned to radiator through the upper hose connection (fig. 81). The water is cooled by air drawn through the radiator core by the fan. A thermostat is located in cylinder head water outlet connection, which restricts the flow of water into the radiator until a temperature of 150°F is reached. A temperature gage, mounted on the instrument panel, indicates the temperature of the water in the cooling system (fig. 10). Many of the operations relating to the cooling system may be performed without removing the units from the vehicle.

80. SERVICE.

a. Inspection.

(1) Externally inspect cooling system components daily. See if radiator is full of water. Add water if necessary. When antifreeze is being used, test strength with a hydrometer (subpar. e below). Add antifreeze if necessary. Check all hose connection clamps. Tighten if necessary.

(2) Inspect water pump packing nut for leaks. Tighten if necessary. CAUTION: *Overtightening will score water pump drive shaft.*

(3) Inspect fan belt tension (fig. 87). Adjust if necessary (par. 85).

(4) Inspect radiator for leaks. Replace if leaking (par. 81). Check tightness of the two radiator-to-frame stud nuts. Tighten if necessary (par. 81) (fig. 84).

(5) If the temperature gage on the instrument panel shows 150°F after the engine has been running a few minutes, then holds at that temperature, the thermostat is operating satisfactorily. If temperature rises slowly and holds at less than 160°F, the thermostat may not close when temperature is low. If temperature rises in a normal

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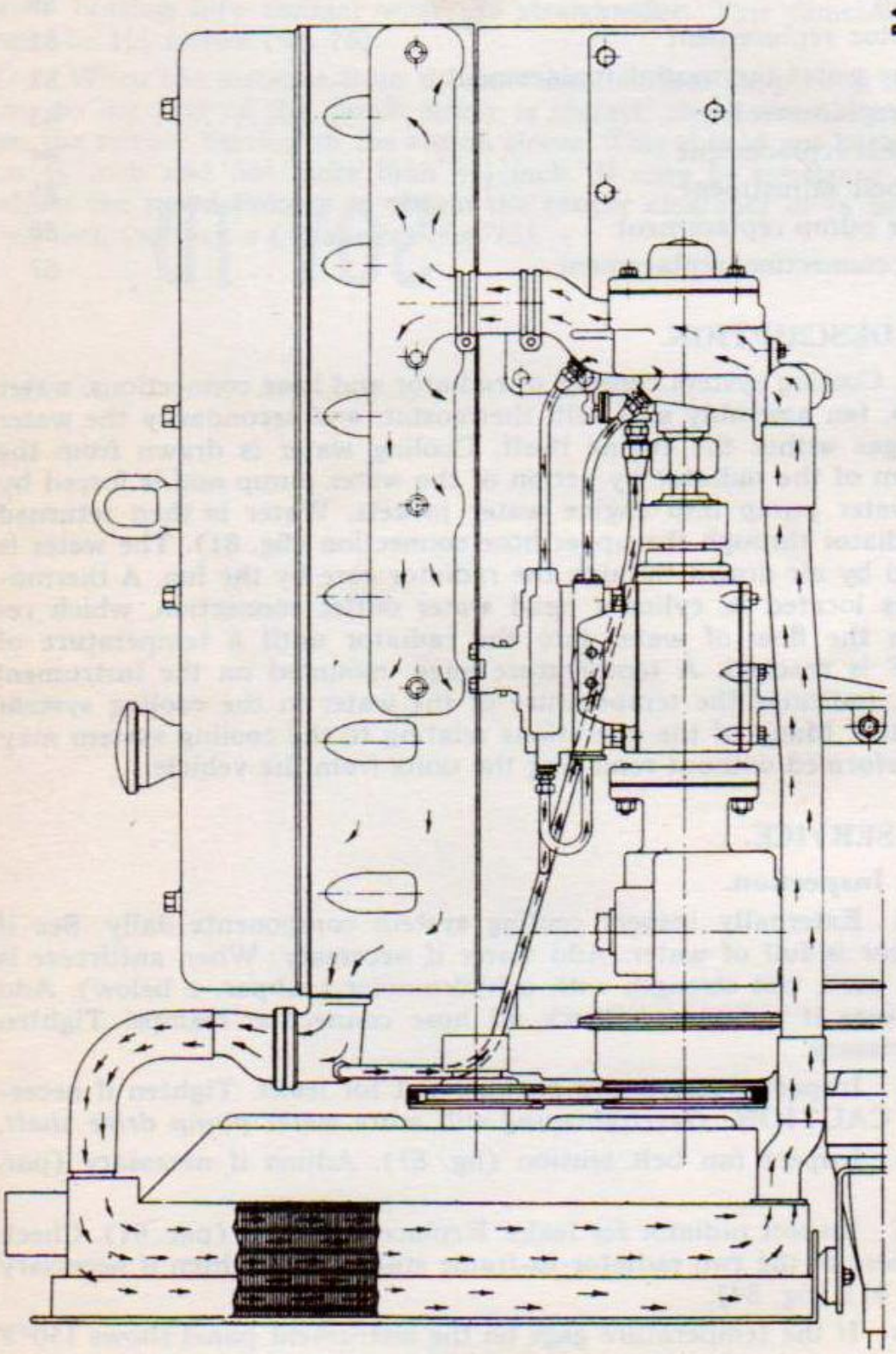

Figure 81—Cooling System Circulation

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Figure 82—Cooling System Drain Plate

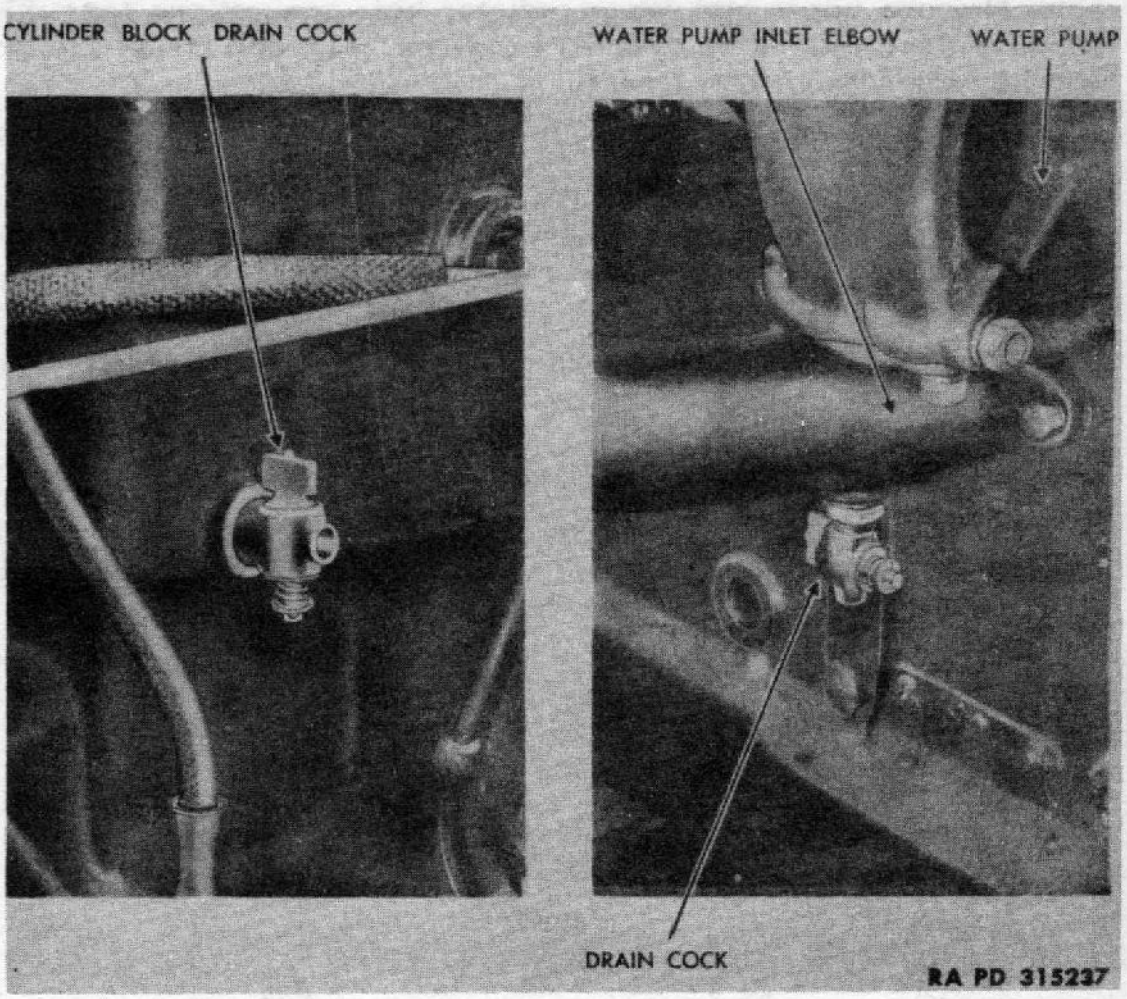

Figure 83—Draining Point—Radiator and Cylinder Block

manner, but continues to rise above 160°F, the thermostat may not open properly. Remove and inspect the thermostat (par. 82) (fig. 85).

b. Draining.

(1) DRAIN RADIATOR. Remove the filler cap slowly to permit pressure to escape, if the radiator is hot. Open the radiator drain cock at water pump inlet (fig. 83). If cooling system contains anti-freeze, drain in pan and save.

(2) DRAIN CYLINDER BLOCK. Open the drain cock at the lower edge of the water jacket on the right side of the engine (fig. 83). Draining the radiator alone will not completely drain the cooling system.

c. Filling. Close the water pump drain cock as well as the drain cock at the lower edge of the water jacket on the right side of the engine. Fill the radiator with cooling solution. The capacity of the cooling system is 35 quarts. Turn filler cap on radiator all the way to the right.

d. Flushing Cooling System.

(1) If dirty water has been used in the cooling system, the system can be flushed to some extent, if a water supply and hose are available. Remove upper and lower radiator hose connections (par. 87). Remove thermostat from cylinder head (par. 82), and install thermostat housing without thermostat.

(2) Place end of water hose in radiator filler opening, and wrap cloth around connection to hold some of the water pressure. Turn on water, and allow water to flow through radiator until water is clean as it leaves radiator. Place end of water hose in opening at the thermostat housing, and allow water to flow through the engine water jackets until water is clean as it leaves the water jackets.

(3) Remove thermostat housing, and install the thermostat (par. 82). Install upper and lower radiator hose connections (par. 87). Refill cooling system.

e. Antifreeze Compound in Cooling System.

(1) Inspect all cooling system units for leaks. If leaks are found, repair or replace the component. Clean and flush cooling system (par. 80). Drain cooling system, then close drain cocks (par. 80).

(2) Refer to the following chart for amounts of antifreeze to use:

Freezing Point	Pints Antifreeze Compound (Ethylene Glycol) per Gallon of System Capacity
+10°F	2
0°F	2½
−10°F	3
−20°F	3½
−30°F	4
−40°F	4½
−50°F	4½
−60°F	5
−70°F	5

(3) First add some water to the radiator; then add the required amount of antifreeze compound to the system, and fill with water to slightly below the filler neck. After installing the compound and warming the engine, the level should be adjusted and the solution checked with a hydrometer and strengthened, if necessary.

(4) In service with either new or used antifreeze solution, the coolant should be inspected weekly for strength and color. If the solution becomes rusty, it is to be discarded, the cooling system

thoroughly cleaned, and new compound added. In handling anti-freeze solution, it is essential that it be kept clean. Use containers and water that are free from dirt, rust, and oil.

81. RADIATOR REPLACEMENT.

a. Removal.

(1) Remove fan assembly (par. 83) (fig. 86). Remove center hood hinge front bearing screws. Remove upper radiator bonding strap cap screw, nut, and lock washer. Disconnect radiator tie rod at both ends. Remove temperature indicator cable tubing clips from radiator tie rod. Lift off engine hood. Drain cooling system (par. 80) (fig. 83). Disconnect upper and lower radiator hose connections.

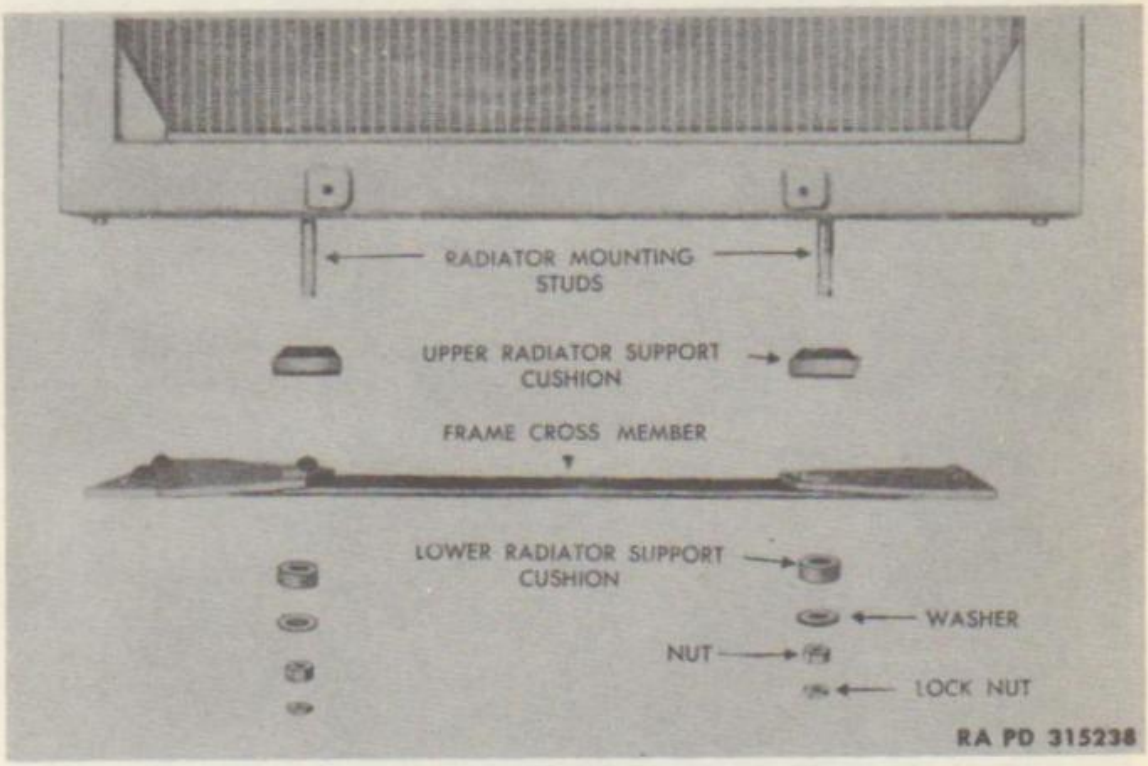

Figure 84—Radiator Mounting Parts Sequence

(2) Remove radiator shell lower bonding straps on front face of radiator core. Remove lock nut, washers, rubber pads, and nuts from radiator shell mounting studs (fig. 84). Lift radiator core and shell assembly out of frame. Remove cap screws, nuts, and lock washers attaching radiator core to shell at upper corners of core. Take out cap screws and lock washers attaching radiator core bottom tank to shell, and lift core from shell.

b. Installation.

(1) Place radiator core in shell and install cap screws, lock washers, and nuts retaining core to shell. Set radiator assembly in place, and install rubber pads, washers, nut, and lock nut on radiator to frame studs (fig. 84). Install radiator lower bonding strap, cap

screws, and washers. Install upper and lower radiator hose connections. Install fan assembly (par. 83) (fig. 86). Place hood in position and install radiator tie rod bolts, nuts, and bonding straps. Install front hood hinge bearing screws and heat indicator cable clips. Close drain cocks (fig. 83). Fill with water and check for water leaks.

82. ENGINE WATER THERMOSTAT REPLACEMENT.

a. Removal. Drain cooling system (fig. 83). Remove thermostat housing to engine water outlet connection stud nuts and lock washers.

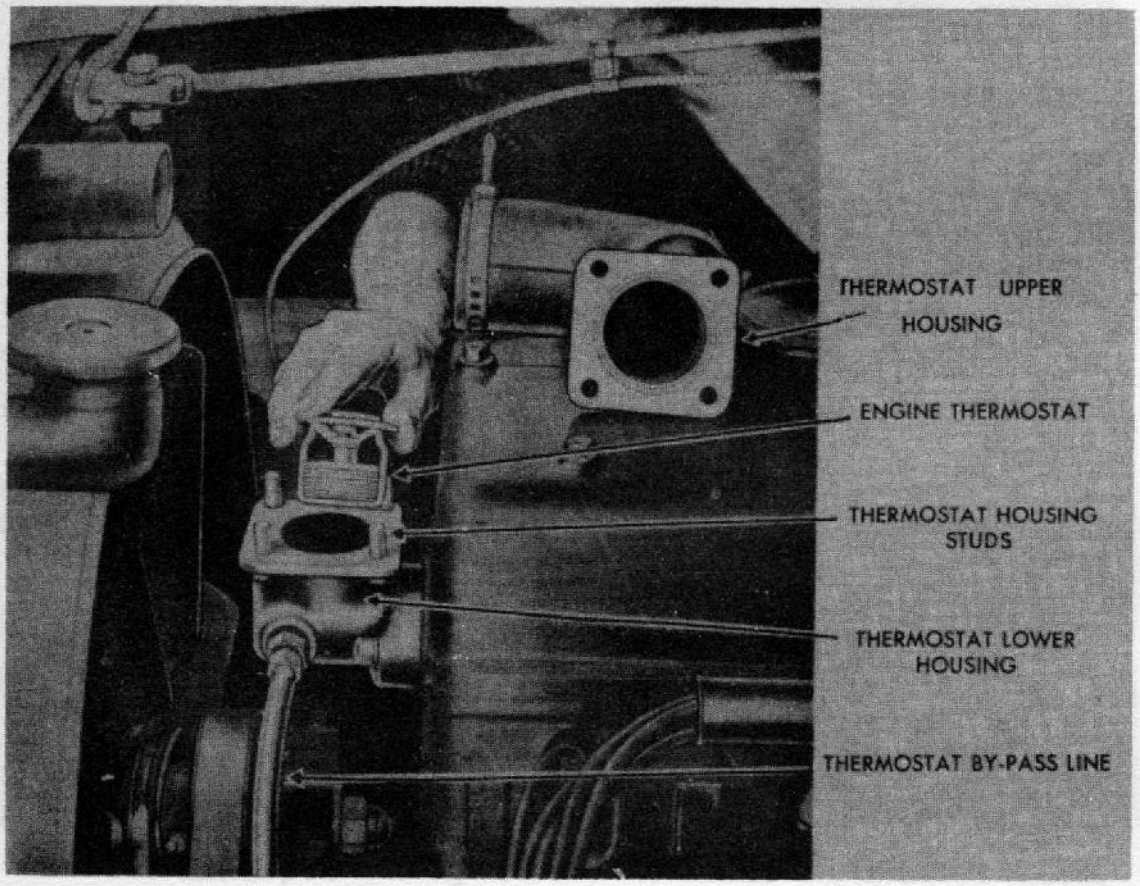

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Figure 85—Removing Engine Thermostat

Loosen radiator upper connections, and hose clamp; lift off water outlet connection. Lift out thermostat (fig. 85).

b. Installation. Install new thermostat housing gasket. Set thermostat with bellows down into thermostat housing (fig. 85). Set water outlet connection on thermostat housing studs, and install lock washers and nuts. Care should be taken to make certain that thermostat fits into counterbore of engine outlet connection. Install radiator inlet connection, and tighten hose connection clamps. Close drain cocks (fig. 83). Fill cooling system and inspect for water leaks.

COOLING SYSTEM

83. FAN REPLACEMENT.

a. Removal.

(1) Remove crankcase ventilator on chain cover. Remove cotter pin from end of fan shaft. Remove fan shaft nut and flat washer. Unscrew fan adjusting screw sufficiently to clear fan shaft. Force fan hub and blade assembly to left as far as possible. Remove drive belt from hub pulley.

(2) Move blade and hub assembly toward radiator core until shaft clears bracket, tilt top of blade to rear of vehicle, and bring

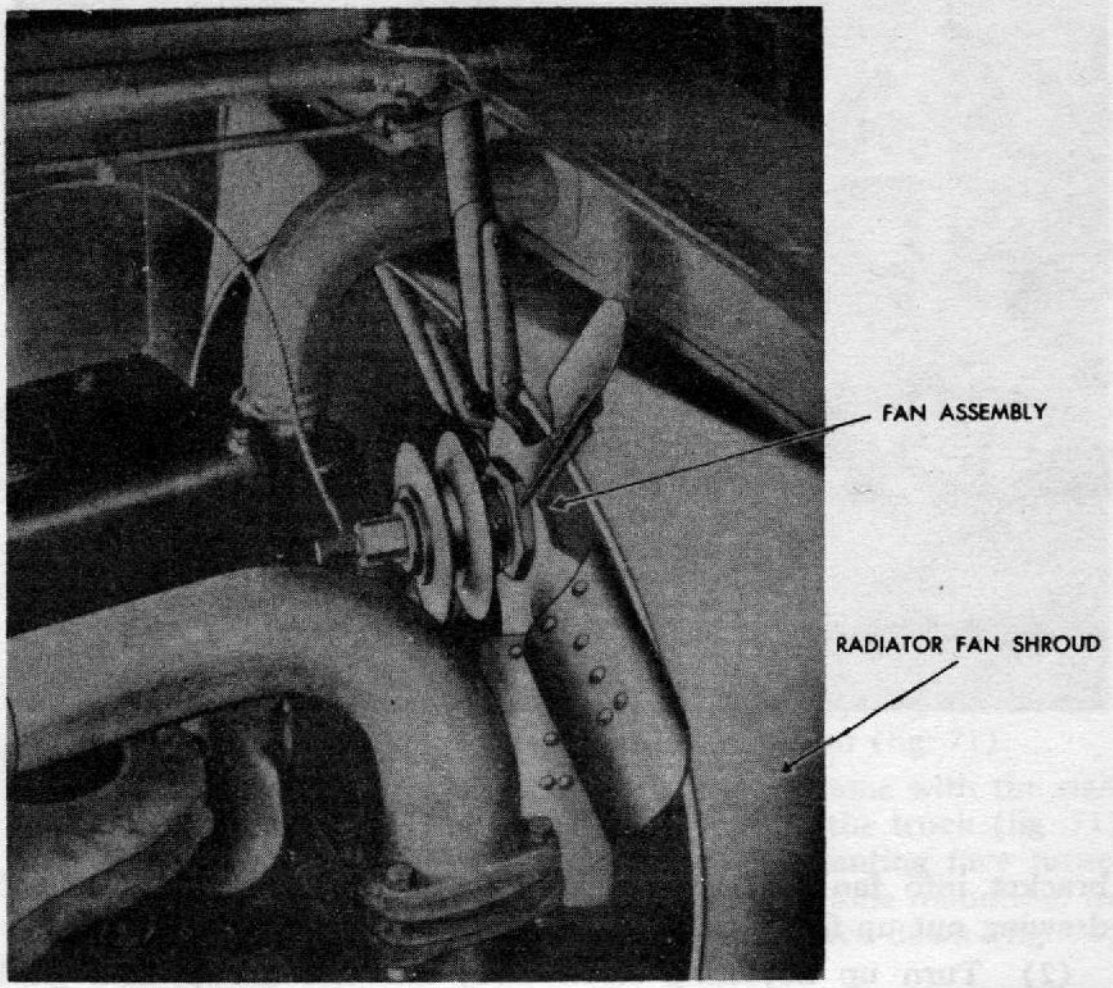

Figure 86—Removing Fan Assembly

hub and blade assembly out in rolling motion over exhaust manifold (fig. 86).

b. Installation.

(1) Enter fan blade and hub assembly between exhaust manifold and fan shroud, and roll it into position (fig. 86). Move assembly forward, install belt on upper pulley, and enter fan shaft in bracket. Force fan assembly in slotted bracket as far to the left as possible, and install belt on drive pulley. Install adjusting screw through

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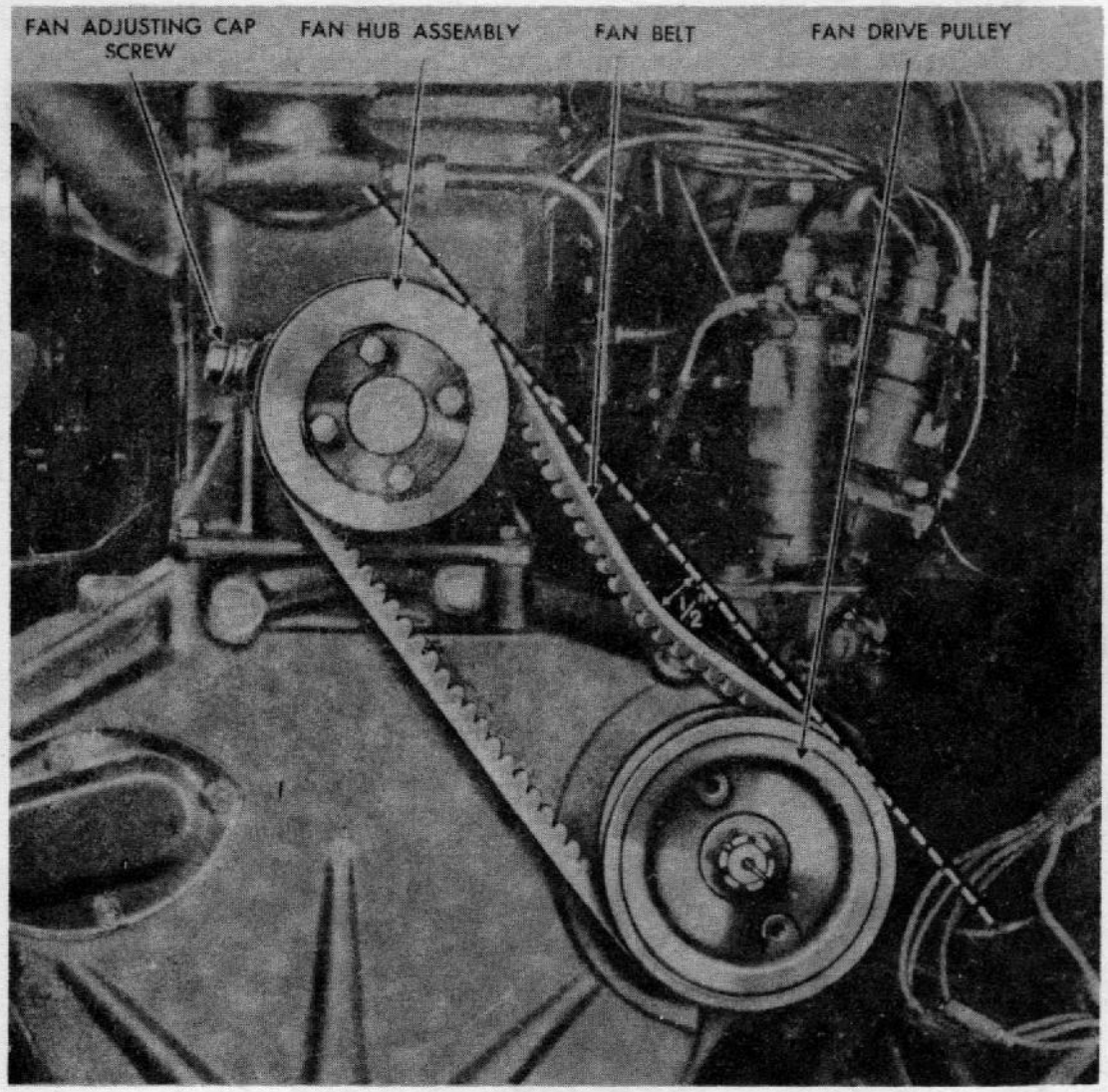

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Figure 87—Fan Belt Adjustment

bracket into fan shaft, and install flat washer and nut on shaft drawing nut up finger-tight.

(2) Turn up adjusting screw until fan belt has ½-inch slack (fig. 87). Tighten fan shaft nut securely. Install crankcase ventilator on chain cover. Test fan belt adjustment again, and lubricate fan bearings through lubricant fitting.

84. FAN BELT REPLACEMENT.

a. Removal. Remove crankcase ventilator. Remove cotter pin from fan shaft, and loosen fan shaft nut on back of fan bracket. Unscrew adjusting screw, and at the same time force fan blade and hub assembly to the left of truck (fig. 87).

b. Installation. Place fan belt over blade assembly, and install belt in lower and upper fan pulley grooves. Draw up adjusting screw

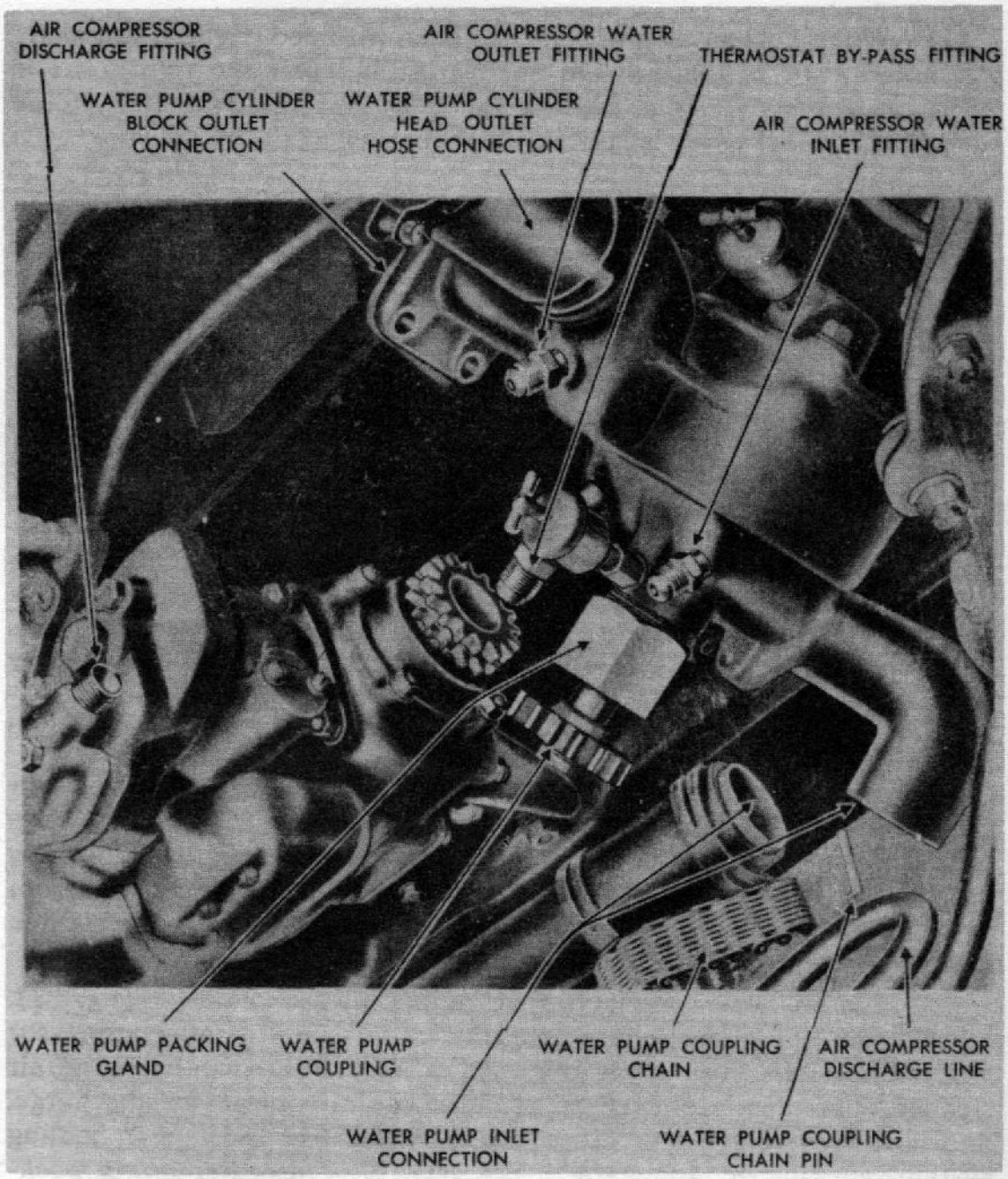


Figure 88—Removing Water Pump

until all slack with the exception of ½ inch is removed from fan belt (fig. 88). Tighten fan shaft nut and cotter pin securely. Install crankcase ventilator.

85. FAN BELT ADJUSTMENT.

a. Adjustment Procedure.

(1) Remove crankcase ventilator. Remove cotter pin and loosen nut on end of fan shaft, one turn. Tighten fan adjusting cap screw until a light pressure on fan belt midway between the pulleys will cause a ½-inch deflection (fig. 87).

(2) When correct adjustment has been attained, tighten fan shaft nut and install cotter pin. Do not adjust fan belt too tightly, as it will cause excessive wear on belt and fan bearings. If belt bottoms in pulleys, or if the belt is split, replace fan belt (par. 84).

86. WATER PUMP REPLACEMENT.

a. Removal.

(1) Drain cooling system (par. 80 b) (fig. 83). To facilitate draining, remove the radiator cap. Remove tachometer cable. Remove engine air cleaner (par. 75). Disconnect compressor discharge and governor lines at compressor head. Remove compressor water lines, using 3/4-inch and 5/8-inch wrenches on tubing nut and union respectively. Remove thermostat bypass line (fig. 88).

(2) Remove cotter pin from coupling chain. The engine may have to be turned over by crank or cranking motor to bring pin to outside. Slide chain coupling pin out of chain and remove chain (fig. 88). Remove water pump inlet and outlet hose connections. Remove six water pump to cylinder block cap screws, and pull water pump free of the truck.

b. Installation.

(1) Set water pump on cylinder block, install cap screw, and run up finger-tight. There is a 1/8-inch clearance between water pump coupling and compressor drive coupling. Place straightedge across both halves of the coupling at two positions, 90 degrees removed from one another, to insure coupling members are in alinement. Tighten cap screws and recheck alinement.

(2) Install hose connections at pump inlet and outlet (fig. 88). Install coupling chain, chain pin, and cotter pin. Install compressor water lines and thermostat bypass line (fig. 88). Install engine air cleaner (par. 75). Connect tachometer cable, compressor discharge, and governor air lines. Close drain cocks (fig. 83). Fill cooling system, and inspect for water leaks. NOTE: *The water pump packing nut has a right-hand thread. Turn clockwise to tighten, counterclockwise to loosen. Care must be taken in tightening, as too much pressure placed on the pump packing will score the pump shaft.*

87. HOSE CONNECTION REPLACEMENT.

a. Radiator Upper Connection.

(1) REMOVAL. Drain cooling system (fig. 83) and loosen two hose clamps. Twist hose to free it on radiator and thermostat housing. Remove hose from connections.

(2) INSTALLATION. Clean radiator and thermostat housing connections. Put hose in place and install hose clamps. Close drain cocks. Fill with water and inspect for leaks.

b. Radiator Lower Connection.

(1) REMOVAL. Drain cooling system (fig. 83) and loosen two hose clamps. Twist hose to loosen, and slide hose free of lower radiator connection. Lift hose and tube until hose can be pulled from tube.

(2) INSTALLATION. Clean tube and lower radiator connections. Place hose on tube, and slide toward rear until it can be lined up with lower radiator connection. Slide hose forward over lower radiator connection, and install hose clamps. Close drain cocks. Fill with water and inspect for leaks.

c. Water Pump Upper Connection.

(1) REMOVAL. Drain cooling system and loosen two hose clamps. With screwdriver, pry upper end of hose free of engine water manifold. Pull hose off water pump.

(2) INSTALLATION. Clean water pump and engine water manifold connections. Place hose on water pump, and force on connection as far as possible. Pry upper end of hose over engine water manifold connection, and install hose clamps. Close drain cocks (fig. 83). Fill with water and inspect for leaks.

d. Water Pump Lower Connection.

(1) REMOVAL. Drain cooling system (fig. 83), and loosen two hose clamps. Twist hose to free and slide toward radiator until hose is free of water pump. Lift hose and tube until hose can be removed from tube.

(2) INSTALLATION. Clean tube and pump connections. Place hose on tube, and slide toward radiator until hose can be alined with water pump connection. Slide hose onto pump and install hose clamps. Close drain cocks. Fill with water and inspect for leaks.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XVIII

IGNITION SYSTEM

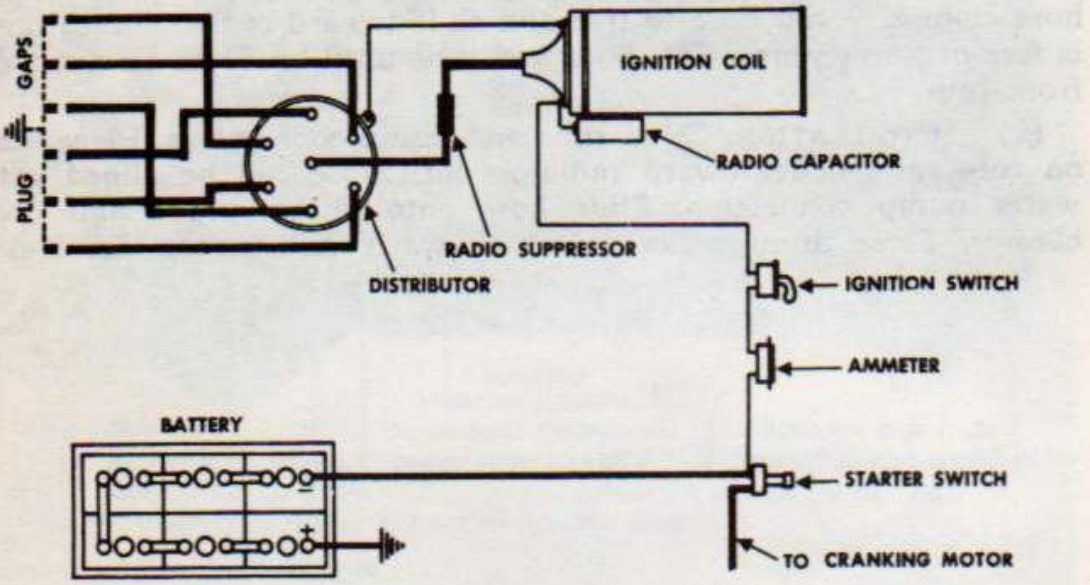


Figure 89—Ignition Wiring Circuit

88. DESCRIPTION.

a. The ignition system consists of the distributor, ignition coil, spark plugs, and necessary high and low tension wires, to complete the circuit for the units of the ignition system. The complete ignition circuit (fig. 89) consists of two separate circuits, the primary circuit and the secondary circuit. The ignition system furnishes high voltage spark at the correct instant to the correct cylinder spark plug.

b. The distributor is mounted back of the timing case in the accessory housing on the left side of the engine. The ignition coil is mounted alongside of the distributor on a bracket at the timing gear case.

89. PERIODIC INSPECTION.

a. Wipe any accumulation of oil or dirt from spark plugs, cables, coil, and distributor cap.

b. Inspect spark plug porcelains for cracks or damage. If porcelain is cracked, replace spark plug (par. 93).

c. Inspect the spark plug cables for broken insulation. If insulation is badly cracked or damaged, replace cables (par. 93).

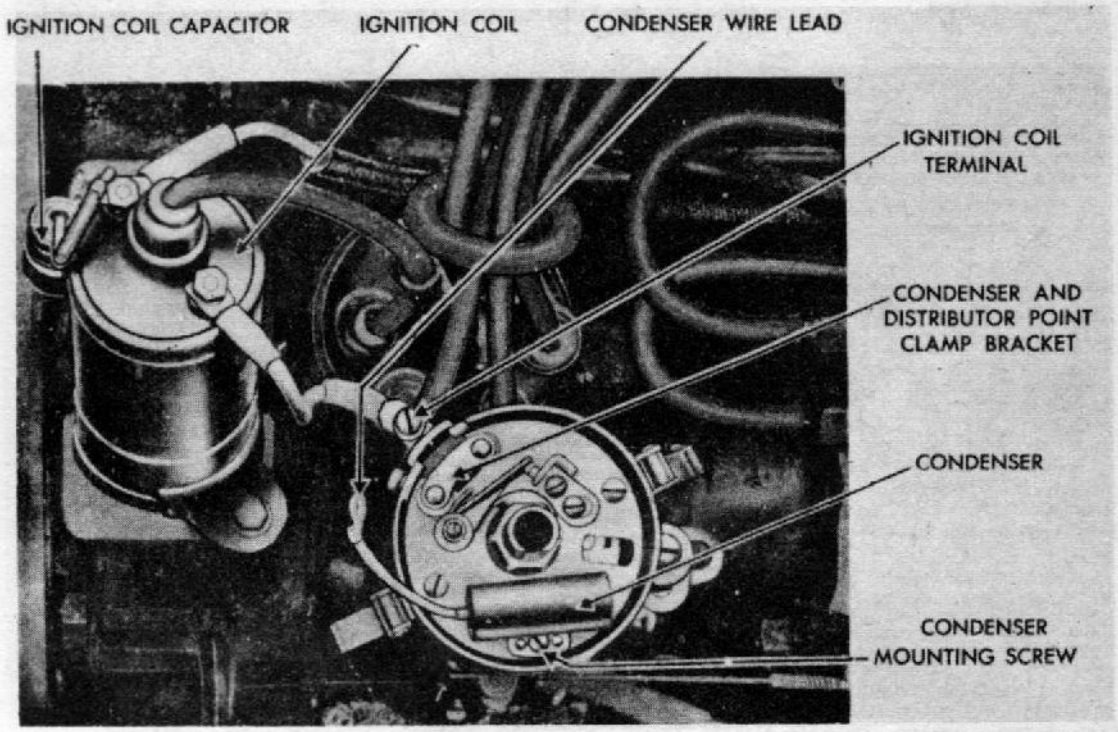


Figure 90—Installing Condenser

d. Inspect and tighten primary wire connections at distributor coil and radio interference filter on dash.

e. Remove, clean, and inspect spark plugs; check and adjust gaps (fig. 94). If badly burned, fouled, or damaged, replace the plugs (par. 93).

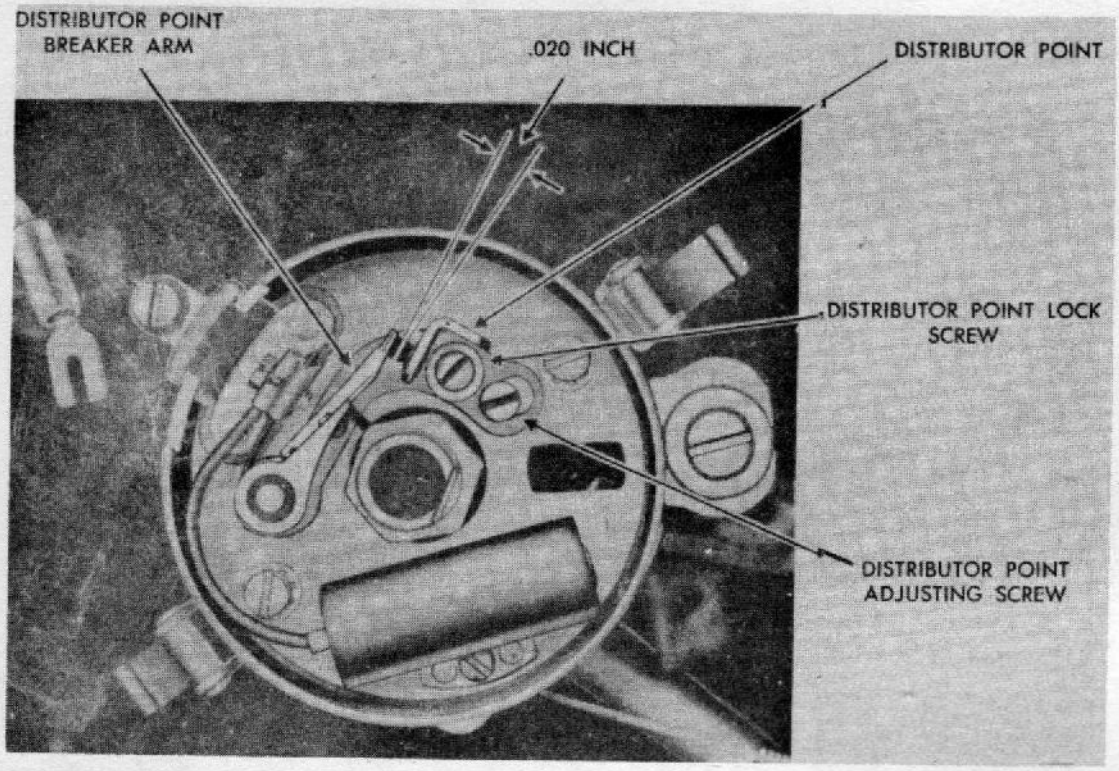
90. CONDENSER REPLACEMENT.

a. **Removal.** The condenser will be found under the distributor cap and rotor. To replace the condenser, unlatch the distributor cap hold-down clips, and lift cap and cable assembly off distributor. Lift off rotor. Remove condenser lead wire screw. Remove condenser attaching screw and lift off condenser (fig. 90).

b. Installation. Place condenser on breaker plate, and install attaching screw (fig. 90). Install lead wire attaching screw through condenser lead wire terminal, breaker plate bracket, breaker arm spring, and plate-type nut with lip up and tighten. Install rotor. Install distributor cap.

91. DISTRIBUTOR POINT REPLACEMENT.

a. Removal. Unlatch distributor hold-down clips, and remove distributor cap. Remove rotor. Loosen breaker arm spring screw, and lift breaker arm out of distributor. Remove stationary breaker point (fig. 91).



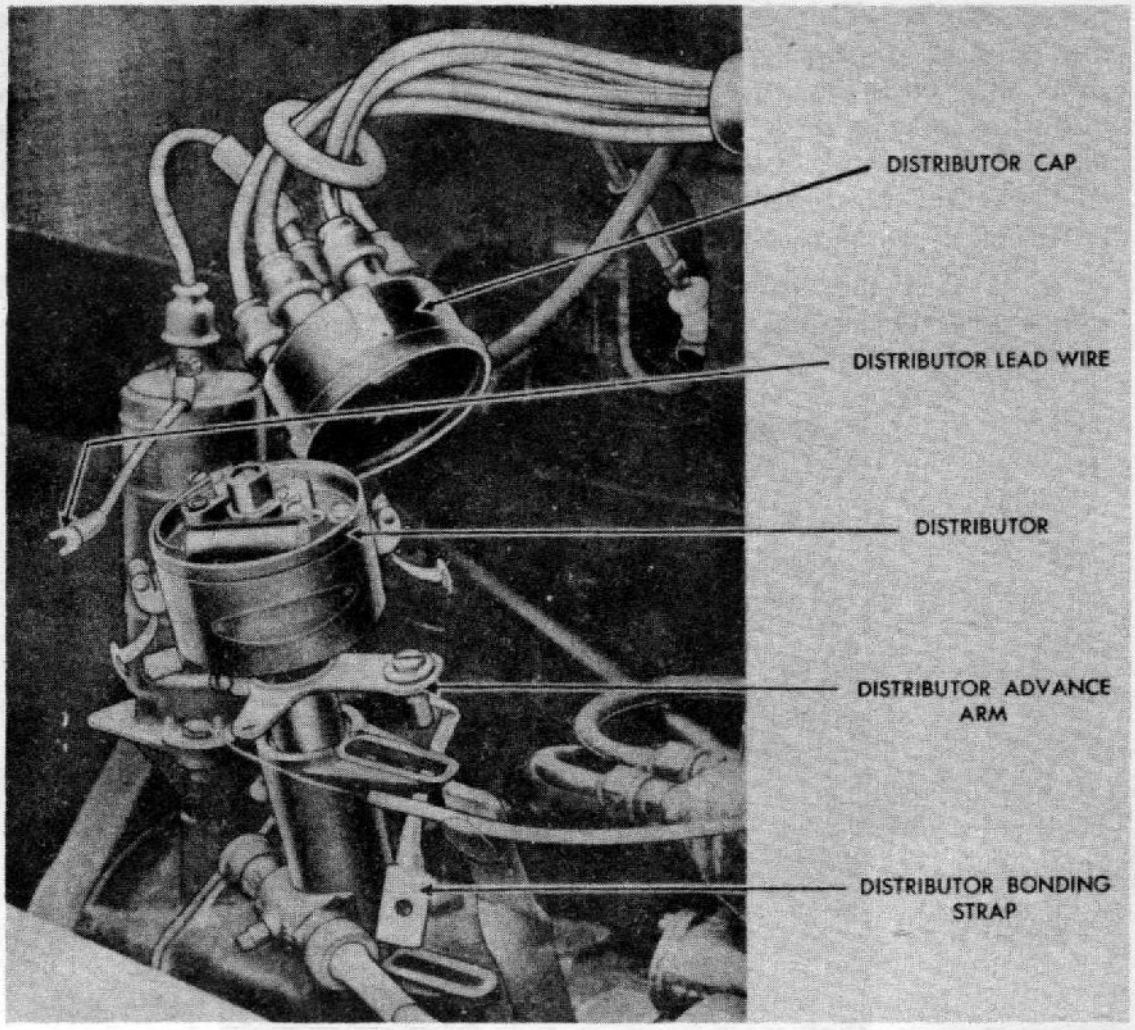
RA PD 315245

Figure 91—Distributor Breaker Point Adjustment

b. Installation.

(1) Install breaker arm spring between plate and bracket. Set breaker arm on breaker arm post, and tighten bracket screw. Install stationary breaker point, and tighten hold-down screw just tight enough to exert pressure on breaker point. Turn over engine until breaker arm rubbing block is on a high point of the cam (fig. 91).

(2) Turn breaker point adjusting screw until a 0.020-inch opening is present between the point (fig. 91). Turn adjusting screw counterclockwise to increase the point gap, and clockwise to decrease the point clearance. Tighten stationary breaker point lock screw (fig. 91). Install rotor and distributor cap.



RA PD 315246

Figure 92—Distributor Replacement

92. DISTRIBUTOR REPLACEMENT.

a. Removal. Unlatch distributor cap hold-down clips, and lift cap and cable assembly off distributor. Remove distributor to coil low tension lead wire (fig. 92). Remove distributor bonding strap at timing gear case. Remove spark advance control cable. Remove advance arm and distributor hold-down screw. Lift distributor out of tachometer drive adapter (fig. 92).

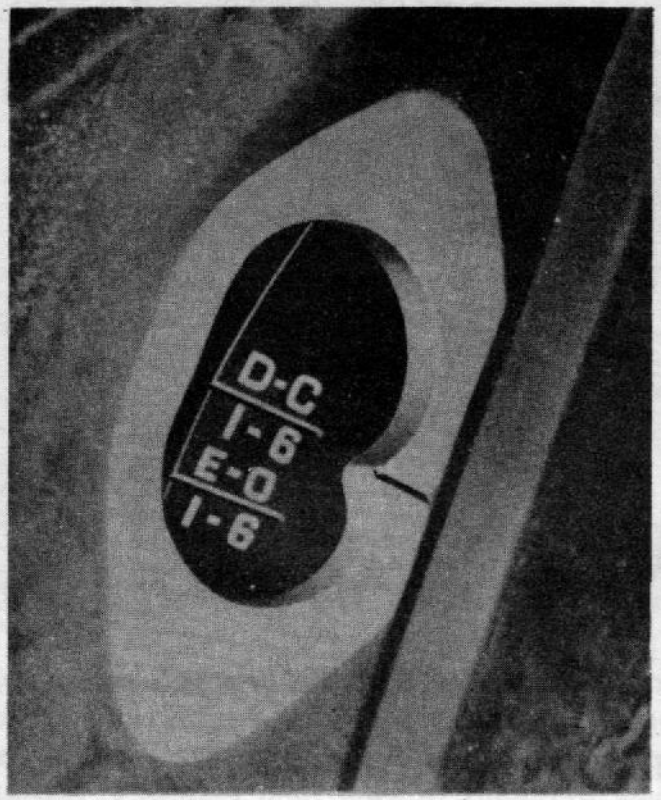
b. Installation. With the distributor cap removed, and the advance arm clamping screw just finger-tight, set the distributor in the tachometer drive housing. Rotate the distributor rotor in either direction until the lugs on the drive coupling mesh with the driving member. Install the distributor advance arm hold-down screw (fig. 92). Install the distributor bonding strap. Connect spark control cable and tighten set screw. Connect distributor lead wire from coil. Install the distributor cap.

c. Ignition Timing.

(1) Set the engine on top dead center of No. 1 cylinder on the

power stroke. This is determined by having No. 1 spark plug removed and a finger placed in the No. 1 spark plug hole to determine the compression stroke. When a pressure is built up in the cylinder, the person setting the timing will then know that the engine is on the compression stroke. Check the marking on the flywheel and continue to rotate the engine until the flywheel marking is directly opposite the point on the flywheel housing (fig. 93).

(2) With the distributor cap removed, and the distributor advance arm clamping screw loosened, rotate the distributor until the



RA PD 315247

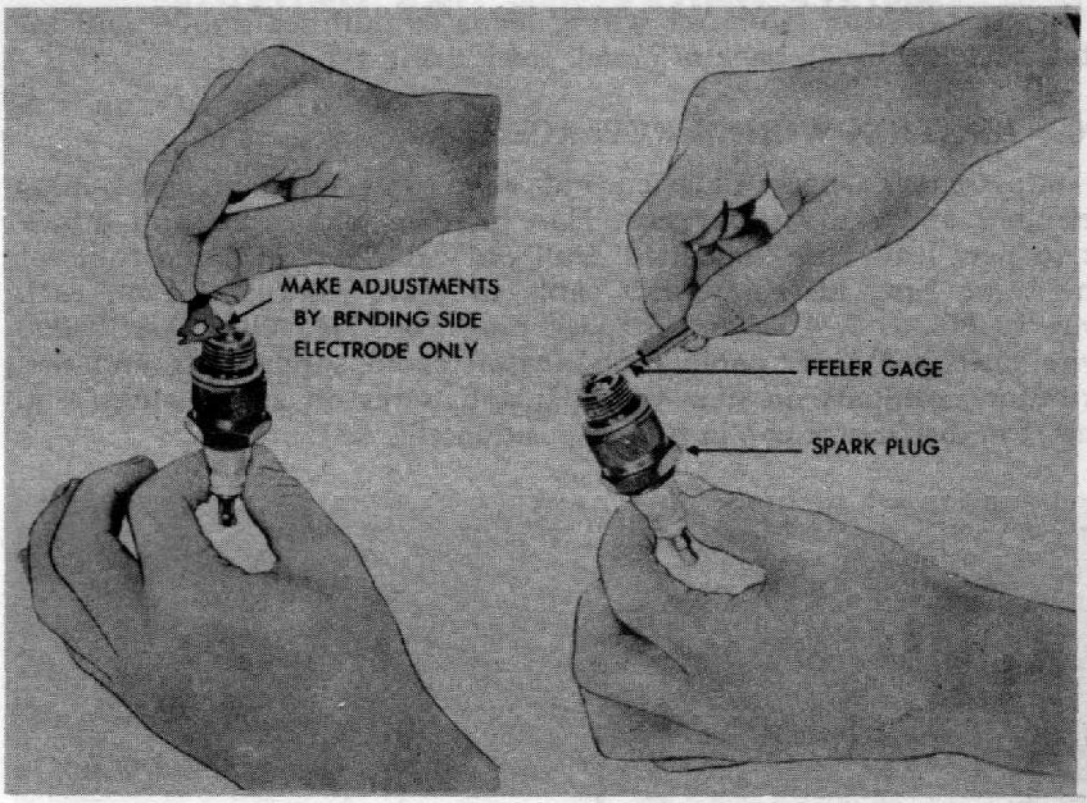
Figure 93—Flywheel Timing Markings

rotor brush is directly opposite No. 1 spark plug lead (fig. 95). With the spark control on the instrument panel pulled out to a full retard position, and with the rotor in alinement with No. 1 segment from the distributor cap (fig. 95), check the position of the distributor points. They should just be starting to open.

(3) The ignition timing is then set in the proper position. Tighten the distributor advance arm clamping screw. Install the distributor cap. Install No. 1 spark plug, and connect spark plug wire lead.

93. SPARK PLUG REPLACEMENT AND SERVICE.

a. Removal. Remove wires from spark plugs. Using a 1-inch deep socket wrench, remove spark plugs.



RA PD 315248

Figure 94—Adjusting and Gaging Spark Plug Gap, Using Gage (41-G-400)

b. Inspection and Adjustment. Clean plugs and examine for cracked porcelain and burned electrodes. Replace faulty plugs. Adjust electrodes to 0.025-inch gap, using gage (41-G-400) (fig. 94).

c. Installation. Use new gaskets on spark plugs, and install in cylinder head. Tighten to 30 foot-pounds. Connect wires.

94. IGNITION COIL REPLACEMENT.

a. Removal. Disconnect battery and distributor wires. Remove high tension wire from center tower. Remove coil attaching cap screw. Using a soldering iron, remove the capacitor from side of coil.

b. Installation. With knife scrape paint from side of coil about 1½ inches below battery wire terminal, and resolder capacitor to coil. Install coil attaching cap screws. Install battery and capacitor leads to negative terminal on coil and distributor wire to positive terminal. Insert high tension lead in center tower.

95. IGNITION SWITCH REPLACEMENT.

a. Removal. Disconnect battery (fig. 103). Remove ring nut from front face of instrument panel, and take switch out through rear of panel. Disconnect black lead with green tracer from upper terminal, and plain yellow and yellow with black tracer from bottom terminal.

b. Installation. Connect wiring leads as outlined above, and install switch through back of panel. Install ring-type nut.

96. IGNITION WIRING REPLACEMENT.

a. Remove spark plug end of wire, and unscrew spark plug terminal and radio suppressor. Bare wire on old cable, and attach it to new lead to be installed. Pull old cable out of cable tube, at the same time installing new cable in tube. Repeat this on each wire to No. 2, 3, 4, 5, and 6 spark plugs. NOTE: *No. 1 spark plug wire does not enter cable tube.* Install radio suppressors and distributor terminals on new wires. Install wires on spark plugs, and insert in distributor cap in proper position (fig. 95).

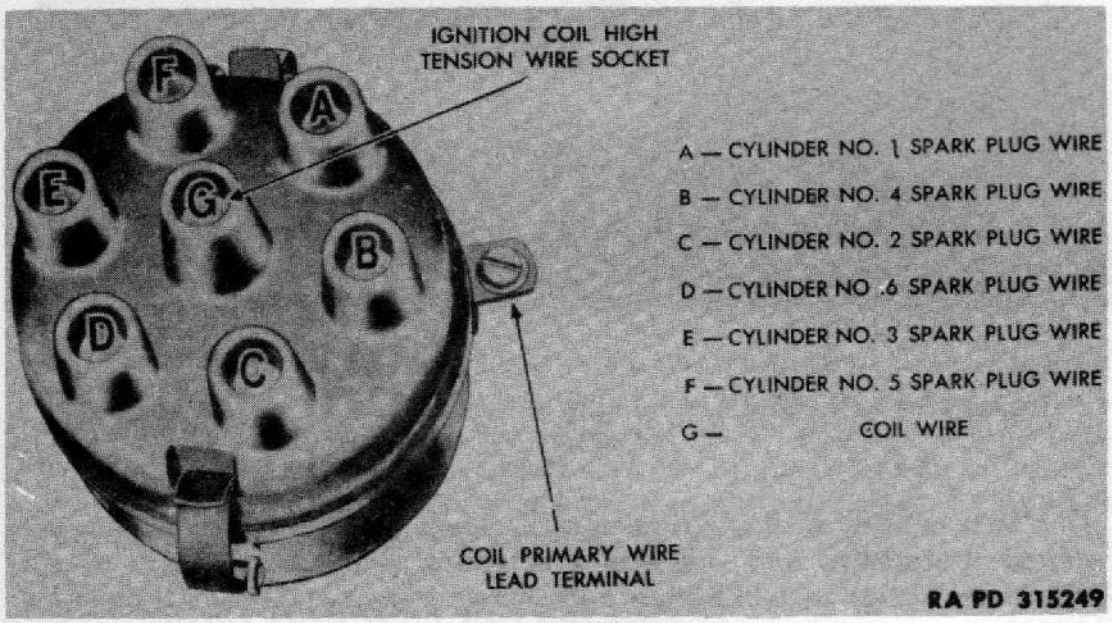


Figure 95—Spark Plug Wire Location

97. ENGINE CONTROL REPLACEMENT.

a. Spark Control.

(1) REMOVAL. Disconnect spark control cable at distributor. Loosen cable clamping screw nut. Remove nut securing control to instrument panel, and loosen bonding clamp at the dashboard. Pull control out through instrument panel.

(2) INSTALLATION. Run control through instrument panel, and install lock and nut on cable. Thread cable through dash panel, bonding clamp, and housing clamp. Enter wire into advance arm swivel. Tighten control nut at instrument panel, bonding clamp nuts, and cable clamping nut. Push control in, turn distributor housing clockwise to full advance position, and tighten swivel screw.

Section XIX

STARTING AND GENERATING SYSTEM

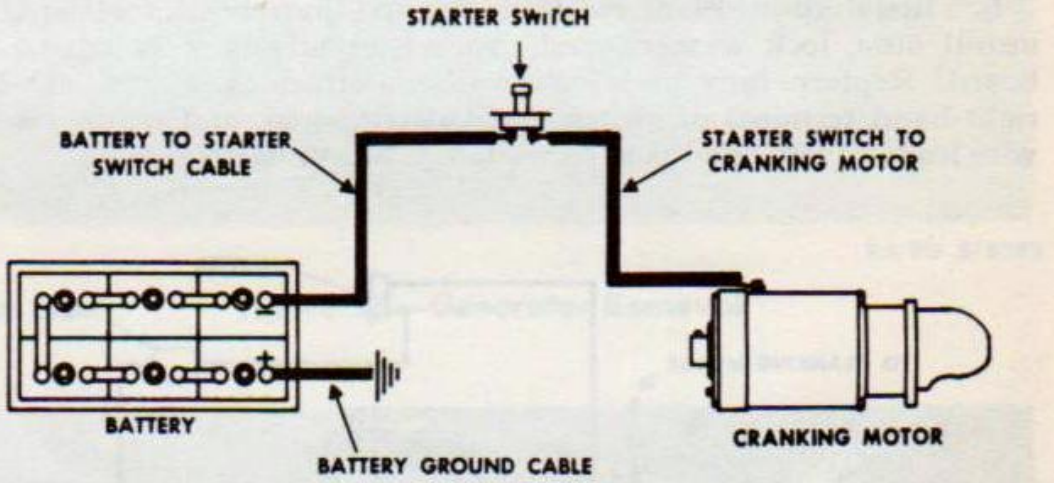


Figure 96—Starting System Wiring Circuit

98. STARTING SYSTEM.

a. Description. The starting system is illustrated in figure 96. It consists of cranking motor, battery cables, and starter switch. The cranking motor is located on right side of engine flywheel housing. It is a 12-volt, four-brush unit, driving through a gear clutch to the flywheel ring gear. The starter switch is a foot-operated button and is attached to the toeboard.

b. Inspection. Inspect cable connections, and tighten if necessary. Test cranking motor engagement with flywheel ring gear and its ability to crank the engine. If it does not engage the flywheel ring gear cleanly and rotate the engine readily, check the condition of the battery and battery connections. If these are in good condition, replace the cranking motor.

