TM 10-3930-235-20

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE MANUAL

TRUCK, LIFT, FORK, GASOLINE
4,000-LB. CAPACITY

TOWMOTOR MODELS	ARMY MODEL	FSN
462SG4024-100 (Solid Tire)	MHE-191	3930-781-3856
462S64024-144 (Solid Tire)	MHE-191	3930-781-3855
502PG4024-144 (Pneumatic Tire)	MHE-190	3930-083-9222

This copy is a reprint which includes current pages from Changes 3 and 4.

HEADQUARTERS, DEPARTMENT OF THE ARMY

TAGO 8217A

OCTOBER 1964

SAFETY PRECAUTIONS

BEFORE OPERATION

When servicing battery, do not smoke or use flame in the vicinity. Batteries generate hydrogen, a highly explosive gas.

Check to be sure there is sufficient engine coolant and engine lubricant before starting the engine.

Do not fill fuel tank while engine is running. Provide metallic contact between the fuel container and fuel tank to prevent a static spark from igniting the fuel.

Always correct or report any faulty conditions that may result in further damage to the truck or cause injury to personnel.

Check the operating area to be sure it is clear of personnel and obstructions.

DURING OPERATION

Do not fill fuel tank while engine is running as fuel vapors may be ignited.

Do not remove the radiator cap from an overheated radiator; stop engine and allow radiator to cool before removing cap to avoid injury by scalding. Allow the engine to cool before filling the radiator; otherwise there is danger of cracking the cylinder head or block.

Do not operate the truck in a closed building without providing adequate ventilation as the exhaust contains carbon monoxide, a colorless, odorless, poisonous gas.

Do not work on the engine while in operation, except for designated adjustments which must be made with the engine operating.

Do not shift directional shift lever while truck is in motion.

AFTER OPERATION

Make sure forks are lowered to the ground when truck is parked and engage hand brake firmly.

If the truck is parked on an incline, block at least two wheels in the event of handbrake failure.

If engine cooling system or any lubricating oil sump is drained, make certain appropriate warning tags are attached to the steering handwheel.

Report or correct any faulty condition that may result in damage to the truck or cause injury to personnel if operation of the truck is continued.

CHANGE
NO. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D. C., *31 December 1991*

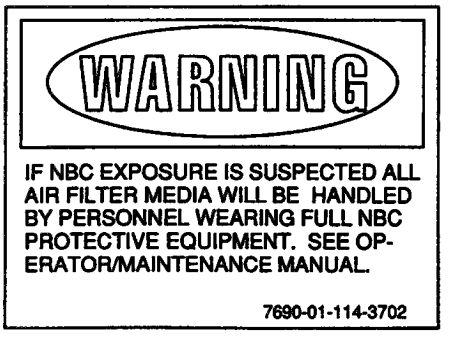
Organizational Maintenance Manual
TRUCK, LIFT, FORK; GASOLINE
4,000-LB. CAPACITY

TOWMOTOR MODEL	ARMY MODEL	NSN
462SG4024-100 (Solid Tire)	MHE 191	3930-00-781-3856
462SG4024-144 (Solid Tire)	MHE 191	3930-00-781-3855
502PG4024-144 (Pneumatic Tire)	MHE 190, MHE 190A, MHE 190B,	3930-00-073-9222
502PG4024-144 (Pneumatic Tire)	MHE 220	3930-00-419-5738

TM 10-3930-235-20,15 October 1964, is changed as follows:

Page 2, the following paragraph is added after Section **II. "DESCRIPTION AND DATA."**

A decal has been developed that warns of NBC exposure. It is to be positioned in a noticeable place on or near the air cleaner or air filter housing. You may order the decal using part number 12296626, CAGEC 19207. Refer to TB 43-0219 for further information. Add the decal to the air cleaner *(page 16,* figure 4, 3/4 front, right side of engine, installed view.)



Add the following WARNING to the following locations;

inside front cover;

page 7, preceding item 5, "AIR CLEANER,"

page 13, preceding item "Engine does not develop full power;"

page 20, paragraph, 23. **Intake and Exhaust Manifold** preceding item *a.* (1) "Disconnect air cleaner hose from carburetor;"

page 23, preceding paragraph, "26.1 Air Cleaner **(Model 220, MHE 190A and MHE 190 B);"**

page 55, preceding paragraph, **"65. Hydraulic Oil Tank Air Cleaner;"**

page 61, preceding item, "0304 Cleaner, air:"

Approved for public release; distribution is unlimited.

WARNING

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the Secretary of the Army
00408

Distribution:

To be distributed in accordance with DA Form 12-25-E (Block 2159) Unit maintenance requirements for TM 10-3930-235-20.

TM 1 o-3930-235-20
● c3

CHANGE
NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., *28 December 1989*

Organizational Maintenance Manual
TRUCK, LIFT, FORK, GASOLINE, 4,000-LB CAPACITY

TOWMOTOR MODELS	ARMY MODEL	NSN
502PG4024-100 (PNEUMATIC TIRE)	MHE-190	3930-00-926-3807
502PG4024-144 (PNEUMATIC TIRE)	MHE-190	3930-00-073-9222
502PG4024-144 (PNEUMATIC TIRE)	MHE-190A	3930-01-044-0075
502PG4024-144 (PNEUMATIC TIRE)	MHE-190B	3930-01-089-8001
462SG4024-1 44 (SOLID TIRE)	MHE-191	3930-00-781-3855
462SG4024-100 (SOLID TIRE)	MHE-191	3930-00-781-3856
502PG4024-144 (PNEUMATIC TIRE)	MHE-220	3930-00-419-5738

TM 10-3930-235-20, 15 October 1964, is changed as follows:

Cover. The manual title is changed to read as shown above.

Page 1.

The manual title is changed to read as shown above.

Table of Contents, Chapter 3.

Change Section VIII paragraph references to "36-43.3".

Delete the entry for "Section X".

Page 2.

Paragraph 1 is superseded as follows:

1. Scope

This manual is for use in maintaining the Towmotor models 462SG4024-100, 462SG4024-144, 502PG4024-100, and 502PG4024-144 forklift trucks as allocated by the maintenance allocation chart.

Paragraph 3 is superseded as follows:

3. Maintenance Forms, Records, and Reports

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by DA Pam 738-750.

Paragraph 4 is superseded as follows:

4. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, U . S . Army Tank-Automotive Command, A-l-l-N: AMSTA-QRD, Warren, MI 48397-5000. A reply will be furnished to you.

Paragraph 4.1 is added after paragraph 4.

4.1. Reporting Equipment Improvement Recommendations (EIRs)

If your forklift truck needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MP, Warren, MI 48397-5000. We'll send you a reply.

Page 4, paragraph 106. Change "TM 38-750" to "DA Pam 738-750".

* This change supersedes C 1, 10 February 1967 and C 2, 22 June 1973.

Page 5.

Paragraph 11. Change "LO 10-3930-235-20" to "LO 10-3930-235-12".

Paragraph 12 is superseded as follows:

12. Lubrication Instructions

Refer to figure 2 for specific lubrication points.

Pages 6 and *7*. Figure 1 is rescinded.

Page 8, Figure 2, Sheet 1. Limit REF. 1 through REF. 4 to "models MHE-190, MHE-190A, MHE-190B, and MHE-191".

Page 9.

Figure 2, Sheet 2.

Limit REF. 28 through REF. 32 to "models MHE-190, MHE-190A, MHE-190B, and MHE-191".

Limit REF. 34 to "models MHE-190, MHE-190A, MHE-190B, and MHE-191".

Limit REF. 33 to "models MHE-190 and MHE-191".

Figure 2, sheet 3 is added as shown on the following page.

Page 12, Figure 3—Continued, ITEM 18.

Column 2, *LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER,* is superseded as follows:

TIRES. Inspect for cuts. Remove foreign material. Replace a defective pneumatic tire. If a solid tire (MHE-191) is damaged, notify general support maintenance.

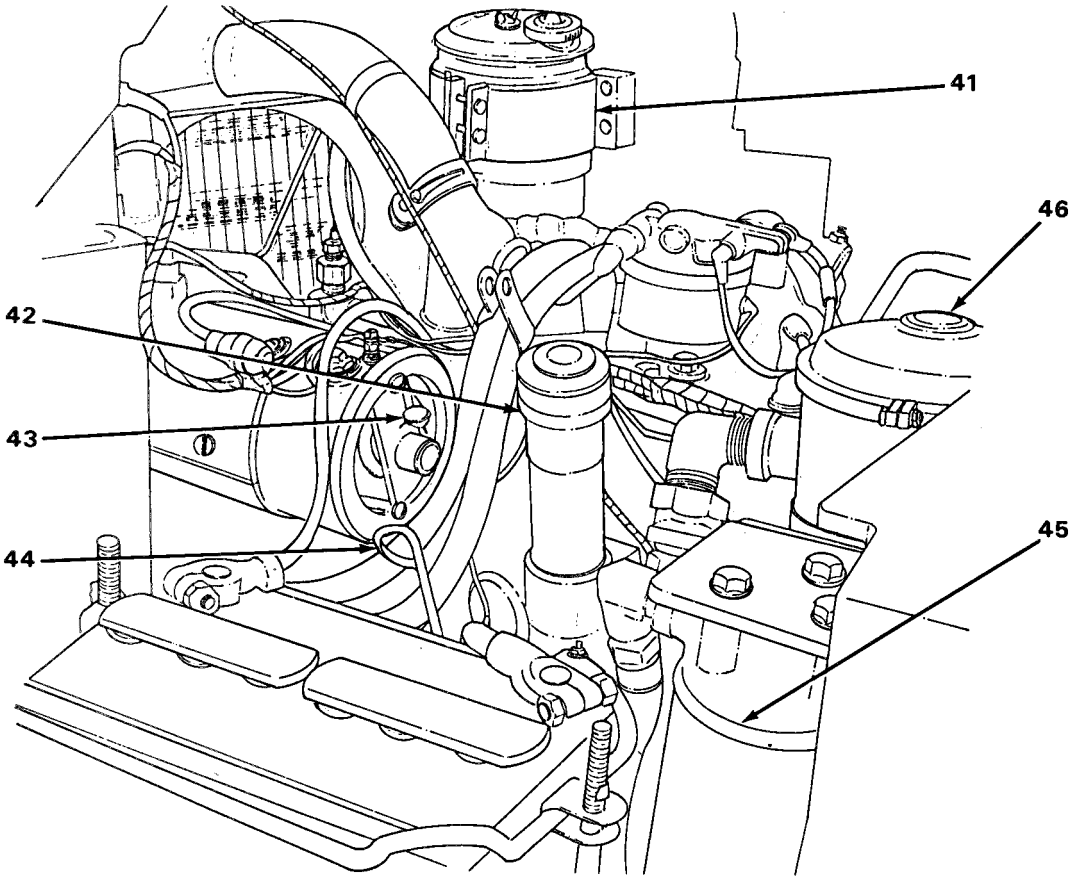
Column 3, *PAR REF.* Add "55".

Page 13, Table 1.

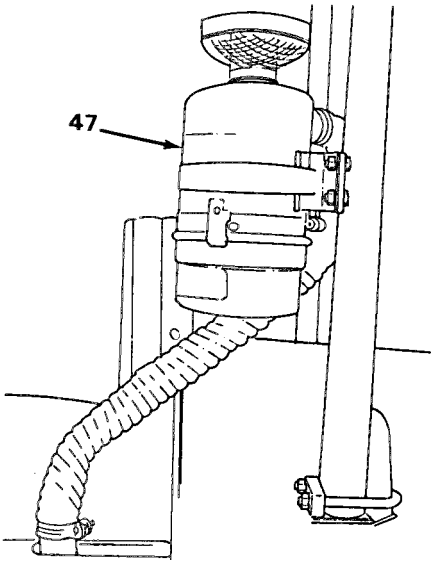
Change "LO 10-3930-235-20" to "LO 10-3930-235-12" throughout table 1.

Column 1, Trouble: *Engine does not develop full power,* Column 3, Remedy. Change "Clean air cleaner (para. 26)." to "Clean air cleaner (para. 26*a* or 26.1*a*).".

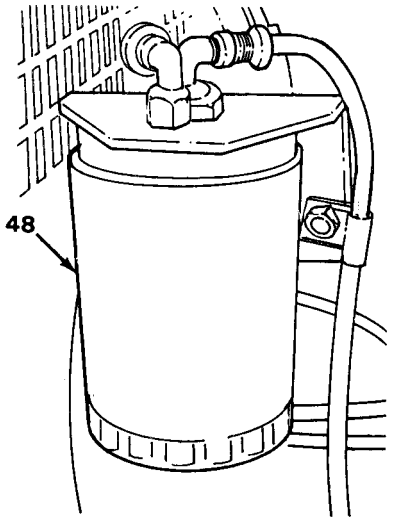
Page 14, Table 1, Column 1, Trouble: *Excessive exhaust smoke,* Column 3, Remedy. Change "Replace gasket (para. 21)." to "Notify direct support maintenance.".



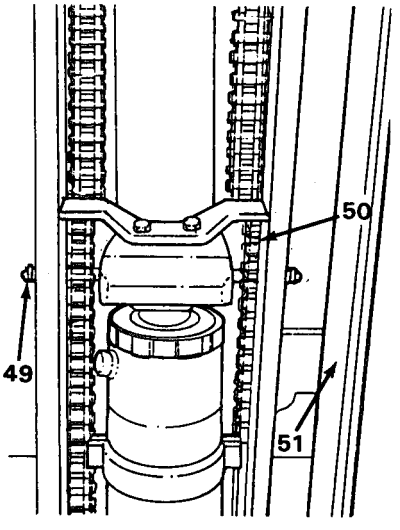
REF. 41. POWER STEERING RESERVOIR
REF. 42. CRANKCASE FILL
REF. 43. GENERATOR
REF. 44. CRANKCASE LEVEL
REF. 45. TRANSMISSION OIL FILTER
REF. 46. HYDRAULIC OIL FILTER



REF. 47. AIR CLEANER



REF. 48. ENGINE OIL FILTER



REF. 49. CROSSHEAD ROLLERS
REF. 50. LIFT CHAINS
REF. 51. MAST SLIDES TA502054

Figure 2. Lubrication points (sheet 3 of 3).

Page 15.

Paragraph 16 is superseded as follows:

16. General

The engine is a four-cylinder, liquid-cooled, L-head gasoline-type. It is lubricated by a gear-type oil pump for positive forced feed lubrication to the crankshaft bearings, connecting rod bearings, camshaft bushing, and valve tappets. MHE-220 forklift trucks are equipped with positive crankcase ventilation (PCV). The engine and its accessories are illustrated in figures 4, 5, 5.1, and 5.2.

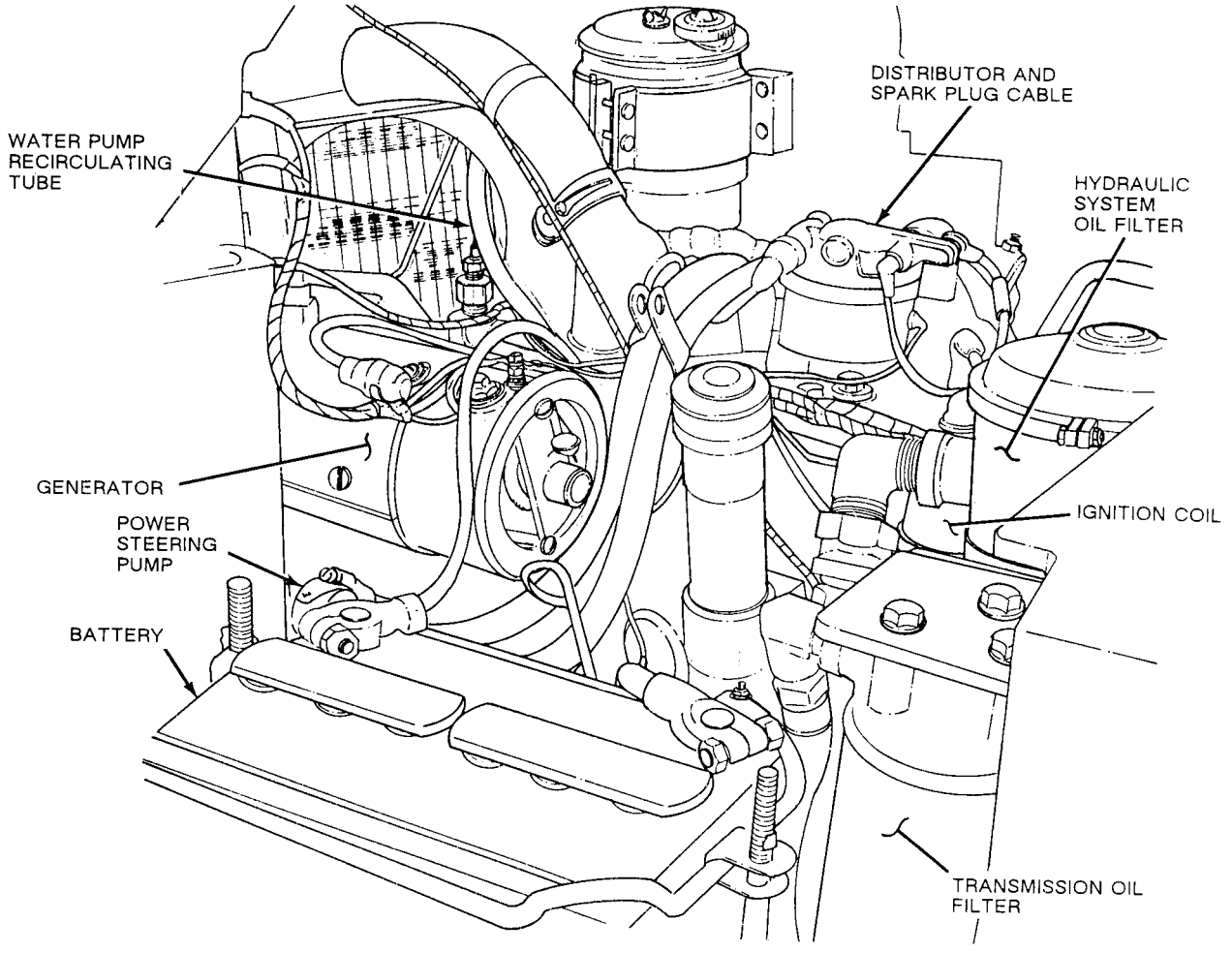


Figure 5.1. 3/4 front, right side of engine, installed view (model MHE-220).

Page 16. Add to the title of figure 4 "(models MHE-190, MHE-190A, MHE-190B, and MHE-191)".

Page 17. Add to the title of figure 5 "(models MHE-190, MHE-190A, MHE-190B, and MHE-191)".

Page 18. Paragraph 21 is rescinded.

Page 19. Figure 7 is rescinded.

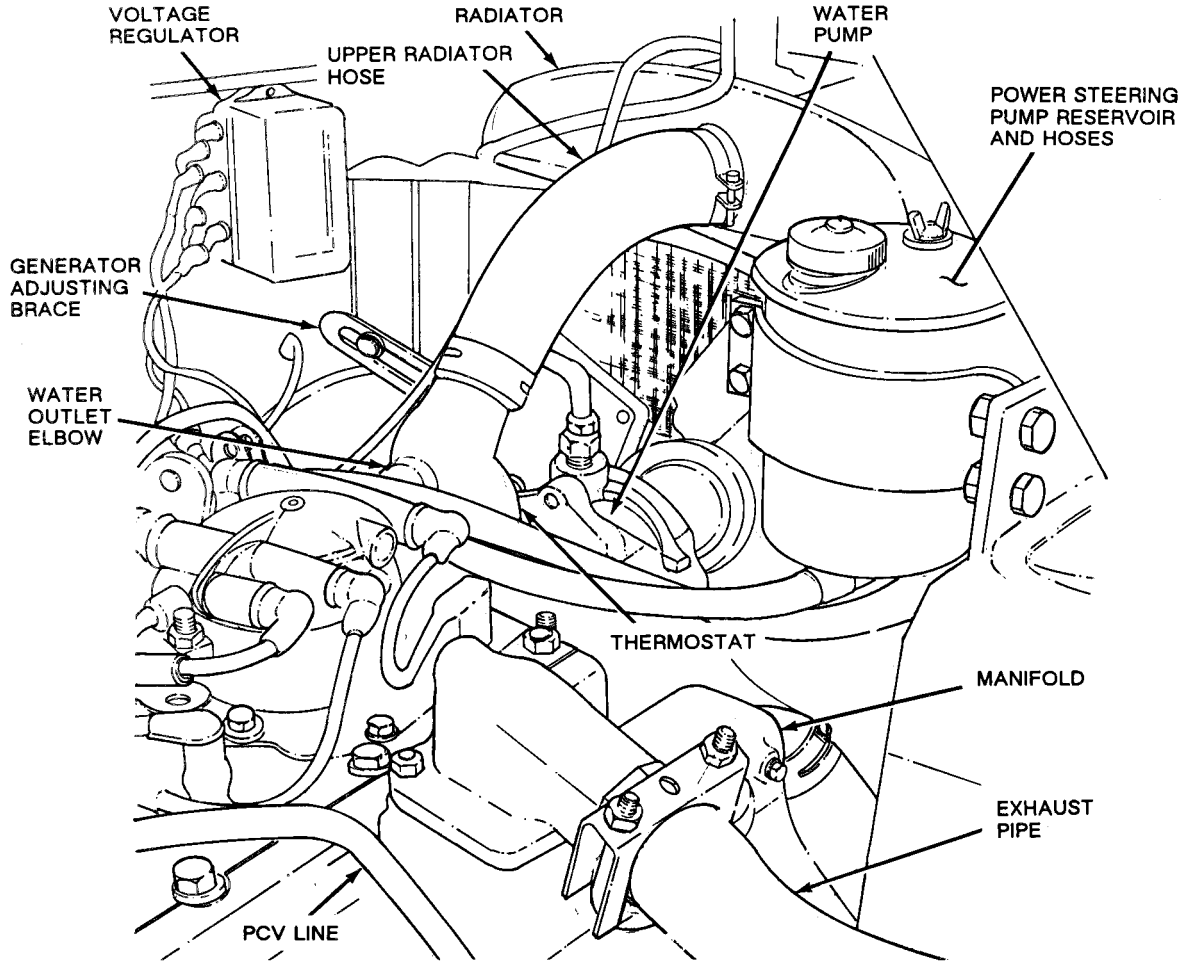


Figure 5.2. 3/4 front, left side of engine, installed view (model MHE-220).

Page 20.

Paragraph 22*a*. The title is superseded as follows:

a. Removal of Valve Chamber Covers (figs. 8, 10, and 10.1).

Paragraph 22*a*(2.1) is added after paragraph 22*a*(2).

(2.1) On model MHE-220, disconnect the PCV line from the intake manifold.

Paragraph 23*a*. The title is superseded as follows:

a. Removal (figs. 9, 10, and 10.1).

Paragraph 23*a*(1.1) is added after paragraph 23*a*(1).

(1.1) On model MHE-220, remove PCV line from manifold.

Page 21. Figure 9 is superseded as shown on the following page.

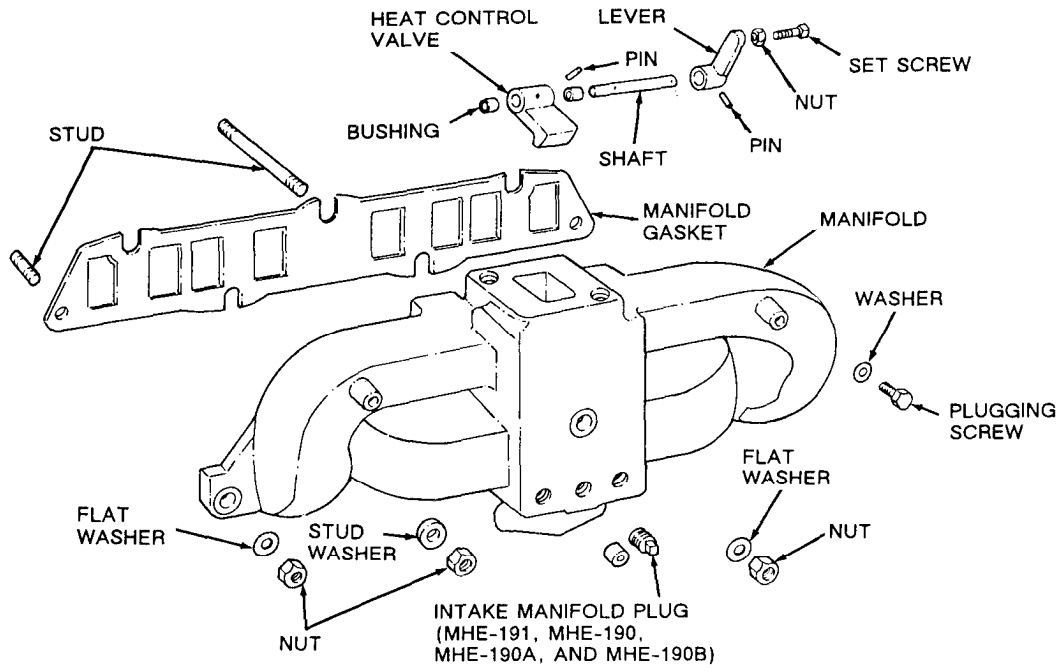


Figure 9. Exhaust and intake manifold, exploded view.

Page 22.

Paragraph 23*d* is added after paragraph 23*c*.

d. PCV System Service.

(1) Disconnect the PCV lines from the valve cover and intake manifold (fig. 10.1).

(2) Remove the valve and lines.

(3) Check the lines for restrictions. Clean all parts with solvent and dry thoroughly.

(4) Reinstall in the reverse order of removal.

Paragraph 23.1 is added after paragraph 23.

23.1. Oil Filter

a. Service (fig. 9.1).

(1) Unscrew and remove oil filter from adapter. Discard oil filter.

(2) Clean adapter with solvent. Dry thoroughly.

(3) Install new oil filter.

b. Removal. Disconnect oil filter inlet and outlet hose at engine. Remove nuts, washers, screws, and oil filter, assembled on bracket, from air cleaner mounting bracket.

c. Installation. Reverse the procedure in *b* above.

Paragraph 24, line 1. Change "(fig. 10)" to "(fig. 10 or 10.1)".

Paragraph 24*a*(1) is superseded as follows:

(1) On models MHE-190, MHE-190A, MHE-190B, and MHE-191, remove the manifold pipe plug (fig. 10) from the intake manifold and install a vacuum gage. On model MHE-220, remove the PCV line (fig. 10.1) from the intake manifold and install a vacuum gage.

Paragraph 24*a*(4)(*b*). Change "(fig. 10)" to "(fig. 10 or 10.1)".

Paragraph 25*b.1* is added after paragraph 25*b*.

b.1. Repair. Inspect all parts for cracks, breaks, damage, and other defects. Replace all damaged and defective parts.

Page 23.

Add to the title of figure 10 "(models MHE-190, MHE-190A, MHE-190B, and MHE-191)".

Paragraph 26. The title is superseded as follows:

26. Air Cleaner (Models MHE-190 and MHE-191)

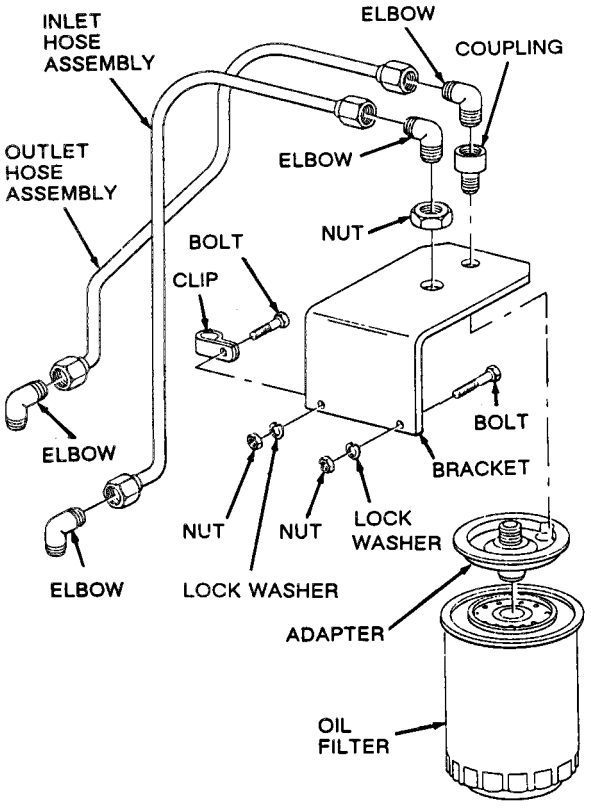


Figure 9.1. Oil filter, exploded view.

Paragraph 26*b.1* is added after paragraph 26*b*.

b.1. Repair. Inspect all parts for cracks, breaks, damage, and other defects. Replace all damaged and defective parts.

Paragraph 26.1 is added after paragraph 26.

26.1. Air Cleaner (Models MHE-190A, MHE-190B, and MHE-220)

a. Servicing.

(1) Loosen the clamp (fig. 10.2) and remove the cup. Twist off the cap.

(2) Clean the cup, air chamber, and cap with SD.

(3) Install the cup and refill with oil.

(4) Install the cap.

b. Removal.

(1) Disconnect the air cleaner hose at the air cleaner.

(2) Remove the screws, nuts, and washers. Remove the air cleaner.

c. Repair. Inspect all parts for cracks, breaks, damage, and other defects. Replace all damaged and defective parts.

d. Installation. Reverse the procedures in *b* above.

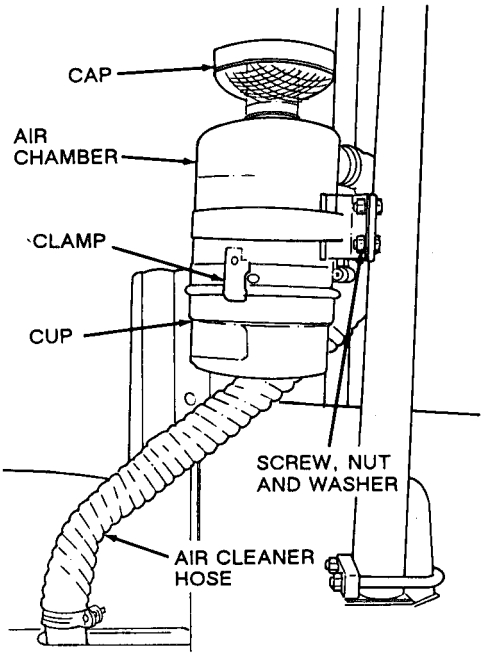


Figure 10.2. Air cleaner (models MHE-190A, MHE-190B, and MHE-220).

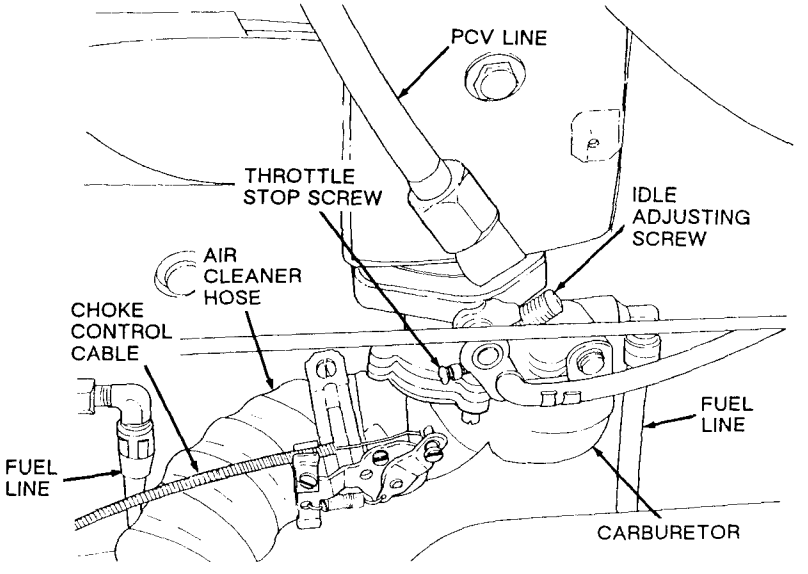


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Figure 10.1. Carburetor assembly, installed view (model MHE-220).

Page 36.

Paragraphs 43.1, 43.2, and 43.3 are added after paragraph 43.

43.1. Fuses

Check fuse block for blown fuses. Replace fuses as required.

43.2. Lights

a. Stop and Taillight (fig. 17.1).

(1) *Removal.*

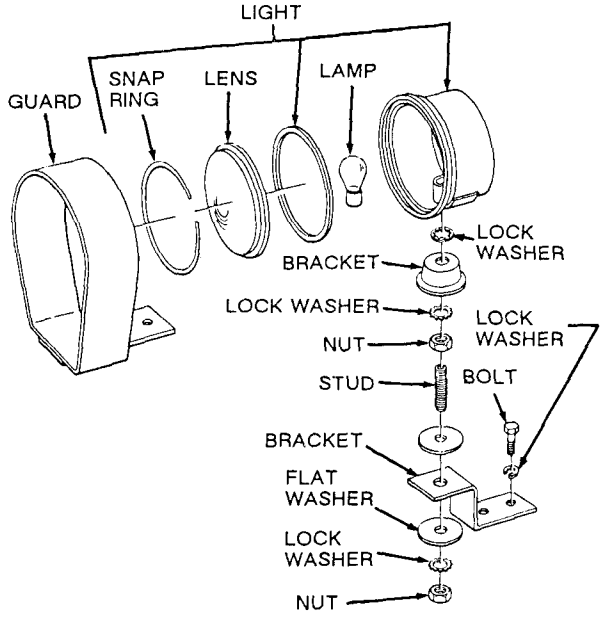
(*a*) Remove nut, lockwasher, and flat washer. Remove stop and taillight from bracket.

(*b*) Remove bolt, lockwasher, and bracket.

(2) *Disassembly.* Disassemble stop and taillight as shown on figure 17.1.

(3) *Repair.* Inspect all parts for cracks, breaks, damage, and other defects. Replace all damaged and defective parts.

(4) *Reassembly and Installation.* Reverse the procedures in (2) and (1) above.



TA502061

Figure 17.1. Stop and taillight, exploded view.

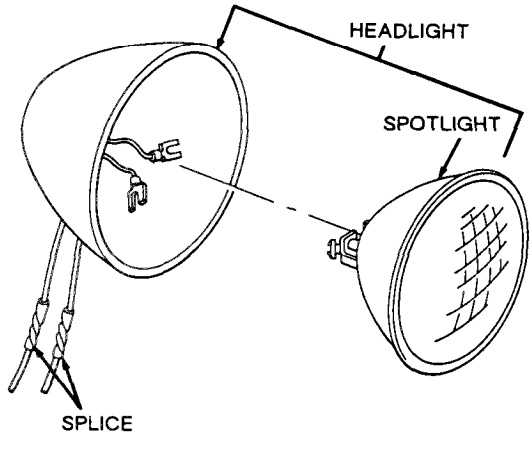
b. Headlight (fig. 17.2).

