DEPARTMENT OF THE ARMY
TECHNICAL MANUAL

TM 9-8028

DEPARTMENT OF THE AIR
FORCE TECHNICAL ORDER

TO 36A12-1C-301

OPERATION AND
ORGANIZATIONAL MAINTENANCE

5-TON 6 x 6 CARGO TRUCK M41, M54 CHASSIS TRUCK M40 M61, M139 AND M139C DUMP TRUCK M51 TRACTOR TRUCK M52 MEDIUM WRECKER TRUCK M62; AND TRACTOR WRECKER TRUCK M246

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
JUNE 1955

***TM 9-8028/TO 36A12-1C-301**

TECHNICAL MANUAL No. 9-8028
TECHNICAL ORDER No. 36A12-1C-301

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

WASHINGTON 25, D. C., *13 June 1955*

OPERATION AND ORGANIZATIONAL MAINTENANCE

5-TON 6 x 6 CARGO TRUCK M41, M54; CHASSIS TRUCK M40, M61, M139, AND M139C; DUMP TRUCK M51; TRACTOR TRUCK M52; MEDIUM WRECKER TRUCK M62; AND TRACTOR WRECKER TRUCK M246

***This manual supersedes TM 9-837, 15 June 1951, including C 1, 20 December 1951; C 2, 31 January 1952; C 3, 2 April 1954; TB ORD 487, 3 February 1953; TB ORD 526, 20 August 1953; TB ORD 532, 15 July 1953; TB 9-837-4, 15 January 1954.**

347797°—55——1

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of personnel to whom this materiel is issued. They contain information on the operation and organizational maintenance of the materiel, as well as descriptions of major units and their functions in relation to other components of the materiel.

b. The appendix contains a list of current references, including supply manuals, forms, technical manuals, and other available publications applicable to the materiel.

c. This manual differs from TM 9–837 as in (1) and (2) below.

(1) *Adds information on:*

(*a*) 5-ton 6 x 6 chassis truck M40

(*b*) 5-ton 6 x 6 chassis truck M61

(*c*) 5-ton 6 x 6 chassis truck M139

(*d*) 5-ton 6 x 6 chassis truck M139c

(*e*) 5-ton 6 x 6 cargo truck M41.

(*f*) 5-ton 6 x 6 cargo truck M54

(*g*) 5-ton 6 x 6 dump truck M51

(*h*) 5-ton 6 x 6 tractor truck M52

(*i*) 5-ton 6 x 6 medium wrecker truck M62

(*j*) 5-ton 6 x 6 tractor wrecker truck M246

(2) *Revises information on:*

(*a*) General description and tabulated data

(*b*) Lubrication

(*c*) Preventive maintenance

(*d*) Organizational maintenance

(*e*) Troubleshooting

(*f*) Removal and installation of major components

2. Organizational Maintenance Allocation

In general, the prescribed organizational maintenance responsibilities will apply as reflected in the allocation of tools and spare parts in the appropriate columns of the current ORD 7 supply manual pertaining to this vehicle and in accordance with the extent of disassembly prescribed in this manual for the purpose of cleaning, lubricating, or replacing authorized spare parts. In all cases where the nature of repair, modification, or adjustment is beyond the scope or facilities of the using organization, the supporting ordnance maintenance unit should be informed in order that trained personnel with suitable tools and equipment may be provided or other proper instructions issued.

Note. The replacement of certain assemblies is normally an ordnance maintenance operation, but may be performed in an emergency by the using organization, provided approval for performing these replacements is obtained from the supporting ordnance officer. A replacement assembly, any tools needed for the operation which are not carried by the using organization, any necessary special instructions regarding associated accessories, etc., may be obtained from the supporting ordnance maintenance unit.

3. Forms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the type, quantity, and condition of materiel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of materiel in the hands of troops and for delivery of materiel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the materiel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units operating and maintaining these vehicles are listed in the appendix. For a current and complete listing of all forms, refer to DA Pam 310–2.

c. Field Report of Accidents. The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in the SR 385–10–40 series of special regulations. These reports are required whenever accidents involving injury to personnel or damage to materiel occur.

d. Report of Unsatisfactory Equipment or Materials. Any suggestions for improvement in design and maintenance of equipment and spare parts, safety and efficiency of operation, or pertaining to the application of prescribed petroleum fuels, lubricants, and/or preserving materials, or technical inaccuracies noted in Department of the Army publications, will be reported through technical channels, as prescribed in SR 700–45–5, to the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM on DA Form 468, Unsatisfactory

Equipment Report. Such suggestions are encouraged in order that other organizations may benefit.

Note. Do not report all failures that occur. Report only REPEATED or RECURRENT failures or malfunctions which indicate unsatisfactory design or materiel. However, reports will always be made in the event that exceptionally costly equipment is involved. See also SR 700–45–5 and printed instructions on DA Form 468.

Section II. DESCRIPTION AND DATA

4. Description

a. Truck Nomenclature. In this manual, the use of the terms "left" and "right" and "front" and "rear" is with respect to the driver sitting in the seat. "Left" indicates to the left of the driver. "Right" indicates to the right of the driver. "Front" indicates the radiator end of the vehicle and "rear" indicates the end opposite the radiator. On the wrecker crane (M62 and M246), the above terms, when used in reference to the crane or its components, are used with respect to the operator sitting in the crane operator's compartment with the crane hook centered over the rear of the vehicle.

b. Models Covered. This manual is written for the 5-ton 6 x 6 cargo trucks M41 and M54; chassis trucks M40, M61, M139, and M139c; dump truck M51; tractor truck M52; medium wrecker truck M62; and tractor wrecker truck M246 (figs. 1–13). All are six-wheel trucks equipped with one driving front axle and two driving rear axles. For detailed description and data of the materiel mounted on the chassis of the various models, refer to specific section of chapter 3.

c. Axles. The front axle steering knuckles incorporate universal joints for driving the front wheels. Tandem rear axles are used on these vehicles, both axles being driving axles. The drive is through a conventional double reduction differential which functions in exactly the same manner as that used with the front axle. The carriers are of the through-shaft construction, which means that the pinion shaft passes through the carrier so that power is delivered to the rear-rear axle after passing through the through-shaft of the forward rear axle. The axles are full floating.

d. Springs and Torque Rods. The front springs are semielliptic-type mounted with the arch down. They are assembled with a bolt through the center of the leaves, and alined with rebound clips. The front springs are pivoted in a hanger at the front end and shackled to a hanger at the rear end. The rear springs are semielliptic-type mounted with the arch up and have slipper-type ends. Spring leaves are held together with a center bolt and spring clips. The ends of the springs rest on the axle housing and are free to slide in brackets. Spring seats mounted on the under side of the springs are equipped