99. CRANKING MOTOR REPLACEMENT.

a. Removal. Disconnect battery cable at cranking motor. Remove three attaching cap screws and lock washers mounting cranking motor to flywheel housing. Slide cranking motor forward and remove.

b. Installation. Enter cranking motor into side of flywheel housing with gear opening facing towards left-hand side of vehicle. Install

cap screws and lock washers. Connect battery cable to the cranking motor. Add three drops of lubricating oil to two oil cups on cranking motor end head and check operation.

100. STARTER SWITCH REPLACEMENT.

a. Removal. Disconnect battery terminal to avoid damage from short circuit (fig. 103). Remove nuts and lock washers attaching starter cable to switch and battery, and the siren, and wiring harness leads to switch. Remove nuts, lock washers, and cap screws attaching switch to toeboard. Switch is removed from lower side of toeboard.

b. Installation. Place switch in position underneath toeboard, and install nuts, lock washers, and cap screws attaching switch to toeboard. Replace nuts and lock washers attaching starter cable to right-hand terminal of switch and battery, siren, and wiring harness wire leads to left-hand post on switch. Connect battery cable.

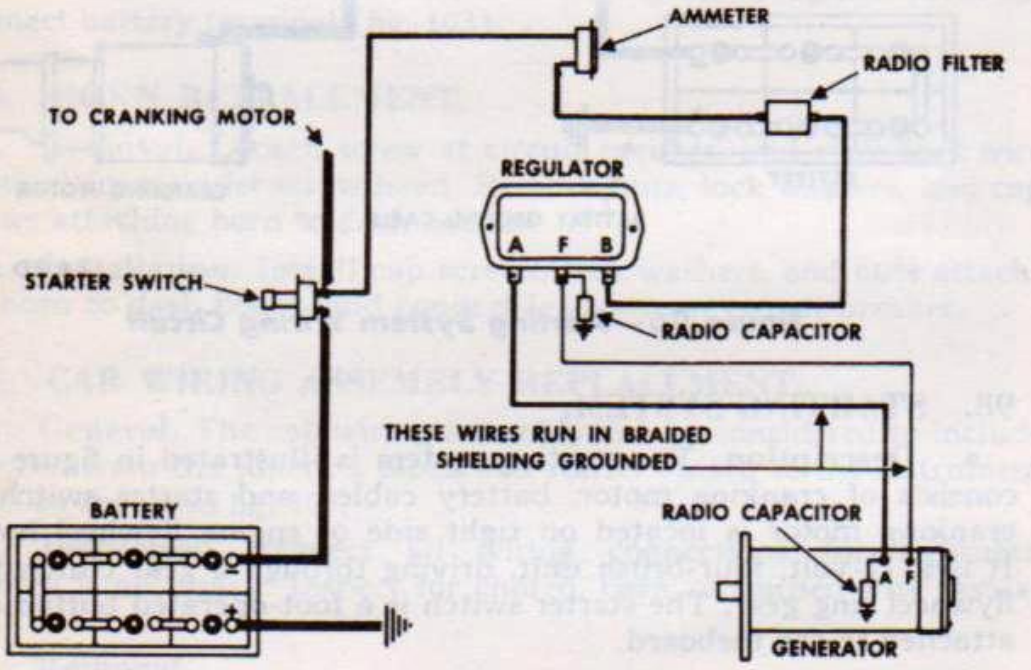
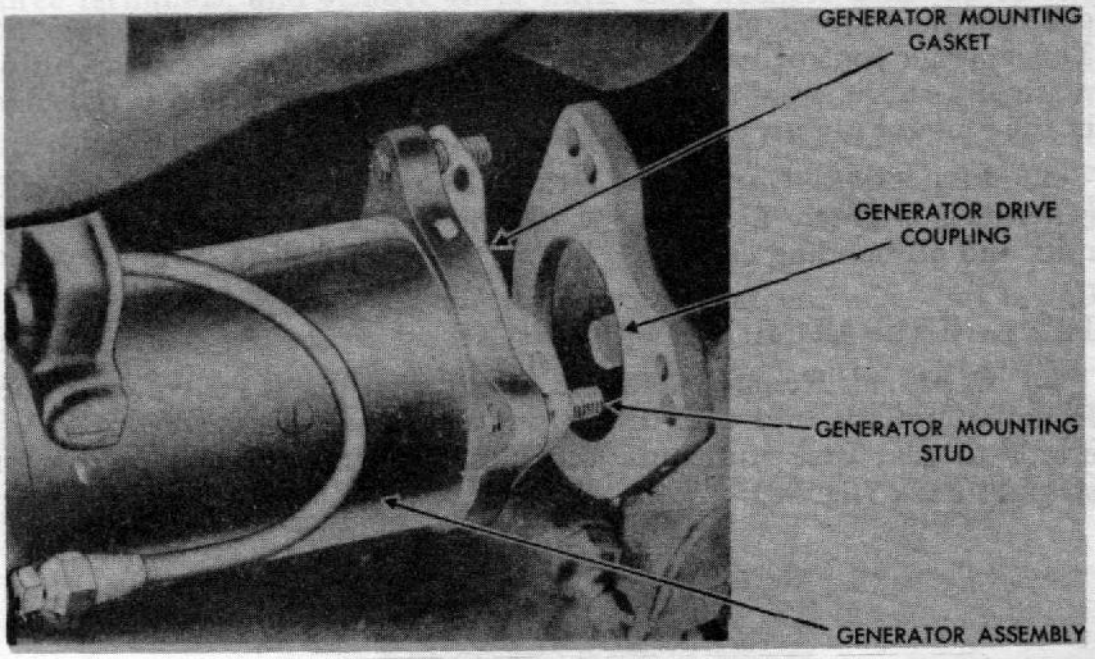


Figure 97—Generating System Wiring Circuit

101. GENERATING SYSTEM.

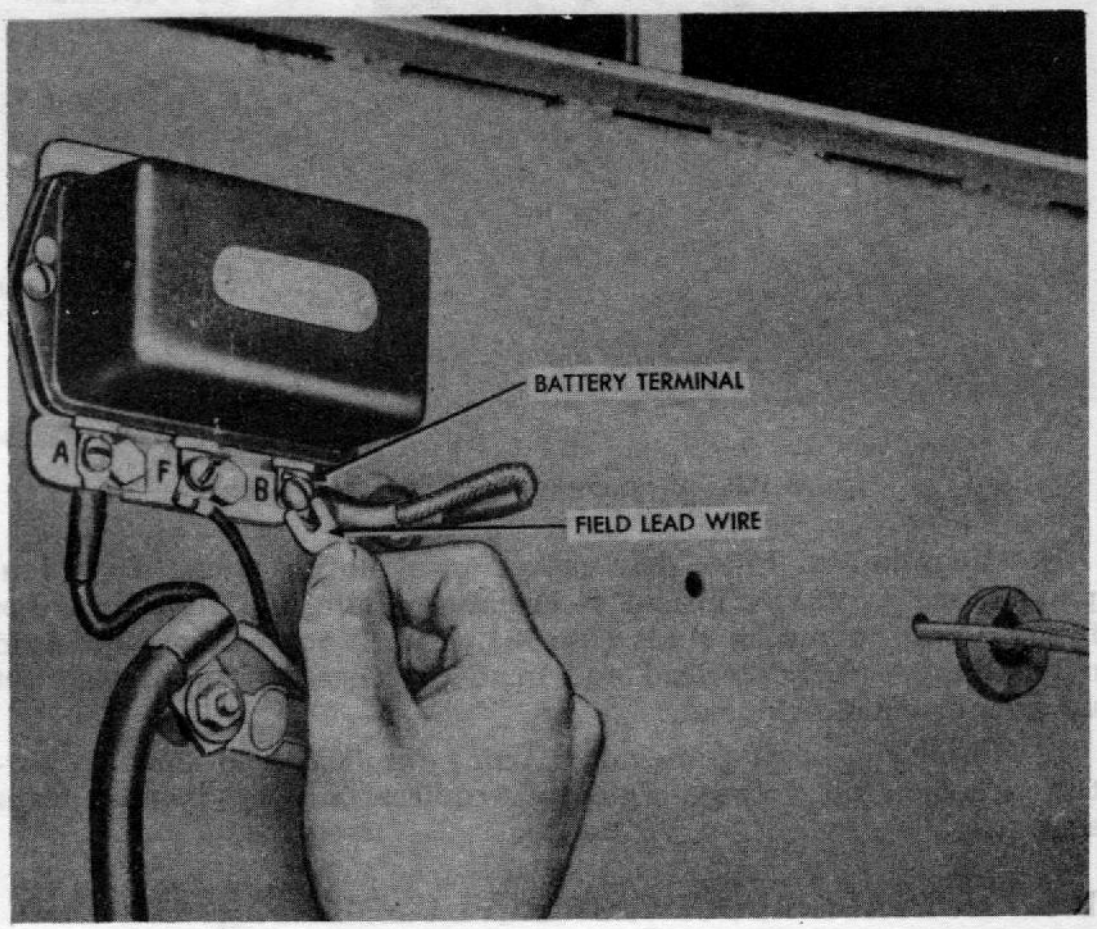
a. Description. The generator and control system as illustrated in figure 97 consists of the generator, regulator, ammeter, and battery. The generator is located on the right side of motor directly back of and driven by the timing gear train. It is a shunt wound, current and voltage-controlled, two-brush force ventilated unit. The regulator, mounted on right side of dash, consists of a circuit breaker which opens and closes the circuit between the generator and battery, a voltage control unit which controls the voltage built up within and the voltage output of the generator, and a current control unit which

STARTING AND GENERATING SYSTEM



RA PD 315252

Figure 98—Generator Removal



RA PD 315253

Figure 99—Polarizing Generator

controls the current output to the battery built up by the generator. The voltage control unit and the current control unit respond automatically to the condition of the battery, and their action is reflected in the amount of output by the generator.

b. Inspection. Inspect the terminal connections at regulator and generator. Tighten if necessary. Tighten generator mounting stud nuts and all bonding clips.

102. GENERATOR REPLACEMENT.

a. Removal. Remove field and armature leads at generator frame. Remove bonding and capacitor grounding screw. Remove three generator to gear case stud nuts and lock washers, and slide generator straight back (fig. 98).

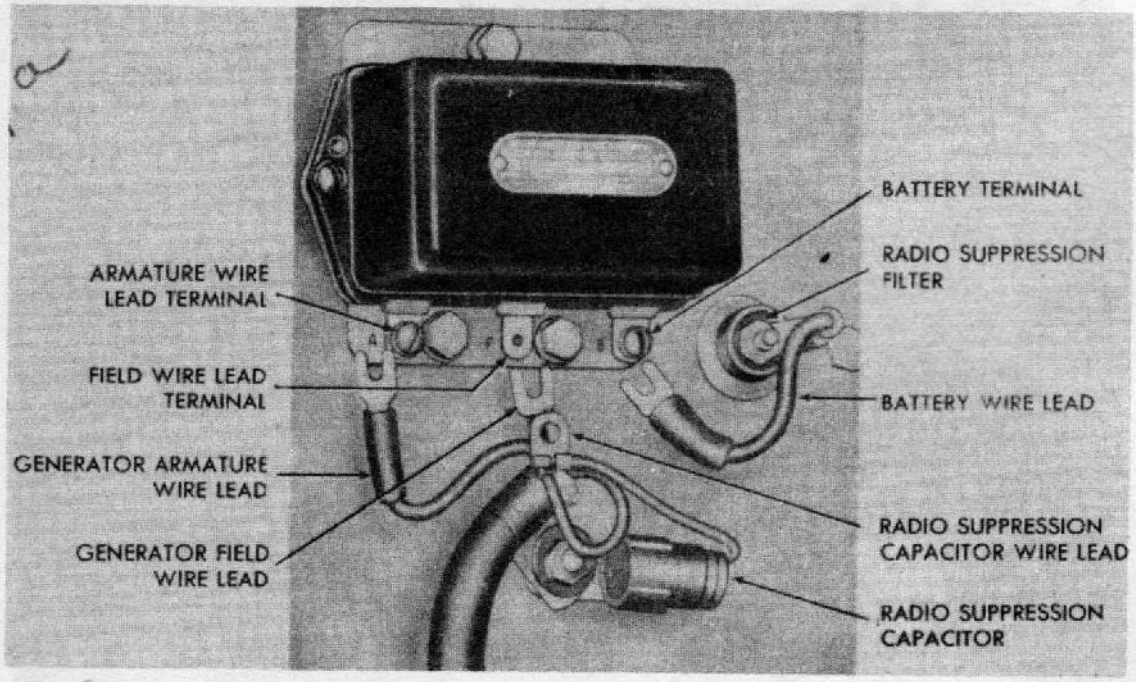


Figure 100—Removing Voltage Regulator

b. Installation. Place new gasket on mounting studs. Aline coupling blades with slot in end of armature shaft, and slide generator forward onto mounting studs (fig. 98). Install lock washers and stud nuts, connect capacitor lead and bond to generator frame. Connect up armature and field leads.

c. Polarization of Generator. Using the field lead short to battery terminal on voltage regulator requires only an instantaneous short (fig. 99).

103. VOLTAGE REGULATOR REPLACEMENT.

a. Removal. The voltage regulator will be found on the right side of the dash board under the hood (fig. 100). Disconnect wires from

three terminals, and remove three nuts, lock washers, and cap screws attaching voltage regulator to dash board. Number 10 size red lead wire leading from the radio suppression filter leads to the right-hand terminal marked "B". The No. 12 size black lead with red tracer and the black lead from capacitor connect onto the center terminal marked "F", and the No. 10 size red wire lead running through the armored cable to the generator connects onto the left-hand terminal marked "A" (fig. 100).

b. Installation. Set the voltage regulator in position, and install the three cap screws, nuts, and lock washers. Connect the lead wire from the radio suppression filter (No. 10 size red wire) to the right-hand terminal marked "B", Connect the No. 12 size black wire with the red tracer end, the black lead wire from the capacitor to the center terminal marked "F", and the No. 10 size red wire lead from the generator armored cable to the left-hand terminal marked "A" (fig. 100).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XX

BATTERY AND LIGHTING SYSTEM

BATTERY AND LIGHTING SYSTEM

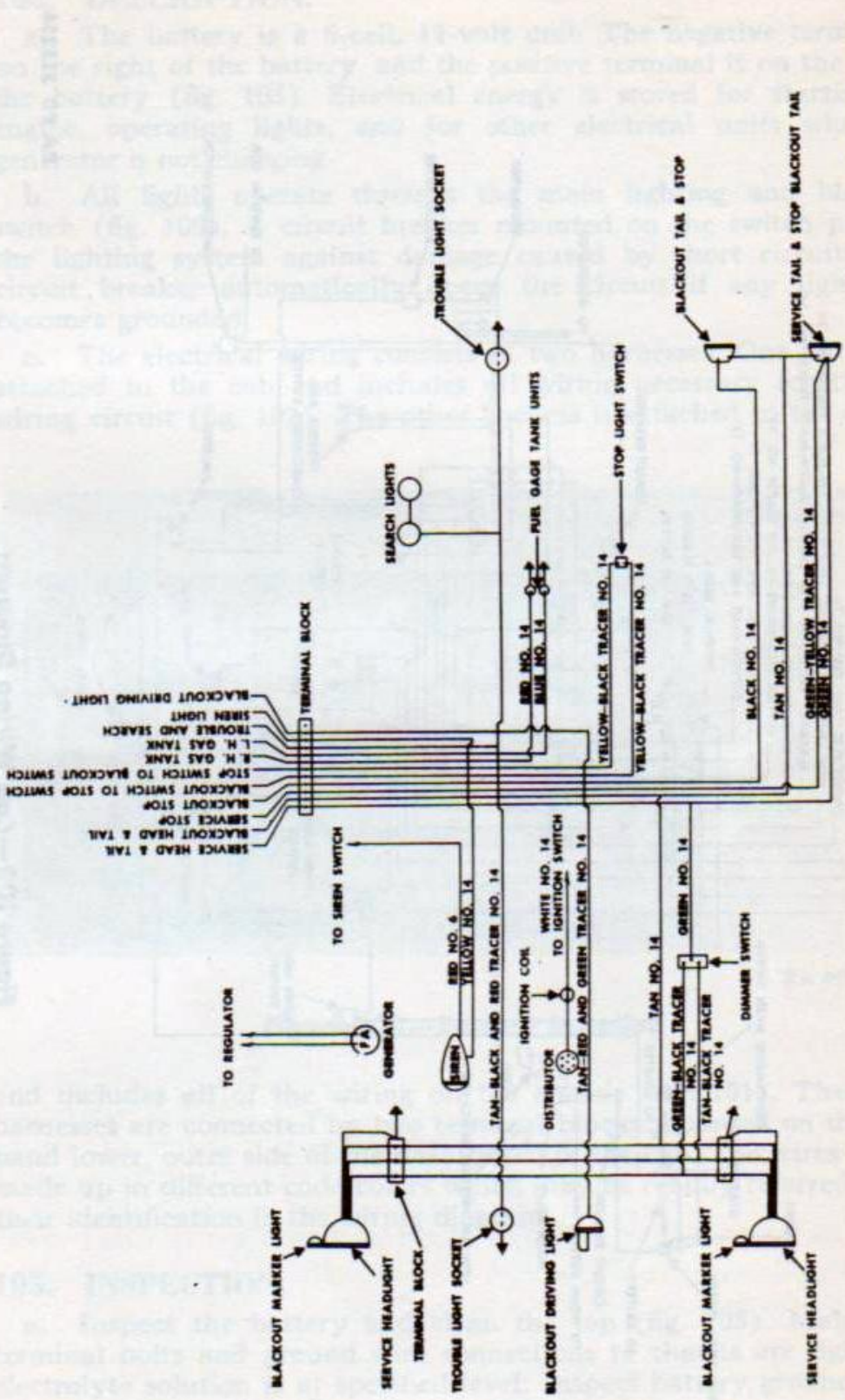


Figure 101—Chassis Wiring Diagram

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

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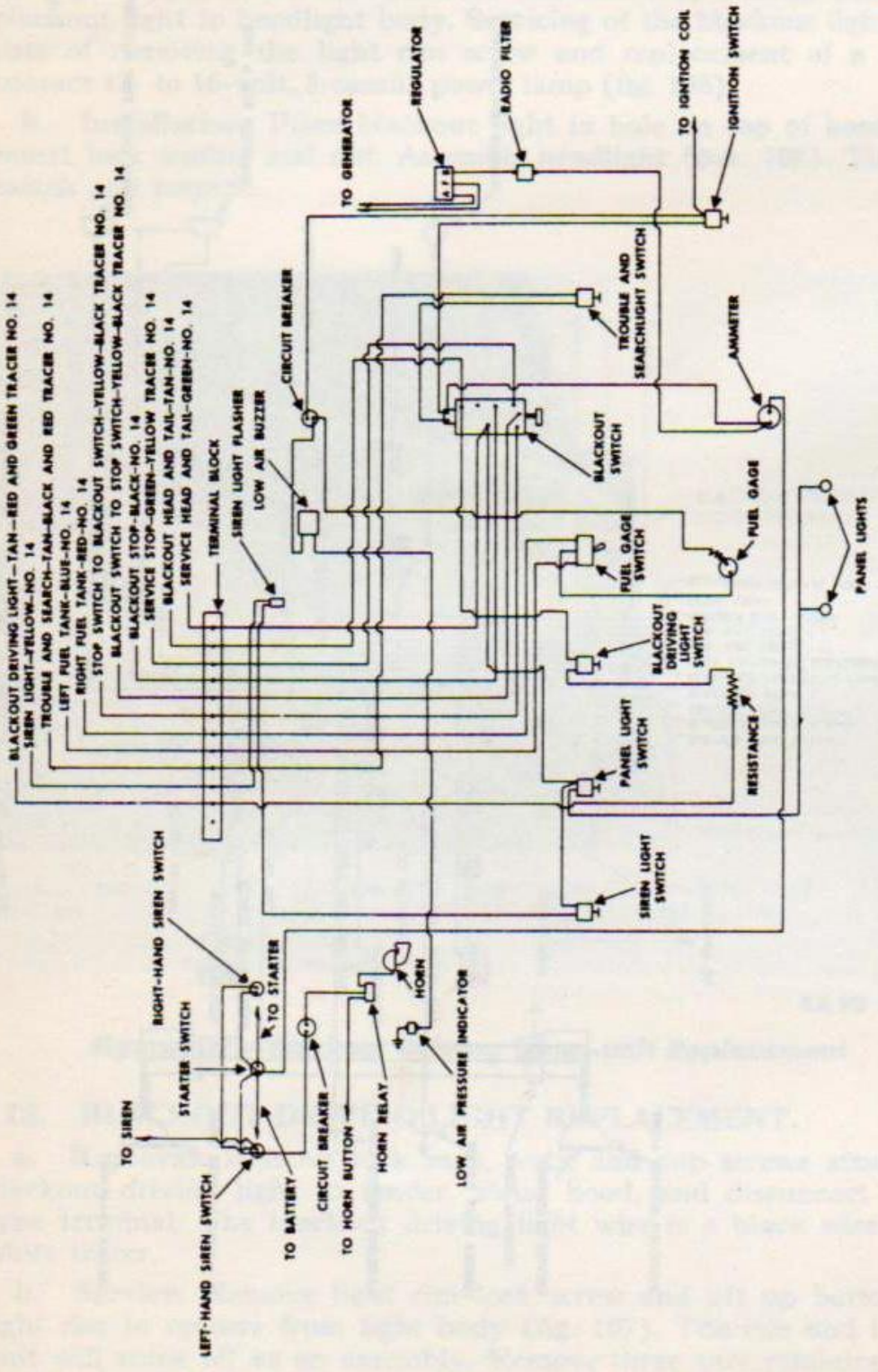


Figure 102—Cab Wiring Diagram

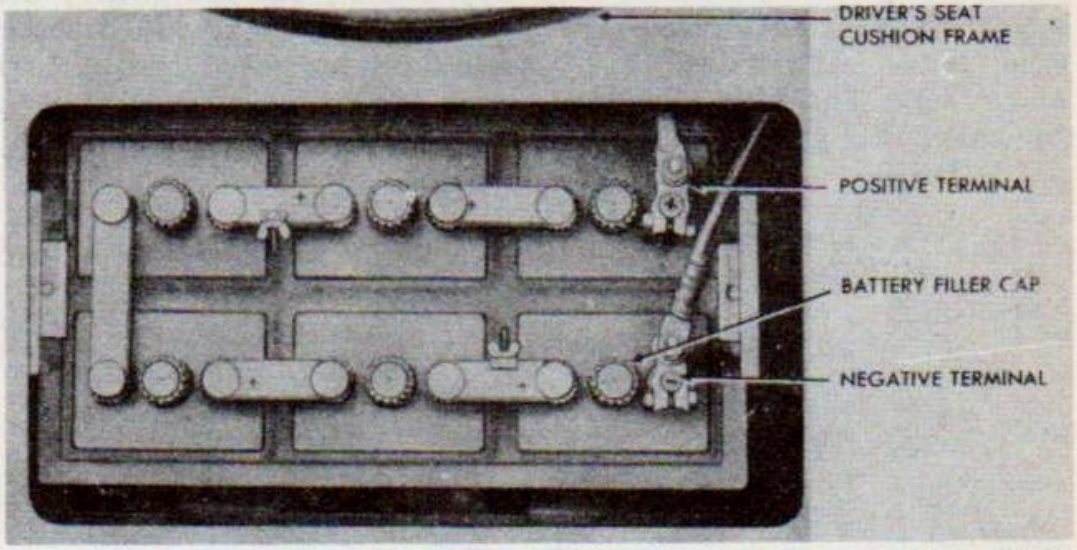
BATTERY AND LIGHTING SYSTEM

104. DESCRIPTION.

a. The battery is a 6-cell, 12-volt unit. The negative terminal is on the right of the battery, and the positive terminal is on the left of the battery (fig. 103). Electrical energy is stored for starting the engine, operating lights, and for other electrical units when the generator is not charging.

b. All lights operate through the main lighting and blackout switch (fig. 109). A circuit breaker mounted on the switch protects the lighting system against damage caused by short circuits. The circuit breaker automatically opens the circuit if any light wire becomes grounded.

c. The electrical wiring consists of two harnesses. One harness is attached to the cab and includes all wiring necessary for the cab wiring circuit (fig. 102). The other harness is attached to the chassis



RA PD 315257

Figure 103—Battery Installed

and includes all of the wiring on the chassis (fig. 101). These two harnesses are connected by two terminal blocks mounted on the left-hand lower, outer side of the dash board of the cab. The wires are all made up in different code colors which may be readily referred to for their identification in the wiring diagram.

105. INSPECTION.

a. Inspect the battery and clean the top (fig. 103). Make sure terminal bolts and ground wire connections to chassis are tight and electrolyte solution is at specified level. Inspect battery ground cable connection at the chassis end, and tighten if loose.

b. Inspect all lights for operation and for broken lens.

c. Inspect wire connections at all switches and junction blocks, and tighten if loose. Inspect wire connections at all electrical units, and tighten if loose.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

106. BATTERY SERVICE AND REPLACEMENT.

a. Removal. The battery will be found under the driver's seat (fig. 103). Remove two lock nuts, nuts, and cap screws attaching cushion frame to seat bracket and lift out. Remove nuts attaching battery cables to post terminals. Lift off cables, and lift battery out of seat riser. Two men should be used for this as the battery weighs considerably more than one man can safely handle.

b. Service. Clean the top of the battery thoroughly with water and brush, if necessary, and wipe dry with cloth. Distilled water should be added when necessary to bring the fluid level up to ½ inch above the top of the plates. Specific gravity reading must be taken before water is added, as water does not mix immediately and a true reading will not be obtained.

c. Temperature Effect on Battery. A fully charged battery will not freeze in temperatures encountered where vehicles will be operated, but a battery with 1.120 specific gravity will freeze at 14°F above zero. The following table shows the freezing temperature of the battery for various specific gravity readings.

BATTERY FREEZING TEMPERATURES

Specific Gravity	Freezing Temperature
1.100	18°F
1.120	14°F
1.140	8°F
1.160	2°F
1.180	— 6°F
1.200	—17°F
1.220	—31°F
1.260	—75°F
1.300	—95°F

d. Recharging. If the battery gravity tests below 1.200, it should be recharged. Remove the battery (subpar. a above). Wash the battery with clear water and a brush, and fill with distilled water until the solution is ½ inch above the plate. Wipe the battery dry with a cloth. Connect the battery terminals positive to positive and negative to negative to a 12-volt battery charger, and recharge the battery until the gravity reading is 1.275, and the voltage 12.5 volts. If the voltage fails to come up to 12.5 after the first hour of charging, replace the battery.

107. BATTERY CABLE REPLACEMENT.

a. Ground Cable.

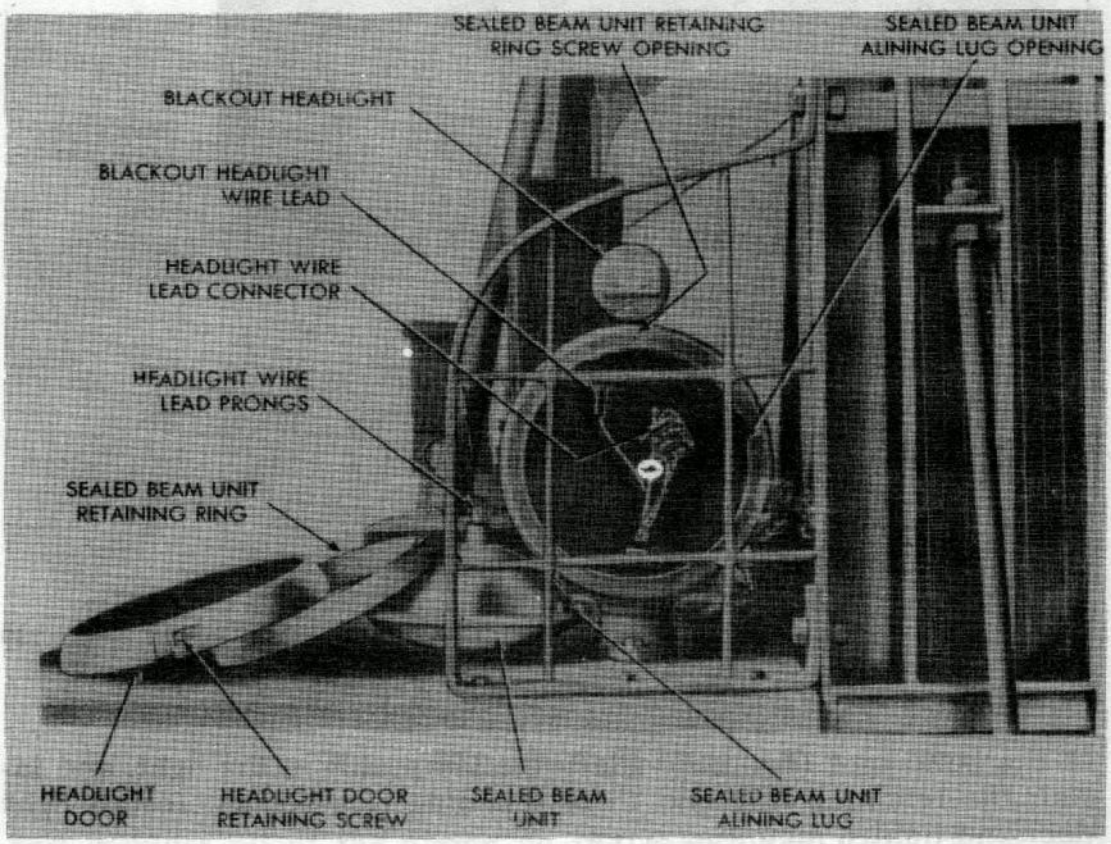
(1) REMOVAL. Disconnect cable at battery terminal and transmission cover. The cap screw and lock washer securing the grounded end on transmission end can be reached from underneath the vehicle on the left side of the transmission case.

(2) INSTALLATION. Place cable through opening in cab floor, and connect to top of transmission by cap screw. Connect other end of cable to positive terminal on battery (fig. 103).

b. Negative Cable.

(1) REMOVAL. Disconnect negative cable at battery terminal (fig. 103). Raising the left side of the hood, disconnect battery cable, wiring harness, and siren wires at starter switch. Battery cable can then be removed from chassis.

(2) INSTALLATION. Place cable through opening in cab floor, and connect one end to the left side of the starter switch with siren wires and wiring harness leads. Connect other end of wire to negative post on battery.



RA PD 315258

Figure 104—Sealed Beam Lamp-unit Replacement

108. HEADLIGHT REPLACEMENT.

a. Removal. Raise hood and disconnect headlight and blackout light wires. These are pull-type connections. Pull wires through fender, and remove light stud nut and lock washer.

b. Service. Remove headlight door. Remove three screws retaining sealed beam lamp-unit to light body, and pull sealed beam lamp-unit out of headlight assembly (fig. 104). Pull cable connector straight off sealed beam lamp-unit.

c. Installation. Hold the sealed beam lamp-unit with the word "TOP" on the lens up, and push the cable connector on the prongs

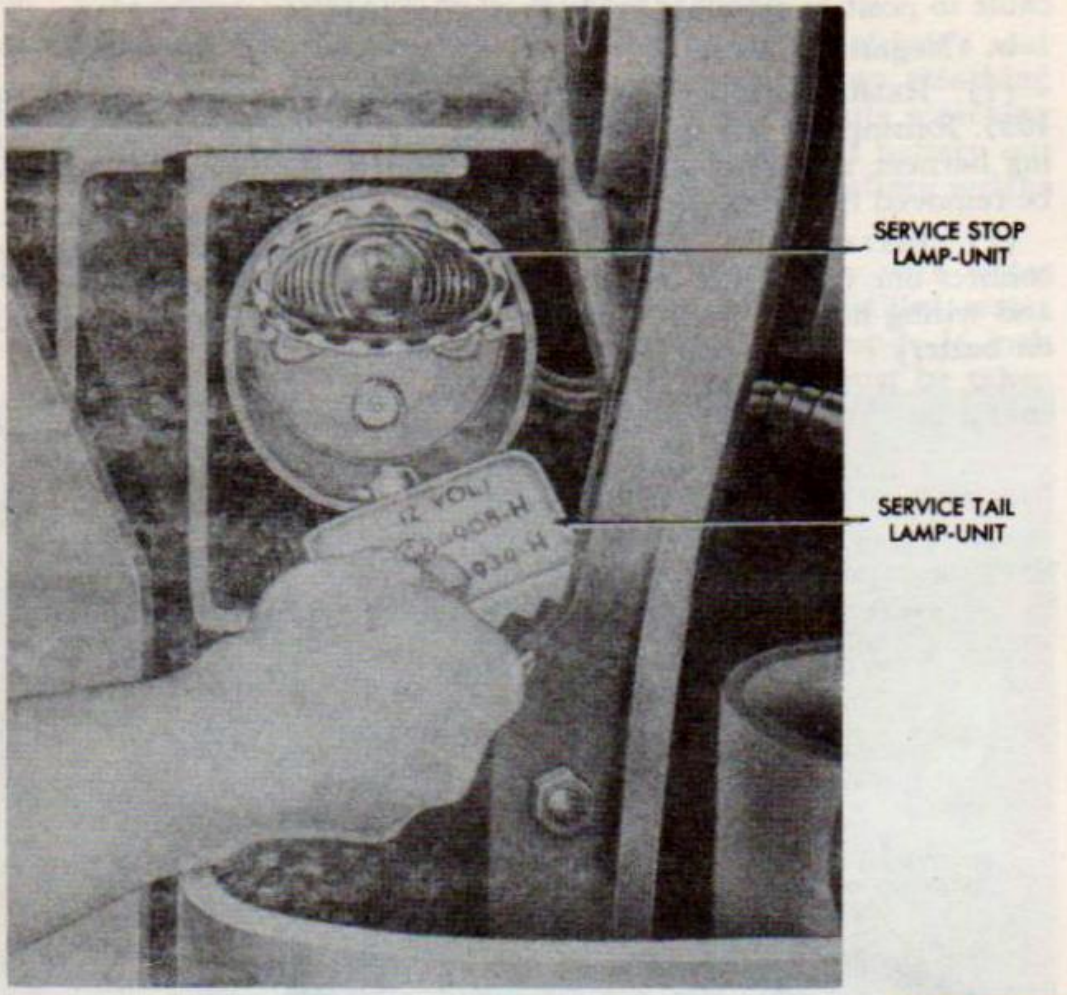


Figure 105—Tail Lamp-unit Replacement

of the lamp-unit (fig. 104). Place the lamp-unit in the light, and install the retaining ring and three retaining ring screws. Install light door and tighten mounting screw.

109. BLACKOUT TAIL AND SERVICE STOP AND TAILLIGHT.

a. Removal. The blackout tail and service stop light is located on the left side, rear of the truck (fig. 105). To remove the light assembly, turn the connection clockwise when looking from the back of the light, and pull directly out. The tan lead connects the blackout taillight, the green lead connects the taillight, and the green lead with the yellow tracer connects the service stop light. Remove the two nuts and lock washers securing the light assembly to the bracket, and lift light assembly off vehicle.

b. Service. It is not necessary to remove the light assembly for lamp-unit replacement. Remove two screws from the front face of the light, and lift off the cover. The lamp-units can be removed by pulling directly out.

c. Installation. Place light on mounting bracket, and install washers and nuts. Insert wire connector in rear of light body, and turn counterclockwise to lock. Place light control switch to "BLACK-OUT" position, and check blackout tail. Place switch to "SERVICE LIGHT" position, and check service tail and stop light.

110. BLACKOUT TAIL AND STOP LIGHT REPLACEMENT AND SERVICE.

a. Removal. The blackout tail and stop light is located on the right rear of the truck (fig. 106). To remove the light assembly, turn the connection clockwise when looking from the back of the light,

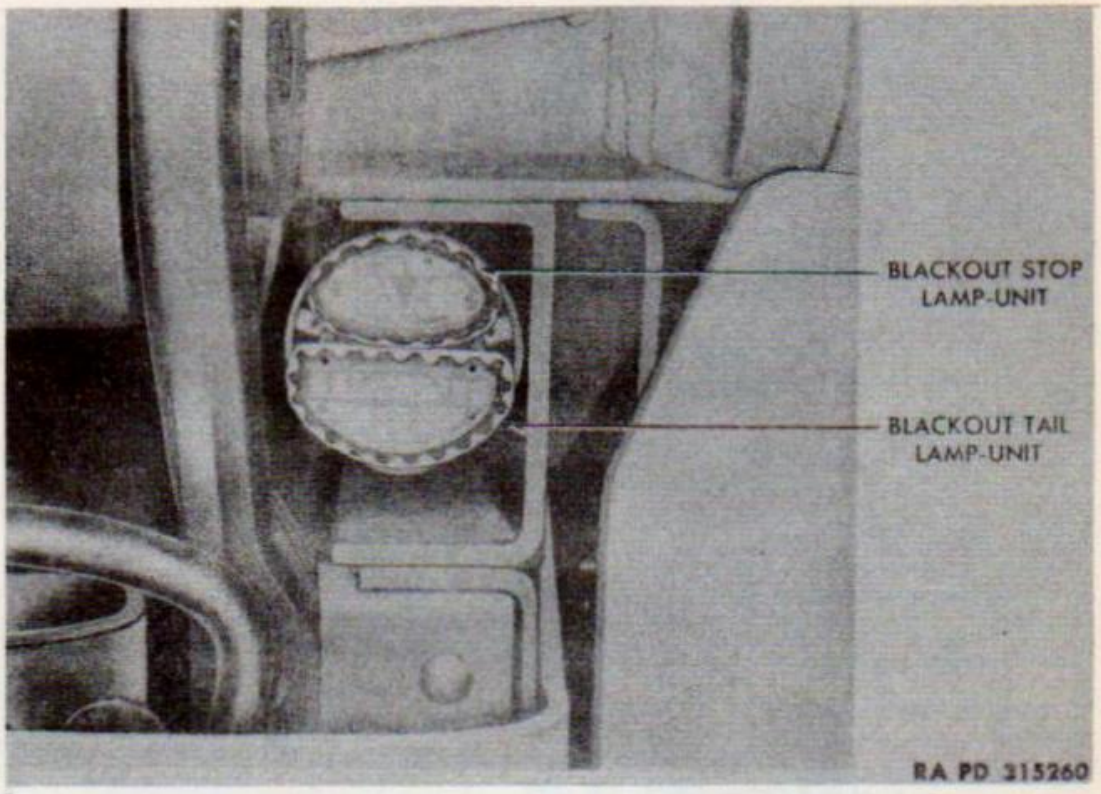


Figure 106—Servicing Blackout Tail and Stop Lights

and pull directly out. The tan lead connects the blackout taillight, and the black lead the blackout stop light. Remove the two nuts and lock washers securing the light assembly to the bracket, and lift light assembly off vehicle.

b. Service. It is not necessary to remove the light assembly for lamp-unit replacement Remove two screws from the front face of the light, and lift off the cover. The lamp-units can be removed by pulling directly out (fig. 106).

c. Installation. Place light on mounting bracket. Install lock washers and nuts. Insert wire connector in back of light body, and turn counterclockwise to lock. Place light control switch to "BLACK-OUT" position, and check blackout tail and stop lights.

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111. BLACKOUT LIGHT ASSEMBLY.

a. Removal. To replace the blackout light assembly, it is necessary to disassemble the headlight (par. 108 b). Disconnect blackout light pull-type connection. Remove nut and lock washer attaching blackout light to headlight body. Servicing of the blackout light consists of removing the light rim screw and replacement of a single contact 12- to 16-volt, 3-candle power lamp (fig. 106).

b. Installation. Place blackout light in hole on top of headlight. Insert lock washer and nut. Assemble headlight (par. 108). Turn on switch and inspect.

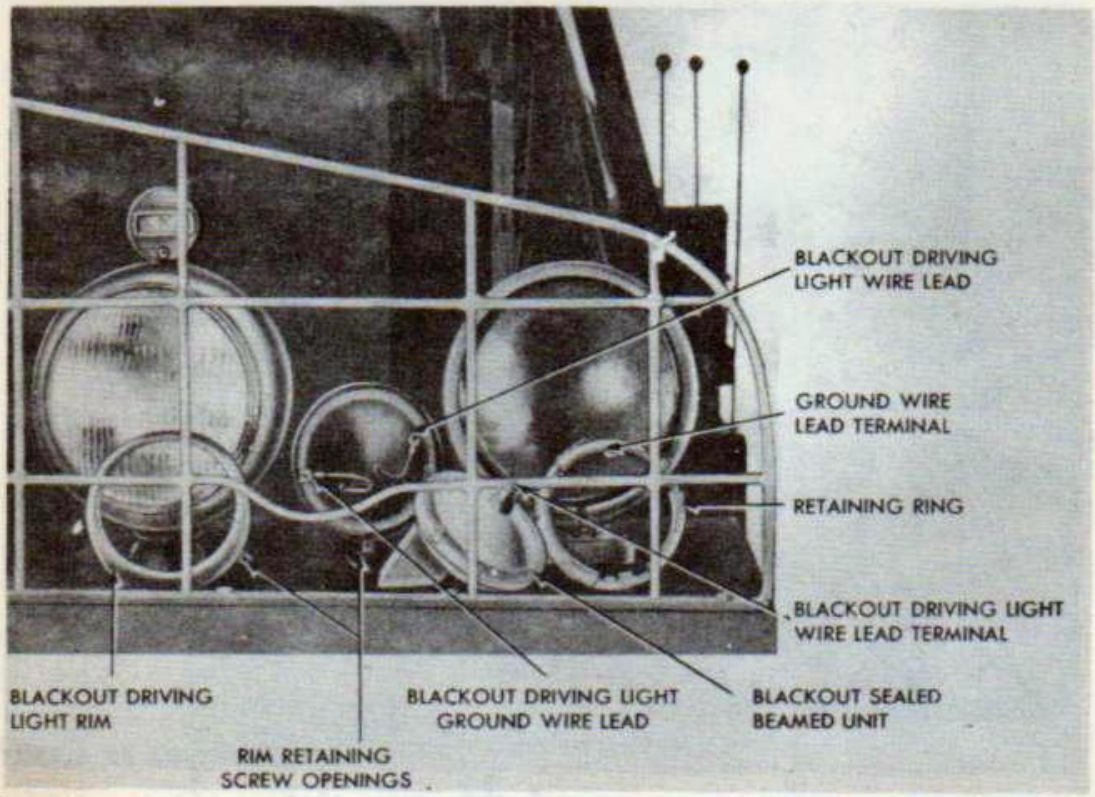

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Figure 107—Blackout Driving Lamp-unit Replacement

112. BLACKOUT DRIVING LIGHT REPLACEMENT.

a. Removal. Remove lock nuts, nuts, and cap screws attaching blackout driving light to fender. Raise hood, and disconnect pull-type terminal. The blackout driving light wire is a black wire with white tracer.

b. Service. Remove light rim lock screw and lift up bottom of light rim to remove from light body (fig. 107). The rim and lamp-unit will come off as an assembly. Remove three wire retaining ring clips. Disconnect wires from lamp-unit and retaining ring. This is a 6-volt sealed-beam lamp-unit to which the hood is permanently attached. To reassemble light, connect black wire with white tracer to

center terminal on lamp-unit and grounding wire to unit retaining ring. Set lamp-unit into light rim, install retaining ring, and press wire clips into position. Install assembly into light body, and install retaining ring screw. Hook up wire connection under hood.

c. Installation. Place light in position, and install two cap screws, lock washers, and nuts. Thread wires through opening in fender and connect at pull-type connection. Turn on switch and check operation.

113. SEARCHLIGHT REPLACEMENT.

a. Removal. Remove searchlight wire connection from back of light. Press and turn counterclockwise to remove. Remove nut, tension spring, and cup holding searchlight yoke to searchlight bracket. Lift searchlight from vehicle.

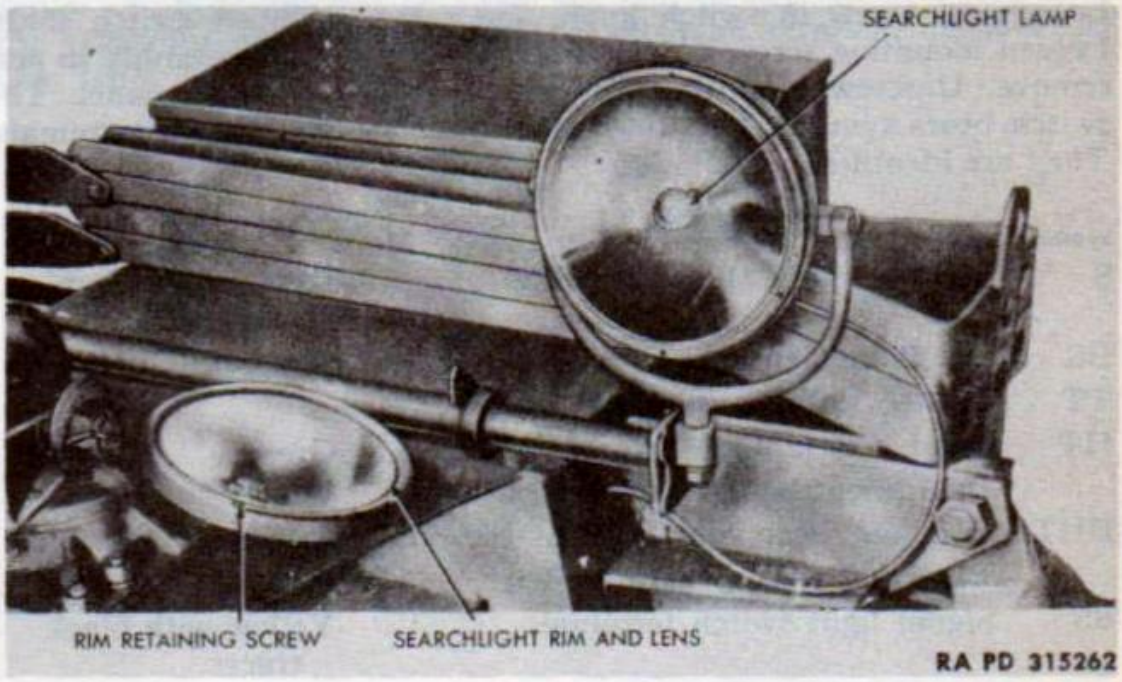

Figure 108—Searchlight Lamp Replacement

b. Installation. Set yoke in socket, and install tension spring. tension spring cup, and nut. Install wire connector in back of searchlight. Push in and turn clockwise to lock.

c. Service.

(1) Remove light rim retaining screw at bottom of light. Pull bottom of rim out, and lift rim and lens assembly from light. Remove lamp by turning counterclockwise and pulling out of socket (fig. 108).

(2) Install lamp by pressing into socket and turning clockwise. Place headlight rim and lens on lug, and press bottom of rim into place. Install rim retaining screw.

114. SEARCHLIGHT SWITCH REPLACEMENT.

a. Removal. Remove set screw from switch knob, and turn knob counterclockwise. Remove switch clamping nut and lock washer from

front face of instrument panel, and slide switch from rear of panel. Disconnect tan wire lead with red and black tracer from left-hand terminal, and plain tan wire from right-hand terminal when looking from the back of the switch.

b. Installation. Connect wiring leads (subpar. **a** above). Put switch in position, and install nut and lock washer. Install knob by turning clockwise, and tighten set screw.

115. MAIN LIGHTING AND BLACKOUT SWITCH ASSEMBLY REPLACEMENT.

a. Removal. Remove switch from instrument panel. Disconnect cable from battery to avoid damage from short circuit (fig. 103). Loosen set screw in switch knob, and screw knob off switch shaft. Loosen mounting screw in lock assembly. Push lock assembly in and remove. Unscrew mounting nut which holds switch to panel. The switch bears symbols (fig. 109) which indicate the various terminals. They are identified as follows:

Symbols	Wire Leading to Terminal	Color of Wire
S	Service signal light terminal	Green with double yellow tracer
BS	Blackout signal light terminal	Black
TT	Trailer taillight terminal	
HT	Head and taillight terminal	Green
	Instrument light switch feed wire	White
BHT	Blackout head and taillight terminal	Brown
	Blackout driving light switch	Red
SS	Signal light switch terminal	Yellow with black tracer
SW	Signal light switch feed terminal	Yellow with black tracer
A	Auxiliary feed terminal	
	(To searchlight switch)	White
B	Battery terminal—switch feed cable	
	(To ammeter)	Green
	(To ignition switch)	Black with green tracer

Disconnect all wires from switch. Identify or tag wires as they are removed, to ensure replacing on proper terminals (fig. 109).

b. Installation. Connect all wires on switch (fig. 109). Install switch in instrument panel. Insert switch shaft through instrument panel, and install toothed lock washer and mounting nut that holds switch in place. Press lock assembly in, and install it over switch shaft with the lock button to the left. Hold lock assembly against instrument panel, and tighten mounting screw. Screw knob onto switch shaft and tighten set screw. Connect battery cable to battery.

116. FUEL GAGE SWITCH REPLACEMENT.

a. Removal. Disconnect red lead at center terminal of switch, blue lead from left-hand terminal, and second red lead from right-hand terminal, as viewed from back of instrument panel. Remove screws, nuts, and lock washers attaching switch to instrument panel. Remove switch through rear of panel.

b. Installation. Set switch in position and indicator plate on front face of instrument panel. Install lock washers, screws, and nuts. Connect wiring leads as indicated (subpar. a above).

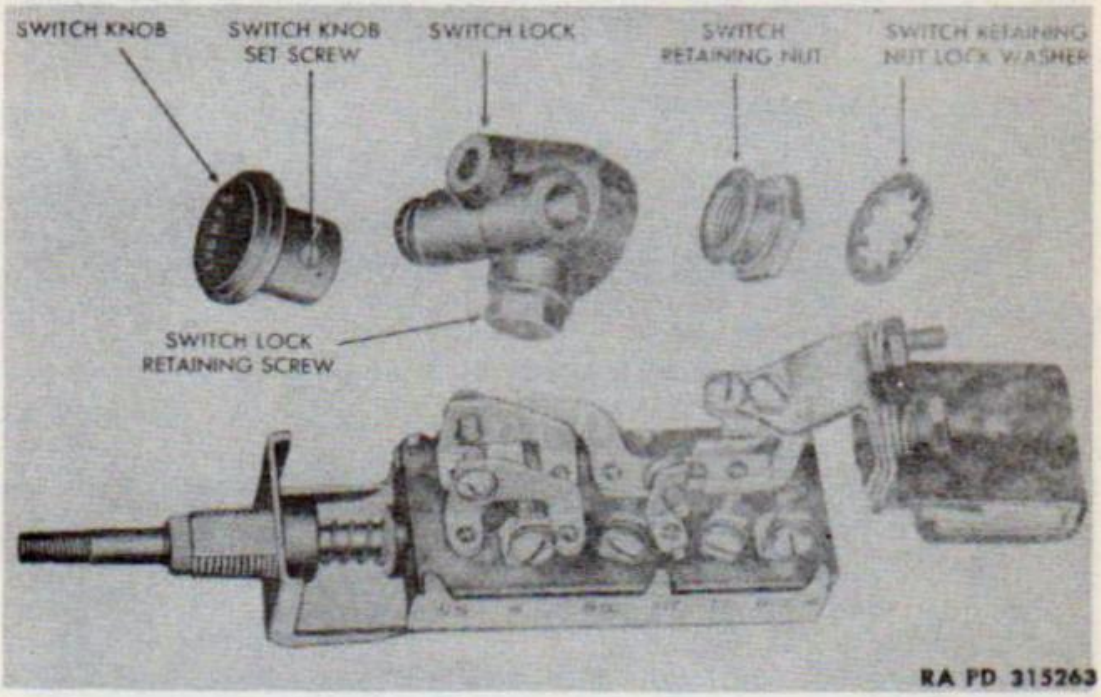

Figure 109—Blackout Switch

117. PANEL LAMP SOCKET REPLACEMENT.

a. Removal. Remove lamp (par. 118). Slide the socket up the wire, and pull small tip from end of wire. Slide the fiber insulator, spring, and socket off the wire.

b. Installation. Slide the socket, spring, and fiber insulator over the wire. Round up the wire tip so that the wire will enter the tip. Place tip on end of wire, and pinch tip to wire. Solder the tip to the wire. Install lamp (par 118).

118. PANEL LAMP REPLACEMENT.

a. Removal. Pull the assembly sharply to one side to release its mounting prongs from the instrument panel. Pull the socket from the light body. Then turn the lamp counterclockwise and pull it from its socket.

b. Installation. Push the lamp into the socket, and turn it clockwise. Push the socket into the light body. Then push the light assembly into the instrument panel with the slot straight down.

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119. PANEL LIGHT SWITCH.

a. Removal. Disconnect two wires from back of switch. Loosen set screw in switch knob, and turn knob counterclockwise to remove. Remove switch body nut. Remove switch from under side of instrument panel.

b. Installation. Insert switch from back side of instrument panel through opening. Install switch body nut. Turn switch knob on shaft clockwise. Tighten knob retaining set screw. Connect white and red wire to right terminal on switch. Connect yellow wire to left terminal.

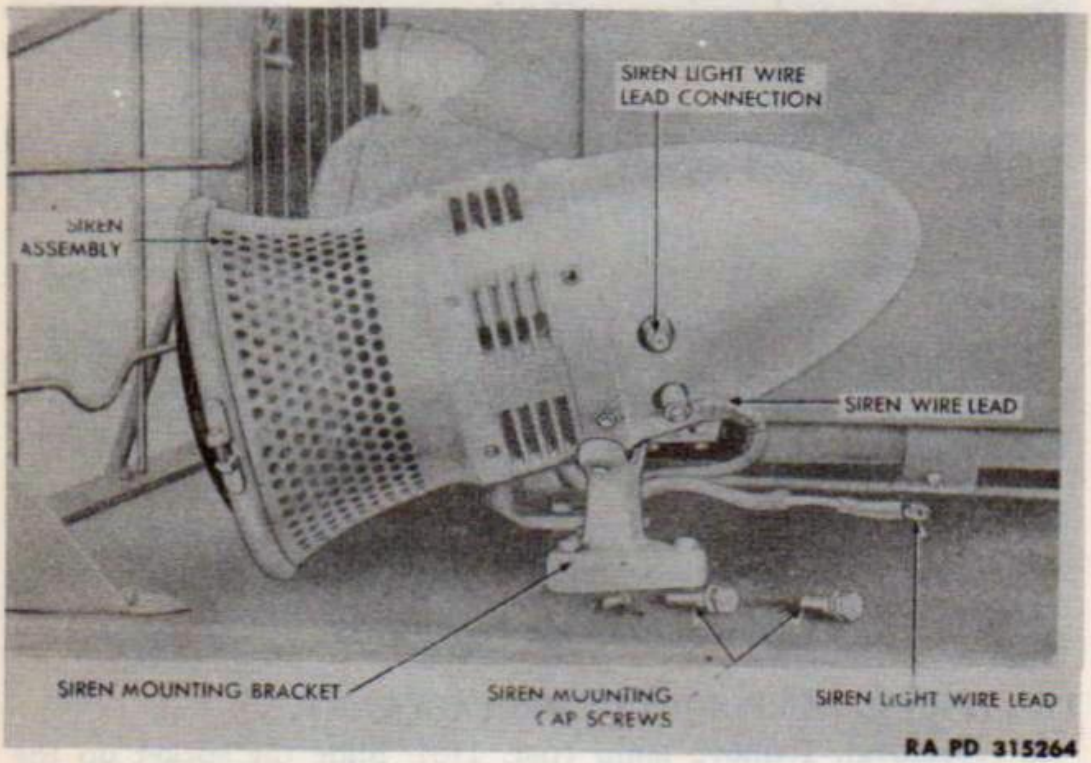

Figure 110—Removing Siren

120. SIREN LIGHT SWITCH REPLACEMENT.

a. Removal. Disconnect two wires from back of switch. Loosen set screw from instrument knob button and turn counterclockwise to remove. Remove nut from switch body. Remove switch from under side of instrument panel.

b. Installation. Insert switch from back side of instrument panel through opening. Install switch body nut. Install switch knob turning clockwise. Tighten knob retaining set screw. Connect yellow wire to right terminal on switch. Connect red wire to left terminal on switch.

121. BLACKOUT DRIVING LIGHT SWITCH.

a. Removal. Disconnect two wires from back of switch. Loosen set screw from instrument knob and turn counterclockwise to remove.

Remove nut from switch body. Remove switch from under side of instrument panel.

b. Installation. Insert switch from back side of instrument panel through opening. Install switch body nut, put switch knob on shaft turning clockwise. Tighten knob retaining set screw. Connect silver wire to right terminal and red wire to left terminal.

122. SIREN REPLACEMENT.

a. Removal. Remove two cap screws and lock washers attaching siren to siren bracket. Rotate siren, remove light and siren connec-

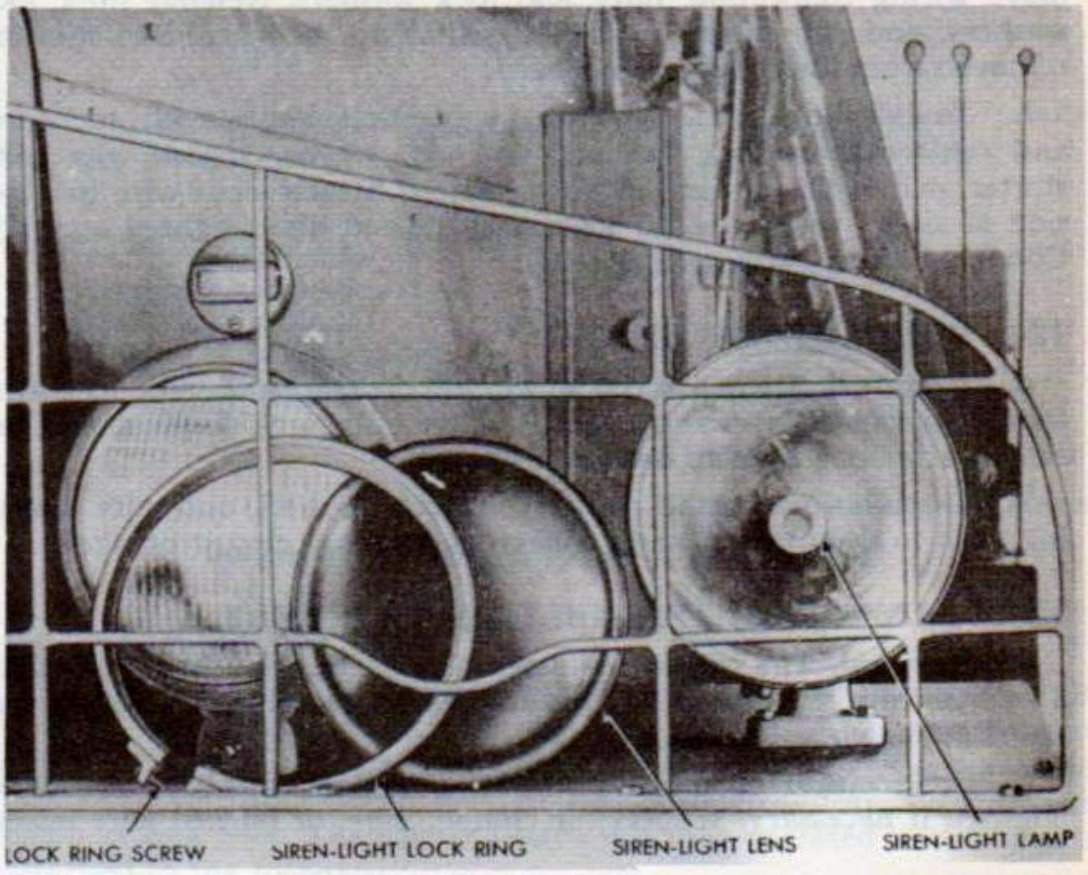

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Figure 111—Siren Light Lamp Replacement

tions. The light connection is directly on the bottom of the siren and is a yellow wire lead. The siren connection, which is the right-hand connection when looking from the rear of the siren, is connected by an armored cable to the siren switch (fig. 110).

b. Installation. Connect siren light wire lead and siren wire. Set siren in position on bracket, and install two cap screws.

c. Service. Remove lock ring screw. Lift lock ring off, at the same time holding the glass against the siren to prevent its falling off and breaking. Lift off glass. To replace lamp, turn counterclockwise and pull out (fig. 111). This is a single-contact, 50-candlepower,

12- to 16-volt lamp. The siren is equipped with a flasher switch which causes the siren light to burn intermittently. In the event that the siren light burns continuously, the siren light switch will be found on the dash board in the driving compartment. To remove, disconnect wire leads, and remove two stove bolts attaching switch to dash board.

123. SIREN SWITCH REPLACEMENT.

a. Removal. Two siren switches are provided, one at each side of the toeboard (fig. 7). Disconnect battery terminal (fig. 103). Remove wiring connection, nuts, and lock washers. Remove nuts, lock washers, and cap screws attaching switch to toeboard. Switches are removed from lower side of toeboard.

b. Installation. Place switch in position underneath toeboard, and replace nuts, lock washers, and cap screws. Install wire from starter switch to one side of siren switch. Attach siren wire to other side of siren switch. Install lock washers and nuts; tighten securely. Connect battery terminal (fig. 103).