(1) *Removal.* Cut wires and remove hardware securing the headlight assembly to the mounting bracket.

(2) *Disassembly.* Remove mounting hardware securing the lamp to the housing. Disconnect the wires and remove lamp.

(3) *Repair.* Inspect all parts for cracks, breaks, damage, and other defects. Replace all damaged and defective parts.

(4) *Reassembly and Installation.* Reassemble and install by reversing procedures (2) and (1) above, and splicing wires.



TA502062

Figure 17.2. Stop and taillight, exploded view.

43.3. Horn

a. Removal.

(1) Disconnect wire from connector on horn assembly.

(2) Remove hardware securing horn assembly to mounting bracket.

(3) Remove horn assembly.

b. Installation. Reverse procedures in *a* above.

43.4. Horn Button Assembly

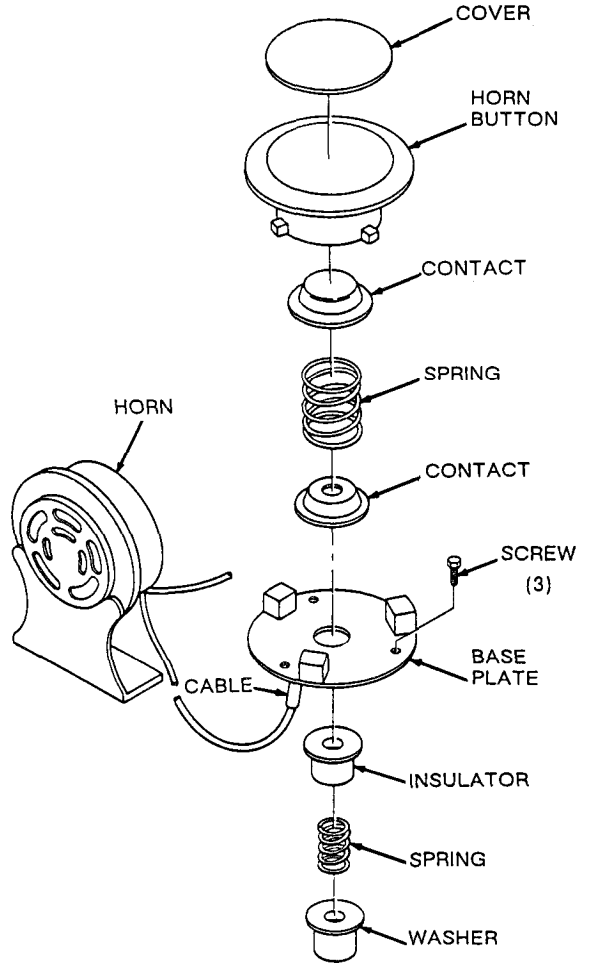
a. Removal.

(1) Disconnect wire from connector on horn assembly.

(2) Push down horn button cover and turn to remove the cover, button, first contact plate, spring, and second contact plate.

(3) Remove the screws securing the base plate to the steering wheel, disconnect wire, and remove base plate.

b. *Installation.* Reverse procedures in *a* above.



TA502063

Figure 17.3. Horn assembly, exploded view.

Paragraph 45.1 is added after paragraph 45.

45.1. Transmission Oil Filter (Model MHE-220)

a. Service.

(1) Unscrew the filter housing from the base (fig. 17.4).

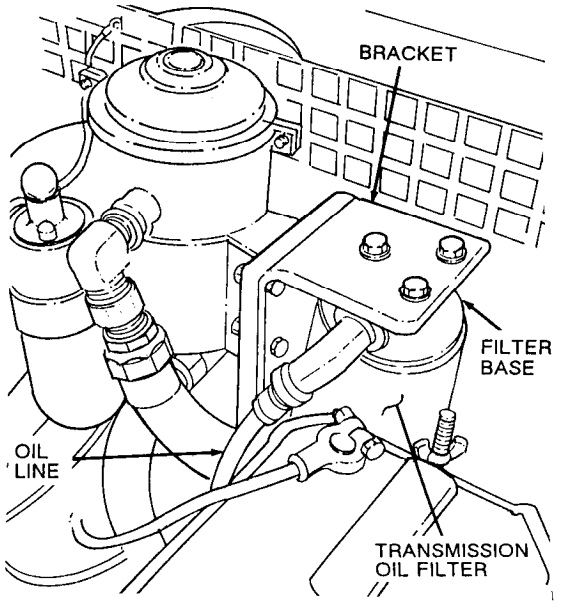
(2) Remove and discard the element.

(3) Clean the housing and base with solvent. Dry thoroughly.

(4) Install a new element and install the filter housing to the base.

b. Removal.

(1) Disconnect the transmission oil line at the filter (fig. 17.4). Cap or plug the openings.



TA502064

Figure 17.4. Transmission oil filter (model MHE-220).

(2) Remove the three bolts and washers securing the filter assembly to the bracket. Remove the filter assembly.

c. Installation. Reverse the procedures in *b* above.

Paragraph 46 is superseded as follows:

46. Creeper Pedal and Linkage

a. General. Creeper motion is controlled by a lever and linkage arrangement between the creeper pedal, creeper control valve, and service brakes. Initial pressure on the creeper pedal disengages clutches in the transmission. Continued pressure on the pedal engages a service brake interlock, which is designed to provide limited braking action. This lever-linkage and service brake interlock is sensitive; therefore, accurate adjustment is necessary for most efficient truck operation when inching or creeping movement is desirable. Proper adjustment eliminates the possibility of brake application while clutches are still engaged; a condition which causes excessive clutch slippage and heat generation in the transmission. In addition, creeper plunger movement must follow closely that of the creeper pedal. Abrupt movement of the plunger in the valve body will cause the truck to lurch and make it difficult to control speed during creeper operation. Consequently, any sticking or binding condition of linkage or interlock must be avoided. During assembly, these parts should be oiled with OE engine oil, and none should be painted. A linkage return spring preloads the linkage to take up initial clearances, plus any additional clearance due to wear.

b. Adjustment. Adjustments are made with the floor plate removed and engine not running. The following procedure is referenced to figure 18. Item reference numbers are bracketed.

(1) Remove cotter pin (4) and washer (3). Raise upper lever (6) off pin on creeper lever support (5).

(2) Loosen locking plug (23) in end of cross shaft. The lower lever (2), which is spring (1) loaded, will then rotate the spacer (25) to a position where both pins in creeper lever control (27) contact the left edge of each hole in spacer (25). Tighten locking plug to approximately 10 foot-pounds torque. Be certain cross shaft does not rotate in cam plate while plug is being tightened.

(3) Pull the creeper control valve plunger, attached to lever (2), out until it is fully extended. Position creeper pedal (19) to allow a 2-inch clearance between pedal and floorboard.

(4) Replace upper lever (6) on pin on the creeper lever support (5). The lever hole in the end nearest center of transmission should be aligned with pin in lower lever (2). If pin and hole are not aligned, loosen ball joint (7) and jamnuts (8), then turn ball joint attached to lever, in or out as necessary for alignment. When lever (6) is properly positioned, install washer (3), cotter pin (4), and tighten jamnuts (8).

(5) It may be necessary to make further adjustments after the truck has been driven the first time. The following conditions could indicate a need for additional adjustment:

(*a*) Clutch disengagement is not complete when creeper pedal is between 1 and 2 inches from floorboard. This may be corrected by adjusting ball joint (7) so that creeper control valve plunger is positioned somewhat into valve body, when creeper pedal (19) is fully released. Plunger should not be positioned into valve body far enough to cause clutch slippage or cause a time increase in shift cycle. The plunger position, which effects a shift cycle time change, varies with each valve assembly. This variance is caused by the internal cored passages in the valve body.

(*b*) Pedal (19) position for creeping or inching movement is not the same for both forward and reverse gears. Rotate spacer (25) on the cross shaft to compensate for clutch linkage travel. If pedal position is lower in forward than it is in reverse gear, rotate spacer (25) clockwise on cross shaft (view from left side of truck). If the opposite condition exists, that is if the pedal is higher in forward than in reverse gear, rotate spacer counterclockwise on cross shaft. This adjustment is required with transmission rebuilding, which affects clutch linkage travel.

c. Creeper Pedal and Brake Interlock Adjustment. The following procedure may be used to determine if clutch disengagement is complete prior to brake application:

(1) Adjust service brakes for highest possible pedal, without excessive brakeshoe drag.

(2) Drive empty truck up on slight grade. Use creeper pedal-brake interlock to hold truck. Place transmission in neutral, let engine idle, then release creeper pedal. Truck should roll slowly backward as pedal releases. (If grade is so slight that truck will not roll, place a maximum load of 1,000 pounds on forks.) This indicates extent of rolling resistance on drive line.

(3) Drive truck on slight grade as previously described. Use creeper pedal-brake interlock to hold truck. With the engine idling and the transmission in forward gear, gradually release creeper pedal. The truck should start to roll backward as pedal is released. Additional releasing of pedal should bring a reduction of truck speed as clutch begins to engage.

(4) Repeat step 3 with the truck backed up on the grade and the transmission in reverse gear.

(5) If truck does not operate as indicated, adjust screw (36) located on lever (35) adjacent to brake pedal, as follows:

(*a*) If brakes apply before clutch is fully released, adjust screw (36) downward.

(*b*) If creeper pedal travel exceeds approximately 1/4 inch after clutch release and prior to brake application, adjust screw (36) upward until this condition does exist.

d. Removal and Disassembly (fig. 18.1).

(1) Unhook all return springs.

(2) Unscrew and remove ball joint nut and lockwasher at pedal lever, then separate ball joint from lever.

(3) Remove the cotter pin and clevis pin, then disconnect cable yoke from lever.

(4) Loosen clamping screw, then slide lever off creeper pedal shaft. Remove key from pedal shaft.

(5) Cut lock wire, then remove setscrew from creeper control arm. Slide creeper pedal out of bracket and at the same time remove control arm from between bracket uprights. If necessary, remove pedal shaft bushings from bracket uprights.

(6) Unscrew and remove ball joint nut and lockwasher at upper lever, then separate rod assembly from lever.

(7) Remove cotter pin and flat washer, then lift off upper support lever.

(8) Remove screws and washers, then remove upper support assembly from control valve body.

(9) Remove cotter pin and flat washer, then lift off support lever from plunger bracket. Remove cotter pins and flat washer, then remove lower support lever from control lever.

(10) Remove locking plug from cross shaft. Remove cotter pins, washers, spacer washers, and cam plate. Remove bushings from control lever pins.

e. Cleaning and Inspection.

(1) Clean all parts with SD and dry thoroughly with compressed air.

(2) Inspect parts for worn pins, oblong holes, broken welds or damaged parts.

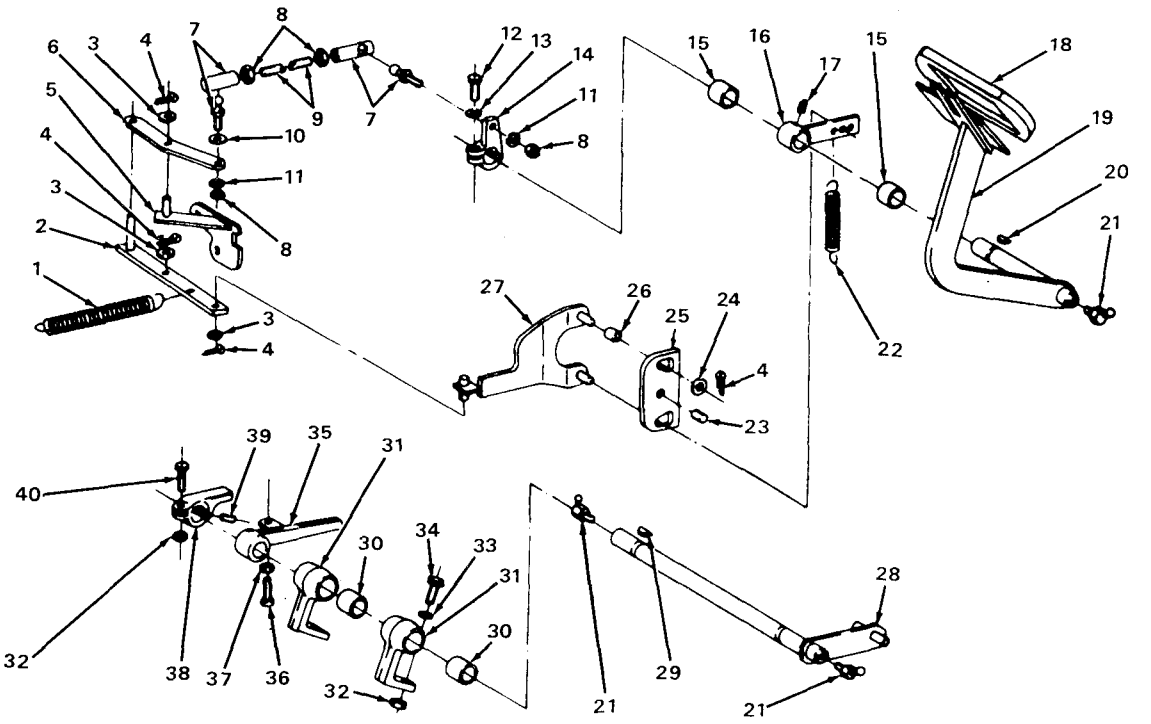
(3) Replace parts as necessary to maintain smooth linkage operation.

f. Reassembly and Installation.

(1) Reverse the procedures in *d* above.

(2) Adjust creeper pedal and linkage.

Page 37. Figure 18 is superseded as follows:



1. Spring	7. Ball joint	13. Washer	19. Pedal	25. Spacer	31. Bracket	37. Nut
2. Lever	8. Nut	14. Lever	20. Key	26. Bushing	32. Nut	38. Lever
3. Washer	9. Rod	15. Bushing	21. Fitting	27. Lever	33. Washer	39. Setscrew
4. Pin	10. Washer	16. Arm	22. Spring	28. Lever	34. Screw	40. Screw
5. Support	11. Washer	17. Setscrew	23. Plug	29. Key	35. Lever	
6. Lever	12. Screw	18. Pad	24. Washer	30. Bushing	36. Screw	

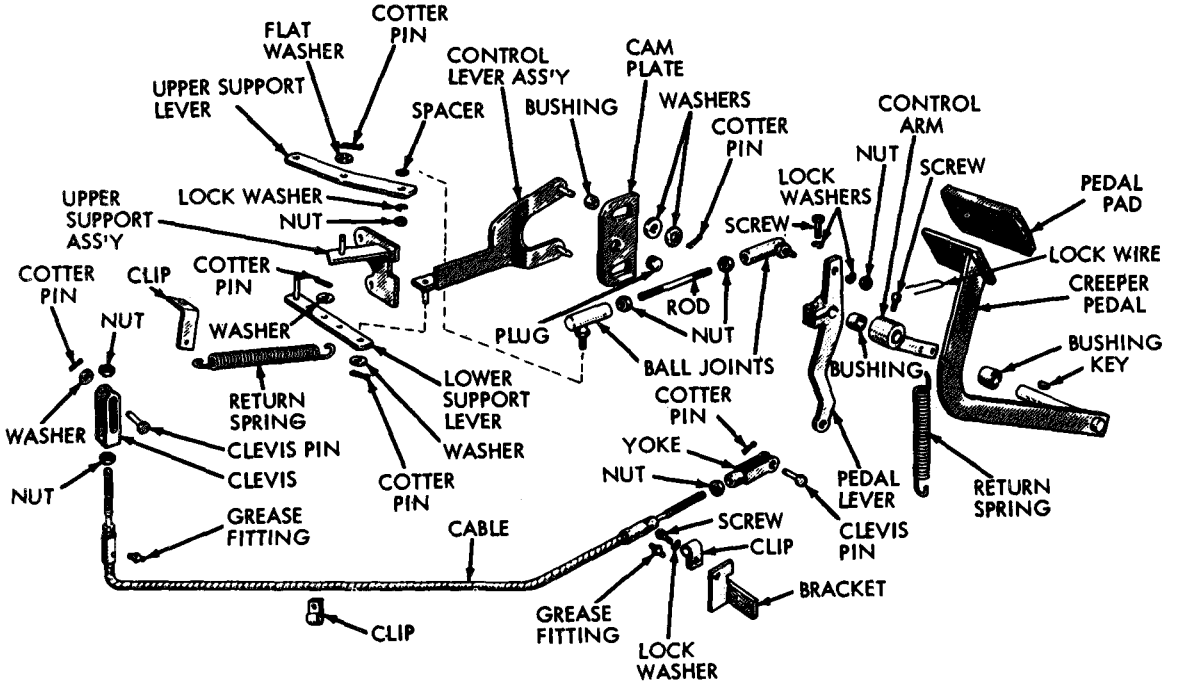
MEC 3930-235-20/18 C1

Figure 18. Creeper pedal adjustment.

Page 38. Section X and figure 19 are rescinded.

Page 40. Paragraph 49*b.1* is added after paragraph 49*b*.

b.1. Repair. Inspect all parts for cracks, breaks, damage, and other defects. Replace all damaged and defective parts.



MEC 3930-235-35/39

Figure 18.1. Creeper pedal and linkage, exploded view.

Page 41. Paragraph 50.1 is added after paragraph 50.

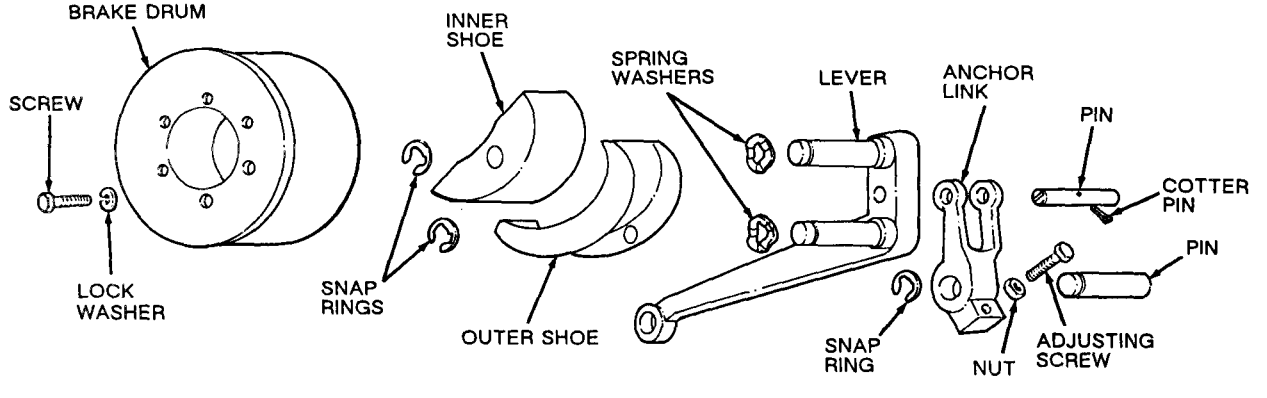
50.1. Handbrake Brakeshoes

a. Removal and Disassembly (fig. 20.1).

(1) Disconnect spring and remove cotter pin, washer, and pin to disconnect cable from pivot lever.

(2) Remove screws and washers fastening brakedrum to brake flange, then slide drum over propeller shaft toward transmission.

(3) Loosen nut and adjusting screw. Remove snap ring fastening the brakeshoe assembly to pin mounted in drive axle differential carrier. Remove the brakeshoe assembly.



TA502065

Figure 20.1. Parking brake brakeshoes, exploded view.

b. Inspection.

(1) Inspect lining for grease-soaked or worn condition. Replace linings if they are grease-soaked or worn. Keep new linings free of oil or grease during installation.

(2) Inspect brake drum for scoring. Replace scored drum.

c. Reassembly and Installation. Reverse the procedures in *a* above.

d. Adjust Parking Brakeshoes (para. 50).

Page 42. Paragraph 51*b.1* is added after paragraph 51*b*.

b.1. Repair.

(1) Inspect brakeshoe linings for grease-soaked or worn condition. If linings are grease-soaked or worn to less than 1/8-inch thick, replace brakeshoe assembly. Linings are bonded to brakeshoes. If linings are faulty or worn, replace shoe assembly.

(2) Inspect all brakeshoe mounting hardware. Replace if damaged.

Page 43. Paragraphs 54*c, d,* and *e* are added after paragraph 54*b*.

c. Removal.

(1) Remove floor plates. Disconnect return spring from spring clip. Remove cotter pin and clevis pin to disconnect yoke from lever.

(2) To remove pedal (fig. 22.1), loosen screw, nut, and washer, then remove lever and key. Remove pedal and pad. If necessary, remove pedal shaft bushings from frame.

d. Inspection.

(1) Inspect pedal to master cylinder yoke, lever, and pins for wear or elongated holes at linkage connecting points.

(2) Replace faulty or worn parts.

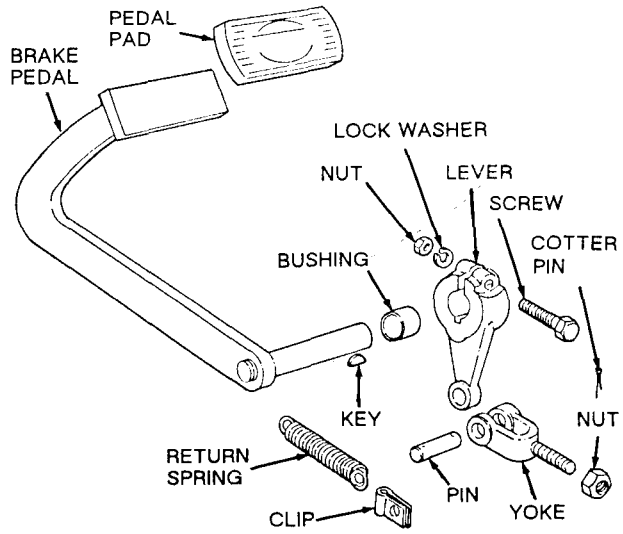


Figure 22.1. Brake pedal, exploded view.

e. Installation.

(1) Reverse the procedures in *c* above.

(2) Adjust service brake pedal as in *b* above.

Pages 44 through *50.* Change all references to "MHE-190" to read "MHE-190, MHE-190A, MHE-190B, and MHE-220".

Page 45, paragraph 55*g*.

Change "(fig. 1)" to "(refer to LO 10-3930-235-12)".

After the last sentence, add "Replace all cracked, damaged, or defective parts.".

Page 46.

Paragraph 55*i*(2) is superseded as follows:

(2) *Installation.* Reverse the procedures in (1) above. Inflate tires to 100 psi.

Paragraph 55*i*(1.1) is added after paragraph 55*i*(1).

(1.1) Repair. Refer to TM 9-2610-200-24.

Page 49. Figure 29 is superseded as shown on the following page.

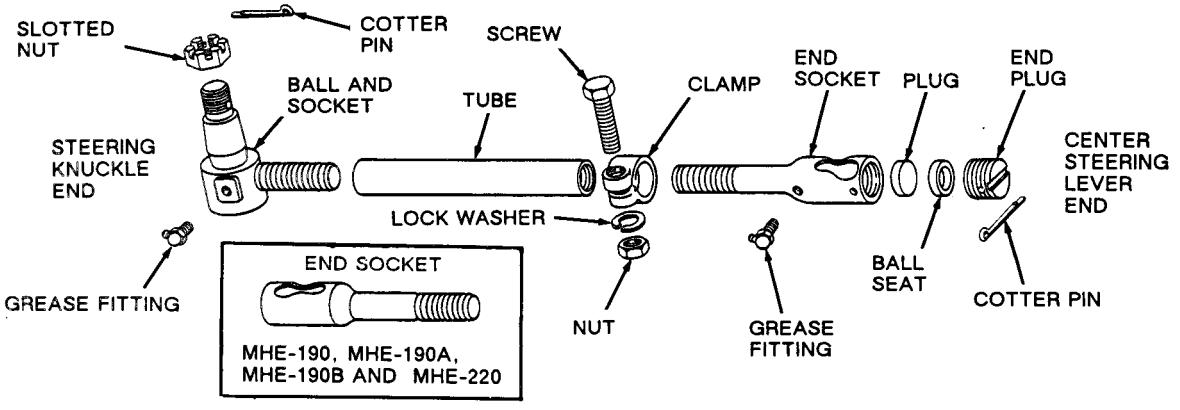


Figure 29. Tie rod, exploded view.

Page 52.

Paragraph 61.1 is added after paragraph 61.

61.1. Overhead Guard

a. Removal.

(1) Remove 4 screws and lockwashers.

(2) Remove 4 nuts, 12 lockwashers, and 2 U-bolts. Remove overhead guard.

b. Installation. Reverse the procedures in *a* above.

Paragraph 63*c*. After the last sentence, add "Repair chains by replacing damaged or defective links.".

Page 53.

Figure 31 is superseded as shown.

Figure 32.1 is added after figure 32 as shown on the following page.

Page 54. Add to the title of figure 32 "(models MHE-190A, MHE-190B, and MHE-191).

Page 55. Paragraph 66*d*.1 is added after paragraph 66*d*.

d.1. Repair. Repair of hydraulic oil filter consists of replacement of worn or damaged piece parts and mounting hardware.

Page 56, paragraph 68*d*(3). Change "TM 9-213" to "TM 43-0139".

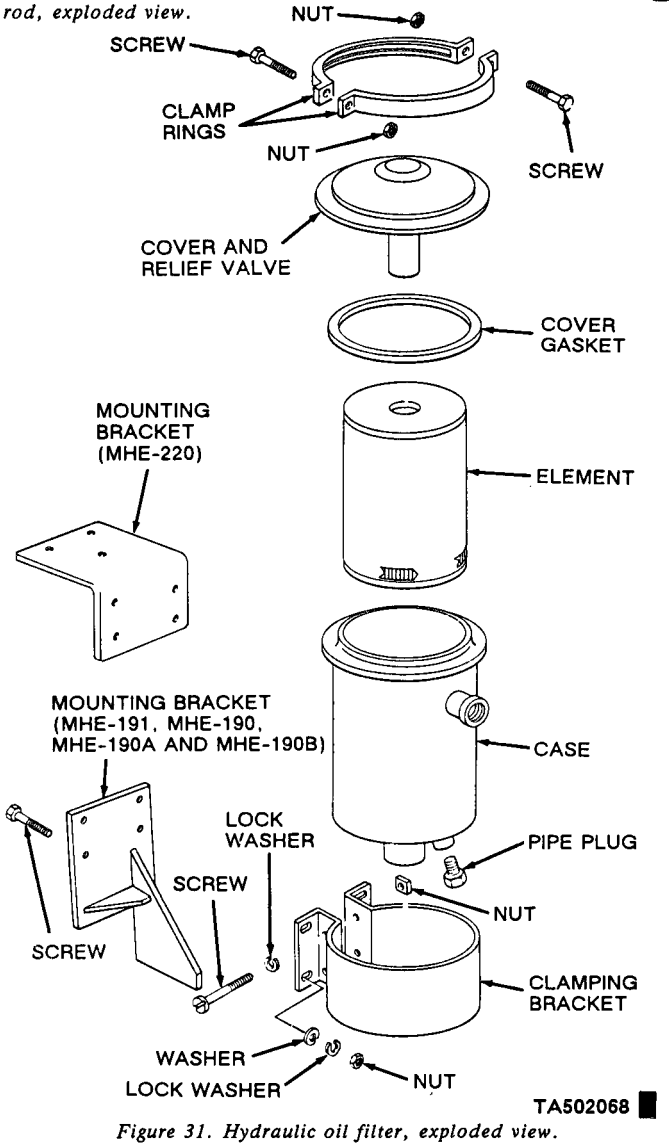
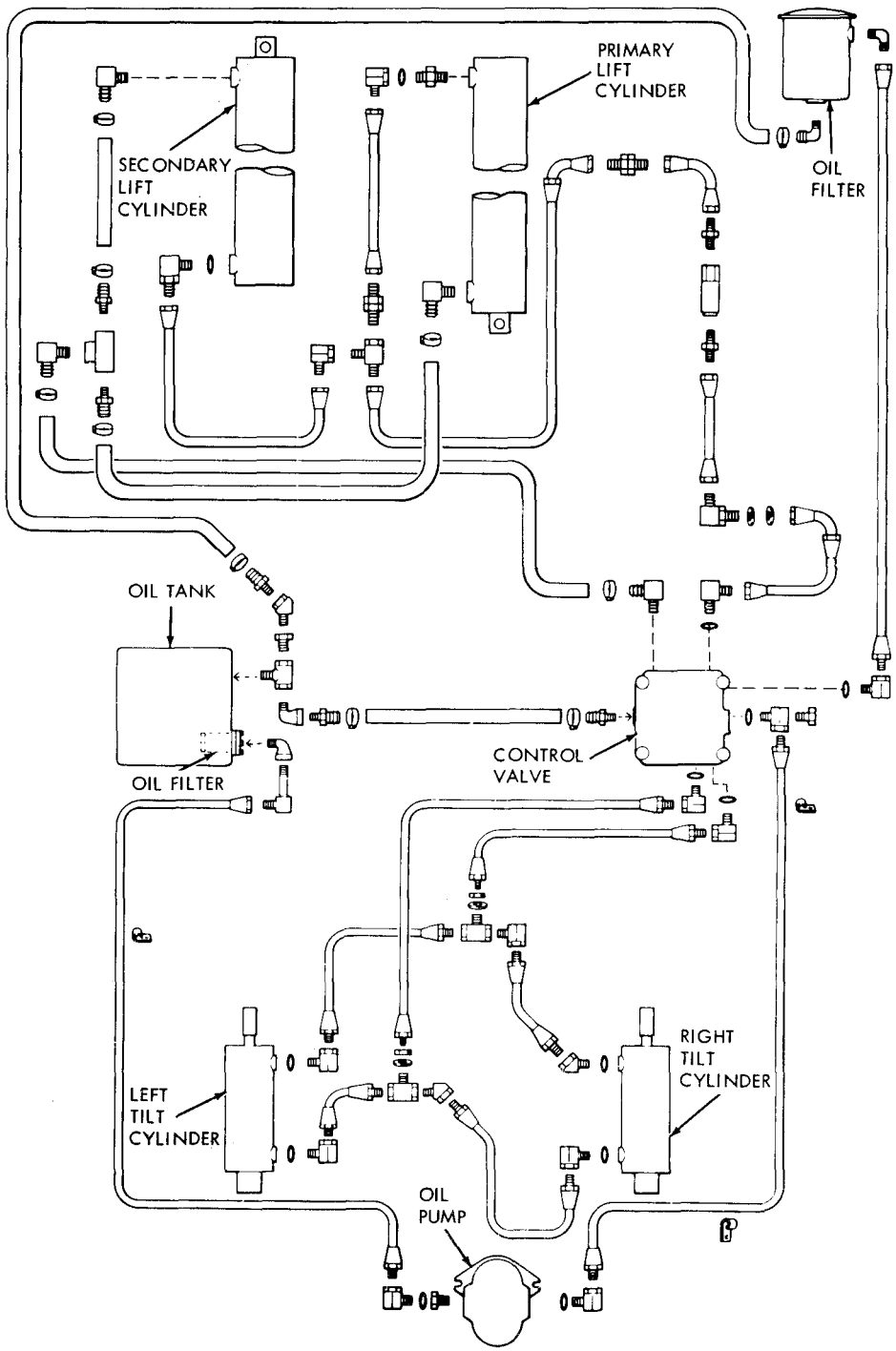


Figure 31. Hydraulic oil filter, exploded view.



ME 3930-235-20/32.1

Figure 32.1. Hydraulic system schematic (model MHE-220).

Page 59. Appendix I is superseded as follows:

APPENDIX I
REFERENCES

1. Fire Protection	
TB 5-4200-200-100	Hand Portable Fire Extinguishers Approved for Army Users
2. Lubrication	
C9100-IL	Fuels, Lubricants, Oils, and Waxes
LO 10-3930-235-12	Lubrication Order
3. Painting	
AR 740-1	Storage and Supply Activity Operations
AR 746-1	Packaging of Army Material for Shipment and Storage
TM 43-0139	Painting Instructions for Field Use
4. Maintenance	
DA Pam 738-750	The Army Maintenance Management System (TAMMS)
FM 29-2	Organizational Maintenance Operations
TB 750-651	Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems
TM 9-6140-200-14	Operator's, Organizational, Direct Support and General Support Maintenance Manual for Lead-Acid Storage Batteries
TM 9-2610-200-24	Organizational Care, Maintenance, and Repair: Pneumatic Tires, Inner Tubes, and Radial Tires
TM 10-3930-235-20P	Organizational Maintenance Repair Parts and Special Tools Lists
5. Shipment and Storage	
TB 740-97-2	Preservation of USAMECOM Mechanical Equipment for Shipment and Storage, Packaging
TM 38-230-1	Preservation, Packaging, and Packing of Military Supplies and Equipment (Volume 1)
TM 740-90-1	Administrative Storage of Equipment
6. Demolition	
TM 750-244-6	Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use
7. Operation	
TM 5-331B	Utilization of Engineer Construction Equipment: Volume B; Lifting, Loading, and Handling Equipment

Page 60. Appendix II is superseded as follows:

APPENDIX II
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at the various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position of the SMR code.

i. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, and disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

3. Explanation of Columns in the MAC, Section II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, as-

semblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00."

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For a detailed explanation of these functions, see paragraph 2.)