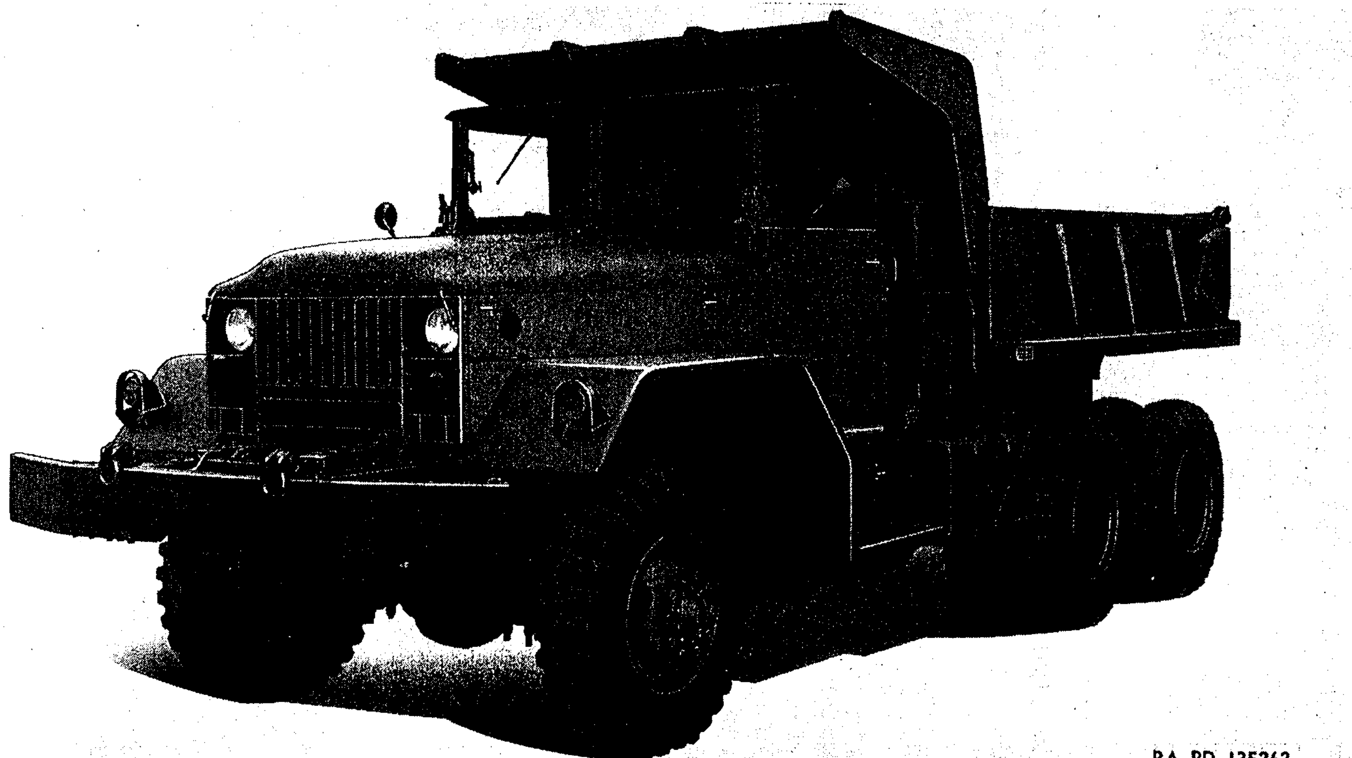


Figure 1. Dump truck M51—left front view.

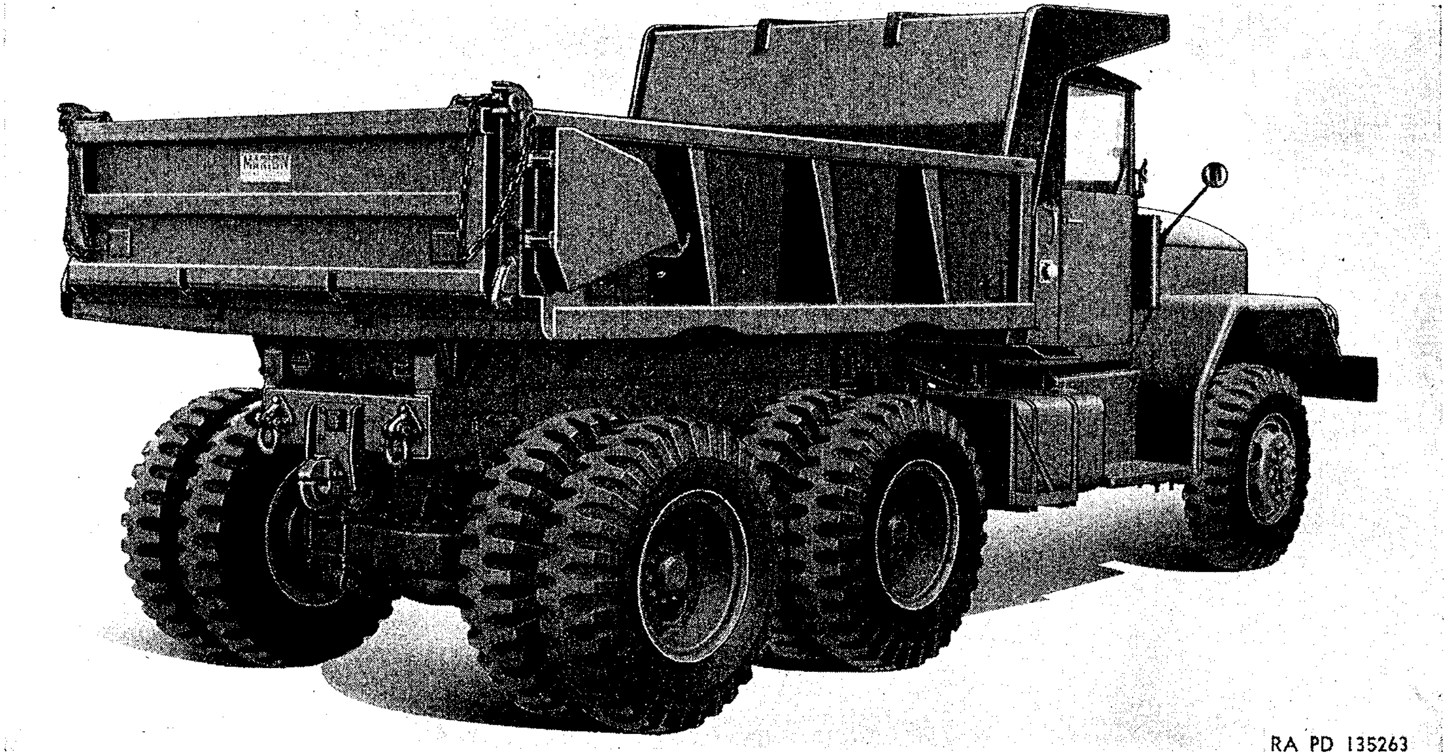
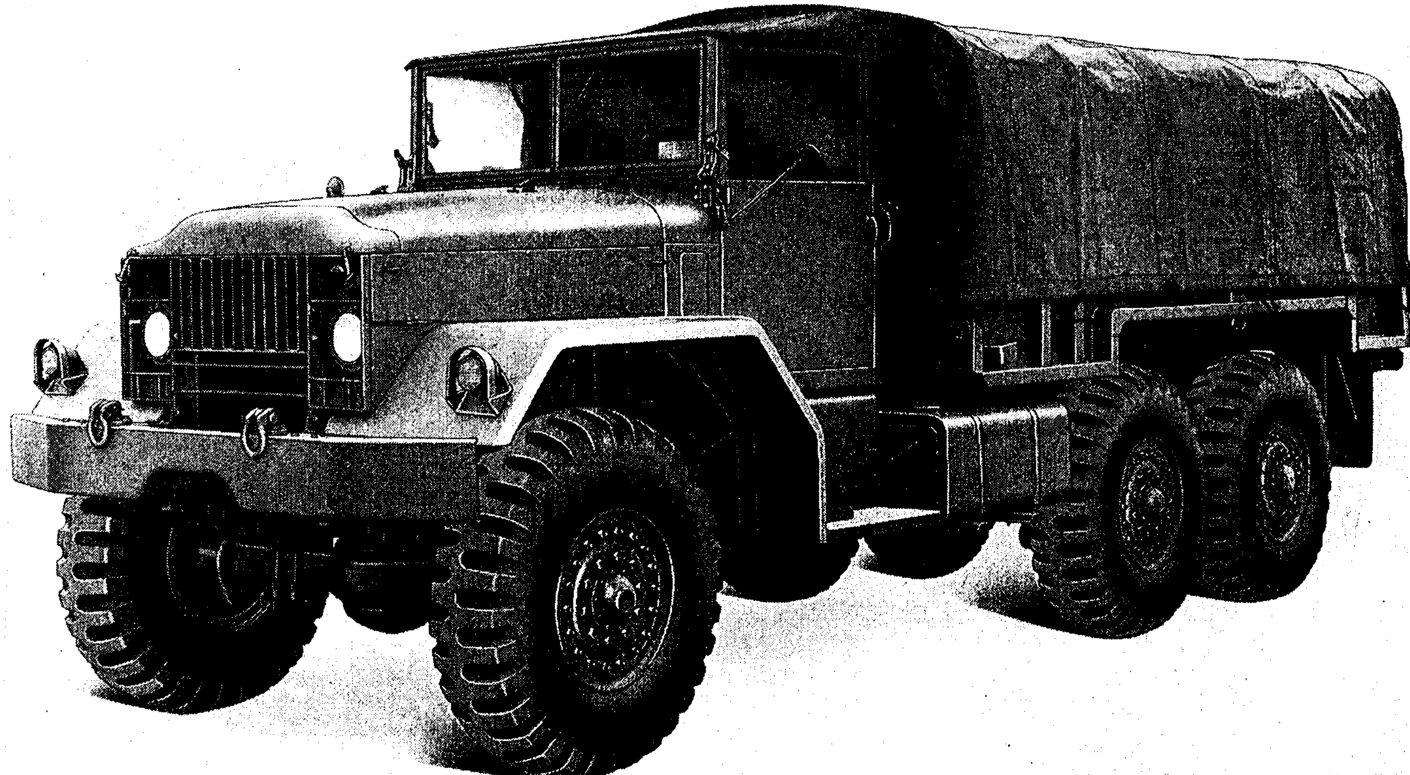