124. HORN REPLACEMENT.

a. Removal. Loosen screw at circuit breaker, and slide lead wire terminal from under screw head. Remove nuts, lock washers, and cap screws attaching horn to dash board.

b. Installation. Install cap screws, lock washers, and nuts attaching horn to dash board, and connect lead wire at circuit breaker.

125. CAB WIRING ASSEMBLY REPLACEMENT.

a. General. The cab wiring assembly can be considered to include all wires from the junction block and starter switch to the instrument panel as shown in fig. 102.

b. Inspection. Inspect all wiring connections for tightness. Tighten if necessary. Inspect for chafed, bare, or burned wire insulation.

c. Removal.

(1) Disconnect battery terminals (fig. 103). Disconnect all wires at the upper side of the junction block except the wire lead on the extreme left terminal which is the horn wire lead. Disconnect No. 8 red main feed wire lead at the left side of starter switch. Loosen feed wire clip on inside of dash board, and pull harness and feed wire through dash board.

(2) Disconnect siren flasher switch and circuit breaker wire leads on the inside of the dash board. Disconnect siren light switch, fuel gage switch, fuel gage, resistor, ammeter, and ignition switch wire leads.

(3) Disconnect following wire leads on blackout switch marked S, BS, HT, BHT, and SS (fig. 109). Cab wiring harness can then be lifted from vehicle.

d. Installation.

(1) Insert end of wiring harness through hole in dash directly above junction block. Insert end of each 11 wire leads in upper half of the block so that the color of each wire matches the color of the wire on the lower side of the junction block.

(2) Run red No. 8 wire lead through hole in dash above starter switch. Tighten wire clip, and connect to starter switch. Connect two yellow wire leads to siren flasher switch, and two white with double black tracer to circuit breaker.

(3) Connect yellow wire on siren light switch. Connect tan wire with red and green tracer to driving light resistance. Connect blue wire lead to left terminal on fuel gage switch, and red wire lead to right terminal on fuel gage switch. Connect white wire with double black tracer to resistance on fuel gage. Connect No. 8 size red wire lead to positive on right side of ammeter. Connect white wire with double black tracer to ignition switch terminal.

(4) Connect the following wire leads to the indicated terminals on the blackout switch (fig. 109):

Wire Leads	Terminals
Green with yellow tracer	S
Black	BS
Green	HT
Tan	BHT
Yellow with black tracer	SS

(5) Connect battery terminals.

126. CHASSIS WIRING HARNESS REPLACEMENT.

a. Removal.

(1) Disconnect battery terminals. Disconnect 11 wire leads from lower terminals on junction block. This is all the leads except the one on the extreme left of the vehicle which is the horn wire lead (fig. 101).

(2) Loosen the 12 wiring clips securing wiring harness to dash, left frame channel, and crane frame.

(3) Disconnect the wire leads as indicated in the table following:

Connecting Unit	Wire Color	Location
Front trouble light socket	Tan—black and red tracer	Right bumper gusset
Blackout driving light	Tan—red and green tracer	Left fender
Siren light	Yellow	Left fender
Headlight—low beam	Green—black tracer	Right and left fenders
Headlight—high beam	Tan—black tracer	Right and left fenders
Blackout headlight	Tan	Right and left headlights

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Connecting Unit	Wire Color	Location
Dimmer switch center	Green	Left side toeboard
Dimmer switch right	Green—black tracer	Left side toeboard
Dimmer switch left	Tan—black tracer	Left side toeboard
Stop light switch	Yellow—black tracer	Left frame rail
Fuel gage tank unit	Red	Left fuel tank
Fuel gage tank unit	Blue	Right fuel tank
Searchlight	Tan—red and black tracer	Top of crane frame
Rear trouble light socket	Tan—red and black tracer	Rear frame cross member
Blackout stop light	Black	Right side rail
Blackout taillight	Tan	Right side rail
Service taillight	Green	Left side rail
Service stop light	Green—yellow tracer	Left side rail

(4) Wiring harness is now completely disconnected and can be pulled from vehicle.

b. Installation. Place wiring harness under wire clips along left frame side rail and tighten clip screws. Connect 11 wire leads into lower side of terminal block so that the color of each wire matches the color of the wire on the upper side of the junction block. Connect the wire leads as indicated in the table in subparagraph **a** (3) above (fig. 101). Connect battery terminals (fig. 103).

127. SIREN HARNESS REPLACEMENT.

a. Removal. Disconnect battery terminals (fig. 103). Disconnect siren wire from left side of starter switch and two siren switch terminals. Loosen wiring clips, and slide cable from under clips. Disconnect siren lead wire at siren (fig. 110).

b. Installation. Place wiring harness under clips on dash and tighten clip screws. Connect ends of harness to right and left siren switches on toeboard, and connect lead wire to left side of starting switch. Connect battery terminals (fig. 103).

128. HORN CIRCUIT BREAKER WIRING REPLACEMENT.

a. Removal. Disconnect circuit breaker lead wire at left siren switch, and disconnect lead at circuit breaker. Disconnect lead wire from opposite side of circuit breaker, and disconnect lead at horn relay.

b. Installation. Connect lead wire at relay and circuit breaker. Connect lead wire at circuit breaker and left side siren switch terminals.

129. LOW-PRESSURE INDICATOR WIRE REPLACEMENT.

a. Removal. Disconnect wire from low-pressure indicator located on the left side of dash. Disconnect wire lead at buzzer on the right side of dash. To disconnect, remove buzzer cover. Remove screw attaching lead wire to buzzer.

b. Installation. Attach lead wire to buzzer, and install buzzer cover. Connect lead wire to top terminal of low-pressure indicator on left side of dash.

130. BUZZER TO CIRCUIT BREAKER WIRE REPLACEMENT.

a. Removal. Remove buzzer cover by removing two terminal screws securing cover to buzzer, and disconnect wire lead. The buzzer is located on the right side of the dash. Disconnect wire lead at lower terminal of circuit breaker.

b. Installation. Connect wire lead to lower terminal on circuit breaker. Connect wire lead to terminal on buzzer and install cover.

131. DRIVING LIGHT SWITCH TO BLACKOUT SWITCH WIRE REPLACEMENT.

a. Removal. Disconnect wire lead at blackout driving light switch, and remove wire lead from terminal marked BHT on blackout switch (fig. 109).

b. Installation. Connect wire lead to terminal marked BHT on blackout light switch, and connect wire lead to blackout driving light switch.

132. BLACKOUT DRIVING LIGHT SWITCH TO RESISTANCE WIRE REPLACEMENT.

a. Removal. Disconnect wire lead at blackout driving light switch and resistance.

b. Installation. Connect wire lead to resistance, and connect to blackout driving light switch on instrument panel.

133. PANEL LIGHT SWITCH TO BLACKOUT SWITCH WIRE REPLACEMENT.

a. Removal. Disconnect panel light switch wire lead. Disconnect panel light feeder wire at blackout switch terminal marked HT (fig. 109).

b. Installation. Connect panel light feeder wire to blackout switch terminal marked HT, and connect other end to panel light switch.

134. FUEL GAGE TO FUEL GAGE SWITCH WIRE REPLACEMENT.

a. Removal. Disconnect center terminal at fuel gage switch, and disconnect terminal at fuel gage.

b. Installation. Connect one end to center terminal on fuel gage switch and other end to the fuel gage.

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135. BLACKOUT SWITCH TO IGNITION SWITCH WIRE REPLACEMENT.

a. Removal. Disconnect battery (fig. 103). Disconnect wire from blackout switch to terminal marked B (fig. 109). Disconnect wire from upper terminal on ignition switch.

b. Installation. Connect one end to terminal post on blackout switch marked B. Connect other end to upper terminal on ignition switch.

136. IGNITION SWITCH TO IGNITION COIL WIRE REPLACEMENT.

a. Removal. Disconnect wire lead from lower terminal on ignition switch, and disconnect wire from forward terminal on ignition coil.

b. Installation. Connect one end of wire to lower terminal on ignition switch and other end to forward terminal on ignition coil.

137. BLACKOUT SWITCH TO TROUBLE AND SERVICE LIGHT SWITCH WIRE REPLACEMENT.

a. Removal. Disconnect wire from post on blackout switch marked A (fig. 109). Disconnect wire from trouble and service light switch.

b. Installation. Connect one end of wire to blackout switch post marked A. Connect other end to trouble service light switch.

138. BLACKOUT SWITCH TO AMMETER WIRE REPLACEMENT.

a. Removal. Disconnect battery (fig. 103). Remove green lead wire from positive terminal on ammeter, and disconnect lead wire at terminal B on blackout switch (fig. 109).

b. Installation. Connect lead wire at blackout switch terminal B, and connect lead wire to positive side of ammeter. Connect battery terminals.

139. AMMETER TO RADIO SUPPRESSION FILTER WIRE REPLACEMENT.

a. Removal. Disconnect battery terminal. Disconnect green lead at positive side of ammeter, and disconnect lead wire at radio suppression filter.

b. Installation. Connect radio suppression lead wire to ammeter positive terminal, and connect lead wire to filter. Connect battery terminals (fig. 103).

Section XXI

TRANSMISSION

140. DESCRIPTION.

a. The transmission is in combination with the axle, a series of axle ratios that provide the truck with the various ability factors required to meet varying conditions of operation.

b. The transmission is a unit-power gear box having five speeds forward and one reverse. The transmission is direct on fourth with an overdrive in fifth speed. The gears are shifted manually by a conventional gearshift lever, and a diagram of the gearshift lever positions is shown in figure 13.

141. INSPECTION.

a. Inspect the transmission mounting cap screws that secure the transmission to the engine flywheel housing. Tighten if necessary.

b. Inspect the transmission for lubricant leakage and damage.

142. REMOVAL.

a. Toeboard Removal. Before starting removal, place transmission in third speed (fig. 13), engage the front axle, place transfer case in low range (fig. 15), and apply emergency brake. Disconnect battery cables (fig. 103), then remove starter switch (par. 100). Remove fire extinguisher from bracket. Remove 16 screws and lock washers from toeboard. Remove cotter pin and clevis yoke pin from accelerator pedal yoke rod. Lift out toeboard.

b. Floor Board Removal. Engage power take-off and front winch jaw clutch levers, release emergency brake, and disengage front axle (fig. 15). Place transfer case in neutral and transmission shift lever in either first or second speed (fig. 13). Remove eight screws from floor board. Lift out floor board.

c. Preparation for Removal. Disconnect throttle spring and brake pedal return spring. Remove remote control throttle cable bracket from transmission shift cover. Tie bracket and cables back to steering column. Remove front axle propeller shaft (par. 150). Remove transmission to transfer case propeller shaft (par. 151). Remove cotter pins and clevis pins from clutch control rod and clutch air cylinder (fig. 74). Remove clutch air cylinder and clutch alinement rod from side of transmission and move to left side. Drain transmission lubricant.

d. Removal Procedure. Place roller-type jack under transmission case, and raise high enough to support the transmission assembly

in its normally installed position. Disconnect front axle declutch lever, transfer case shift lever, and emergency brake lever pull rods (fig. 112). Remove 12 clutch housing cap screws and lock washers. Slide transmission back until clutch shaft and drive gear is clear of clutch assembly. Rotate transmission assembly on jack clockwise when viewed from the top, and at the same time, lower to the ground.

143. INSTALLATION.

a. Installation Procedure. Raise transmission, and rotate counterclockwise at the same time. Enter clutch gear into clutch plate and

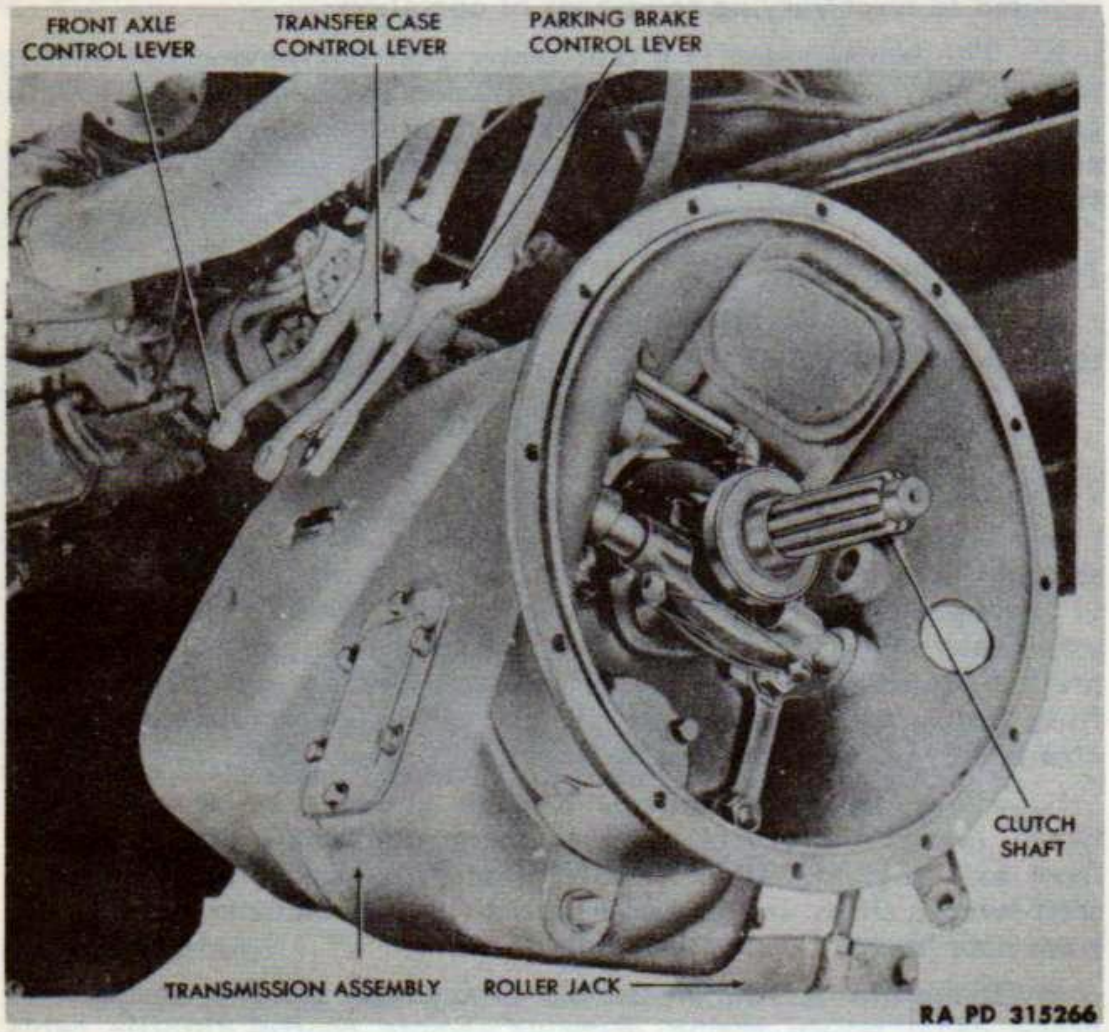

Figure 112—Transmission Removal from Vehicle

pilot bearing (fig. 112). Install clutch housing cap screws and lock washers. Connect transfer case shift lever, front axle declutch lever, and emergency brake pull rods. Install clutch air cylinder and alining rod (fig. 74). Install front axle propeller shaft (par. 150). Install transmission to transfer case propeller shaft (par. 151). Install remote control throttle cable bracket, brake pedal return spring, and throttle control spring.

b. Floor Board Assembly. Install floor board, toeboard, fire extinguisher, and connect foot accelerator pedal in order named. Install starter switch, and connect battery cable (fig. 103). Fill transmission to proper level, and lubricate controls and linkage through lubricant fittings (par. 26).

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Section XXII

TRANSFER CASE

144. DESCRIPTION.

a. The transfer case is mounted behind the transmission through which the front end rear axles are driven. A declutching device is attached for engagement and disengagement of the front axle. Also mounted on the transfer case is a power take-off assembly for driving the front winch, rear winch, and crane. It provides the necessary offset to permit driving the front axle. An additional speed reduction is provided in the transfer case, and the selection of the high range gear or low range gear is made by means of a control lever in the cab. For control of the transfer case and lever positions refer to paragraph 7 **h** and figure 15.

145. INSPECTION.

a. Inspect the transfer case mounting bolts for looseness. Tighten if necessary. Inspect for clogged breather opening, and clean if indicated. Inspect for damage and lubricant leakage.

146. TRANSFER CASE REPLACEMENT.

a. Removal.

(1) Drain lubricant. Remove power take-off (par. 242). Remove front axle, transmission, and rear axle propeller shafts (pars. 150 and 151). Remove front axle declutching shift and transfer case shift control rod cotter and clevis pins. Loosen socket head set screw in declutch cross shaft, and slide shaft out of frame bearing.

(2) Remove parking brake shoe assemblies (par. 188). Remove rear axle propeller shaft flange yoke lock nuts, nuts, and bolts, and lift off brake disk. Remove application valve (par. 182). Disconnect speedometer cable. Remove lock nuts, nuts, and bolts attaching transfer case front cross member to frame side rails. Disconnect parking brake pull rod (fig. 113). Remove lock wire, and loosen rear support yoke draw bolt.

(3) Place roller jack under transfer case, and raise sufficiently to take the load off the transfer case. Slide the transfer case forward 2 inches out of the rear support yoke (fig. 118). Remove lock wire and cap screws attaching cross member to transfer case. As last cap screw is removed from transfer case cross member, the case assembly

will have to be balanced on the roller jack. Remove cross member, and lower transfer case to floor (fig. 113).

b. Installation.

(1) With roller-type jack, raise transfer case into place and set front cross member in position. Install four cap screws attaching cross member to transfer case and wire (fig. 113). Slide transfer case to rear, and enter boss on rear of case into rear support yoke. CAUTION: *Do not tighten draw bolt.* Install front cross member to frame attaching cap screws, nuts, and lock nuts. Tighten rear support yoke draw bolt and wire to cross member yoke.

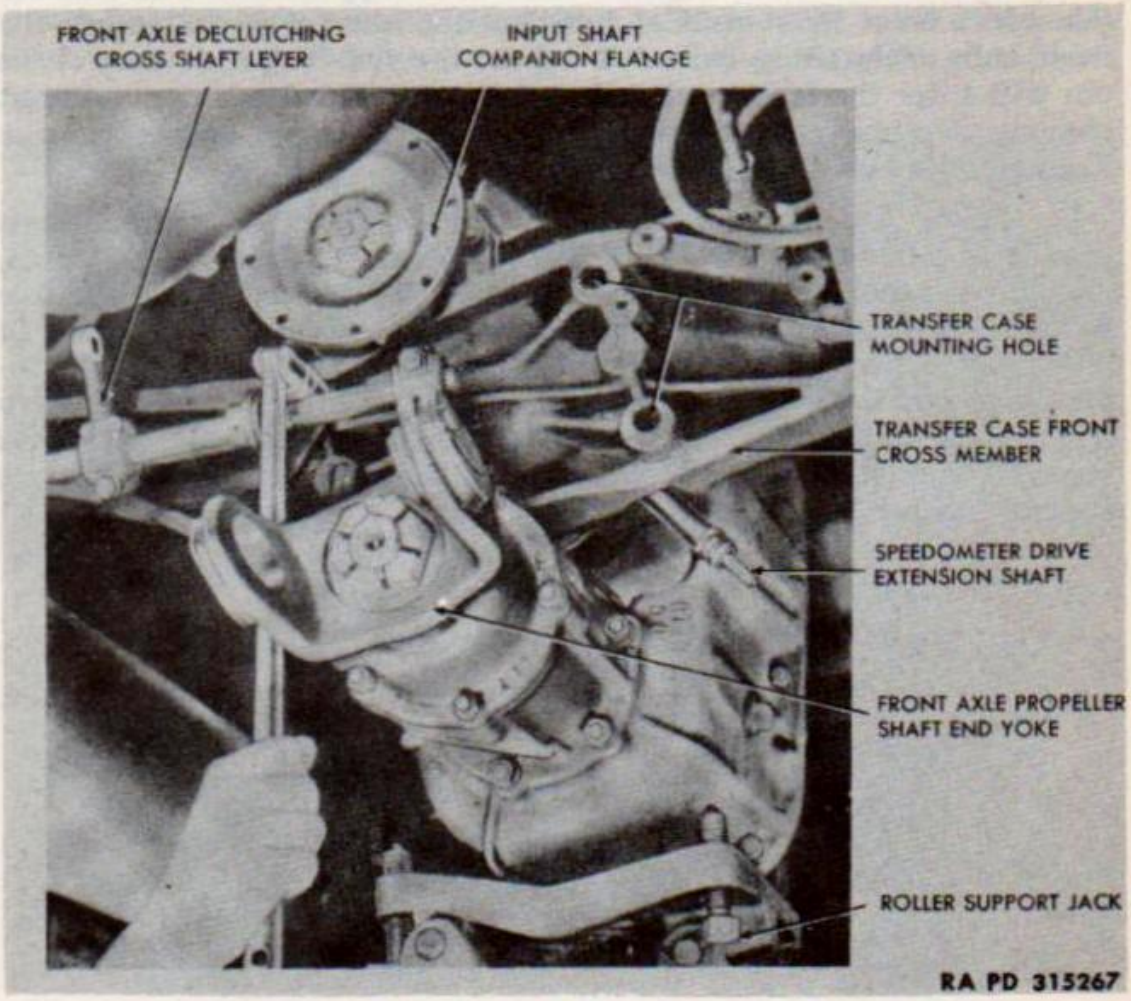


Figure 113—Removing Transfer Case

(2) Install front axle propeller shaft (par. 150). Install power take-off (par. 242). Install transmission to transfer case propeller shaft (par. 151). Place parking brake disk and flange yoke in position, and install eight cap screws, nuts, and lock nuts. Remove roller jack. Install parking brake shoe assemblies (par. 188). Install rear axle propeller shaft (par. 150). Install brake application valve (par. 182).

(3) Slide control cross shaft to right of truck and enter shaft in frame bearing. Place set collar in position against cross shaft outboard bracket and tighten set screw. Connect front axle declutching

pull rod to cross shaft lever. Install clevis and cotter pins. Connect transfer case shift rod, and install clevis and cotter pins. Connect parking brake pull rod to operating cross shaft lever. Install clevis and cotter pins. Fill transfer case with lubricant to proper level. Inspect for lubricant leaks.

147. TRANSFER CASE CONTROL REPLACEMENT.

a. Transfer Case Shift Control. Remove cotter pins and clevis pins from transfer case shift control rod. Inspect rod for worn pins and yokes. The normal length of this rod is 24½ inches. With transfer case shift lever in a vertical position and the lever contacting the front axle declutching lock nut, adjust the rod length so that clevis pin will enter the lever and shift rail, in its neutral position, without changing vertical position of lever. Install clevis pin and cotter pin. Tighten adjustable yoke lock nuts.

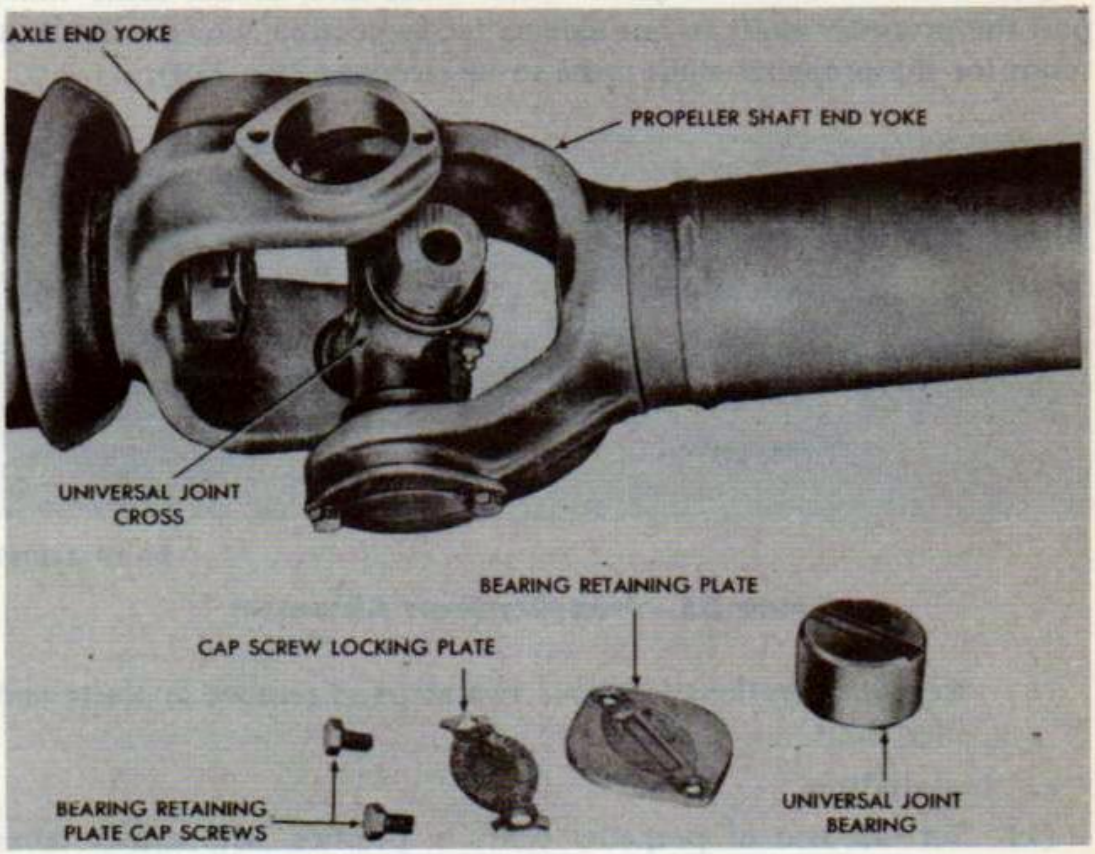
b. Front Axle Declutching Control. Remove cotter and clevis pins from declutch control rod. Examine for worn pins or yoke eyes, and loose threads on the adjustable yoke. The normal length of the rod is 24¾ inches. Remove cotter pins and clevis pins from declutch lever link. Check for worn pins and links. With the front axle declutching control lever in a vertical position, connect the pull rod to the control and cross shaft levers, without changing position of shift lever or cross shaft lever. Install the clevis and cotter pins. Lubricate control linkage (par. 26).

Section XXIII

PROPELLER SHAFTS

148. DESCRIPTION.

a. There are four propeller shafts used on this truck. The propeller shafts consist of a tubular shaft with a permanent joint and a slip joint on each end. Briefly, the universal joint or propeller shaft joint



RA PD 315268

Figure 114—Universal Joint Disassembly

consists of two yokes, flexibly connected by a one-piece center cross, mounted on needle bearings supported in the yokes.

149. INSPECTION.

a. Inspect propeller shafts for loose yokes, flanges, and flange bolts. Inspect shafts for worn bearing assemblies and spline shafts. Inspect for damage to shaft tubing and dust cap. Inspect shafts for loose lock plate screws.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

150. PROPELLER SHAFT REPLACEMENT.

a. General. The front axle to transfer case, transfer case to center rear axle, and inter-axle propeller shafts all have the same replacement procedure.

b. Removal.

(1) Bend lugs on lock plates away from bearing plate cap screws. Remove four lock plate cap screws. Lift off lock plate and bearing plate (fig. 114). Using a hammer, tap propeller shaft yoke to force bearing cup assembly off universal joint cross. Repeat this operation on opposite side of yoke to remove opposite cup from cross.

(2) Tilt the universal joint center cross and, at the same time, pull the propeller shaft to one side as far as possible which will allow room for the propeller shaft cross to be removed (fig. 114).

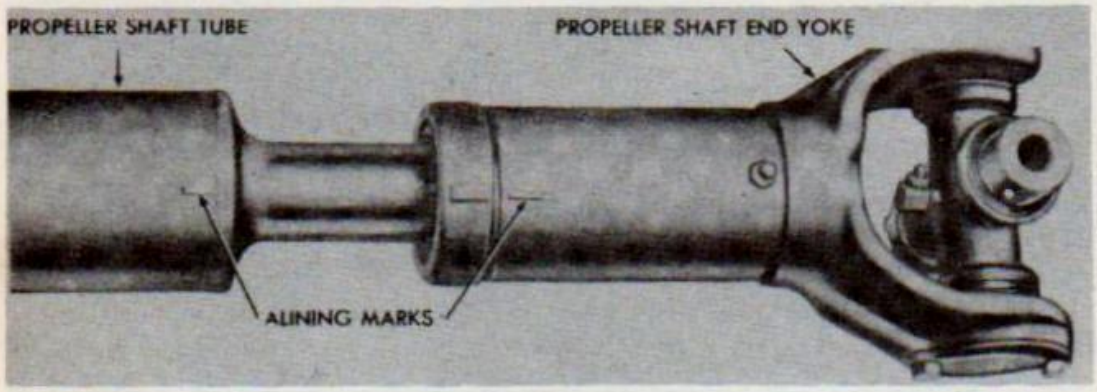


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Figure 115—Propeller Shaft Alinement

(3) Repeat operations in above two steps to remove opposite end of propeller shaft.

c. Installation.

(1) Set one end of propeller shaft in position with center cross installed on loose yoke (fig. 114). Tilt the universal joint center cross so as to enter fixed yoke. Push the propeller shaft to one side as far as possible, and straighten universal cross into position. Place a small amount of grease on bearing assemblies to retain needles; insert into yoke lug bearing bores and onto center cross.

(2) Install bearing plate and new lock plate. Install bearing plate cap screws. Bend lugs on lock plates against flat side of lock plate cap screws to prevent loosening. Lubricate propeller shaft at both ends and sliding spline through lubricant fittings (par. 26). NOTE: *Cold chisel marks on propeller shaft tubing and sleeve yoke must be in alinement (fig. 115).*

PROPELLER SHAFTS

151. SHORT COUPLED PROPELLER SHAFT REPLACEMENT.

a. Removal. Remove 16 companion flange to flange yoke bolts, nuts, and lock washers. Compress propeller shaft to shortest length, and remove assembly from the truck.

b. Installation. With propeller shaft compressed to its shortest length, place in position and install flange yoke to companion flange bolts, nuts, and lock washers. Lubricate propeller shaft through lubricant fittings (par. 26).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XXIV

FRONT AXLE

152. DESCRIPTION.

a. The front axle is of the driving type. Specially designed steering knuckles are provided to transmit driving torque. The axle shafts themselves transmit only driving and braking torque, therefore, the load is carried by the cast center member. The driving unit is a conventional double reduction assembly employing a high traction four-pinion differential. The driving unit is mounted in a conventional manner with the exception that the pinion shaft is pointing to the rear of the truck instead of to the front. Power is delivered from the engine through the transmission, a close coupled propeller shaft to the transfer case, through the transfer case, and the forward propeller shaft.

153. FRONT AXLE USAGE.

a. Engage the front axle only when needed. Its use is to be avoided as much as possible. Front axle engagement, wherever good traction conditions exist, causes excessive tire wear, gear failure, and high driving unit temperature. Remember that front axle engagement does not increase power, it actually decreases it. Traction only is increased by front axle engagement.

b. Never wait until truck is stalled before engaging front axle. Engage the front axle before proceeding into bad spots. Keep the truck moving at an even speed. The front axle is an auxiliary traction device to be used only when conditions make its use necessary and before getting stalled, for lack of traction and not lack of power.

c. A control lever is located in the cab to engage and disengage the front axle (fig. 15). This axle must be engaged when the transfer case is in the low range and where heavy ground or loading is encountered.

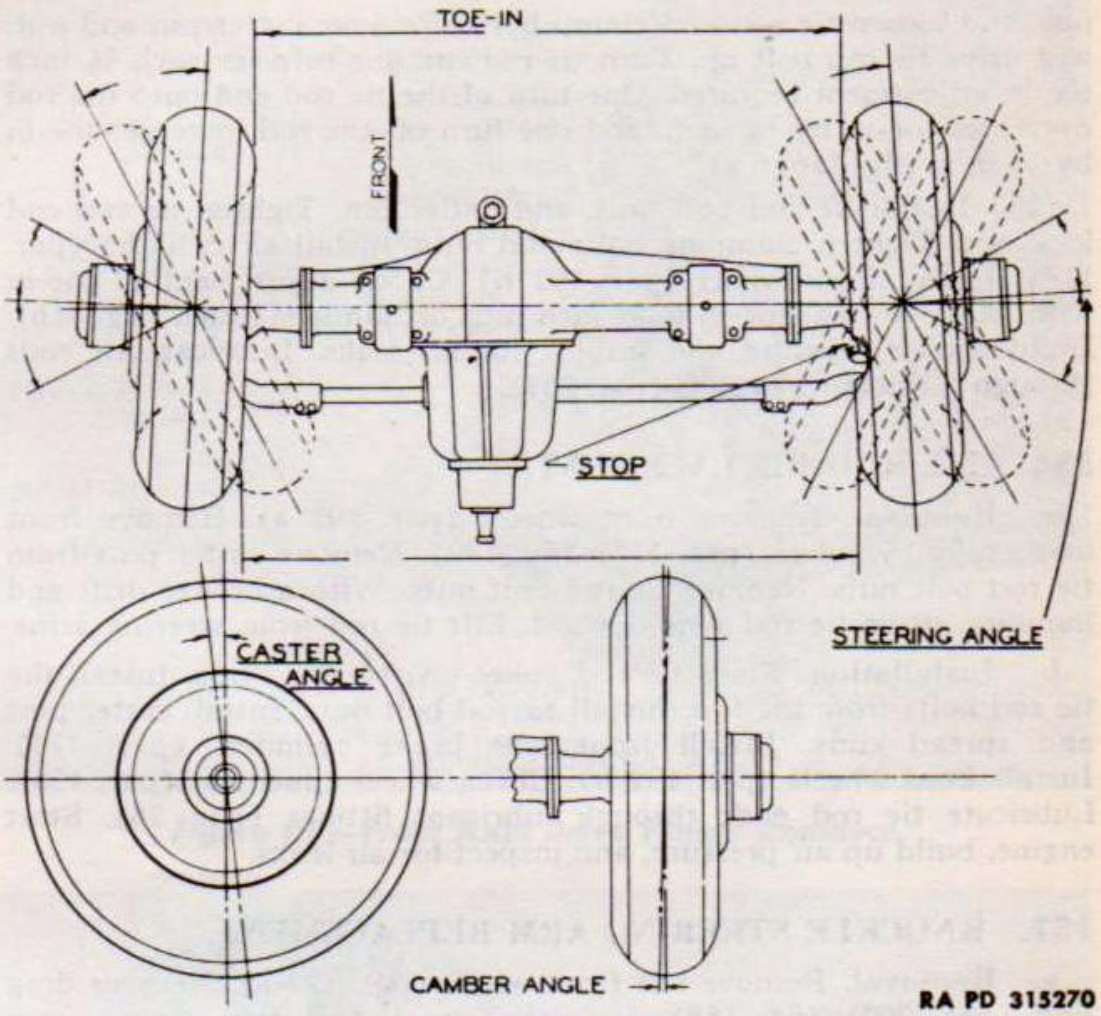

Figure 116—Front Axle Wheel Alinement

154. INSPECTION.

a. Inspect for proper toe-in, loose tie rod bolts or bushings, and excessive backlash. Tighten drive flange nuts, spring U-bolt nuts, and carrier housing nuts. Inspect for proper oil level and grease leaks.

155. TOE-IN ADJUSTMENT.

a. General.

(1) Toe-in adjustment is made at the cross tie rod. Each end of the rod is threaded. The left-hand end has a coarse thread (12 thread) and the right-hand end, a fine thread (16 thread). The tie rod ends screw on these threads and are clamped tight by two cross tie rod end clamp bolts. In addition, the right-hand tie rod end is locked by a cross tie rod end lock nut which is also screwed on the end of the rod. Toe-in adjustments are usually made at the fine thread right-hand end of the rod.

b. Procedure.

(1) Remove right front axle wheel (par. 192 a). Remove right front brake cylinder (par. 174) (fig. 139). Back off tie rod end lock

nut, and loosen tie rod end clamp bolts. Remove cotter pin and nut, and drive tie rod bolt up. Turn tie rod end one turn for each ⅛-inch toe-in adjustment required. One turn of the tie rod end onto the rod decreases toe-in by ⅛ inch, and one turn off the rod increases toe-in by ⅛ inch (fig. 116).

(2) Install tie rod bolt, nut, and cotter pin. Tighten tie rod end lock nut. Tighten clamping bolts and nuts. Install air cylinder (par. 174). Install front wheel (par. 192 **b**). Check adjustment of toe-in with gage. Normal toe-in is ¼ inch plus or minus 1/16 inch (fig. 116). Build up air pressure and inspect for air leaks. Lubricate tie rods through lubricating fittings (par. 26).

156. TIE ROD REPLACEMENT.

a. Removal. Remove front wheels (par. 192 **a**). Remove front axle brake cylinders (par. 174) (fig. 139). Remove cotter pins from tie rod bolt nuts. Remove tie rod bolt nuts. With a bronze drift and hammer, drive tie rod pins upward. Lift tie rod from steering arms.

b. Installation. Place tie rod yokes on steering arms. Install the tie rod bolts from the top. Install tie rod bolt nuts. Install cotter pins and spread ends. Install front axle brake cylinders (par. 174). Install front wheels (par. 192 **b**). Check wheel alinement (par. 155). Lubricate tie rod ends through lubricant fittings (par. 26). Start engine, build up air pressure, and inspect for air leaks.

157. KNUCKLE STEERING ARM REPLACEMENT.

a. Removal. Remove left front wheel (par. 192 **a**). Remove drag link (par. 209) (fig. 168). Remove four ⅜-inch cap screws from brake assembly upper dust shield. Remove hub and drum assembly (par. 195 **a**). Remove upper brake shoe assembly (par. 168). Remove four steering arm stud nuts and lock washers. Pry steering arm off studs (fig. 117).

b. Installation. Set arm on studs. NOTE: *Do not disturb knuckle adjusting shims.* Install lock washers and nuts. Install upper brake shoe (par. 168) (fig. 132). Install hub and drum assemblies (par. 195 **c**). Install drag link (par. 209). Install left front wheel (par. 192 **b**).

158. FRONT AXLE DRIVE FLANGE REPLACEMENT.

a. Removal. Remove two cap screws from drive flange retainer plate and lift off plate. Remove eight drive flange stud nuts. Lift off lock washers. Insert two ½-inch standard square head puller screws in drive flange (fig. 117). Hit driving flange on outside face with hammer to loosen. Run in puller screws. Remove four drive flange stud collets. Slide drive flange directly out and off spline.

b. Installation. Remove puller screws, and spread small amount of lubricant on drive flange and knuckle splines. Using a new gasket between hub and flange (fig. 117), slide driving flange into position

FRONT AXLE

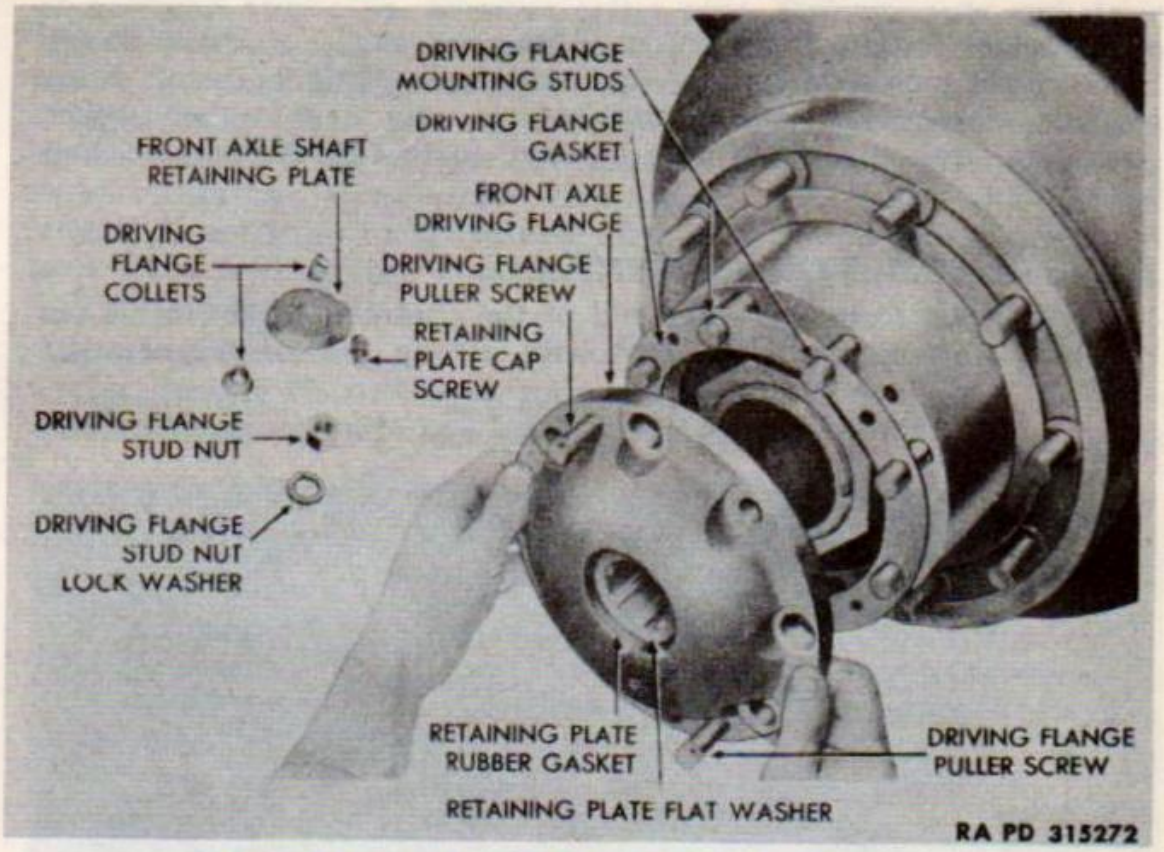

Figure 117—Front Axle Drive Flange Removal

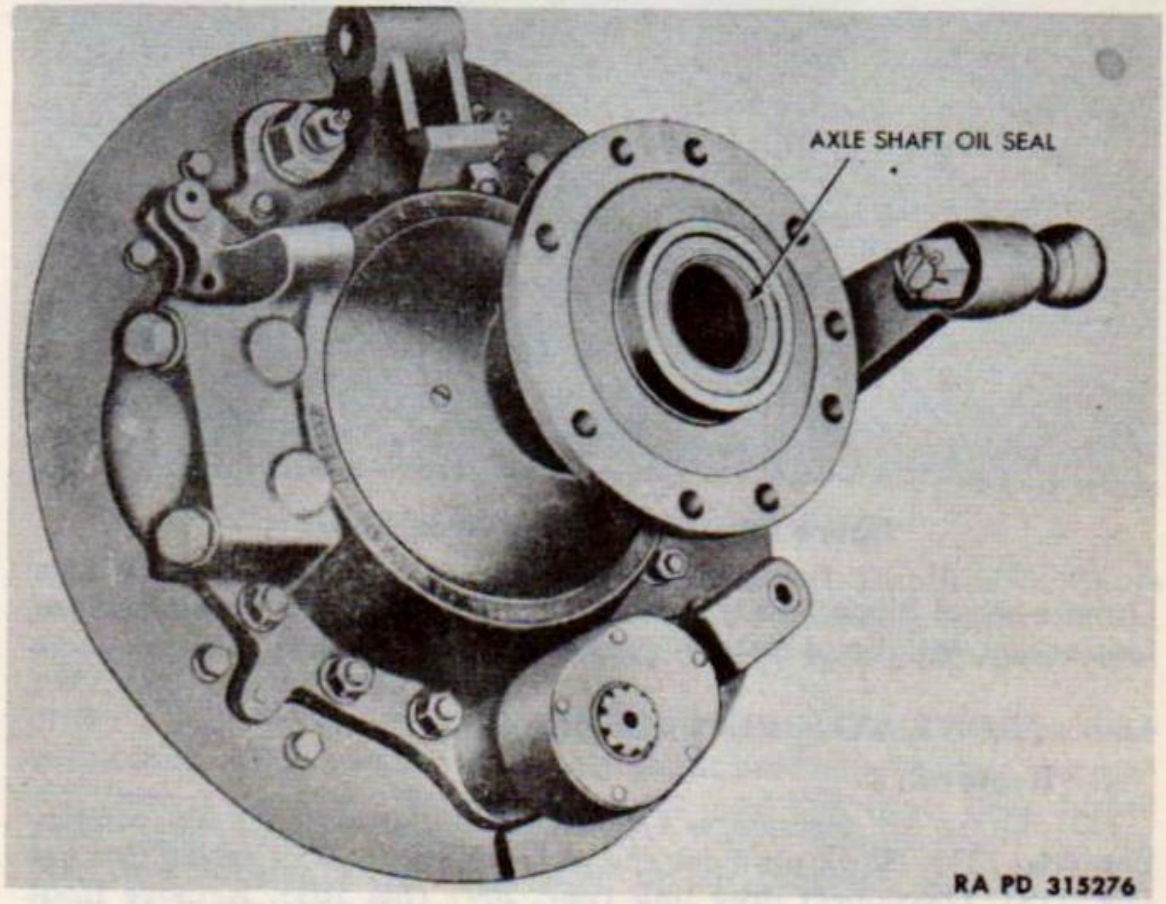

Figure 118—Front Axle Shaft Oil Seal Replacement

on knuckle. Install four collets in tapered holes of drive flange. Install eight lock washers and nuts, and draw up tight. Install a new retainer plate paper gasket, flat washer, and new rubber gasket. Install retainer plate and two retainer plate cap screws and lock washers.

159. OIL SEAL REPLACEMENT.

a. Working from the outer end of the trunnion socket, drive out the axle shaft oil seal (fig. 118) with a long punch and hammer.

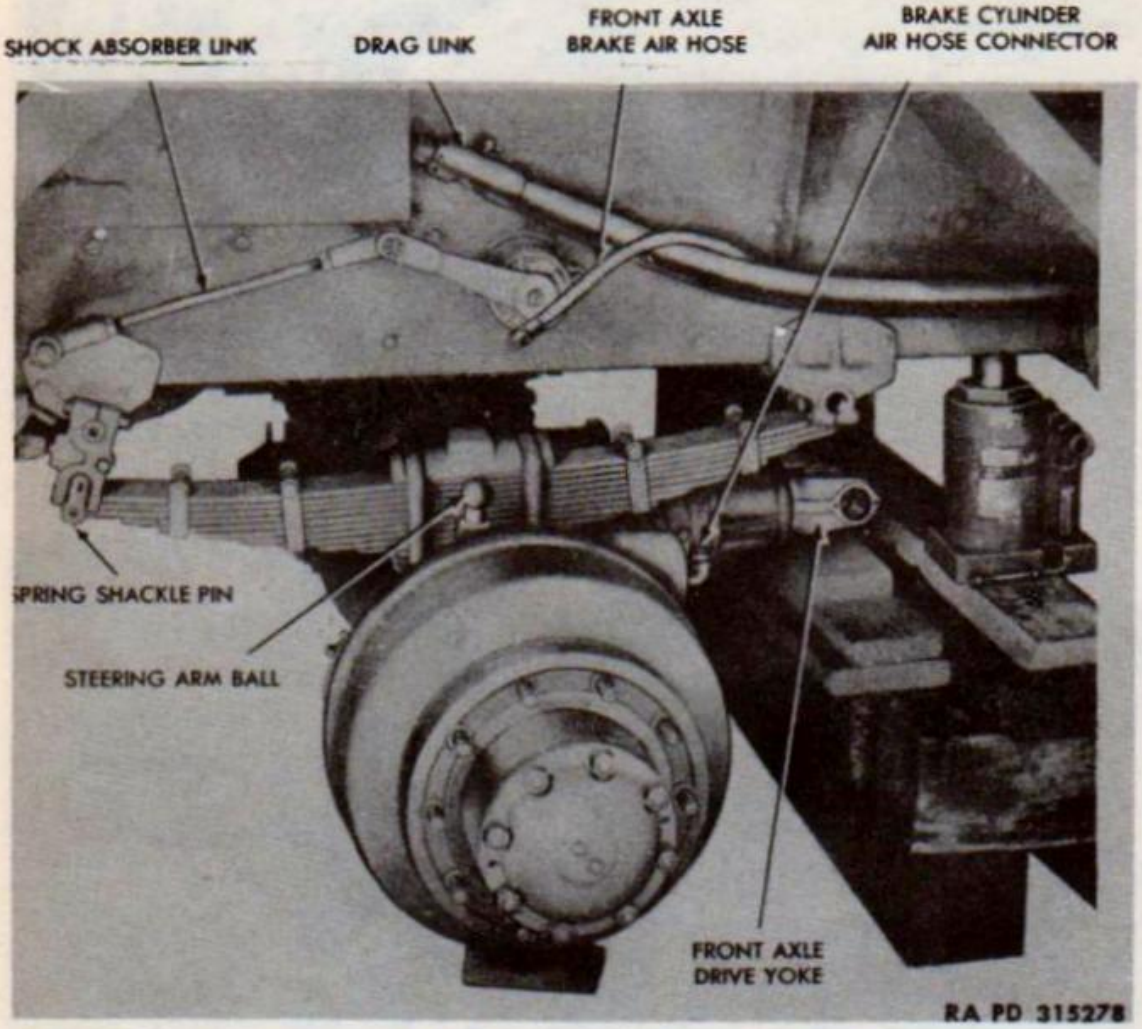

Figure 119—Front Axle Disconnected

Using a wood block and hammer, drive axle shaft oil seal into trunnion socket with lip of leather seal facing out.

160. FRONT AXLE REPLACEMENT.

a. Removal.

(1) Drain air reservoirs. Disconnect brake cylinder air connection (fig. 134). Block up front end of truck just rear of spring bracket (fig. 119). Disconnect drag link (par. 209) (fig. 163). Remove front axle propeller shaft (par. 150) (fig. 114). Disconnect shock absorber

at axle end (fig. 119). Remove cotter pins. Remove nuts and drive link pins out of axle brackets (fig. 120) with a soft hammer. Remove spring pin draw bolt lock nuts, nuts, and bolts (fig. 119).

(2) Place roller jack under center of axle housing, and lower axle assembly until springs are clear of brackets and the housing bowl clears the front winch rope guard. Roll axle, with springs attached, out from under vehicle (fig. 120). Remove lock nuts, and nuts from front spring U-bolts. Drive U-bolts out of axle housing. Lift springs free of axle.

b. Installation.

(1) Install U-bolts over spring top plate and springs. Position axle caster plate with thin edge forward and drive U-bolt through

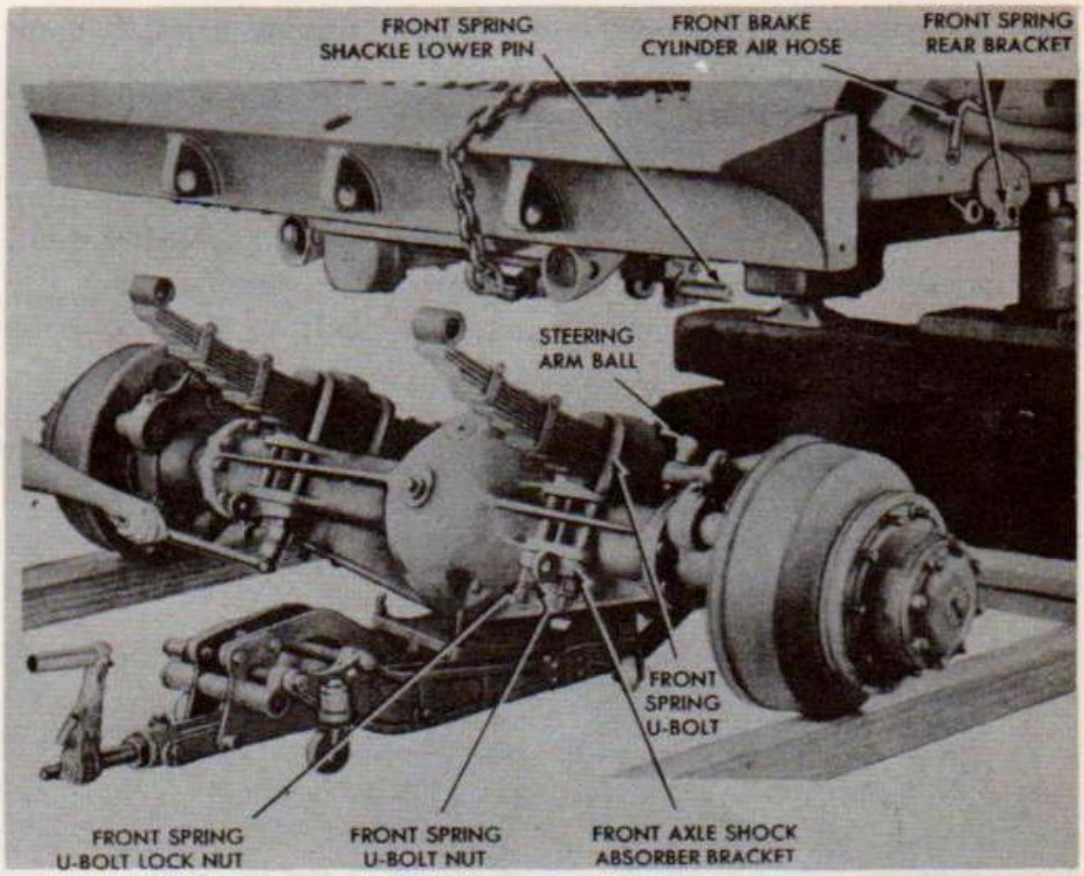

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Figure 120—Removing Front Axle

axle housing. Install shock absorber axle bracket. Install U-bolt nuts and lock nuts. Tighten securely. Roll axle and spring under vehicle and raise into position. Install spring pins and spring pin draw bolts, nuts, and lock nuts (fig. 156).

(2) Hook up shock absorber link. Connect brake cylinder hose connection, using two wrenches to prevent placing a twist in the flexible hose connection (fig. 134). Connect drag link (par. 209). Install front axle propeller shaft (par. 150). Install wheels (par. 192 **b**). Remove blocking and jacks. Build up air pressure. Inspect for air leaks at brake cylinder connections. Lubricate axle spring pins, drag link, and propeller shaft through lubricating fittings (par. 26).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XXV

REAR AXLE

161. DESCRIPTION.

a. This truck is equipped with two rear driving axles that are incorporated into a unit by a system of torque rods and a spring suspension that maintain alinement and equalize the load respectively. The axles are of the full-floating type, using double reduction driving units and conventional four-pinion differentials. Drive is from the engine, through the transmission, a short-coupled propeller shaft, the transfer case, and rear propeller shaft to the center driving axle and then through the inter-axle propeller shaft to the rear axle.

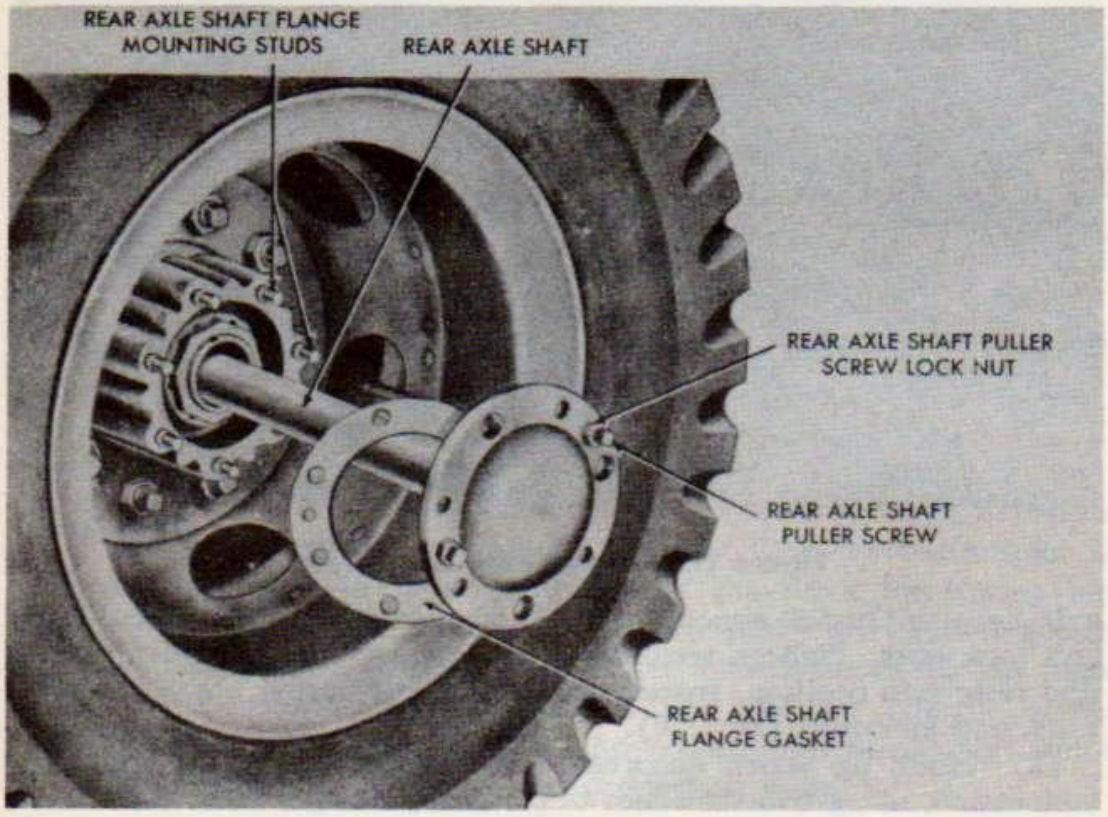

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Figure 121—Rear Axle Shaft Replacement

162. INSPECTION.

a. Inspect for loose axle flange nuts, spring U-bolt nuts, and carrier housing nuts. Tighten if necessary. Inspect for lubrication leaks. Inspect brake linkage, and replace any missing linkage pins and cotter pins. Inspect tire inflation and condition.

163. REAR AXLE SHAFT REPLACEMENT.

a. Removal. Remove seven nuts and lock washers attaching axle shaft to hub. Back off puller screw lock nuts, and run in puller screws to pull axle shaft off hub studs. Slide axle shaft straight out from housing (fig. 121). Remove three collets from axle flange, and remove puller screws.

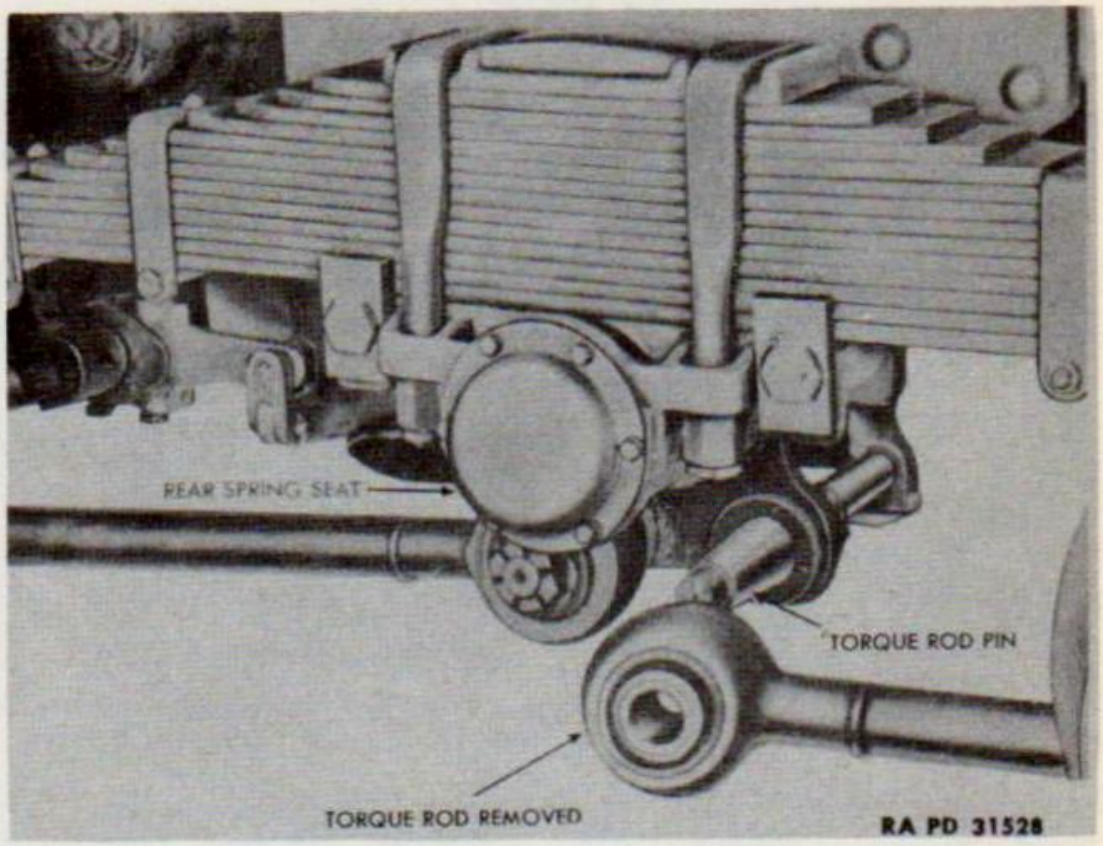

Figure 122—Lower Torque Rod Removal

b. Installation. Install axle shaft with new gasket. Slight rotation may be necessary in order to aline spline with driving unit side gear. Install collets, lock washers, and nuts. Replace set screws, and run check nuts up against flange to secure puller screws in position (fig. 121).

164. TORQUE ROD REPLACEMENT.

a. Lower Torque Rod Removal.

(1) To facilitate removal of the torque rods, it is advisable to remove the wheels from the truck on the side that the torque rod or rods are to be replaced (par. 193). Remove cotter pins at both ends

of torque rod, and loosen nuts securing torque rods to pins until outer face of the nuts are flush with the end of the torque rod pin.

(2) Place a bar back of the torque rod at the axle end. Place pressure outward on the torque rod, and strike the torque rod pins with a soft hammer to loosen the rod on the pin tapers. Remove the nuts, and pry rod off center pin (fig. 122). With torque rod clear of center pin force downward and then pry torque rod off axle end torque rod pin.

b. Upper Torque Rod Removal.