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a *work time* figure in the appropriate subcolumn(s), the level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/ fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the Maintenance Allocation Chart. The symbol designations for the various maintenance levels are as follows:

C ..... Operator or Crew
O ..... Organizational Maintenance
F ..... Direct Support Maintenance
H ..... General Support Maintenance
D ..... Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

4. Explanation of Columns in Tool and Test Equipment Requirements, Section III

a. Column 1, Tool or Test Equipment Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National/NATO Stock Number. The National or NATO Stock Number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

5. Explanation of Columns in Remarks, Section IV

a. Column 1, Reference Code. The code recorded in Column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
01	**ENGINE**								
0100	*Engine Assembly*	Inspect	0.1						
		Test		1.0					A
		Service	0.2						
		Replace			8.0				
		Repair				12.0			
		Overhaul					28.0		B
0101	*Crankcase, Block, Cylinder Head*								
	Head, Cylinder	Replace			2.5				
	Block, Engine	Repair			4.0				
0102	*Crankshaft*	Replace				12.0			
0103	*Flywheel Assembly*	Replace			1.0				
		Repair			1.0				
0104	*Pistons, Connecting Rods*								
	Piston, Internal	Replace				4.0			
		Repair				2.0			
0105	*Valves, Camshafts, and Timing System*								
	Valves, Intake and Exhaust	Adjust		0.5					
		Replace			5.5				
0106	*Engine Lubrication System*								
	Filter, Fluid Pressure	Replace		0.2					
0108	*Manifolds*	Replace		1.0					
03	**FUEL SYSTEM**								
0301	*Carburetor, Fuel Injector*								
	Carburetor	Adjust		0.5					
		Replace		1.0					
		Repair			2.0				
0302	*Fuel Pumps*	Test		0.3					
		Service		0.2					
		Replace		0.5					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
0304	*Air Cleaner*	Service		0.2					
		Replace		0.2					
0306	*Tanks, Lines, and Fittings*								
	Tank, Fuel	Service	0.1						
		Replace		0.4					
0308	*Engine Speed Governor and Controls*	Adjust		0.3					
		Replace			0.5				
0309	*Fuel Filters*	Service		0.2					
		Replace		0.3					
0312	*Accelerator, Throttle or Choke Controls*								
	Pedal and Linkage, Accelerator	Adjust		0.4					
		Replace		0.8					
04	**EXHAUST SYSTEM**								
0401	*Muffler and Pipes*	Replace		1.0					
05	**COOLING SYSTEM**								
0501	*Radiator, Evaporative Cooler, or Heat Exchanger*								
	Radiator	Inspect	0.1						
		Service	0.2	1.0					
		Replace		1.0					
		Repair				2.0			
0503	*Water Manifold, Headers, Thermostats and Housing Gasket*								
	Thermostat	Test		0.2					
		Replace		0.4					
0504	*Water Pump*	Inspect	0.1						
		Replace		0.8					
0505	*Fan Assembly*								
	Belt, Fan	Inspect	0.1						
		Adjust		0.2					
		Replace		0.2					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
06	**ELECTRICAL SYSTEM**								
0601	*Generator, Alternator*								
	Generator	Test		0.5					C
		Replace		0.5					
		Repair			1.5				
0602	*Generator Regulator (Voltage)*	Test		0.2					
		Replace		0.2					
0603	*Starting Motor*	Test			0.2				
		Replace		0.6					
		Repair			1.5				
0605	*Ignition Components*								
	Distributor, Ignition	Adjust		0.3					
		Replace		0.4					
		Repair		0.4					
	Spark Plugs	Adjust		0.1					
		Replace		0.2					
0607	*Instrument or Engine Control Panel*								
	Gages and Instruments	Replace		1.0					
0608	*Miscellaneous Items*								
	Fuses	Replace		0.1					
0609	*Lights*	Replace		0.1					
		Repair		0.1					
0611	*Horn, Siren*								
	Horn	Test	0.1						
		Replace		0.2					
	Horn Button	Replace		0.3					
		Repair		0.3					
0612	*Batteries, Storage*	Inspect	0.1						
		Test		0.1					
		Service		0.2					
		Replace		0.2					
		Repair				2.5			
	Cables, Battery	Inspect	0.1						
		Replace		0.2					
0613	*Chassis Wiring Harness*	Replace		4.5					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
07	**TRANSMISSION**								
0705	*Transmission Shifting Components*								
	Lever and Linkage	Service		0.1					
		Adjust		0.3					
		Replace			1.0				
0708	*Torque Converter or Fluid Coupling*								
	Converter	Replace			0.5				
0710	*Transmission Assembly*	Test			2.0				
		Service		0.3					
		Replace			8.0				
		Repair				12.0			
		Overhaul					16.0		
0713	*Intermediate Clutch*								
	Clutch Assemblies	Replace				4.0			
		Repair				4.0			
0714	*Servo Unit*								
	Valve, Transmission Control	Replace			0.8				
		Repair			1.5				
0721	*Coolers, Pumps, Motors*								
	Pump Assembly	Replace			1.0				
		Repair			0.8				
	Element, Sediment, Transmission Oil	Replace		0.2					
0726	*Brake, (Special)*								
	Pedal and Linkage	Adjust		0.5					
		Replace		1.0					
09	**PROPELLER, PROPELLER SHAFTS, UNIVERSAL JOINTS, COUPLER AND CLAMP ASSEMBLY**								
0900	*Propeller Shafts*								
	Universal Joint	Service			1.2				
		Replace			1.0				
		Repair			1.0				

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
10	**FRONT AXLE**								
1000	*Front Axle Assembly*	Service		0.1					
		Replace			2.0				
		Repair				2.0			
1002	*Differential*	Replace				3.0			
		Repair				2.0			
1003	*Planetary or Final Drive*								
	Axle Housing and Spindle	Replace				4.0			
11	**REAR AXLE**								
1100	*Rear Axle Assembly*								
	Axle, Steering	Replace			3.0				
		Repair			3.0				
1104	*Steering, Sideshift and Wheel Leaning Mechanism*								
	Knuckles and Bell Crank	Service		0.2					
		Replace			2.0				
		Repair			2.0				
12	**BRAKES**								
1201	*Hand Brakes*								
	Lever Assembly	Adjust		0.3					
		Replace		0.7					
	Brakeshoe, Hand Brake	Test	0.1						
		Adjust		0.3					
		Replace		1.0					
1202	*Service Brakes*								
	Brakeshoes, Service Brake	Adjust		0.3					
		Replace		1.0					
1204	*Hydraulic Brake System*								
	Cylinder Assembly, Master	Service		0.1					
		Replace		1.0					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
1206	*Mechanical Brake System*								
	Pedal and Linkage, Service Brake	Adjust		0.3					
		Replace		0.5					
13	**WHEELS**								
1311	*Wheel Assembly*	Replace		1.2					
	Bearings, Wheel	Service		0.3					
		Replace		1.0					
	Hub Assembly	Replace		1.2					
		Repair		0.8					
1313	*Tires and Tubes*	Inspect	0.1						
		Service	0.1						
	Tire, Solid (MHE-191 Only)	Replace				1.7			
	Tire, Pneumatic	Replace		0.6					
		Repair		0.6					
14	**STEERING**								
1401	*Mechanical Steering Gear Assembly*	Adjust			1.0				
		Replace			4.0				
		Repair				2.0			
	Drag Links and Tie Rods	Service		0.4					
		Adjust		0.5					
		Replace		1.5					
		Repair		0.5					
1410	*Hydraulic Pump or Fluid Motor Assembly*								
	Pump, Power Steering	Replace			1.5				
		Repair			1.5				
	Belt, Pump Drive	Adjust		0.2					
		Replace		0.4					
1411	*Hoses, Lines, Fittings*	Inspect	0.1						
		Replace		1.0					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
1412	*Hydraulic or Air Cylinders*								
	Cylinder, Power Steering	Replace		1.0					
		Repair			2.0				
1414	*Steering System Valves*	Replace			0.3				
		Repair			1.5				
15	**FRAME, TOWING ATTACHMENTS, DRAWBARS AND ARTICULATION SYSTEMS**								
1501	*Frame Assembly*	Replace			2.0				
16	**SPRINGS AND SHOCK ABSORBERS**								
1601	*Springs*	Replace			4.5				
		Repair			1.0				
18	**BODY, CAB, AND HOOD**								
1801	*Body, Cab, and Hood Assemblies*								
	Overhead Guard	Inspect	0.1						
		Replace		0.3					
1806	*Upholstery Seats and Carpets*								
	Cushions, Seat, and Backrest	Adjust	0.1						
		Replace		0.5					
24	**HYDRAULIC AND FLUID SYSTEMS**								
2401	*Pump and Motor*								
	Pump Assembly, Hydraulic	Test			0.4				
		Replace			1.0				
		Repair			2.0				
2402	*Manifold and/or Control Valves*								
	Valve Assembly, Hydraulic Control	Adjust			0.4				
		Replace			1.0				
		Repair			2.0				

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
2403	*Hydraulic Controls and/ or Manual Controls*								
	Lever, Control	Replace			0.5				
2404	*Tilt Cylinders and Tilt Crank*								
	Cylinder Assembly, Tilt	Replace		0.5					
		Repair			1.5				
2405	*Mast Column*								
	Cylinder Assembly, Lift	Replace			1.0				
		Repair			2.0				
	Mast Assembly, Triple Lift	Service		0.1					
		Replace			2.0				
		Repair			2.0				
	Carriage Assembly	Service		0.1					
		Replace			1.5				
	Chain, Hydraulic Lift	Service		0.1					
		Adjust		0.3					
		Replace		0.5					
		Repair		0.5					
2406	*Strainers, Filters, Lines and Fittings*								
	Filter, Hydraulic Oil	Replace		0.2					
2408	*Liquid Tanks or Reservoirs*								
	Tank Assembly, Hydraulic Oil	Service		0.2					
		Replace			0.7				

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

Not Applicable.

Section IV. REMARKS

(1) Reference Code	(2) Remarks
A	Compression vacuum timing.
B	Reboring may be accomplished at depot maintenance if facilities are available from government or commercial sources.
C	Voltage output test.

Pages 66 and *67,* Index.

The following entries are added or superseded alphabetically:

	Paragraph(s)	Page
Air cleaner, carburetor	26,26.1	23
Engine oil filter	23.1	22
Fuses	43.1	36
Horn	43.3	36
Horn button assembly	43.4	36
Lights	43.2	36
Oil filter (engine)	23.1	22
Overhead guard	61.1	52
Transmission oil filter	4–5.1	36

The following entries are deleted alphabetically:

	Paragraph	Page
Axle, drive	47	38
Axle, front	47	38
Axle shaft, drive	48	38
Cylinder head	21	18
Drive axle	47	38
Front axle (drive)	47	38

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25F-R, (Block No. 2159) Unit maintenance requirements for Fork Lift, 4000 LB capacity, Pneumatic & Solid, Gas Tire (Model MHE-190A, 190B, 191, 220).

TM 10-3930-235-20

TECHNICAL MANUAL
No. 10-3930-235-20

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *15 October 1964*

Organizational Maintenance Manual

TRUCK, LIFT, FORK, GASOLINE
4,000-LB CAPACITY

TOWMOTOR MODEL	ARMY MODEL	FSN
462SG4024-100 (Solid Tire)	MHE-191	3930-781-3856
462SG4024-144 (Solid Tire)	MHE-191	3930-781-3855
502PG4024-144 (Pneumatic Tire)	MHE-190	3930-073-9222

		Paragraph	Page
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II.	Description and data	6-7	2
CHAPTER 2.	SERVICE UPON RECEIPT OF TRUCK	8-10	4
CHAPTER 3.	MAINTENANCE INSTRUCTIONS		
Section I.	Lubrication	11-12	5
II.	Preventive maintenance services	13-14	10
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IV.	Engine	16-23	15
V.	Fuel system	24-29	22
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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

These instructions are published for the use of personnel responsible for the organizational maintenance of the truck, lift, fork, solid rubber tired wheels, 4,000-lb capacity, Towmotor models 462SG4024-100 (FSN 3930-781-3856) and 462SG4024-144 (FSN 3930-781-3855) respectively, Army model MHE-191, procured under contract number DSA-4-014877-MP310, and Towmotor model 502PG 4024-144 (FSN 3930-073-9222), Army model MHE-190, 4,000-lb capacity, pneumatic rubber tired wheels, procured under contract number DSA-4-014863-MP310.

2. Appendixes

Appendix I is a list of current references. Appendix II is the maintenance allocation chart. The repair parts and special tools list authorized for use at organizational maintenance is published in TM 10-3930-235-20P.

3. Forms, Records, and Reports

The maintenance forms, records, and reports to be used in the organization maintenance of this equipment are listed and described in TM 38-750.

4. Reporting of Equipment Manual Improvements

The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to the Commanding Officer, U.S. Army Mobility Equipment Center, ATTN: SMOME-MM, P.O. Drawer 58, St. Louis, Mo. 63166. One information copy will be provided to the individual's immediate supervisor (e.g., officer, noncommissioned officer, supervisor, etc.).

5. Orientation

Throughout this manual, the use of the terms right, left, front, and rear, with respect to engine and truck are determined with the operating sitting in the seat of the truck.

Section II. DESCRIPTION AND DATA

6. Description

a. Refer to TM 10–3930–235–10 for a general description of the truck.

b. Additional descriptive material will be found in sections of this manual that pertain to a particular assembly.

7. Tabulated Data

a. Capacities.

Cooling System	11 qt
Crankcase (with filter)	5 qt
Differential	5 pt
Fuel tank	5.8 gal
Air cleaner	1 pt

Hydraulic system	6½ gal
Brake master cylinder	8 oz
Power steering system	2 qt
Steering gear housing	2½ pt
Transmission	11 qt

b. Engine.

Make	Continental
Model	FS162
Firing order	1–3–4–2
Governed speed	2400 rpm
Idle speed	500 rpm
Valve clearances:	
Intake	0.014 in. hot
Exhaust	0.014 in. hot
Spark plug gap	0.030 in.
Distributor point gap	0.020 in.
Oil pressure (normal operating speed)	30 to 40 psi.
Cylinder head nuts	60–65 ft-lb torque
Spark plugs	15–20 ft-lb torque

c. Electrical System.

Generator:	
Rated voltage	12
Rotation	Clockwise
Ground polarity	Negative
Brush spring tension	18–36 ounces
Field current draw	1.6–1.7 amperes at 12 volts
Motoring draw	2.9–3.0 amperes at 12 volts
Output	25 amperes at 15 volts 2200 rmp
Control	3 element regulator
Starting motor:	
Rated voltage	12 volts
Rotation (drive end)	Clockwise
Brush spring tension	18–36 ounces
Armature end play	0.005 in. min
No load test	55 amperes 10 volts, 5200 rmp
Stall torque test	235 amperes 4 volts
Generator regulator:	
Rated voltage	12 volts
Ground polarity	Negative
Circuit breaker (cutout relay):	
Armature airgap	0.025–0.027 in.
Contact point gap	0.015 min.
Contact open	3.0–5.0 amperes
Contact close	12.6–13.6 volts
Current limiting regulator:	
Armature airgap	0.048–0.052 in.
Operating amperes	25
Voltage regulator:	
Armature airgap	0.048–0.052 in.
Operating voltage	14.5 @ 80°F.
Battery:	
Negative ground	12 volts
Capacitors:	
(At ignition switch)	0.001 MFD 100 volt dc
(At voltage regulator)	0.001 MFD 100 volt dc
(At coil)	0.001 MFD 100 volt dc
(At generator)	0.001 MFD 100 volt dc

CHAPTER 2

SERVICE UPON RECEIPT OF TRUCK

8. General

When either a new or used truck is received by an organization, it must be serviced as described in paragraphs 12 and 14 to prepare it for operation. These services will be performed by organizational maintenance personnel.

9. Removal of Preservatives

a. Remove tape, paper, or other packing. Use extreme care when unpacking and installing separately packaged components.

b. Remove, with SD (solvent, drycleaning), the preservative compound which has been sprayed on all metal surfaces. Because this compound is not a lubricant, take special care to see that it is completely removed from all wearing surfaces.

c. If any component or system contains preservative oil, drain the oil from it. Fill with proper lubricant as indicated in LO 10-3930-235-20.

d. When necessary, fill the battery with electrolyte and prepare the battery for service.

10. Maintenance Inspection and Tests

a. The organization mechanic will perform the services and tests that are listed in figure 3. The services performed at this time will begin the cycle of regularly scheduled preventive maintenance services.

b. The deficiencies and shortcomings noted, and the corrective action taken will be reported on the appropriate form prescribed and explained in TM 38-750.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION

11. General

LO 10-3930-235-20 prescribes lubrication maintenance for the towmotor models 462SG-4024-100, 462SG4024-144, and 502PG4024-144 trucks; and compliance with its instructions is mandatory at all levels of maintenance. If a truck is received without a lubrication order, the using organization must requisition a copy through normal channels in accordance with provision of AR 310-1.

12. Lubrication Instructions

The lubrication order is illustrated in figure L The numbers that have been inserted on the border of the illustration refer to specific lubrication points that are illustrated in figure 2.

LUBRICATION ORDER LO 10-3930-235-20

TRUCK, LIFT, FORK, GASOLINE, 4,000-POUND CAPACITY

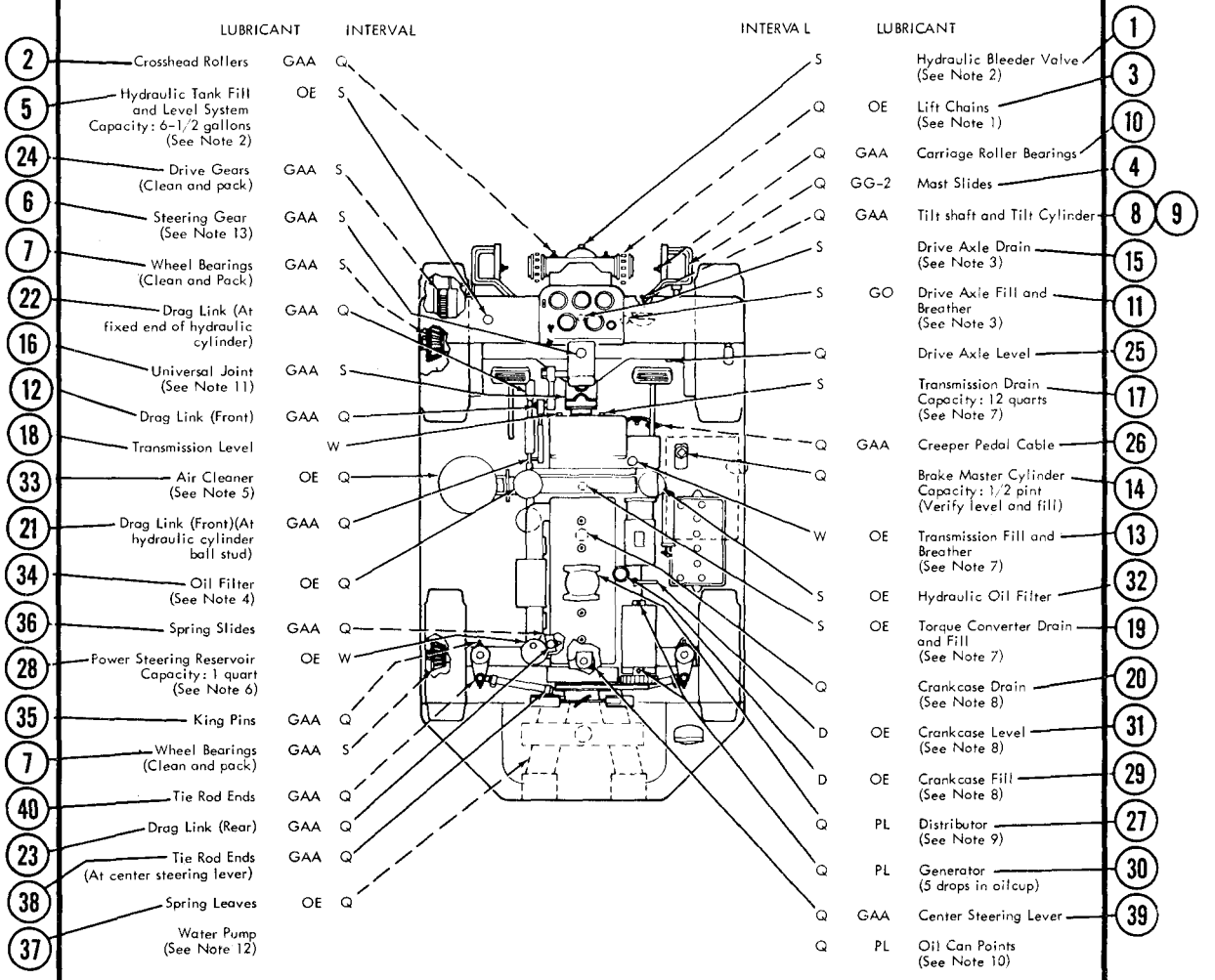
TOWMOTOR MODELS	ARMY MODELS
462 SG 4024—100 (SOLID TIRE)	MHE—191
462 SG 4024—144 (SOLID TIRE)	MHE—191
502 PG 4024—144 (PNEUMATIC TIRE)	MHE—190

REFERENCE: TM10-3930-235-20. C9100-SL

8 OCTOBER 1964

Intervals given are maximum for normal 8-hour day operation. For abnormal conditions or activities, intervals should be shortened to compensate. During inactive periods, intervals may be extended commensurate with adequate preservation.

Wash truck and clean fittings before lubricating. Relubricate after fording. Clean parts with SD (Solvent - dry cleaning). Dry before lubricating. Broken arrow shafts indicate lubrication points on both sides of the equipment. Drain gear cases only when hot after operating; verify levels and replenish when cool.



MEC 3930-235-20/1 (1)

Figure 1. Lubrication order.

- KEY -

LUBRICANTS	EXPECTED TEMPERATURES			INTERVALS
	above +32°F.	+40° to -10°F.	0° to -65°F.	
OE - LUBRICATING OIL, Internal Combustion Engine				D - Daily W - Weekly Q - Every 3 months or every 250 operating hours, whichever occurs first S - Every 6 months or every 500 operating hours, whichever occurs first
Engine Crankcase	OE-30	OE-10	OES	
Hydraulic Tank	OE-10	OE-10	OES	
Power Steering Reservoir	OE-10	OE-10	OES	
Transmission	OE-10	OE-10	OES	
GO - LUBRICATING OIL, Gear	GO-90	GO-80	GOS	
HB - HYDRAULIC FLUID, Nonpetroleum (Brake)	HB	HB	HBA	
PL - LUBRICATING OIL, General Purpose, Preservative	PL-Medium	PL-Special	PL-Special	
GAA - GREASE, Automotive and Artillery				all temperatures
GG-2 - GREASE, Graphite				all temperatures
OES - LUBRICATING OIL, Internal Combustion Engine (Subzero)				
GOS - LUBRICATING OIL, Gear (Subzero)				
HBA - HYDRAULIC FLUID, Nonpetroleum, Automotive (Arctic Type) (Brake)				

NOTES

1. LIFT CHAINS - Q, oil as necessary. S, remove, soak, and wash in SD; drain and dry. Soak in OE-10, drain and wipe outer surfaces.

2. HYDRAULIC TANK FILL AND LEVEL - W, check level and oil condition. If oil condition indicates contamination (water, dirt particles, and the like), drain system and replenish with clean oil. Bleed system if necessary.

3. DRIVE AXLE - Q, verify levels and fill as necessary with seasonal GO. S, drain, clean drain plugs, and refill.

4. OIL FILTER - Q, when crankcase is drained, remove oil filter and discard. Install new filter.

5. AIR CLEANER - Q, drain, clean, and refill. D, under extremely dusty or other unusual conditions.

6. POWER STEERING RESERVOIR - W, verify level and fill. Change element after first 100 hours operation, then each 500 hours operation thereafter.

7. TRANSMISSION AND TORQUE CONVERTER FILL AND LEVEL - W, verify level when hot. Q, clean breather cap with SD, re-oil with PL, and re-install. S, drain only when hot and refill with OE-10 above 0° and OES from 0° to -65° F. when cool. To drain, remove transmission and torque converter drain plugs; crank engine to move torque converter drain to bottom. After draining, replace drain plugs.

8. CRANKCASE - D, verify level. Q, drain and refill with seasonal OE. Capacity: 5 quarts (with oil filter change).

9. DISTRIBUTOR - Q, wipe breaker cam lightly with GAA. S, lubricate breaker arm pivot and wick under rotor with 1 or 2 drops of seasonal PL. Clean vents. W, 6 drops of PL in oil cup.

10. OIL CAN POINTS - Q, apply seasonal PL to accelerator levers, creeper pedal linkage, brake and throttle linkages, and other friction points not equipped with pressure fittings or oil cups.

11. UNIVERSAL JOINT - S, TO BE LUBRICATED BY DIRECT SUPPORT MAINTENANCE. Disassemble and repack with GAA.

12. WATER PUMP - Sealed bearing... no lubrication required.

13. STEERING GEAR - S, TO BE LUBRICATED BY GENERAL SUPPORT MAINTENANCE. Disassemble and repack with 2-1/2 pounds of GAA.

A copy of the Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory and supersede all conflicting orders issued prior to this date.

BY ORDER OF THE SECRETARY OF THE ARMY:

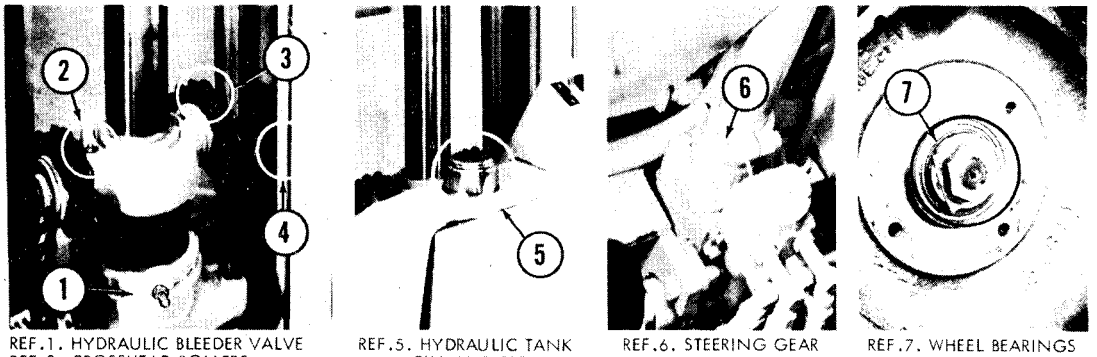
EARLE G. WHEELER
General, United States Army,
Chief of Staff

OFFICIAL:

J. C. LAMBERT
Major General, United States Army,
The Adjutant General

MEC 3930-235-20/1 (2)

Figure 1—Continued.

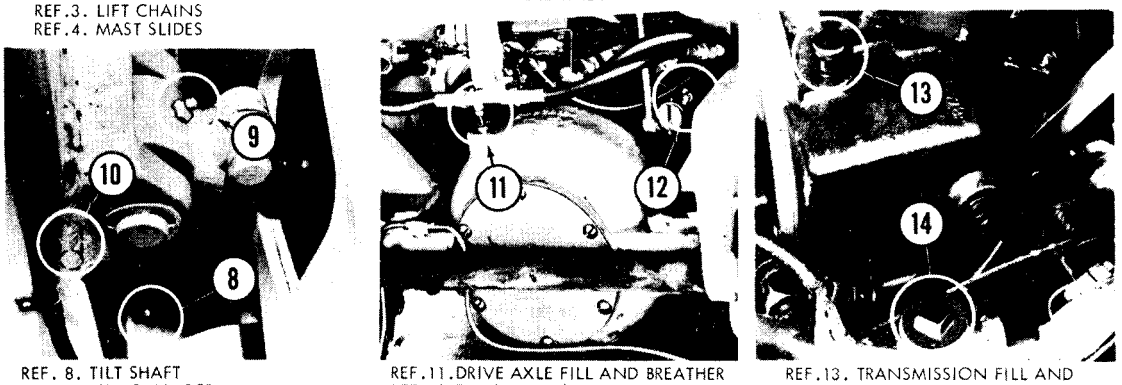


REF.1. HYDRAULIC BLEEDER VALVE
REF.2. CROSSHEAD ROLLERS
REF.3. LIFT CHAINS
REF.4. MAST SLIDES

REF.5. HYDRAULIC TANK FILL AND BREATHER

REF.6. STEERING GEAR

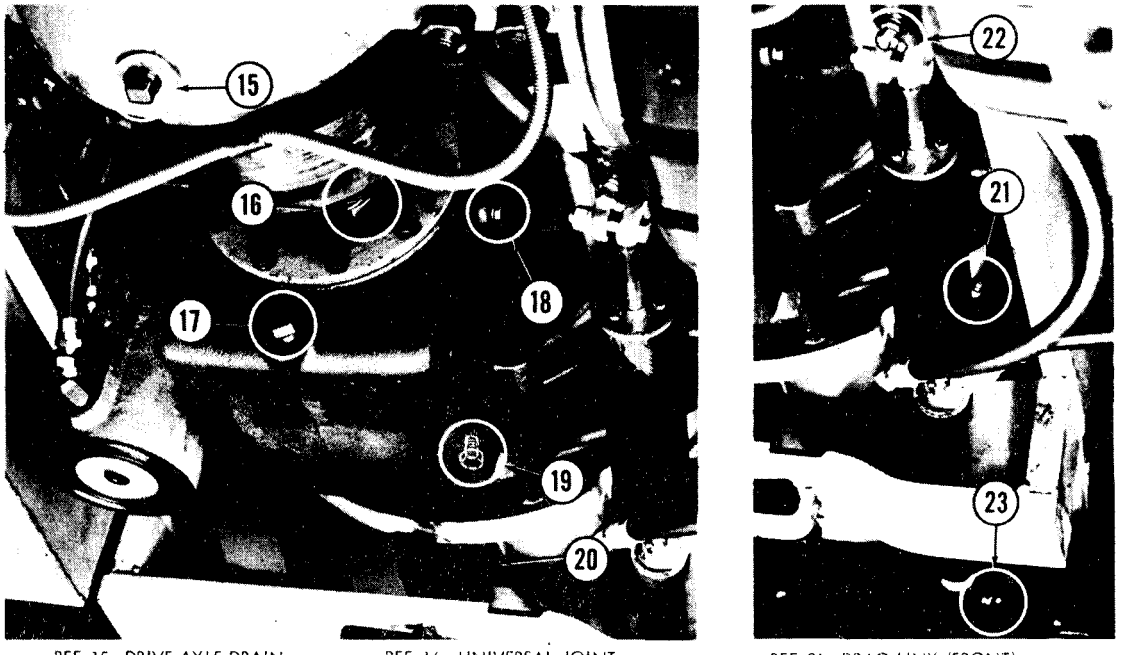
REF.7. WHEEL BEARINGS



REF. 8. TILT SHAFT
REF. 9. TILT CYLINDER
REF.10. CARRIAGE ROLLER BEARINGS

REF.11. DRIVE AXLE FILL AND BREATHER
REF.12. DRAG LINK (FRONT) (AT STEERING GEAR)

REF.13. TRANSMISSION FILL AND BREATHER
REF.14. BRAKE MASTER CYLINDER

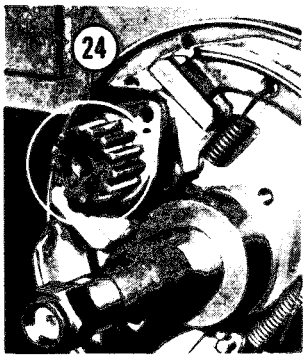


REF.15. DRIVE AXLE DRAIN
REF.16. UNIVERSAL JOINT
REF.17. TRANSMISSION DRAIN
REF.18. TRANSMISSION LEVEL
REF.19. TORQUE CONVERTER DRAIN
REF.20. CRANKCASE DRAIN

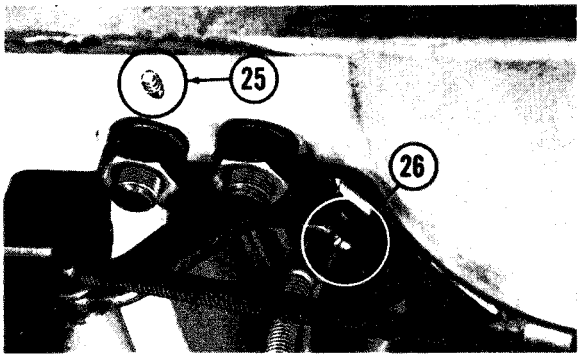
REF.21. DRAG LINK (FRONT) (AT HYDRAULIC CYLINDER BALL STUD)
REF.22. DRAG LINK (REAR) (AT FIXED END OF HYDRAULIC CYLINDER)
REF.23. DRAG LINK (REAR) (AT CENTER STEERING LEVER BALL STUD)

MEC 3930-235-20/2 (1)

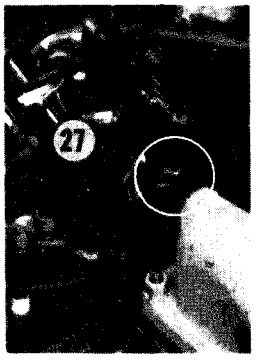
Figure 2. Lubrication points.



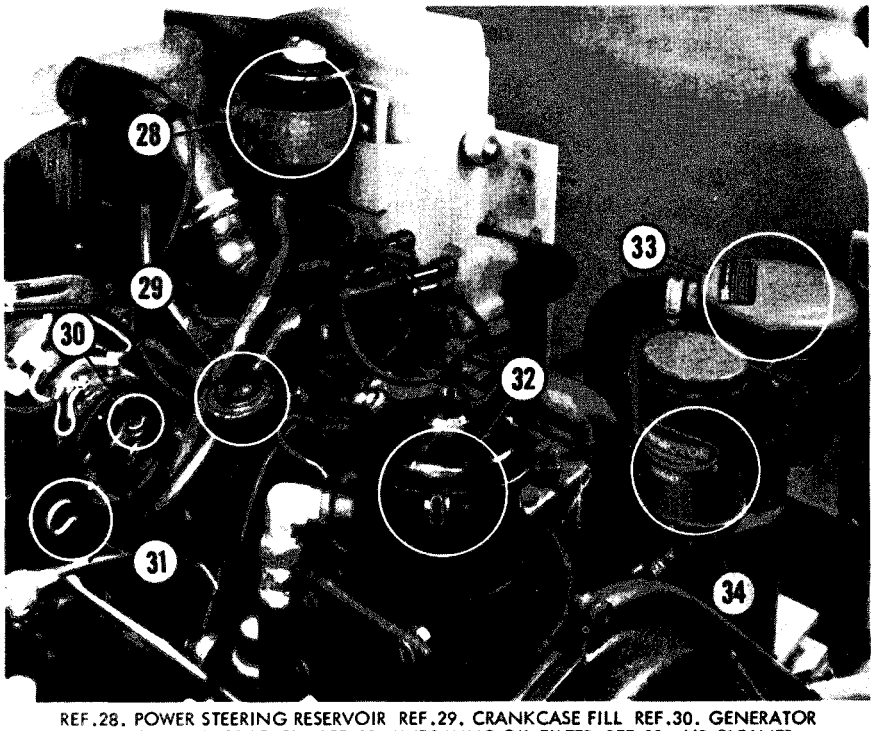
REF.24. DRIVE GEARS



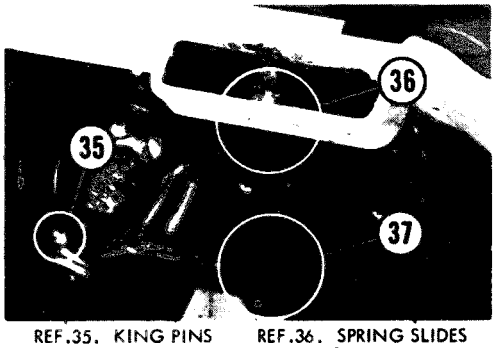
REF.25. DRIVE AXLE LEVEL REF.26. CREEPER PEDAL CABLE



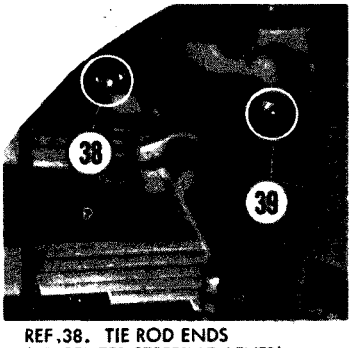
REF.27. DISTRIBUTOR



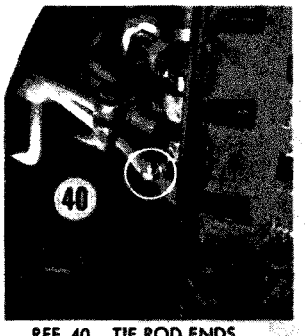
REF.28. POWER STEERING RESERVOIR REF.29. CRANKCASE FILL REF.30. GENERATOR
REF.31. CRANKCASE LEVEL REF.32. HYDRAULIC OIL FILTER REF.33. AIR CLEANER
REF.34. OIL FILTER



REF.35. KING PINS REF.36. SPRING SLIDES
REF.37. SPRING LEAVES



REF.38. TIE ROD ENDS
(AT CENTER STEERING LEVER)
REF.39. CENTER STEERING LEVER



REF.40. TIE ROD ENDS
(AT STEERING KNUCKLES)

MEC 3930-235-20/2 (2)

Figure 2—Continued.