Figure 2. Dump truck M51—right rear view.



RA PD 135748

Figure 3. Cargo truck M41—left front view.

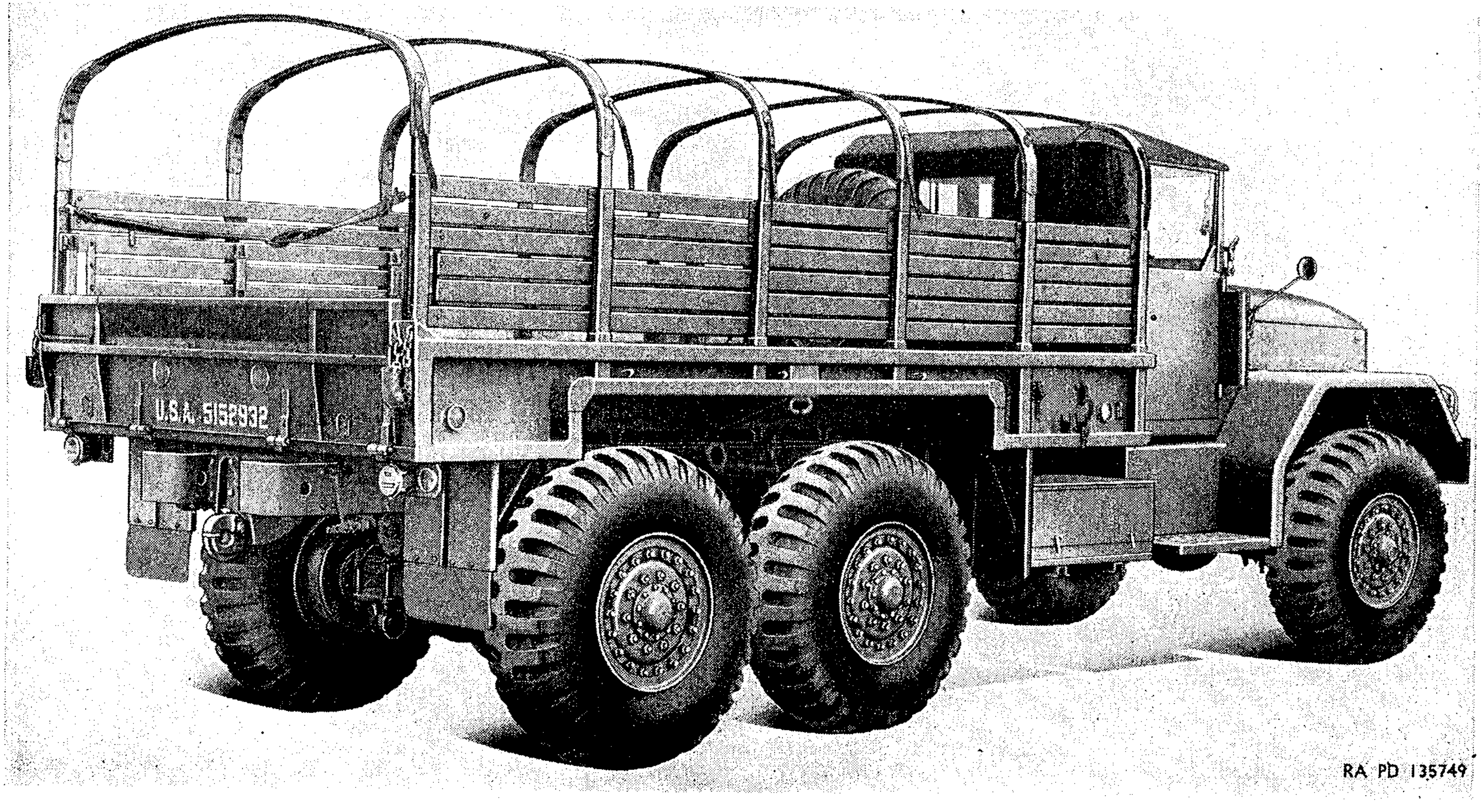


Figure 4. Cargo truck M41—right rear view.