(1) For replacement of upper torque rods, remove the torque rod and pin brackets from the carrier housing and frame support as

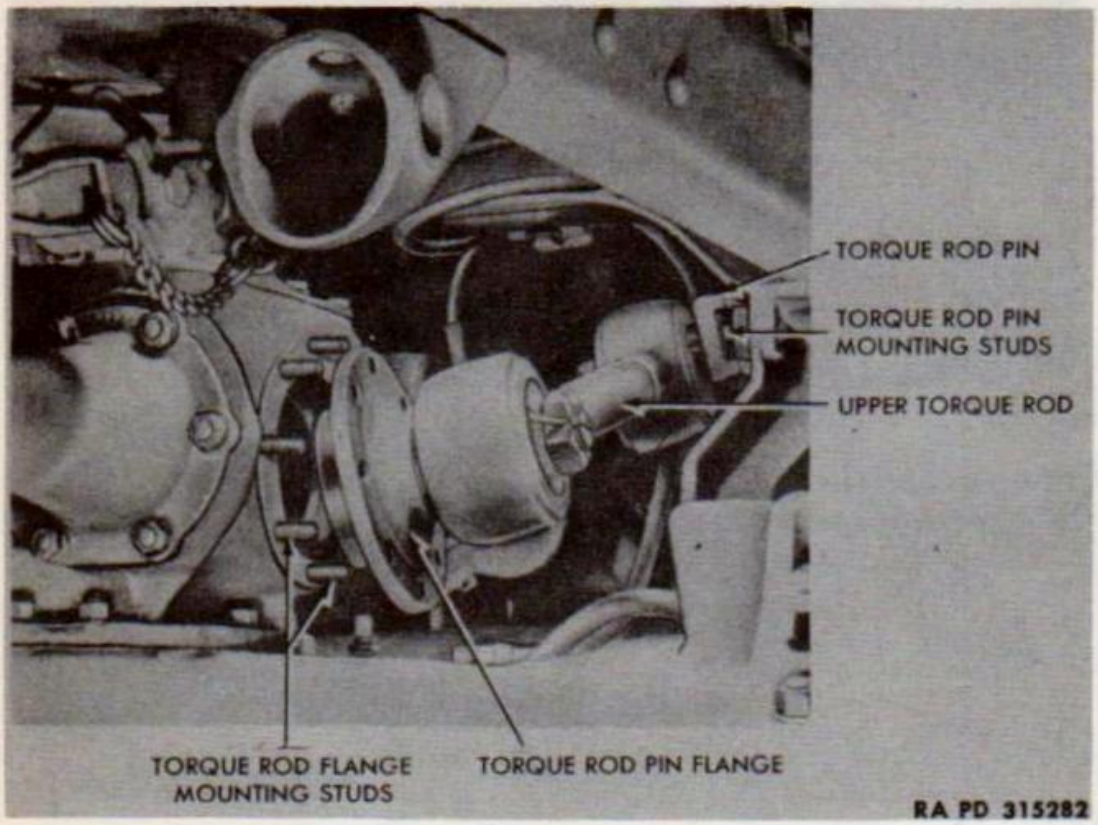

Figure 123—Removing Upper Torque Rod

an assembly (fig. 123). Remove the lock wire locking the eight pin bracket stud nuts at the carrier housing. At the frame support seat, remove the lock wire and the two stud nuts.

(2) With a cold chisel and hammer, remove the collets in the frame torque rod pin bracket. Ply torque rod clear of the carrier housing studs, and lift torque rod off the frame support. Remove cotter pins and nut from torque rod pin, and press pin out of torque rod assembly.

c. Lower Torque Rod Installation. Place the frame bracket end of the torque rod on the torque rod pin. Partially install the nut,

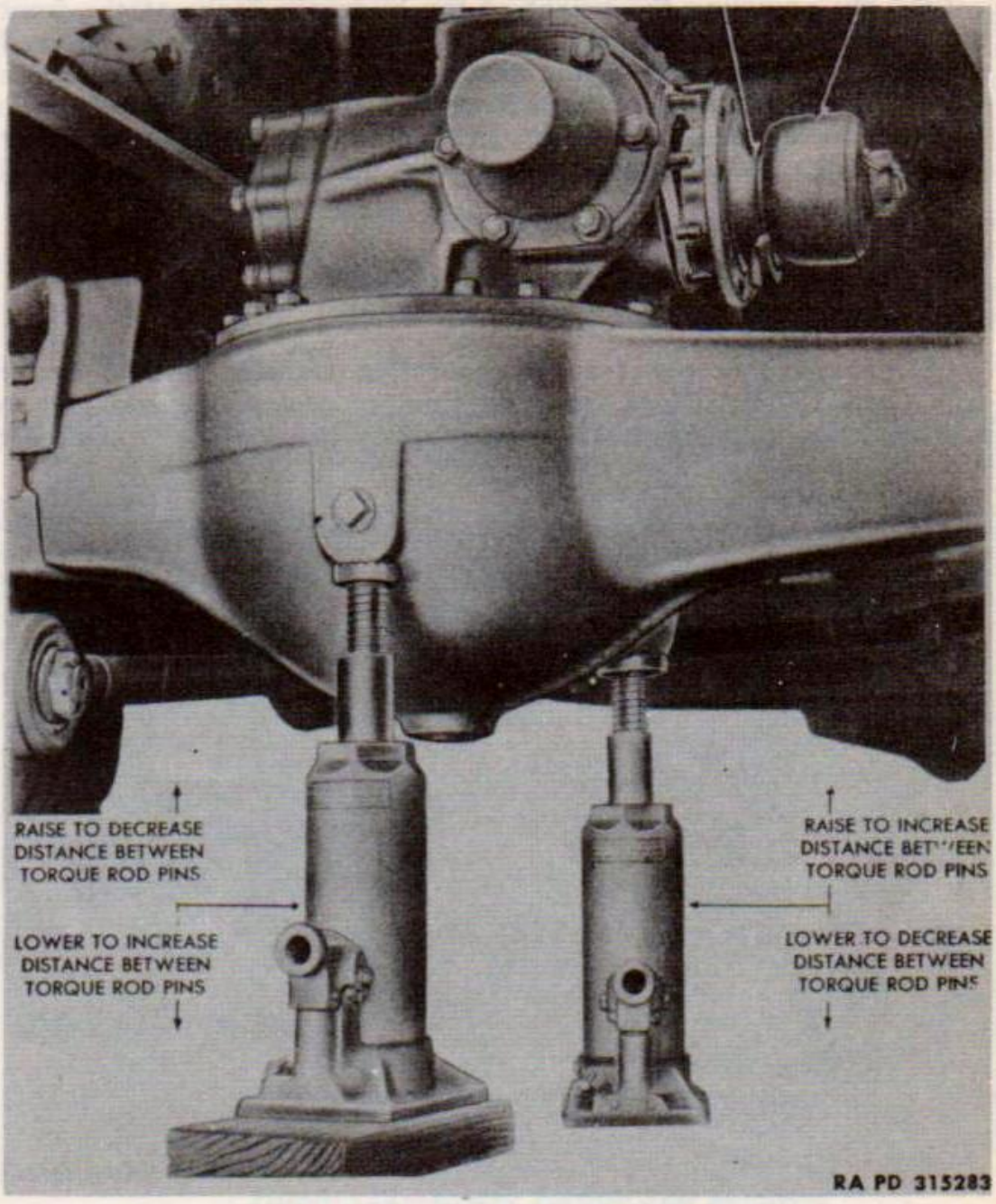

Figure 124—Method of Adjusting Torque Rod Centers

and leave the rod loose on the pin taper. Install the axle end of the torque rod on the torque rod pin. When torque rod is positioned on pin tapers, install pin nuts and tighten securely. Install cotter pins. Install wheels (par. 193 **b**).

d. Upper Torque Rod Installation.

(1) Install the frame bracket torque rod pin bracket collets and nuts. Tighten securely, and wire studs together. Replace the carrier housing torque rod pin bracket, and install stud nuts and wire studs together. Set frame bracket end of torque rod on pin, and partially install the nut, but leave the torque rod loose on the pin taper.

(2) By adjusting the height of the hydraulic jacks at the front and rear of the housing bowl, the distance between the torque rod pins can be moved to enter the torque rod on the carrier housing pin (fig. 124). To secure alinement, place two jacks underneath the axle housing, one at the oil filter boss, and the other at the brake chamber bracket (fig. 124). Tighten torque rod nuts securely, and install cotter pins.

165. REAR AXLE BOGIE REPLACEMENT.

a. Removal.

(1) Remove propeller shaft connecting transfer case to center axle (par. 150 b). Block frame at front of center axle and just to rear of crane frame (fig. 125). Remove field chocks. The frame must

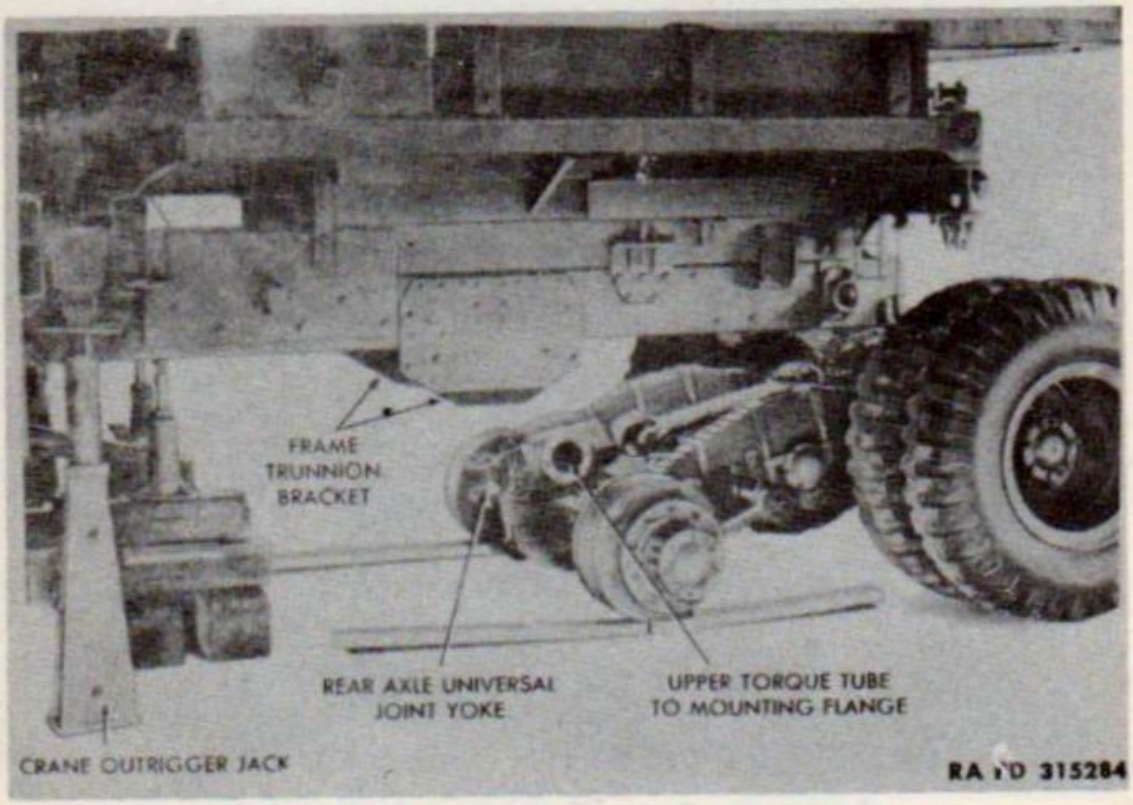

Figure 125—Rear Axle Bogie Removal

be raised a minimum of 3 inches (measurement taken at rear of bumperette). CAUTION: *Lower the outrigger jacks to the ground to stabilize the vehicle.* Remove upper torque rods (par. 164 b). Open air reservoir drain cocks. Disconnect towing air connection and relay valve to brake chamber air lines. Remove two towing air connection cap screws, nuts, and lock washers.

(2) Remove eight cap screws, nuts, and lock washers attaching bogie center tube bracket to frame trunnion bracket. Remove wheels from center axle only (par. 193 a). Place a 2-inch plank under brake drums of forward driving axle parallel with the vehicle. Lower center

axle onto planking, and roll complete bogie assembly to the rear from under the truck.

b. Installation. Roll assembly under truck (fig. 125). Jack up center rear axle. Line up holes in cross tube bracket with frame bracket. Install eight cap screws, nuts, and lock washers. Install towing air connections, and connect air lines. Connect air lines leading from brake chamber bracket fitting to relay valve. Install upper torque rods (par. 164 **d**). Replace field chocks. Install wheels on center driving axle (par. 193 **b**). Replace outrigger jacks in carrying position. Remove blocking. Install transfer case to center axle propeller shaft (par. 150). Close air reservoir drain cocks. Start engine, and build up the air pressure. Inspect for air leaks. Lubricate rear axle driving units (par. 26).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XXVI

BRAKE SYSTEM

166. DESCRIPTION.

a. This truck is equipped with air-operated internal expanding axle brake assemblies on all six wheels. Trailer connections are provided at both the front and rear of the truck for towing purposes. The air brake system is divided into two general groups, namely, the mechanical portions which include shoes, drums, cams, anchors, camshafts, slack adjusters, and the air control portion which includes the air compressor, governor, application valve, safety devices, chambers, reservoirs, and connecting lines.

b. The parking brake is a four-shoe disk-type brake. It is mounted on a frame cross member at the rear of the transfer case. The disk is attached to the propeller shaft companion flange on the rear output shaft of the transfer case.

BRAKE SYSTEM

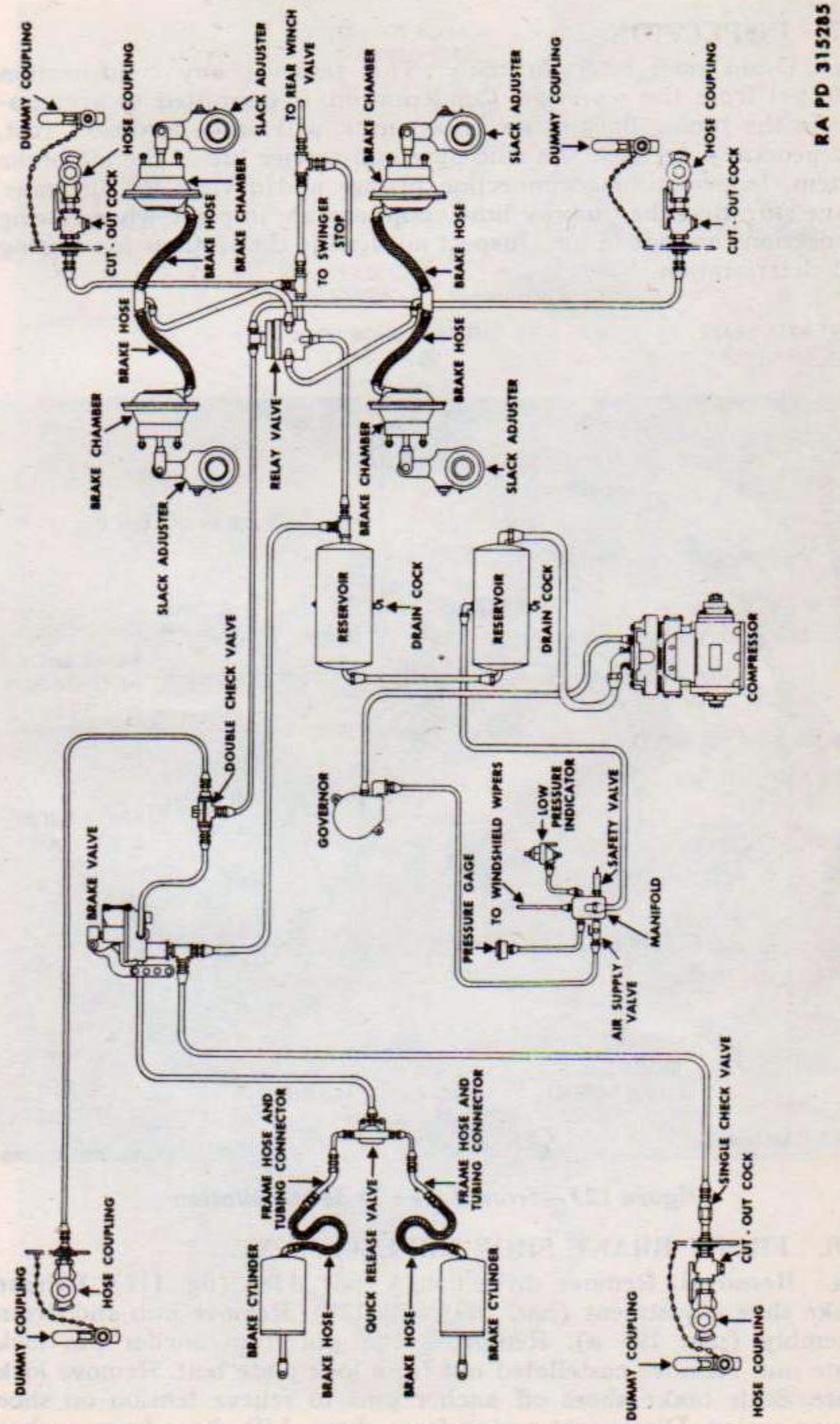

Figure 126—Air Brake Piping Diagram

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

167. INSPECTION.

a. Drain each reservoir daily. This removes any condensation collected from the reservoir. Condensation, if permitted to accumulate in the tubing lines or air brake units, will cause corrosion, rust, and generally decrease the efficiency and service life of the air brake system. Inspect tubing connection fittings and devices for air leaks. Make sure that the dummy hose couplings are in place when towing connections are not in use. Inspect all flexible connections for chafing and deterioration.

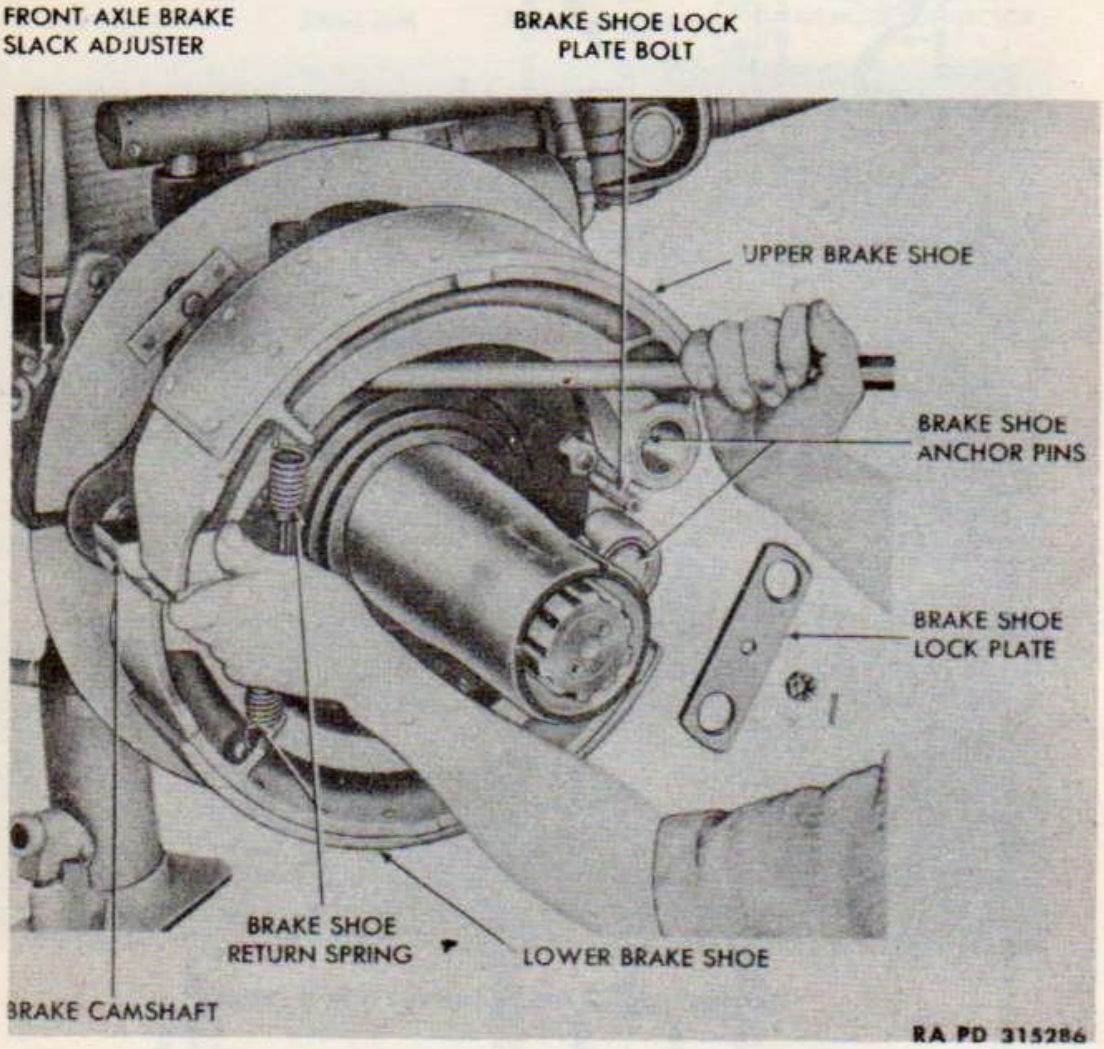

Figure 127—Front Brake Shoe Installation

168. FRONT BRAKE SHOE REPLACEMENT.

a. **Removal.** Remove drive flange (par. 158) (fig. 117). Release brake shoe adjustment (par. 169) (fig. 129). Remove hub and drum assembly (par. 195 a). Remove cotter pin from anchor pin lock plate nut. Remove castellated nut from lock plate bolt. Remove lock plate. Slide brake shoes off anchor pins to relieve tension on shoe return spring. Disconnect spring from shoes. Lift shoes from anchor pins.

b. Installation. Place lower shoe on anchor pin. Hook brake return spring into lower shoe. Set upper shoe just partially on anchor pin, and rest cam end of shoe on lower shoe wear plate (fig. 127). Hook brake shoe return spring into upper brake shoe assembly. Place bar between upper shoe and steering knuckle flange and pry up. With shoe assembly forced upwards, press shoe onto anchor pin and brake cam. Install brake shoe lock plate bolt through inside of

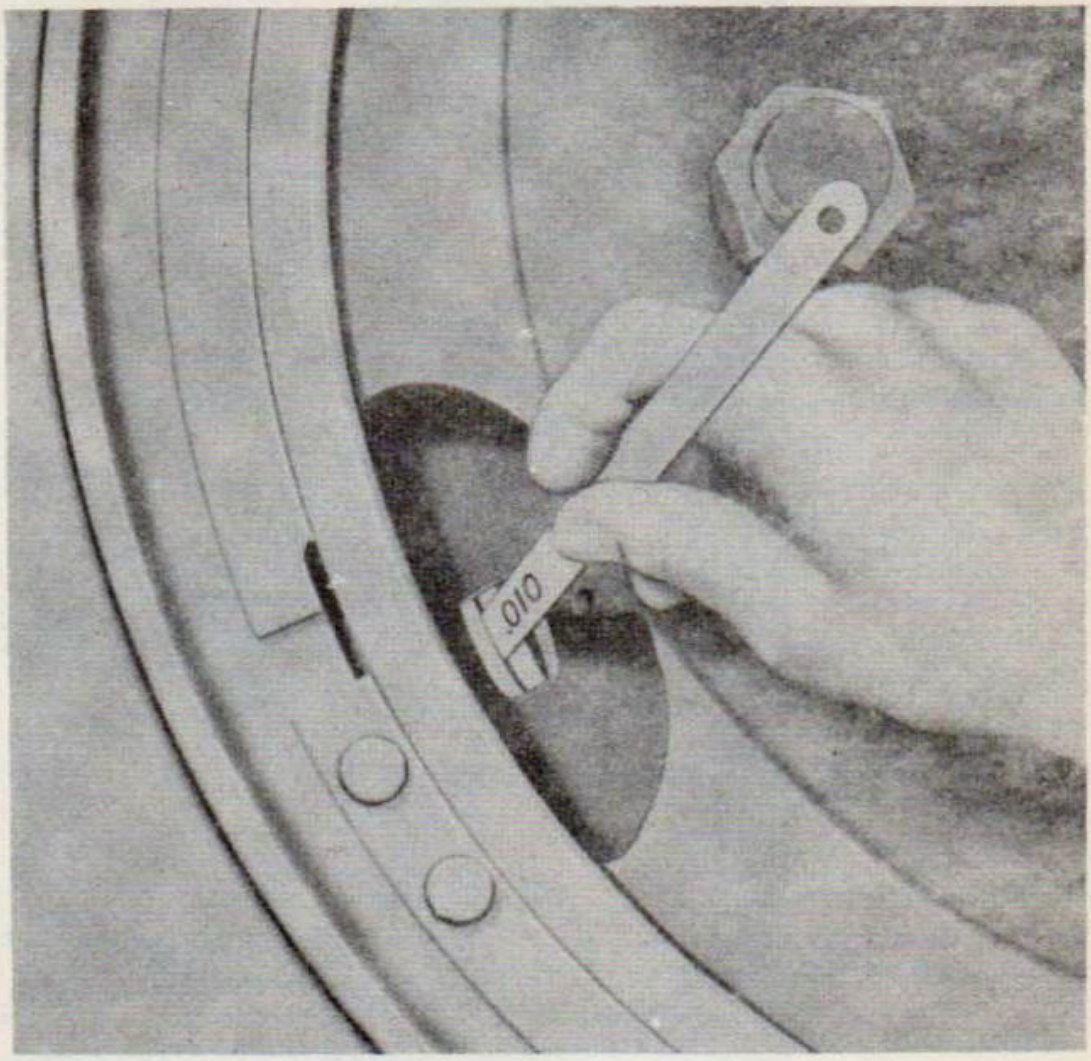

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Figure 128—Gaging Shoe Adjustment, Using Gage (41-G-400)

brake assembly. Install lock plate. Install and tighten lock plate bolt and castellated nut. Install cotter pin. Lubricate anchor pins through lubricant fittings (par. 26). Install hub and drum assembly (par. 195 c). Install drive flange (par. 158) (fig. 117).

169. FRONT AXLE BRAKE ADJUSTMENT.

a. Method of Checking. Using two hydraulic jacks, raise both front wheels and tires clear of ground. Loosen brake drum inspection

cover cap screw, and turn brake drum inspection cover to one side. Turn wheel and tire so brake drum inspection hole is just above brake shoe anchor pin. Insert a 0.010-inch feeler gage (41-G-400) through brake drum inspection hole, and between lining upper brake shoe assembly and brake drum (fig. 128).

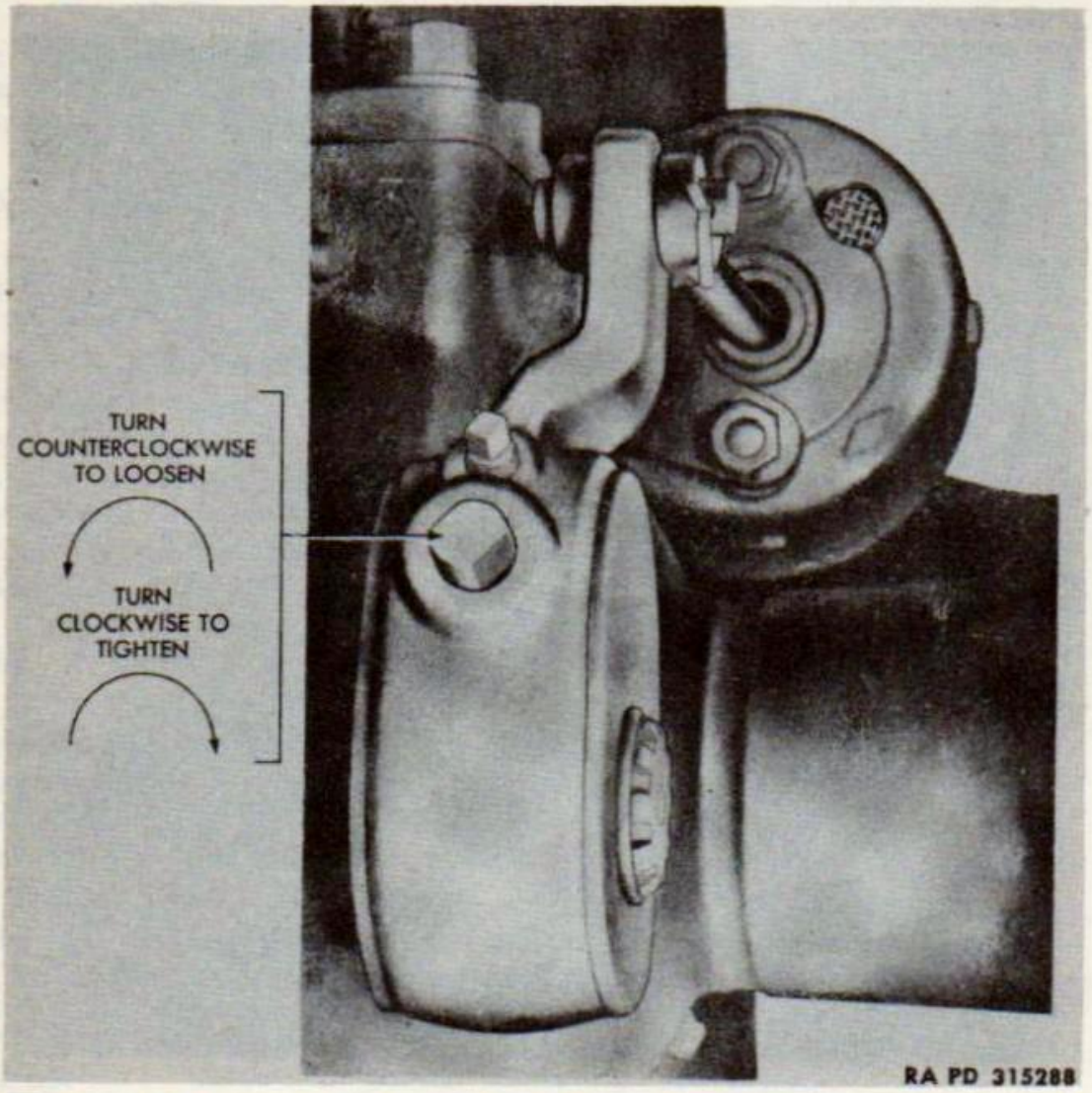

Figure 129—Front Axle Brake Shoe Adjustment

b. Anchor Pin Adjustment. Loosen upper of two brake shoe anchor pin nuts. Then turn brake shoe anchor pin clockwise or counterclockwise until upper brake shoe assembly has been moved, and the 0.010-inch feeler gage is gripped, but can be withdrawn. Tighten the anchor pin lock nut, and at the same time, hold the anchor pin from turning. Loosen lower brake shoe anchor pin lock nut, and turn anchor pin until described condition in subparagraph **b** above is acquired for the lower shoe. Tighten lock nut. Install inspection plate and cap screw.

c. Camshaft Adjustment. Turn the slack adjuster worm until brake shoes are tight against brake drum. Then back off worm three notches (fig. 129). Inspect wheel for free rotation.

170. REAR AXLE BRAKE SHOE REPLACEMENT.

a. Removal. Remove axle shaft (par. 163) (fig. 121). Back off brake shoe adjustment. Remove hub and drum assembly with wheels installed (par. 197). Remove backing plate cap screws and lock

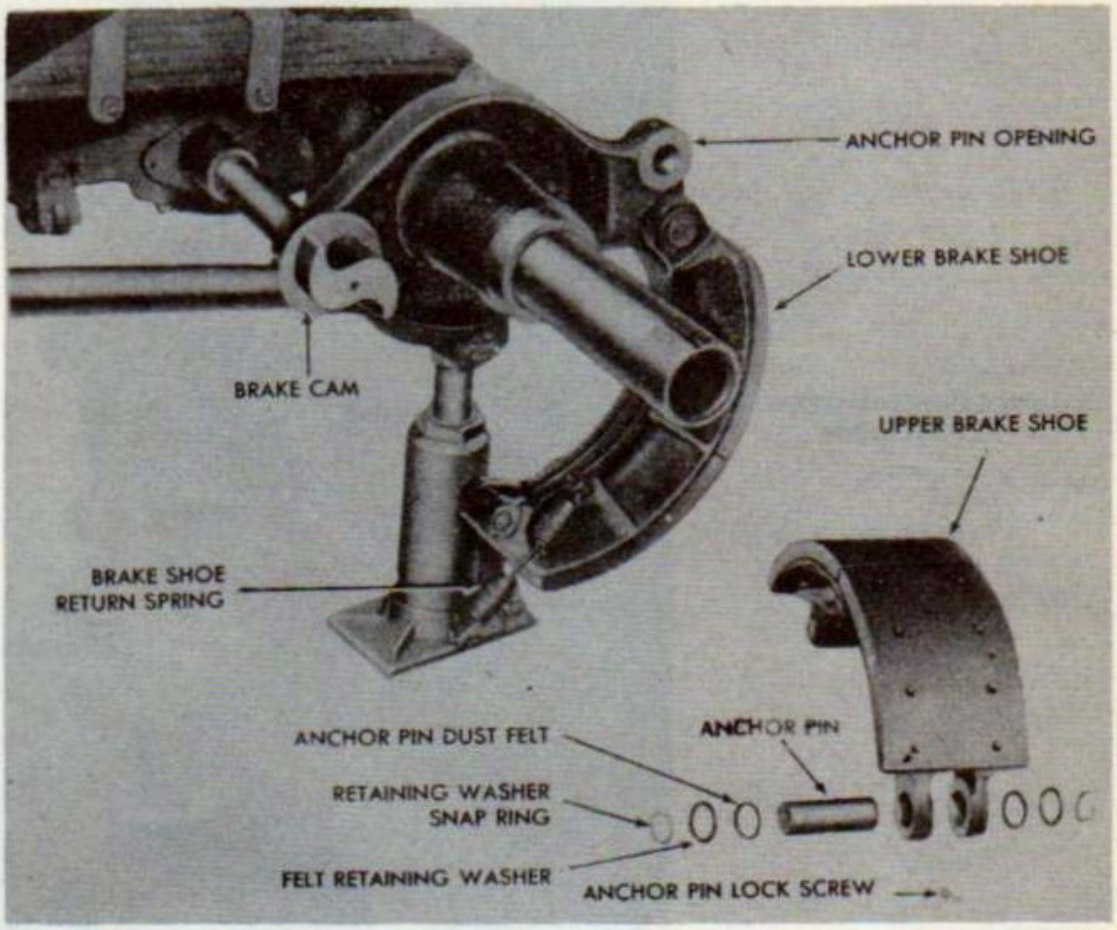

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Figure 130—Rear Axle Brake Shoe Replacement

washers. Disconnect brake shoe return spring. Remove anchor pin set screw lock wire. Remove set screw. Remove anchor pin lock rings, and drive anchor pins out of shoe assembly, using care not to damage or misplace anchor pin grease felts and retainers; lift off shoes (fig. 130).

b. Installation. Position shoes on brake spider. Install anchor pin. Install grease retainer felts, retainers, and lock ring. Install brake anchor pin cap screw and lock wire (fig. 130). Install brake shoe return spring, and set brake camshaft to full released position,

turning slack adjuster adjusting worm counterclockwise. Replace hub and drum assembly (par. 197 b). Install axle shaft (par. 163) (fig. 121). NOTE: *Wheel bearings should be serviced whenever brake shoe replacements are made (par. 198).* Adjust brake assemblies (par. 171) (fig. 121).

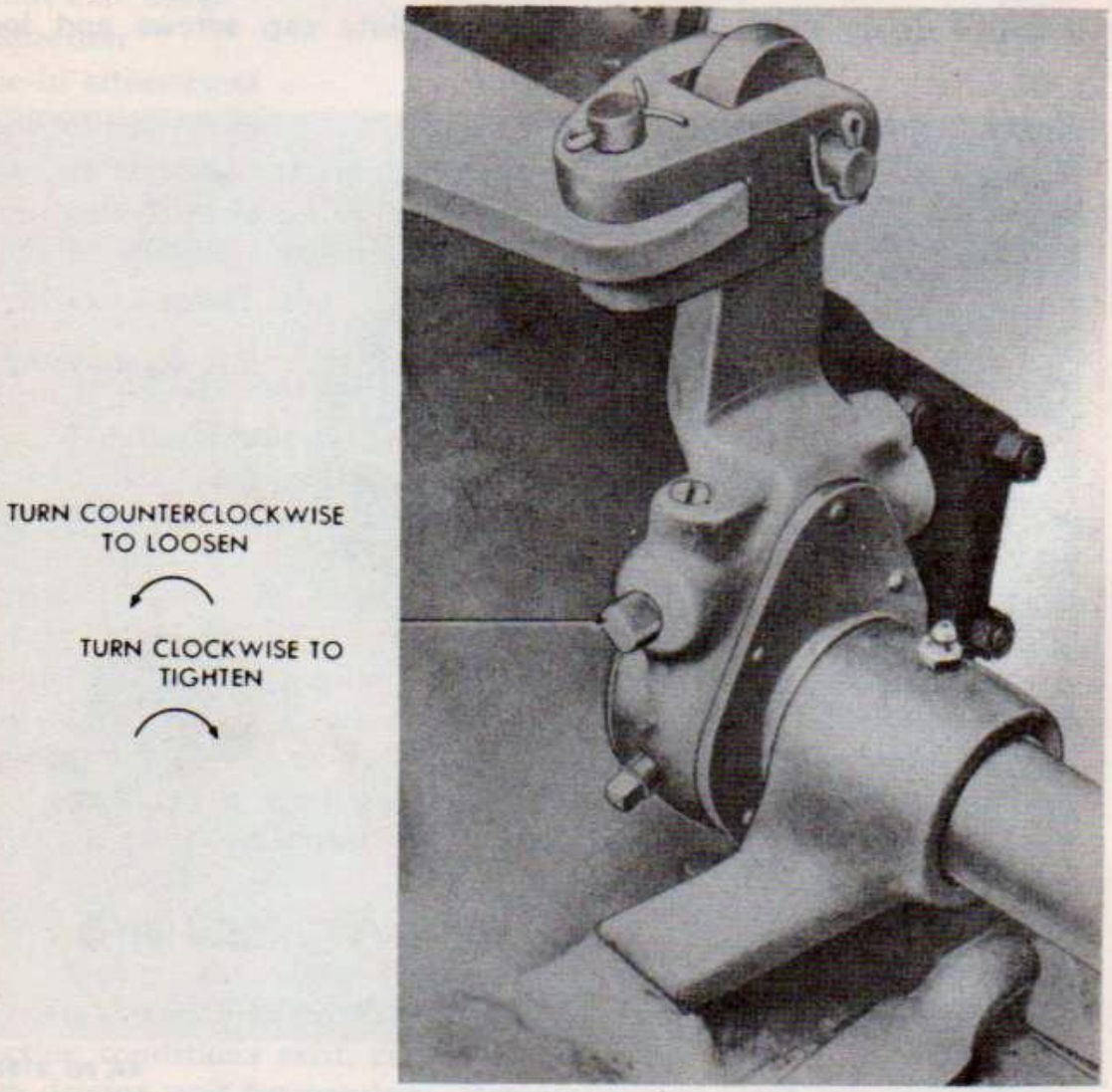

Figure 131—Rear Axle Brake Shoe Adjustment

171. REAR AXLE BRAKE ADJUSTMENT.

a. Adjustment Procedure. Place a jack under the rear axle housing, and raise wheel and tire clear of the ground. Turn brake slack adjuster worm clockwise until the brake shoes are tight against the brake drum; then turn the adjuster worm counterclockwise three notches.

b. Testing Procedure. Build up the air pressure in the reservoirs until 90 pounds of pressure is obtained; then step on brake pedal and measure the travel of the slack adjuster arm. This measurement

should be ¾ inch when the brakes are adjusted. When the arm travel has increased to 1½ inches, the brakes should be readjusted as outlined in subparagraph **a** above. Repeat this operation on each rear axle brake assembly until all four brake assemblies have been adjusted.

172. FRONT BRAKE DRUM REPLACEMENT.

a. Removal. Remove wheel (par. 192 **a**). Remove front axle drive flange (par. 158) (fig. 117). Remove hub and drum assembly (par. 195 **a**). Place the hub and drum assembly with the drum open end up, and remove the 10 wheel stud inner nuts. Turn nuts counter-

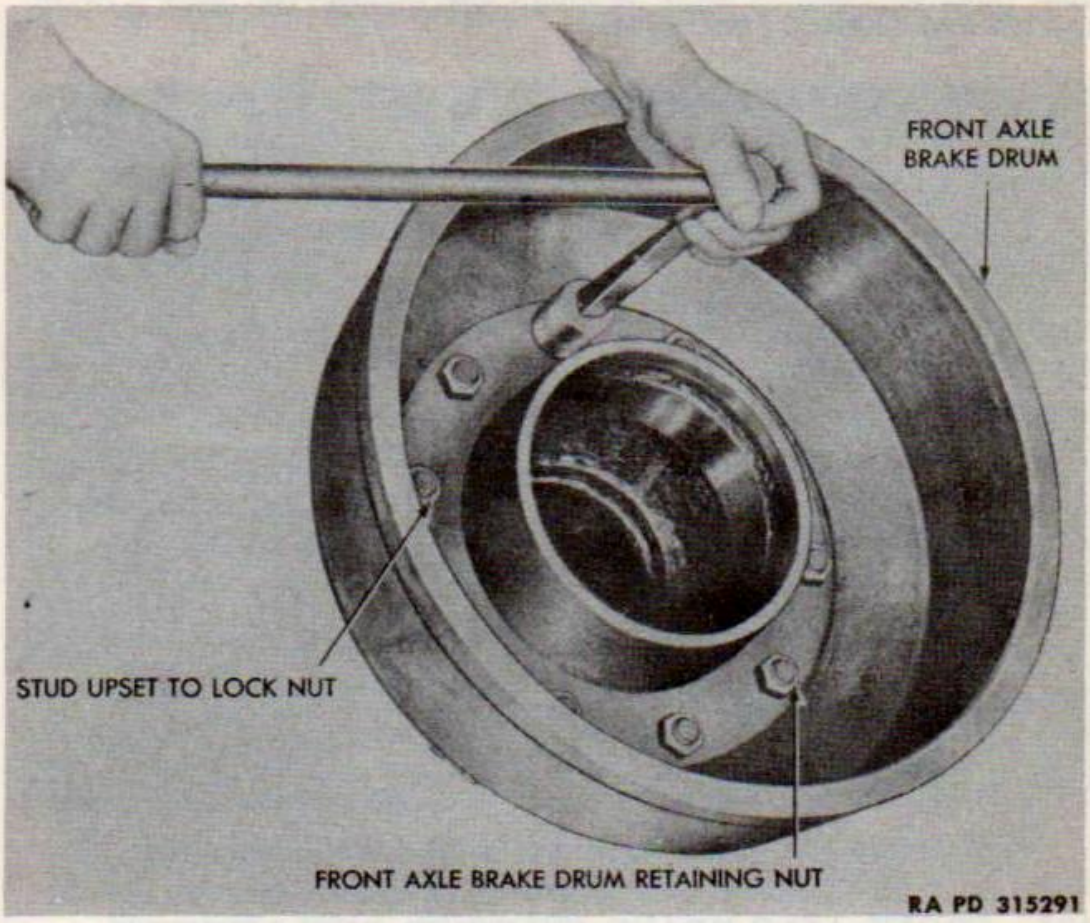

Figure 132—Replacing Front Axle Brake Drum

clockwise. Turn drum face down, rest hub on wood block, and drive drum off wheel studs.

b. Installation. Place drum on studs. Install 10 drum stud nuts, and tighten down securely. Do not tighten stud nuts in a circle but proceed in a criss-cross fashion. Upset threads on each stud at juncture of stud and nut (fig. 132). Install hub and drum assembly (par. 195 **c**). Install axle drive flange (par. 158) (fig. 117). Install wheel (par. 192) (fig. 151). Adjust brakes (par. 169) (fig. 129).

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173. REAR BRAKE DRUM REPLACEMENT.

a. Removal. Remove wheels (par. 193) (fig. 152). Remove axle shaft (par. 163) (fig. 121). Remove hub and drum assembly (par. 197). Remove hub and drum stud inner nuts (fig. 133). Lift off grease slinger and remove drum.

b. Installation. Set drum on studs, and install grease slinger. Install hub and drum nuts, and upset each stud to lock nuts in position. Install hub and drum assembly (par. 197 **b**). Install axle shaft (par. 163) (fig. 117). Install wheels (par. 193) (fig. 152). Adjust brakes (par. 171) (fig. 131). Wheel bearings should be inspected and serviced (par. 198).

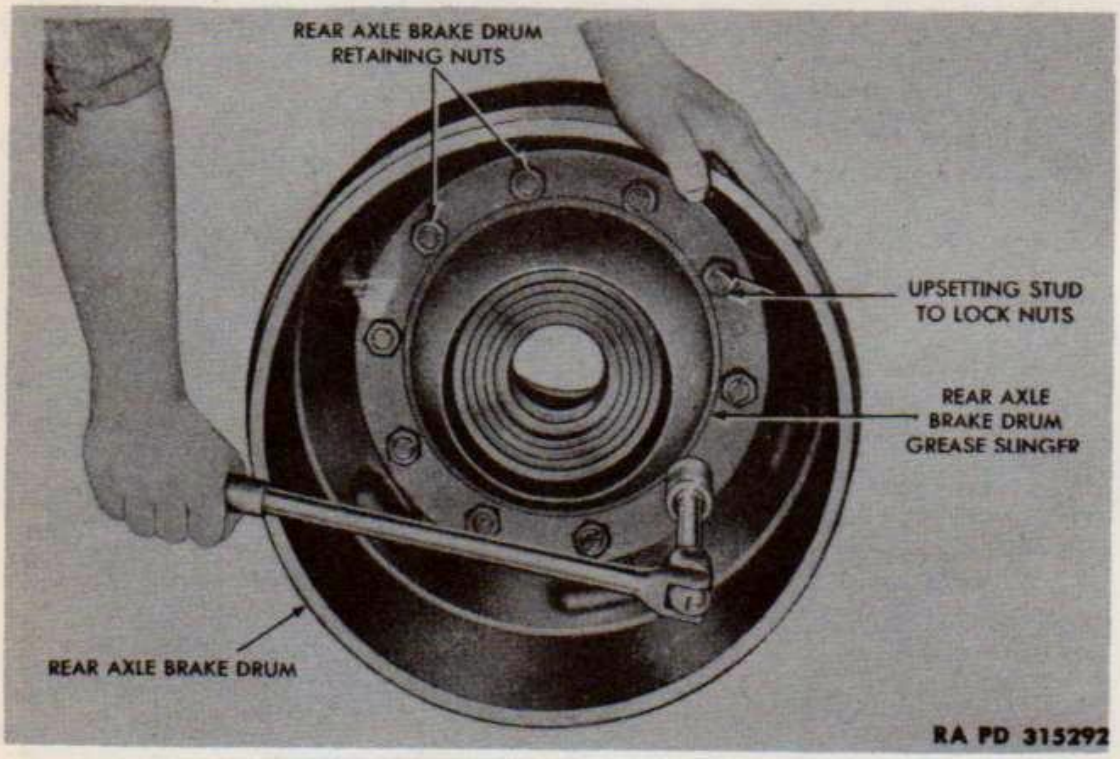

Figure 133—Rear Axle Brake Drum Replacement

174. FRONT AXLE BRAKE CYLINDER REPLACEMENT.

a. Removal. Remove cotter pin from push rod yoke pin. Remove yoke pin. Remove brake chamber air line (fig. 134). Remove two brake chamber stud nuts. Lift brake cylinder off bracket studs.

b. Installation. Mount brake cylinder on bracket studs and install nuts. Replace yoke pin and cotter pin attaching push rod to slack adjuster. Install brake chamber air line. Hold the $^{15}/_{16}$-inch wrench against rotation, and tighten union fitting into cylinder elbow. In this way, no twist is placed in the flexible air hose (fig. 134). Adjust brakes (par. 169) (fig. 129). Build up air pressure, and apply brakes to inspect for air leaks.

175. REAR BRAKE CHAMBER REPLACEMENT.

a. Removal. Disconnect air hose at brake chamber pressure plate using a 7/8-inch wrench to turn union. At the same time use a 15/16-inch wrench on the air hose fitting to prevent rotation and placing a twist in the flexible air line (fig. 134). Remove push rod yoke cotter and clevis pins. Remove four stud nuts and lock washers attaching brake chamber to bracket. Lift chamber off studs (fig. 135).

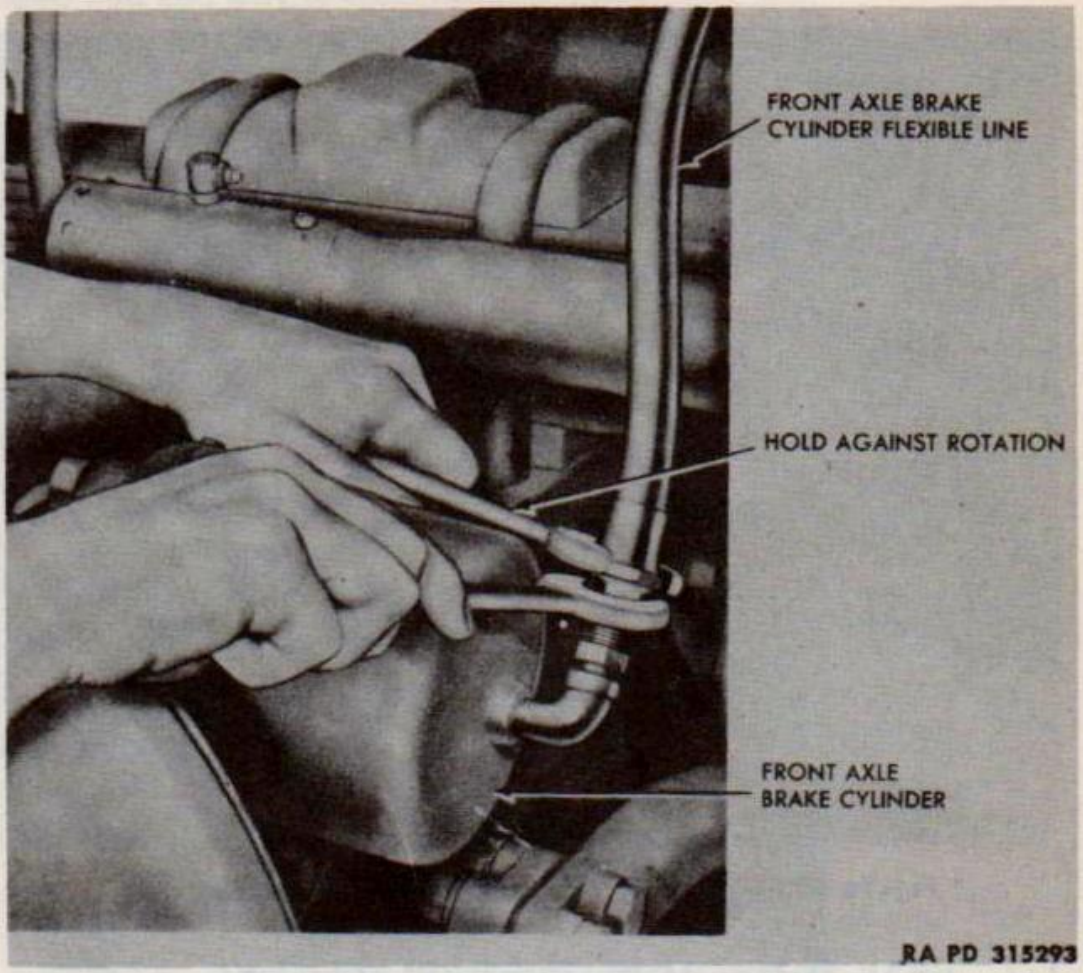

Figure 134—Front Axle Brake Cylinder Removal

b. Installation. Place chamber on bracket studs, and install lock washers and nuts. Connect chamber push rod to equalizer beam by installing clevis and cotter pins (fig. 135). Connect air hose as outlined in subparagraph a above. Adjust brakes (par. 171) (fig. 131). Start motor and build up the air pressure. Apply brakes, and inspect for air leaks.

176. FRONT SLACK ADJUSTER REPLACEMENT.

a. Removal. Remove cotter pin from push rod yoke pin, and remove yoke pin (fig. 135). Turn adjusting screw counterclockwise until arm is clear of chamber push rod yoke (fig. 131). Place small

screwdriver back of brake camshaft snap ring and pry off (fig. 136). Slide slack adjuster off camshaft.

b. Installation. Place slack adjuster in position, and install snap ring. Turn adjusting screw on slack adjuster to position arm in push rod yoke (fig. 129). Replace yoke pin and cotter pin. Adjust brake shoe clearance (par. 169).

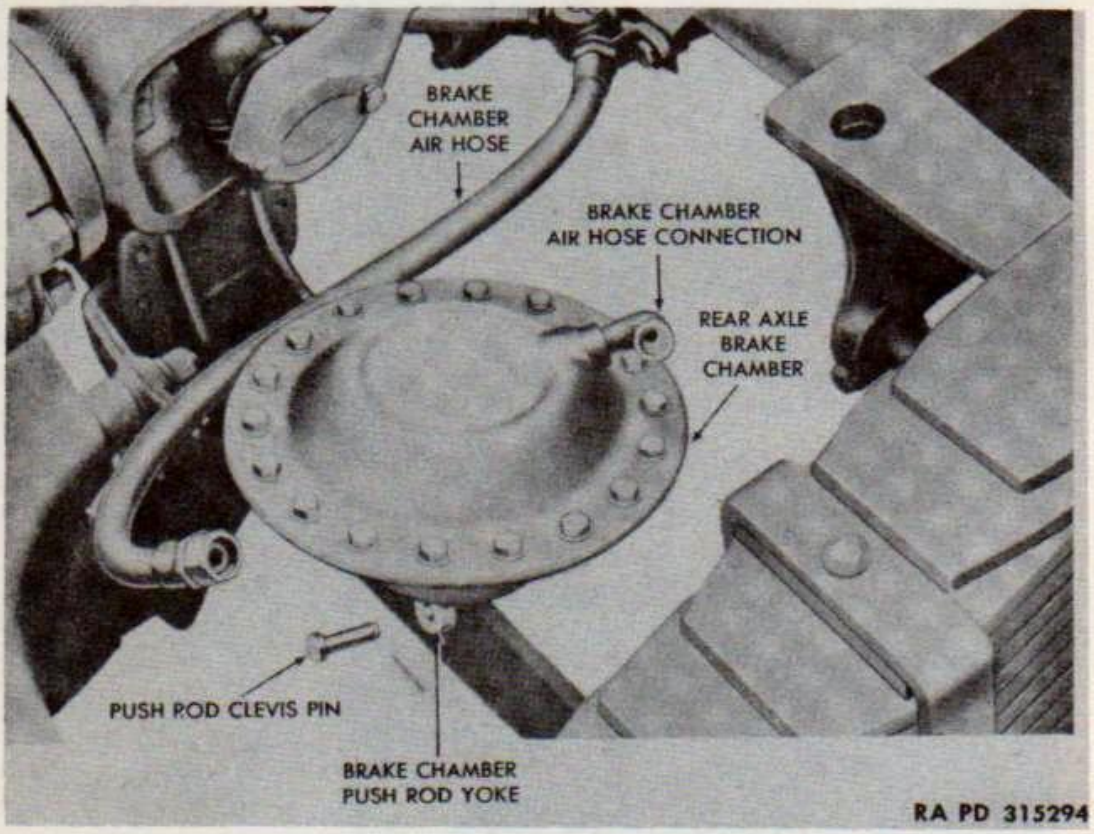

Figure 135—Rear Axle Brake Chamber Replacement

177. REAR SLACK ADJUSTER REPLACEMENT.

a. Removal. Remove cotter and clevis pins attaching slack adjuster arm to equalizing beam (fig. 135). Remove slack adjuster retaining screw from end of brake camshaft. Turn slack adjuster adjusting screw clockwise to raise arm clear of clevis, and slide arm towards center of axle until clear of spline (fig. 137).

b. Installation. Set slack adjuster on spline, and install retaining washer and retaining washer screw. Center punch retaining washer into slot of screw head. Turn slack adjuster adjusting screw counterclockwise to lower arm into equalizing clevis, and install clevis pin and cotter pin. Adjust brakes (par. 171) (figs. 131 and 134).

178. COMPRESSOR REPLACEMENT AND SERVICE.

a. Service. The only service required on the air compressor is removal and cleaning of the air intake filter (fig. 138). This service should be performed every time the engine air cleaner is serviced. Remove two screws attaching air filter to compressor cylinder block.

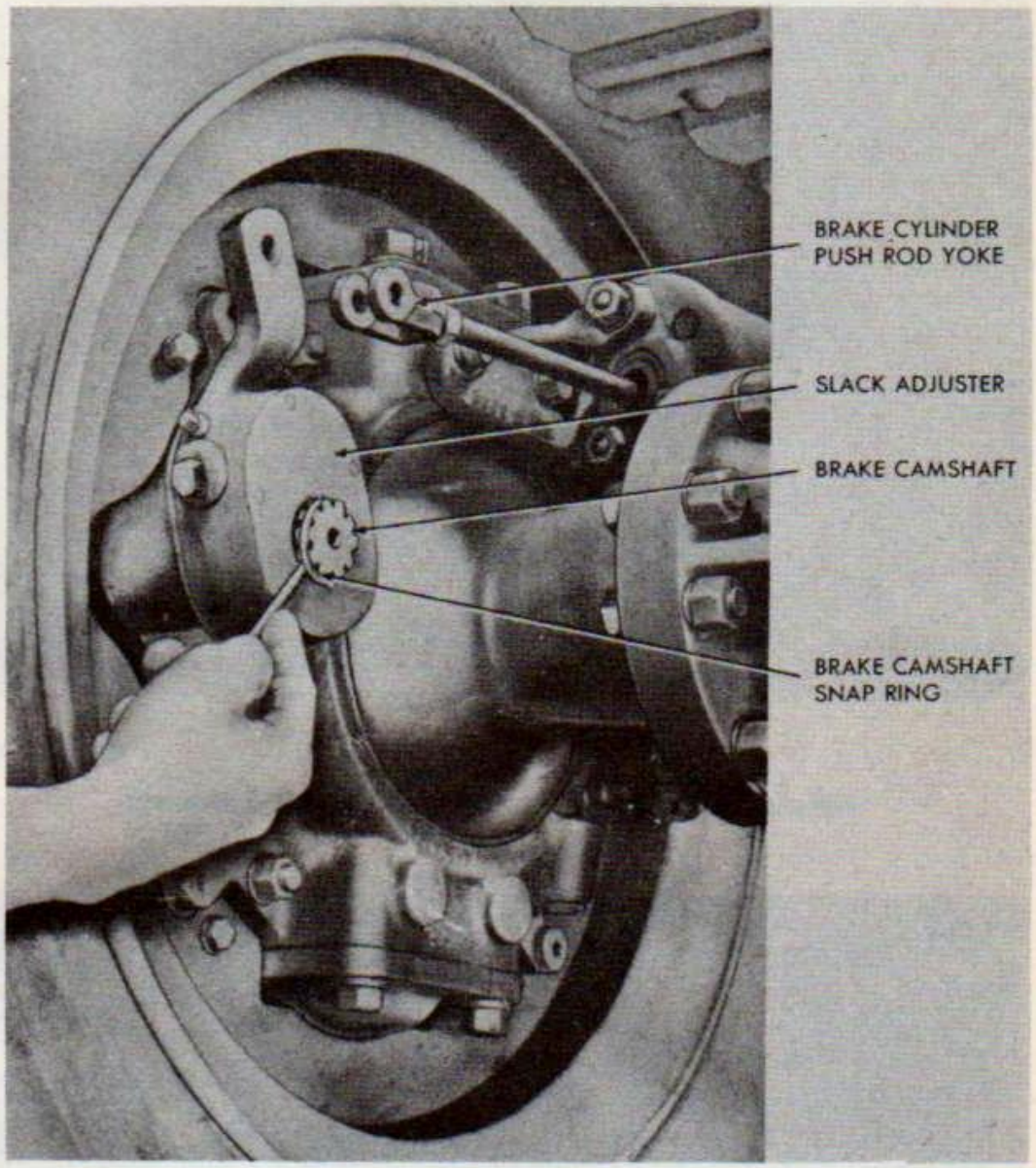

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Figure 136—Removing Front Axle Slack Adjuster

Remove lock wire from base of filter housing and remove plates, screens, spring, and curled hair. Wash parts in dry-cleaning solvent, and reoil curled hair. Assemble filter parts in rotation shown in figure 138. Position filter on compressor and install screws.

b. Removal. The compressor is located on the left side of the engine at the rear of the timing gear case (fig. 58). Remove air cleaner (par. 75). Remove water pump (par. 86) (fig. 88). Remove

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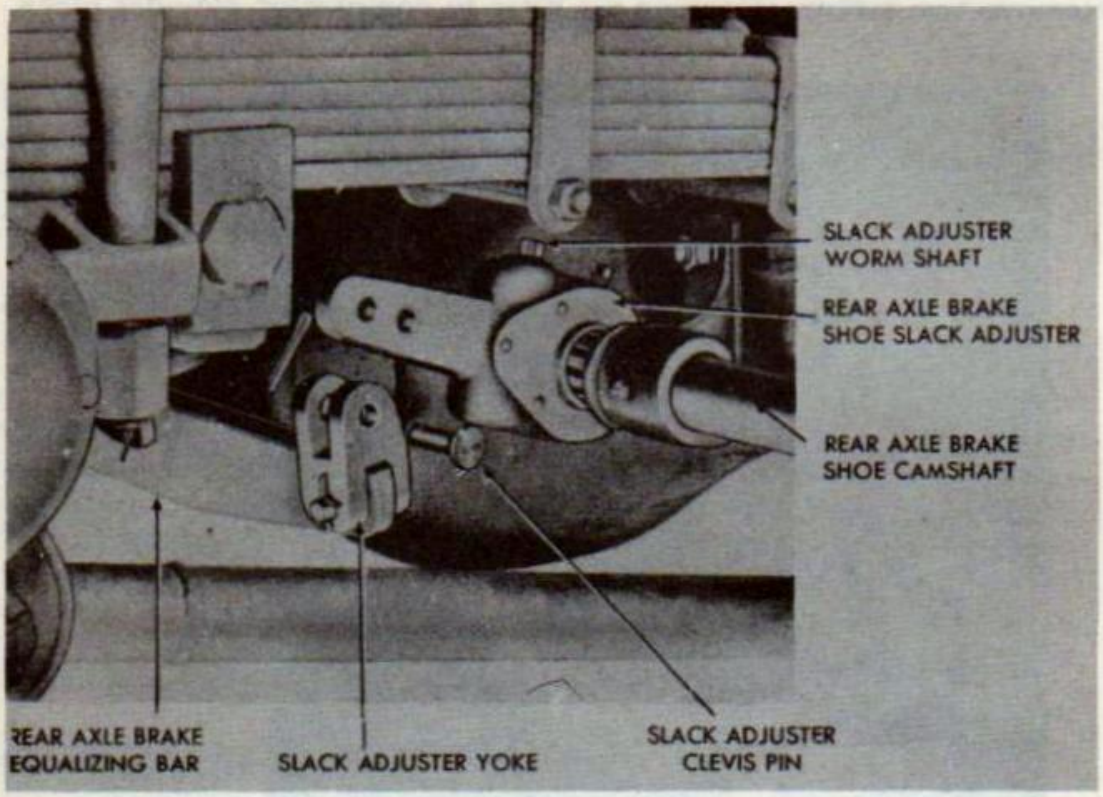
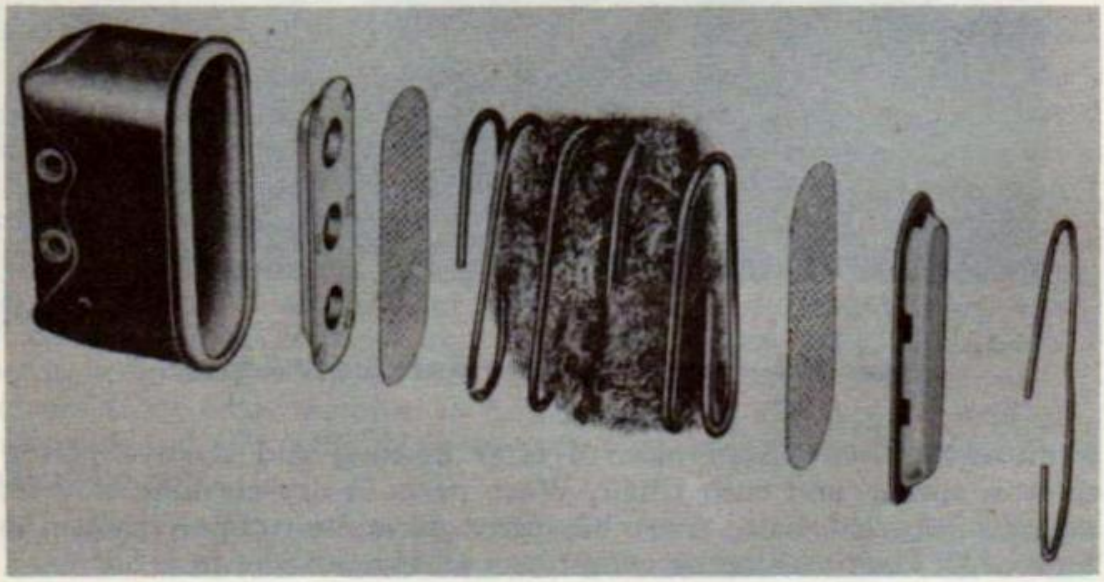


RA PD 315296

Figure 137—Rear Axle Slack Adjuster Removal



RA PD 315297

Figure 138—Air Compressor Air Filter Service

governor air line at compressor head. Disconnect discharge line. Remove three stud nuts and lock washers at compressor mounting flange. Remove two cap screws at compressor end of support bracket, and remove two stud nuts and lock washers at crankcase end of compressor support bracket. Using two bars, pry compressor back from gear case, one bar at top, and one bar at bottom of compressor mounting flange. Lift compressor from truck (fig. 138).