Section II. PREVENTIVE MAINTENANCE SERVICES

13. General

To insure that the truck is ready for operation at all times, it must be inspected systematically, so that defects will be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraph 14. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the truck will be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies, and shortcomings will be recorded with the corrective action taken on DA Form 2404 at the earliest possible opportunity.

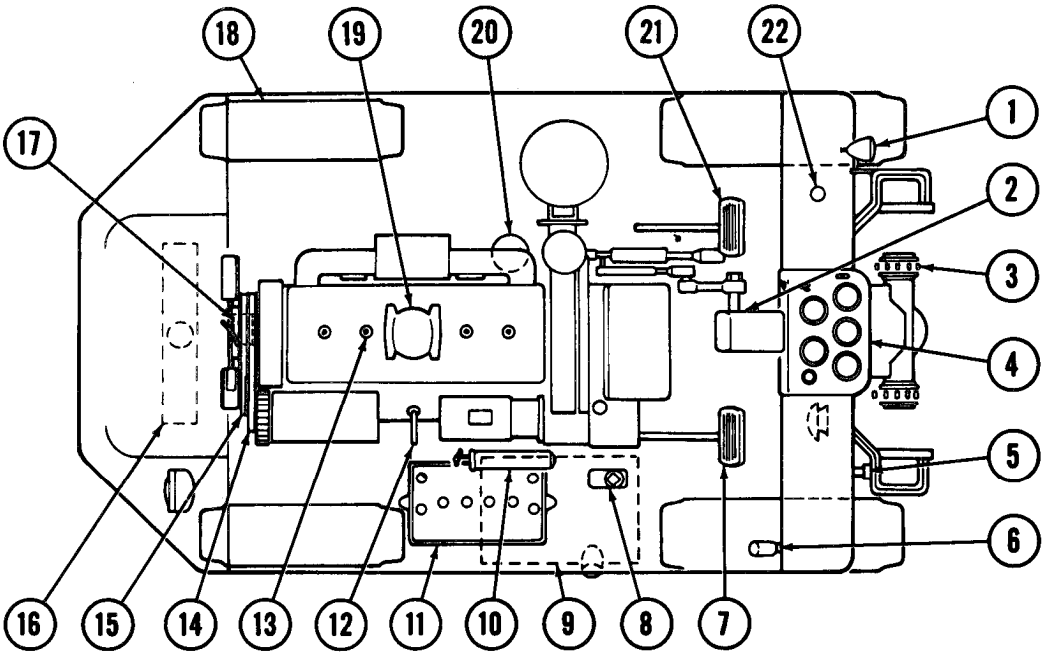
14. Quarterly Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 months, or 250 hours of operation, whichever occurs first. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3 for the quarterly preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES
QUARTERLY

TM 10-3930-235-20 FORK LIFT TRUCK

TOWMOTOR MODELS
462SG4024-100, 462SG4024-144 and 502PG4024-144



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	LIGHT. Inspect for defective lamp. Tighten loose connections, replace a defective wire.	
2	STEERING GEAR. Inspect for leaks and insecure mounting.	
3	LIFT CHAINS. Inspect for cracked, broken, or excessively worn links. Clean a dirty chain. Reference current L.O. Replace a defective chain. Adjust as necessary.	63
4	CONTROLS AND INSTRUMENTS. Replace damaged instruments. Tighten loose mounting. With the unit operating, check for proper operation. Normal operating readings for instruments are as follows: Ammeter — Slight positive charge Hourmeter — Indicates total hours of operation Oil pressure gage — 30 to 40 psi Temperature gage — 160° to 180°F	42
5	TILT CYLINDERS. Inspect for leaks. Insecure mounting. Adjust as necessary.	62

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Figure 3. Quarterly preventive maintenance services.

ITEM	LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER	PAR REF
6	HAND BRAKE. Check operation. Adjust as necessary.	49
7	SERVICE BRAKE. Inspect for strong pressure when brake pedal is applied. Proper free travel is 1/2 inch. Adjust brakes as necessary.	51 and 54
8	BRAKE MASTER CYLINDER. Inspect for leaks, add fluid as required. Reference current L.O. Clean fill plug vent. Replace a defective cylinder.	52
9	FUEL TANK. Add fuel as required. Tighten loose mounting. Replace leaking fuel tank. Replace defective cap. Clean cap vent.	27
10	FIRE EXTINGUISHER. Inspect for correct gage pressure. If needle is positioned in green area extinguisher has full charge of approximately 180 psi. If needle is in red or discharge position, replace or recharge extinguisher.	
11	BATTERY. Tighten loose cables and mountings. Remove corrosion. Fill to 1/2 inch above the plates. Clean venthole in filler cap before installing. In freezing weather run engine minimum of 1 hour after adding water. Replace a cracked or leaking battery.	43
12	OIL LEVEL GAGE. Add oil as indicated by level gage. Reference current L.O.	
13	SPARK PLUGS. Replace spark plugs that have cracked insulators and burned electrodes. Clean and set spark plug gaps for 0.030 inch. Torque spark plugs to 15 to 20 foot pounds. Replace leads which are frayed or broken. Clean and tighten lead connections.	41
14	FAN BELT. Proper adjustment is a deflection of 1/2 inch midway between pulleys. Replace worn, frayed, or cracked belt.	35
15	POWER STEERING BELT. Inspect for proper adjustment. Replace worn, frayed, or cracked belt.	58
16	RADIATOR. Proper coolant level is bottom of filler neck. Replace cracked or frayed hose. Replace defective radiator. Remove obstructions in the air passages. Tighten all mounting and leaking connections.	32
17	HYDRAULIC PUMP, CONTROL VALVE, HOSES. Inspect for leaks and insecure mounting.	
18	TIRES. Inspect for cuts. Remove embedded foreign material. Replace a defective tire.	55
19	DISTRIBUTOR. Replace pitted or burned points. Proper gap adjustment is 0.020 inch (check adjustment every 500 hours).	40
20	FUEL PUMP, FILTER, LINES. Inspect for insecure mounting and leaks. Clean bowl and screen. Replace bowl gasket.	25 and 28
21	CREEPER PEDAL Inspect for proper pedal free travel. Adjust as necessary.	46
22	HYDRAULIC OIL TANK. Inspect for leaks, add oil as required. Reference current L.O.	64

Figure 3—Continued.

Section III. TROUBLESHOOTING

15. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the truck and its components. Table 1 contains a "Trouble" column, a "Cause" column, and a "Remedy" column. The probable causes of each trouble are listed in the, order they are most likely to occur. The possible remedy recommended is listed opposite the related probable cause. Any trouble beyond the scope of organization maintenance will be reported to the direct support maintenance personnel.

TABLE 1.
TROUBLESHOOTING CHART

Trouble	Cause	Remedy
Engine will not turn over- - -	Dead battery or loose leads to starting motor.	Blow horn. If horn does not sound, charge or replace battery. If horn sounds, check leads to starting motor terminals.
	Piston lock or seizure- - - - - - - - - - - - -	With ignition off, insert a bar in flywheel housing and try to rotate flywheel. If flywheel will not turn, report condition to direct support maintenance.
Engine turns but will not start.	Weak battery- - - - - - - - - - - - - - - -	Charge or replace battery.
	Faulty ignition or fuel system- - - - - - - - -	Disconnect 1 spark plug lead and hold it about 3/16 inch from the cylinder head while cranking the engine. If a good spark occurs, the fault is in the fuel system. If there is no spark, check ignition coil, distributor, and points (para. 40).
	Defective distributor- - - - - - - - - -	Remove distributor cap. Connect a short piece of high tension cable to high tension terminal of coil. If no spark occurs when cranking engine, inspect and replace distributor or coil, as necesary (para. 40).
	Fuel not reaching carburetor - - - - - - - -	Open carburetor feed valve. If this does not help, check for restrictions in fuel lines and fuel pump. Remove restrictions.
	Carburetor flooded- - - - - - - - - -	Turn ignition switch to OFF position and wait several minutes before attempting to start engine.
	No fuel in tank - - - - - - - - - - - - - - -	Fill tank.
	Intake manifold leaking or obstructed.	Clean manifold; replace gasket (para. 23).
	Spark plug gap improperly set - - - - - -	Adjust gap to 0.030 in. (para. 41).
Engine does not develop full power.	Air cleaner clogged - - - - - - - - - - - -	Clean air cleaner (para. 26).
	Fuel lines clogged - - - - - - - - - -	Clean lines.
	Manifold leaking - - - - - - - - - -	Install new gasket (para. 23).
	Improper ignition timing- - - - - - - - -	Adjust timing (para. 20).
	Engine governor improperly adjusted.	Correct adjustment (para. 28).
	Valve tappet clearance incorrect- - -	Check clearance (para. 22).
	Engine losing compression - - - - - - -	Perform compression test (para. 18).
	Exhaust clogged - - - - - - - - - - - -	Clean exhaust system.
Engine misses fire - - - - - -	Spark plug defective - - - - - - - - - - - - -	Clean or replace plugs (para. 41).
	Cylinder head gasket leaking - - - - - -	Replace gasket (para. 21).
	Manifold leaking - - - - - - - - - - - -	Tighten manifold nuts or replace gasket (para. 23).
	Spark plugs improperly gapped- - - -	Set gap at 0.30 in. (para. 41).
	Contact points sticking or improperly gapped.	Clean points and set gap at 0.020 in. (para. 40).
	Improper ignition timing - - - - - - -	Adjust timing (para. 20).

Trouble	Cause	Remedy
Engine overheats	Low coolant level	Add coolant to radiator.
	Cylinder head gasket leaking	Replace gasket (para. 21).
	Water pump drive belt loose or worn.	Tighten or replace (para. 34).
	Thermostat defective	Replace (para. 33).
	Water pump defective	Replace (para. 34).
	Improper ignition timing	Adjust timing (para. 20).
	Cooling system clogged	Flush cooling system (para. 32).
"Excessive or unusual engine noises.	Valve tappets improperly adjusted	Adjust (para. 22).
	Improper ignition timing	Adjust (para. 20).
	Low grade fuel	Drain tank and refill with proper grade of fuel.
	Fouled spark plugs	Clean plugs and set gap at 0.030 in. Replace if necessary (para. 41).
	Low oil supply	Fill with proper grade oil (LO 10-3930-235-20).
High or low engine oil pressure.	Improper grade of oil	Fill with proper grade of oil for operating temperature (LO 10-3930-235-20).
	Oil pressure gage inaccurate	Replace gage. Normal operating pressure is 30 to 40 psi.
	Insufficient oil in crankcase	Stop engine immediately and fill to prescribed level as shown on LO 10-3930-235-20. Check for leaks while operating the engine.
Excessive oil consumption	External oil leaks	Correct or report condition to direct support maintenance.
	Faulty piston rings or valves	Perform compression test (para. 18).
	Improper grade of oil	Fill with correct grade of oil (LO 10-3930-235-20).
	Crankcase ventilation system clogged.	Check and clean.
Excessive exhaust smoke	Carburetor improperly adjusted	Adjust (para. 24).
	Excessive oil supply	Drain to correct level.
	Cylinder head gasket leaking	Replace gasket (para. 21).
Ammeter indicates low charging rate.	Battery fully charged	Normal condition-no remedial action necessary.
	Generator belt loose	Tighten or replace (para. 35).
	Generator or regulator defective	Check generator output by grounding the field terminal of regulator. If the charging rate does not increase, the generator is defective and must be replaced (para. 37). If the charging rate increases to a high value, the regulator is defective and must be replaced (para. 38).
Ammeter indicates high charging rate.	Battery charge low	Normal condition—no remedial action necessary.
	Defective regulator or grounded circuit.	With battery fully charged, disconnect wire from regulator field terminal. If output remains high, check for grounded circuit in generator or harness. If output drops, the regulator is defective and must be replaced (para. 38).
Lights do not illuminate	Defective lamp	Replace lamp.
	Blown fuse	Check circuit for a short in lights or wiring. Replace fuse.
	Defective switch	Replace switch.
Horn does not sound	Blown fuse	Replace.

Trouble	Cause	Remedy
Brake drag	Weak or broken return spring	Replace spring (para. 51).
	Improperly adjusted pedal or linkage	Adjust pedal for free travel of ½ inch at pedal pads (para. 54).
	Wheel bearings loose	Adjust bearings (para. 55).
	Wheel cylinder defective	Replace cylinder (para. 53).
Spongy or soft brake pedal	Air in system	Bleed system (para. 52).
	Inadequate fluid supply	Fill master brake cylinder.
	Improperly fitted brake linings	Replace brakeshoes (para. 51).
	Improperly adjusted pedal	Adjust pedal (para. 54).
	Glazed brake linings	Replace brakeshoes (para. 51).
Excessive pedal travel required to apply brakes.	Air in system or inadequate fluid supply.	Pump brake pedal several times. If pedal builds up to normal travel, bleed brake system. If normal travel does not occur, fill master brake cylinder.
Truck pulls to one side	Fluid or grease on brake lining	Replace lining (para. 51).
	Wheel bearings loose	Adjust bearings (para. 55).
	Defective wheel cylinder	Replace cylinder (para. 53).
	Brakeshoe return spring defective	Replace spring (para. 51).
Creeper pedal mechanism not operating properly.	Improperly adjusted pedal or linkage	Adjust (para. 46).
Difficult steering	Steering linkage inadequately lubricated.	Lubricate as shown on LO 10-3930-235-20).
	Incorrect toe-in	Adjust the rods (para. 57).
	Binding in steering linkage	Inspect and correct (para. 56).
Erratic steering control	Loose steering linkage	Inspect and correct (para. 56).
	Loose steering wheel bearings	Adjust bearings (para. 55).
	Incorrect toe-in	Adjust the rods (par. 57).
Unable to lift or tilt load	Load too heavy	Lighten load to 4000 lbs.
	Insufficient oil in hydraulic tank	Fill as prescribed in LO 10-3930-235-20.
	Leaks in hydraulic system	Inspect fittings and hose. Tighten connections. Install new hose if necessary (para. 67).
Lift and tilt too slow	Engine speed governed too low	Adjust governor (para. 28).
	Air leaks in system	T'ighten all connections.
	Improperly adjusted relief valve	Report to direct support maintenance-personnel.
Load creeps tilting	Leaks in oil lines	Tighten all connections or replace damaged lines.
	Defective tilt cylinders	Replace defective cylinders (para. 62).
Noisy hydraulic pump	Insufficient oil in hydraulic tank	Fill as prescribed in LO 10-3930-235-20.
	Air leaks at pump	Tighten intake connections at pump.
	Oil tank air cleaner restricted	Clean breather cap.
	Pump head loose	Tighten screws.
	Worn or defective pump	Report to direct support maintenance personnel.
Oil overheating	Relief valve set too high	Report to direct support maintenance personnel.
	Restricted lines	Locate restriction and correct.
Lift mechanism lifts but will not lower load.	Control valve defective	Report to direct support maintenance personnel,

Section IV. ENGINE

16. General

The engine is a Continental model FS162, four cylinder, liquid tooled, L-head gasoline type. It is lubricated by a gear-type oil pump for positive forced feed lubrication to the crankshaft bearings, connecting rod bearings, camshaft bushing, and valve tappets. The engine and its accessories are illustrated in figures 4 and 5.

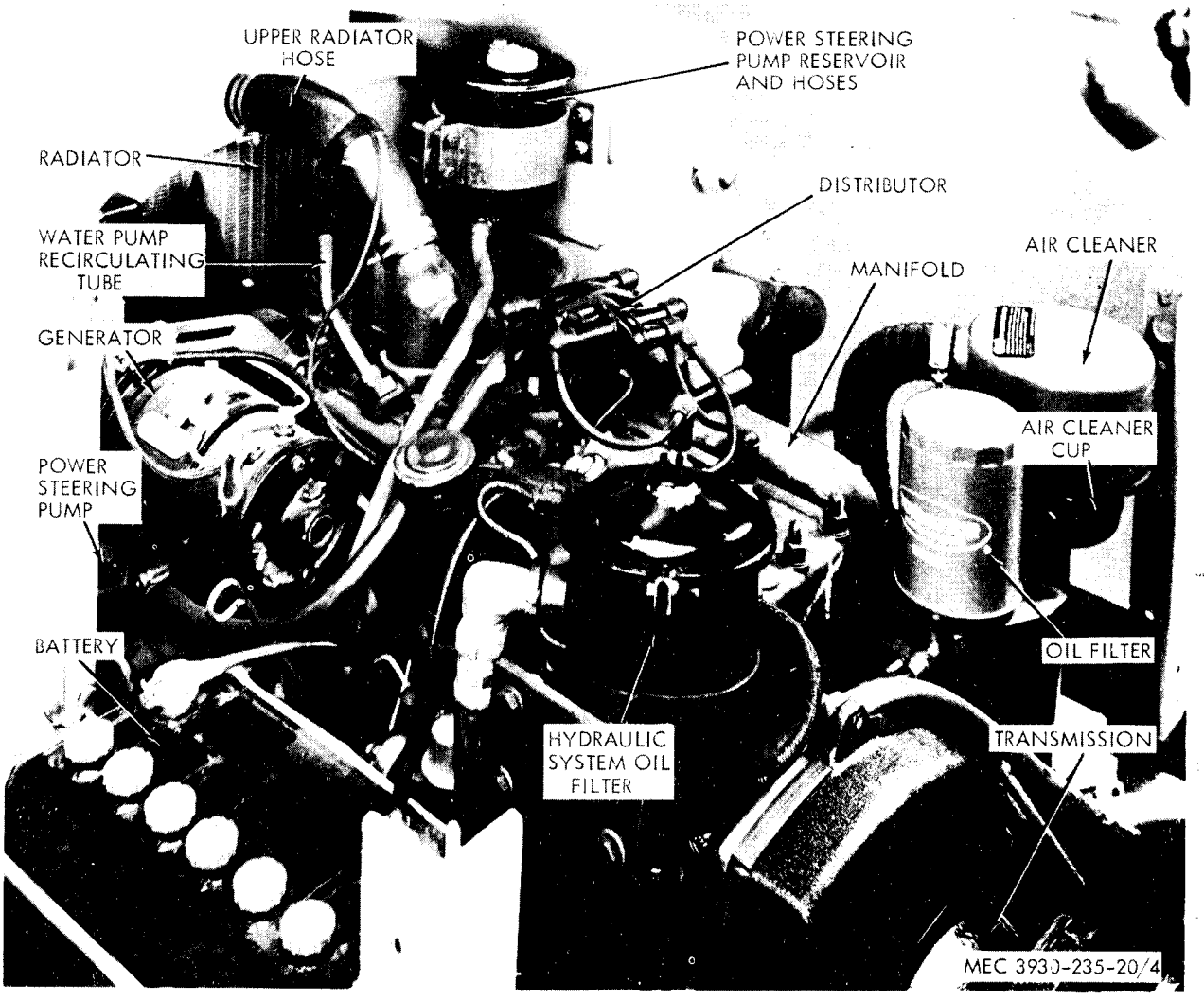

Figure 4. ¾ front, right side of engine, installed view.

17. Repair Instructions

The following maintenance procedures are the responsibility of the organizational maintenance personnel as allocated by the maintenance allocation chart.

18. Engine Assembly Compression Test

The compression test is performed to aid in determining the condition of valves and rings and to detect a leaking head gasket. Perform compression test as follows:

a. Start engine and allow it to idle until normal operating temperature is reached.

b. Turn ignition switch OFF and leave it in OFF position.

c. Remove the spark plugs. Open the choke and throttle as wide as possible.

d. Install a compression gage tightly in No. one spark plug hole.

e. Crank the engine with the starting motor for at least six compression strokes and note the gage reading.

j. Repeat the test on each of the remaining cylinders.

g. Compression readings for the cylinders should not vary more than 10 pounds. Normal

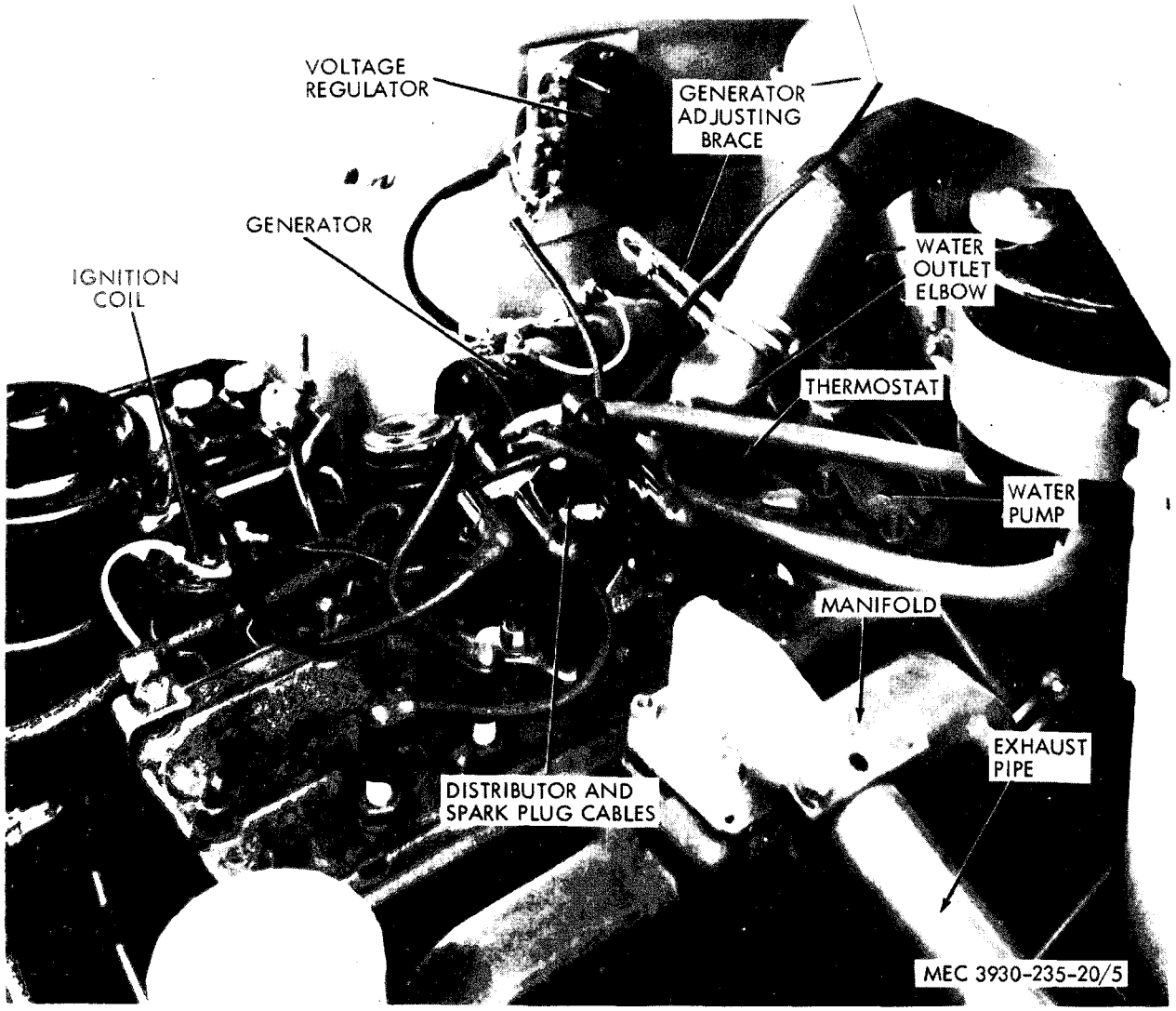

Figure 5. ¾ front, left side of engine, installed view.

compression pressures at cranking speed is 110 to 120 pounds (psi).

h. Retest low-reading cylinders using the oil test as follows:

(1) Add oil through the spark plug sufficiently to seal the piston rings.

(2) Crank engine five or six times to allow oil to work down around the rings, then take another compression reading.

(3) An increase in compression indicates defective or worn piston or rings.

(4) No increase in compression indicates defective valves.

(5) Two adjacent low-reading cylinders indicate a defective cylinder head gasket.

19. Engine Assembly Vacuum Test

To perform a reliable vacuum test, start engine and let it idle until it reaches normal operating temperature. Proceed with test as follows:

a. Stop engine when normal temperature has been reached, then remove intake manifold plug (fig. 9) and install a vacuum gage.

b. Start engine and observe the vacuum gage. Analyze the gage readings as follows:

(1) If the engine is normal, a vacuum of approximately 18-inch suction pressure will be indicated. "The pressure will drop to about 3 inches when the throttle is opened and will increase to about 22 inches when the throttle is closed.

(2) A vacuum of 15 or 16 inches, with a steady needle, indicates that the piston rings, pistons, or lubricant are probably in PC-r condition. Slight needle motion indicates late ignition timing.

(3) A vacuum of 8 to 12 inches with a steady needle indicates worn valve guides, worn piston rings, poor lubricant, or an intake manifold leak.

(4) A vacuum of below 5 inches with a steady needle indicates an intake manifold leak.

(5) If the vacuum pressure is normal but drops at irregular intervals, sticking valves, rich or lean carburetor mixture, or defective spark plugs is indicated.

(6) If the vacuum pressure is normal when when the engine starts but drops gradually, the exhaust system is probably defective or the muffler is restricted.

(7) If the vacuum pressure is normal but drops at regular intervals, defective valves, or a leaky cylinder head gasket is indicated.

20. Engine Assembly Ignition Timing

a. General Method.

(1) Ignition timing should be set to fire No. 1 cylinder at TDC (top dead center).

(2) Remove No. 1 spark plug and rotate engine slowly until timing mark (DC) on flywheel alines with pointer in flywheel housing (fig. 6).

(3) Remove distributor cap. Distributor rotor should be in position for firing No. 1 spark plug.

(4) Remove distributor rotor and seal plate. Turn cam counterclockwise to remove backlash and adjust position of distributor so that breaker points begin to open at a slight clockwise movement of the cam.

(5) To adjust distributor, loosen nut holding clamp then rotate distributor counterclockwise to advance the timing, or clockwise to retard the timing. Tighten nut to lock distributor in this position. Install seal plate and rotor.

(6) If a test lamp is available, connect one lead to the terminal post and the other lead to a ground on the distributor. With ignition switch ON, the lamp will light when points are closed and will go OUT as soon as points open.

b. Neon Light Method. The neon light, when connected in series with No. 1 spark plug, should flash each time No. 1 cylinder is fired. When No. 1 cylinder is fired. When No. 1 cylinder is fired, the flywheel painted mark (DC) should align with pointer in flywheel housing. With the engine operating at idle speed, the light should synchronize with the alignment of the painted mark and pointer. Adjust ignition timing as follows:

(1) Remove wire from No. 1 spark plug terminal and connect one lead of neon light to wire and the other to the plug terminal.

(2) Start engine and operate it at idle speed. Direct neon light flash at hole in flywheel housing and inspect position of flywheel painted mark in relation to pointer in flywheel housing hole.

(3) Adjust distributor as noted in a(5) above.

(4) After adjusting timing correctly, and with neon light still connected, accelerate engine rapidly from idle speed and watch flywheel mark movement. If the spark advance is working correctly, the mark will move counterclockwise on the flywheel when accelerating the engine and recede to its original position when engine is decelerated to idling speed.

21. Cylinder Head

a. Removal (figs. 4 and 5).

(1) Drain cooling system (para. 32a).

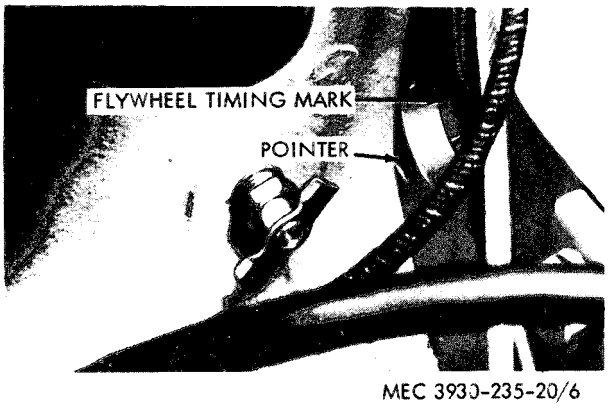

Figure 6. Flywheel timing mark.

(2) Disconnect power steering hydraulic hoses and catch oil in a receptacle.

(3) Disconnect and remove upper radiator hose and water pump recirculating tube.

(4) Remove distributor and spark plug cables (para. 40b) and distributor drive shaft.

(5) Remove ignition coil.

(6) Remove nuts and washers then lift engine wire harness clips off of studs.

(7) Disconnect temperature sending unit wire, then remove sending unit.

(8) Remove nuts and washers, then remove cylinder head and gasket.

b. Cleaning and Inspection.

(1) Clean all carbon from cylinder head, block, and top of pistons using a carbon scraper and wire brush.

(2) Clean the cylinder head thoroughly with SD.

(3) Inspect head and block for cracks or excessive erosion of water passages.

(4) Make sure that gasket surfaces are clean, smooth, and flat.

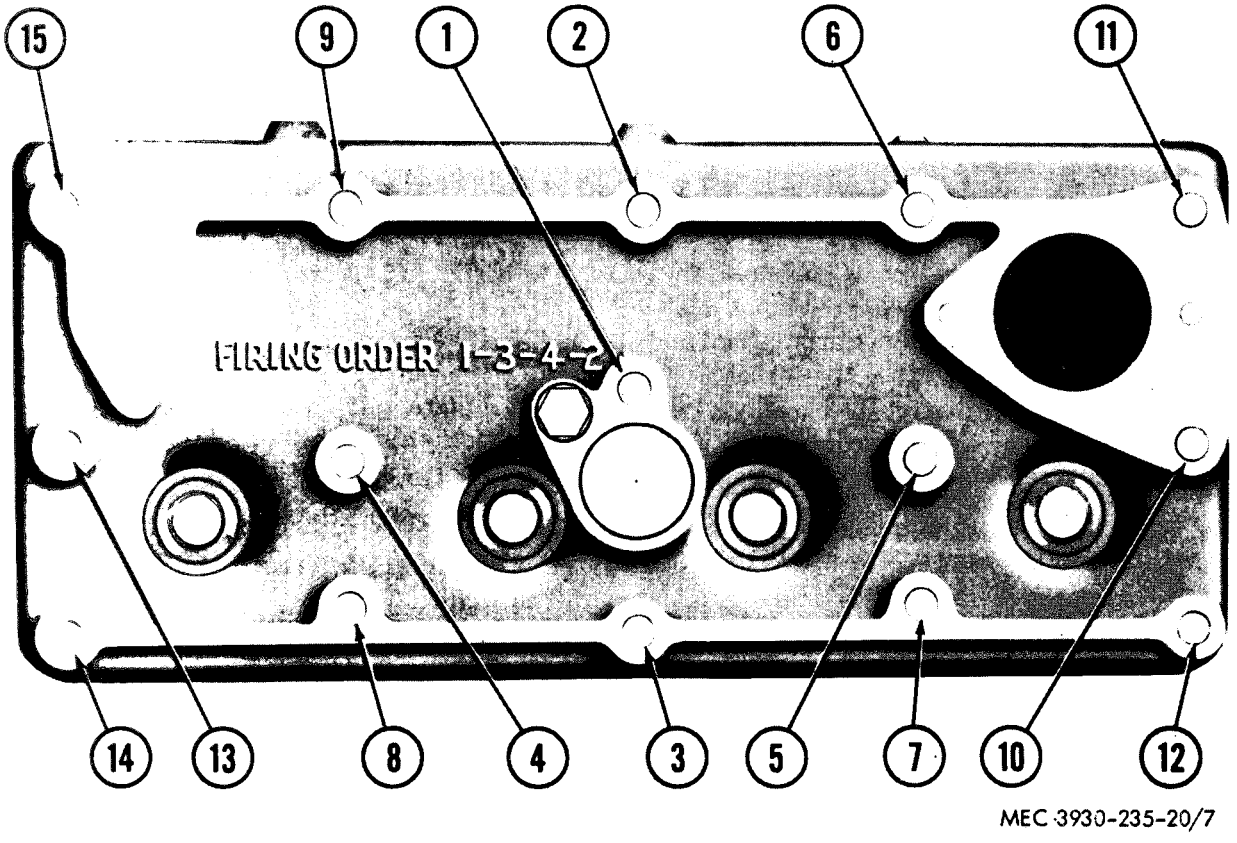

Figure 7. Sequence for Tightening cylinder head nuts.

c. Installation.

(1) Reverse procedures in a above using a new head gasket.

(2) Tighten the cylinder head nuts in the sequence shown in figure 7 to a torque value of 60 to 65 foot-pounds.

Note. Tighten nuts in the proper sequence to about one-half the required torque value for the first tightening. At the second tightening bring torque value up to the required foot-pounds.

(3) Start engine, inspect for leaks and observe engine performance. Retighten cylinder head nuts when engine is hot.

22. Valves

Correct valve clearance settings prolong engine life and aid performance. Excessive clearances will disturb timing and will harm camshaft and tappets. Insufficient clearances will also disturb timing and possibly cause burned valves. Correct valve clearance for both intake and exhaust valves is 0.014 inch hot (fig. 8).

a. Removal of Valve Chamber Covers (figs. 8 and 10).

(1) Disconnect air cleaner hose from air cleaner and carburetor.

(2) Disconnect choke cable and throttle linkage at carburetor.

(3) Disconnect fuel line at carburetor.

(4) Remove two mounting nuts and washers, then remove carburetor and gasket.

(5) Remove two barrel nuts and gaskets, then remove valve cover and valve cover gasket. Remove baffles.

b. Cleaning of Valve Chamber Cover. Clean cover with SD. Use new gasket when installing cover.

c. Inspection of Valve Springs, Locks, and Seats. Inspect valve springs, locks, and seats for alignment, for cracks, and proper seating. Check for weak springs.

d. Adjustment of Intake and Exhaust Valves (fig. 8).

(1) Remove spark plugs and rotate engine until No. 1 piston is at TDC on its compression stroke. Both valves of No. 1 cylinder will be closed at this position.