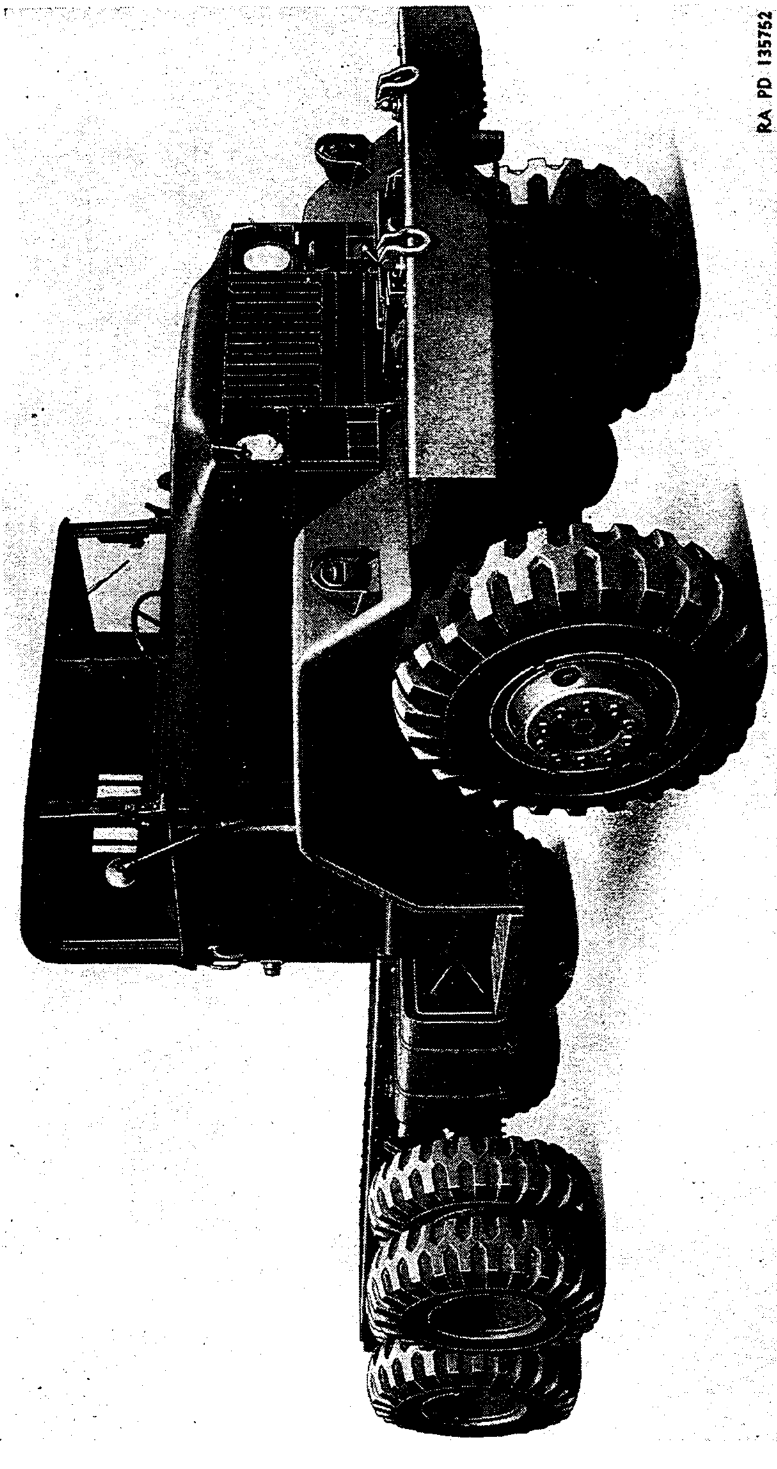


Figure 5. Chassis truck M139—right front view.

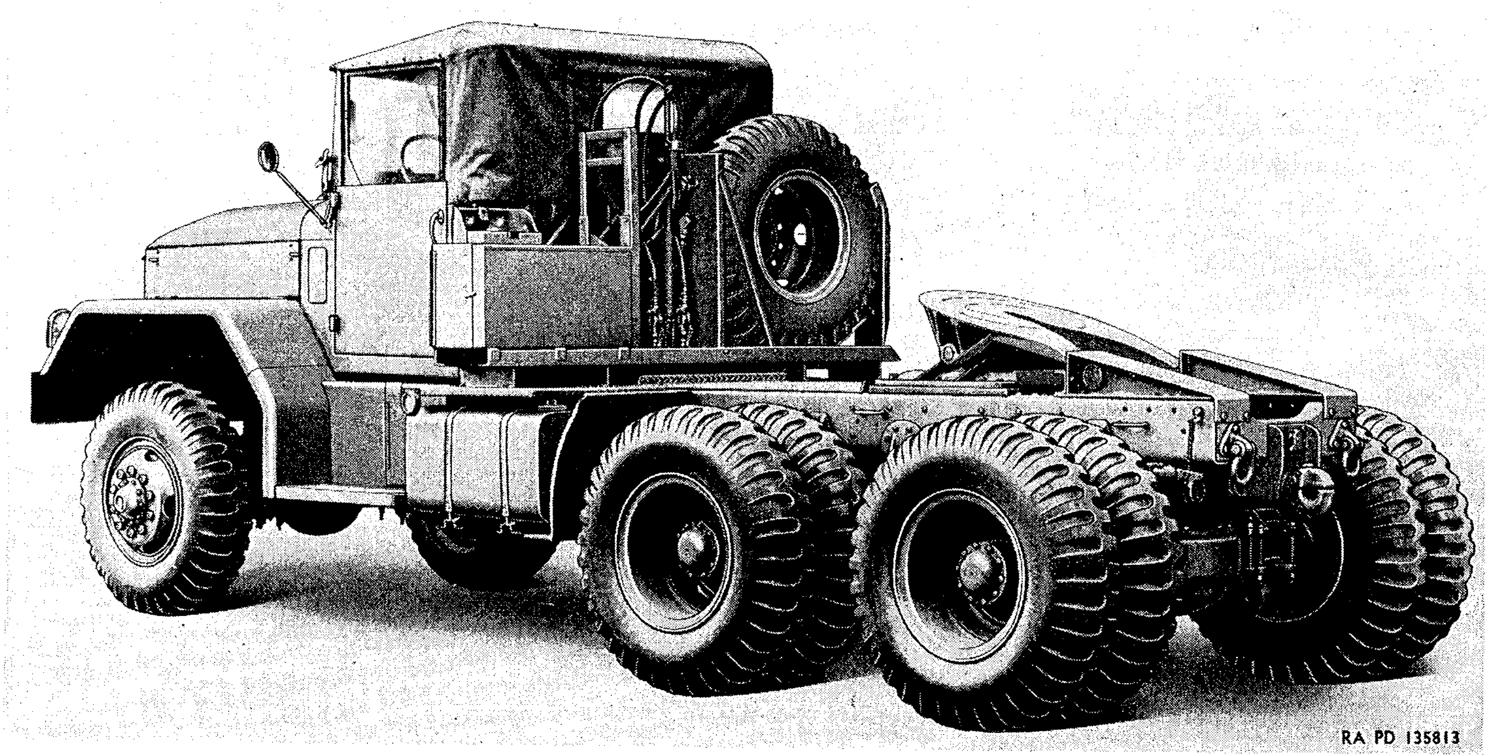


Figure 6. Tractor truck M52—left rear view.