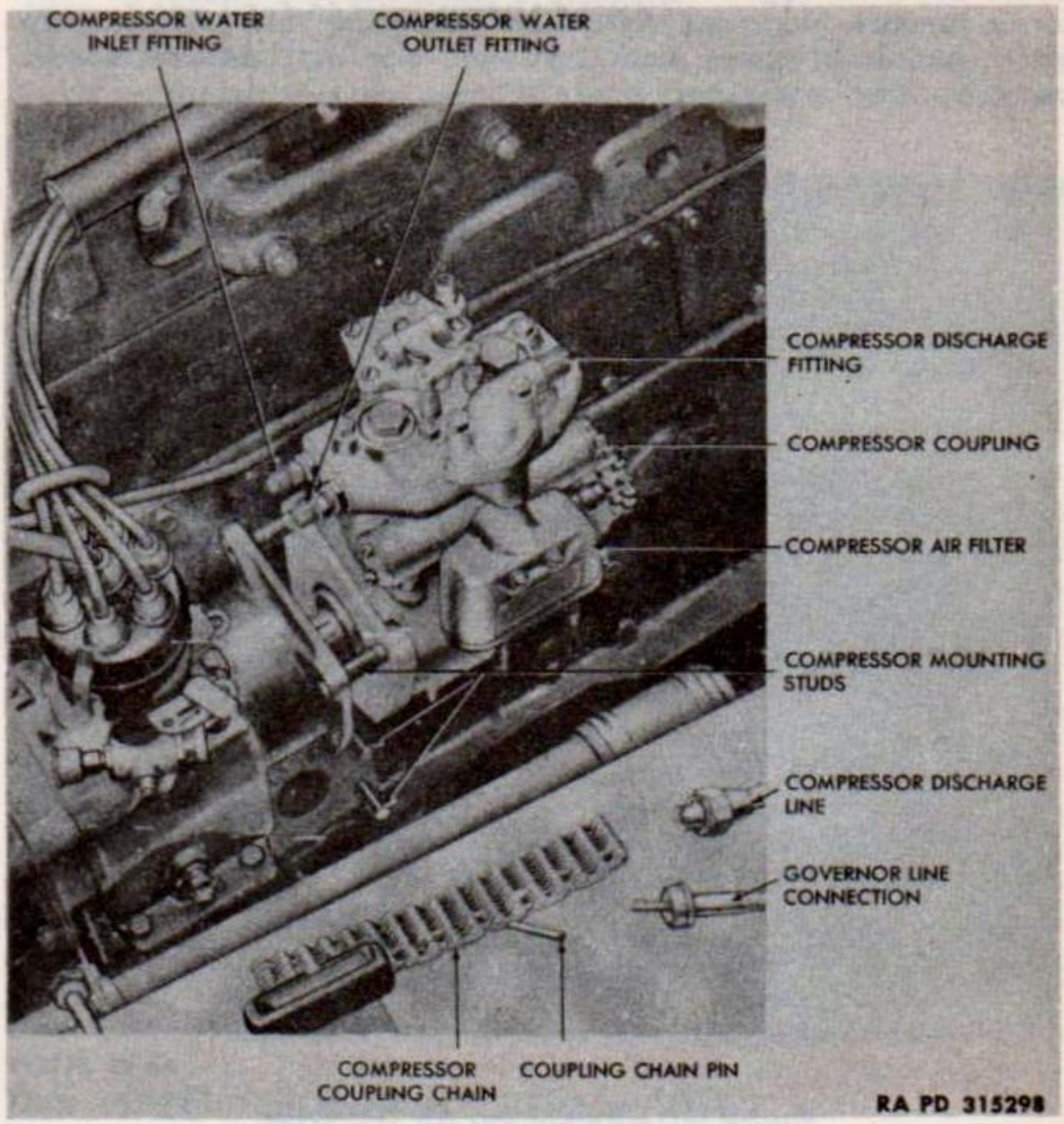


Figure 139—Air Compressor Removal

c. Installation. Make sure that lubricating oil metering pin is in the accessory drive shaft before installing the compressor. With a new gasket between compressor mounting flange and drive housing, enter compressor crankshaft splined and into drive sleeve, and push compressor forward into position (fig. 138). Install three stud nuts and lock washers attaching compressor to mounting flange. Replace cap screws and lock washers at compressor end of support bracket. Install lock washers and stud nuts at crankcase end of support

bracket. Connect governor air line at compressor head, and install compressor discharge line. Install water pump (par. 86) (fig. 88). Install engine air cleaner (par. 75).

179. GOVERNOR (AIR) REPLACEMENT.

a. Removal. The air compressor governor is mounted on the dash under the hood (fig. 140). Drain air reservoir. Disconnect air lines to air junction block and compressor unloading valve. Remove cap screw, nut, lock washer, and stove bolt, also nut and lock washer under warning buzzer cover inside of dash.

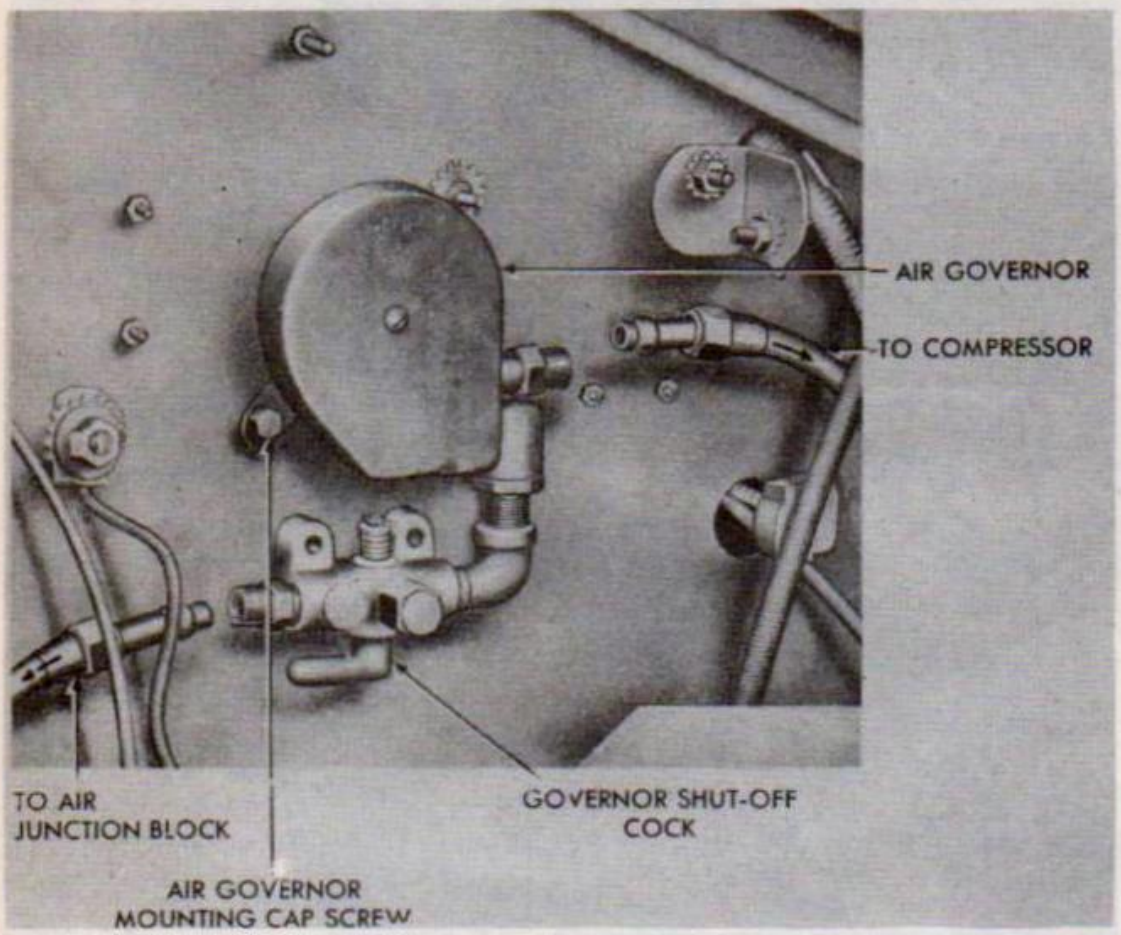


Figure 140—Removing Air Governor

b. Installation. Install cap screw, lock washer, and nut, also stove bolt, lock washer, and nut. Install warning buzzer cover. Connect air lines (fig. 140). Close reservoir drain cock, and build up air pressure. Inspect connections for air leaks.

180. RESERVOIR REPLACEMENT.

a. Removal. The air reservoirs are located on the inside of the frame side rails to the rear of the transfer case. Drain air reservoir. Disconnect three air line connections at reservoir. Remove tank

clamp bolt nuts and lock washers. Using a bar, pry lower half of clamp down, and lift reservoir out through bracket opening (fig. 141).

b. Installation. Set reservoir in frame clamp brackets, and install clamp bolt lock washers and nuts. Connect air lines (fig. 141). Close drain cock. Build up air pressure. Inspect for air leaks.

181. SAFETY VALVE REPLACEMENT.

a. Removal. The safety valve is located on the front of the dash board at the air junction block. Drain air reservoir. Turn valve out of junction block (fig. 142).

b. Installation. Install valve in junction block, and close drain cock. Build up air pressure, and inspect for air leaks.

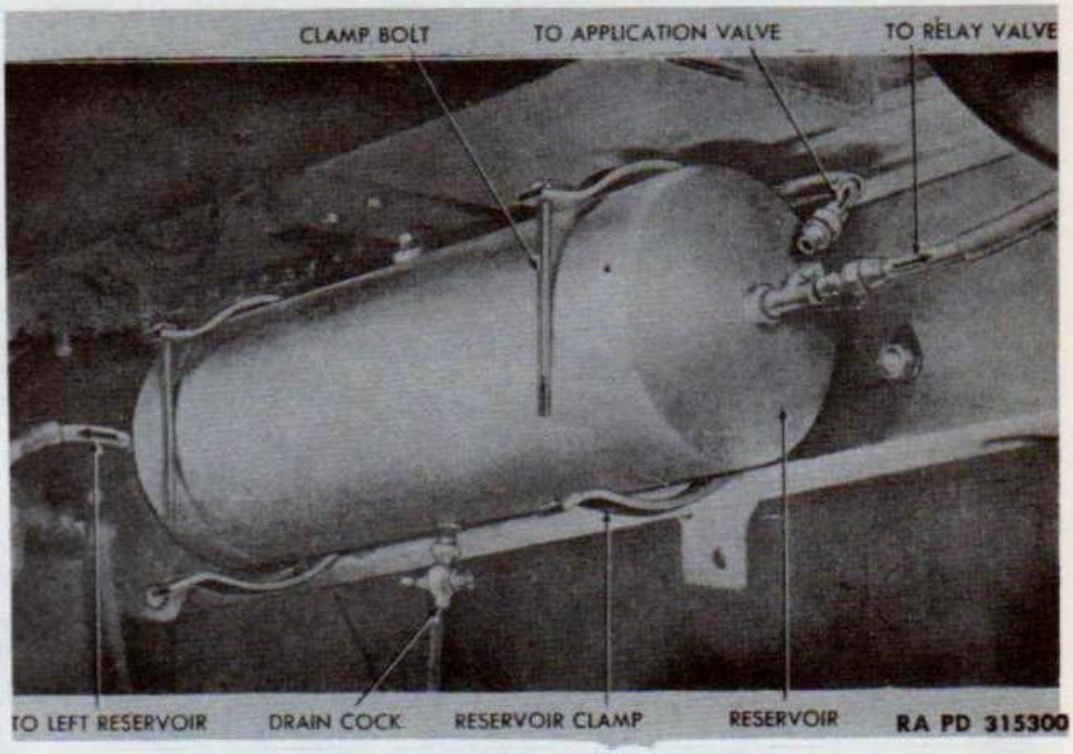


Figure 141—Air Reservoir Replacement

182. APPLICATION VALVE REPLACEMENT.

a. Removal. The application valve is located on the left front side of the transfer case support. Drain air reservoir. Remove cotter and clevis pins at pull rod. Disconnect four air line connections. Remove four cap screws and lock washers attaching valve to transfer case front support (fig. 143).

b. Installation. Position valve on bracket, and install attaching cap screws and lock washers. Connect air lines (fig. 143). Close reservoir drain cock. Start engine and build up air pressure. Inspect for air leaks.

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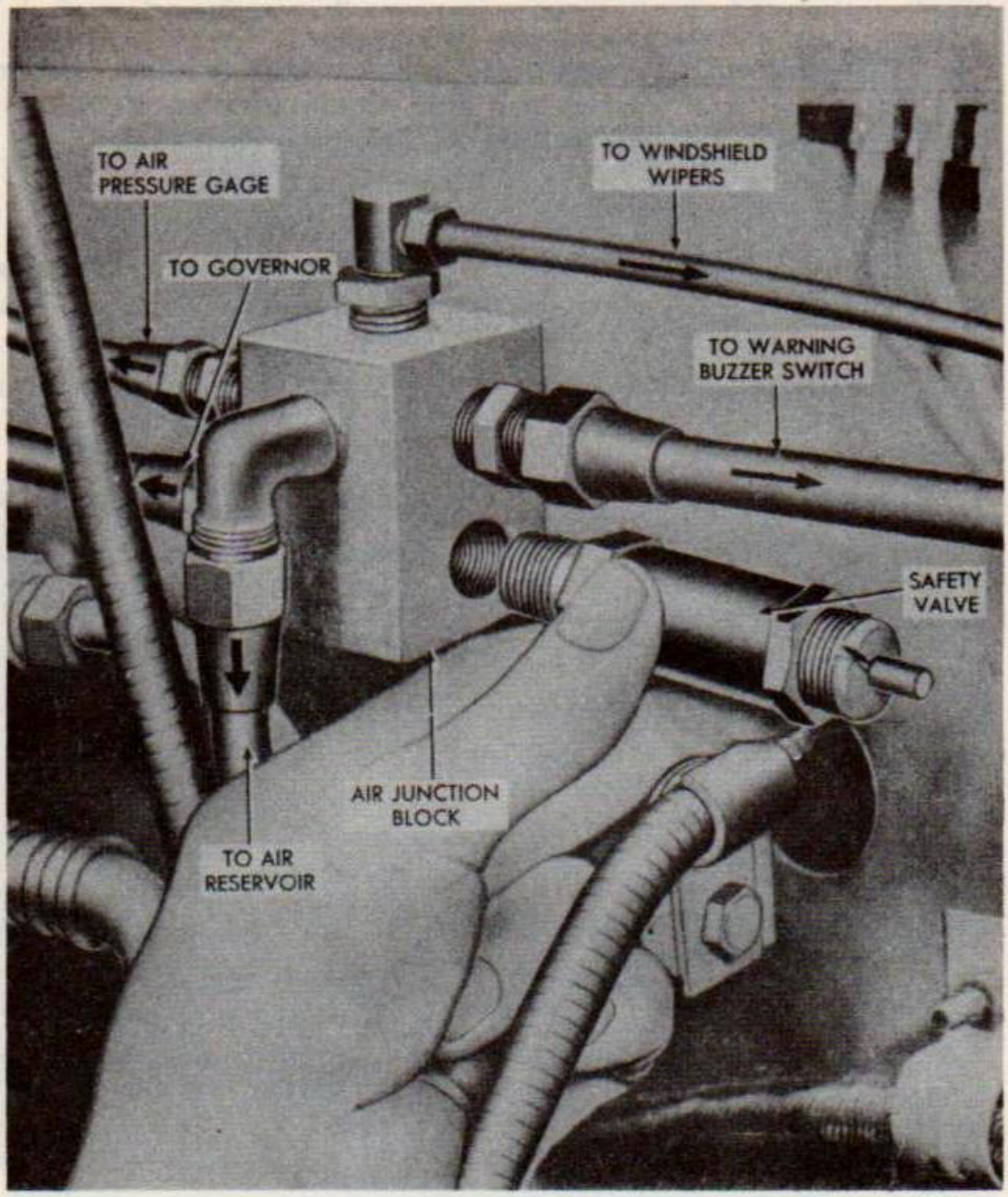

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Figure 142—Installing Safety Valve

183. SERVICE BRAKE CONTROL.

a. Linkage Adjustment. The brake application valve end on the pull rod is provided with an adjustable yoke. The normal rod length is 27 inches with the brake pedal at rest against the toeboard. With the rod properly adjusted, the application valve arm should be off its stop $\frac{1}{16}$ inch. Adjustment is made by removal of cotter and clevis pins from adjustable yoke and loosening lock nut. To lengthen, turn yoke counterclockwise, to shorten turn clockwise.

184. RELAY VALVE REPLACEMENT.

a. Removal. The relay valve is located on forward side of frame cross member above the rear axles. Drain reservoir. Disconnect seven air lines at relay valve (fig. 144). Remove two cap screws, nuts, and lock washers attaching valve to rear axle cross member.

b. Installation. Place valve in position on cross member, and install two attaching cap screws, nuts, and lock washers. Connect

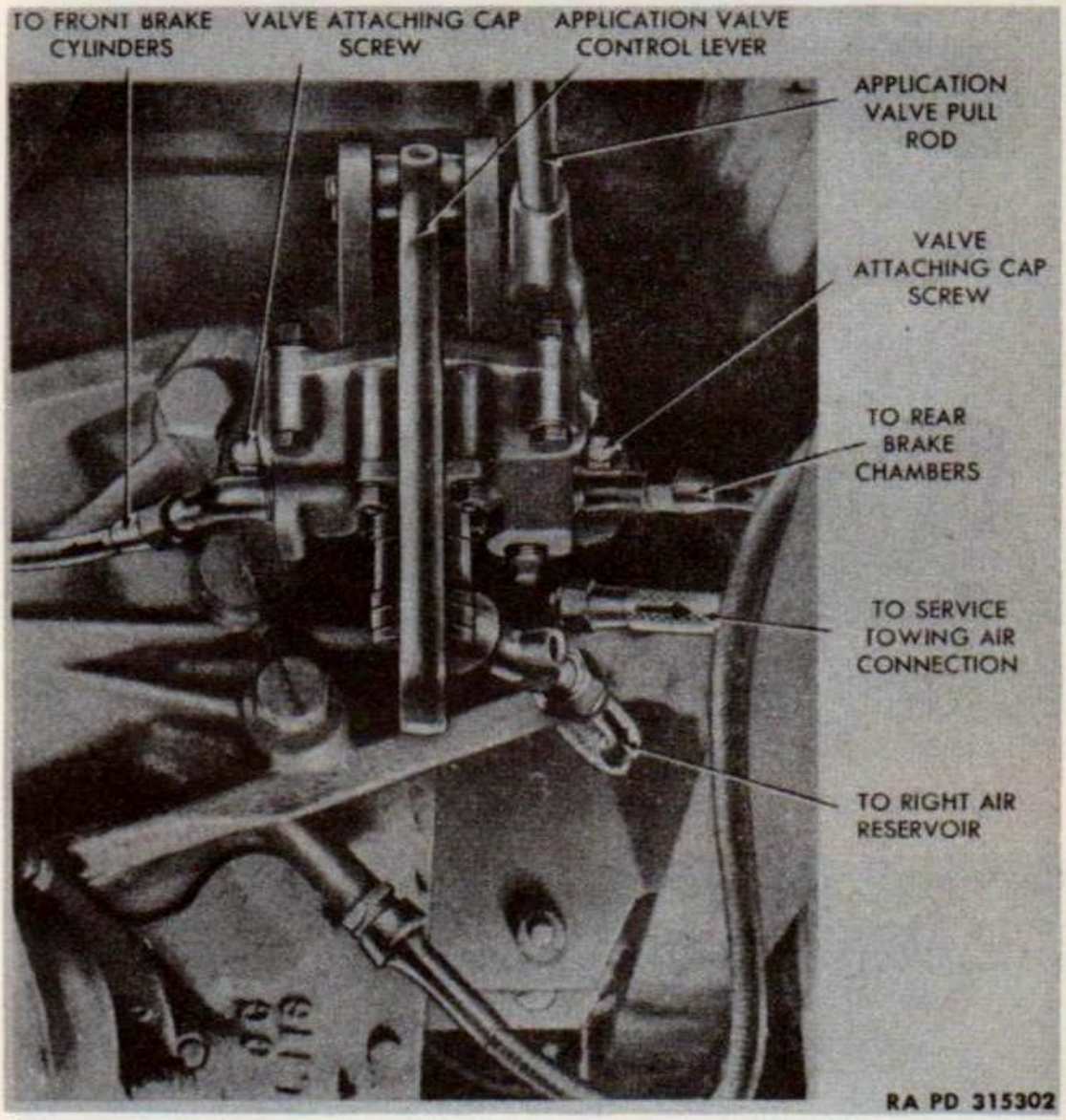

Figure 143—Brake Application Valve Removal

air lines (fig. 144). Close reservoir drain cock. Start engine and build up reservoir pressure. Inspect for air leaks.

185. QUICK RELEASE VALVE REPLACEMENT.

a. Removal. The quick release valve is located on forward side of front cross member below the radiator. Drain air reservoir. Remove

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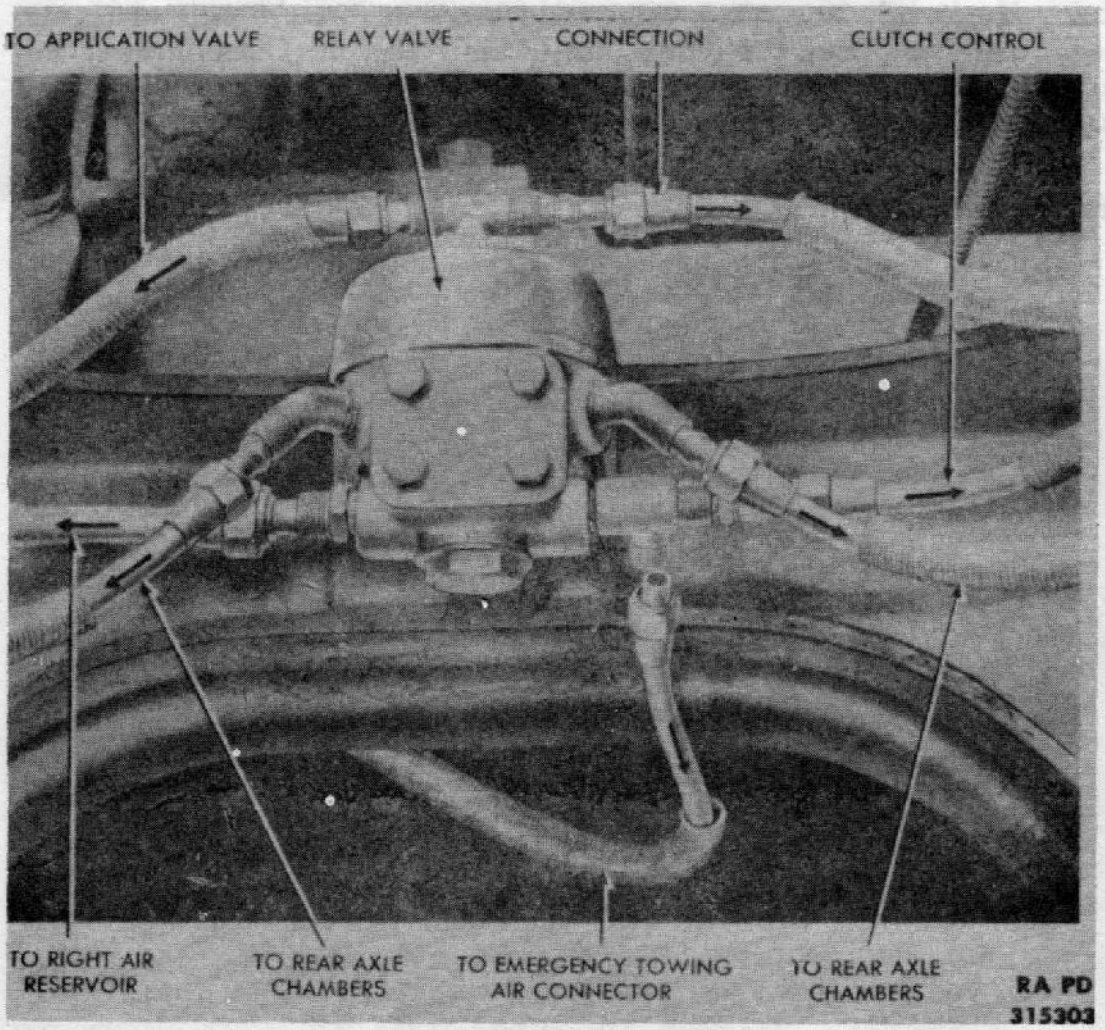

Figure 144—Relay Valve Removal

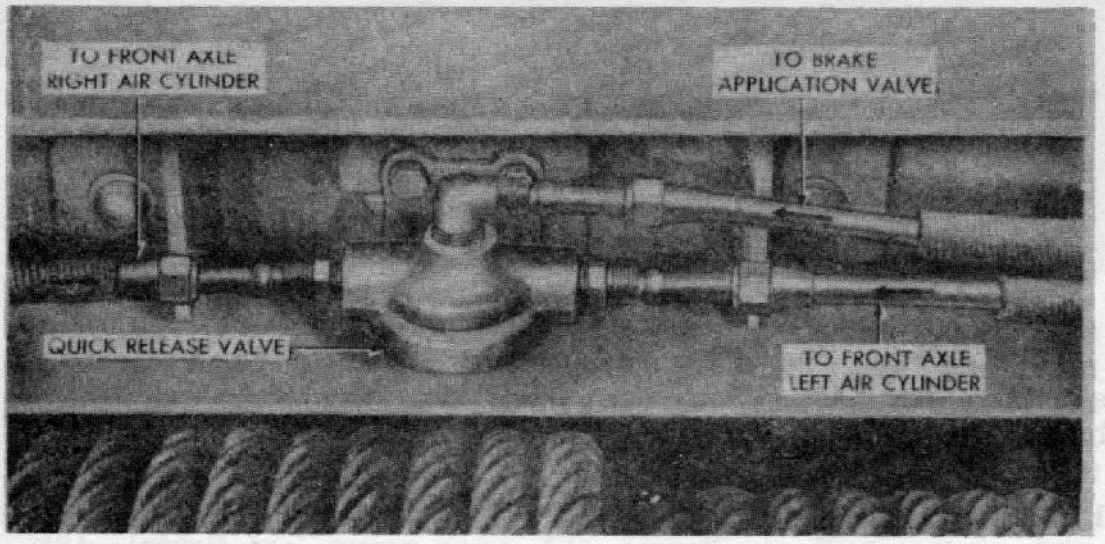

Figure 145—Removing Quick Release Valve

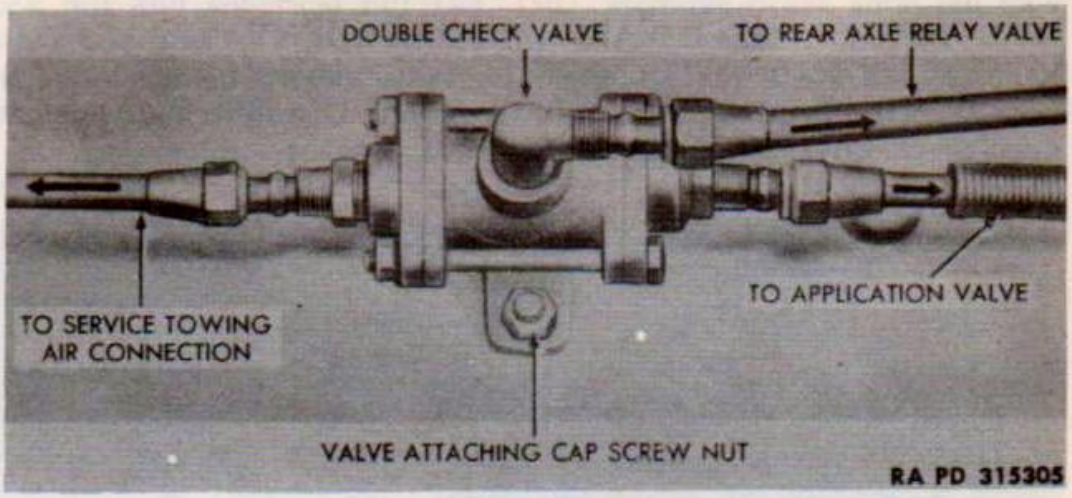

Figure 146—Double Check Valve Removal—Crane Line

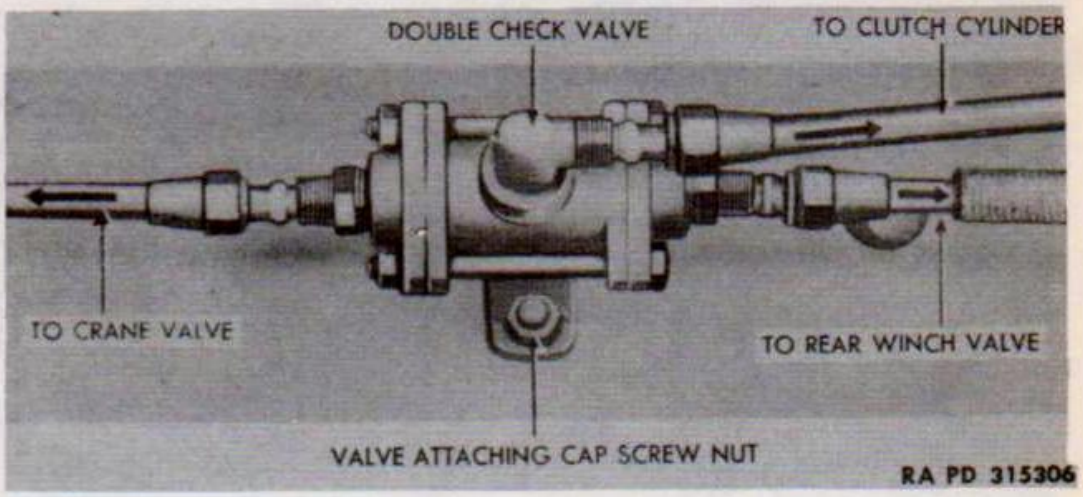

Figure 147—Double Check Valve Removal—Towing Line

three air lines. Remove two cap screws, lock washers, and nuts attaching valve to cross member (fig. 145).

b. Installation. Place quick release valve in position, and install cap screws, lock washers, and nuts. Connect air lines (fig. 145). Close drain cock. Start engine and build up air pressure. Apply brakes and inspect for air leaks.

186. DOUBLE CHECK VALVE REPLACEMENT.

a. Removal. There are two double check valves installed on the truck, one in each frame rail. Drain air reservoir. Disconnect three air lines (figs. 146 and 147). Remove cap screw, nut, and lock washer attaching valve to frame rail.

b. Installation. Install attaching cap screw, lock washer, and nut. Connect air lines (figs. 146 and 147). Close reservoir drain cock. Start engine and build up air pressure. Inspect for air leaks.

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187. SINGLE CHECK VALVE REPLACEMENT.

a. Removal. The single check valve is located on the lower left corner of the brush guard. Drain reservoir. Disconnect air line, and turn check valve out of cut-out cock (fig. 148).

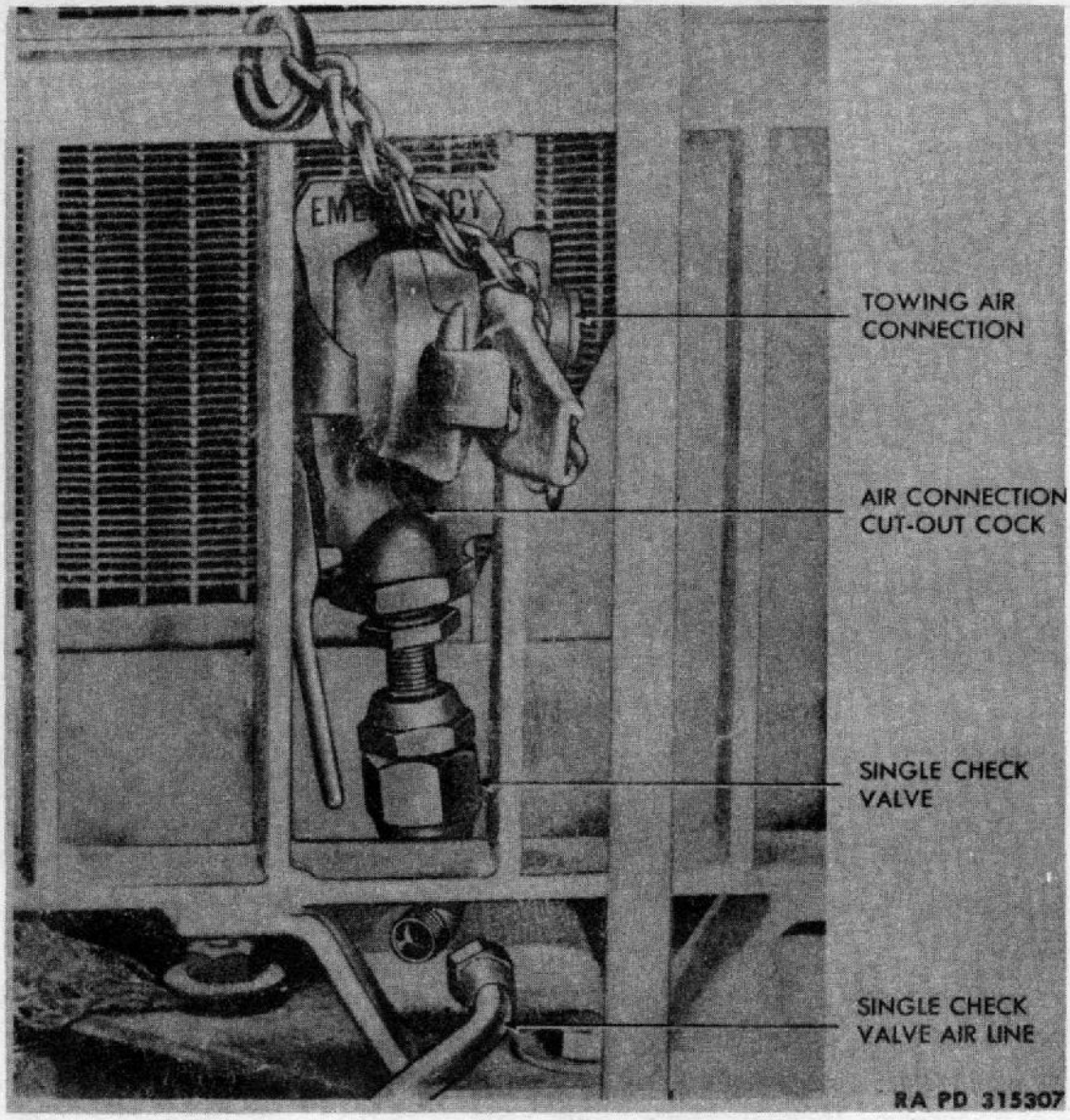

Figure 148—Removing Single Check Valve

b. Installation. Turn valve into cut-out cock and connect air line. Close reservoir drain cock. Start engine, and build up reservoir pressure. Inspect for air leaks.

188. PARKING BRAKE SHOE REPLACEMENT.

a. Removal. Remove pull rod cotter and clevis pins from shoe operating lever and cross shaft levers (fig. 150). Remove three cap screws and lock washers anchoring shoe assembly to frame cross member. These are located on top of cross member. Shoe assembly can then be lowered and removed from truck. Remove adjusting rod

lock nut and spherical nut (fig. 150). Remove brake shoe pin lock cap screw and lock washer, and lift off lock plate (fig. 149). Drive pin out of shoe. Disconnect shoe alining spring, and lift shoe out of assembly (fig. 149).

b. Inspection. Inspect shoe lining and bushing for wear, and replace with new shoe if worn. Inspect disk for scoring, run-out, looseness or heat checking.

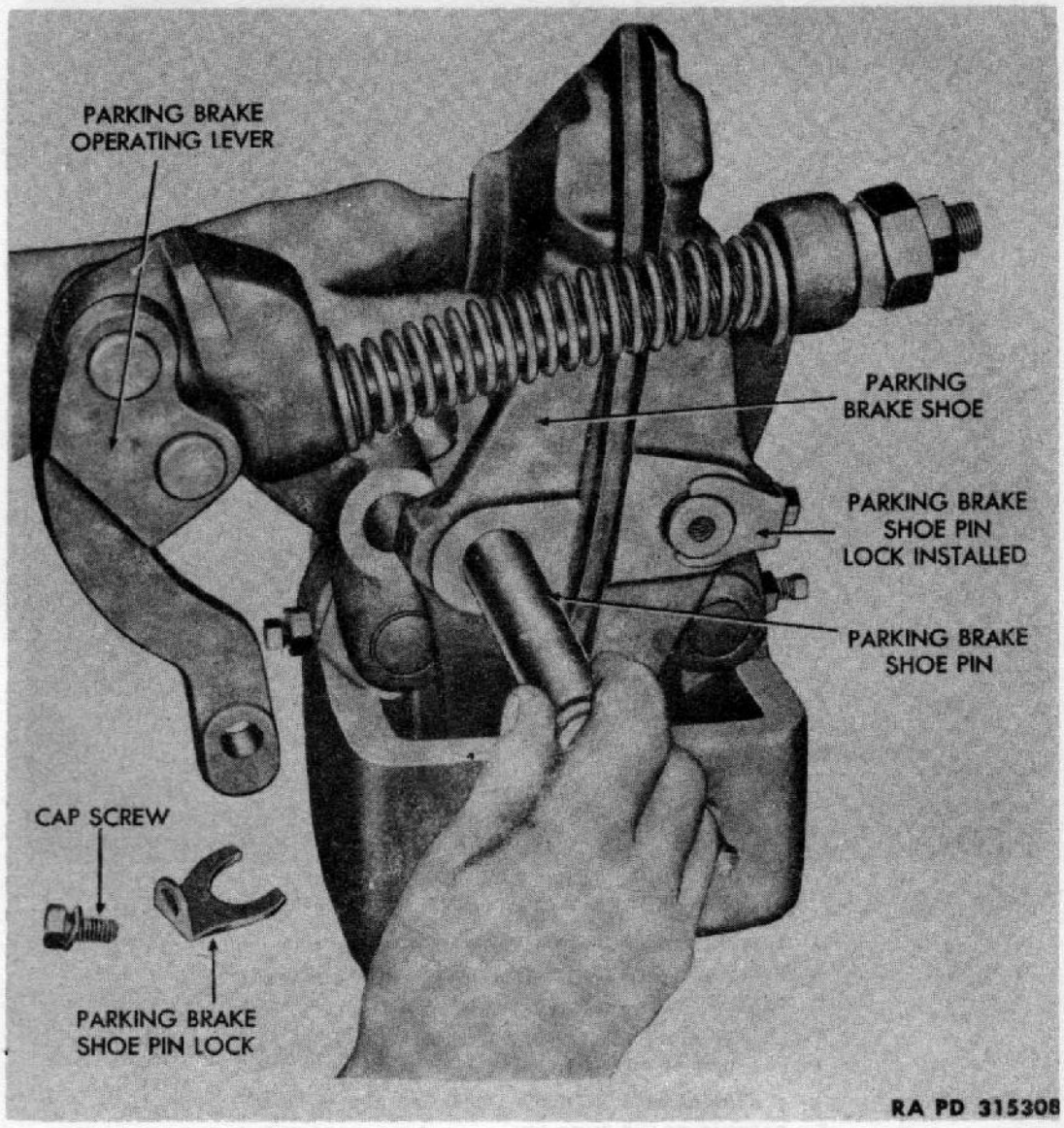

Figure 149—Parking Brake Shoe Replacement

c. Installation. Position shoe in bracket and install shoe pin, lock plate, cap screw, and lock washer (fig. 149). Install shoe alining spring. Install spherical nut on operating lever rod. Install lock nut. Position complete shoe and bracket assembly in truck cross member. Install three cap screws and lock washers. Install the two operating lever to cross shaft lever pull rods (fig. 150). Install clevis and cotter pins (fig. 150).

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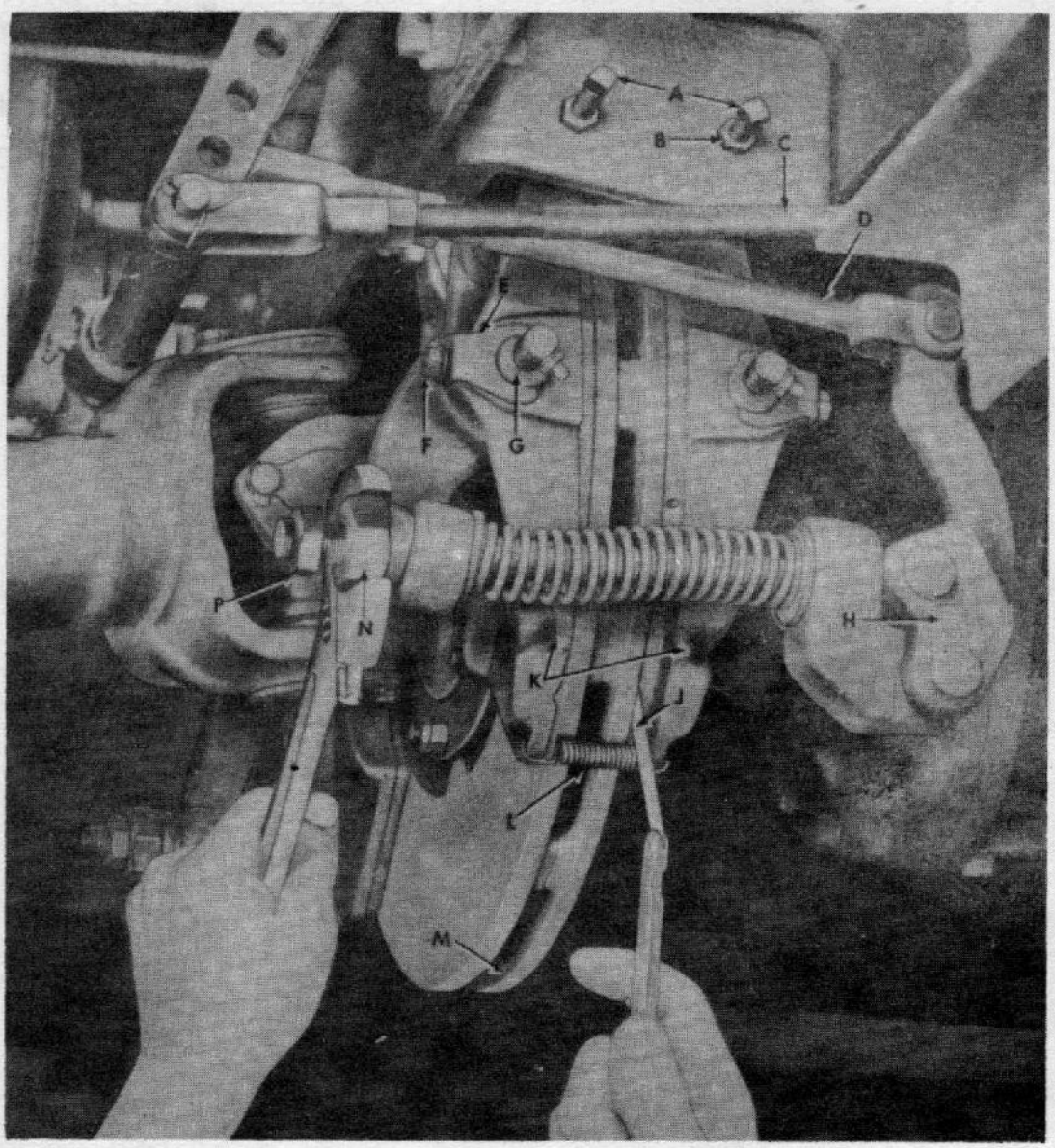

A—PARKING BRAKE SHOE ALINEMENT SCREWS
B—PARKING BRAKE SHOE ALINEMENT SCREW LOCK NUT
C—PARKING BRAKE HAND LEVER PULL ROD
D—CROSS SHAFT TO OPERATING LEVER PULL ROD
E—PARKING BRAKE SHOE PIN LOCK
F—PARKING BRAKE SHOE PIN LOCK CAP SCREW
G—PARKING BRAKE SHOE PIN
H—OPERATING LEVER
J—FEELER GAGE
K—PARKING BRAKE SHOES
L—PARKING BRAKE SHOE ALINING SPRING
M—PARKING BRAKE DISK
N—SPHERICAL ADJUSTING NUT
P—SPHERICAL ADJUSTING NUT LOCK NUT

RA PD 315309

Figure 150—Parking Brake Shoe Adjustment, Using Gage (41-G-400)

d. Adjustment. Loosen lock nuts on alining screws. Insert 0.020-inch feeler gage (41-G-400) between disk and shoe lining, and turn alining screws to secure proper clearance on upper end of shoe (fig. 150). Turning clockwise decreases clearance, and counterclockwise increases clearance. Back off lock nut, and turn spherical adjusting nut to secure 0.020-inch spacing at lower end of shoe. Turning adjusting nut clockwise, decreases clearance, and counterclockwise increases shoe clearance. Set up lock nut and recheck clearance (fig. 150). Lubricate shoe anchor pins and linkage (par. 26).

189. PARKING BRAKE CONTROL ROD SERVICE AND REPLACEMENT.

a. General. There are three pull rods actuating the parking brake. One leading from the parking brake lever to cross shaft, and two from cross shaft to the brake shoe operating levers. The normal length of these rods is 53½ inches and 11½ inches center-to-center of yoke pin holes.

b. Removal. Remove cotter and clevis yoke pins from each end of rod and lift from truck.

c. Inspection. Inspect rod clevis yokes and pins for wear and any thread looseness in yoke or on rod. Replace parts as necessary.

d. Installation. Adjust rod length as indicated in subparagraph **a**, and install yoke pins and cotter pins. Lock adjustable clevis nut.

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Section XXVII

WHEELS, WHEEL BEARINGS, HUBS, AND TIRES

190. DESCRIPTION.

a. The wheels as installed on this truck are 10-hole disk type and are interchangeable front and rear. The hubs are so designed that dual wheels may be installed on the front axle hub as well as on the rear without alteration. The truck carries a normal complement of 12 tires, 2 of which are carried as spares. The tire size is 11.00 x 20 with nondirectional tread.

191. INSPECTION.

a. Load check the wheel stud nuts for tightness. Inspect the tires for damage. Test inflation pressure and, if necessary, inflate to 70 pounds. Inspect tires for abnormal wear. If tires show abnormal wear, check for the possible cause. If it is beyond the scope of the operating personnel, report the condition to higher authority. Change wheel and tire positions to reverse direction of tire rotation should tires show any sign of irregular wear. Refer to section VI for further inspection data.

192. FRONT WHEEL REPLACEMENT.

a. Removal.

(1) Place a hydraulic jack under the axle housing. Turn the hydraulic valve to the right as far as possible by placing the notch end of the handle over the valve and turning the valve head. Place handle in the jack, and raise the wheel just clear of the ground. Using the square end of the wheel wrench, remove the 10 wheel nuts (fig. 151).

(2) It is advisable to leave the tire in contact with the ground to prevent its rotating while the nuts are being loosened. The weight of the wheel and tire is over 250 pounds. It can either be lifted off by two men, or by using a short piece of board with its upper surface coated with grease. Slide the board under the tire, and lower

the hydraulic jack till the tire touches the board. Lift the wheel and tire off the hub and drum assembly and onto the greased surface of the board. Slide the wheel and tire outward on the board until it is clear of the hub assembly. Roll the wheel and tire aside.

(3) The spare tires are carried on either side of the wrecker frame. Three hexagon wheel nuts secure the tire to the wrecker

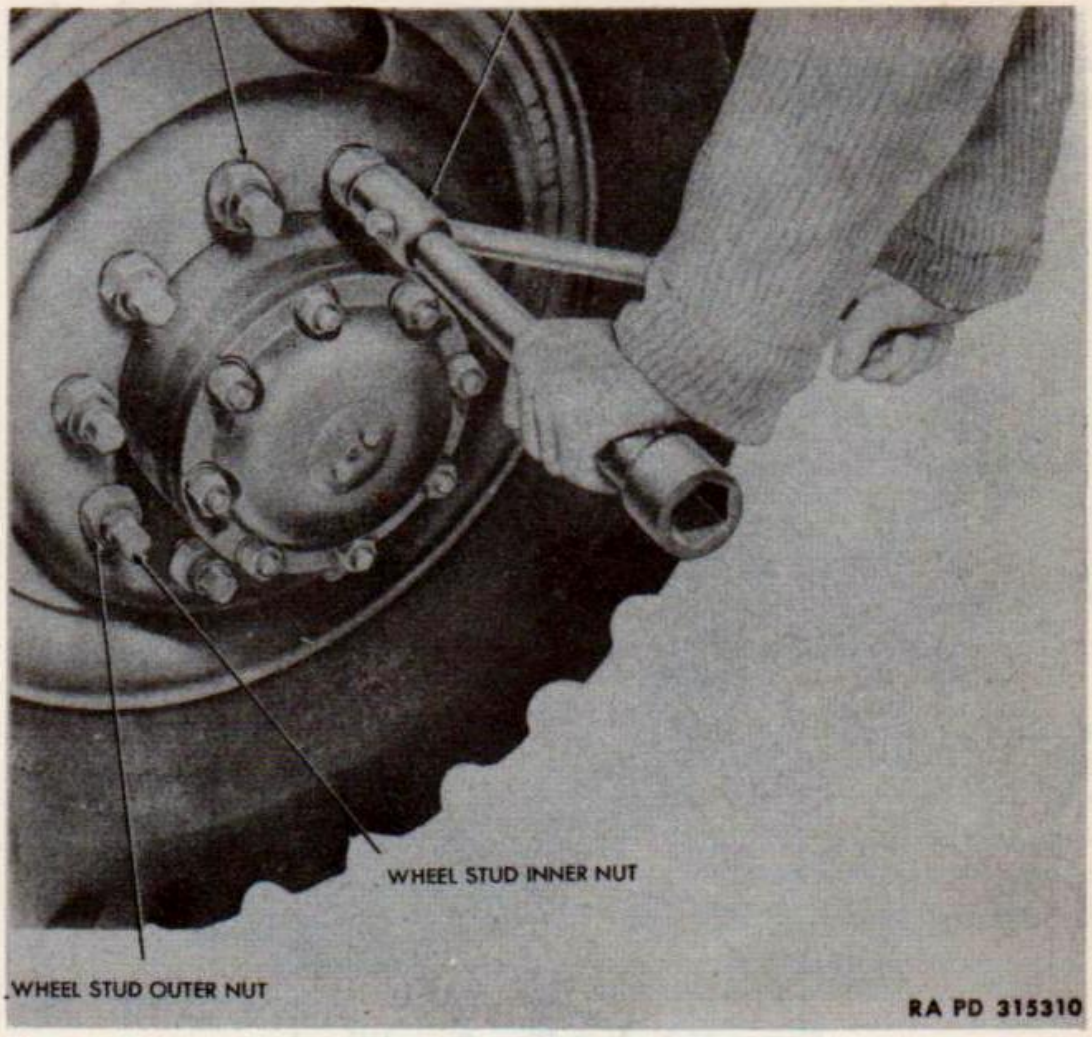


Figure 151—Front Wheel Removal

frame. Using the hexagon end of the wheel wrench to remove the three nuts, tilt the tire vertical, and roll it toward the front of the truck and onto the tool box and running board. Use two men for this operation.

b. Installation. Roll the tire onto the greased board. Slide it towards the hub and drum assembly and onto the wheel studs. Install the wheel stud nuts and tighten securely (fig. 151). Always examine the wheel at the countersunk holes, the faces of the disk,

and the hub flanges where they bear together to insure their being free from dirt, grease, and excess paint. The presence of foreign matter will prevent proper bearing and create high spots which are likely to cause loosening.

193. REAR WHEEL REPLACEMENT.

a. Removal.

(1) The rear dual wheel is the double-cap nut type. The inner dual wheel is individually secured by the sleeve-shaped inner cap

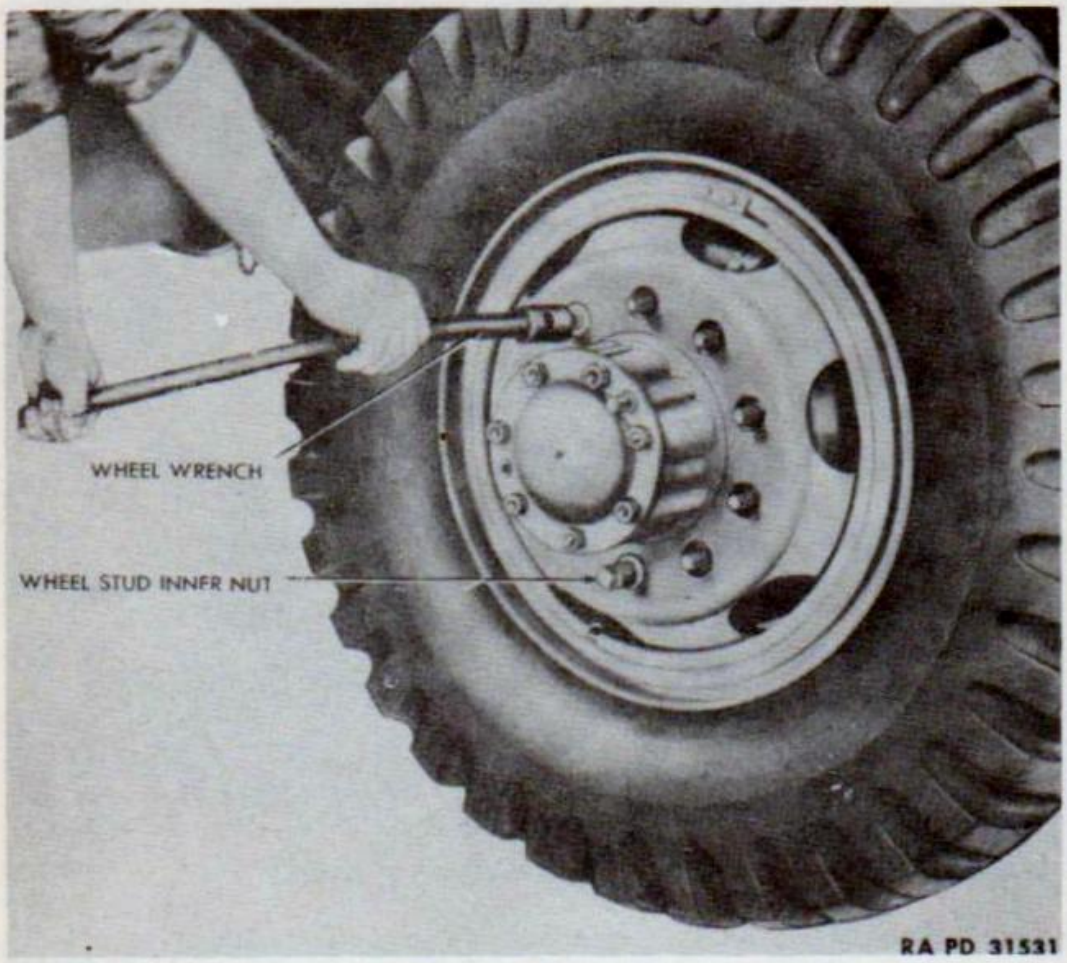


Figure 152—Installing Rear Wheel

nut. This inner cap nut must be securely tightened before the outer wheel or outer nut is installed. A short length of pipe, to serve as an extension for the standard wrench handle, is advisable for tightening the wheel stud nuts. Place jack under rear axle housing, and turn valve with notched end of jack handle clockwise as far as possible. Using jack handle, raise the wheels just clear of the ground. Using the hexagon end of the wheel wrench from the vehicle tool equipment, remove the 10 hexagon nuts securing the wheel to the hub studs.

(2) The weight of the wheel and tire is over 250 pounds. It can either be lifted off by two men, or by using a short piece of board with its upper surface coated with grease. Slide the board under the tire, lower the hydraulic jack till the tire touches the board, lift the wheel and tire off the hub and drum assembly and onto the greased surface of the board. Slide the wheel and tire on the board until it is clear of the hub assembly. Roll the wheel and tire to the side.

(3) With the outside wheel removed, use the square end of the wheel wrench, and remove the inner cap nuts (fig. 152). Lift tire clear from studs and roll aside.

b. Installation.

(1) Lift tire onto studs. Install inner cap nuts, and tighten securely. Set outside dual wheel on cap nuts, and install the hexagon nuts securing the outer wheel. Lower wheel to the ground.

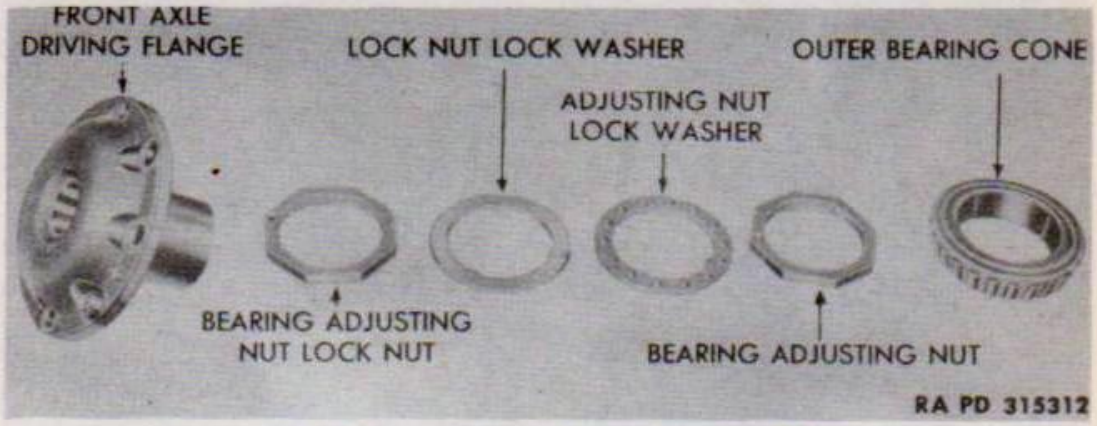


Figure 153—Front Wheel Bearing Parts Sequence

(2) Make sure that the clamping surfaces of the hub and wheels are free of dirt when installing dual wheels. Also make sure that the counterbore in the wheels and the ball section of the nuts are clean and free of paint. Any excessive amount of paint or dirt will result in wheel loosening. After wheel replacement has been made and the vehicle operated under load, the wheel stud nuts should be inspected for tightness.