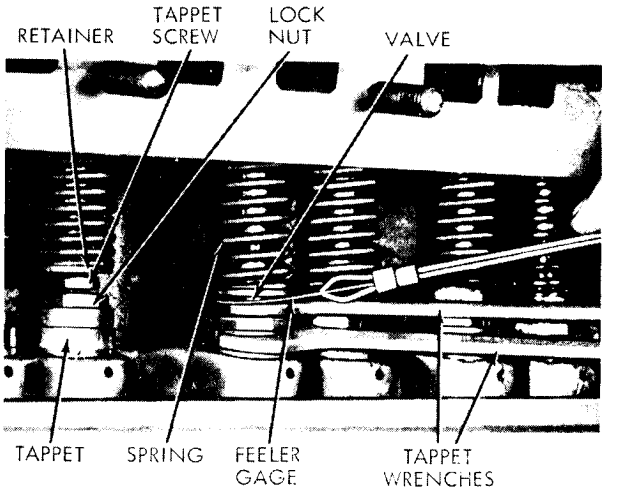

Figure 8. Measuring and adjusting tappet clearances.

(2) With a 0.014-inch feeler gage (fig. 8) check clearance between adjusting screw and roto cap on each valve.

(3) To adjust each valve to proper clearance of 0.014 inch hot, hold the valve lifter assembly firmly with wrench, arid with another wrench, turn adjusting screw until desired clearance is obtained.

(4) Adjust remaining valves for each cylinder in the same manner.

e. Installation of Valve Chamber Cover. Reverse procedures in *a* above.

22. Intake and Exhaust Manifold

a. Removal (figs. 9 and 10).

(1) Connect air cleaner hose from carburetor.

(2) Disconnect choke cable and throttle linkage from carburetor.

(3) Disconnect fuel line at carburetor.

(4) Remove mounting nuts and washers, then remove carburetor and gasket.

(5) Loosen clamp that attaches muffler to frame.

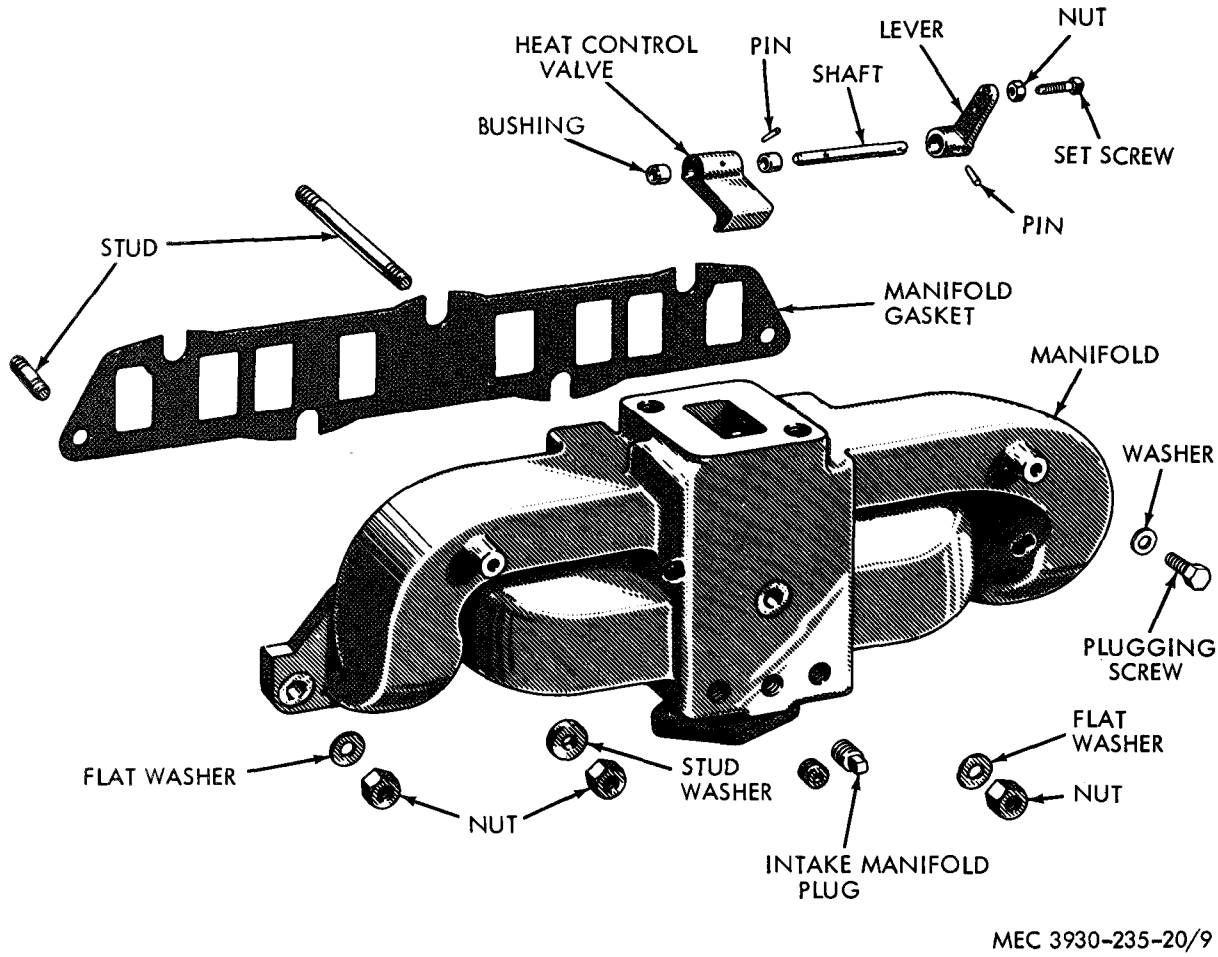

Figure 9. Exhaust and intake manifold, exploded view.

(6) Loosen clamp that attaches exhaust inlet pipe to muffler.

(7) Loosen manifold elbow clamp and remove inlet pipe from muffler.

(8) Remove two brass nuts that attach manifold elbow to manifold then work elbow from manifold and remove elbow.

(9) Remove 7 nuts, 3 flat washers, and 4 stud washers that attach manifold to cylinder block.

(10) Pull manifold far enough from cylinder block to remove stud from center of manifold. Remove stud.

(11) Remove manifold and gasket.

b. Adjustment of Heat Control Valve. The engine intake and exhaust manifold is equipped with a heat control valve (fig. 9) for the purpose of preheating the engine fuel mixture. The heat control valve is set at the factory in a fully closed position. Deviations from this setting are not necessary unless cold weather conditions are encountered. Three position settings are provided. The fully closed position allows exhaust gases to pass directly into the exhaust pipe and out through the muffler. The fully open position allows all burned exhaust gases to circulate through the intake manifold, preheating the engine fuel mixture to a maximum. The intermediate position allows a portion of exhaust gases to circulate through the intake manifold, while the remaining portion is directed out through the exhaust pipe and muffler.

(1) Adjust heat control valve as follows: Loosen setscrew and move lever in a vertical position to fully open the valve. Move lever to a horizontal position to close valve. Tighten setscrew after adjusting.

(2) Set heat control valve in the following positions, depending on prevailing temperature: Fully closed position above 70° F.; intermediate position between 32° and 70° F., and fully open position below 32° F.

c. Installation. Reverse procedure in a above, using new gaskets. Tighten manifold studs to a torque value of 16 to 18 foot-pounds.

Section V. FUEL SYSTEM

24. Carburetor

The carburetor (fig. 10) is a single-barrel updraft type with fixed jets covering all speeds except idle speed.

a. Adjustment. The best method to obtain the correct idle adjustment on the carburetor is with the use of a vacuum gage, Proceed as follows :

(1) Unscrew manifold pipe plug (fig. 10) from intake manifold and install vacuum gage.

(2) Start engine and allow it to warm until normal operating temperature is reached.

(3) Adjust engine to normal idling speed by adjusting the throttle stop screw.

(4) Turn idle adjusting screw to obtain the highest, possible vacuum reading on the gage. The reading should be constant with very little movement of the needle on the vacuum gage. If no vacuum gage is available, proceed as follows :

(a) With engine warm, turn adjusting screw counterclockwise until engine idles smoothly.

(b) Adjust to desired idle speed by turning throttle stop screw (fig. 10).

b. Removal.

(1) Disconnect air cleaner hose from carburetor.

(2) Disconnect throttle linkage at throttle lever.

(3) Disconnect choke control at choke lever.

(4) Disconnect fuel line at inlet elbow.

(5) Remove two mounting nuts and washers, then remove carburetor and gasket.

c. Installation. Reverse procedure in *b* above.

25. Fuel Pump

a. Removal (fig. 10).

(1) Disconnect inlet and outlet fuel lines at fuel pump.

(2) Remove two mounting capscrews and lockwashers.

(3) Remove fuel pump and gasket.

b. Cleaning.

(1) Clean exterior of fuel pump with SD.

(2) Remove cover plate screw, gasket, cover plate, and *cover* plate gasket from fuel pump cover. Remove screen,

(3) Clean screen and top recesses of fuel pump cover with SD and airdry.

c. Installation.

(1) Install screen; new cover plate gasket, and cover plate, then secure with gasket and cover plate screw.

(2) Reverse procedure in a above.

d. Tests.

(1) *Static pressure test.*

(a) Disconnect pump outlet line at fuel pump.

(b) Install necessary adapter and fitting in pump outlet and attach pressure gage with rubber tubing. Length of of tubing must not exceed 6 inches or inaccurate readings will result.

(c) Start engine and run it at idle speed with the fuel remaining in the carburetor.

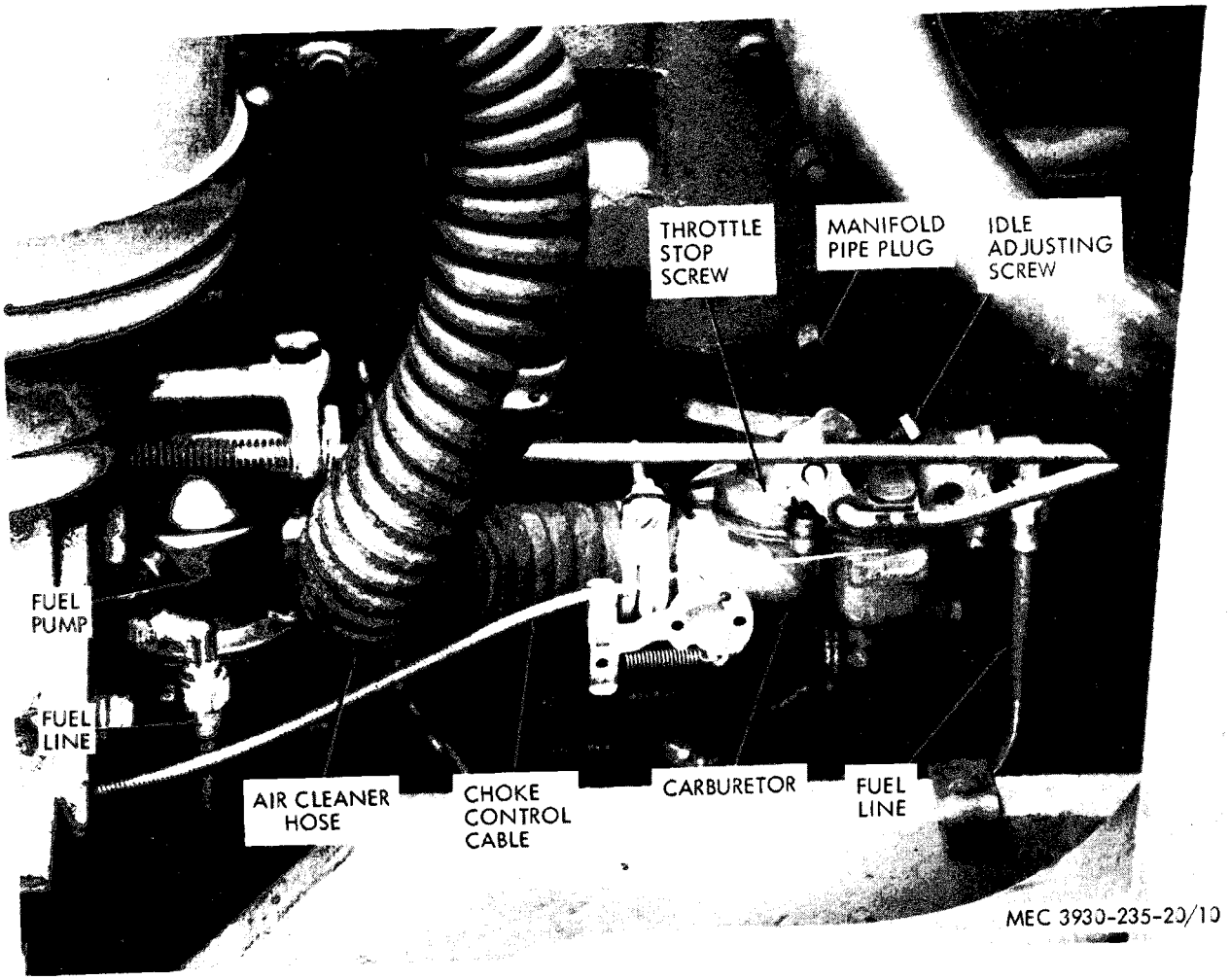

Figure 10. Carburetor assembly, installed view.

(d) The reading on the gage is the static pressure of the fuel pump. Reading should be between 3 to 4 psi.

(e) Replace pump if static pressure test shows an underpressure or an overpressure reading.

(2) *Capacity test.* The capacity test measures the amount of fuel that the pump will deliver in excess of fuel needed to operate the engine at idling speed.

(a) Attach a T-fitting in carburetor inlet.

(b) Connect fuel line to T-fitting.

(c) Start engine and not time necessary to fill a l-quart measure with fuel from remaining outlet of T-fitting. Adequate fuel delivery is available when a full quart flows in 1 minute or less at 500 rpm.

26. Air Cleaner

a. Cleaning.

(1) Turn air cleaner cup clockwise (fig. 4) then remove cup and air chamber. Remove air chamber from cup.

(2) Clean cup and air chamber with SD.

(3) Refill to level indicated in center of air chamber with seasonal OE (fig. 1).

b. Removal.

(1) Disconnect air cleaner hose at air cleaner.

(2) Loosen bracket screw, nut, and washer.

(3) Lift out air cleaner.

c. Installation. Reverse procedure in *b* above.

27. Fuel Tank and Fuel Filter

a. Fuel Tank.

(1) *Removal.*

(a) Disconnect battery ground strap at battery. Disconnect wire at tank unit.

(b) Observing fire regulations, remove drain plug and drain tank. Disconnect fuel lines. Unscrew and remove fuel tank cap.

(c) Remove screws and washers, then remove tank from underside of vehicle.

(2) *Cleaning.* Flush tank out with SD.

(3) *Installation.* Reverse procedures in (1) above.

b. Fuel Filter.

(1) *Removal.* Disconnect fuel line at each side of the filter, then remove filter. Remove elbow and nipple from filter.

(2) *Cleaning.* Loosen bowl thumb nut and remove bowl. Remove element with fingers. Clean bowl and element with SD and dry thoroughly with compressed air. Replace element that cannot be cleaned thoroughly. Install element with fingers, then install filter bowl with new gasket.

(3) *Installation.* Reverse procedure in (1) above.

28. Governor

Governor high speed adjustment (fig. 11) can be regulated by varying tension on the governor rod spring. Surging of the engine can be eliminated by adjusting the surge adjusting screw located in the timing gear cover. Proceed as follows to adjust governor, and to eliminate surging.

a. To increase or decrease engine speed, loosen locknut on the end of the governor rod.

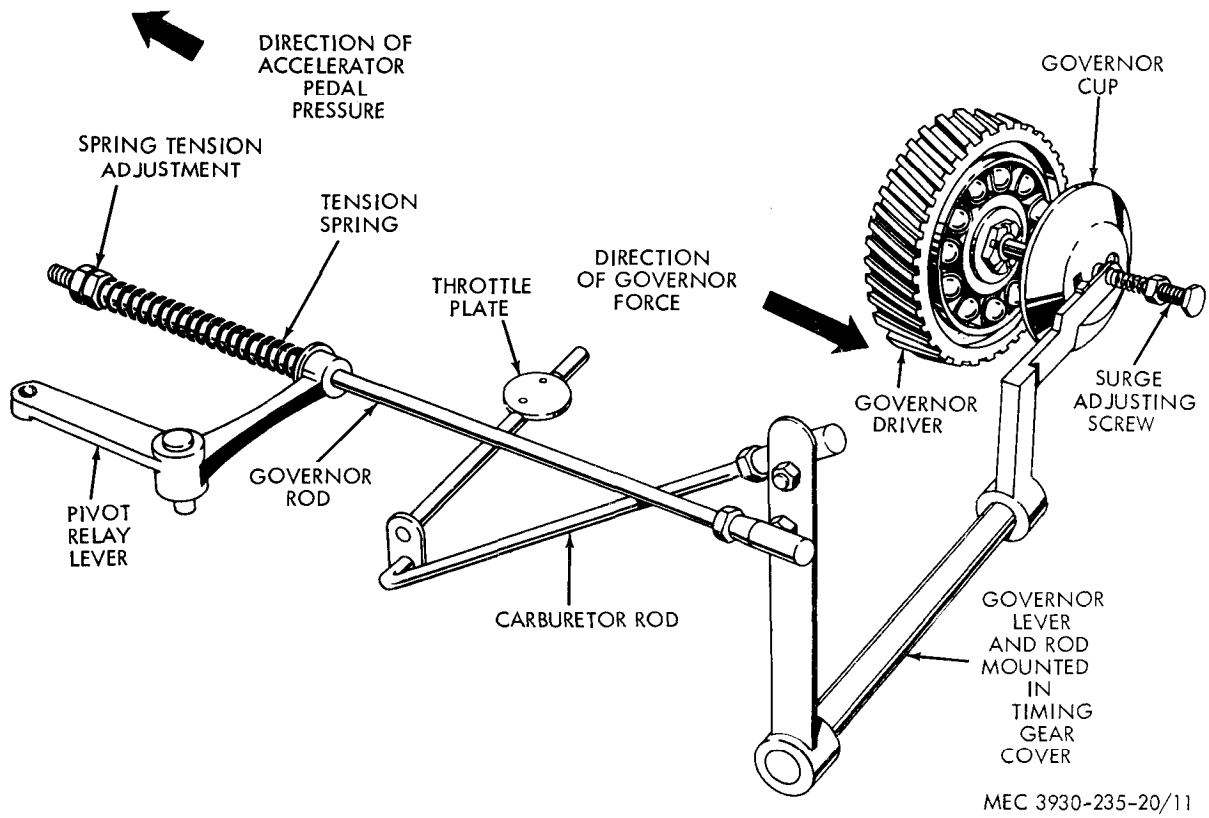

Figure 11. Adjustment of governor.

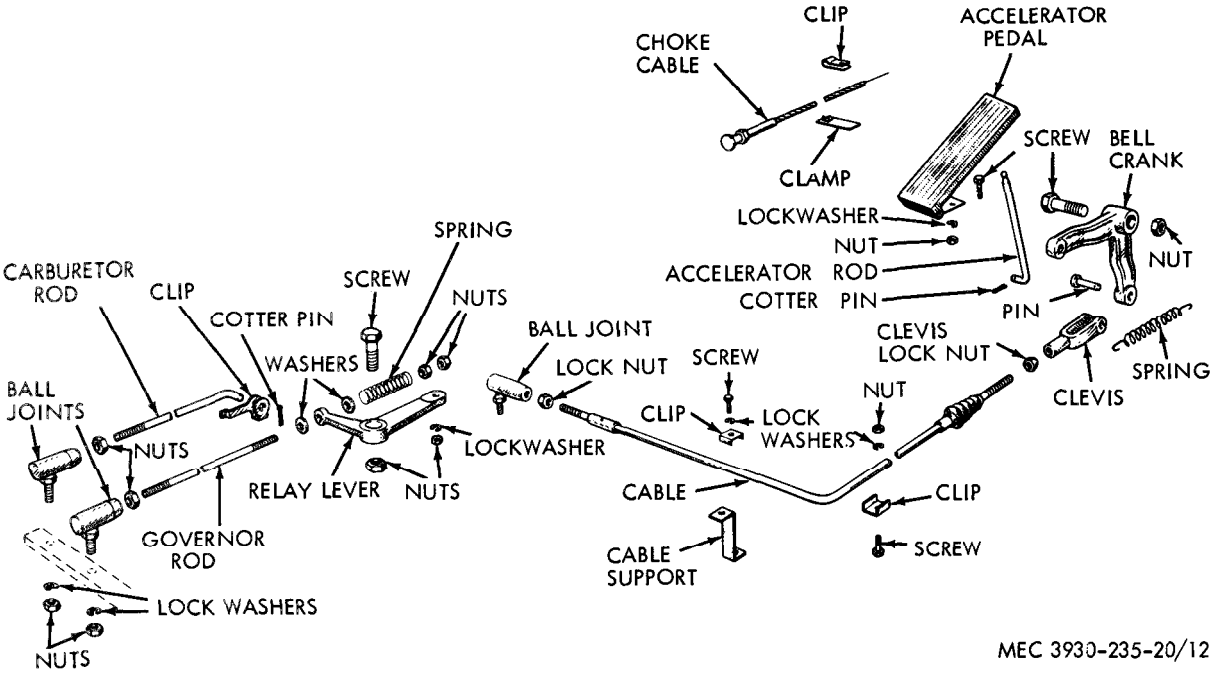

Figure 12. Accelerator pedal and linkage, exploded view.

Turn adjusting nut clockwise to increase engine speed and counterclockwise to decrease engine speed until the correct setting is obtained. Tighten locknut against adjusting nut after correct speed adjustment is obtained.

b. When correct speed adjustment is obtained, a slight surge may show up in operation. To eliminate this surge, loosen locknut at timing gear cover, then turn adjusting screw in or out as necessary. Loosen the adjusting screw if engine speed surges at high speed and tighten the screw if engine speed surges at idling speed. Tighten locknut when desired adjustment is obtained.

29. Accelerator Pedal and Linkage

a. Adjustment. The cable (fig. 12) can be adjusted at either the clevis near the accelerator pedal or at the ball joint near the carburetor relay lever. Proceed as follows:

(1) Remove nut and washer that attaches cable ball joint to carburetor relay lever, then disconnect ball joint at relay lever.

(2) Loosen locknut next to ball joint.

(3) Turn ball joint clockwise to shorten cable and counterclockwise to lengthen cable.

(4) When adjustment is made, tighten locknut and reconnect ball joint to relay lever.

(5) Working through opening over right front wheel, unhook accelerator return spring from pin through bellcrank and remove pin.

(6) Loosen locknut that is next to clevis.

(7) Turn clevis on end of cable to obtain desired adjustment, then tighten locknut.

(8) Install pin to attach clevis to bellcrank. Connect accelerator return spring to clevis pin.

b. Replacement. Figure 12 illustrates the complete accelator pedal and linkage. It is an extremely rare occasion when the complete system must be replaced. Replace only those parts which are damaged or unserviceable.

30. Muflfer

a. Inspection.

(1) Inspect muffler for good condition and secure mounting.

(2) Check to see that both the exhaust inlet pipe (fig. 13) and exhaust tail pipe are securely clamped to the muffler and that there are no visible signs of leaks.

(3) Check to see that drain holes in the muffler are at lowest point and are not clogged.

b. Removal.

(1) Block unit up to a height suitable to work underneath.

(2) Remove clamps from both ends of exhaust inlet pipe, then separate inlet pipe from muffler.

(3) Remove clamp that attaches exhaust tailpipe to muffler.

(4) Loosen nut on clamp (fig. 13) at clamp bracket, then separate tailpipe from muffler.

(5) Remove nut and bolt with two washers and two grommets that attach muffler to frame and remove muffler.

c. Installation. Reverse procedure in *b* above and inspect in accordance with *a* above.

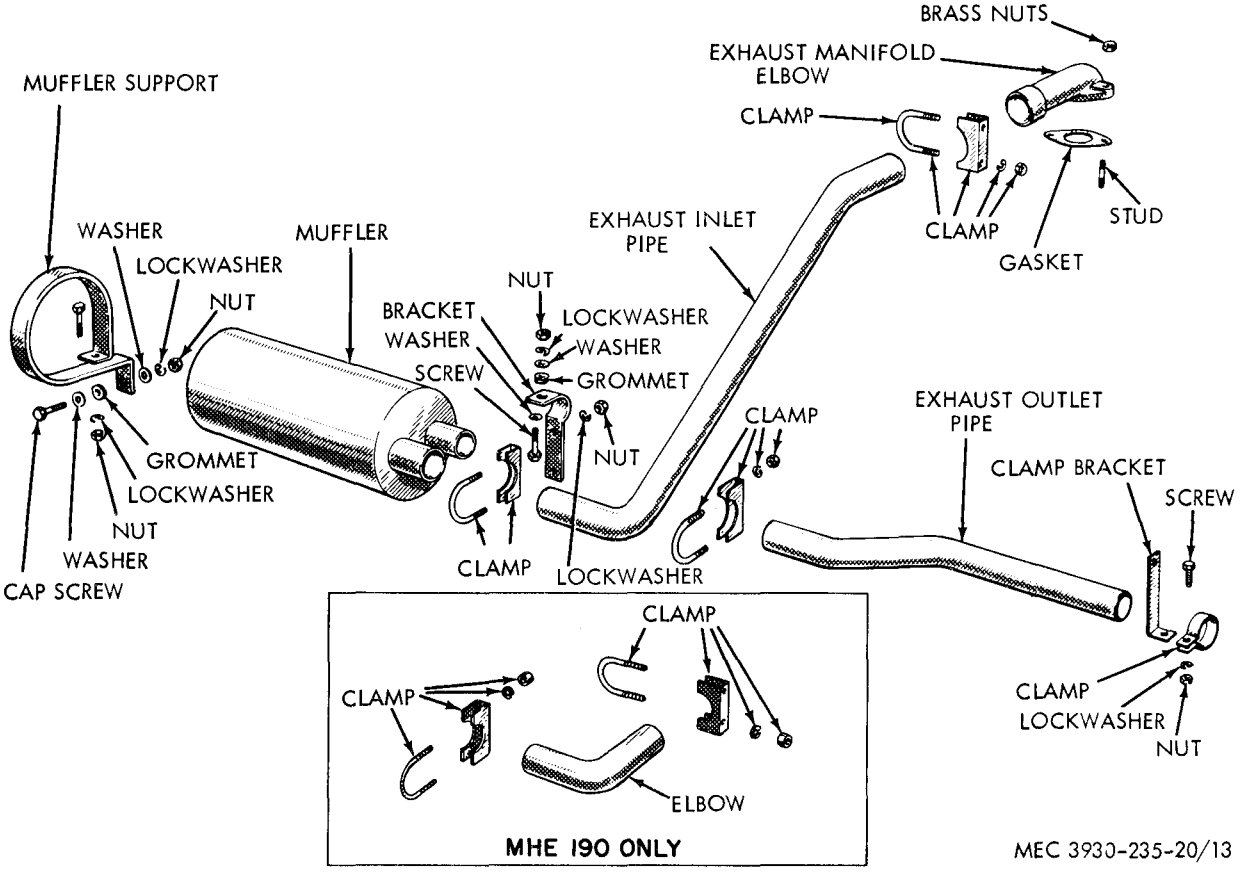

Figure 13. Muffler and pipes, exploded view.

31. Exhaust, Inlet Pipe and Tailpipe

a. Inspection.

(1) Inspect pipes for good condition and secure mounting.

(2) Check to see that inlet pipe is securely attached at manifold and that there are no visible signs of leaks.

(3) Check tailpipe for obstructions at its outer end and for secure mountings.

b. Removal.

(1) Block unit up to a height suitable to work underneath.

(2) Remove radiator grille from counterweight.

(3) Remove clamp at clamp bracket.

(4) Remove outlet pipe clamp at muffler.

(5) Loosen inlet pipe clamp at muffler.

Note. On Army model MHE-190, a right angle elbow is used between the muffler and exhaust outlet pipe. Remove these clamps and elbow as necessary.

(6) Loosen manifold elbow clamp.

(7) Remove two brass nuts that attach manifold elbow to manifold, then work elbow loose from manifold and remove elbow and exhaust inlet pipe.

(8) Remove nut, bolt, lockwashers, and grommets at muffler support then rear end of muffler will drop down.

(9) Remove exhaust tailpipe.

c. Installation. Reverse procedure in *b* above.

Section VII. COOLING SYSTEM

32. Radiator

a. Draining and Filling (fig. 4).

(1) To drain cooling system, open drain valves at bottom of radiator and right side of cylinder block. If cooling system is not to be refilled immediately, attach a notice to steering handwheel to warn personnel that radiator has been drained.

(2) To refill cooling system, close drain valves and add antifreeze *d* below and/or clean water to radiator filler opening as necessary. Use corrosion inhibitor compound (FSN 6850-281-1989) in a cooling system containing water only. Do not mix inhibitor and antifreeze solution in the cooling system. Add approximately 9 ounces of corrosion inhibitor to the 11 quarts of water in the cooling system. Operate engine, inspect water level, and add water if required.

b. Cleaning and Flushing. Use a good grade of commercial flushing compound. Follow directions provided with the compound. Inspect for leaks after flushing and cleaning, Clean radiator core air passages by blowing out with dry compressed air or steam applied carefully from outside toward engine.

c. Pressure Reverse Flushing. If the radiator tubes become clogged, the obstructions may sometimes be removed by reverse flushing of the radiator. Proceed as follows:

(1) Drain the cooling system (a above).

(2) Disconnect upper and lower radiator hoses.

(3) Connect a pressure water hose to the lower radiator connection with a suitable adapter.

(4) Plug the upper hose connection and remove the radiator cap.

Caution: **Do not use more than *6* pounds of pressure in the flushing operation as excessive pressure may cause the radiator tubes, oil cooler, or tanks to rupture.**

(5) Force water upward through the radiator to loosen foreign material from the tubes and the tanks. The material will flow out through the top of the radiator.

(6) Inspect carefully for leaks after re-reverse flushing.

d. Antifreeze Protection.

(1) Antifreeze solution will be drained from the cooling system at the end of each cold season and discarded.

(2) Never add antifreeze to a cooling system containing corrosion inhibitor. The cooling system must be cleaned and flushed *(b* above) to remove all traces of corrosion inhibitor before adding antifreeze.

(3) Add a sufficient quantity of ethylene glycol to the cooling system to provide protection at the lowest expected temperature.

(4) Add water as necessary to the ethylene glycol, then run engine and allow coolant to reach operating temperature. Check strength of the solution with a hydrometer.

e. Removal.

(1) Remove overhead guard.

(2) Disconnect tail and stoplight wires at connectors, then remove counterweight.

(3) Drain cooling system *(a* above).

(4) Remove upper and lower radiator hoses.

(5) Disconnect transmission oil cooling lines.

(6) Remove screws fastening radiator to radiator supports, then remove radiator supports, then remove radiator.

f. Installation. Reverse procedures in e above.

Caution: **Use extreme care when installing the counterweight so as not to bump the radiator. Make sure all hoses and lines are tight.**

33. Thermostat

a. Removal. The thermostat is located in the water outlet elbow (fig. 5) attached to the cylinder head, remove as follows:

(1) Open radiator drain valve and drain cooling system until the level in the radiator is below the water outlet elbow.

(2) Disconnect upper radiator hose at water outlet elbow.

(3) Remove two nuts and lockwashers securing the elbow, then lift off elbow and gasket. Remove thermostat.

b. Testing.

(1) Fill a container with sufficient water to cover the thermostat.

(2) Suspend a reliable thermometer in the water.

(3) Place the container over a heat source and stir water occasionally for even heating.

(4) Thermostat should start to open in the temperature range of 162 to 172° F. and should be completely open between 190 and 192° F.

(5) Remove thermostat from water and within a short time the thermostat should start to close.

(6) Discard thermostat if it fails to pass test.

c. Installation. Reverse procedure in *a* above, Use a new gasket and cement in place. Tighten hose clamp and check for leaks with engine running.

34. Water Pump

a. Inspection. Visually inspect for leaks or signs of wear.

b. Removal (figs. 4 and 5).

(1) Drain cooling system (para. *32a).*

(2) Remove upper radiator hose and disconnect the lower hose at the pump.

(3) Remove recirculating tube.

(4) Loosen screw fastening adjusting brace to generator and slip fan belt off generator pulley.

(5) Loosen locknut, then unscrew power steering pump adjusting screw sufficiently to allow removal of power steering pump drive belt.

(6) Slip fan belt over fan blade and remove.

(7) Remove screws and washers fastening pump to block, then remove pump and fan as an assembly.

(8) Remove old pump gasket.

c. Installation. Reverse procedure in *b* above. Use a new mounting gasket.

Note. Install fan and generator drive belt first before installing power steering pump drive belt. Check carefully for leaks after filling cooling system.

35. Fan Belt

a. Adjustment and Inspection. Inspect the belt for wear, fraying, deterioration, or oil soaked condition. If necessary replace the belt. Check for approximately ½ to ¾ inch deflection at a point halfway between the generator pulley and the fan drive pulley. Adjust belt as follows:

(1) Loosen screws at the generator adjusting strap and screws at the generator hinge mounting.

(2) Using a pry bar, pry generator away from the engine until proper tension is obtained.

(3) Hold generator in this position, then tighten adjusting strap screws and then tighten generator hinge screws, in that order.

b. Removal.

(1) Loosen locknut, then unscrew power steering pump adjusting screw sufficiently to allow removal of power steering pump drive belt. Remove belt.

(2) Loosen screws at the generator adjusting strap and screws at the generator hinge mounting.

(3) Using a pry bar, push generator toward engine, then slip belt off generator pulley, over fan drive pulley and over fan blade.

c. Installation. Reverse procedure in *b* above. Adjust belt tension a above.

Note. After correctly adjusting fan and generator belt, adjust power steering belt (para. *58d).*

36. General

The electrical system (fig. 14) includes a 12-volt negative-ground battery, distributor, generator, ignition coil, spark plugs, starting motor solenoid, current and voltage regulator, horn circuit, lights, sending units, and gages and wiring. The horn and lighting circuits are protected by fuses. Fuses are installed on a fuse block located under the cowl near the top center. Refer to paragraph 7 for operating specifications of generator, voltage regulator, and darting motor.

Note. If tests in paragraph *37a* are performed on bench, it is desirable to check regulator operation while operating with the same generator it will control when installed on engine.

37. Generator

a. Generator and Regulator Tests.

(1) Check generator and regulator operation by measuring charging rate with and without regulator in the testing circuit. Perform tests on engine or on test bench. Test bench will require a variable speed drive to operate generator at simulated engine speeds. Make sure battery is in good condition. Measure specific gravity, if below 1.250, recharge or use a new battery during tests. Figure 15 illustrates generating system electrical connections.

(2) To measure generator and regulator output, disconnect lead wire to voltage regulator terminal "B". Connect an ammeter in series between the disconnected lead wire and regulator terminal "B". Connect a voltmeter to voltage regulator terminal "B" and ground on regulator base.

(3) Start engine (or test bench drive) and accelerate to 2400 rpm, noting voltage and current readings. As generator speed is accelerated, voltage and current output should increase to a maximum of 14.3 to 14.5 volts with current of 24 to 26 amperes. If output is not within these specifications, check generator operation without regulator in circuit.

(4) Remove meters to restore generating circuit to its normal condition (fig. 15).