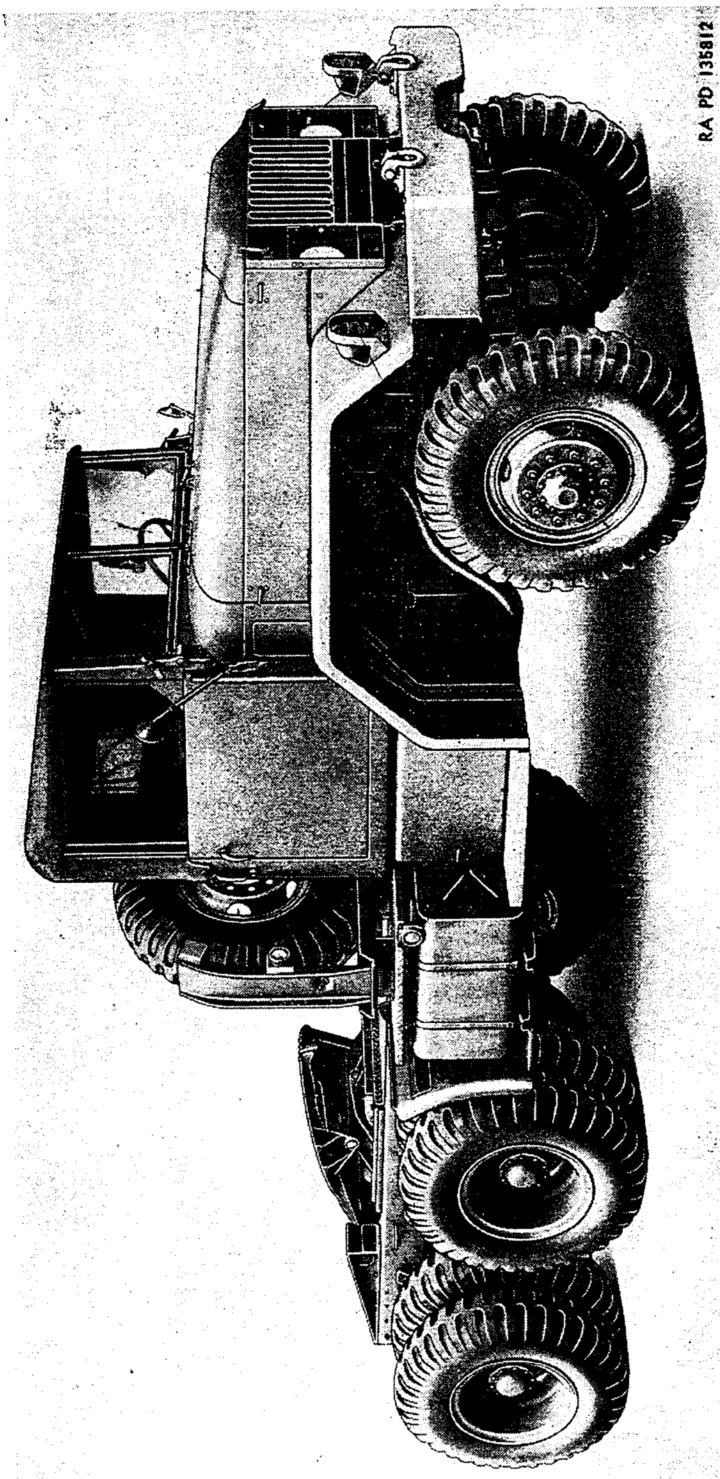


Figure 7. Tractor truck M52—right front view.

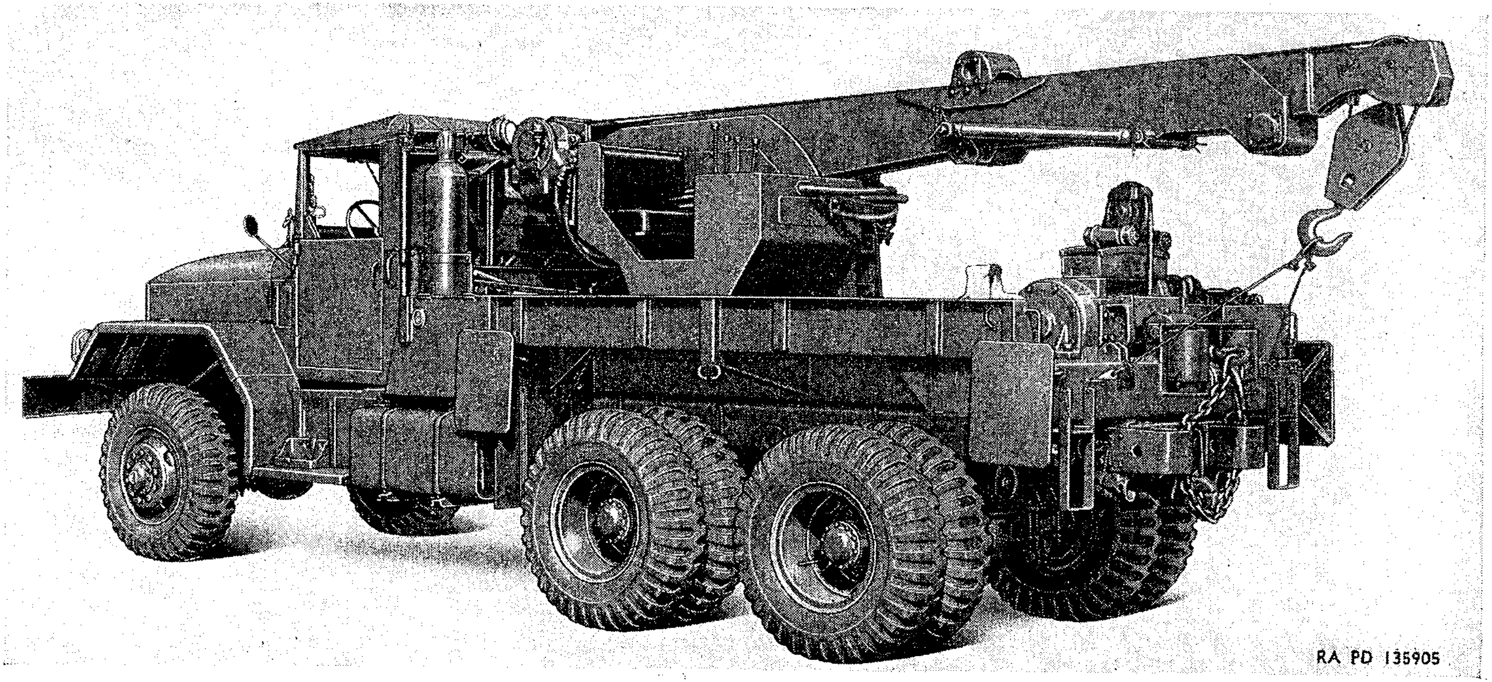


Figure 8. Medium wrecker truck M62—left rear view.