194. DUAL WHEEL TIGHTENING.

a. Tightening Procedure. Loosen the outer cap nut (hexagon). Tighten the inner cap nut (square). Retighten the outer cap nut (hexagon).

b. Parts Identification. In mounting the hub on the chassis, in replacing studs or nuts, or in tire replacement, right-hand studs must be used on the hub with the wheel mounting surface facing the right-hand side of the truck. Left-hand studs must be used on hub with the wheel mounting surface facing the left-hand side of the truck. All studs and nuts are plainly marked "R" and "L" and must be so used.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

195. FRONT HUB AND DRUM REPLACEMENT.

a. Removal. Remove front axle drive flange (par. 158) (fig. 117). Bend back lock washer from flat on hub bearing lock nut. Remove wheel bearing lock nut. Remove lock nut lock washer. Remove adjusting nut lock washer. Remove adjusting nut (fig. 153). Slide drum and hub assembly from knuckle. Use two men for this operation.

b. Inspection and Service. Clean grease from steering knuckle. Using a screwdriver, pry off inner wheel bearing cone. Clean wheel

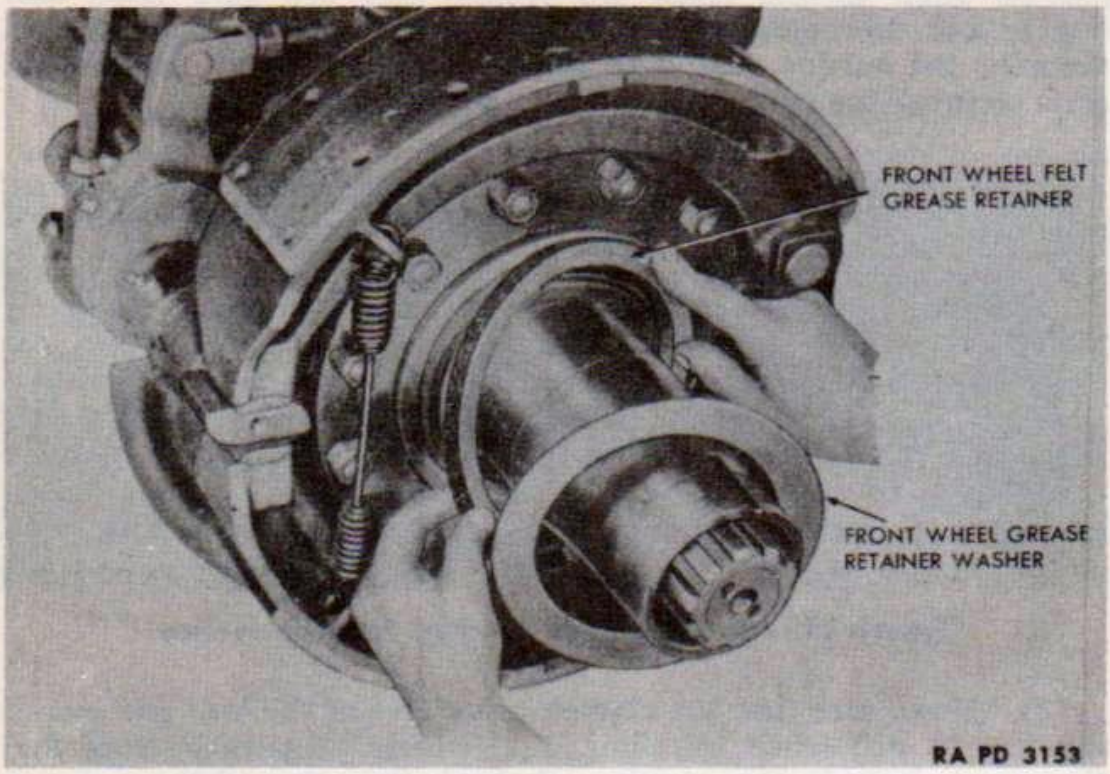


Figure 154—Front Wheel Bearing Grease Retainer Installation

bearing cones and cups with dry-cleaning solvent. Inspect wheel bearing cones and cups for indications of tight or loose adjustments, and roughness due to presence of foreign matter. Knead wheel bearing grease into bearing cones. Place a small amount of lubricant in hub cavity.

c. Installation. Install inner wheel bearing cone on steering knuckle. Place the hub and drum assembly on steering knuckle. Install outer wheel bearing cone. Install wheel bearing adjusting nut and draw up tight; then back off ¼ turn (fig. 153). Inspect wheel for free rotation. Install adjusting nut lock washer. Slight rotation of adjusting nut may be necessary in order that pin on adjusting nut will enter hole on lock washer. Install lock nut lock washer. Install wheel bearing lock nut and draw up tight. Bend lock washer over one flat on lock nut. Inspect hub for proper adjustment and free rotation.

196. FRONT WHEEL BEARING GREASE FELT REPLACEMENT.

a. Removal. Remove front axle drive flange (par. 158) (fig. 117). Remove hub and drum assembly (par. 195 a). Remove inner wheel bearing cone from steering knuckle. Remove wheel bearing felt retainer washer. Lift off wheel bearing felt grease retainer.

b. Installation. Install wheel bearing grease seal felt and retainer washer. Install inner wheel bearing cone (fig. 154). Lubricate wheel bearing cones, and put a small amount of lubricant in hub cavity. Install hub and drum assembly (par. 195 c). Install front axle drive flange (par. 158) (fig. 117). Inspect wheel bearing adjustment and wheels for tightness. Adjust or tighten, if necessary.

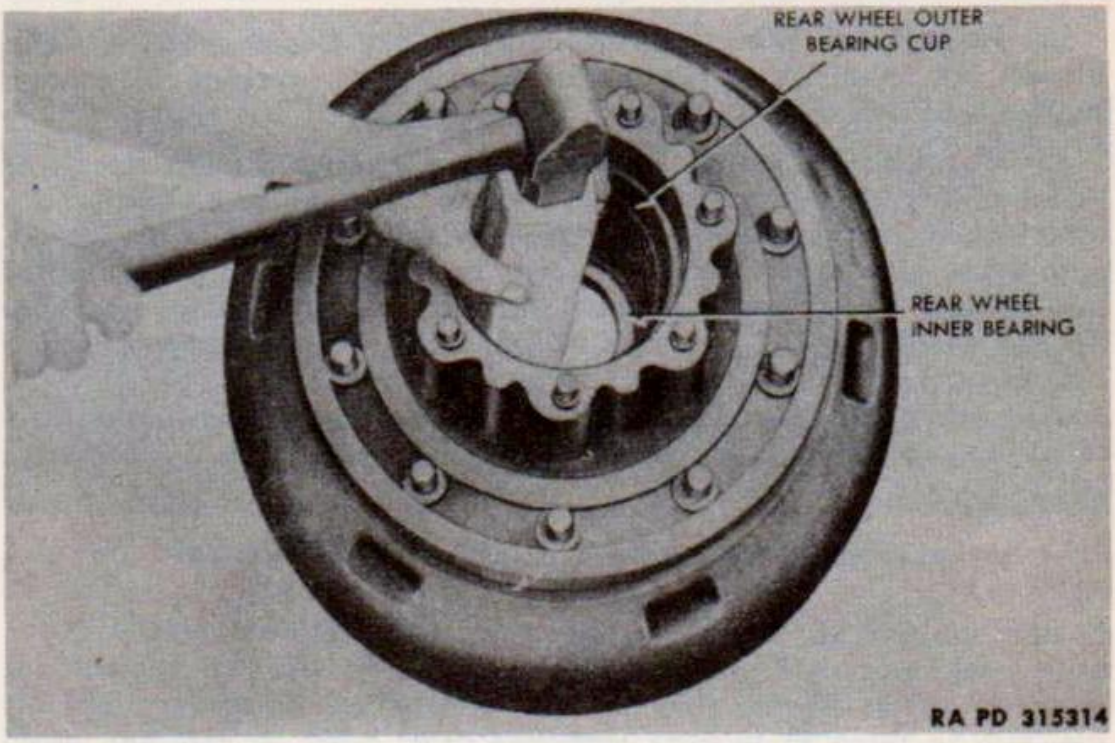


Figure 155—Rear Wheel Bearing Cup and Oil Seal Removal

197. REAR AXLE HUB AND DRUM REPLACEMENT.

a. Removal. Remove wheels (par. 193 a). Remove axle shaft (par. 163) (fig. 121). Remove hub bearing lock nut. Slide off adjusting nut washer, and remove adjusting nut. Release brake shoes by turning slack adjuster screw counterclockwise (fig. 121). Slide hub and drum assembly off housing sleeve, using care that outer wheel bearing cone does not fall out of hub.

b. Installation. Service wheel bearings (par. 198). Slide hub and drum assembly on housing sleeve, and replace outer wheel bearing cone. Install adjusting nut, bring up tight, and back off ¼ turn. Install adjusting nut lock washer; slight rotation, either clockwise or counterclockwise, may be necessary in order to allow pin in adjusting nut to aline with nearest hole in lock washer. Install wheel

bearing lock nut, tighten securely, and inspect bearing adjustment. Hub should rotate freely and without clearance. Install axle shaft (par. 163) (fig. 121). Install wheels (par. 193 b) (fig. 152). Adjust brakes (par. 171) (fig 131). Inspect wheel bearing adjustment and wheel tightness. Adjust or tighten as necessary.

198. REAR WHEEL BEARING INSPECTION AND SERVICE.

a. Removal. Remove axle shaft (par. 163). Remove hub and drum assembly (par. 197 a). To remove inner bearing cone, use a wood block and hammer, and drive inner bearing cone out of the hub bore. This will also remove the wheel bearing inner oil seal (fig. 155). If wheel bearing cups show distress, drive out of hub bores.

b. Inspection. Wash bearing cones in dry-cleaning solvent, and inspect for evidence of improper adjustment, presence of foreign matter, and lack of lubrication.

c. Installation. Install bearing cups, using a soft bronze drift and hammer. Knead fresh lubricant into bearing cones, and install inner wheel bearing. Soak new wheel bearing oil seal in engine oil, and drive into hub to its seat with leather lip towards center of hub. Score the drum bore to secure grease retainer in position. Spread small amount of wheel bearing lubricant into cavity of hub between bearing cups. Install hub and drum assembly (par. 197 b). Install axle shaft (par. 163) (fig. 121). Inspect wheel bearing adjustment and wheels for tightness. Readjust, or tighten if necessary.

Section XXVIII

SPRINGS AND SHOCK ABSORBERS

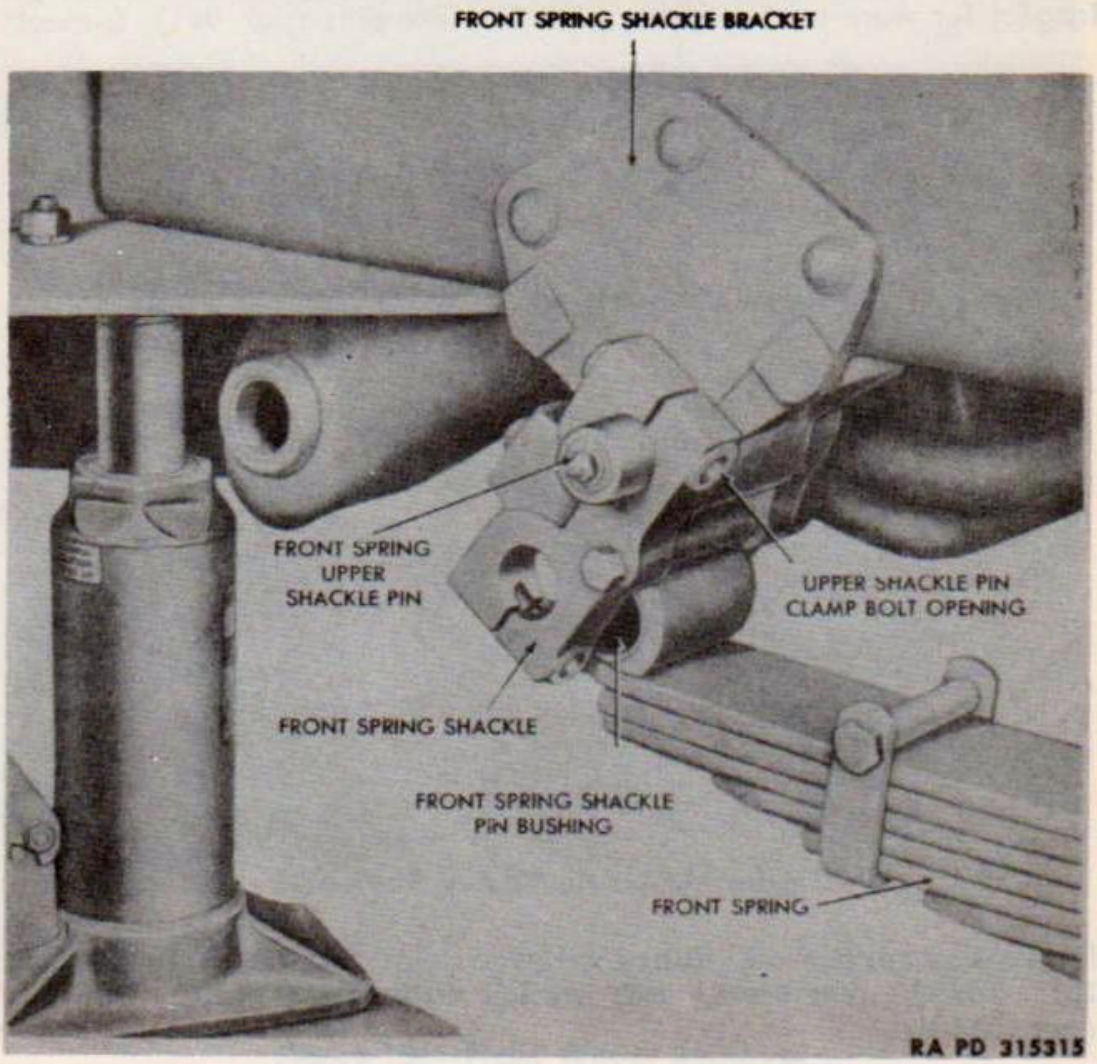


Figure 156—Removing Front Spring Shackle Bolt

199. DESCRIPTION.

a. The front springs are mounted on the front axle by means of U-bolts and to the vehicle frame through a shackle at the front end, which in turn is anchored to a frame bracket. The rear end of the front spring is anchored directly to the frame bracket.

b. The rear springs are full-floating and equalize the load be-

tween the two rear axles. The seats on which the springs are mounted at the center are free to oscillate on the tubular cross member which is attached to the chassis frame by two supporting brackets. The spring seats are mounted on tapered roller bearings.

c. The shock absorbers are mounted on the right and left sides of the frame, directly above the front axle. They are connected by a connecting rod to the front axle housing.

200. INSPECTION.

a. Inspect spring clips for tightness, and tighten if necessary. Inspect for worn or dry spring pins. Replace pins (par. 201). Inspect

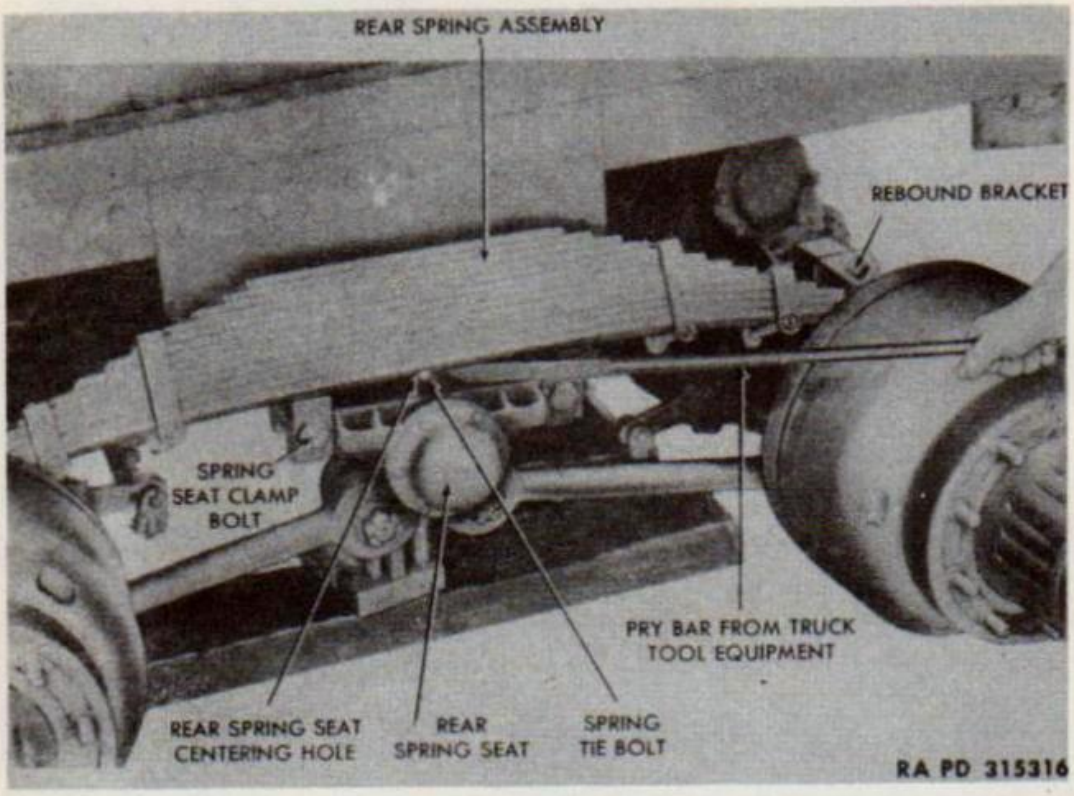
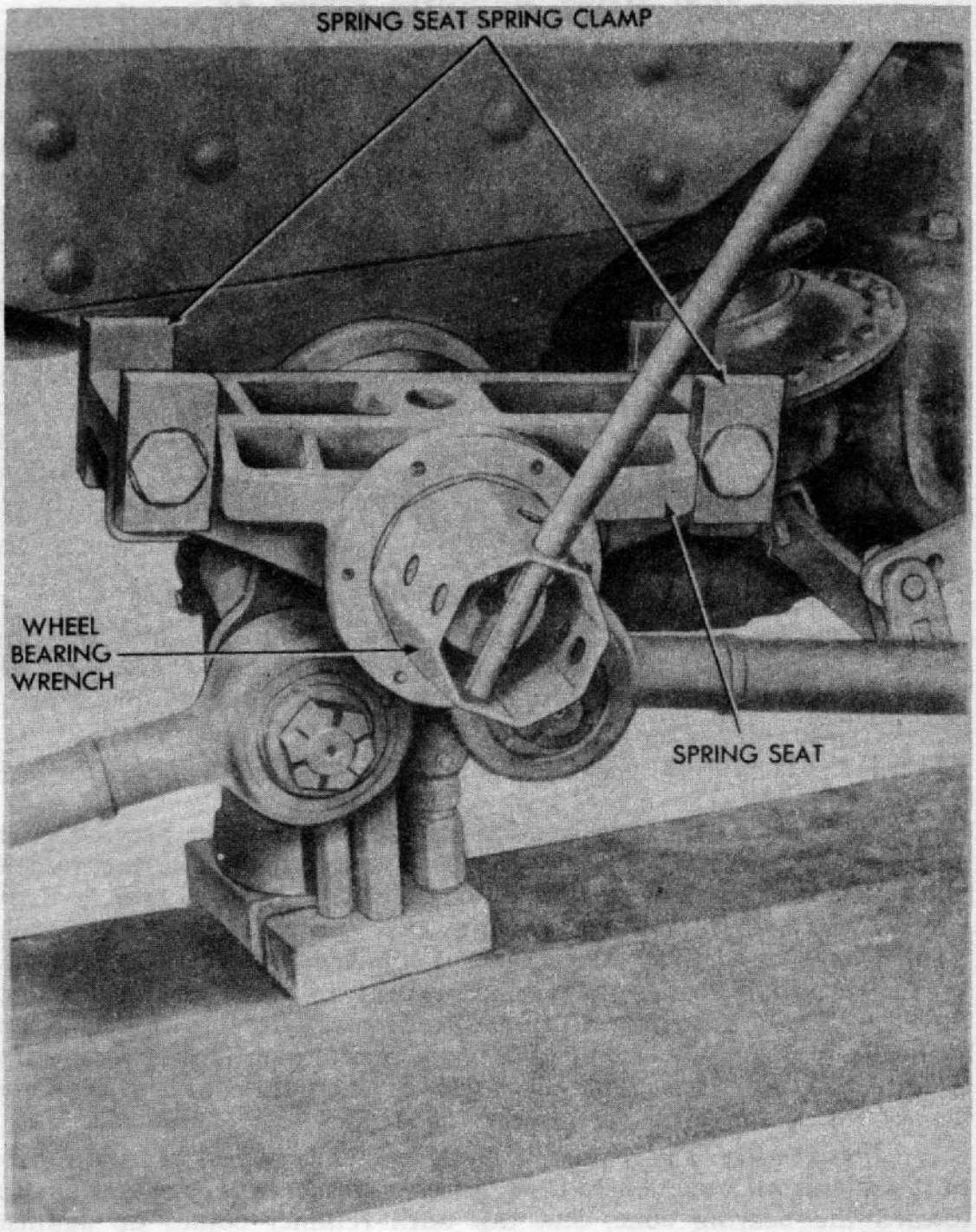


Figure 157—Rear Spring Removal

for broken springs and spring rebound clips. Replace springs (par. 202). Inspect rear spring seat bearing adjustment. Adjust bearings (par. 203 d).

201. FRONT SPRING SHACKLE BOLT REPLACEMENT.

a. **Removal.** Place jack under frame side rail at front bumper (fig. 156). With notched end of jack handle, turn valve clockwise to close. Raise jack until weight is taken off shackle bolt. Remove two shackle tie bolts, lock nuts, and nuts. Drive lower shackle bolt out of shackle and spring from inside. Drive shackle assembly forward to remove upper draw bolt. Drive upper shackle bolt out of frame bracket and shackle (fig. 156).



RA PD 315317

Figure 158—Installing Rear Spring Seat

b. Installation. Install upper shackle bolt. Install draw bolt, nut, and lock nut. Drive shackle back over spring until hole in shackle and spring aline. Drive lower shackle bolt into position. Install shackle lower draw bolt, nut, and lock nut. Lubricate shackle bolts through lubricant fittings.

202. REAR SPRING REPLACEMENT.

a. Removal. Place a jack under the spring seat cross tube, and raise the spring seat until the spring ends clear the axle pads (fig.

157). Remove wheels (par. 193 a). Remove the lock nuts from the spring U-bolts and the four U-bolt nuts. Drive the U-bolts up and out of the spring seat, and lift off top plate. Remove the cotter pins from the spring seat clamp bolts, and back off the clamp bolt nuts. Pry the spring up out of the spring seat and tilt back the top. This will bring spring ends out from under rebound brackets. Using two men, lift the spring, one end at a time, and set it over on the brake drum and from this position, lower the spring to the ground. The spring, because of its weight and tendency to twist, makes it very difficult to handle. Take care to avoid personal injury.

b. Installation. Set the spring on the brake drums, and lower each end onto axle pad. Tilt back the top, and pry spring into position onto spring seat, making certain that the dowel has entered spring seat. Tighten the clamp bolt, nuts, and key and set the spring top plate into position. Install the U-bolts, nuts, and lock nuts. Install the wheels (par. 193 b).

203. SPRING SEAT REPLACEMENT AND SERVICE.

a. Removal. Remove rear spring (par. 202). Remove six cap screws and lock washers from spring seat bearing cover. Remove bearing adjusting nut lock nut, slide off washer, and back off adjusting nut (fig. 158). Pry spring seat outward and, at the same time, remove outer bearing cone. Inner bearing cone will come off with spring seat (fig. 159).

b. Inspection. Using a wood block, drive the inner bearing cone and oil seal out of the seat. Using a scraper, smooth the punch marks from the inner bearing bore, and with a soft bronze drift and hammer, drive out the bearing cup. Turn the seat over and, using the same method, drive the outer bearing cup out of the seat. Wash out the bearing cones, and inspect for lack of lubrication, tight or loose adjustment, and presence of foreign matter. To assemble, drive the bearing cups into position until they come up against the cup seats. The high side or thick side of the cups go toward the center of the spring seat (fig. 159).

c. Installation. Pack inner bearing cone with wheel bearing lubricant and install cone. Install the grease retainer with the leather lip toward the bearing cone, and tap until retainer comes up against the bearing cup. Upset the spring seat at three positions to retain grease seal in position. Set seat on cross tube, pack outer bearing cone, and install adjusting nut, lock washer, jam nut, gasket, and cap (fig. 158). Lubricate spring seat bearings through lubricant fittings (par. 26). Install spring (par. 202). Install wheels (par. 193 b).

d. Spring Seat Bearing Adjustment.

(1) The spring seat bearings call for a constant preload of 250 inch-pounds. In other words, a 25-pound weight imposed on the spring 10 inches from the center line of the cross tube should just cause the seat and spring assembly to rotate on the cross shaft. The following procedure should be followed in adjusting these bearings:

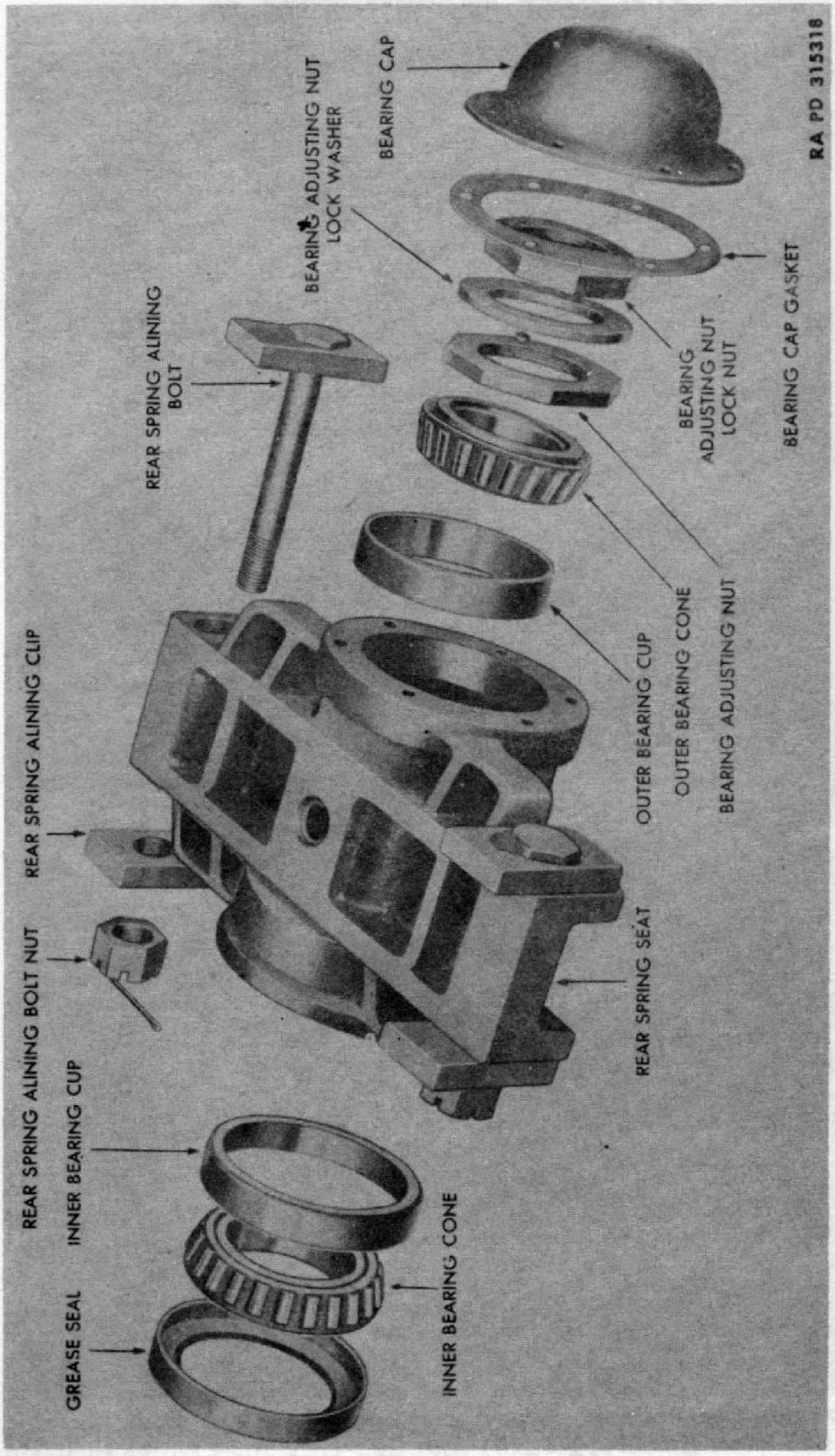
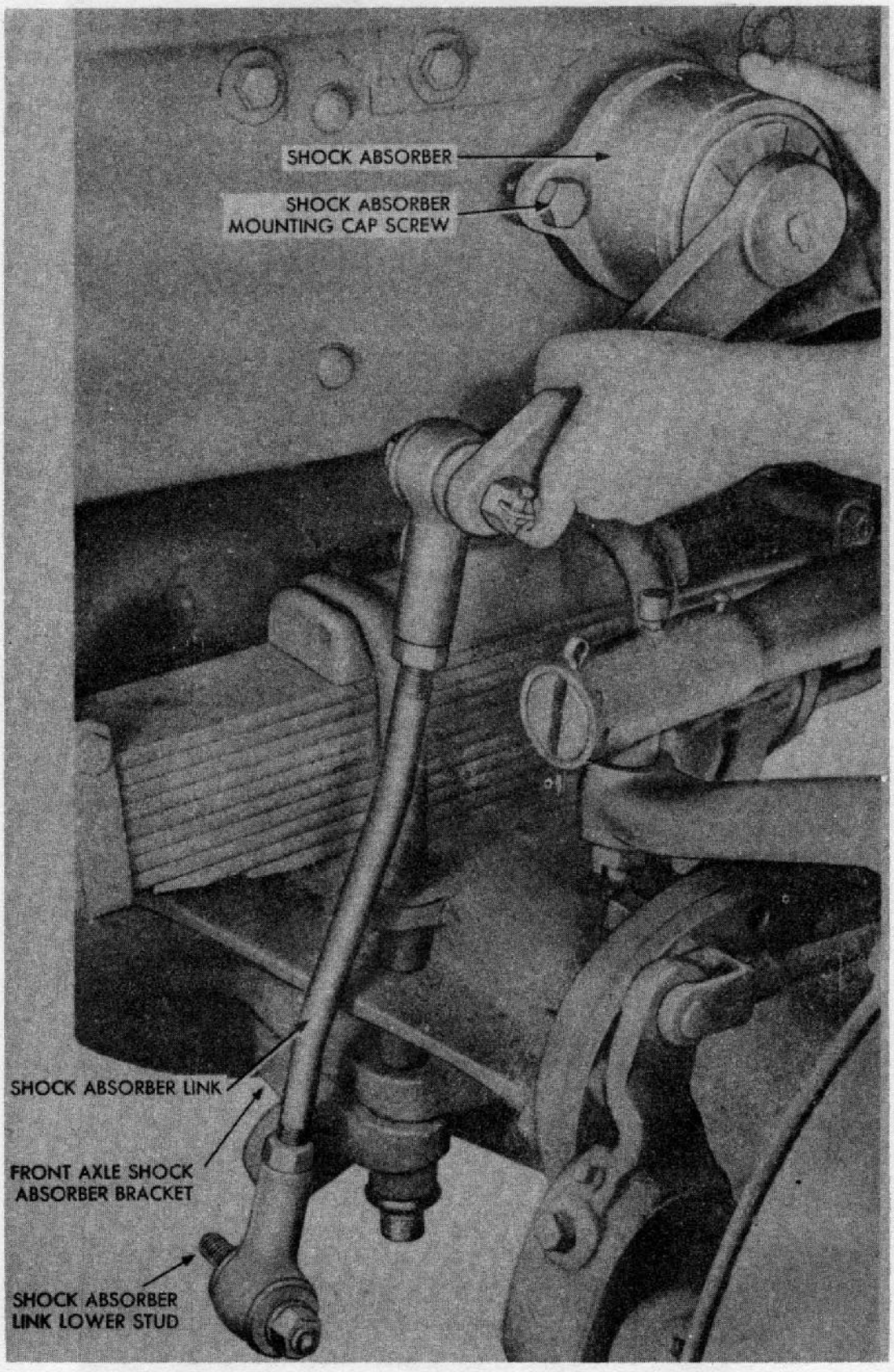


Figure 159—Rear Spring Seat Disassembled

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)



RA PD 315319

Figure 160—Removing Shock Absorber

(a) Jack up the rear end of the truck by means of a jack under the cross tube to such a height that the spring is centrally located between the pad on which the spring rests on the axle and the spring keeper (fig. 151). Remove the cap on the end of the cross tube, release the jam nut, and pull back the adjusting nut lock washer. Then bring the adjusting nut up against the outer bearing cone until all side play has been removed. Continue tightening the adjusting nut until a decided drag is felt when an effort is made to oscillate the spring between the keeper and axle pad.

(b) A torque-indicating wrench calibrated in inch-pounds is ideal for checking this adjustment. A 25-pound weight imposed on the spring 10 inches from the center line of the cross seat bearing will suffice, and when the bearings are tightened sufficiently, should just cause the seat and spring assembly to rotate on the cross shaft.

(c) A third method of adjusting the spring seat bearings would be to tighten the adjusting nut with a 10-inch bar, using a normal pull on the bar. Do not exert extra effort until the bearing is tight. Then, with an extension on the wrench, or by striking the wrench with a hammer, tighten the adjusting nut one additional flat and lock in place (fig. 158). After the adjustment has been secured, replace the adjusting nut, lock washer, and securely tighten the jam nut.

(2) Install bearing cover and six cap screws. Inspect adjustment. Lubricate spring seat through lubricating fittings (par. 26).

204. SHOCK ABSORBER AND LINKAGE REPLACEMENT.

a. Removal. Remove cotter pin from a lower link stud. Remove link stud castellated nut. Remove lock washer. Drive stud from axle bracket. Remove two cap screws, nuts, and lock nuts attaching shock absorber body to frame. Lift shock absorber from frame side rail (fig. 160).

b. Installation. Place shock absorber against frame side rail, and install cap screws, nut, and lock nuts (fig. 160). Install lower link stud in bracket. Install lock washer, link stud nut, and cotter pin. Inspect link lock nuts for tightness and tighten. Inspect fluid level, and fill, if necessary, with shock absorber fluid only.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XXIX

STEERING GEAR

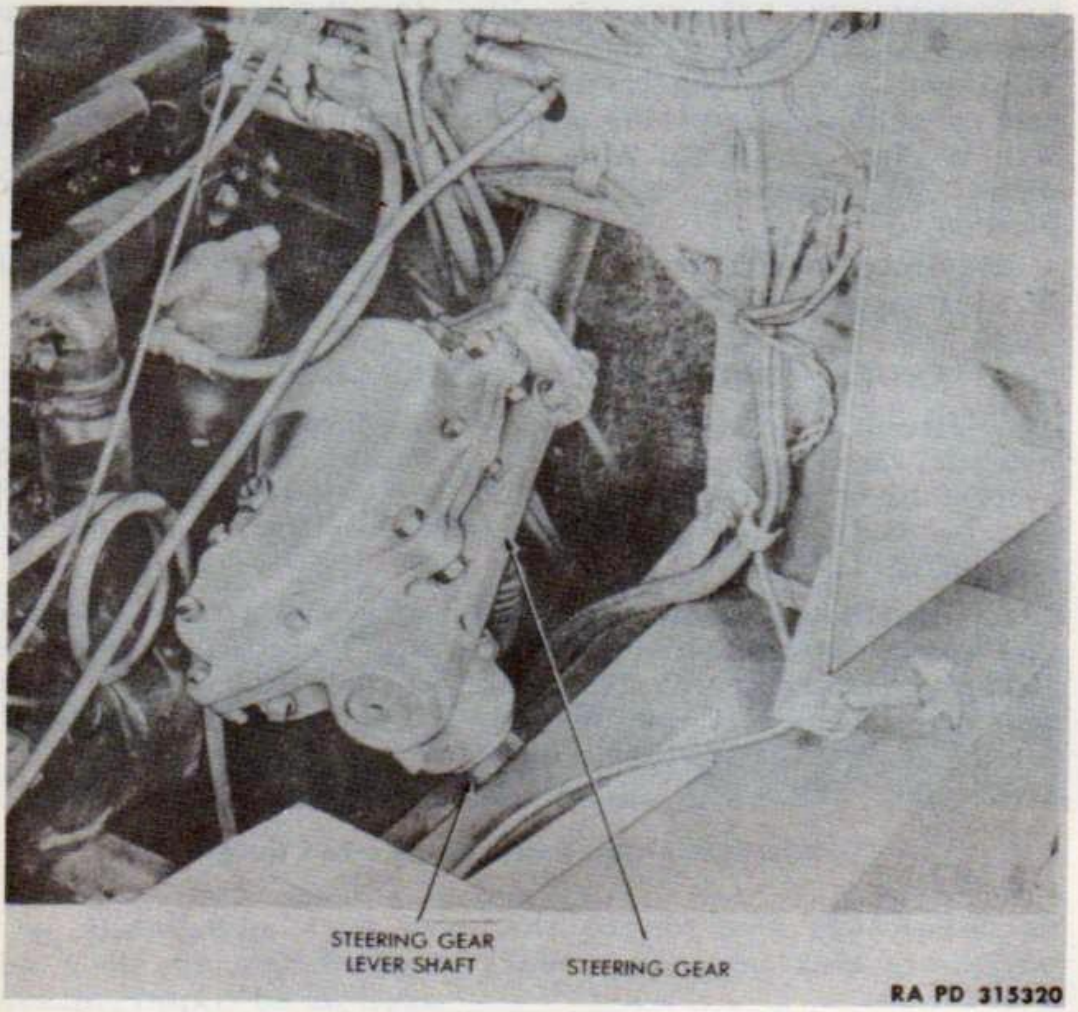


Figure 161—Steering Gear Removal

205. DESCRIPTION.

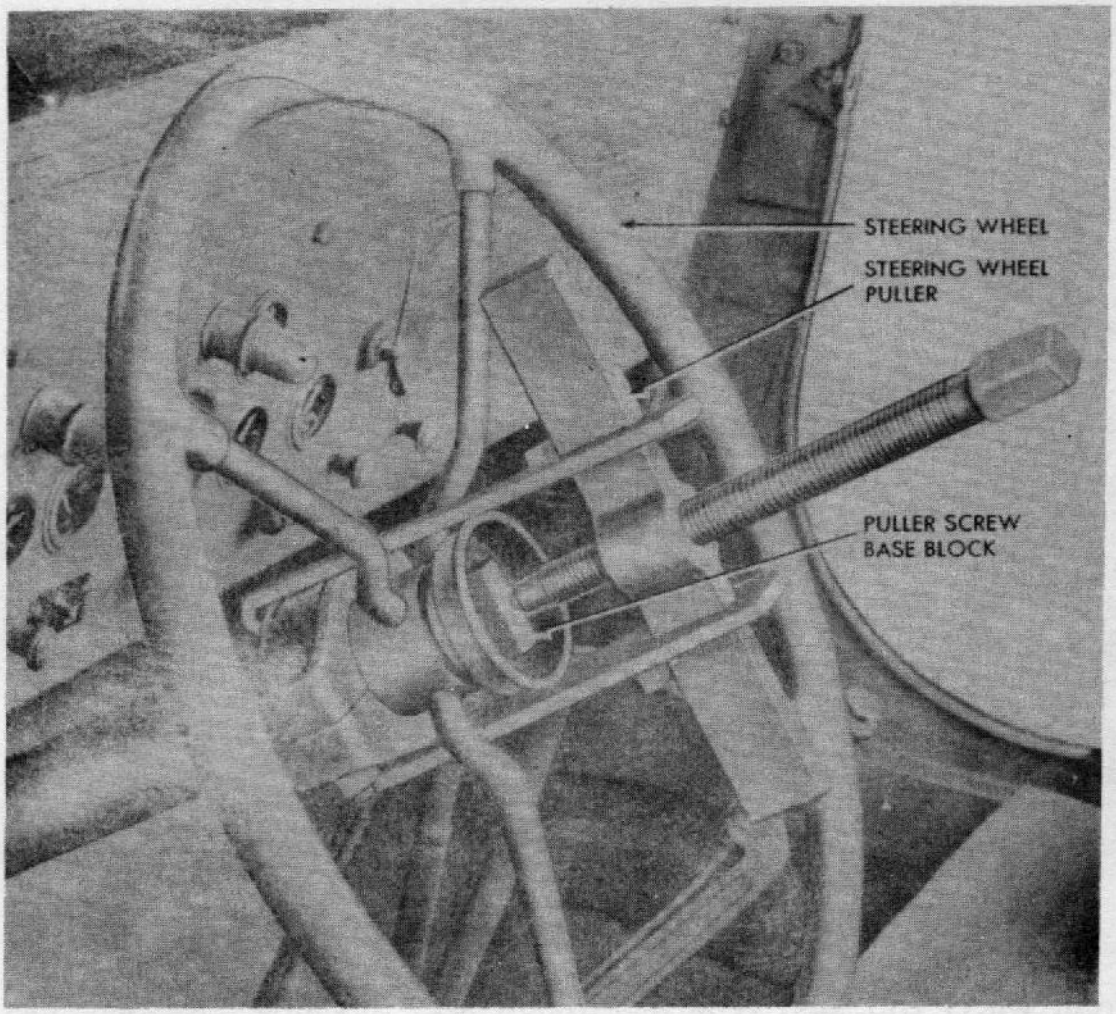
a. The steering gear in this truck is the cam and lever design. The names "cam" and "lever" are derived from the names of the actuating and actuated parts of the steering gear.

b. When the cam is turned left or right by means of the steering wheel, the studs mounted in the lever shaft are moved through the groove of the cam, thus rotating the lever shaft and providing angle movement to the steering arm.

206. INSPECTION.

a. Inspect steering gear for tightness and alinement. Replace gear (par. 207) or aline.

b. Inspect steering gear for being loose in the frame bracket and at instrument panel clamp. Tighten if necessary.



RA PD 315321

Figure 162—Removing Steering Wheel, Using Puller (41-P-2954)

207. STEERING GEAR REPLACEMENT.

a. Removal.

(1) NOTE: *Before starting steering gear removal, place transmission in third speed, engage the front axle, place transfer case in low range, and apply emergency brake. Disconnect battery cable.*

(2) Remove horn button and steering wheel assembly (par. 208) (fig. 162). Remove fire extinguisher from bracket. Remove 16 screws

and lock washers from toeboard. Remove cotter pin and clevis yoke pin from accelerator pedal yoke rod. Disconnect battery (fig. 103). Remove two cap screws, nuts, and lock washers from starter switch. Lift out toeboard. Remove air cleaner (par. 75). Remove fuel pump (par. 69). Remove Pitman arm (par. 210) (fig. 164).

(3) Remove two steering gear trunnion to frame bracket cap screws, nuts, and lock nuts. Remove steering column bracket U-bolt. Lift steering gear housing up, rotate counterclockwise as viewed

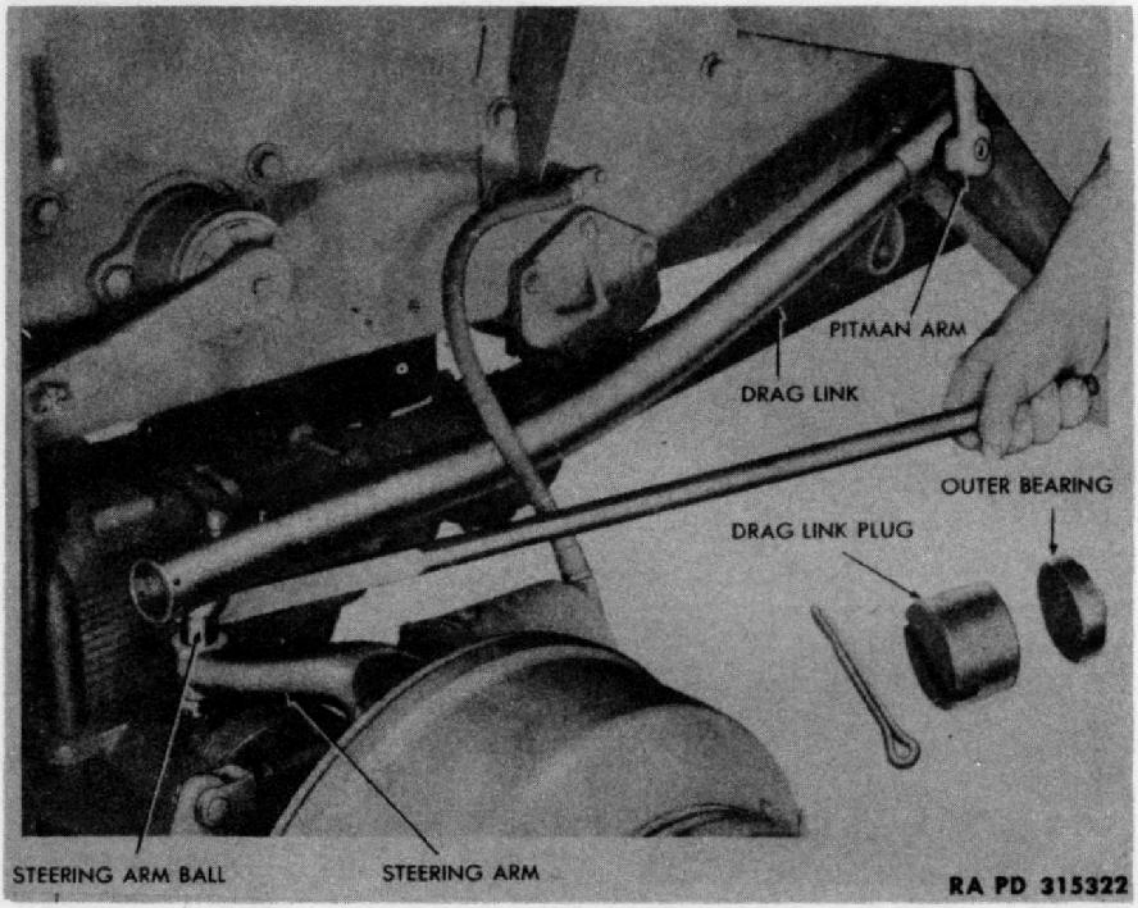


Figure 163—Drag Link Removal

from wheel end, and remove through hood opening. Use two men for this operation, one at each end of the steering gear (fig. 161).

b. Installation.

(1) Enter steering gear over left front fender and under dash bulkhead. When gear housing is over frame bracket, lift wheel end and, at the same time, rotate clockwise to set gear on frame bracket (fig. 161). Install steering gear trunnion to frame bracket cap screws, nuts, and lock nuts. Install steering column bracket U-bolt. Install Pitman arm (par. 210) (fig. 164).

(2) Install fuel pump (par. 69). Install air cleaner (par. 75). Install toeboard. Install starter switch. Hook up accelerator pedal. Install fire extinguisher. Connect battery (fig. 103). Install steering

wheel and horn button (par. 208) (fig. 162). Inspect grease level (par. 26). Inspect mounting bolts. Tighten if necessary.

208. STEERING WHEEL REPLACEMENT.

a. Removal.

(1) Disconnect horn button wire (silver covered wire) at extreme left of junction block on dash board. Press down horn button and twist slightly to right or left to disengage lugs on button. Lift off horn button. Remove contact cups and springs. Remove three screws from base plate, and pull wire lead from center of steering column. Loosen wheel nut, and turn counterclockwise two full turns.

(2) Install wheel puller (41-P-2954) (fig. 162). Use square plate to act as base for puller screw, and tighten puller screw securely. Use puller to draw steering wheel off taper. Remove puller and nut from end of steering gear, and lift off steering wheel.

b. Installation. Set wheel on steering gear column. Install column nut and tighten. Thread horn button wire lead through center of steering column tube. Install horn button base plate and screws. Install small contact cup, horn button spring, and large contact cup. Install horn button, and twist clockwise to lock. Hook up horn button wire at junction block on left side of dash board. Test horn for operation. Inspect wheel for tightness, and tighten if necessary.

209. DRAG LINK REPLACEMENT.

a. Removal. Remove cotter pins. Remove screw-type plugs at both ends of drag link. Remove bearing seats (fig. 163). Place bar from wrecker equipment between steering arm and drag link, and apply pressure upwards. Rotate steering wheel slightly to right and left to center ball in opening of drag link. Lift drag link from truck.

b. Installation.

(1) Install inner bearings in the drag link. Install drag link on front axle steering and Pitman arm. Install outer bearings through ends of drag link. Install adjusting plugs (fig. 163). Bring adjusting plugs up tight, and back off to nearest cotter pin hole in drag link. Install cotter pins.

(2) When drag link is installed, the truck wheels should be in the straight-ahead position, and the steering gear should be divided; namely, count off the number of turns from a full right-hand turn, then back up just halfway, and the axle steering arm ball and the Pitman arm ball should be in the proper position for installation. Lubricate both ends of drag link through lubricant fittings (par. 26).

210. STEERING GEAR (PITMAN) ARM REPLACEMENT.

a. Removal. Disconnect drag link at steering gear Pitman arm end (par. 209). Remove cotter pin from end of steering gear lever shaft. Remove the Pitman arm nut. Place bar behind Pitman arm

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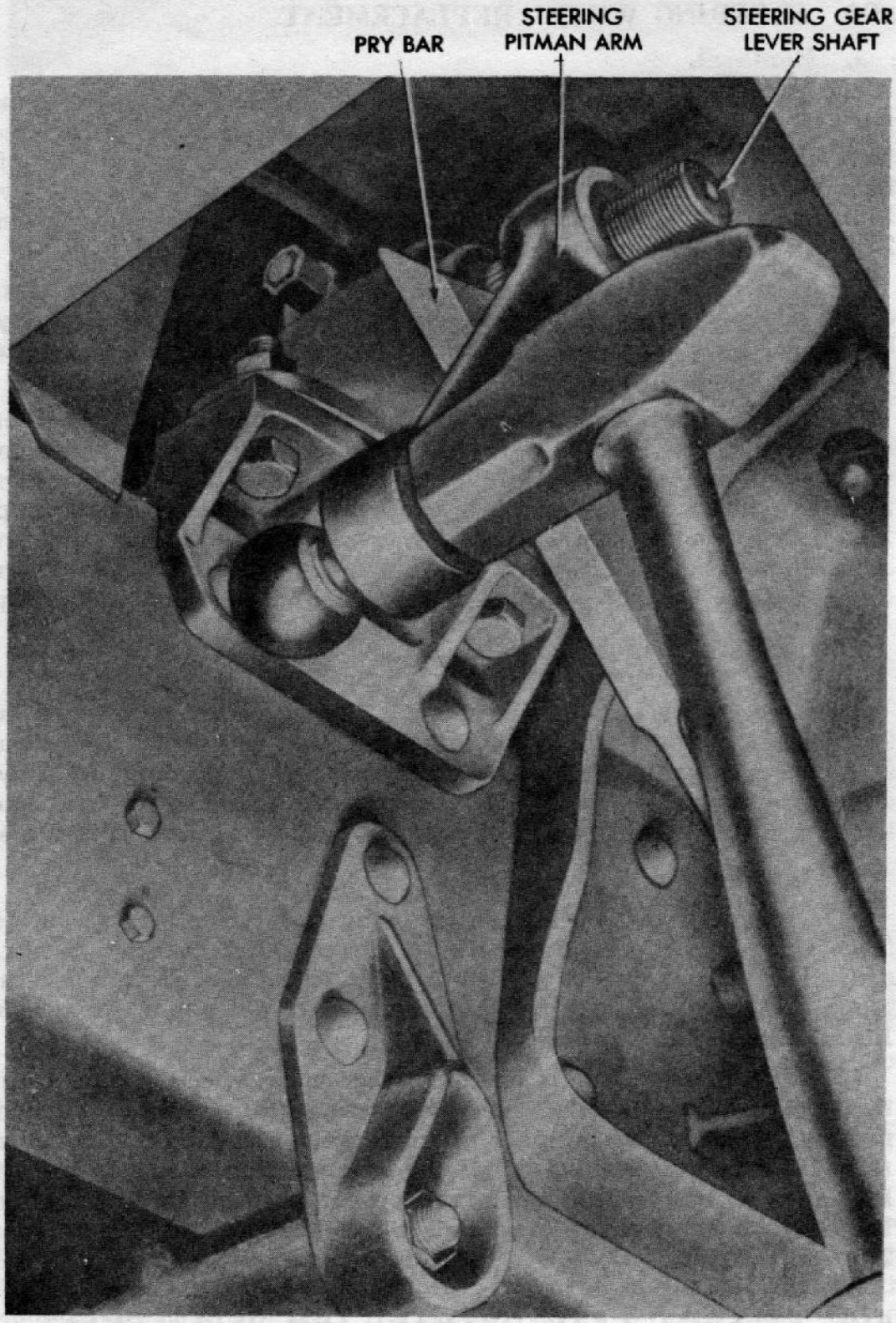


RA PD 315323

Figure 164—Removing Steering Gear Arm

against steering gear housing, and apply pressure against Pitman arm. Strike Pitman arm at ball stud to loosen arm on shaft spline (fig. 164).

b. Installation. Place the truck front wheels in dead-ahead position. Using drag link as positioning guide, place Pitman arm on serrated spline of the lever shaft. Install Pitman arm lock washer and nut. Install cotter pin. Do not change the position of the steering wheel while the Pitman arm is removed. If moved, it will change the lever shaft position, and the steering gear will have to be redivided (par. 207). Install drag link (par. 209). Lubricate drag link through lubricant fittings (par. 26).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

Section XXX

BODY AND FRAME

211. DESCRIPTION.

a. The body and sheet metal parts covered in this section includes the fenders, tool boxes, curtains, seats, windshield, windshield wipers, and fire extinguisher.

b. The frame is constructed of pressed steel channel section side rails reinforced by cross members. A pintle hook is mounted on the rear cross member of the frame, and a tow hook is attached to the front of each of the frame side rails.

212. INSPECTION.

a. Inspect curtains and upholstery for damage. Inspect the fenders and tool boxes for looseness. Tighten bolts if necessary.

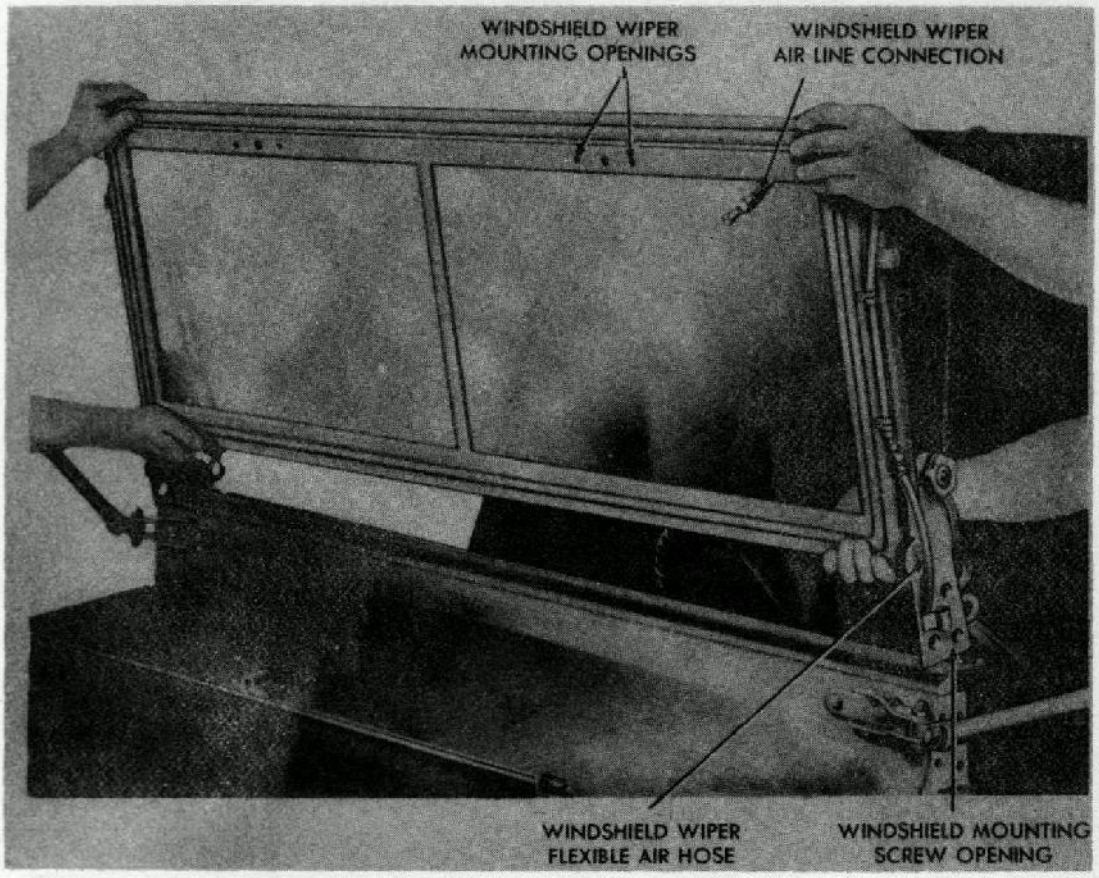
b. Inspect frame and bumper bolts for looseness. Tighten bolts if necessary. Inspect painting, and paint all bare surfaces. Inspect pintle for proper operation.

BODY AND FRAME

213. WINDSHIELD REPLACEMENT (fig. 165).

a. Removal. Remove top tarpaulin (par. 218). Remove wiper assemblies (par. 219). Disconnect wiper flexible line. Remove eight nuts, lock washers, and flat head screws attaching windshield assembly to cab. Using two men, lift windshield from cab.

b. Installation. Place windshield in position on cab. Install eight flat head screws, lock washers, and nuts. Install windshield wipers (par. 219). Connect flexible air line. Install top tarpaulin (par. 218).



RA PD 315324

Figure 165—Removing Windshield

214. SEAT CUSHION REPLACEMENT (fig. 166).

a. Removal. Raise seat, and turn top fastening clip 90 degrees; lower seat, lift front of cushion, and pull forward.

b. Installation. Set cushion in position. Raise cushion and frame, and turn retaining clip on cushion over seat frame.

215. SEAT BACK REPLACEMENT (fig. 167).

a. Removal. Move seat back forward, and slide back out of frame channel.

b. Installation. Start binding on seat back flap in seat channel, and slide cushion towards center of truck.

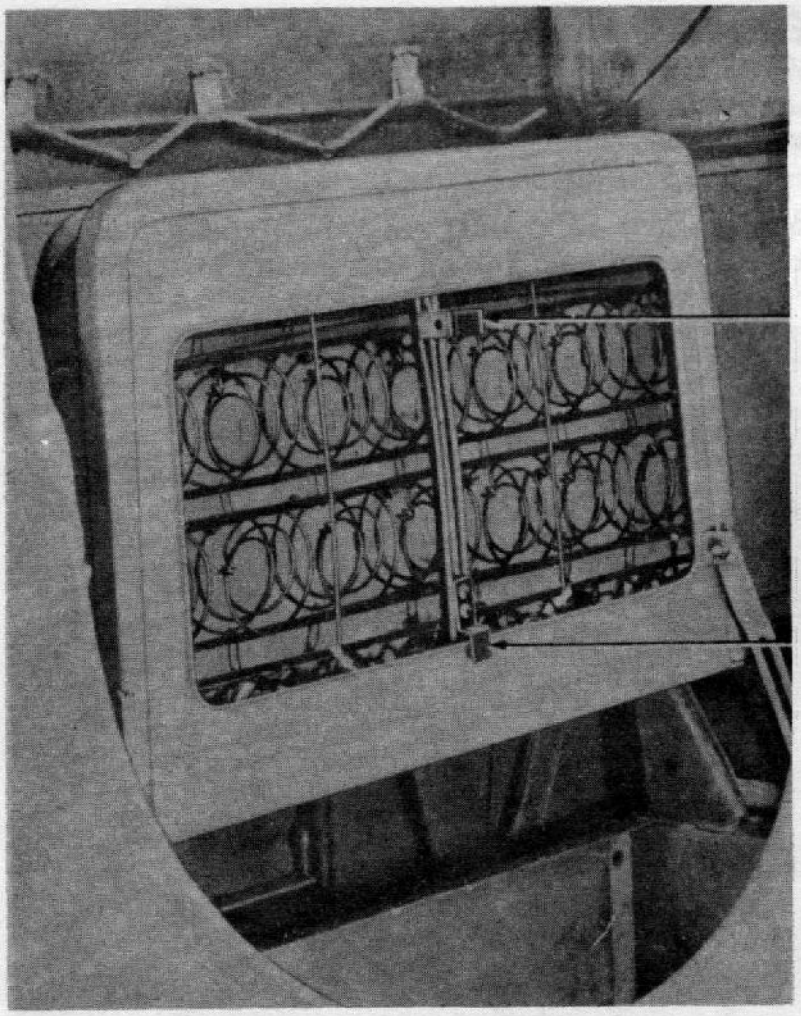


Figure 166—Seat Cushion Removal

216. SIDE CURTAIN REPLACEMENT. (fig. 168).

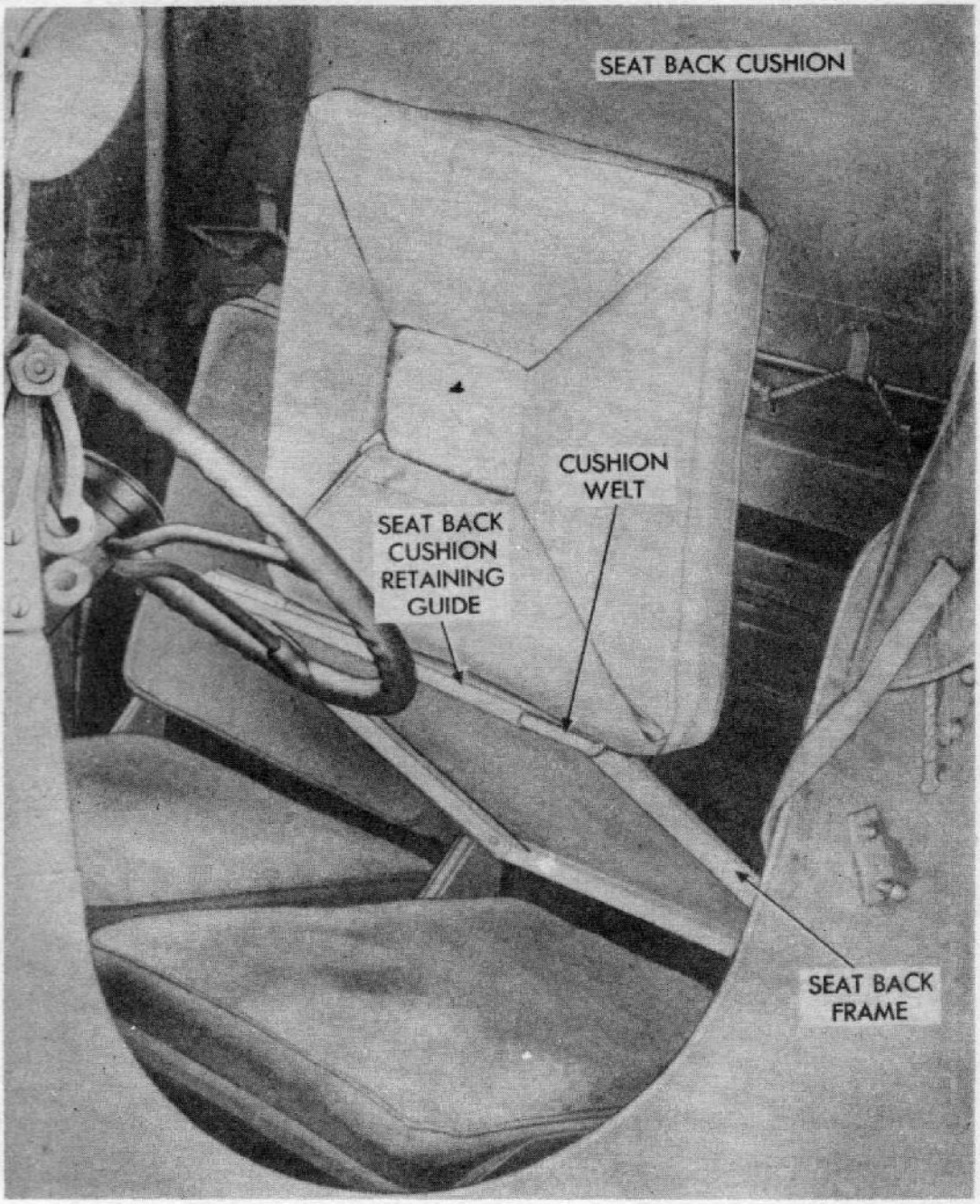
a. Removal. Release curtain retaining clip, and move curtain out at 90 degrees to vehicle. Lift curtain up and out of retaining hinge brackets.

b. Installation. With curtain at right angles to cab, place hinge pins in retaining sockets and lower into sockets.