(5) To test generator operation only, disconnect lead wires at voltage regulator terminals "B" and "A" and connect an ammeter between these two lead wires

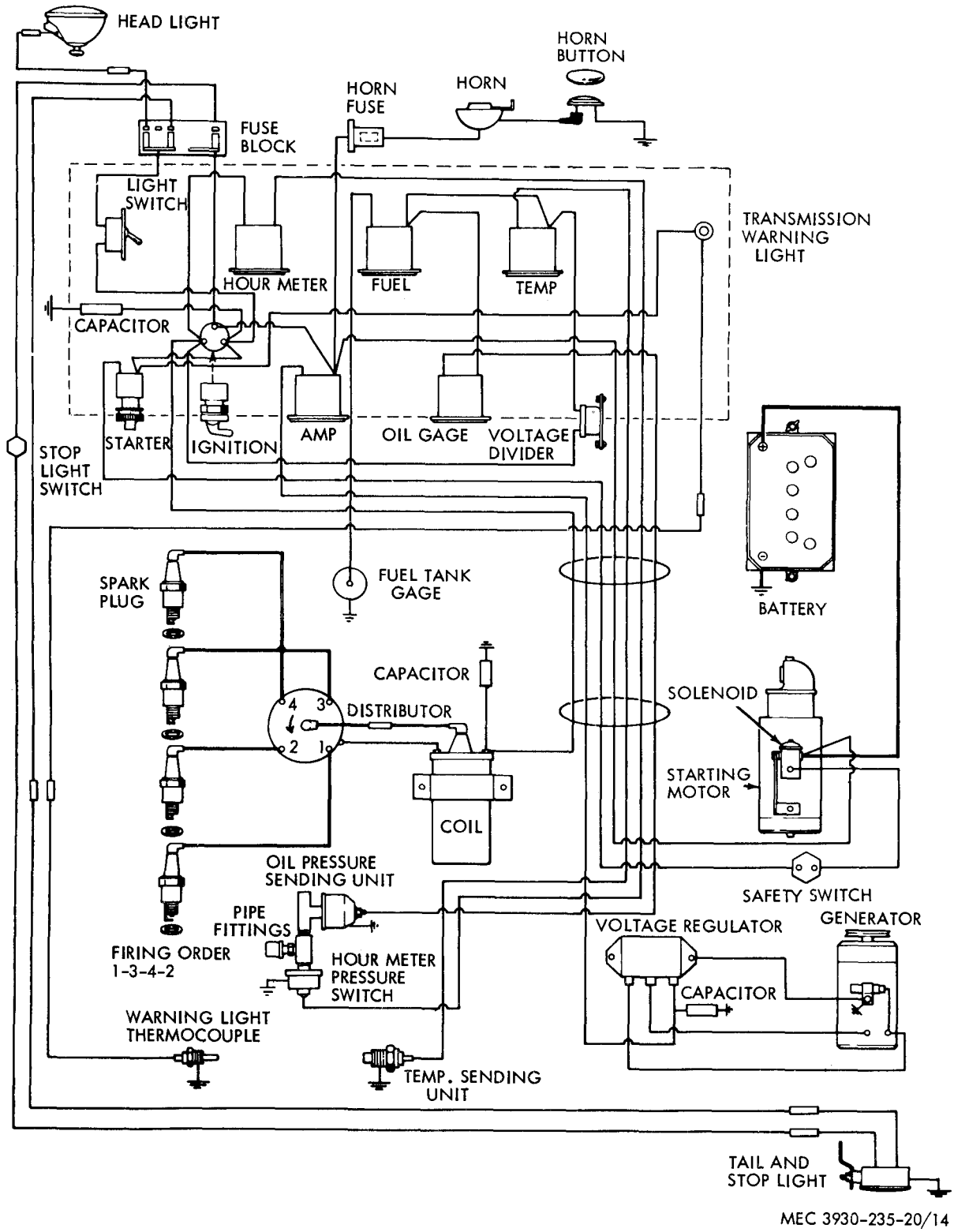

Figure 14. Electrical schematic diagram.

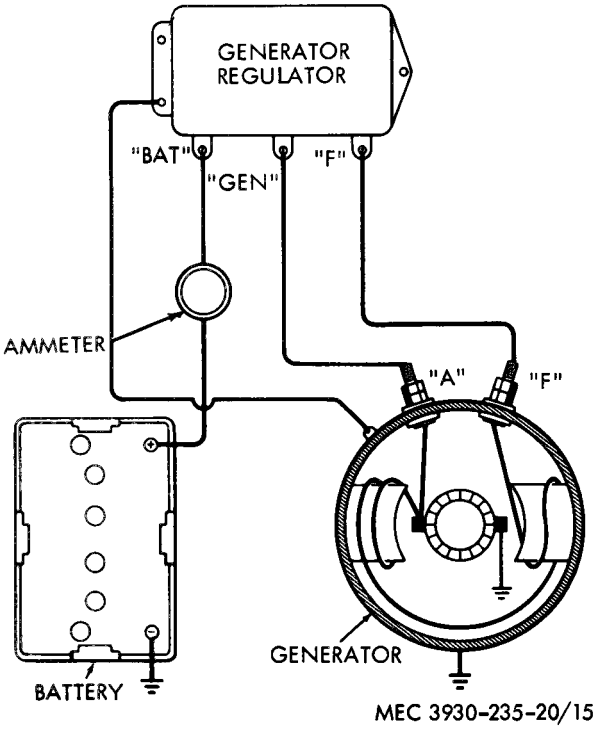

Figure 15. Generating system wiring diagram.

to complete the circuit battery and generator armature terminal. This will cause a discharge through generator and the engine (or test bench drive) should be immediately operated at idle speed (500 rpm).

(6) Disconnect field lead wire from voltage regulator terminal "F," while operating engine at idle speed, touch the field lead from the generator to the regulator base. Increase engine generator speed slowly, noting charging rate. Do not increase speed and generator output above rated capacity of the generator (25 amperes at 14.5 volts and 2400 rpm).

(7) If the generator output will not build up, generator is faulty. Overhaul or replace a faulty generator.

(8) If generator output builds up to rated output and charging tests in a above indicate low or no output, the voltage regulator is faulty. Replace a faulty regulator.

b. Removal.

(1) Disconnect battery at ground strap.

(2) Disconnect the armature and field leads from the generator terminals.

(3) Remove screw, lockwasher, and plain washer from the adjusting strap.

(4) Loosen the two screws and nuts which attach the generator to its mounting bracket. Move the generator toward the engine and slip drive belt off pulley.

(5) Remove the two screws, nuts, and lockwashers attaching the generator to the mounting bracket and lift the generator off.

c. Installation.

(1) Reverse procedure in *b* above.

(2) If a new or rebuilt generator is installed, polarize it by momentarily touching a jumper wire between the battery and armature terminals of the voltage regulator before starting engine. This allows polarization of generator in respect to the battery it has to charge.

Caution: **Failure to polarize a new or rebuilt generator (or regulator) will result in extensive damage to the generator, cutout relay, connecting wiring, and will also result in rapid battery discharge.**

38. Generator Voltage Regulator

This unit (fig. 16) is a three stage vibrating type regulator and consists of a cutout relay, voltage regulator, and current regulator. The cutout relay connects and disconnects the battery and generator. The voltage regulator limits generator output voltage to prevent battery overcharge and high voltage. The current regulator limits generator output current to protect the generator from overloads.

a. Testing and Adjusting.

(1) *Cutout relay.* The cutout relay requires three checks and adjustments, as follows:

(a) Air-gap. With the batery disconnected, press the armature down until the points just close, then

measure gap, between armature and. center of core, with feeler gage. The correct gap is 0.025 to 0.027 inch. If adjustment (fig. 16) is required, loosen the two screws in back of relay, then raise or lower the armature until correct airgap is obtained. Tighten mounting screws, then recheck airgap.

(b) Point opening. Check point opening and adjust to a correct reading of 0.015 inch. Adjust by bending upper armature stop.

(c) Closing voltage. The closing voltage should be 12.6 to 13.6 volts. Connect a voltmeter between the regulator terminal and ground. Slowly increase generator speed and observe the relay closing voltage. Decrease generator speed and make sure the points open. Points should open at 3.0 to 5.0 amperes.

(2) *Voltage regulator.* The voltage regulator requires two checks and adjustments as follows:

(a) Airgap. With the battery disconnected, push the armature down and check the airgap. Airgap should be 0.048 to 0.052 inch. If adjustment is needed, loosen the contact mounting screws and raise or lower the contact mounting bracket as required. Make sure the contact points are aligned and the mounting screws securely tightened after adjustment.

(b) Voltage setting. The voltage regulator setting can be checked and adjusted by using either a fixed or variable resistance method.

1. Fixed ¼-ohm resistance method. Proceed as follows:

a. Connect a ¼-ohm fixed resistor of not less than 25 watts into the charging circuit at the B terminal and in series with the battery.

b. Connect a voltmeter from the regulator B terminal to ground on regulator base.

c. Operate the generator, with the regulator cover in place, for approximately 15 minutes without electrical load to reach operating temperature.

d. Cycle the generator by moving the voltmeter lead from the regulator B terminal to the G terminal. Retard generator speed until the generator voltage is reduced to 4 volts. Then move the voltmeter lead back to the B terminal. Bring the generator back up to specified speed and note the voltage setting. The correct voltage setting range is 14.3 to 14.5 volts .

e. Turn the adjusting screw clockwise to increase and counterclockwise to decrease the voltage setting.

2. Variable resistance method. Proceed as follows:

a. Connect a variable resistance, of not less than 25 watts, and an ammeter into the charging circuit and in series with the battery at the regulator B terminal.

b. Connect a voltmeter from the regulator B terminal to ground on the regulator base.

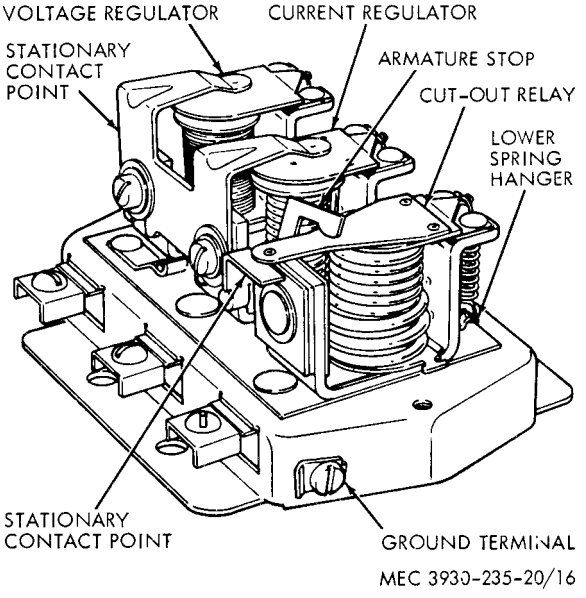

Figure 16. Generator regulator adjustments.

c. Start the generator and adjust the variable resistance to obtain a current flow of not more than 10 amperes. Then run the generator at 2780 armature rpm. The voltmeter should register approximately 14 volts. The regulator cover must be in place.

d. Cycle the generator by moving the voltmeter lead from the regulator "B" terminal to the G terminal. Retard generator speed until the generator voltage is reduced to 4 volts. Then move the voltmeter lead back to the B terminal. Bring the generator back up to specified speed and note the voltage setting. Correct voltage range is 14.3 to 14.5 volts.

e. Turn the adjusting screw "clockwise to increase and counterclockwise to decrease the voltage setting.

(3) *Current regulator adjustment.* Two checks and adjustments are required on the current regulator: airgap and current setting.

(a) Airgap. Check and adjust (fig. 16) in exactly the same manner as for the voltage regulator. Refer to 2 (a) above.

(b) Current setting. To check the current regulator setting, the voltage regulator unit must be prevented from operating.

1. Connect an ammeter into the charging circuit between the regulator "B" terminal and the battery as shown in figure 15.

2. If installed on the truck, turn on lights.

3. Operate the generator for about 15 minutes until operating temperature is reached. Keep the regulator cover in place while checking.

4. Insert a screwdriver blade through the regulator. Hold screwdriver firmly with blade touching the regulator base and shield at the same time.

5. Operate the generator at specified speed and note the current setting. The current setting range is 24 to 26 amperes.

6. If adjustment (fig. 16) is necessary, remove the cover and turn the adjusting screw clockwise to increase or counterclockwise to decrease the current setting.

b. Removal. Remove generator voltage regulator as follows:

(1) Disconnect field, armature, and battery leads.

(2) Remove the screws and washers securing the regulator to its mounting plate and remove the regulator.

c. Installation. Reverse procedures in *b* above. Perform adjustments as outlined in paragraph *37a.*

39. Starting Motor

a. Removal.

(1) Remove battery.

(2) Disconnect all electrical leads from the starting motor.

(3) Remove the screws and washers securing the starting motor to the flywheel housing.

(4) Back the starting motor away from the flywheel housing until the drive end clears the housing. Then tilt the drive end upward and lift starting motor out of engine compartment.

b. Installation. Reverse procedures in a above.

40. Distributor

a. Adjustments. Refer to paragraph 20 for ignition timing adjustments. Adjust distributor contact points as follows:

(1) Remove distributor cap, rotor, and seal plate.

(2) Rotate crankshaft until the breaker lever fiber rubbing block is on a high spot on the cam, and points are open to their maximum open position.

(3) Loosen the contact plate locking screw.

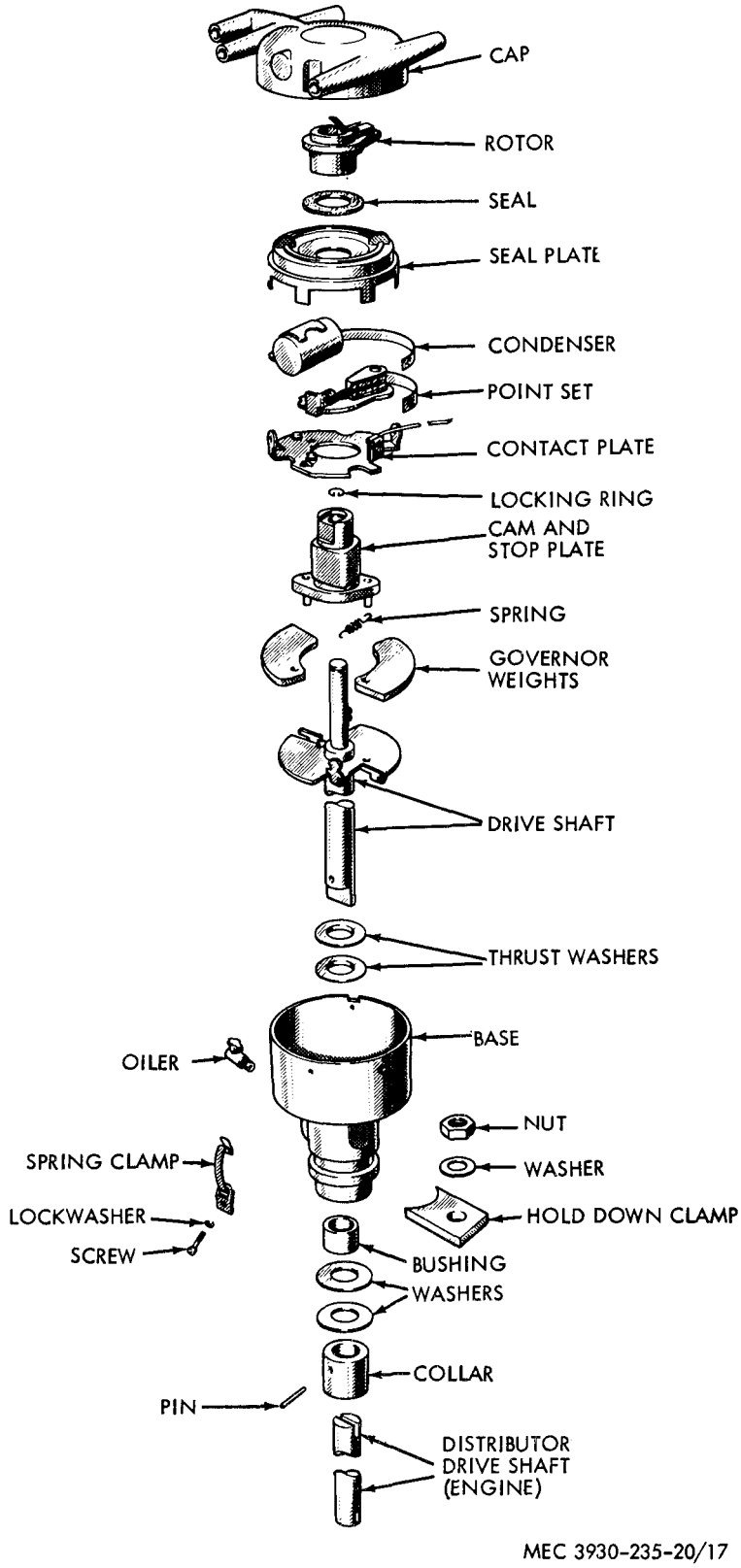

Figure 17. Distributor, exploded view.

(4) Turn the eccentric adjusting screw to obtain the correct gap of 0.020 inch, then tighten the locking screw.

(5) Recheck the gap after tightening the locking screw.

(6) Install seal plate, rotor and distributor cap.

b. Removal.

(1) Disconnect spark plug cables from the spark plugs, ignition coil cable from the coil, and the primary lead from the distributor primary terminal.

(2) Remove two nuts, washers, and clamps securing distributor to cylinder head, then lift out distributor.

c. Insallation. Reverse procedures in *b* above.

NOTE. If engine doesn't start after installing distributor, remove distributor and turn drive shaft 180° and reinstall.

d. Repair.

(1) *Disassembly.* Refer to figure 17 and disassemble the distributor as follows:

(a) Unfasten cap clamps then remove cap, rotor, and seal plate.

(b) Remove contact points and condenser.

(c) Disconnect primary lead at terminal.

(2) *Inspection.*

(a) Clean all parts thoroughly and replace any damaged or worn parts. Do not clean the cap, seal plate, rotor condenser, insulators, or housing in decreasing compound.

(b) Repair slightly worn or pitted contact points with a few strokes of a clean, fine-cut point file. Replace contact points if worn or badly pitted.

(c) Check the breaker lever fiber rubbing block for excessive wear.

(d) Check the condenser for leakage. Replace if testing is impractical.

(e) Check the distributor cap and rotor for cracks, burning of contacts, or carbon streaks.

(3) *Reassembly.* Reverse procedures in (1) above. During assembly, make certain all parts operate freely.

41. Spark Plugs

Spark plugs and spark plug wires must always be maintained in good condition and kept free of dirt, grease, and oil. Replace any burned, cracked, or broken spark plugs.

a. Removal.

(1) Disconnect wires at the spark plugs. Blow out all dirt from the spark plug wells with compressed air,

(2) Use the correct spark plug wrench and remove the spark plugs and gaskets.

b. Cleaning.

(1) Clean spark plugs by scraping excess carbon and lead deposits off the electrodes and insulator body.

(2) Sand blasting does not clean between the electrodes and will ruin the glaze on the insulator material if left in the sand blast machine too long.

(3) Using a fine file, file electrodes until square or flat at the gap surface.

(4) Clean exposed insulator surface of all grease, dirt, or paint.

c. Adjusting Gap. Adjust the gap by bending the outside electrode. Never bend the center electrode. Use a round wire feeler gage for measuring. Adjust gap to 0.030 inch.

d. Testing. After cleaning and adjusting the gap, test all spark plugs in a standard spark plug testing machine. Discard all plugs that test unsatisfactorily.

e. Installation.

(2) Tighten plugs by hand then torque to 15-20 foot-pounds.

(3) Connect spark plug wires. Make sure connections are made to the correct plugs and are secure. Firing order 1-3-4-2.

42. Gages and Instruments

All gages and instruments are mounted on the instrument panel and may be removed by disconnecting the wiring from the individual gage or instrument. Remove items as necessary and tag wire for correct installation.

43. Battery and Cables

a. Removal.

(1) Remove both cables from the battery posts. To prevent accidental damage to the battery posts or cable terminals, use a cable terminal puller tool to remove the cables.

(2) Remove the wingnuts from the holddown studs, then remove holddown.

(3) Lift battery out of truck.

b. Cleaning.

(1) Clean the top of battery, posts, and cable terminals with a solution of baking soda and water.

(2) Make sure that filler caps are tight to prevent any solution from entering the cells.

(3) After foaming stops, flush the battery and cable terminals with clean water.

c. Inspecting and Testing.

(1) Inspect cables for broken strands, defective insulation, damaged terminals and corrosion.

(2) Inspect the battery for cracks or damage.

(3) Take a specific gravity reading of the electrolyte using a hydrometer. If the reading is 1.225 or lower, recharge the battery. A fully charged battery will read from 1.265 to 1.290 specific gravity.

Section IX. TRANSMISSION

44. Shift Lever and Linkage Adjustment

a. Shift lever travel in both directions should be equal distance from the spring plunger assembly located in the steering column upper bracket. A notch in the shift lever stop bracket, is provided for neutral position of the lever.

b. Remove cotter pin and clevis pin, then disconnect the rod assembly at control valve plunger.

c. With control valve forward and reverse plunger and shift lever in neutral position, adjust by loosening locknut, then turn clevis in either direction as necessary to lengthen or shorten rod assembly to fit between plunger and clevis eye.

d. When length has been determined, install clevis pin and secure with cotter pin.

45. Oil Sediment Element

a. Removal.

(1) Disconnect inlet tubing at elbows in side and bottom of transmission case.

(2) Unscrew and remove elbow at bottom of transmission case.

(3) Unscrew and remove element.

b. Cleaning. Clean with SD.

c. Installation. Reverse procedure in a above.

46. Creeper Pedal and Linkage

a. General. The creeper pedal is connected to the creeper control plunger through a series of levers and linkage. This linkage is quite sensitive in its creeper pedal actions, therefore accurate adjustments are required for best efficiency and operation of the truck during creeping. A control cable is connected between the creeper pedal and the brake pedal and is used to apply partial breaking effort during creeping pedal actuation. It is necessary that the movement of the creeper plunger closely follow the movement of the pedal, due to the nature of this control mechanism. A binding or sticking condition in the linkage that results in an abrupt movement of the plunger in the valve body, causes the truck to lurch and gives difficulty in controlling the truck speed during creeping. The linkage should be lubricated with OE engine oil at each pivot point during assembly and none of the linkage should be painted. The linkage return spring preloads the linkage to take up the initial clearances at each pivot, and any increase in clearance due to wear.

b. Adjustment. Refer to figure 18 and adjust as follows:

(1) Remove cotter pin, then disconnect the upper lever from the creeper lever support mounted on the transmission.

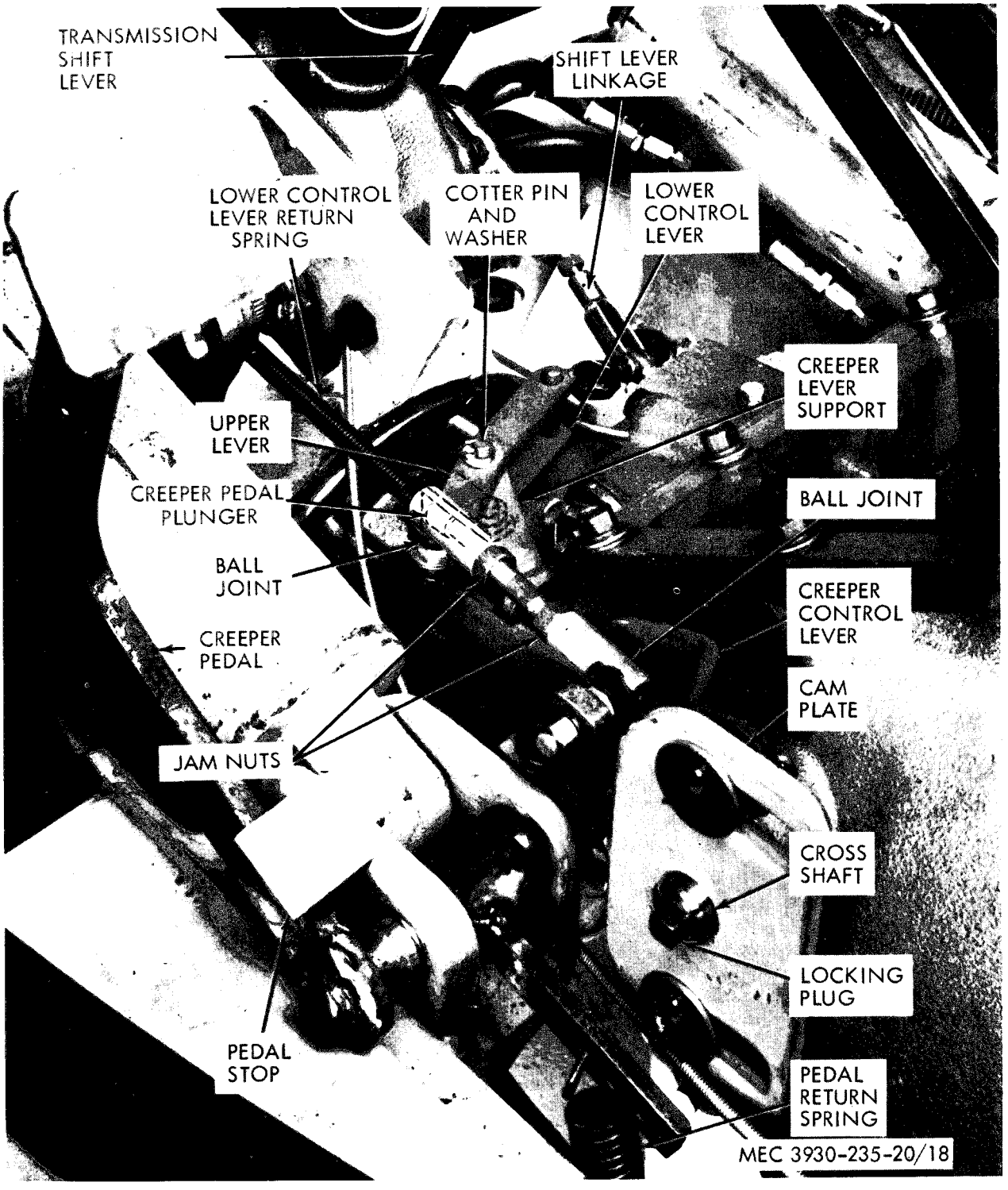

Figure 18. Creeper pedal adjustment.

Slip the upper lever off the creeper lever support.

(2) Loosen the locking plug in the end of the cross-shaft, the spring loaded lower control lever will then rotate the cam plate until both creeper control lever pins contact the left edge of the holes in the cam plate. Then tighten the locking plug to approximately 10 foot-pounds of torque and make sure the cross-shaft does not rotate in the cam plate.

(3) Move the creeper plunger to its fully extended position and place the creeper pedal against the pedal stop.

(4) With the creeper plunger extended and the creeper pedal against the stop, reinstall the upper lever on' the creeper lever support. The hold in the upper lever should be aligned with the pin in the lower lever. To make this alignment, loosen ball joint jamnuts, then turn ball joint and upper lever, as an assembly, in or out as necessary to align pin and hole. After alignment is set, tighten ball joint jamnuts and install washers and cotter pins as necessary.

(5) After the initial adjustments have been made, it may be necessary to make further adjustments to the linkage after the truck has been driven for the first time. The following conditions could cause the need for further adjustments:

(a) If the clutch does not completely disengage with the creeper pedal positioned 'between 1 or 2 inches from the floorboard, the ball joint may be adjusted to have the creeper plunger positioned somewhat into the valve body with the pedal fully released. The plunger should not be positioned into the valve body far enough to cause an increase in the shift cycle time or the clutches to slip. The position of the plunger, that would cause a change in the shift cycle time, varies with each valve body, due to the internal cored oil passages in the body.

(b) If the pedal position for creeping the truck is not the same in forward and reverse gear, the cam plate may be rotated slightly on the cross shaft to compensate for the difference in travel of the clutch linkage. If the pedal position is lower in forward gear than in reverse, rotate the cam plate on the cross-shaft in a clockwise direction (viewed from the left side of the truck). If the pedal position is higher in forward gear than in reverse gear, rotate the cam plate on the cross-shaft in a counterclockwise direction. This adjustment will be required with each rebuild of the transmission that affects the amount of travel of the clutch linkage.

c. Creeper Pedal to Brake Pedal Control Cable Adjustment. With the creeper pedal and brake pedal correctly adjusted, adjust the cable length to eliminate all slack. Proceed as follows:

(1) Remove cotter pin and clevis pin, then disconnect cable yoke from creeper pedal.

(2) Loosen locknut, then turn adjustable yoke in or out as necessary to lengthen or shorten the cable.

(3) When correct adjustment is obtained, connect yoke to creeper pedal and secure with clevis pin and cotter pin.

Section X. FRONT AXLE (Drive)

47. Drive Axle Shaft

a. Removal.

(1) Remove drive wheels (para. 55*a* or *b*).

(2) Cut lock wire (fig. 19) then remove four capscrews and grease shield from axle housing.

(3) Pry out axle shaft and bearing assembly and note number of gaskets removed.

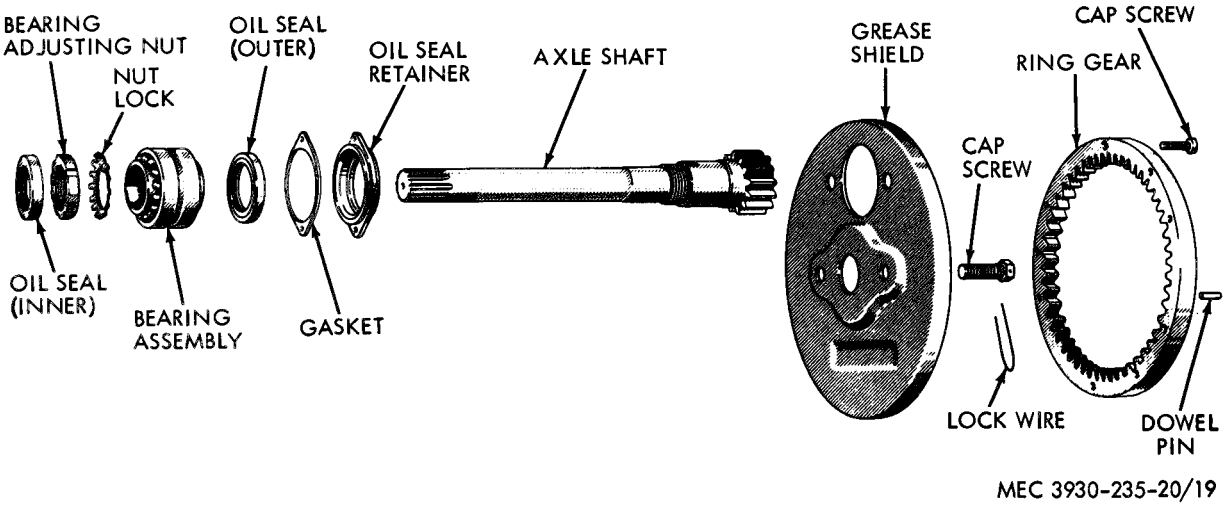

Figure 19. Drive axle shaft, exploded view.

(4) If necessary, remove inner oil seal from axle housing using a suitable puller.

(5) Repeat above procedures for other side of truck if necessary.

b. Disassembly.

(1) Straighten ears of nut lock, then unscrew and remove bearing adjusting nut and lock.

(2) Remove bearing assembly, and oil seal retainer assembly.

(3) If necessary, remove oil seal from retainer.

c. Inspection.

(1) Inspect bearing cones and cup for scoring, nicks, or flat spots. If there is evidence of bearing cone or cup wear, the bearing assembly must be replaced as a complete assembly.

(2) Inspect axle shaft for chipped or broken teeth or splines, and oil seal ring surfaces for scratched or scarred conditions.

d. Repair. If axle shaft oil seal bearing surfaces are scratched or scarred, remove scratches or scars using a fine emery paper, then polish with emery cloth. If axle shaft surface will not clean up to a fairly smooth finish, replace axle shaft.

e. Reassembly.

(1) Reverse procedure in b above.

(2) Tighten bearing adjusting nut until axle shaft binds when turned, then back off nut one-sixth turn, or until axle shaft turns without binding.

f. Installation. Reverse procedures in a above, except that if gaskets were damaged or lost, it will be necessary to measure the gap between the bearing retainer and the axle housing. Refer to *g* below for adjustment of axle shaft.

g. *Adjustment of Axle Shaft.* To determine the amount of gaskets required to fill the gap between the bearing retainer and the axle housing, install the axle shaft assembly in the axle housing without gaskets. Measure the clearance between bearing retainer and axle housing with a flat feeler gage. Select gasket thicknesses totaling 0.001 to 0.005 inch less than the measured gap dimension.

Section XI. BRAKES

48. General

a. The handbrake (fig. 20) is a two shoe, mechanical type and is mounted on a pin installed in the differential carrier. The brake-drum is fastened to a brake flange installed on the drive axle pinion. The brakeshoes are acuated through a cable by an adjustable over-center-type handbrake lever.

b. The service brake system consists of a mechanically actuated master cylinder with a heavy duty brake line, transmitting hydraulic pressure to wheel brake cylinders in each drive wheel. The wheel cylinders are double-end type and are located behind dust shields. Each brakeshoe is provided with one adjustment to compensate for normal lining wear. The adjustments are located on the brake backing plate.

49. Handbrake Lever, Cables, and Linkage

a. Adjustment. The adjusting knob (fig. 20) on the handbrake lever can be used to compensate for normal brake lining wear. When the adjusting knob will no longer provide the necessary brake adjustment, and sufficient lining still remains, further adjustment can be made at the cable yoke.

(1) *Adjustment using the handbrake lever knob.*

(a) Set the lever in fully released position.

(b) Turn knob 1 or 2 times clockwise. Check adjustment by engaging the brake. Pull back on lever to the fully applied position, and at this point the lever should be past center and in a fully applied position. If considerable effort is required to pull the lever past center, readjust knob as necessary to lessen the effort required to pull the lever past center and still have the brake applied.

(c) Repeat *(b)* above if necessary until adjustment is correct.

(2) *Adjustment of cable yoke.*

(a) Disengage the brake and turn the adjusting knob 4 or 5 turns counterclockwise.

(b) Remove cotter pin, washer, and clevis pin securing cable adjustable yoke to handbrake lever.

(c) Loosen yoke jamnut, then turn yoke 3 or 4 times to shorten the cable length.

(d) Install the adjustable yoke on the brake lever and check adjustment by engaging the brake. Readjust as necessary to prevent brakeshoes from dragging when disengaged.

(e) Tighten the yoke jamnut and install the washer and cotter pin.

b. Removal.

(1) *Removal of lever assembly.*

(a) Disengage the handbrake.

(b) Remove cotter pin, washer, and clevis pin to disconnect cable from handbrake lever.

(c) Remove two screws, nuts and washers, then separate handbrake lever and spacer plate from right side of cowl panel.