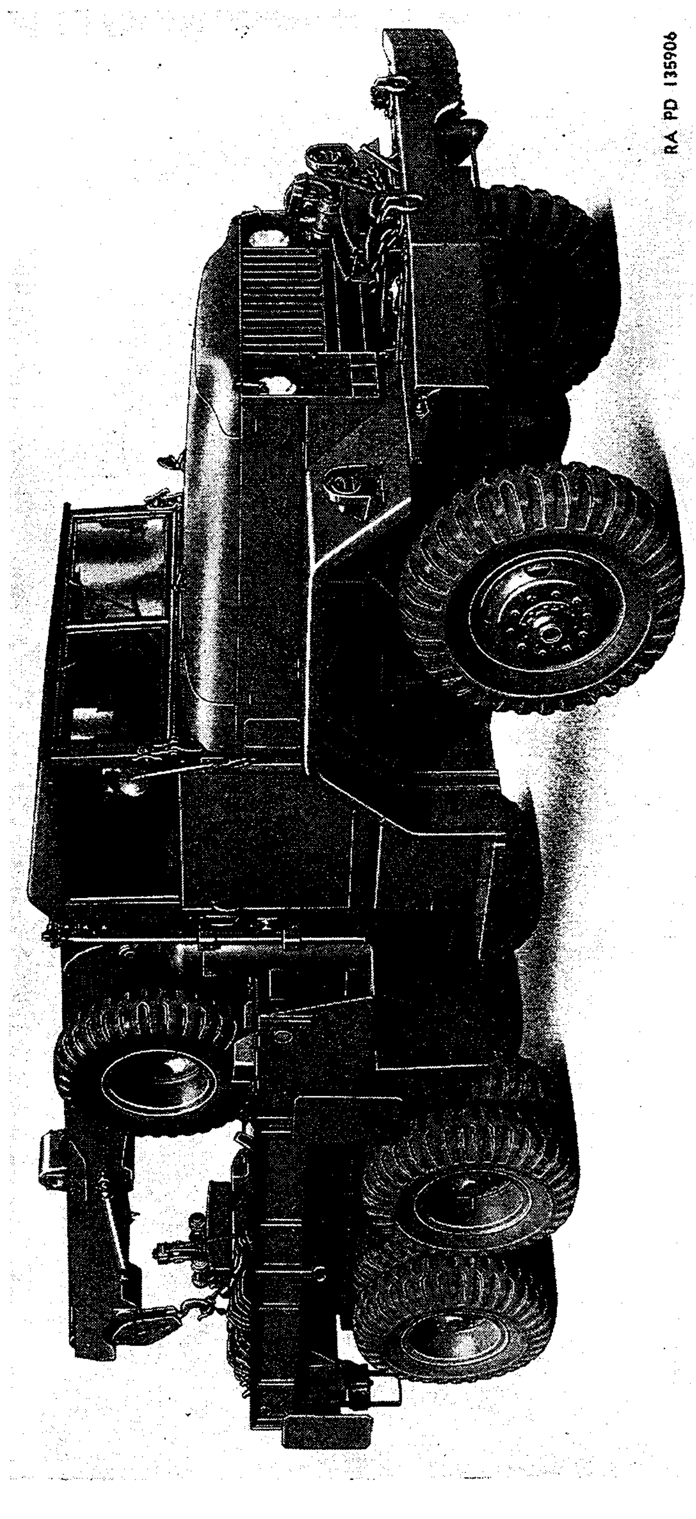


Figure 9. Medium wrecker truck M62—right front view.

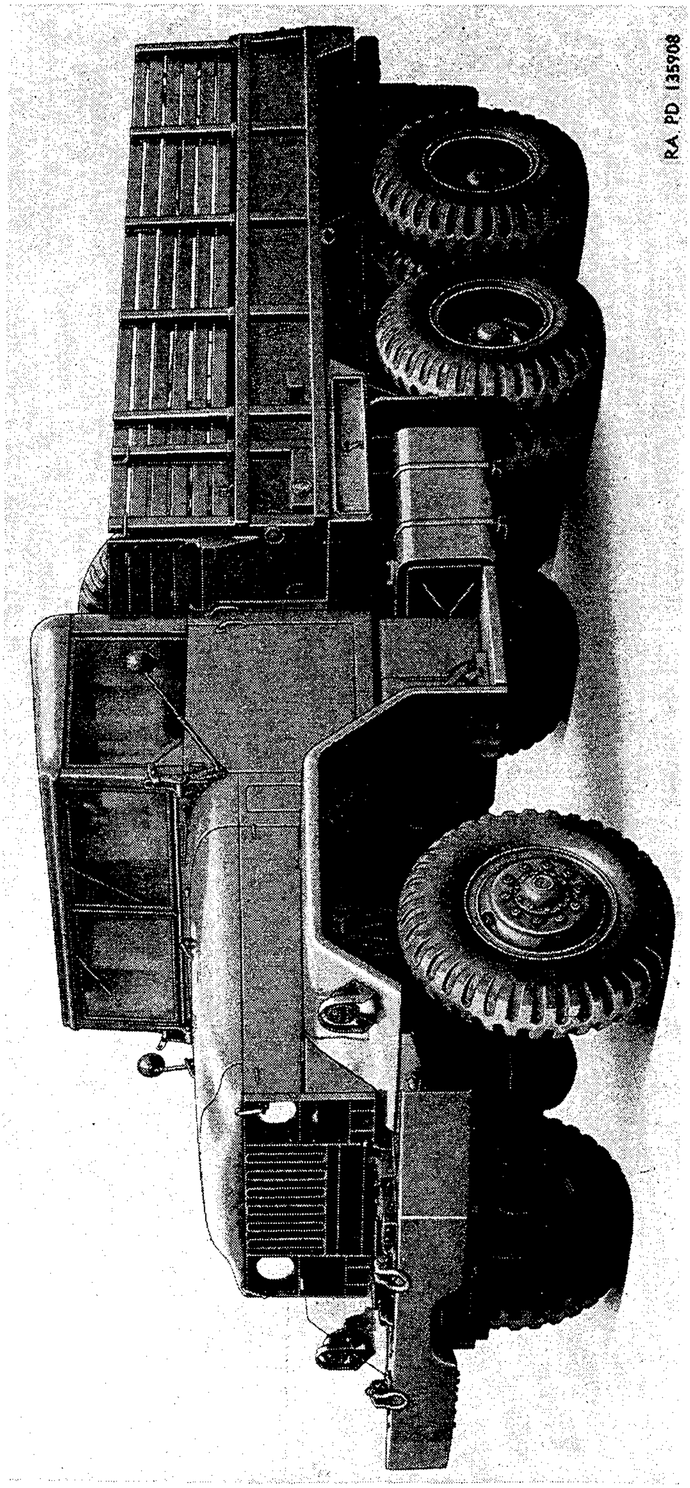


Figure 10. Cargo flat bed truck M54—left front view.