217. CAB BOW REPLACEMENT.

a. Removal. Slack off top deck and rear curtain ropes and straps. Remove 17 sheet metal screws retaining rear curtain to bow. Loosen wing nuts at cab corners, and lift bow up and off cab.

b. Installation. Place bow in sockets. Install 17 sheet metal screws retaining rear deck to bow. Tighten wing nuts. Place top deck in position and tie ropes.



RA PD 315326

Figure 167—Seat Back Removal

218. TOP REPLACEMENT.

a. Removal. Remove top deck rear ropes, and lay tarpaulin deck over engine hood. Release leather strap from staples at windshield corners, and slide top tarpaulin from windshield channel.

b. Installation. Start binding on top tarpaulin in channel on top of windshield, and slide top tarpaulin into position. Push top tarpaulin corners over staples at upper windshield posts, and insert

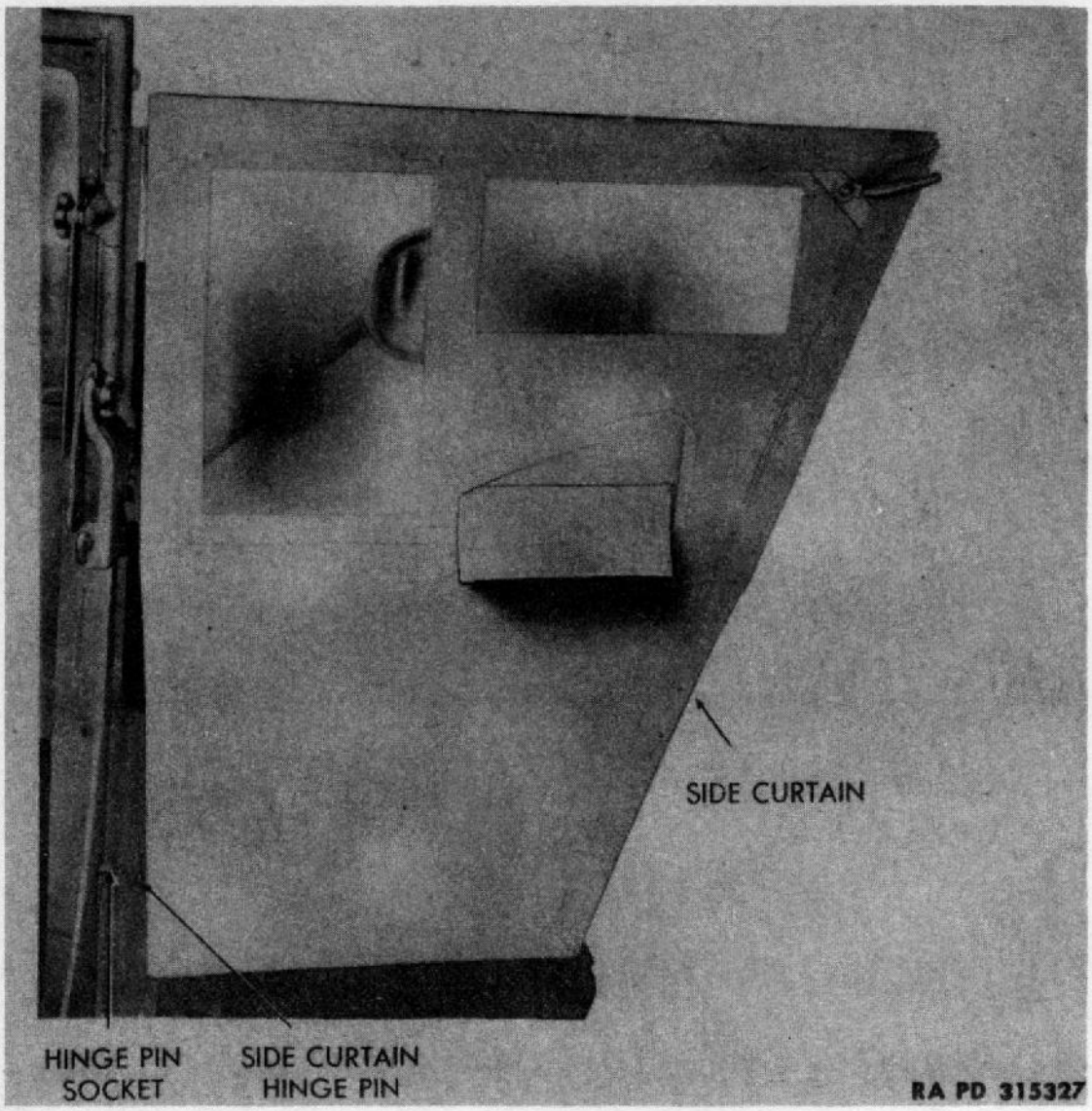


Figure 168—Side Curtain Installation

leather straps. Pull rear of top tarpaulin over rear bow, and secure retaining ropes.

219. WINDSHIELD WIPER REPLACEMENT.

a. Removal. Drain air reservoir. Remove windshield wiper arm lock nut. Slide arm off shaft. Disconnect air line at control valve. Remove two screws attaching wiper to windshield frame. Lift wiper from windshield.

b. Installation. Place wiper in position on windshield frame, and install two retaining screws. Connect air line at control valve. Place wiper arm on splined shaft in line with the manual lever on wiper. Install wiper arm nut and tighten. Start motor, build up air pressure, and inspect for air leaks.

220. FIRE EXTINGUISHER SERVICE.

a. The fire extinguisher is mounted in a spring locking bracket attached to the right cowl side panel. To remove the fire extinguisher, pull locking clamp lever, and pull extinguisher from bracket. This fire extinguisher is the vaporizing liquid type. It may be used on any class of fire resulting from burning wood textile, oil, grease, gasoline, flammable liquids, or electrical short circuits. It may be used on burning electrical equipment in the truck, such as generator, cranking motor, or wiring connections. To operate the extinguisher, turn the handle and work it like a pump. To secure

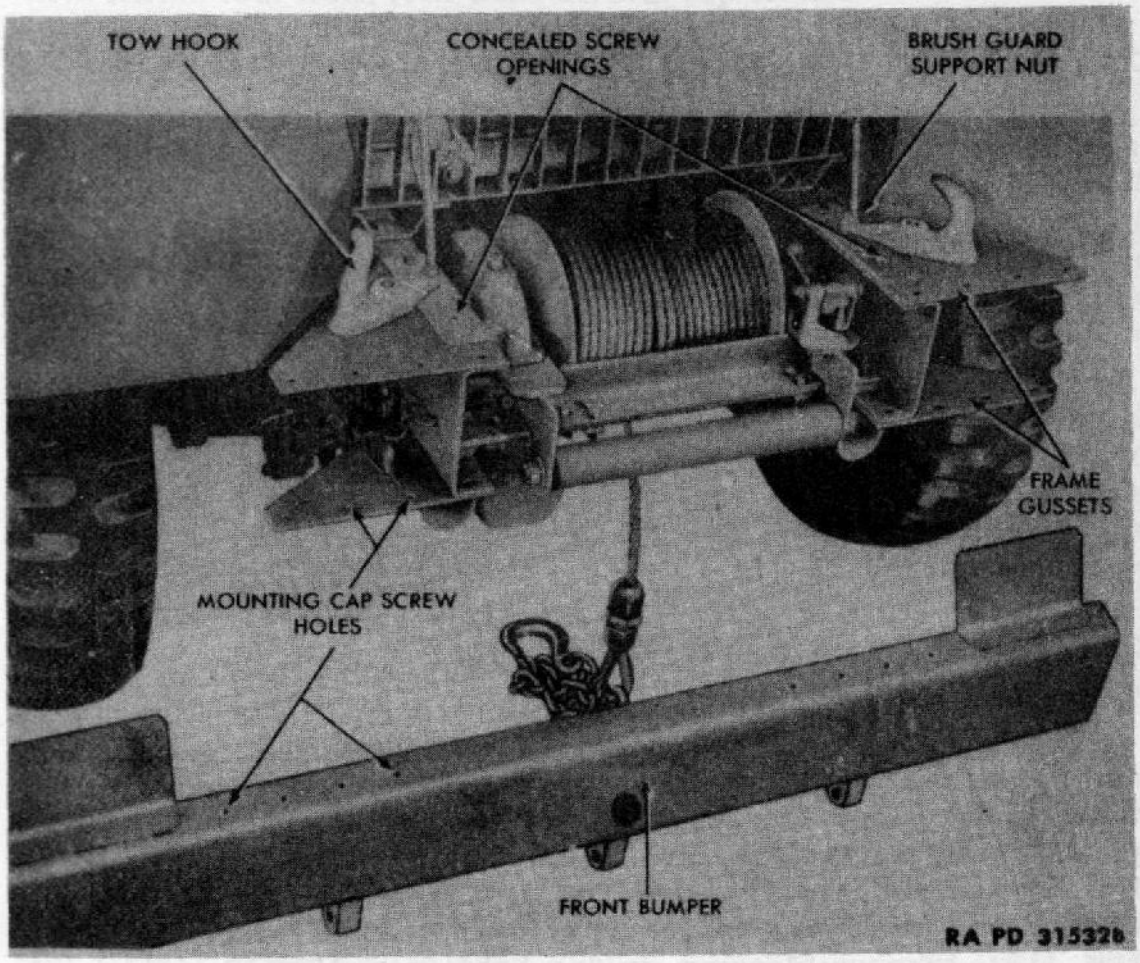


Figure 169—Front Bumper Removal

best results, direct the discharge at the base of the flame. When used on burning liquids in a container direct the discharge just above the burning liquid. Keep the extinguisher clean. Wipe the exterior at the top and around the handle, to remove dirt and other matter which might tend to obstruct operation of the extinguisher. After use, exchange the extinguisher immediately for one that is fully charged.

b. To refill, remove filler hole plug, and pull handle out to full extent of travel. Pour approved fire extinguishing liquid through filler hole until extinguisher is full. Install filler hole plug, and pump extinguisher plunger up and down once or twice to remove trapped air.

Push handle down and lock in position. Remove filler hole plug, and add sufficient liquid to fill the extinguisher. Install filler plug and gasket. The capacity is 1 quart. Every 6 months, test the extinguisher by pumping some of the fluid in a clean glass container. If the pump works satisfactorily, and the fluid in the glass container is clean and free of foreign matter, pour the liquid back into the extinguisher through the filler hole in the cap. Then, if the extinguisher is full of fluid (1 quart liquid capacity), it is in normal operating condition. If the pump does not operate satisfactorily, or the extinguisher contains insufficient or dirty fluid, exchange the extinguisher for one that is in satisfactory operating condition.

221. FRONT BUMPER REPLACEMENT.

a. Removal. Unhook front winch chain. Remove whiffletree from position on front bumper (fig. 52). Remove 14 cap screws, nuts, and lock washers attaching front bumper to frame gussets. Remove front tow hook cap screw, nut, and lock washer. Loosen brush guard brace nut, and swing tow hooks outward (fig. 169). Remove two flat head screws, lock washers, and nuts attaching bumper to frame gusset under tow hooks. Slide bumper forward and off truck (fig. 169).

b. Installation. Place bumper in position, and install two flat head screws, lock washers, and nuts. Relocate tow hooks, and install tow hook cap screw, lock washer, and nut. Tighten brush guard brace nut. Replace 14 cap screws, lock washers, and nuts attaching bumper to frame gussets. Replace whiffletree on bumper, and secure front winch chain (par. 12) (fig. 52).

222. FRONT FENDER REPLACEMENT.

a. Removal.

(1) Raise engine hood. Remove 11 cap screws, nuts, lock washers, and flat washers attaching the fender to brush guard. Remove pioneer tools, and remove four cap screws, lock nuts, and nuts securing pioneer tool bracket to truck. Remove lock nut and nut from cab front corner support. Using a drift and hammer, drive cab support bolt up and out, and remove spacer block. Remove siren (par. 122) (fig. 110). Remove blackout driving light (par. 112). Remove headlight (par. 108).

(2) Remove eight fender to frame side rail cap screws, flat washers, nuts, and lock washers; remove two cap screws, flat washers, lock washers, and nuts attaching fender to running board. Slide fender straight out from truck and lift off.

b. Installation.

(1) Position fender on truck, and install flat washers on cap screws; install cap screws through fender and frame side rail. Install lock washers and nuts on inside of frame side rail. Install two cap screws, flat washers, lock washers, and nuts at fender to running board. Drive cab hold-down bolt through spacer block fender and support; install nut and lock nut.

(2) Install siren (par. 122) (fig. 110). Install blackout driving light (par. 112). Install headlight (par. 108). Replace pioneer bracket, and install cap screws, nuts, and lock nuts securing bracket to truck (fig. 53). Install pioneer tools. Inspect lights and siren for operation.

223. RUNNING BOARD REPLACEMENT.

a. Removal. Remove four nuts, lock washers, and cap screws attaching running board to bracket. Slide outward from truck and lift running board from brackets.

b. Installation. Start forward end of running board between front fender and front running board bracket. Slide running board in position. Install four nuts, lock washers, and cap screws.

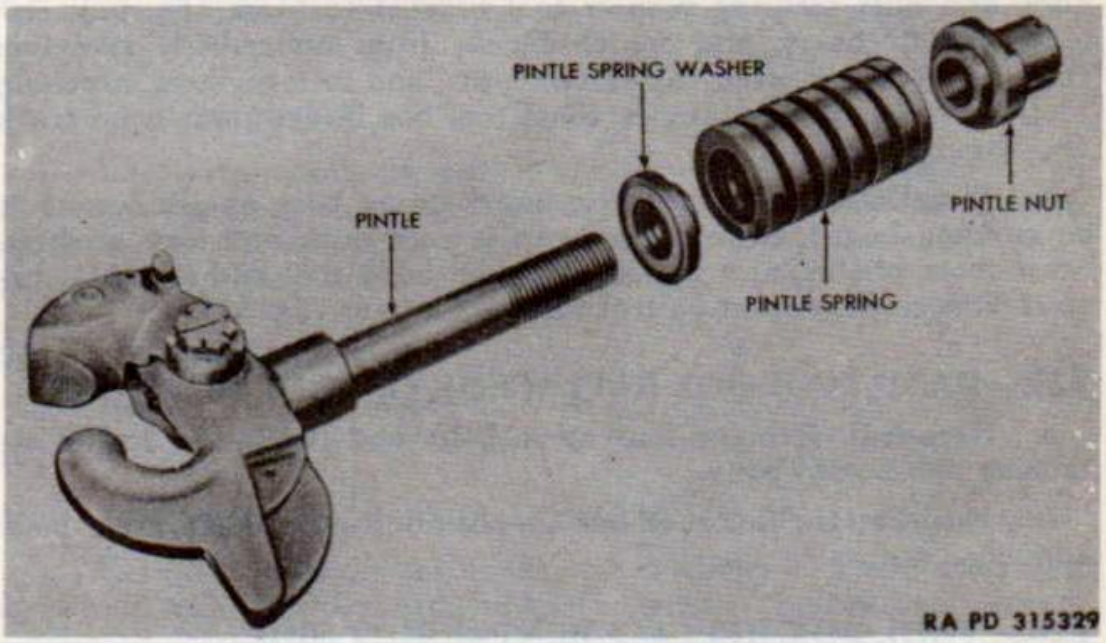


Figure 170—Pintle Hook Disassembled

224. TOW HOOK REPLACEMENT.

a. Removal. Remove tow hook cap screw, nut, and lock washer. Run brush guard brace upper nut at tow hook up as far as it will go, and remove brush guard brace nuts at guard and under frame side rail. Press brush guard back at top, and lift out brush guard brace. Remove tow hook.

b. Installation. Place tow hook in position. Press brush guard back at top, and insert brace rod through tow hook and frame side rail. Install rod in brush guard. Install rod lock washers and nuts, and tighten. Replace tow hook cap screws, lock washers, and nuts.

225. PINTLE HOOK REPLACEMENT.

a. Removal. Remove pintle shaft cotter pin. Remove four lock nuts, nuts, and cap screws securing pintle hook to cross member. Remove pintle shaft nut. Remove taillight wire clips on rear gussets. Remove pintle, washers, and spring (fig. 170).

b. Installation. Set the pintle shaft nut through the hole in the cross member. Place the rear washer in the spring, and set the spring in position by entering the spring and washer through the bottom of the pintle cross members. Install parts in same rotation as shown in figure 170. Secure alinement and run pintle shaft through cross members and spring. Install nut and tighten until cross member bolt holes are in alinement. Install cap screws, nuts, and lock nuts, then back off pintle shaft nut until end of nut and shaft are flush. Install cotter pin. Install light wiring connection clips.

226. UNDER-BODY TOOL BOX REPLACEMENT.

a. Removal. Remove pioneer tools and remove cap screws, lock nuts, and nuts securing pioneer tool bracket to truck (fig. 53). Remove tools, chains, and snatch blocks from under-body tool box (fig. 51). Remove seven cap screws, nuts, and lock washers attaching tool box to crane base angles. Slide tool box directly out from truck and lower to ground.

b. Installation. Set tool box under crane base angles resting it on running board. Install seven cap screws, nuts, and lock washers. Stow tools, chains, and snatch blocks in body tool box (fig. 51). Install pioneer kit bracket on truck and stow tools (fig. 53).

227. HAND TOOL BOX REPLACEMENT—LEFT SIDE BODY.

a. Removal. Remove four stove bolts and two wood screws attaching tool box to body.

b. Installation. Set tool box in position, and install stove bolts and wood screws.

228. TOOL BOX REPLACEMENT—RIGHT SIDE.

a. Removal. Remove tools from box and take out eight carriage bolts securing tool box bottom to body bed.

b. Installation. Set tool box in position and install carriage bolts. Replace tools in box.

229. TOOL BOX REPLACEMENT—TOP OF CRANE FRAME (fig. 50).

a. Removal. Remove tools from box and take out three cap screws, nuts, and lock washers securing box to crane frame.

b. Installation. Set tool box in position, and install cap screws, nuts, and lock washers securing box to frame. Replace tools in box.

Section XXXI

INSTRUMENTS

230. DESCRIPTION.

a. The instruments covered in this section include all gages with the exception of the fuel gage. Their significance is covered in paragraph 6. The purpose is to provide the operator with a constant indication of truck condition and operating control.

231. INSPECTION.

a. Inspect all instruments for loose wiring connections. Inspect for loose instruments in panel. Inspect for oil and air line leakage.

232. SPEEDOMETER REPLACEMENT (fig. 171).

a. **Removal.** Disconnect speedometer cable. Remove two wing nuts and lock washers attaching speedometer bracket and speedometer to instrument panel. Remove speedometer through front of instrument panel.

b. **Installation.** Place speedometer through opening in front face of instrument panel and install bracket on studs. Install two wing nuts. Connect speedometer cable. Road test to make sure miles per hour, trip odometer, and total mileage odometer are registering.

233. SPEEDOMETER CABLE REPLACEMENT.

a. **Removal.** Remove knurled nut connecting speedometer cable to speedometer head. Loosen bonding clamp at front of dash, and slip cable out of clamp. Pull cable through dash board. Remove knurled nut at front of transfer case, lift out speedometer drive extension on shaft (fig. 113), and pull cable from truck.

b. **Installation.** Replace speedometer extension shaft, and install cable at transfer case. Tighten knurled nut. Lay speedometer cable in frame channel running it under the clutch and brake pedal bracket past the steering gear. Thread the cable through the dash board and connect to speedometer head. Place cable in bonding clamp and tighten clamp. Road test for proper speedometer operation.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

A—HAND THROTTLE CONTROL CABLE
B—CHOKE CONTROL CABLE
C—IGNITION SWITCH
D—HEAT INDICATOR
E—AMMETER
F—PANEL LIGHT
G—SPEEDOMETER
H—AIR PRESSURE GAGE
J—TACHOMETER
K—TACHOMETER LOCK
L—SIREN LIGHT SWITCH
M—PANEL LIGHT SWITCH
N—BLACKOUT DRIVING LIGHT SWITCH
P—FUEL GAGE
Q—FUEL GAGE SWITCH
R—SPARK CONTROL CABLE
S—TRIP ODOMETER SET STEM
T—OIL PRESSURE GAGE
U—BLACKOUT SWITCH
V—TROUBLE AND SEARCHLIGHT SWITCH

RA PD 315330

Figure 171—Instrument Panel Rear

INSTRUMENTS

234. TACHOMETER REPLACEMENT (fig. 171).

a. Removal. Disconnect tachometer cable removing two wing nuts and lock washers from back of tachometer casing. Lift off blackout driving light resistance unit and clamp. Slide tachometer out through front of instrument panel.

b. Installation. Place tachometer through opening in front face of instrument panel, and install clamp over studs on back of tachometer. Install resistor, lock washers, and wing nuts, and tighten securely. Connect tachometer cable. Start engine. Inspect tachometer for registering engine revolutions per minute.

235. HEAT INDICATOR REPLACEMENT (fig. 171).

a. Removal. Drain water from engine (par. 80 **b**). Disconnect heat indicator from thermostat housing. Remove two cable clamps from hood tie rod. Loosen bonding clamp at dash and pull cable free. Remove stud nuts and lock washers from back of heat indicator instrument. Remove clamp, and pull instrument through opening in panel, feeding cable through hole in dash until instrument is free.

b. Installation. Insert end of cable through hole in instrument panel and on through hole in dash up to thermostat housing. Connect at thermostat housing. Set cable in two clamps on hood tie rod, and tighten bonding clamp at dash. Place bracket over instrument studs; install lock washers and stud nuts. Fill engine with water; inspect for water leaks at thermostat connection. Start engine and observe instrument to make sure engine temperature registers.

236. OIL PRESSURE GAGE REPLACEMENT (fig. 171).

a. Removal. Disconnect oil line at back of gage. Remove two stud nuts and lock washers retaining instrument clamp. Slide gage forward through opening in instrument panel.

b. Installation. Insert gage through opening in face of instrument panel. Place clamp over studs. Install lock washers and nuts. Connect oil line. Start motor and check for oil leakage at connection. Observe gage to make sure engine oil pressure registers.

237. OIL PRESSURE GAGE LINE REPLACEMENT.

a. Removal. Use two wrenches to remove the flexible oil line connection at the motor. Holding the $^{9}/_{16}$-inch wrench so that it does not rotate, turn the $^{7}/_{16}$-inch wrench to disconnect the oil line. Remove oil line clamp screw on dash, and disconnect line at oil pressure gage.

b. Installation. Connect line to gage. Install tubing clamp, and connect flexible oil line to motor, using two wrenches as described in subparagraph **a**. Inspect connections for oil leakage.

238. AIR PRESSURE GAGE REPLACEMENT (fig. 171).

a. Removal. Drain air reservoirs. Disconnect air gage line. Remove stud nuts and lock washers from back of gage. Remove clamp, and slide gage through front face of instrument panel.

b. Installation. Position gage through front face of instrument panel. Install clamp, lock washers, and nuts. Connect air line. Build up air pressure and check for air leakage.

239. AMMETER REPLACEMENT (fig. 171).

a. Removal. Disconnect battery (fig. 103). Remove terminal nuts and lock washers. Remove red lead from positive side and blue and green leads from negative side. Remove nuts, lock washers, and clamps from back of ammeter. Remove ammeter from opening in instrument panel.

b. Installation. Position ammeter through front face of instrument panel. Install clamp, lock washers, and nuts. Connect leads on terminals indicated in subparagraph a above. Connect battery (fig. 103).

Section XXXII

POWER TAKE-OFF

240. DESCRIPTION.

a. The power take-off is located on the rear end of the transfer case input shaft. It is equipped with a jaw clutch for engagement and disengagement of the power-driven equipment. A control lever is located in the cab for the power take-off operation.

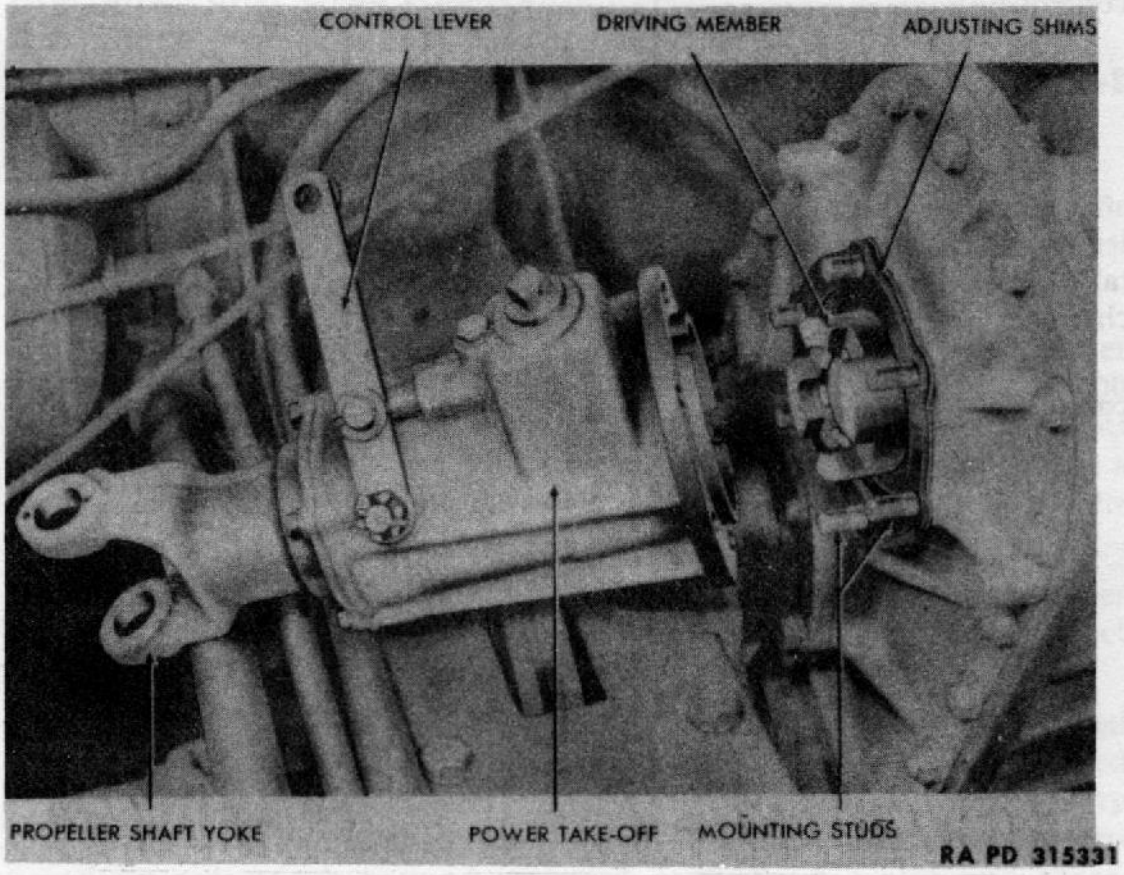


Figure 172—Power Take-off Removed

b. Before power can be transmitted to crane, front and rear winches, the main transmission must be placed in gear and the power take-off engaged (fig. 7).

241. INSPECTION.

a. Inspect the power take-off for free engagement, and replace if necessary. Inspect the power take-off mounting nuts for tightness, and tighten if it is required. Inspect control for damage and wear, and replace if necessary.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

242. POWER TAKE-OFF REPLACEMENT (fig. 172).

a. Removal. Disconnect power take-off propeller shaft. Removing lock plate cap screws at power take-off yoke, lift off lock plates. Drive cross as far to one side as possible to remove bushing. Drive cross in opposite direction to remove opposite bushing. Tilt cross to clear yoke and lift out. Remove cotter and clevis pins from power take-off control rod. Remove six stud nuts and lock washers. Pry power take-off to rear to clear studs and lift off.

b. Installation. Place power take-off on retaining studs with lever to the top. Install lock washers and nuts. Place universal cross in yoke, and install universal joint bearings, lock plate, and cap screws. Connect control rod. Lubricate power take-off with ½ pint of gear oil through filler plug (par. 26). Inspect for free engagement. Adjust control linkage as necessary. Inspect for grease leakage.

243. POWER TAKE-OFF CONTROL SERVICE AND REPLACEMENT.

a. Removal. Remove cotter and clevis pins. Remove power take-off control rod. Examine for worn pins and yoke eyes. The normal length of power take-off rod is 27 inches. The rear of the power take-off rod is provided with an adjustable yoke which should be checked for worn or loose threads.

b. Installation. Place control rod on levers, and install clevis and cotter pins. Tighten clevis lock nut.

Section XXXIII

WINCHES

244. DESCRIPTION.

a. The front winch is power driven from the transfer case power take-off through a lay shaft and has a direct pull capacity of 20,000 pounds. The front winch is to be used for light recovery operations only, or to assist the truck in recovery operations by forming a front end anchor when the rear winch is being used, or to pull the truck itself out if it becomes mired (fig. 19).

b. The rear winch is power driven from the transfer case power take-off through a two-speed and reverse gear box. It has a direct pull capacity of 47,500 pounds.

c. Each winch has a separate set of controls. They can be used in conjunction with one another or separately. A shear pin is installed in one yoke of each propeller shaft. This shear pin acts as a safety fuse to prevent overloading the winches. In the event a load is imposed on any winch beyond its rated capacity, the pins will shear, thereby protecting the winch affected (figs. 174 and 177).

245. INSPECTION.

a. Inspect cable for being correctly wound and tight on the drum. Rewind coil to coil tightly and evenly. Inspect cable rollers for free rotation, and lubricate if necessary. Inspect cable for kinks, lubrication, and frayed or broken strands. Inspect controls for proper operation. Readjust or replace if necessary. Inspect shear pins for presence and wear. Replace shear pins as necessary. Inspect winches for tightness in frame, and tighten if it is required.

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

246. FRONT WINCH REPLACEMENT.

a. Removal. Remove winch cable (par. 248). Remove front bumper (par. 221) (fig. 169). Disconnect trouble light connection wire, and pull wire through opening in frame channel. Remove four lock nuts, nuts, and cap screws from four corners of winch base angle. Remove shear pin attaching wormshaft to drive shaft yoke (fig. 174). Slide winch and base angle assembly forward out of frame channels (fig. 173).

b. Installation. Slide base and winch assembly into frame channels, and install four cap screws, nuts, and lock nuts attaching winch base angles to frame (fig. 173). Connect drive shaft and install shear

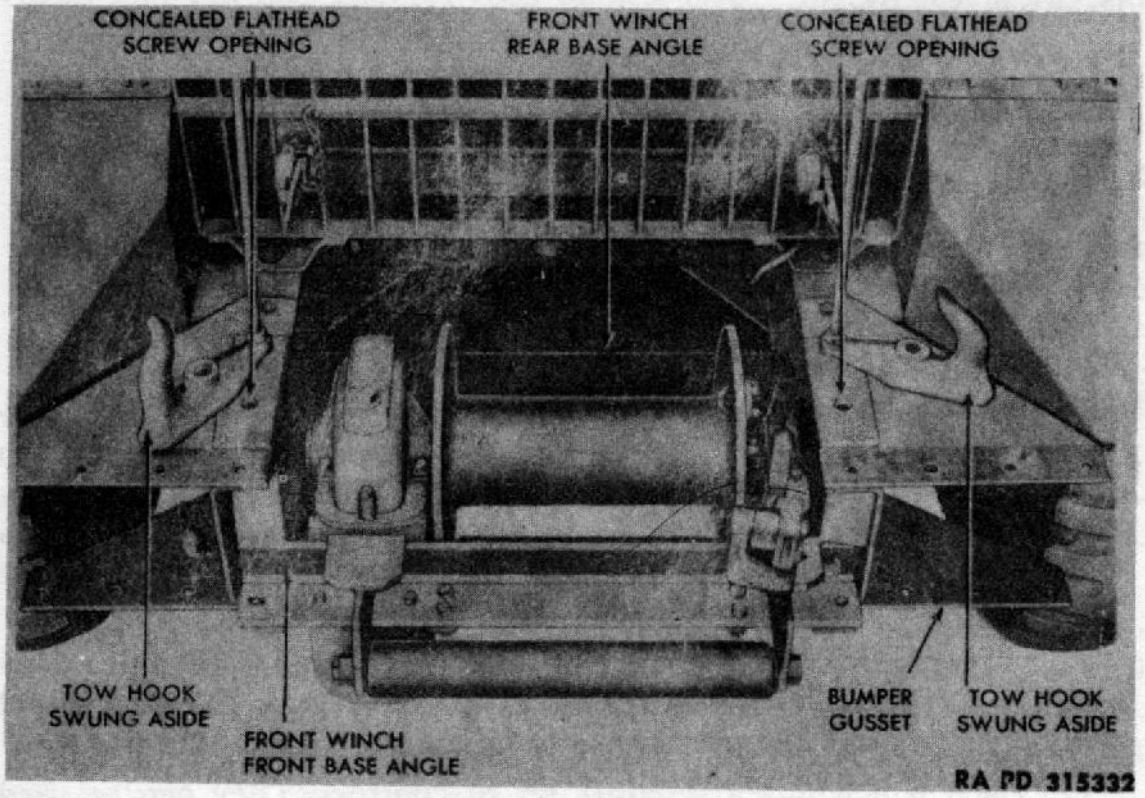


Figure 173—Front Winch Removal

pin (pars. 247 and 249) (fig. 174). Install front bumper (par. 221) (fig. 169). Rewind cable on drum (par. 248). Connect trouble light wire. Fill winch gear case with lubricant (par. 26). Inspect for grease leakage.

247. FRONT WINCH PROPELLER SHAFT REPLACEMENT (fig. 174).

a. Removal. Remove four cap screws and lock washers attaching propeller shaft center bearing to frame side rail. Remove front winch shear pin (par. 249). Remove socket head set screw at propeller shaft universal joint yoke. Drive yoke off front winch sprocket shaft. Remove propeller shaft from truck.

b. Installation. To install propeller shaft, connect universal joint yoke at front winch. Install shear pin (par. 249). Drive universal joint yoke on sprocket shaft, and replace set screw. Install four propeller shaft center bearing cap screws and lock washers. Inspect for shear pin cotter pin presence.

248. FRONT WINCH CABLE REPLACEMENT (fig. 16).

a. Removal. Disengage jaw clutch on front winch and unwind cable off drum. The disengagement of the front winch clutch places the drum in "free wheeling" and the cable can be removed by pulling

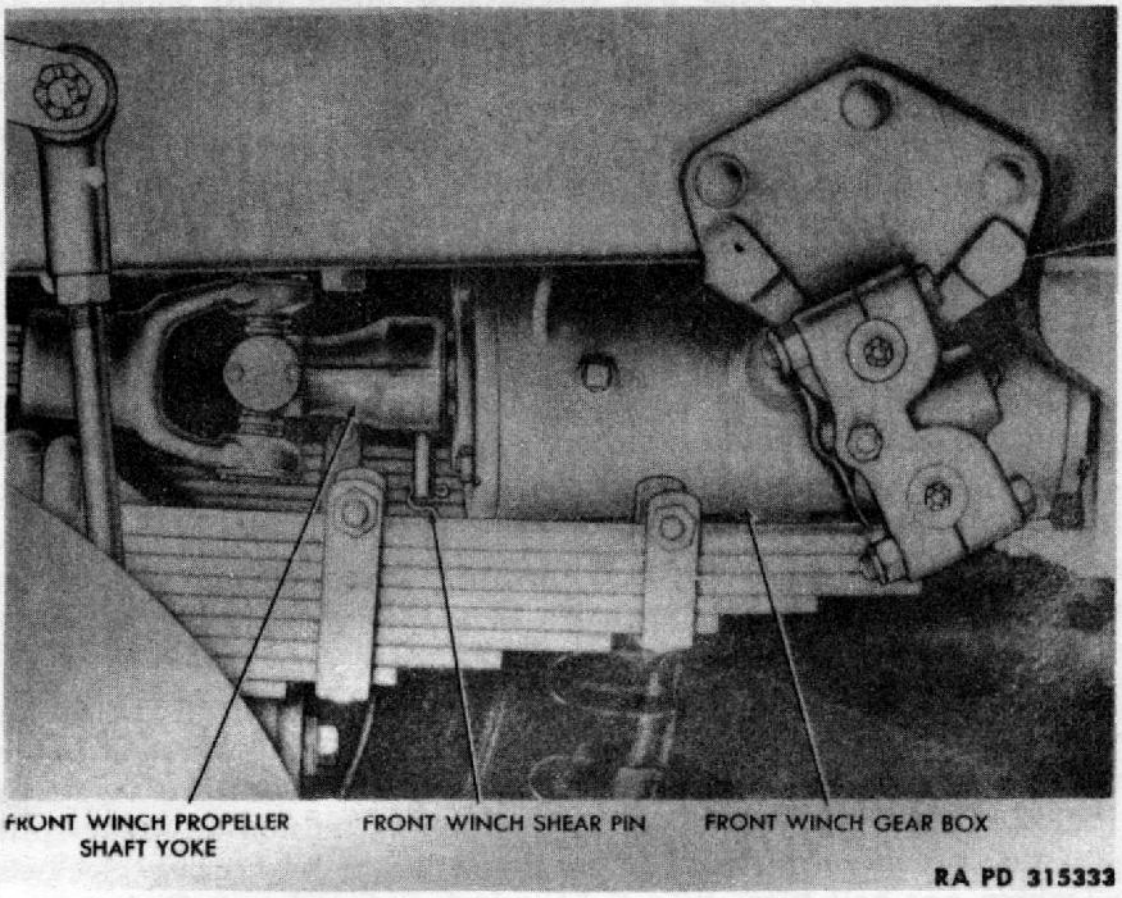


Figure 174—Front Winch Shear Pin Replacement

the cable off the drum by hand. Loosen nuts on cable clamp U-bolt, and remove cable from drum.

b. Installation. Insert cable in drum clamp, and tighten U-bolt nuts. Engage front winch hand jaw clutch. Wind cable on drum. Secure cable chain to front tow hook and tighten carefully. Inspect cable for being wound coil to coil and layer to layer. Inspect cable for being wound tightly.

249. FRONT WINCH SHEAR PIN REPLACEMENT (fig. 174).

a. Removal. Remove cotter pin. Drive shear pin out of yoke and shaft.

b. Installation. Aline holes in universal yoke and shaft. Drive shear pin through yoke and shaft holes. Install cotter pins.

250. FRONT WINCH DRIVE CHAIN REPLACEMENT.

a. Remove two cotter pins on the same link. Drive off side plate, and pull link pins disconnecting chain.

b. Placing new chain on one link pin and the other link pin in the old chain, turn the double universal joint assembly counterclockwise with the front winch jaw clutch and the power take-off disengaged (fig. 17). This will thread new chain onto sprocket, and when new chain appears at lower drive sprocket, remove old chain from link pin and connect ends of new chain. Install side plate and cotter pins.

251. FRONT WINCH BRAKE BAND REPLACEMENT.

a. Removal. Remove four cap screws and lock washers securing brake case cover to gear case and base angle. Back off adjusting nut on lower side of brake case. Should interference exist between cover and rope roller bracket, use a torch and cut off $\frac{3}{8}$ inch from rope roller bracket; then slide cover and band forward and off winch brake drum. Remove brake band anchor end nut and adjusting nut on outside of brake case, and remove band from brake case. Lift spring off adjusting stud.

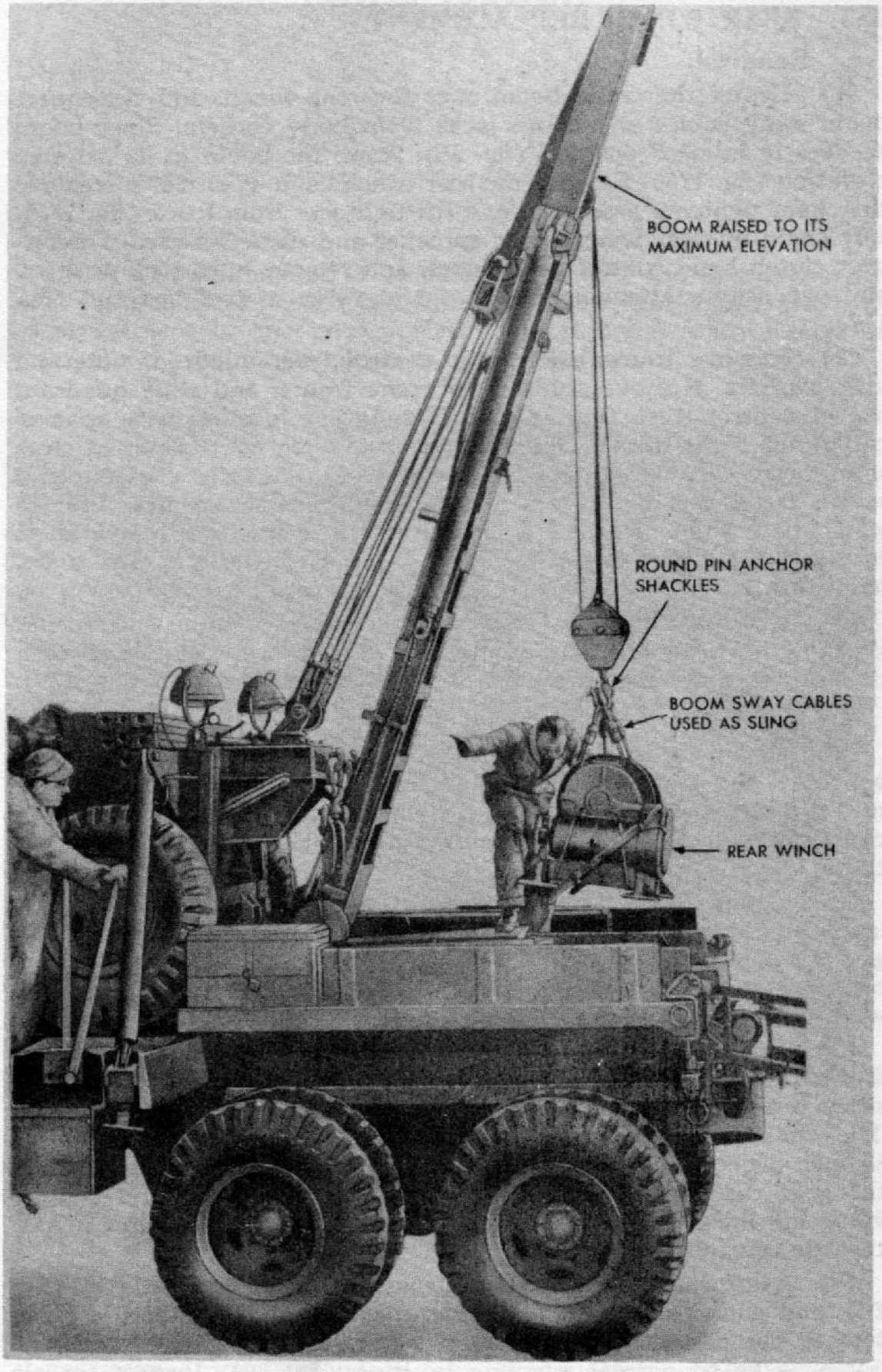
b. Installation. With band installed in cover and with adjustment left loose, set cover assembly in position, and install brake case cap screws, and lock washers.

c. Adjustment. The brake band on the front winch should prevent the drum from turning when the power take-off is in neutral or the shear pin has failed. If load slips when take-off is in neutral, or when shear pin has failed, increase spring tension on brake spring by turning the adjusting nut on underside of brake case clockwise. Tighten one-half turn, then tighten lock nut and test. Tighten more (by one-half turns) if necessary. Even if correctly adjusted, the brake will heat somewhat, but if the hand cannot be held on the brake case, the brake adjustment is too tight.

252. FRONT WINCH DRAG BRAKE SHOE REPLACEMENT (fig. 173).

a. Removal. Remove front winch (par. 246). Remove two front winch base angle cap screws and lock washers, and slide base angle forward. Remove cotter pin from clutch yoke pin. Drive pin out of yoke. Remove drag brake.

b. Installation. Set drag brake in position in yoke, and install yoke pin and cotter pin. Install front winch base angle. Install front winch (par. 246).



RA PD 315334

Figure 175—Rear Winch Removal

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

253. REAR WINCH REPLACEMENT.

a. Removal.

(1) Center the crane boom over the rear winch, and disconnect boom sway cables and boom jacks from body corners. Place boom sheaves in inboard position (fig. 26). Raise the boom to its extreme elevation (fig. 175). Remove the rear winch cable (par. 257). Remove the chain tightener assembly, and lift tightener from truck (fig. 176). Lift chain off rear winch drive sprocket and move forward. Disconnect clutch hand control valve pipes, and remove nuts, lock washers, and cap screws attaching hand control valve to tool box end (fig. 177).

(2) Remove transmission shift control lever quadrant nuts and lock washers. Remove studs from crane frame, and slide quadrant out of control lever (fig. 181). Lift quadrant together with spacing collars off crane frame. Disconnect transmission control rod at cross shaft lever; remove cotter and yoke clevis pins. Remove four cap screws, nuts, and lock washers attaching transmission gear case to winch base angle. Remove four cap screws, nuts, and lock washers securing frame base angles to crane frame. Remove four cap screws, lock washers, and nuts from throttle control and lay in body.

(3) Utilizing the boom sway cables and two round pin anchor shackles, form a sling around the winch gear case and the winch drum shaft, and hoist rear winch assembly out of the truck (fig. 175).

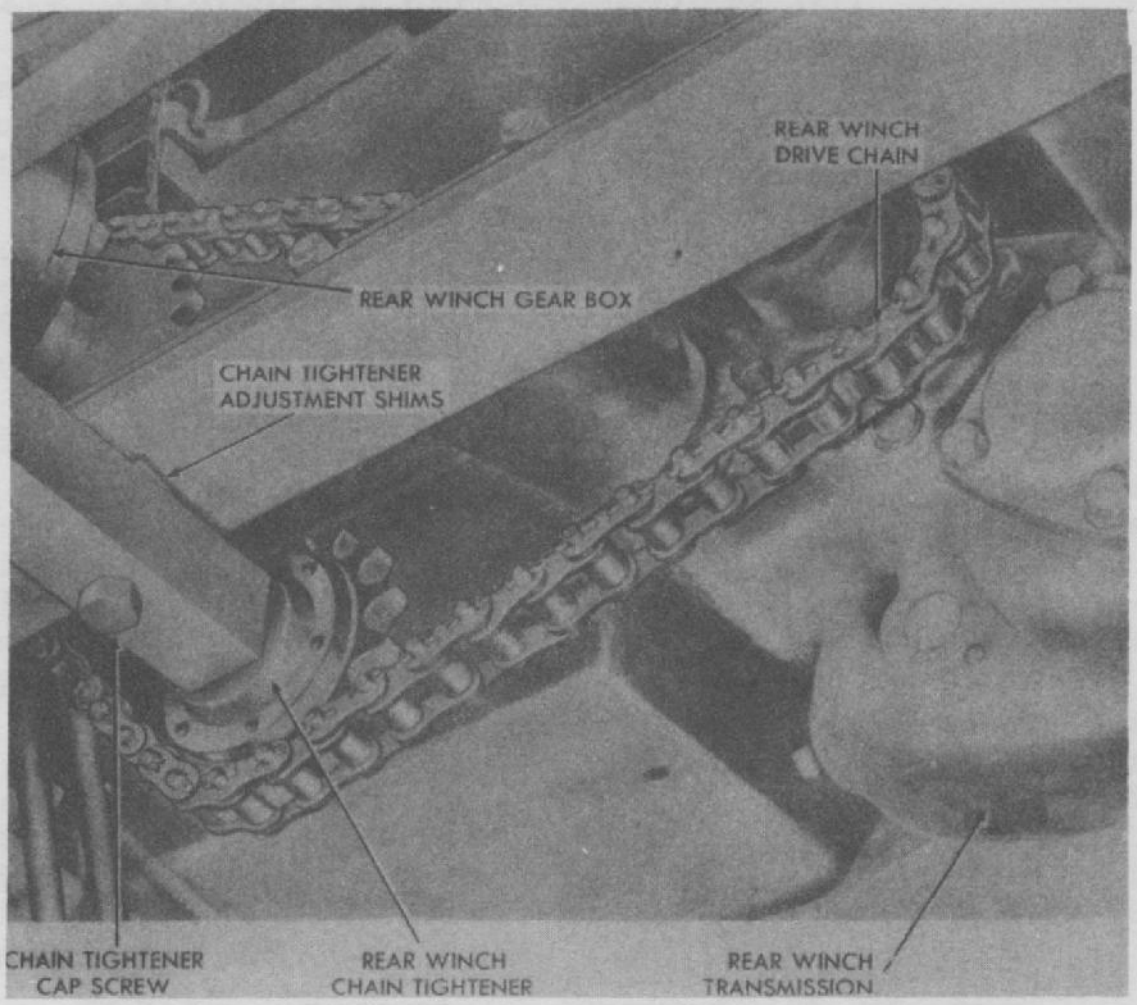
b. Installation.

(1) Using the method shown in figure 175, position the rear winch on the crane frame base angles. Install the four cap screws, nuts, and lock washers securing the winch to the crane frame. Install cap screws, nuts, and lock washers securing the transmission gear case to the winch base angle.

(2) Connect winch transmission control rod to the cross shaft lever, and install yoke clevis and cotter pins. Position transmission gear shaft lever quadrant in lever (fig. 181), and install spacing collars between quadrant and crane frame. Install quadrant studs, lock washers, and stud nuts.

(3) Install rear winch drive chain and chain tightener assembly. The chain tightener is adjusted by the removal and installation of shims between the chain tightener and the winch base angle (fig. 176). The chain, when properly adjusted, provides for a maximum of ¼-inch deflection with the load placed in center of the chain between the gear case and driving sprockets. Connect clutch hand control valve air lines, and attach hand control valve to tool box. Install throttle control lever assembly.

(4) Start engine. Place winch transmission in forward gear (fig. 20), and wind cable onto rear winch drum (par. 257). Secure cable to rear bumperette (par. 12). Install sway cables on boom and rear boom jacks to normal carrying position (fig. 30). Inspect for air leaks. Lubricate winch gear case (par. 26). Inspect adjustment of safety brake (fig. 179). Adjust if necessary (par. 256).



RA PD 315335

Figure 176—Rear Winch Drive Chain Replacement

254. REAR WINCH DRIVE CHAIN REPLACEMENT.

a. Removal. Remove two nuts, lock washers, and cap screws from chain tightener support. Remove chain tightener assembly (fig. 176). Remove two cotter pins from chain link. Remove chain pin plate and pins.

b. Installation. Connect new chain on master link pin to connect end of new chain to the old chain. Turn winch drive sprocket, feeding the new chain around sprockets as the old one is taken off. When the end of new chain arrives at starting point, connect ends of new chain. Install plate and cotter pins. Place chain tightener in position. By installing and removing spacer shims between chain tightener and winch frame, proper adjustment of chain may be obtained (par. 253 b (3)).

255. REAR WINCH SHEAR PIN REPLACEMENT.

a. Removal. Remove cotter pin, and drive shear pin out of worm-shaft sprocket hub.

b. Installation. Aline holes in sprocket hub and worm shaft. Drive new pin in position and install cotter pin (fig. 177).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

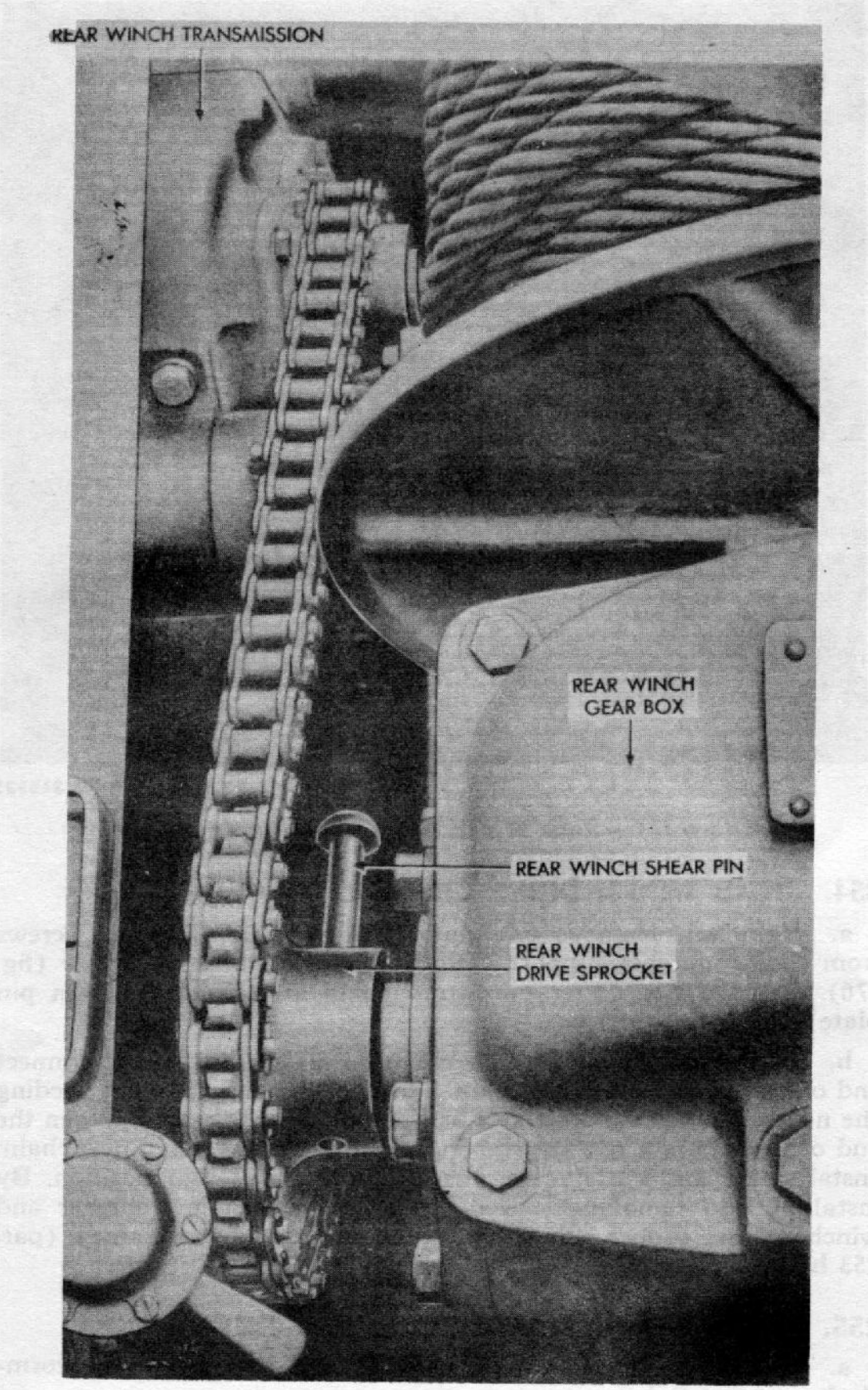


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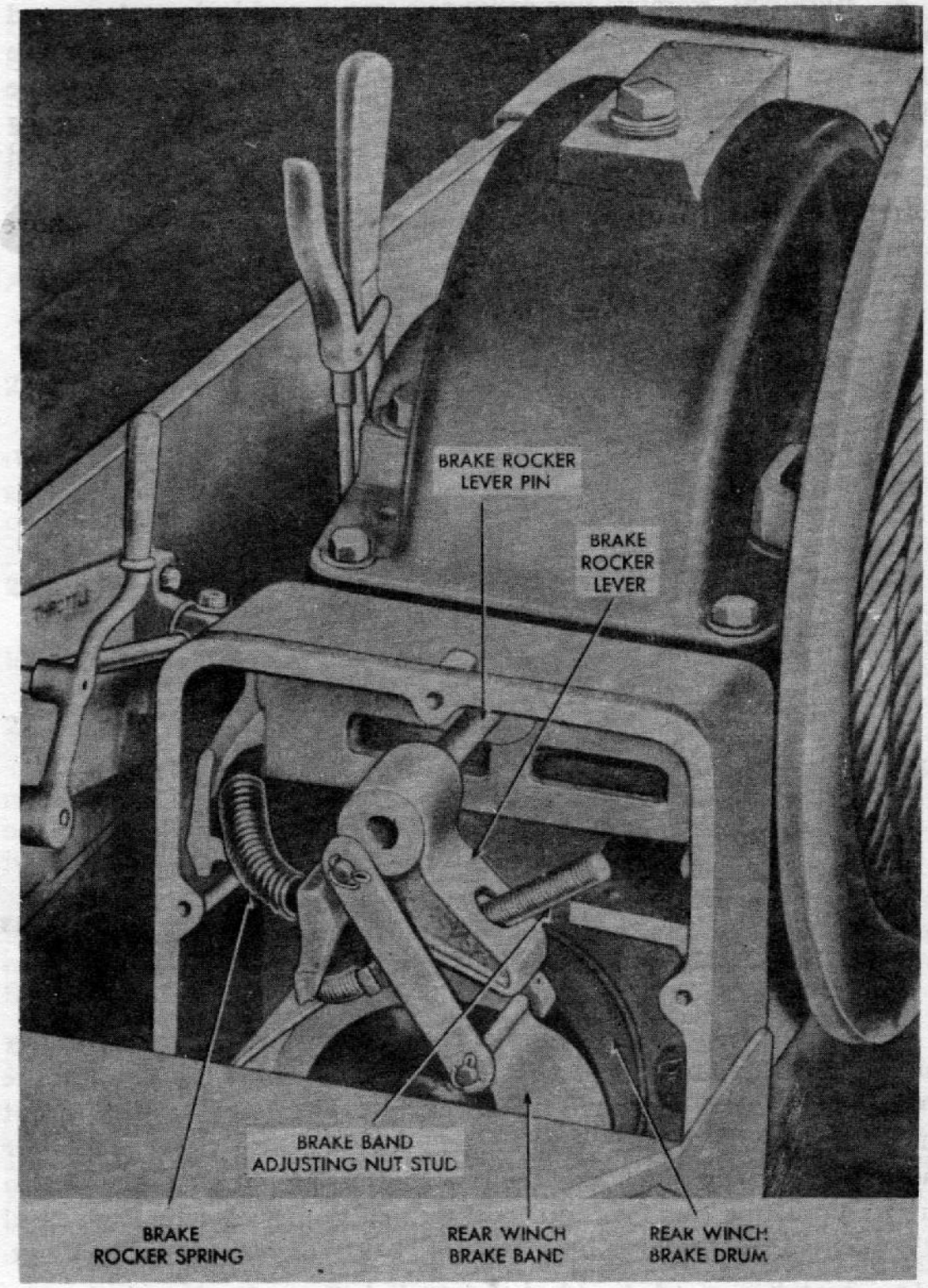
Figure 177—Rear Winch Shear Pin Replacement



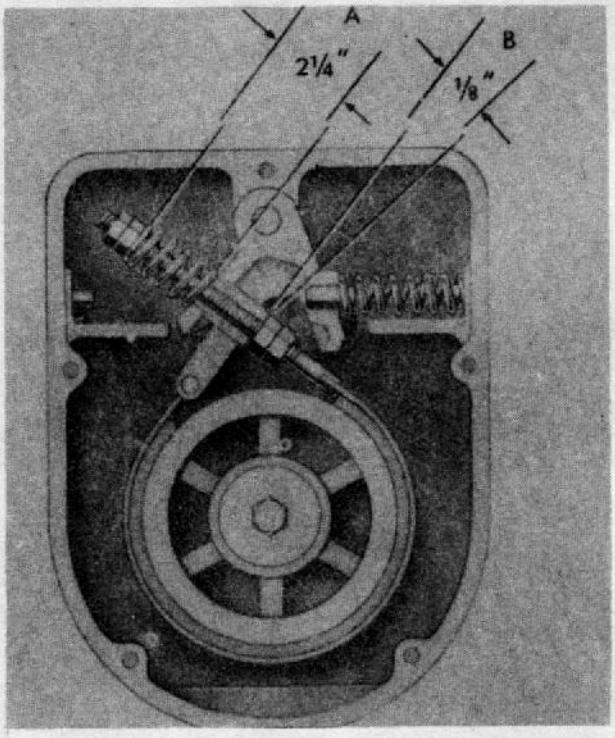
RA PD 315337

Figure 178—Removing Rear Winch Safety Brake

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

256. REAR WINCH SAFETY BRAKE BAND REPLACEMENT AND SERVICE.

a. Removal. Remove five cover cap screws and lock washers, and lift off cover. Remove brake band adjusting lock nut and nut. Remove spring seat and spring. Slide band assembly toward the rear of the truck until rocker lever is free of pin, and at the same time removing band return spring. Then lower through opening between the bed and frame (fig. 178). After assembly is free from truck, remove cotter pins from control linkage pins, then it is possible to remove band from linkage.