(2) *Removal of brake cable.*

(a) Perform (1) *(a)* and *(b)* above.

(b) Disconnect cable return spring at cable mounting clevis pin, then remove washer and clevis pin, with cotter pin assembly from the brake operating lever.

(c) Remove U-bolt nuts, washers and U-bolt, then remove cable.

c. Installation. Reverse procedures in *b* above. Make final adjustments as instructed in a above. Yoke adjustment should be such as to allow approximately 5 turns on the adjusting knob for future periodic adjustment.

50. Handbrake Brakeshoe Adjustment

a. Disengage handbrake.

b. Perform procedure in paragraph *49b* (2) *(b).*

c. Loosen adjusting screw jamnut at anchor link.

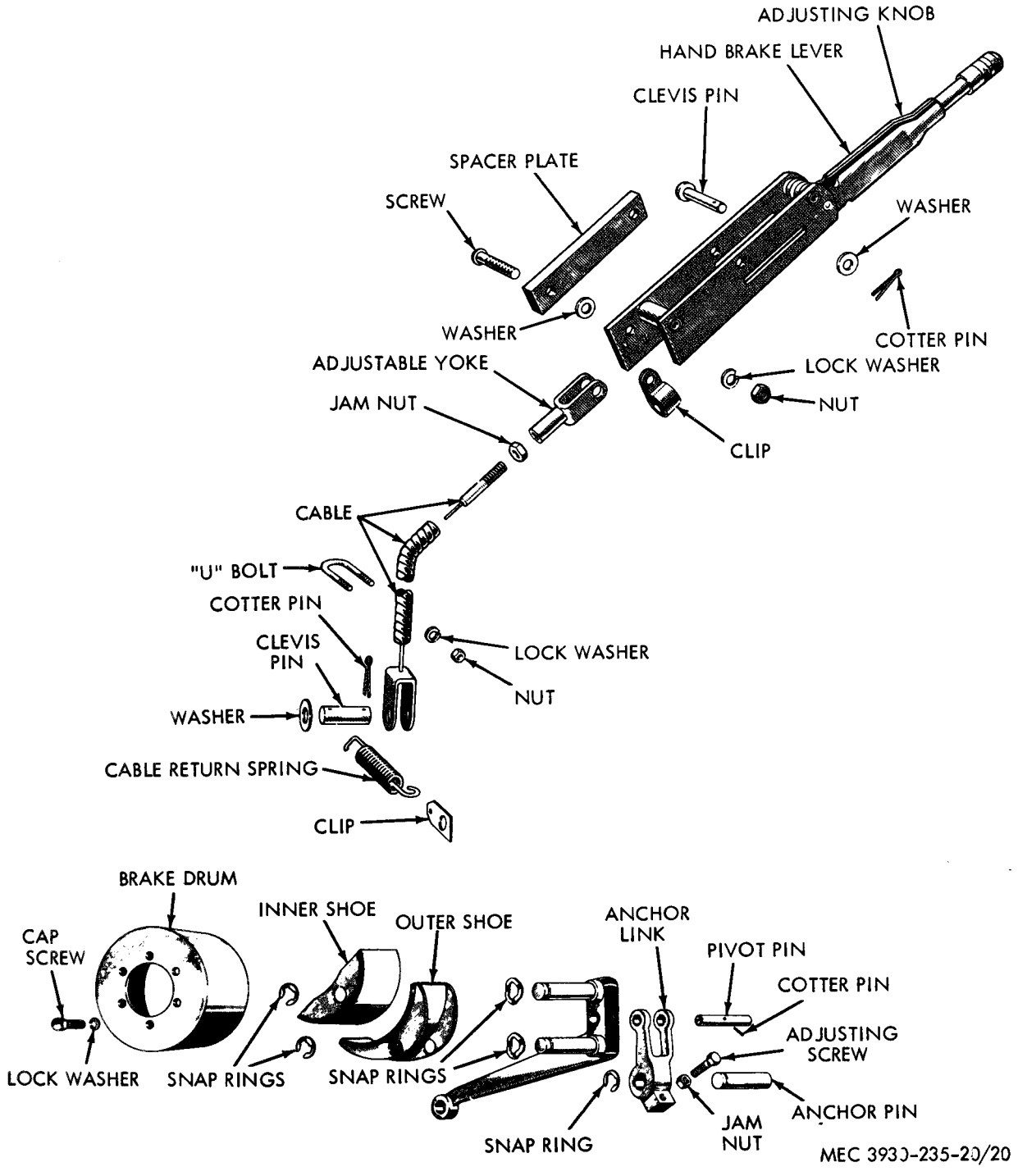

Figure 20. Handbrake, lever, cable, and linkage; exploded view.

d. Turn adjusting screw clockwise until outer brakeshoe just barely contacts the drum.

e. Connect cable yoke to brake operating lever and secure with clevis pin and washer. Connect return spring in hole of clevis pin.

f. Adjust handbrake (para. *49a).*

51. Service Brake Brakeshoes

a. Adjustment. Each brakeshoe may be adjusted by turning an adjusting stud, mounted on the backing plate. This adjustment compensates for normal lining wear. The opposite end of brakeshoe slides back and forth in the anchor slot and requires no adjustment. To adjust brakes, turn adjusting stud until lining contacts the brakedrum and locks the wheel, then back off the stud until wheel spins free. Adjust both brakeshoes of both front wheels, then depress and release the brake pedal a few times and again check wheel rotation to make sure that the brakeshoes are not sticking and that the linings are not dragging. Check master cylinder fluid level each time brakes are adjusted.

(1) *Right front wheel.* Facing square end of studs (fig. 22) turn forward stud clockwise to tighten and rear stud counterclockwise to tighten.

(2) *Left front wheel.* Facing square end of studs (fig. 22) turn forward stud counterclockwise to tighten and rear stud clockwise to Lighten.

b. Removal. Raise and block front end of truck, and proceed as follows:

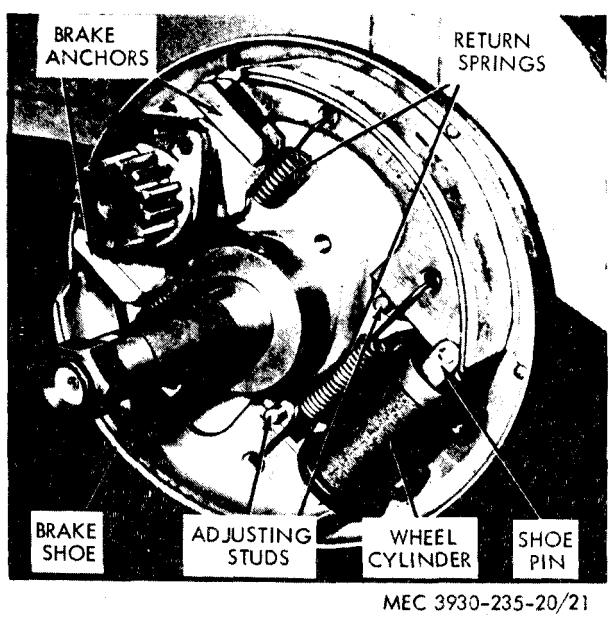

Figure 21. Service brakeshoes, installed view.

Figure 22. Service brakeshoes adjusting studs.

(1) Tilt mast column to extreme backward position.

(2) Remove wheels (para. *55a* or *b).*

(3) Cut lock wire then remove capscrews and grease shield.

(4) Install standard automotive clamps to prevent pistons from being forced out of the cylinder.

(5) Using proper tool, disconnect heel return spring (fig. 21) and toe return spring,

(6) Lift off brakeshoes.

c. Installation. Reverse procedure in *b* above. Rotate adjusting studs to fully released position. Adjust. brakeshoes *(a* above).

52. Master Cylinder

a. Removal.

(1) Disconnect hydraulic brake line tubing at master cylinder fitting.

(2) Disconnect two electrical leads at stoplight switch.

(3) Disconnect yoke at brake pedal lever.

(4) Remove mounting bolt, nut, and lockwasher, and the mounting capscrew and lockwasher.

(5) Remove master cylinder.

b. Installation. Reverse procedure in *a* above, then bleed hydraulic system (c below).

c. Bleeding Hydraulic Brake System.

(1) Fill master cylinder. Attach rubber hose to the end of the wheel cylinder bleeder screw and extend the open end of the hose in a receptacle containing brake fluid.

(2) Loosen the bleeder screw one-half turn. Then slowly depress and release the brake pedal until fluid runs out of the base in a steady stream without bubbles. Tighten bleeder screw.

53. Wheel Cylinder

a. Removal.

(1) Remove wheels (para. *55a* or *b).*

(2) Remove grease shield (para. *51b)* (1) through (3).

(3) Remove brakeshoes and lining (para. *51b* (4) through (6)).

(4) Disconnect brake line tubing at wheel cylinder.

(5) With suitable Allen wrench, remove two capscrews and lockwashers that attach wheel cylinder to axle housing.

(6) Remove wheel cylinder.

b. Installation. Reverse procedure in a above, then bleed hydraulic system (para. *52c).*

54. Service Brake Pedal and Linkage

a. General. The brake pedal is connected to an operating lever which is connected to an adjustable yoke installed in the master cylinder push rod. The adjustable yoke provides the means for adjusting brake pedal free play.

b. Service Brake Pedal Adjustment. The brake pedal must have sufficient free play to permit the master cylinder piston to return to its released position and uncover the fluid return hole in the reservoir. The hydraulic pressure built up in the wheel cylinders returns through this relief hole to release the brakeshoes. If pressure is not permitted to bleed back through the relief hole, the brakes will drag and eventually lock the wheels. If brake pedal play is excessive, the brake pedal will be low even with the brake adjusted correctly. Brake pedal adjustment is made at the factory and should not have to be changed until brake pedal linkage becomes worn. Adjust linkage as follows:

(1) Loosen locknut on master cylinder adjustable yoke,

(2) Unhook pedal return spring from yoke connecting pin, then remove yoke connecting pin to disconnect operating lever from adjustable yoke.

(3) Turn yoke to shorten or lengthen the linkage as desired. Correct adjustment is obtained when pedal moves ½ inch before push rod contacts master cylinder piston.

(4) Connect yoke to operating lever and install yoke connecting pin. Install pedal return spring.

(5) Tighten locknut when correct adjustment is obtained.

Section XII. WHEELS

55. Wheel and Tire Assemblies

a. Drive Wheel Removal (MHE-191).

(1) Block up front end of truck to clear wheels of floor.

(2) Remove capscrews, lockwashers and hubcap.

(3) Bend ears of lock plate away from nut, then remove nut, lock plate, key washer and outer bearing cone.

(4) Remove wheel from spindle.

(5) Remove grease shield and inner bearing cone from drive gear side of the wheel.

(6) Tap out bearing cups from wheel hub using a brass drift positioned in hub slots.

(7) Repeat above procedures for the other wheel.

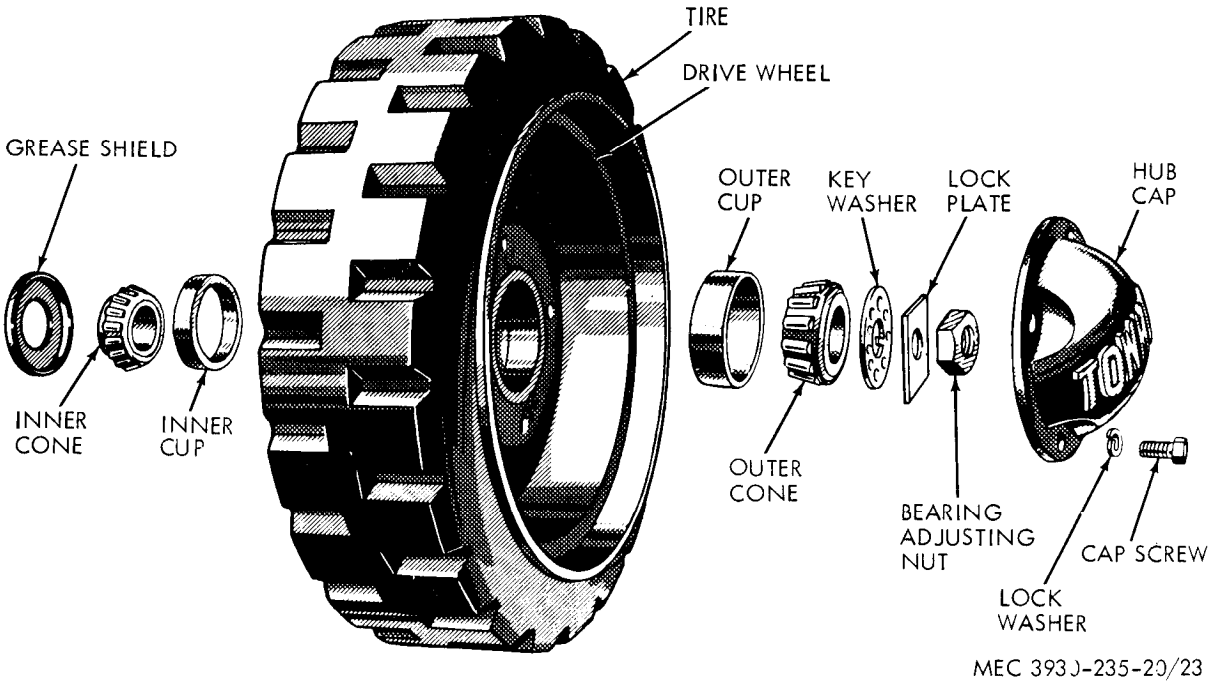

Figure 23. Drive wheel, exploded view (MHE–191).

b. Drive Wheel Removal (MHE-190).

(1) Block up front end of truck to clear wheels of floor.

(2) Remove wheel mounting nuts then remove outer and inner wheels with tires assembled.

(3) Remove adapter mounting nuts, then remove outer wheel adapter from hub.

(4) Bend ears of lock plate away from nut, then remove nut, lock plate, bearing washer, and outer bearing cone.

(5) Remove hub from spindle.

(6) Remove grease shield and inner bearing cone from drive gear side of the hub.

(7) Tap out bearing cups from hub using a brass drift positioned in hub slots.

c. Drive Wheel Installation. Reverse procedures in *a* or *b* above. Install and adjust wheel bearings as instructed in *h* below.

d. Steering Wheel Removal (MHE-191).

(1) Block up real end of truck to clear wheels of floor.

(2) Remove capscrews, lockwashers, and hubcap.

(3) Bend ears of lock plate away from nut, then remove nut, lock plate, key washers, and outer bearing cone.

(4) Remove wheel from steering knuckle.

(5) Remove grease shield and inner bearing cone.

(6) Tap out bearing cups from wheel hub using a brass drift positioned in hub slots.

(7) Repeat above procedures for the other wheel.

e. Steering Wheel Removal (MHE-190).

(1) Block up rear end of truck to clear wheels of floor.

(2) Remove wheel mounting nuts, then remove wheel with tire assembled.

(3) Remove capscrews, lockwashers, and hubcap.

(4) Bend ears of lock plate away from nut, then remove nut, lock plate, key washer, and outer bearing cone.

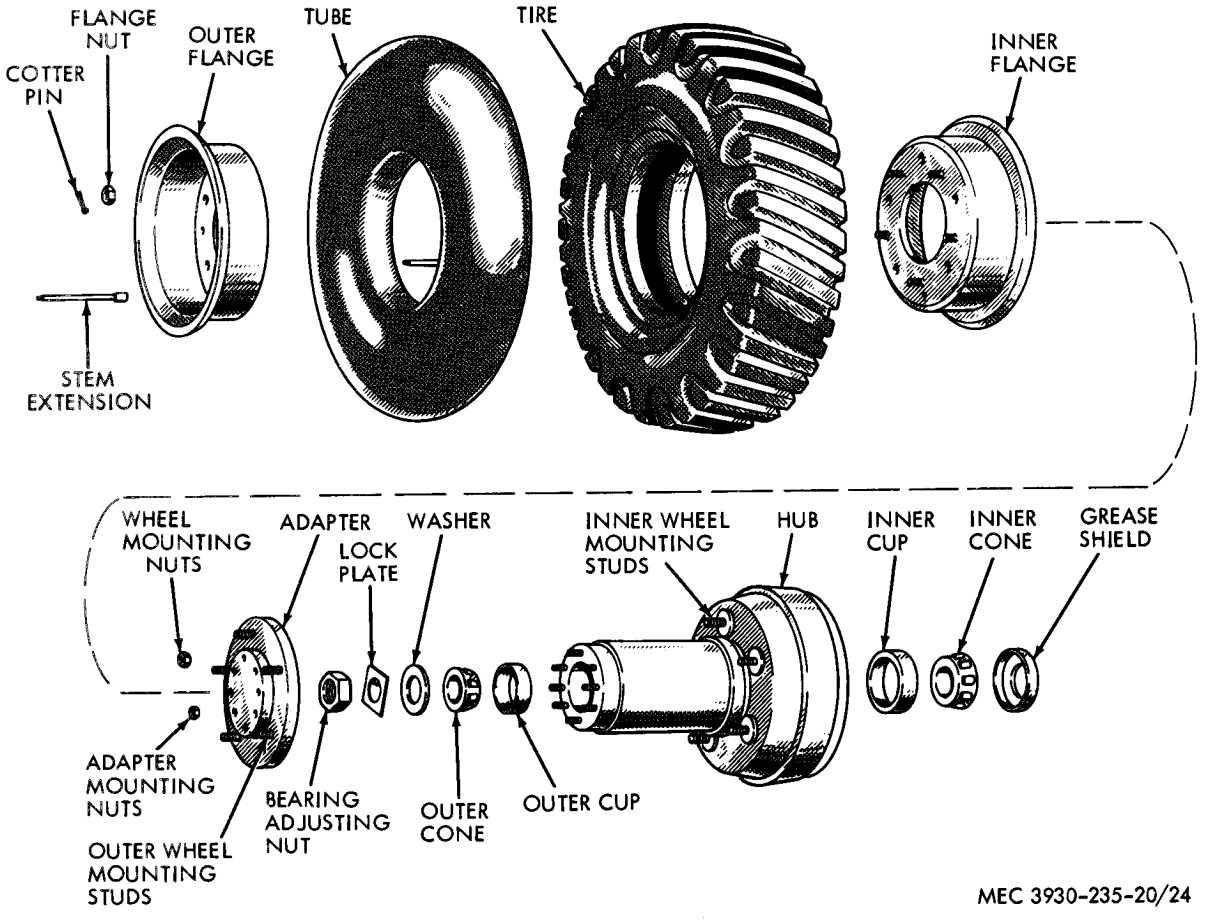

Figure 24. Drive wheel, exploded view (MHE–190).

(5) Remove hub from spindle.

(6) Remove grease shield and inner bearing cone.

(7) Tap out bearing cups from hub using a brass drift positioned in hub slots.

f. Steering Wheel Installation. Reverse procedures in *d* or *e* above. Install and adjust wheel bearings as instructed in *h* below.

g. Cleaning and Inspection. Using SD, wash all grease from the bearing surfaces and inside bore of wheel hub. Inspect bearing cones and cups for excessive wear or scoring. Repack bearings (fig. 1).

h. Installation and Adjustment.

(1) Install bearing cups with the taper to the outside of the wheel or hub. Tap into place using a brass drift and hammer. Tap evenly around edge of cup. Use care to prevent cup from binding.

(2) Install the bearing cones and wheel or hub assemblies in reverse order of removal. Hold the wheel assemblies in position while installing outer bearings.

(3) Install key washer, lock plate, and bearing nut.

(4) Tighten the bearing nut and at the same time, rotate the wheel until a heavy drag is felt. Loosen the nut to a point where the wheel rotates freely but with no apparent bearing end play.

(5) Bend ears of lock plate against side of nut flats. Install hubcap.

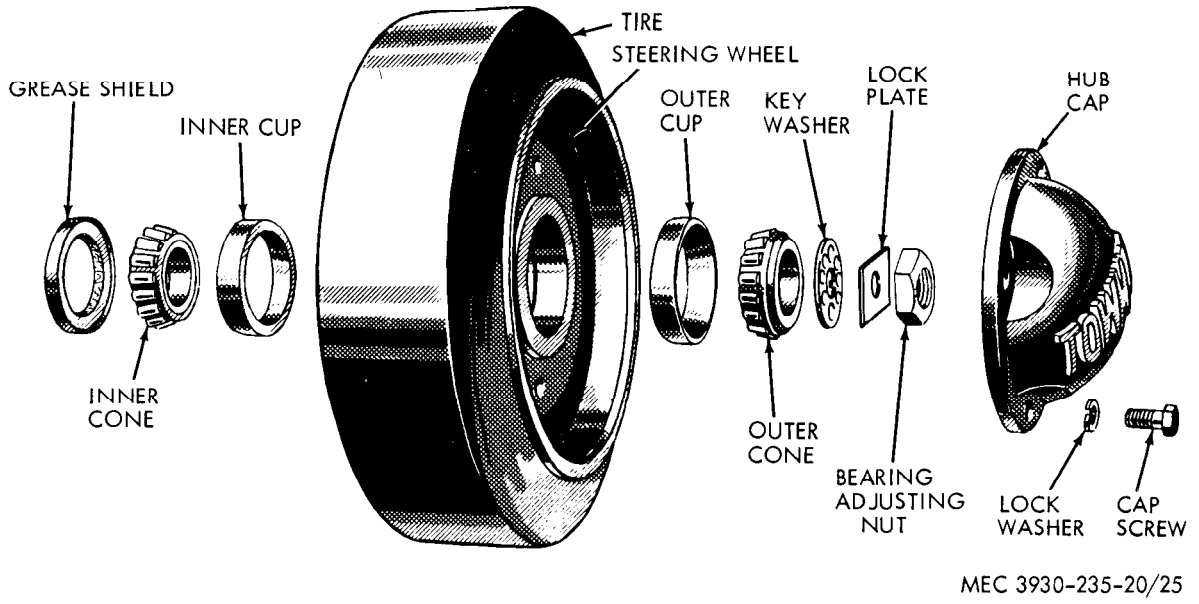

Figure 25. Steering wheel, exploded view (MHE-191).

i. Tire Assemblies (MHE-190).

(1) *Removal.*

(a) Raise vehicle sufficiently to clear wheels of floor.

(b) Remove wheel mounting nuts, then remove wheel assembly with tire.

(c) Deflate tire by removing valve stem core.

(d) Remove cotter pins and flange nuts. Break tire bead loose from flange, then separate outer flange from inner flange.

(e) Remove inner flange from tire.

(f) Remove tube from tire.

(g) Follow same procedures for each pneumatic tire, except that steering wheel pneumatic tired wheels do not use cotter pins to secure flange nuts.

(2) *Installation.* Reverse procedures in (1) above. Inflate steering wheel tires to 100 psi and drive wheel tires to 70 psi air pressure.

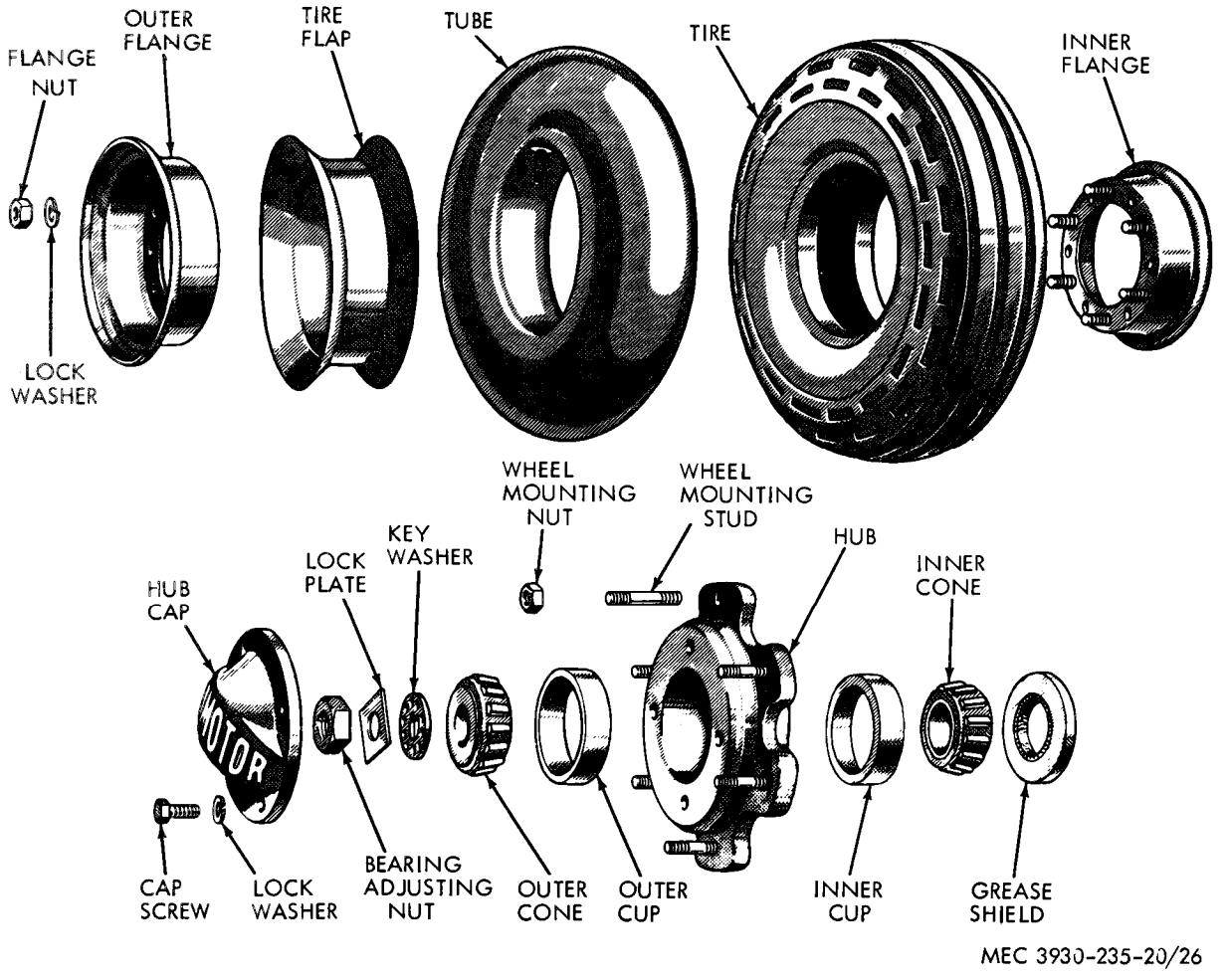

Figure 26. Steering wheel, exploded view (MHE–190).

Section XIII. STEERING

56. Drag Links

a. Front and Rear Adjustment.

(1) Block up truck to a height suitable to work from underneath.

(2) Remove cotter pin (fig. 27).

(3) Tighten end plug as much as possible; then back off one-half turn; then to nearest cotter pinhole.

(4) Secure adjustment by replacing cotter pin.

(5) Adjust other ends of drag link assembly in the same manner as above.

b. Removal of Front Drag Link.

Note. Measure length of exposed threads on both front and rear drag links at clamp ends before disassembly. These measurements will aid in reassembly to insure correct position of steering arm and steering axle wheels.

(1) Block up truck to a height suitable to work from underneath.

(2) Remove cotter pin (fig. 27) then unscrew and remove end plug at each end.

(3) Lift drag link off of ball studs.

(4) Remove ball seats.

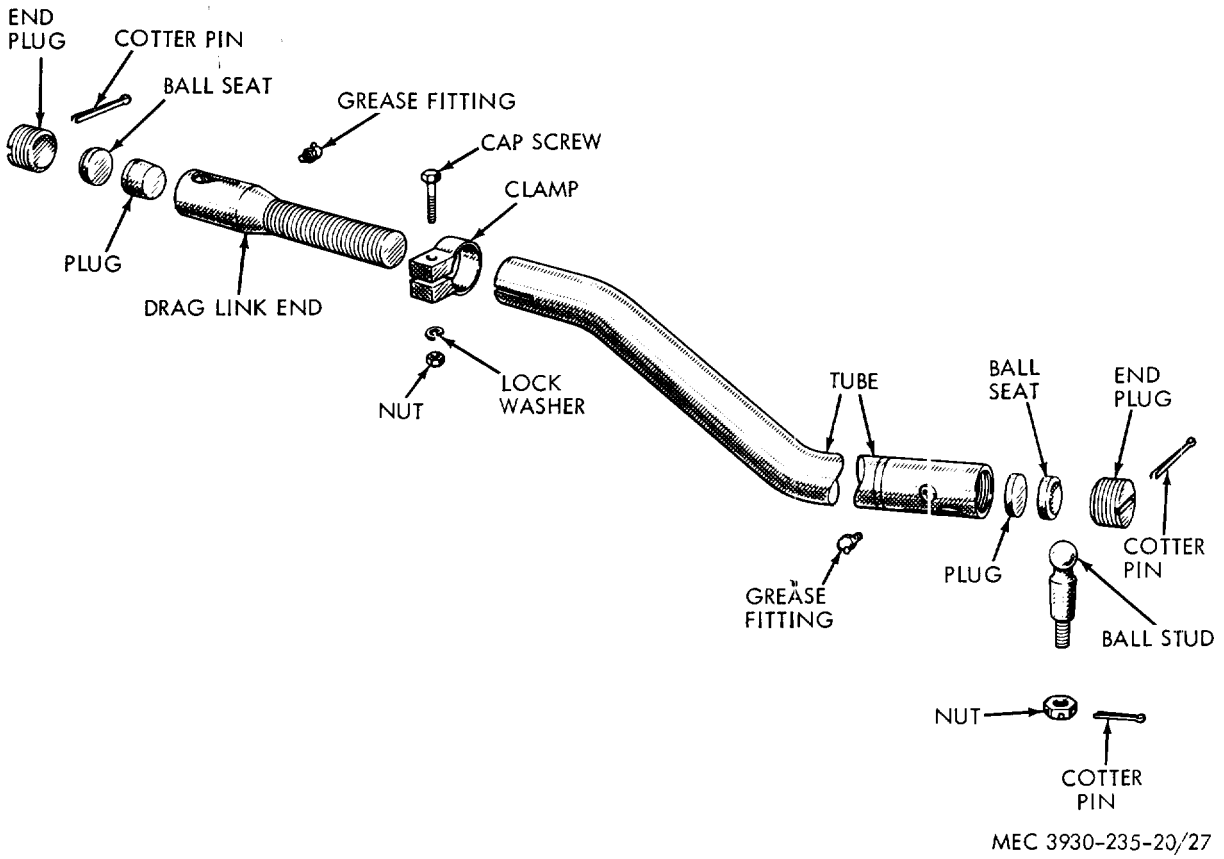

Figure 27. Front drag link, exploded view.

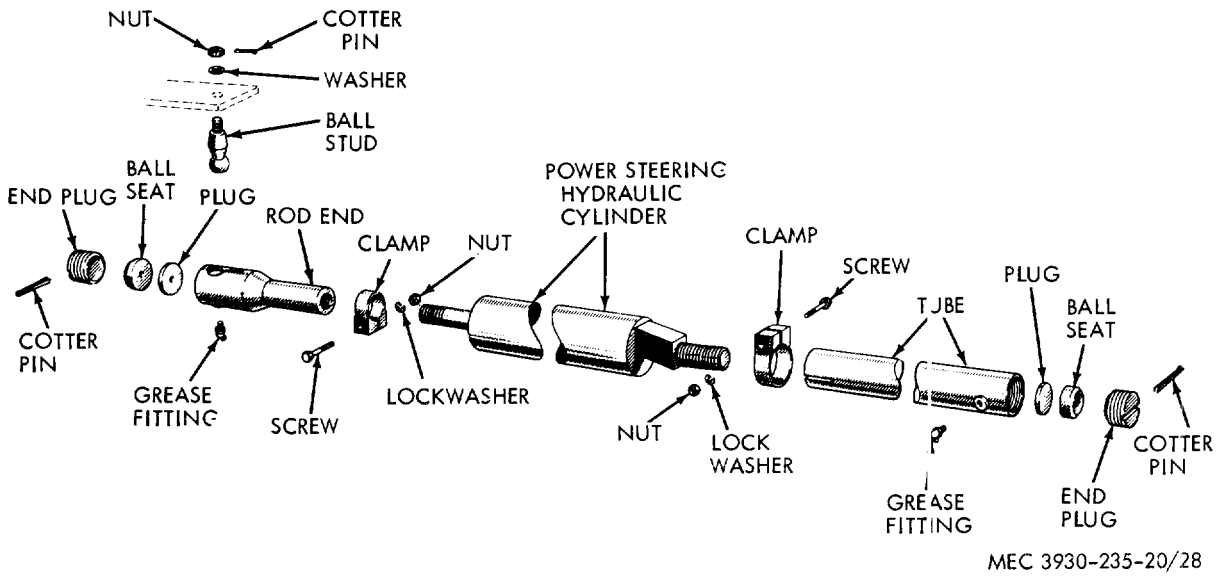

Figure 28. Rear drag link, exploded view.

c. Installation of Front Drag Link. Reverse procedure in *b* above.

d. Removal of Rear Drag Link and Hydraulic Cylinder.

(1) Remove cotter pin (fig. *27),* then unscrew and remove end plug. Lift front drag link off ball stud at hydraulic cylinder.

(2) Disconnect hoses at hydraulic cylinder.

(3) Remove cotter pins (fig. 28), then unscrew and remove end plugs.

(4) Lift drag link and cylinder off ball studs.

(5) Remove ball seat. Loosen clamp nut, then unscrew tube from cylinder. Remove clamp.

(6) Remove ball seat. Loosen clamp nut, then unscrew rod end from hydraulic cylinder piston rod.

(7) Remove cotter pin, nut, washer, and ball stud from hydraulic cylinder.

e. Install Rear Drag Link. Reverse procedures in *d* above. Measure same amount of exposed threads determined during disassembly before tightening clamp screws, nuts, and washers.

f. Cleaning and Inspection. Wash all parts in SD and dry with compressed air. Inspect for worn end plugs, ball seats, and ball studs. Inspect for damaged threads.

g. Repair and Replacement. Replace defective parts as necessary.

57. Tie Rods

a. Adjustments (MHE-191). Remove cotter pin at center steering lever end, then tighten end plug as much as possible. Back off plug one: half turn to the nearest cotter pinhole. Secure end plug position with cotter pin.

b. Adjustment (MHE-190). Remove cotter pin (fig. 29) at either the center steering lever end or the steering knuckle end, then tighten end plug as much as posible. Back off plug one-half turn to the nearest cotter pinhole, Secure end plug position with cotter pin.

c. Removal (MHE-191).

(1) Block truck up to a height suitable to work from underneath.

(2) Remove wheels (para. *55d).*

(3) Remove cotter pin, (fig. 29) then loosen end plug, at center steering lever end, sufficiently to remove it from ball stud.