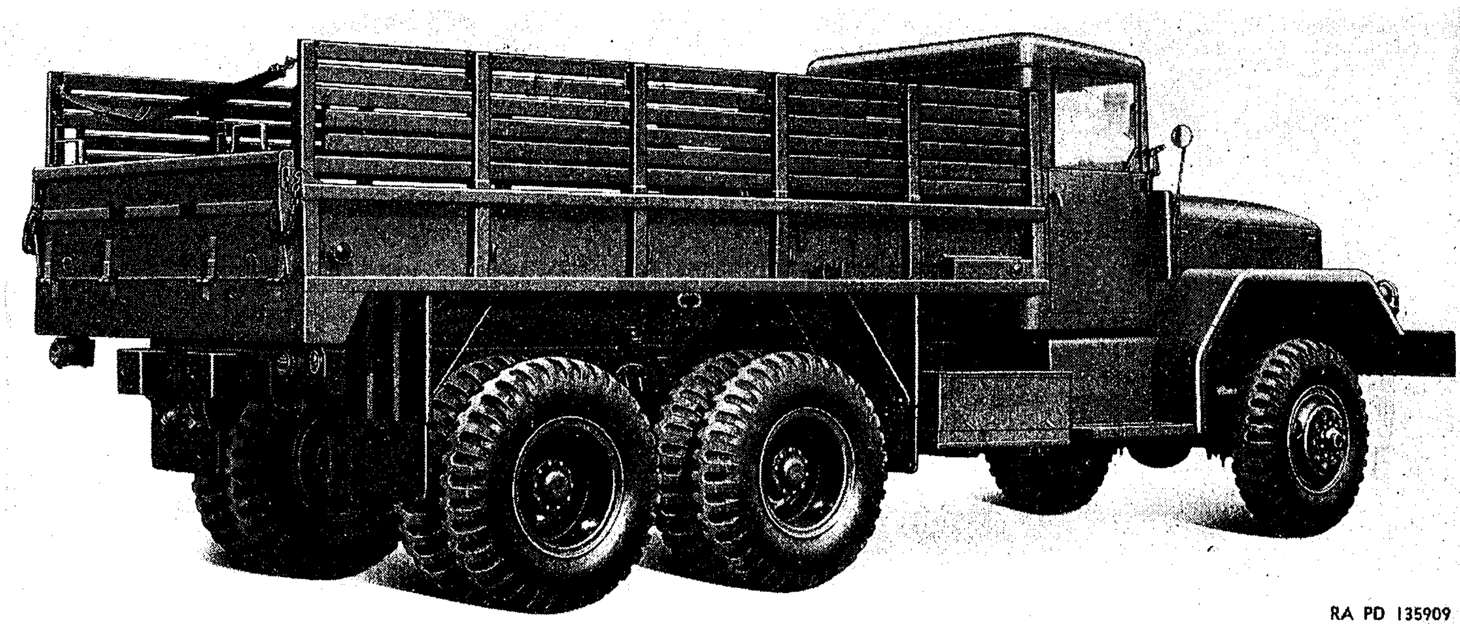


Figure 11. Cargo flat bed truck M54—right rear view.

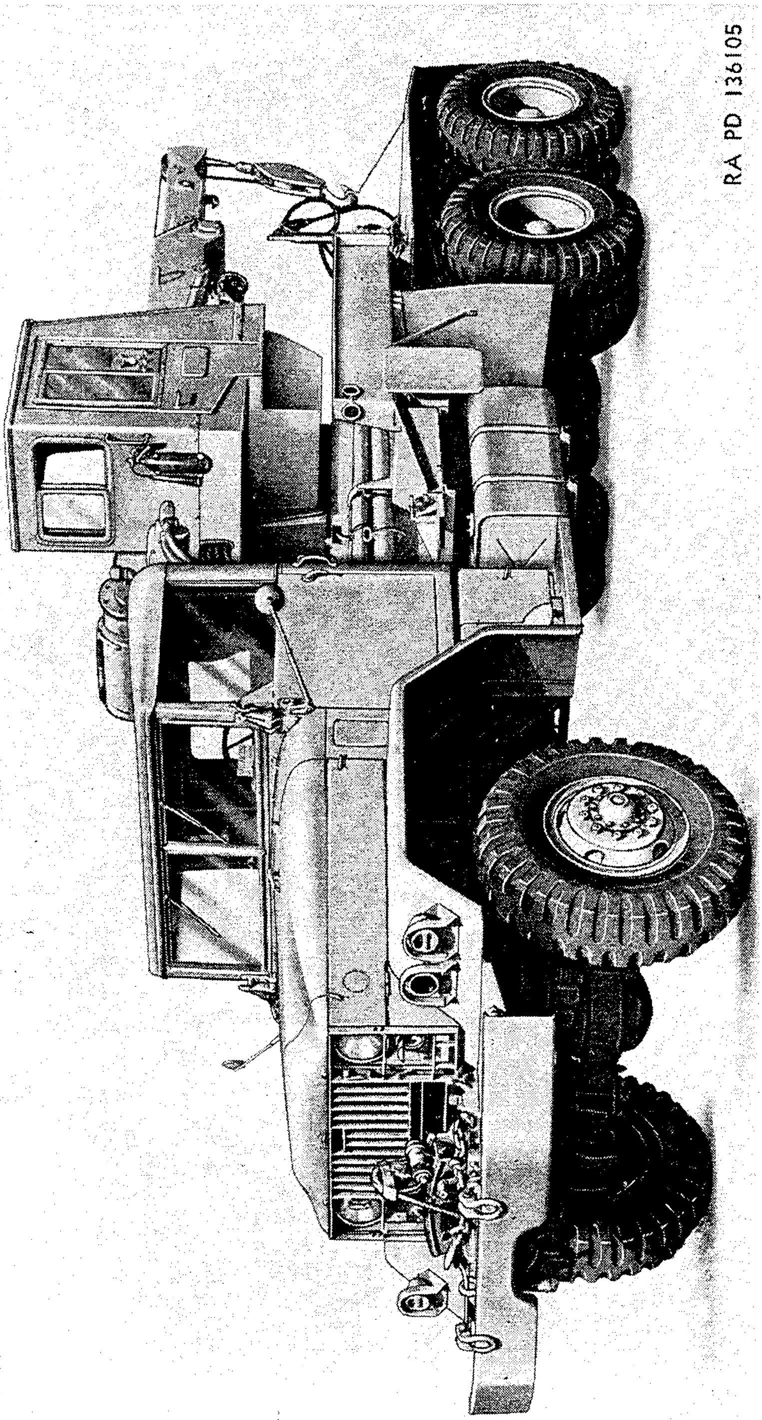


Figure 12. Tractor wrecker truck M246—left front view.

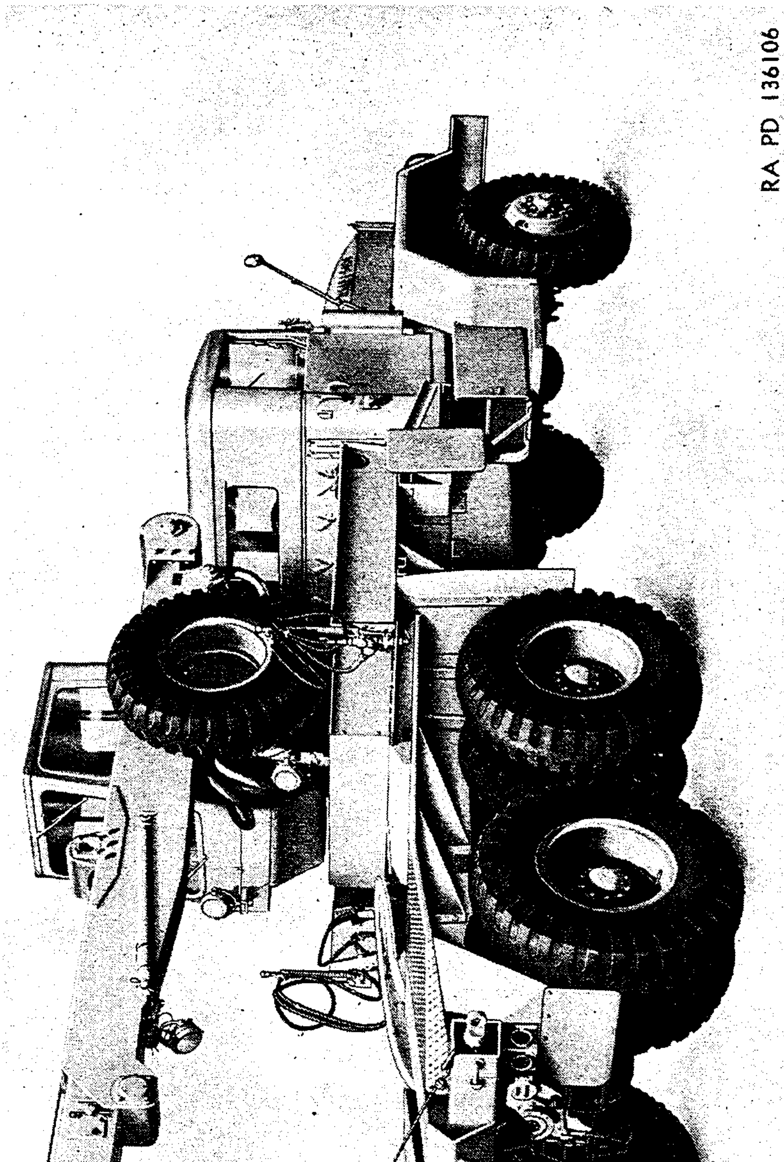


Figure 13. Tractor wrecker truck M246—right rear view.