RA PD 315338

Figure 179—Rear Winch Safety Brake Adjustment

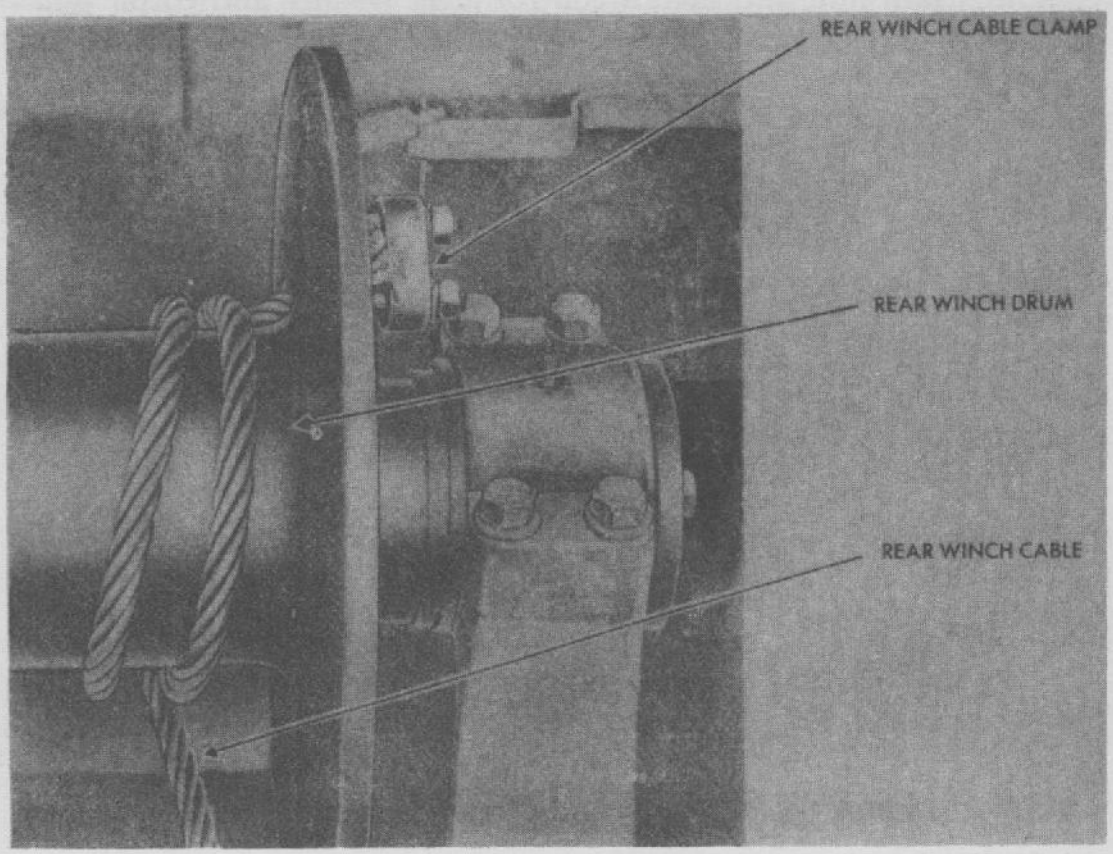
b. Adjustment. Remove brake case cover. With the spring spacer sleeve pressed into the rocker lever until it comes up against the rocker lever seat, back off the check nut, and lower adjusting nut until clearance of ⅛ inch is obtained between spacer sleeve and lower adjusting nut (fig. 179). Tighten lower adjusting nut lock nut. Loosen upper adjusting nut lock nut, and tighten upper adjusting nut until 2¼-inch spring height is obtained (fig. 179). Tighten upper lock nut.

c. Installation. Assemble band to linkage and rocker lever (fig. 183), and bring assembly through opening between brake case and base angle. Position rocker lever on mounting pin and band on drum. Install rocker lever return spring. Inspect brake band adjustment. Readjust if necessary. Install brake case cover and cap screws.

257. REAR WINCH CABLE REPLACEMENT.

a. Removal. Start engine. Place transmission and power take-off in gear (fig. 17). Release engine clutch, and place rear winch transmission in reverse gear (fig. 20). Unwind rear winch cable, winding the cable on the spool as it unwinds from the rear winch. When only a few turns of cable remain on the winch drum, stop the winch and loosen the two rope clamp nuts; then remove the remainder of the cable from the winch drum (fig. 180).

b. Installation. Before installing cable, refer to paragraph 12 on cable winding. Enter winch cable through drum flange opening,



RA PD 315339

Figure 180—Rear Winch Cable Removal

install cable clamps, and tighten securely. Start the engine, and place transmission and power take-off in gear (fig. 17). Engage winch transmission in low gear, and carefully wind cable on drum tightly coil to coil and layer to layer (par. 12) (fig. 20). Inspect cable clamps for tightness. Secure winch cable to bumperettes (par. 12).

258. REAR WINCH THROTTLE CONTROL REPLACEMENT.

a. Removal. Remove cotter pin in throttle control lever, and slide yoke off lever pin. Loosen yoke jam nut and turn yoke out of end of control cable. Loosen control cable clamp bracket. Remove control cable clamps at body frame rail and transmission bracket. Remove clevis and cotter pins at throttle cross shaft lever. Loosen yoke jam

nut, turn clevis yoke off end of cable, and pull control assembly through rear of truck.

b. Installation.

(1) Thread control cable through rear of truck, and place cable under reservoir mounting brackets. Tighten control cable clamp bracket at control lever end of cable. Install cable clips at body rail and transmission cover.

(2) Install clevis and cotter pins attaching control cable to accelerator cross shaft lever. Install adjustable yoke on control cable. Tighten jam nut, and install control lever washer and cotter pin.

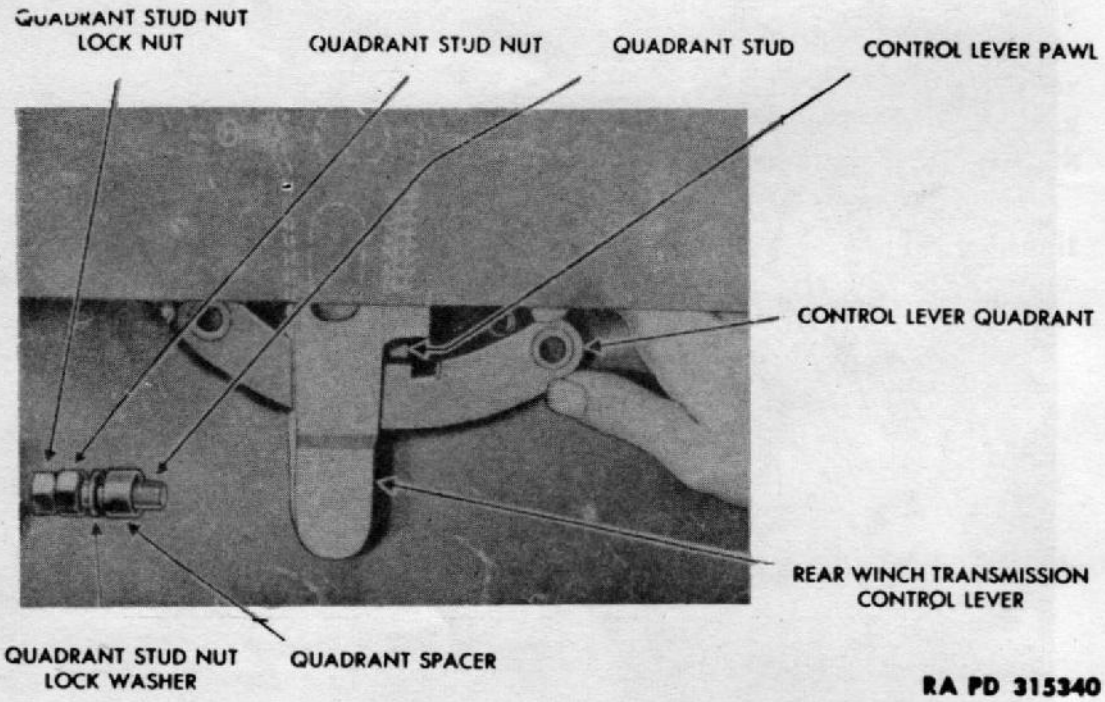


Figure 181—Rear Winch Control Segment Removal

259. REAR WINCH TRANSMISSION CONTROL LEVER REPLACEMENT (fig. 181).

a. Removal. Loosen shift lever quadrant stud nuts two turns and install jam nuts on studs. Tighten nuts securely and turn studs out of crane base channel. Loosen jam nut and set screw attaching control lever to cross shaft, and pry shift lever off cross shaft. Compress control lever latch spoon, raise pawl out of ratchet segment, and slide ratchet out of shift lever.

b. Installation. Place control lever on end of cross shaft with spoon to rear of truck and drive into position. Tighten set screw and lock nut. Depress latch spoon, and insert segment in opening in control lever with notch side up. Install spacers between segment and crane frame. Install studs, lock washers, and stud nuts.

Section XXXIV

CRANE

260. DESCRIPTION.

a. The crane is full powered direct from the engine through the power take-off mounted on the transfer case. All operations of hoisting and lowering the load and boom, or swinging the boom right or left, is accomplished by worm geared winches and swinger. One clutching gear case is provided for driving the load hook, the boom topping and swinging. Each operation is controlled by a single hand lever banked at the side of the crane A-frame. A throttle control is installed near the control levers for regulating the truck engine speed. The crane is equipped with a swinger cut-out that will disengage the engine clutch if the boom is swung too far to the right or left.

b. The maximum capacity of the crane is 11,000 pounds when the boom jacks are used, with the exception that a 16,000-pound load is permissible when the inner sheave only is used with the boom jacks extended to the ground at a jack height of 10 feet, 10 inches.

261. INSPECTION.

a. Inspect boom swinger cut-out for clutch release. Inspect free engagement of shift levers; lubricate and service, if necessary. Inspect condition of cables, and replace, if necessary.

262. BOOM PIVOT REPLACEMENT.

a. Removal.

(1) Anchor boom jack legs at their minimum length in the corners of the body, and lock in position with the anchor and tube pins. Slack off the boom topping cable until the boom load is barely resting on

the boom jacks. In positioning boom jacks, make sure that both jacks are exactly the same length (fig. 182).

(2) Remove boom pivot sheave cotter pin. Drive the sheave pin out of the boom pivot to the right of the truck. Place a wood block between hoist cable and boom cross bar to prevent cable damage. Hook the hoist line into the boom, and tighten carefully until all slack in the hoist line is taken up.

(3) Remove boom indicator plate. Remove lubricating fittings in boom hinge pin. Remove boom hinge pin cotter pin and remove hinge pin nut. Drive hinge pin out of boom pivot (fig. 182).

(4) Release boom topping line and, at the same time, raise the hoist line. The boom will then pivot and support itself on the boom

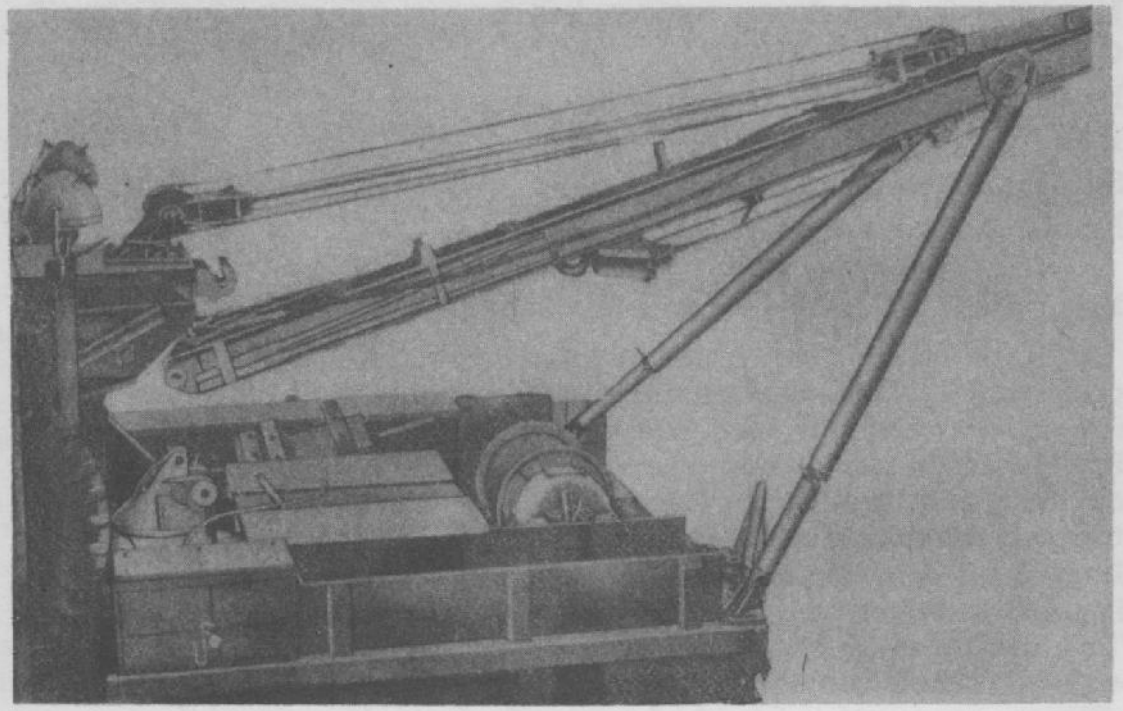


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Figure 182—Boom Positioning—Pivot Removal

jacks and move toward the rear of the truck. The inner end of the boom will rise clear of the boom pivot (fig. 182).

(5) Remove cut-out valve air line connections. Remove two cap screws, nuts, and lock washers retaining cut-out valve to crane frame. Remove cut-out valve. Remove cut-out valve air line tubing clip, and bend line toward front of truck (fig. 183).

(6) Remove eight boom pivot nuts, lock washers, and cap screws attaching boom pivot to crane frame. Slide boom pivot assembly to left of truck until spline of boom pivot coupling shaft clears coupling. Placing a long bar in boom hinge pin opening, raise boom pivot, and slide planking under boom pivot base (fig. 183). Place boom pivot sheave pin in position and install cotter pins. Using a chain hoist

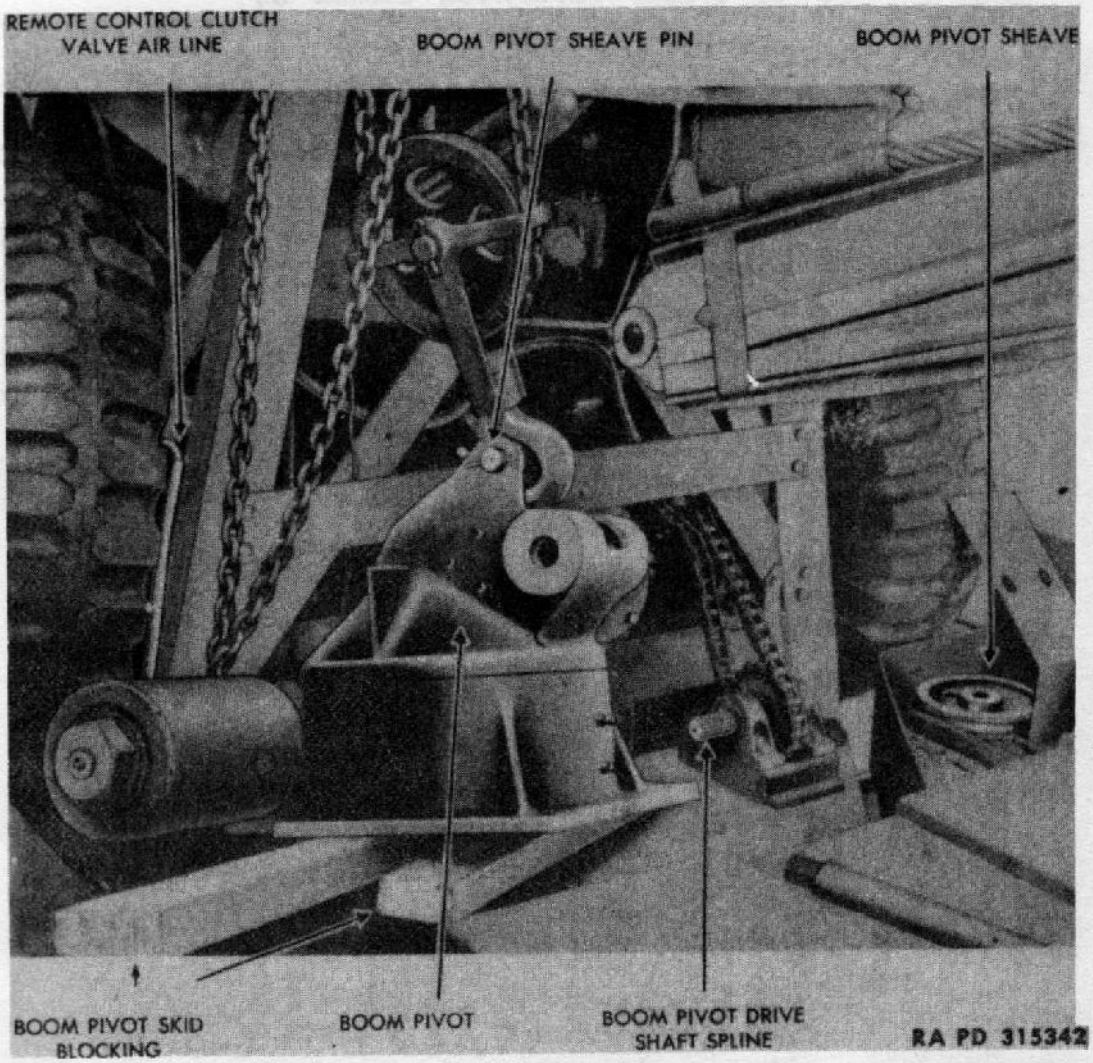

Figure 183—Boom Pivot Removal

hook on the sheave pin, raise boom pivot off blocking and clear of the truck (fig. 183).

b. Installation.

(1) Using chain hoist hook on sheave pin, raise boom pivot into position on crane frame. Aline boom pivot wormshaft spline with spline coupling (fig. 183). Slide boom pivot assembly toward right of truck until retaining bolt holes are alined. Install eight cap screws, lock washers, and nuts attaching boom pivot to crane frame.

(2) Place cut-out valve in position, and install two cap screws, nuts, and lock washers (fig. 188). Connect two cut-out valve air line connections, and install air line tubing clip.

(3) Lower hoist line and, at the same time, raise topping line which will lower boom into position on top of boom pivot. Aline holes in boom pivot, and install hinge pin, nut, and cotter pin. Place boom indicator plate in position, and install cap screws and lock washers.

(4) Lower hook line until line is free. Set pivot sheave in position, and install pivot sheave, pin, and cotter pin with the cable under sheave. Lubricate boom pivot and hinge pin (par. 26).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

263. TOPPING PIVOT REPLACEMENT.

a. Removal.

(1) Remove oxygen and acetylene tanks. Lower boom until it comes to rest on blocking placed across the rear winch drum (fig. 23). Continue to lower until one turn of line remains on the boom topping drum. Disconnect cable clamp at drum, and pull cable out of guide, fleeting sheaves, and topping pivot.

(2) Remove cotter pin, castellated nut, flat washers, and shaft from topping pivot sheave and pivot horizontal block. Lower block

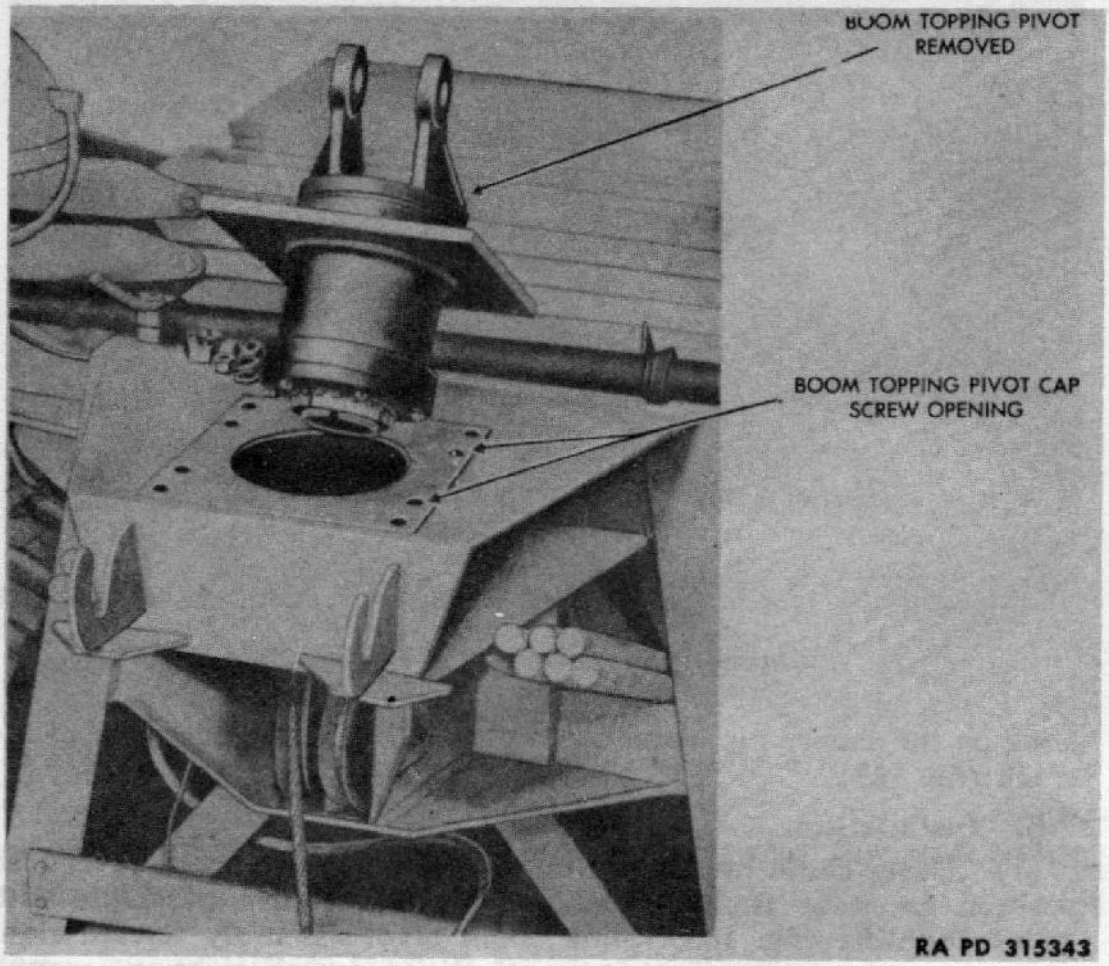

Figure 184—Topping Pivot Removal

and line, and lay on boom. Remove eight nuts, lock washers, and cap screws holding topping pivot to crane frame. Lift topping pivot free of crane (fig. 184).

b. Installation.

(1) Set topping pivot in place on crane frame. Install eight cap screws, lock washers, and nuts retaining pivot to frame. Place topping pivot block and sheave in place, and install block and sheave bolt, washers, nut, and cotter pin.

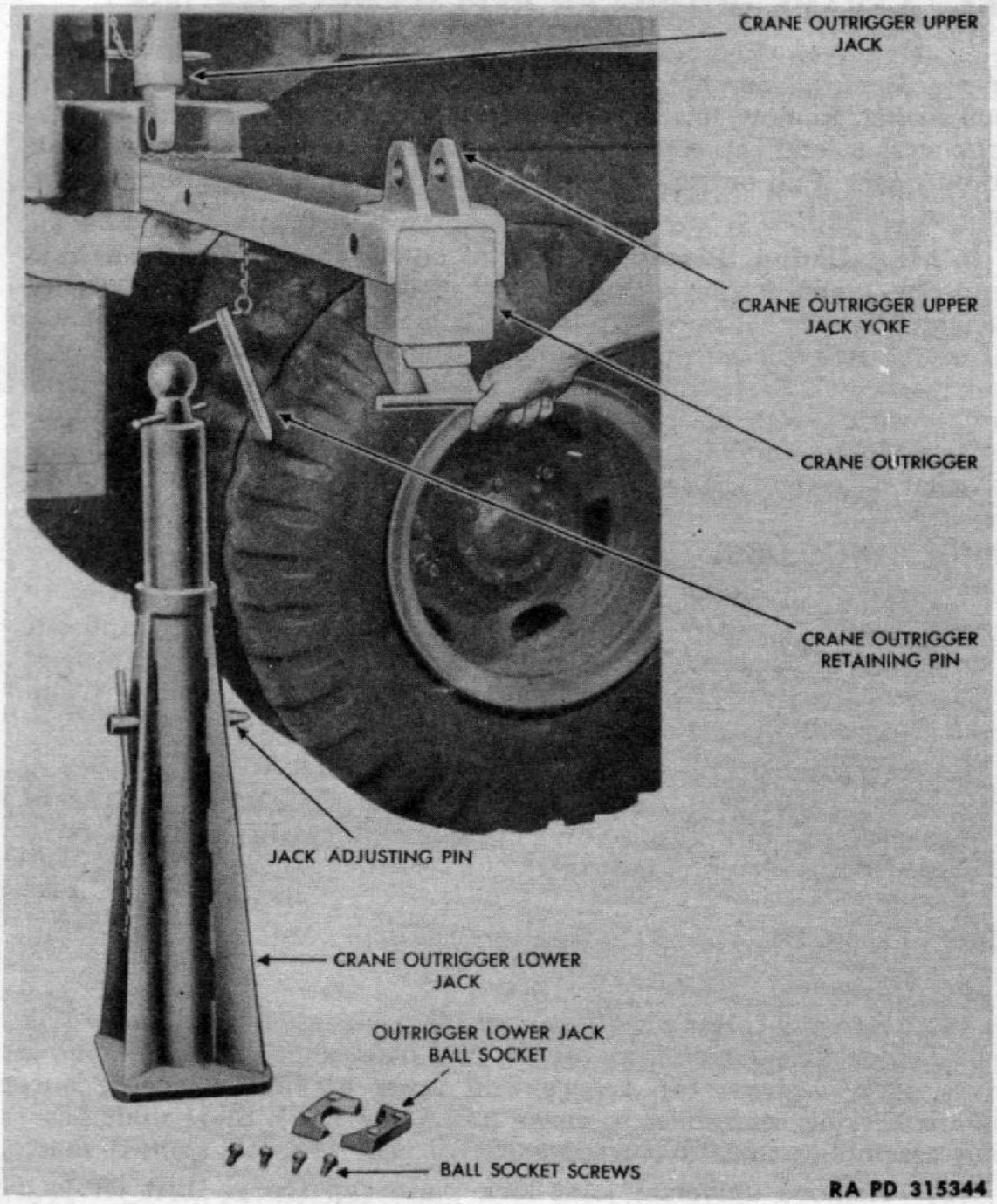

Figure 185—Removing Outrigger

(2) Taking free end of topping line, thread over top of pivot sheave through center opening in topping pivot, under vertical guide sheave directly below topping pivot, and over top of fleeting sheave directly above boom drum. Place end of cable in drum cable clamp. Tighten clamp securely.

(3) Engage boom lift, winding cable on the drum coil to coil without any open winding or building up of turns at changes in layer, until boom is lifted to normal position (fig. 23). Replace oxygen and acetylene tanks. Lubricate topping pivot and sheave pins (par. 26).

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

264. A-FRAME OUTRIGGER REPLACEMENT (fig. 185).

a. Removal. Remove clevis pin locking lower outrigger jack to frame. Remove four flat head screws holding lower outrigger jack in ball socket. Remove lower outrigger jack from outrigger. Remove nut, lock washer, and cap screw holding lower end of upper outrigger jack to outrigger. Pull outrigger retaining pin from channel. Pull outrigger free of crane frame.

b. Installation. Place inner end of outrigger on frame, and slide into the crane frame with ball socket down until it supports its weight. Place lower outrigger jack in ball socket. Place lower portion of socket in position, and install four flat head screws. Place upper outrigger jack in position, and install cap screw, lock washer, and nut. Push outrigger in toward the truck until retaining pin holes are in line. Insert retaining pin. Push lower boom jack up to retaining bracket on frame and install pin.

265. BOOM JACK REPLACEMENT.

a. Removal. Remove cotter and clevis pins from lower end of boom jack. Lift lower end of boom jack free of socket, and pull out two inner tubular sections of boom jack. Remove cotter pin, nut, and cap screw from upper end of boom jack. Remove upper end of boom jack from boom.

b. Installation. Place upper end of boom jack in clevis on boom, and insert cap screw, nut, and cotter pin. Slide inner sections of boom jack in outer casing, and place lower end in clevis on body corner. Insert clevis pin and cotter pin.

266. MAIN DRIVE LINE REPLACEMENT.

a. Removal.

(1) Remove cotter pins from two pins on same link. Remove link plate, slide link out of front winch, and hoist winch chains. Remove nuts, lock washers, cap screws, and taper washers attaching outboard bearing assemblies to crane frame (fig. 186). Slide shaft bearing assemblies toward rear of truck to pull yoke off splined shaft.

(2) Remove universal joint lock plate cap screws. Lift off lock plate, drive center cross to one side of yoke, and remove bearing assembly. Drive cross in opposite direction to remove opposite bearing, tilt center cross, and remove the power take-off shaft yoke.

(3) Remove cotter pin in end of power take-off shaft, remove nut, and install yoke puller. Remove yoke from power take-off shaft.

b. Installation.

(1) Place universal yoke on power take-off shaft, and install nut and cotter pin. Place universal cross in yoke on power take-off, and install universal bearings, lock plates, and cap screws.

(2) Enter universal joint spline shaft in main drive line spline, and aline holes in main drive line and crane frame. Install nuts, lock

washers, cap screws, and taper washers. Install link pins, plate, and cotter pins in main drive chain and front winch drive chain.

267. HOIST AND BOOM CHAIN REPLACEMENT.

a. Removal. Remove two cotter pins on the same link in old chain. Drive off side plate, and pull link pins out of chain. Turn main drive line double joint clockwise and remove old chain.

b. Installation.

(1) Place new chain over right side of rear winch drive sprocket. Pull it to the left of the truck, then thread it under and up one side of the hoist winch gear case sprocket. Pull the chain up and over boom swinger gear case sprocket, over the top of the boom lift sprocket, and then over the top of the chain tightener located on crane frame. Finally thread it back under main drive sprocket. Join

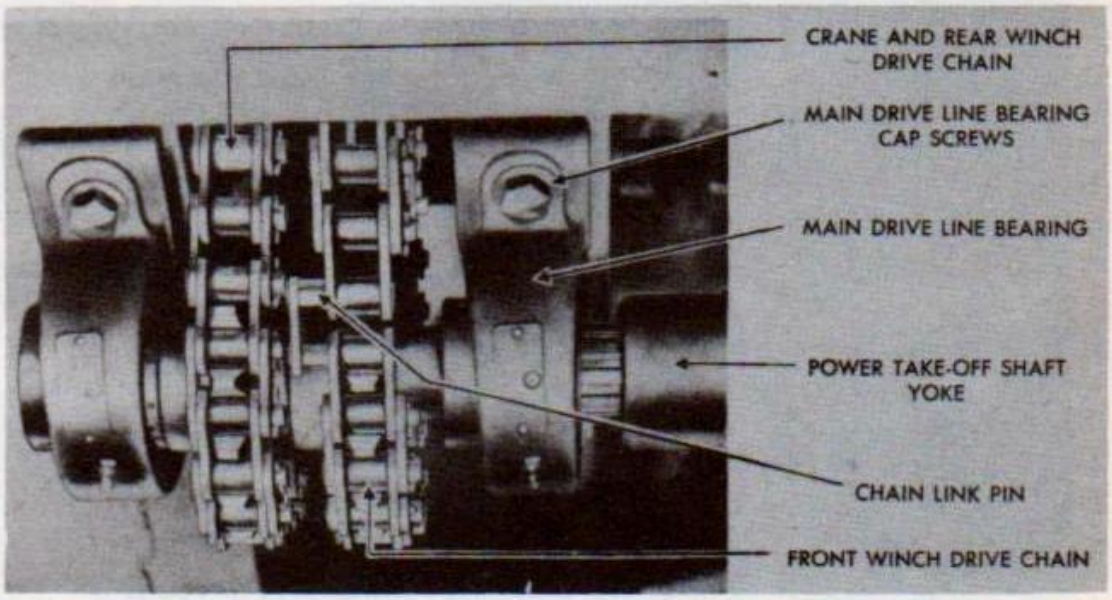

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Figure 186—Main Drive Chain Replacement

the two ends; install link side plate and cotter pins. Lubricate chain (par. 26).

(2) Adjust chain tension at eccentric chain tightener. Loosen chain tightener clamp bolts. Turn carrier until all slack is removed from chain. Tighten clamp bolts.

268. SWINGER GEAR CASE TO SWINGER WORM SHAFT CHAIN REPLACEMENT.

a. Removal. Remove swinger worm shaft sprocket chain guard cap screws. Remove two cotter pins from same link, and drive off side plate. Pull link out of chain and remove.

b. Installation. Place chain over gear case sprocket, over chain tightener sprocket, and around and under boom pivot worm shaft sprocket. Install link side plate and cotter pins.

269. BOOM LINE FLEETING SHEAVE REPLACEMENT.

a. Removal. The boom line fleeting sheave is located within the crane frame and is the sheave at the right-hand side of the crane. Start engine, place transmission in third gear, and engage power take-off. Lower boom to rear winch until boom line is slacked off

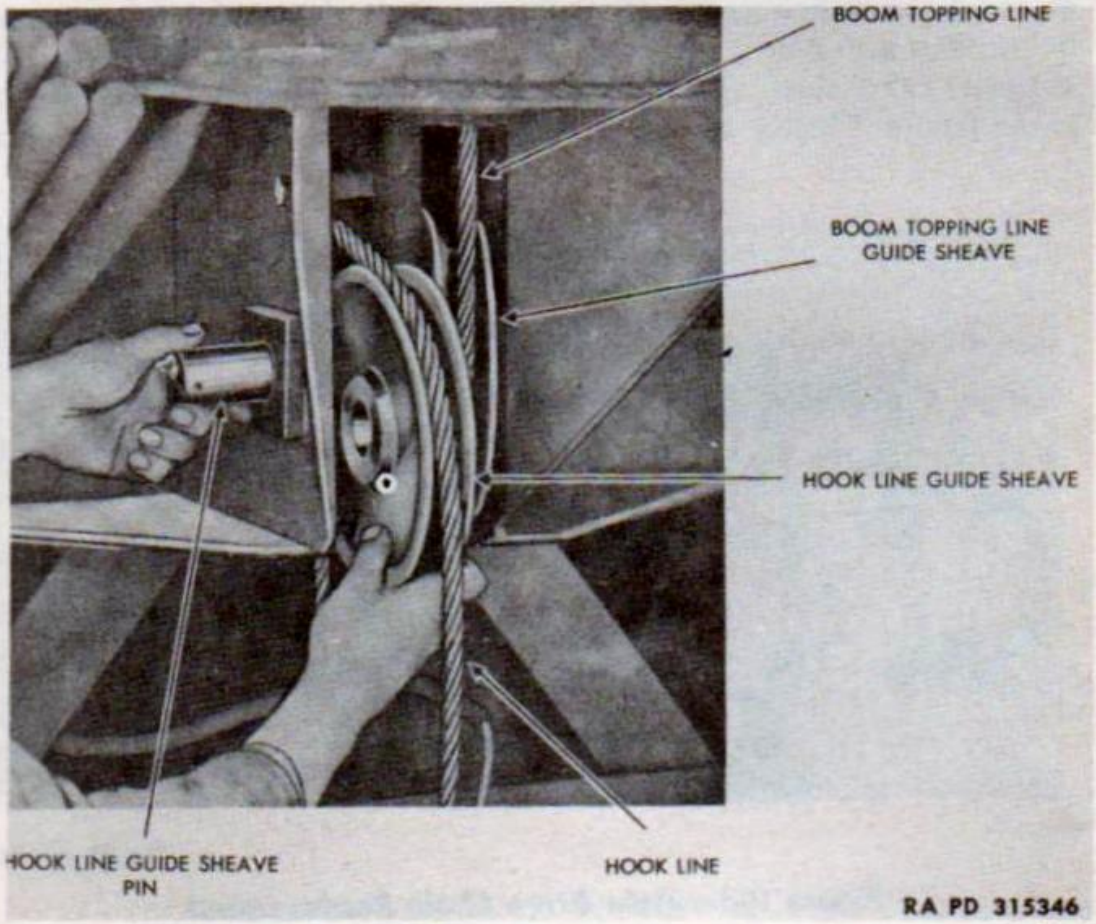


Figure 187—Guide Sheave Replacement

(figs. 13, 17, and 23). Remove lubricating fitting from boom sheave pin. Remove sheave pin and cotter pin. Drive sheave pin towards center of truck until it is clear of the sheave.

b. Installation. Place sheave on sheave pin, and drive pin through sheave and fleeting arm. Aline cotter pin hole. Install cotter pin. Replace lubricating fitting, and lubricate sheave pin (par. 26). The boom line winds over the top of the fleeting sheave.

270. HOIST LINE FLEETING SHEAVE REPLACEMENT.

a. Removal. The hoist line fleeting sheave is located within the crane frame on the left side of the truck. Start engine, place trans-

mission in third gear, and engage power take-off. Lower the lifting hook to the ground until the hoist line is slacked off (figs. 13, 17, and 23). Remove lubricating fittings from hoist sheave pin. Remove sheave pin cotter pin. Drive sheave pin towards center of truck until it is clear of the sheave.

b. Installation. Place sheave on sheave pin, and drive pin through sheave and fleeting arm. Aline cotter pin holes and install cotter pin. Replace lubricating fittings, and lubricate sheave pin (par. 26). NOTE: *The hoist line winds over the top of the fleeting sheave.*

271. GUIDE SHEAVE REPLACEMENT.

a. Removal.

(1) The boom and hoist line guide sheaves are located on the front face of the crane frame; to remove, start the engine. Place transmission in third gear and engage power take-off (figs. 13 and 17). Lower the boom onto the rear of the winch until the boom line slackens. Lower the lift hook to the ground until the hoist line slackens (fig. 23).

(2) Remove lubricating fittings from the end of guide sheave pin and remove cotter pins. Drive the guide sheave pin to the left side of the truck to replace the hoist line sheave. Drive until sheave pin is clear of sheave, and lift sheave out through rear of crane frame. If the boom line sheave is to be replaced, drive the sheave pin to the right of the truck until clear of sheave, and remove sheave to rear of crane frame (fig. 187).

b. Installation. Position pin in crane frame so that cotter pin holes are in alinement with pin support block holes. Drive sheave pins into supports. Replace cotter pins, install lubricating fittings, and lubricate sheave pin (par. 26). Raise boom and hook line, and secure hook line in boom (fig. 23). NOTE: *The hoist sheave line runs over the sheave, and the boom sheave line runs under the sheave.*

272. BOOM CABLE LOAD LINE REPLACEMENT.

a. Removal. Start engine. Place transmission in third gear and engage power take-off (figs. 13 and 17). Run hoist line until all cable is off hoist winch drum. Disconnect cable line at hoist drum rope clamp, and pull cable free of fleeting guide, boom pivot, and boom end sheaves. Remove cap screw, nut, and lock washer at hoist line lifting hook block, and remove cable dead end eye.

b. Installation.

(1) Install dead end eye of cable in hoist line block, and install cap screw, lock washer, and nut. Place free end of cable over and around rear of right-hand boom end sheave and through hook line block. Then place cable over left-hand boom end sheave, and thread it through the boom and under the boom pivot sheave. Thread over the left-hand crane frame guide sheave and over the fleeting sheave.

(2) The hoist line is underwound on the hoist winch drum. Install end of cable under hoist winch drum U-bolt, and tighten U-bolt

securely. Start the engine. Place the transmission in first speed, and engage the power take-off. Hold the tension on the hoist line slowly, and carefully wind the cable on the hoist drum (figs. 13, 17, and 23). Refer to paragraph 12 regarding cable winding.

273. BOOM LINE CABLE REPLACEMENT.

a. Removal. Remove oxygen and acetylene tanks. Lower boom until it comes to rest on blocking placed across the rear winch drum. Continue to lower until one turn of line remains on the boom topping drum (fig. 23). Loosen cable clamp at drum, and pull cable out of

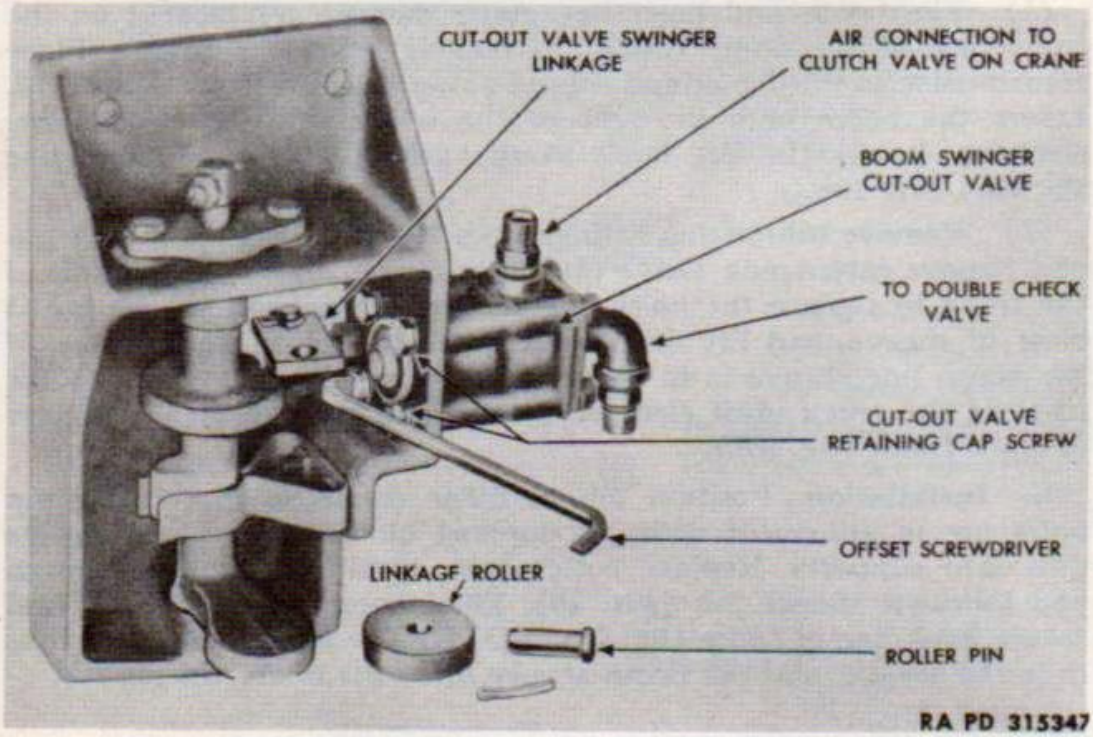


Figure 188—Swinger Cut-out Valve Removal

fleeting, guide, and topping pivot sheaves. Continue to pull cable entirely free of boom blocks. Remove cotter pin, and drive out pin retaining horizontal sheave and end of line to boom.

b. Installation. Place horizontal sheave with dead end eye of line on top in position; insert pin and cotter pin. Take free end of line and enter right side of upper horizontal sheave on topping pivot. Thread line through sheave, and pull all the cable through. Continue with free end to the left side of horizontal boom block, thread through sheave, and pull cable tight. Enter cable in right side of lower horizontal topping pivot block, thread through sheave, and pull cable tight. Enter lower side of left vertical block on boom, thread through sheave, and pull cable tight. Continue over top of left vertical block at topping pivot, thread through sheave, and pull cable tight. Enter lower side of right sheave in vertical block on boom, thread through

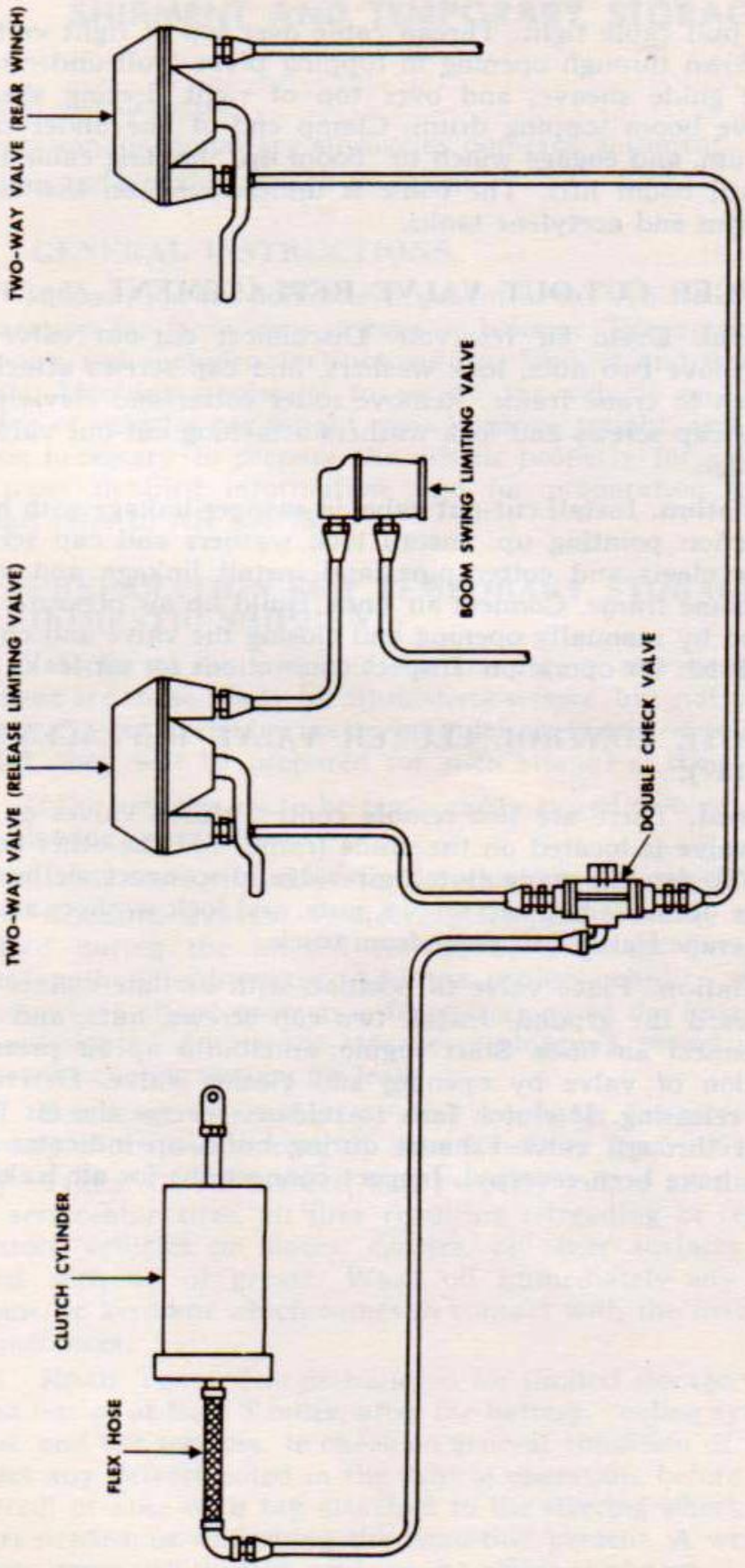


Figure 189—Air Clutch Piping Diagram

sheave, and pull cable tight. Thread cable over top of right vertical block, and down through opening in topping pivot. Pull under right crane frame guide sheave, and over top of right fleeting sheave directly above boom topping drum. Clamp end of line under cable clamp on drum, and engage winch to "boom up," holding cable tight on drum until boom lifts. The cable is underwound on the drum. Replace oxygen and acetylene tanks.

274. SWINGER CUT-OUT VALVE REPLACEMENT (fig. 188).

a. Removal. Drain air reservoir. Disconnect cut-out valve air lines, and remove two nuts, lock washers, and cap screws attaching cut-out switch to crane frame. Remove roller cotter and clevis pins. Remove four cap screws and lock washers attaching cut-out valve to swinger linkage.

b. Installation. Install cut-out valve in swinger linkage with hand valve connection pointing up. Install lock washers and cap screws. Install roller clevis and cotter pins, and install linkage and valve bracket on crane frame. Connect air lines. Build up air pressure, and test operation by manually opening and closing the valve and checking engine clutch for operation. Inspect connections for air leaks.

275. REMOTE CONTROL CLUTCH VALVE REPLACEMENT (fig. 189).

a. Removal. There are two remote control clutch valves on this truck. One valve is located on the crane frame, and the other at the rear winch. To remove crane clutch air valve, disconnect air lines at base of valve. Remove two cap screws, nuts, and lock washers attaching valve to crane frame. Lift valve from truck.

b. Installation. Place valve in position with air line connections pointing toward the ground. Install two cap screws, nuts, and lock washers. Connect air lines. Start engine, and build up air pressure. Test operation of valve by opening and closing valve. Determine if clutch is releasing. If clutch fails to release, reverse the air lines. Escaping air through valve exhaust during build up indicates that the air lines have been reversed. Inspect connections for air leaks.

Section XXXV

SHIPMENT AND TEMPORARY STORAGE

276. GENERAL INSTRUCTIONS.

a. Preparation for domestic shipment of the vehicle is the same as preparation for temporary storage or bivouac. Preparation for shipment by rail includes instructions for loading and unloading the vehicle, blocking necessary to secure the vehicle on freight cars, number of vehicles per freight car, clearance, weight, and other information necessary to prepare the vehicle properly for rail shipment. For more detailed information, and for preparation for indefinite storage, refer to AR 850-18.

277. 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 30 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 vehicle completely (par. 26).

(2) COOLING SYSTEM. If freezing temperature may normally be expected during the limited storage or shipment period, test the coolant with a hydrometer. 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. 106).

(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 5 miles, after the battery, cooling system, lubrication, and tire services, to check on general condition of the vehicle. Correct any defects noted in the vehicle operation, before the vehicle is 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 the vehicle exterior with flint paper 2/0. 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, chains, and, in the case of track-laying vehicles, metal tracks, should be coated with a protective medium grade lubricating oil. Close firmly all cab doors, windows, and windshields. Vehicles equipped with open-type cabs with collapsible tops will have the tops raised, all curtains in place, and the windshield closed. Make sure tarpaulins and window curtains are in place and firmly secured. Leave rubber mats, such as floor mats, where provided, in an unrolled position on the floor, and not rolled or curled up. Euipment, 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 vehicle is 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. 21).

(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 1 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.

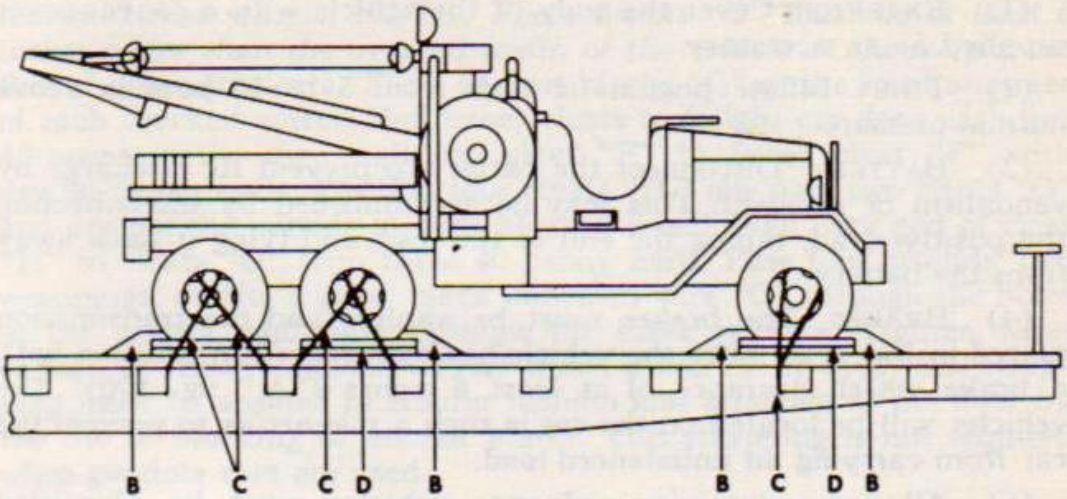
c. Inspections in Limited Storage.

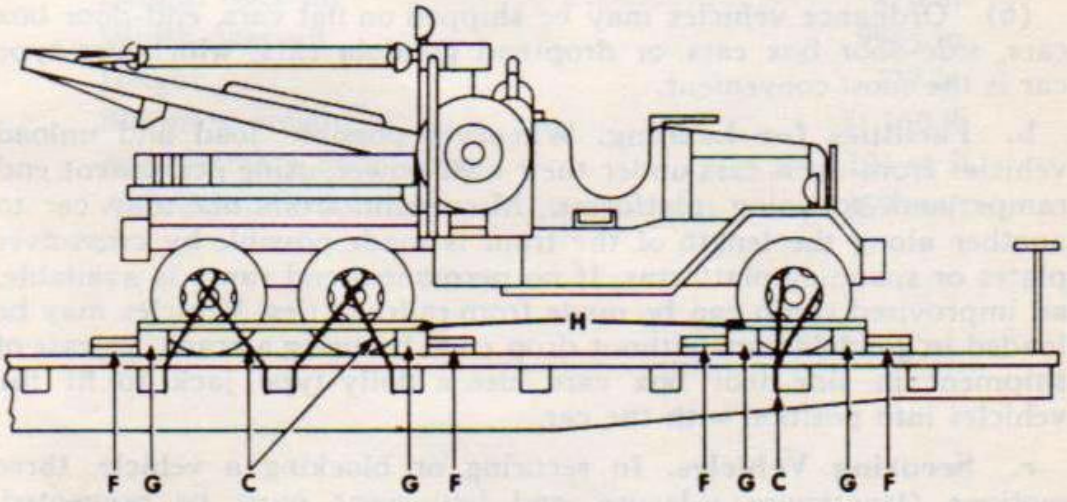
(1) Vehicles in limited storage will be inspected weekly for condition of tires and battery. If water is added when freezing weather is anticipated, recharge the battery with a portable charger, or remove the battery for charging. Do not attempt to charge the battery by running the engine.

278. LOADING AND BLOCKING FOR RAIL SHIPMENT.

a. Preparation. In addition to the preparation described in paragraph 277, when ordnance vehicles are prepared for domestic shipment, the following preparations and precautions will be taken:

SHIPMENT AND TEMPORARY STORAGE





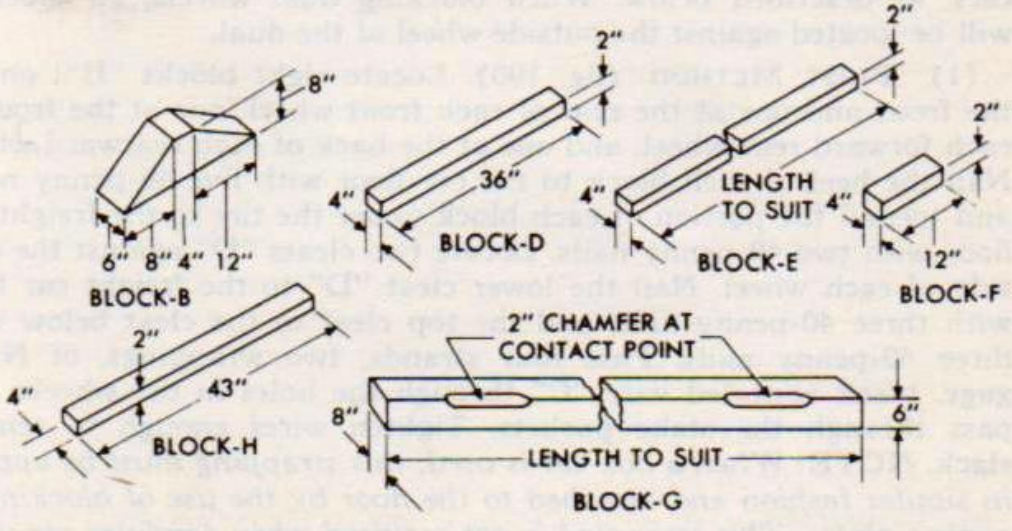


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Figure 190—Blocking Requirements for Securing Truck to Railroad Car

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

(1) EXTERIOR. Cover the body of the vehicle 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. 190). The vehicles will be located on the car in such a manner as to prevent the car from carrying an unbalanced load.

(5) All cars containing ordnance vehicles must be placarded "DO NOT HUMP."

(6) Ordnance vehicles may be shipped on flat cars, end-door box cars, side-door box cars, or drop-end gondola cars, whichever type car is the most convenient.

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. Vehicles may be loaded in gondola cars without drop ends by using a crane. In case of shipment in side-door box cars, use a dolly-type jack to fit the vehicles into position with the car.

c. Securing Vehicles. In securing or blocking a vehicle, three motions (lengthwise, sidewise, and bouncing) must be prevented. There are two approved methods of blocking the vehicles on freight cars, as described below. When blocking dual wheels, all blocking will be located against the outside wheel of the dual.

(1) FIRST METHOD (fig. 190). Locate eight blocks "B"; one at the front and one at the rear of each front wheel, one at the front of each forward rear wheel, and one at the back of each rearward wheel. Nail the heel of each block to the car floor with five 40-penny nails, and toenail the portion of each block under the tire to the freight car floor with two 40-penny nails. Locate two cleats "D" against the outside of each wheel. Nail the lower cleat "D" to the freight 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 holes in the wheels, and pass through the stake pockets. Tighten wires enough to remove slack. NOTE: *When a box car is used, this strapping must be applied in similar fashion and attached to the floor by the use of blocking or anchor plates. This strapping is not required when gondolas are used.*

(2) SECOND METHOD (fig. 190). Place two blocks "G"; one at the front and one at the rear of the front wheels. Place two blocks "G";

one at the front of the forward rear wheels and one at the back of the rearward rear wheels. NOTE: *These blocks "G" must be at least 8 inches wider than the over-all width of the vehicle at the freight car floor.* Locate 16 cleats "F"; 2 against blocks "G" at the front and rear of each blocked wheel. Nail lower cleats to freight car floor with five 40-penny nails, then nail top cleat "F" to lower cleat "F" with five 40-penny nails. Position four cleats "H," one over two cleats "G" and against the outside of each blocked wheel. Nail each end of cleat "H" to cleats "G" with three 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "C" through the holes in the wheels, and pass through the stake pockets. Tighten wires enough to remove slack. NOTE: *When a box car is used, this strapping must be applied in similar fashion and attached to the floor by the use of blocking or anchor plates.* This strapping is not required when gondola cars are used.

d. Shipping Data.

Length over-all	276 in.
Width over-all	99½ in.
Height	117 in.
Shipping weight	31,150 lb
Approximate floor area	191 sq ft
Approximate volume	1859 cu ft

HEAVY WRECKING TRUCK M1A1 (KENWORTH MODEL 573, WARD LaFRANCE SERIES 5)

REFERENCES

PUBLICATIONS 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:

Introduction to Ordnance Catalog (explains SNL system)	ASF Cat. ORD-1 IOC
Ordnance publications for supply index (index to SNL's)	ASF Cat. ORD-2 OPSI
Index to ordnance publications (lists FM's, TM's, TC's and TB's of interest to Ordnance personnel, MWO's, OPSR'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, devices, and displays)	FM 21-8

STANDARD NOMENCLATURE LISTS.

Truck, wrecking, heavy, M1 (Ward LaFrance and Kenworth)	SNL G-116
Cleaning, preserving, and lubricating 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.

Fundamental Principles.

Automotive electricity	TM 10-580
Automotive lubrication	TM 10-540
Basic maintenance manual	TM 38-250
Driver's manual	TM 10-460

REFERENCES

Driver selection and training	TM 21-300
Electrical fundamentals	TM 1-455
Military motor vehicles	AR 850-15
Motor vehicle inspections and preventive maintenance service	TM 9-2810
Precautions in handling gasoline	AR 850-20
Standard military motor vehicles	TM 9-2800
The internal combustion engine	TM 10-570

Maintenance and Repair.

Cleaning, preserving, lubricating and welding materials and similar items issued by the Ordnance Department	TM 9-850
Cold weather lubrication and service of combat vehicles and automotive materiel	OFSB 6-11
Maintenance and care of pneumatic tires and rubber treads	TM 31-200
Ordnance Maintenance: Crane assembly USA6 for heavy wrecking truck M1A1 (Ward LaFrance and Kenworth)	TM 9-1796
Ordnance Maintenance: Power train for heavy wrecker M1 series 2 (axles, transmissions, wheels and tires)	TM 9-1795A
Ordnance Maintenance: Engine for heavy wrecking truck M1	TM 9-1795B
Ordnance Maintenance: Crane and winches for heavy wrecking truck M1 (Ward LaFrance and Kenworth)	TM 9-1795C
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: Speedometers and tachometers (Stewart-Warner)	TM 9-1829A
Tune-up and adjustment	TM 10 530

Protection of Materiel.

Camouflage	FM 5-20
Chemical decontamination, materials and equipment	TM 3-220
Decontamination of armored force vehicles	FM 17-59
Defense against chemical attack	FM 21-40
Explosives and demolitions	FM 5-25

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Storage and Shipment.

Ordnance storage and shipment chart, group G—Major items	OSSC-G
Registration of motor vehicles	AR 850-10
Rules governing the loading of mechanized and motorized army equipment also major caliber guns, for the United States Army and Navy, on open top equipment published by Operations and Maintenance Department of Association of American Railroads.	
Storage of motor vehicle equipment	AR 850-18

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