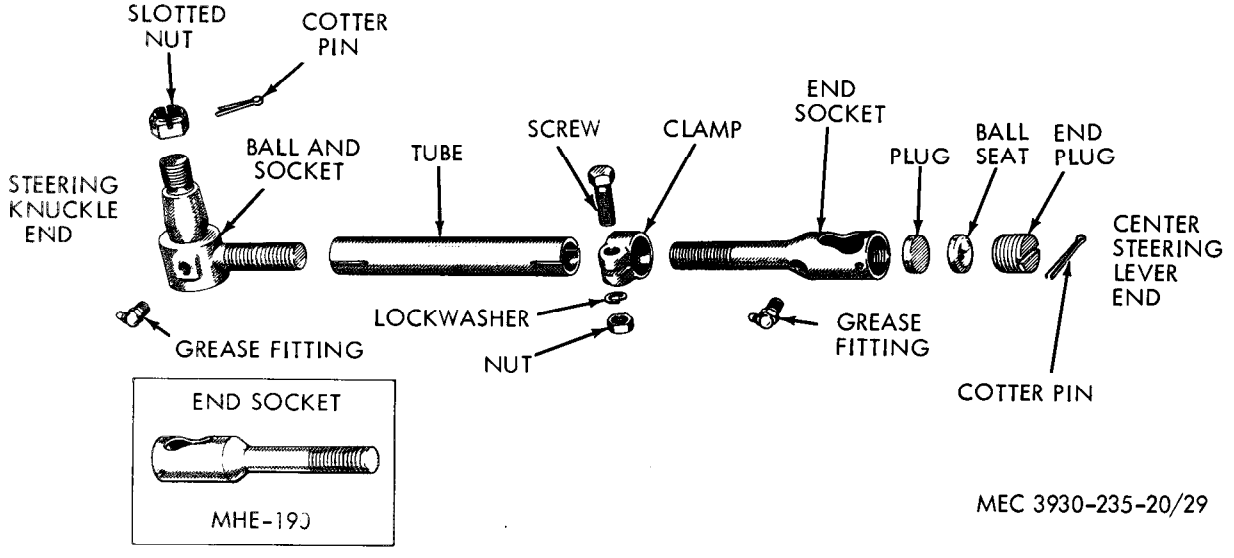

Figure 29. Tie rod, exploded view.

(4) Remove cotter pin and slotted nut at steering knuckle, then tap ball and socket out of knuckle. Remove tie rod assembly.

d. Removal (MHE-190).

(1) Block truck up to a height suitable to work from underneath.

(2) Remove wheels (para. *55e).*

(3) Remove cotter pins, then loosen end plugs at center steering lever and at steering knuckle sufficiently to remove tie rod from ball studs.

e. Repair. Replace defective parts with new part.

f. Installation. Reverse procedures in *c* or *d* above.

g. Toe-In Adjustments. With truck in level surface and steering wheels set straight ahead, measure distance between rear wheels at hub height on rim. Mark point where measurement was made. Move truck forward until these marks are on opposite side of axle, then measure distance between the two wheels at hub heights at this point. The distance between these two measurements is the toe-in or toe-out. If the markings are closer together at the front than at the rear, the wheels are toed-in. If the markings are closer together at the rear than at the front the wheels are toed-out. Adjust toe-in from 0 to 1/8 inch by loosening clamp nuts and turning the tie rod tubes until desired adjustment is obtained.

58. Power Steering Belt

a. Removal. Disconnect tail and stoplight cable at connection. Remove cable clamp. Remove counterweight. Loosen locknut, then unscrew pump adjusting screw sufficiently to allow removal of power steering belt. Remove belt.

b. Inspection. Inspect belt for wear, fraying, deterioration, or oil soaked condition.

c. Installation. Reverse procedure in *a* above and adjust belt.

d. Adjustment.

(1) Loosen locknut, then tighten power steering pump adjusting screw to a point where 18 to 22 foot-pounds of torque is required to slip the pulley on the belt. Tighten locknut against adjusting screw, then recheck torque slip valve.

(2) If a new power steering pump drive belt is used, tighten adjusting screw to a point where 24 to 28 foot-pounds of torque is required to slip the pulley on the belt. This is the initial tensioning required for a new belt.

(3) Retension the belt again after the first 50 hours operation to the same torque value. After another 50 hours operation, readjust to the 18 to 22 foot-pounds of torque.

59. Power Steering Hydraulic Oil Reservoir

a. Removal.

(1) Disconnect hoses at reservoir and drain hydraulic oil.

(2) Loosen clamp nuts (fig. 30) then remove.

b. Installation. Reverse procedures in a above.

c. Removal of Element.

(1) Remove screw, flat washer, and gaskets, then separate cover from reservoir. Remove gasket.

(2) Remove spring, filter cap, and filter element from reservoir.

d. Cleaning. Remove excess oil, then clean interior and exterior of reservoir with SD and dry thoroughly.

e. Installation. Reverse procedure in *c* above. Use a new element and gasket.

60. Power Steering Hydraulic Cylinder

a. General. The power steering hydraulic makes up a portion of the entire length of the rear drag link assembly. At the piston rod end of the cylinder, a rod end containing ball seats, threaded end plug and a clamp to anchor the rod end to the piston rod. At the opposite end of the cylinder, a tube is connected between the cylinder and the center steering lever. The

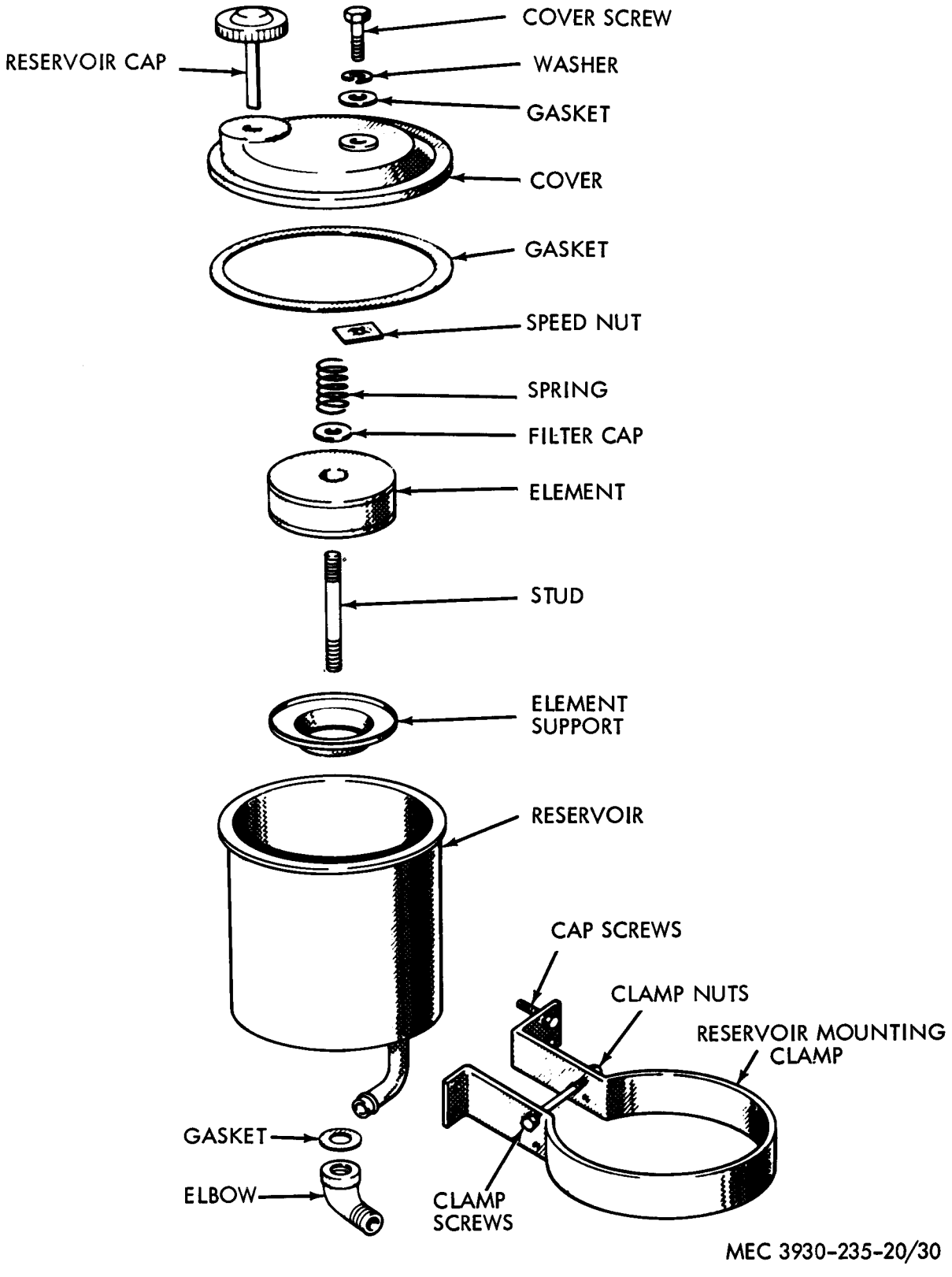

Figure 30. Power steering hydraulic oil reservoir, exploded view.

tube consists of a ball seat threaded end plug and a clamp to anchor the tube end to the cylinder.

b. Adjustment. There are no specific adjustments on the power steering cylinder itself. When the cylinder is installed into the entire length of rear drag link, the rod end and the tube end can be adjusted to a specific length to fit between the fixed ball stud at the front axle and the ball stud at the center steering lever on the rear axle.

c. Removal.

(1) Block up truck to a height suitable to work from underneath.

(2) Remove cotter pin (fig. 27) from front drag link, then unscrew and loosen threaded end plug at ball stud mounted on power steering cylinder. Lift drag link off ball stud.

(3) Remove rear drag link and hydraulic cylinder following procedures in paragraph *56d*.

Note. Measure length of exposed threads on the rod end and the tube end before disassembly. These measurements will aid in reassembly to insure correct length of rear drag link.

d. Install Power Steering Cylinder. Install new cylinder into rear drag link, then reverse procedures given in paragraph *56d*.

Section XIV. BODY

61. Seat and Backrest Cushions

a. Removal.

(1) To remove seat cushion, simply lift it from the frame.

(2) To remove the backrest cushion, remove the screws securing it to the frame.

b. Installation. Reverse procedures in a above.

Section XV. HYDRAULIC LIFT

62. Tilt Cylinder Assembly

a. Adjustment. If cylinder is leaking oil, use a suitable spanner wrench and tighten packing nut.

b. Removal.

(1) Lower lift forks to floor or block so that mast column cannot move after tilt cylinders are disconnected.

(2) Remove floor plates, then disconnect hydraulic hoses at cylinder. Cap hoses to prevent loss of hydraulic oil.

(3) Remove retaining rings and pin at mast column and at frame, then remove tilt cylinder.

c. Installation. Reverse procedure in b above.

63. Hydraulic Lift Chains

a. Adjustment. An adjustment of the lift chain is necessary if the lift forks are at different levels. Loosen two locknuts and turn anchor rod nut clockwise to decrease chain length and counterclockwise to increase chain length. Secure adjustment by tightening locknuts.

b. Removal. To remove chains, raise carriage approximately 1 foot and block in this position. Lower lift cylinder piston rod to release tension on chains. Remove cotter pins, side bars, and pin links to disconnect chain at carriage and at mast column. Remove chain assembly.

c. Cleaning and Inspection. Soak chains in SD and wash them with a stiff brush. Suspend chains to drain and dry, then coil and soak chains in a pan of OE-10. Move chains around to allow oil to penetrate to all parts. Suspend chains to drain, and wipe surplus oil from chain surface. Inspect chains for good condition.

d. Installation. Reverse procedure in b above.

64. Hydraulic Oil Tank

a. Cleaning.

(1) Drain oil from tank, then disconnect hydraulic hoses.

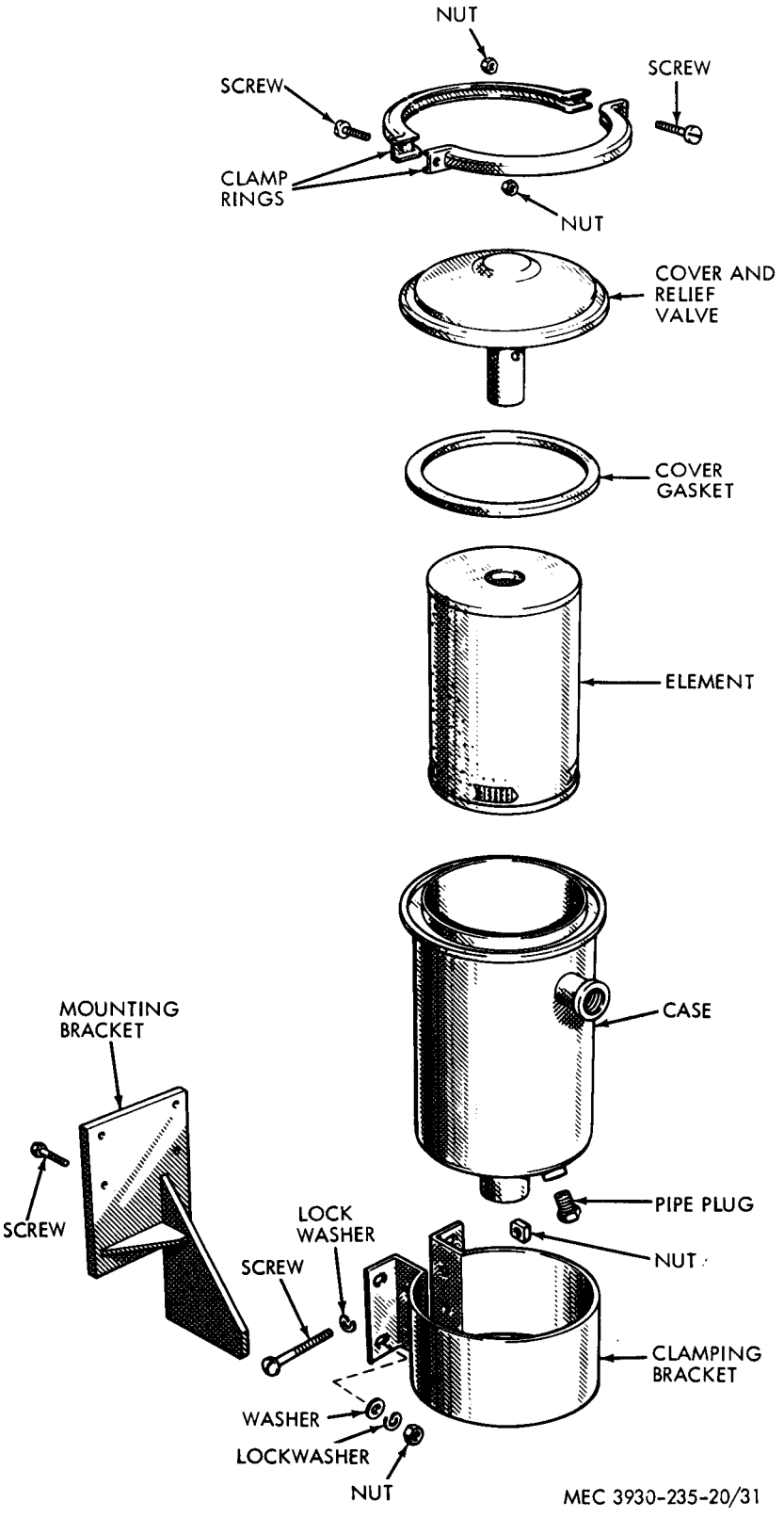

Figure 31. Hydraulic oil filter, exploded view.

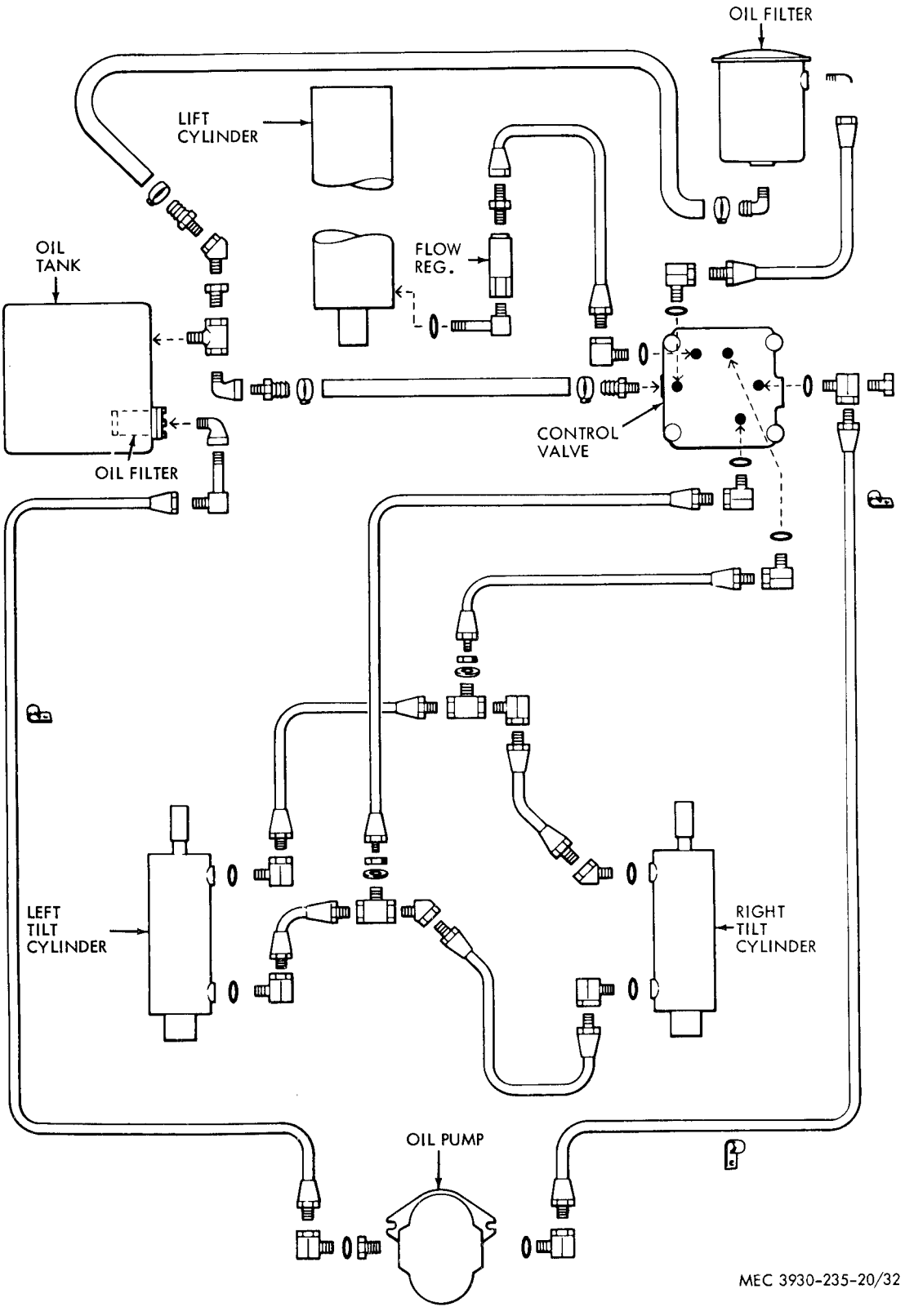

Figure 32. Hydraulic system schematic.

(2) Remove screws and washers, then remove oil strainer screen from tank.

(3) Plug openings, then flush tank thoroughly with SD and drain.

(4) Wash oil strainer screen thoroughly and dry with compressed air.

b. Installation. Reverse procedures in a above. Use a new gasket when installing oil strainer screen. Fill system as per lubrication order.

65. Hydraulic Oil Tank Air Cleaner

a. Removal. Remove cap by turning it counterclockwise and lifting it off.

b. Cleaning. Wash thoroughly in SD and dry.

c. Installation. Reverse procedure in a above.

66. Hydraulic 011 Filter

a. Remove Element.

(1) Remove pipe plug (fig. 31) from bottom of filter case and drain oil.

(2) Remove clamping ring screws and nuts, then remove clamping rings, cover, and cover gasket.

(3) Remove and discard filter element.

b. Cleaning. Wash inside of filter case thoroughly with SD and dry thoroughly.

e. Installation. Reverse procedures in a above. Use a new element and gasket. Fill system per lubrication order and check for leaks,

d. Removal of Oil Filter.

(1) Disconnect hydraulic lines and catch oil in a receptacle.

(2) Remove screws, nuts, and washers fastening filter and mounting bracket to engine mounting bracket.

(3) Remove screws, nuts, and washers; then remove filter from clamping bracket.

e. Installation. Reverse procedures in d above. Fill system per lubrication order and check for leaks.

67. Hydraulic lines and Fittings

When replacing any of the hydraulic lines and fittings, use figure 32 as a guide.

CHAPTER 4

SHIPMENT, LIMITED STORAGE AND DEMOLITION

Section I. SHIPMENT AND LIMITED STORAGE

68. Domestic Shipment and Limited Storage

a. General. The following instructions apply to the truck that is ready for immediate use upon arrival from shipment, or the truck that will be out of service temporarily for a period not to exceed 6 months (limited storage).

b. Preliminary Inspection. Before storage or shipment, examine truck carefully to determine condition. Correct deficiencies and take additional action as prescribed in *c* through *g* below.

c. Operations Test. Test truck to be sure that it operates satisfactorily by putting the truck through an operation test similar to the run-in test (para. 10). Correct all deficiencies if facilities are available for such service. If repairs cannot be made at this time, make appropriate notations on tag that will be attached to steering handwheel. This tag may also carry an appraisal as to the general condition of the truck.

d. Servicing. Perform services listed below before domestic shipment or limited storage of truck.

(1) *Battery.* Ship or store battery with truck, first charging battery in the truck with a portable charger or removing battery and using a battery charger. Replace battery in truck, but do not connect ground strap to battery. Tape terminal end of ground strap to prevent battery from being discharged by accident. Use tape, adhesive, pressure-sensitive, conforming to Specification PPP-T-60. The steering handwheel note should advise that ground strap has been disconnected.

(2) *Lubrication.* Lubricate truck completely in accordance with instructions on lubrication order (fig. 1).

(3) *Cleaning and painting.* Clean truck by washing, and remove debris from floor and engine compartment. Remove rust and corrosion, and scrape flaked and peeling paint; then dry all surfaces to be painted or coated with preservative. Repaint as required to protect against deterioration, and stencil LIFT HERE on surfaces adjacent to each lifting hole. Painting will be as outlined in TM 9-213.

(4) *Accessories.* Remove seat cushions, headlight (spotlight), stoplight-taillight, and fire extinguisher from truck, and securely box. Mark box to identify it with truck, and fasten box securely to truck.

(5) *Electrical system.* Check for loose connections and tighten as required.

(6) *Cooling system.* Flush cooling system with clean water, and drain. Repeat this operation until water runs clear.

(7) *Fuel tank.* Do not drain fuel from fuel tank if truck is to be stored for less than 90 days. For storage beyond 90 days, follow procedure outlined in current edition of MIL-STD-162 or Specification MIL-E-10062.

(8) *Lift forks.* Remove lift forks from lift carriage and fasten securely to body of truck.

(9) *Tires.* Clean all tires thoroughly.

(10) *Waterproofing.* Secure hood and seat assembly, and seal with tape.

e. Final Inspection. Make a systematic inspection just before shipment or storage to determine that all required steps have been taken

and that all equipment is mechanically ready for operation on call.

f. Storage Instructions. Provide access to each truck in limited storage. Do not block truck, but be sure tires are not resting on floors, cinders, or other surfaces that are soaked with grease or oil. Cover truck if stored outdoors.

g. Petiodic Inspection and Operation.

(1) Perform quarterly inspection and maintenance and record findings by preparing DA Form 2404. Required maintenance will be performed promptly to insure the truck is mechanically sound and ready for use.

(2) Operate the truck sufficiently to bring it up to operating temperature. After operation, represerve for shipment and limited storage.

(a) Engine and cooling system. Adjust fan and generator drive belt. Clean fuel pump and carburetor strainers, if necessary.

(b) Chassis. Check alignment, steering, and gear shifting mechanism.

(c) Wheels and brakes. Check brake linkage. Tighten hydraulic lines, if necessary.

(d) Lubrication. Lubricate truck thoroughly in accordance with instructions on lubrication order (fig. 1), if necessary. Be sure to check lubricant levels in drive axle and transmission, and bring to proper level, if necessary.

(e) Electrical system. Inspect all electrical connections; make necessary adjustments.

69. Oversea Shipment

Instructions for oversea shipment are found in current edition of MIL-STD-162.

70. Loading and Blocking on Railroad Cars

a. Loading. Load and unload truck under its own power, whenever possible, using permanent ramps or spanning platforms. If truck cannot operate under its own power, push, tow, or lift into position. When lifting equipment, be sure to attach hooks, chains, or cables only to places marked LIFT HERE.

b. Brakes. After truck is put in position on flatcar, set handbrake (parking brake) and wire down footbrake pedal or place block between brake pedal and equipment frame to hold pedal in applied position.

c. Clearances. Position truck on flatcar so that flatcar brake handwheel will have proper clearance on all sides and so that overall car clearances will conform to requirements of the Association of American Railroads rules.

d. Securing Truck. Secure truck to flatcar as follows: The truck will be secured on the car as outlined in section 6, figure 54 of AAR Rules Governing the Loading of Commodities on Open Top Cars.

Section II. DEMOLITION OF TRUCK

71. Authority

The truck will be destroyed only if there is danger of capture and use by the aggressor, and only after the order is given by the unit commander. Destroy the same parts on all similar equipment to prevent salvage by the aggressor.

Warning: Observe adequate safety precautions.

72. Methods

a. Destruction by Hand.

(1) Smash the items listed below with a sledge, a hammer, or an ax:

(a) Controls.
(b) Valves.
(c) Hydraulic cylinders.
(d) Hydraulic pump.
(e) Carburetor.
(f) Manifold.
(g) Generator.
(h) Distributor.
(i) Ignition coil.
(j) Spark plugs.
(k) Battery.

(2) Smash the items listed below by using

a heavy hammer to drive a pointed steel bar into the parts:

(a) Engine.

(b) Drive axle and differential.

(c) Gear housing.

(d) Steering gear housing.

(e) Radiator.

(f) Oil and fuel tanks.

(3) Destroy the items listed below by cutting them or ripping them out:

(a) Wires.

(b) Cables.

(c) Lines.

b. Destruction by Misuse.

(1) Drain the crankcase and radiator, disconnect the radiator fan, and run the engine at full throttle.

(2) Place sand, gravel, nuts, bolts, screws, or broken glass in the fuel tank.

(3) Pack cloths saturated with gasoline around the engine and inside the truck, and set the cloths afire.

(4) Remove the carburetor, the generator, and the distributor and bury them in the ground or throw them into a body of water.

APPENDIX 1

REFERENCES

AR 320-5	Dictionary of United States Army Terms
AR 320-50	Authorized Abbreviations and Brevity Codes
AR 600-55	Motor Vehicle Driver-Selection, Testing, and Licensing
AR 750-5	Organization, Policies, and Responsibilities for Maintenance Operation
C-9100SL	Fuels, Lubricants, Oils; and Waxes
DA Pam 108-1	Index of Army Motion Pictures, Film Strips, Slides, Tape, and Phono-Recordings
DA Pam 310-1	Military Publications: Index of Administrative Publications
DA Pam 310-2	Military Publications: Index of Blank Forms
DA Pam 310-3	Military Publications: Index of Training Publications.
DA Pam 310-4	Military Publications: Index of Technical Manuals, Technical Bulletins, Supply Manuals (type 4, 6, 7, 8, and 9) Supply Bulletins, Lubrication Orders, and Modification Work Orders
DA Pam 310-5	Index of Graphic Training Aids and Devices
FM 21-5	Military Training
FM 21-6	Techniques of Military Instruction
FM 21-30	Military Symbols
TM 21-300	Driver Selection and Training (Wheeled Vehicles)
TM 38-750	Army Equipment Record Procedures

APPENDIX II

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

1. General

This appendix contains explanations of all maintenance and repair functions authorized the various levels of maintenance. Section II contains the maintenance allocation chart.

2. Maintenance

Maintenance is any action taken to keep material in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of material includes the following:

a. Service. To clean, preserve, and replenish fuel and lubricants.

b. Adjust. To regulate periodically to prevent malfunction.

c. Inspect. To verify serviceability and detect incipient electrical or mechanical failure by scrutiny.

d. Test. To verify serviceability and detect incipient electrical or mechanical failure by use of special equipment such as gages, meter, and the like.

e. Replace. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

f. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

g. Align. To adjust two or more components of an electrical system so that their functions are properly synchronized.

h. Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

i. Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

3. Explanation of Columns

a. Functional Group. The functional group is a numerical group set up on a functional basis. The applicable Functional Grouping Indexes (obtained from the United tates Army Mobility Command) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Components and Related Operation. This column contains the functional grouping index heading, subgroup heading, and a brief description of the part starting with the noun name. It also designates the operations to be performed such services as, adjust, inspect, test, replace, repair, and overhaul.

c. *Levels of Maintenance.* This column contains the various levels of maintenance by letter designation: O/C-Operator or Crew, O-Organizational, DS-Direct Support, GS-General Support and D-Depot. An X is placed in

the appropriate level column in lines with an indicated maintenance function authorized that level to perform the function. The X indicates the lowest level responsible for performing the function, but does not necessarily indicate repair parts stockage at that level. Higher levels are authorized to perform the indicated functions of lower levels.

d. Remarks. This column lists specific maintenance functions, special tools, cross-references, instructions, and the like pertinent to the operation being performed.

Section II. MAINTENANCE ALLOCATION CHART

Functional Group	Components and Related Operation	Levels of Maintenance					Remarks
		O/C	O	DS	GS	D	
01	ENGINE						
0100	Engine assembly						
	Test		X				Compression vacuum timing.
	Replace			X			
	Overhaul				X		
0101	Block, engine						
	Inspect				X		
	Overhaul (rebore)					X	Reboring may be accomplished at depot maintenance if facilities are available from Government or commercial sources.
	Head, cylinder						
	Clean, inspect, replace		X				
	Repair			X			
0105	Valves, intake and exhaust						
	Adjust		X				
	Replace, repair			X			
0108	Manifold, intake and exhaust						
	Clean, inspect, replace		X				
03	FUEL						
0301	Carburetor						
	Adjust, replace		X				
	Repair			X			
0302	Pump fuel						
	Clean, test, replace		X				
0304	Cleaner, air						
	Clean, replace		X				
0306	Tank, fuel						
	Clean, replace		X				
0308	Governor						
	Adjust		X				
	Replace, repair				X		
0309	Filter assembly, fuel						
	Clean, replace		X				
0312	Pedal and linkage, accelerator						
	Adjust, replace		X				
04	EXHAUST						
0401	Muffler and Pipes						
	Inspect, replace		X				

Functional Group	Components and Related Operation	Levels of Maintenance					Remarks
		O/C	O	DS	GS	D	
05	COOLING						
0501	Radiator						
	Clean, replace		X				
	Test, repair				X		
0503	Thermostat						
	Test, replace		X				
0504	Water pump						
	Inspect, replace		X				
0505	Belt, fan						
	Adjust, replace		X				
06	ELECTRICAL						
0601	Generator						
	Test, replace		X				Voltage output test.
	Test, repair			X			
0602	Regulator, voltage						
	Adjust, test, replace		X				
0603	Motor, starting						
	Replace		X				
	Test, repair			X			
0605	Distributor, ignition						
	Adjust, replace, repair		X				
	Spark plugs						
	Clean, adjust, test, replace		X				
0607	Gages and instruments						
	Inspect, replace		X				
0612	Battery and cables						
	Clean, test, replace		X				
07	TRANSMISSION						
0702	Transmission						
	Test, replace			X			
	Overhaul				X		
0703	Valve, transmission control						
	Test, replace, repair			X			
0705	Lever and linkage						
	Adjust		X				
	Replace			X			
0710	Creeper pedal and linkage						
	Adjust		X				
	Replace			X			
0712	Element, Sediment, transmission oil						
	Clean, replace		X				
0900	Universal, joint						
	Replace, repair			X			
10	FRONT AXLE ASSEMBLY (DRIVE						
1000	Axle assembly, drive						
	Inspect, replace, repair				X		
	Shaft, drive axle						
	Inspect, replace		X				
11	REAR AXLE (STEER)						
1104	Axle assembly, steering						
	Adjust, replace, repair			X			

Functional Group	Components and Related Operation	Levels of Maintenance					Remarks
		O/C	O	DS	GS	D	
12	BRAKES						
1201	Lever, cables, and linkage handbrake						
	Adjust, replace	-----	X				
	Brakeshoe, handbrake						
	Adjust	-----	X				
	Replace	-----		X			
1202	Brakeshoes, service brake						
	Adjust, replace		X				
	Repair			X			
1204	Cylinder assembly, master						
	Replace	-----	X				
	Repair	-----	-----	X			
1206	Pedal and linkage, service brake						
	Replace		X				
	Adjust	-----	-----	X			
13	WHEELS						
1311	Wheel and tire assemblies						
	Replace		X				
	Repair	-----			X		
	Bearings, wheel						
	Clean, adjust, inspect, replace		X				
14	STEERING						
1401	Gear assembly, steering						
	Adjust, replace	-----		X			
	Repair	-----	-----	-----	X		
	Drag links, and tie rods						
	Adjust, replace, repair	-----	X				
1401	Pump, power steering						
	Test, replace, repair	-----	-----	X			
	Belt, pump drive						
	Adjust, replace		X				
	Reservoir, hydraulic oil						
	Clean, replace	-----	X				
1412	Cylinder, power steering						
	Adjust, replace	-----	X				
	Repair, test	-----		X			
1414	Valve, power steering						
	Test, replace, repair	-----	-----	X			
16	SPRING						
1601	Spring assembly						
	Replace, repair	-----	-----	X			
18	BODY						
1806	Cushions, seat, and backrest						
	Replace	-----	X				
	Repair	-----	-----		X		
24	HYDRAULIC LIFT						
2401	Pump assembly, hydraulic						
	Test, replace, repair	-----	-----	X			
2402	Valve assembly, hydraulic control						
	Test, replace, repair	-----	-----	X			

Functional Group	Components and Related Operation	Levels of Maintenance					Remarks
		O/C	O	DS	GS	D	
2404	Cylinder assembly, tilt						
	Adjust, replace		X				
	Repair			X			
2405	Cylinder assembly, lift						
	Replace, repair			X			
	Mast assembly						
	Replace, repair			X			
	Carriage assembly						
	Replace, repair			X			
	Chain, hydraulic lift						
	Clean, adjust, inspect, replace		X				
2406	Tank assembly, hydraulic oil						
	Clean		X				
	Replace			X			
	Cap, breather, hydraulic oil tank						
	Clean, replace		X				
	Filter, hydraulic oil						
	Clean, replace		X				

APPENDIX III

REPAIR PARTS AND SPECIAL TOOL LISTS

Allocated repair parts to support and maintain this equipment will be found in TM 10-3930-235-20P.

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NG: State AC (3).

USAR: **None.**

For explanation of abbreviations used, see AR 320-50.

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