with tapered roller bearings which support the spring seat connecting tube. Driving and braking forces are transmitted to the chassis by a system of torque rods arranged for parallel motion.

e. Power Plant. Power is supplied by a six cylinder, four cycle, water cooled, valve-in-head-type, gasoline engine. Accessories, such as generator, starter, distributor, oil filters, carburetor, clutch, et cetera are mounted on the engine. The transmission, mounted at the rear of the engine, has five speeds forward and one reverse. The clutch is of the single dry-disk-type and is attached to the engine flywheel.

f. Transfer. The transfer is a two-speed unit driven by the transmission and distributes power to the front and rear axles through propeller shafts. Driver's control is by a shift lever in the cab for high and low ranges. Transfer gearing is designed to drive the front axle only when the speed (rpm) of the rear axles exceeds that of the front axle (as during slipping or spinning of the rear wheels). An over-running clutch on the drive to the front axle automatically eliminates delivery of power to the front axle when the speed of the rear axle is the same as that of the front axle, as during normal operation. When the transmission is shifted into reverse gear, an air valve, mounted on the transmission, automatically shifts the over-running clutch into the reverse position. Power is then delivered to the front and rear axles during reverse motion in the same manner as described above for forward motion.

g. Bodies. For a description of the various types of bodies mounted on the rear of the chassis truck, refer to paragraph 5.

5. Difference Between Models

a. General. The 5-ton 6 x 6 trucks covered by this manual are of various wheelbases and body styles. A brief description of the various chassis and body types is as shown in *b* through *l* below.

b. Chassis Truck M40. The 5-ton 6 x 6 chassis truck M40 has a 179-inch wheelbase with 11:00 x 20 tires and dual wheels on the rear.

c. Chassis Truck M61. The 5-ton 6 x 6 chassis truck M61 has a 167-inch wheelbase with 11:00 x 20 tires and dual wheels on the rear.

d. Chassis Truck M139. The 5-ton 6 x 6 chassis truck M139 has a 215-inch wheelbase with 14:00 x 20 tires and dual wheels on the rear. This chassis is specifically designed for the transporting of bridge building equipment.

e. Chassis Truck M139C. The 5-ton 6 x 6 chassis truck M139C has a 215-inch wheelbase with 14:00 x 20 tires and dual wheels on the rear. This chassis is specifically designed for transporting the 762-mm rocket launcher. The M139C has an axle gear ratio of 10:26:1.00 which supplies increased tractive power.

f. Cargo Truck M41. The 5-ton 6 x 6 cargo truck M41 has a 179-inch wheelbase with 14:00 x 20 tires, single rear wheels, and a

14-foot cargo body mounted on the rear. The cargo body is suitable for transporting troops or cargo.

g. Cargo Truck M54. The 5-ton 6 x 6 cargo truck M54 has a 179-inch wheelbase with 11:00 x 20 tires and dual wheels on the rear. A 14-foot flat bed cargo body is mounted on the rear.

h. Dump Truck M51. The 5-ton 6 x 6 dump truck M51 has a 167-inch wheelbase with 11:00 x 20 tires and dual wheels on the rear. A 5-cubic-yard capacity dump body and twin-cylinder hoist assembly is mounted on the rear of the chassis.

i. Tractor Truck M52. The 5-ton 6 x 6 tractor truck M52 has a 167-inch wheelbase with 11:00 x 20 tires and dual wheels on the rear. A fifth wheel assembly, approach plates, and deck plate, suitable for hauling trailers, are mounted on the rear of the chassis. Tractor-to-trailer brake hose and connections are mounted behind the cab.

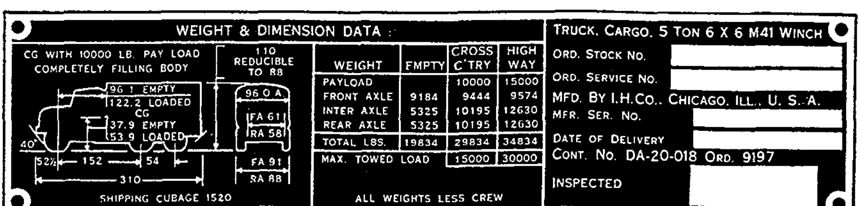
j. Medium Wrecker Truck M62. The 5-ton medium wrecker truck M62 has a 179-inch wheelbase with 11:00 x 20 tires and dual wheels on the rear. A hydraulic crane and winch assembly are mounted on the rear of the chassis.

k. Tractor Wrecker Truck M246. The 5-ton 6 x 6 tractor wrecker truck M246 has a 215-inch wheelbase with 12:00 x 20 tires and dual wheels on the rear. A hydraulic crane and a fifth wheel assembly are mounted on the rear of the chassis.

l. Front Winch Assembly. Some of the trucks are equipped with a winch mounted at the front of the truck on support brackets attached to frame side extensions. Power for operating the front winch is supplied by a propeller shaft extending from the power-take-off mounted on the right side of the transmission to the winch drive shaft. On vehicles which are not equipped with a front winch, frame extensions, winch support brackets, power-take-off, and winch propeller shaft are omitted, and the front bumper is inverted when assembled to the vehicle.

6. Name, Caution, and Instruction Plates

a. Truck nameplate. This plate (fig. 14), mounted on the instrument panel to the right of the instrument cluster (H, fig. 65), lists vehicle weight and dimension data, load weight data, and vehicle

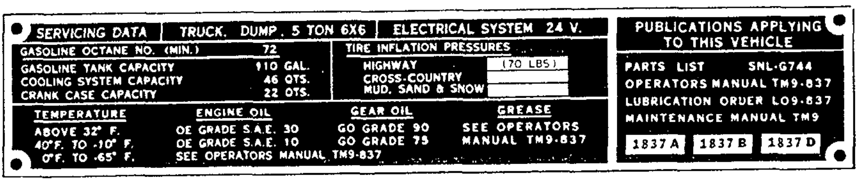


RA PD 135264

Figure 14. Truck nameplate—model M41.

identification data. Figure 14 illustrates the nameplate for the cargo truck M41 only. Corresponding data for other vehicles covered by this manual are contained in paragraph 7.

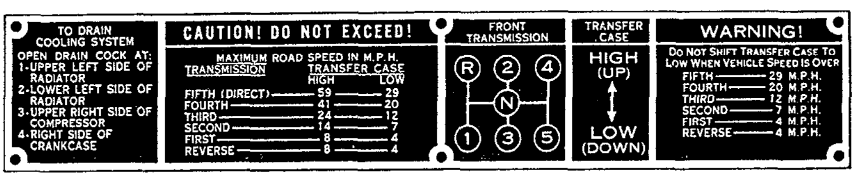
b. Servicing and Publication Data Plate. This plate (fig. 15), located at the right end of the instrument panel (D, fig. 65), lists servicing data, tire inflation pressure, capacities, TM numbers of technical manuals, and SNL numbers of parts manuals for use with the vehicle. Figure 15 illustrates the servicing and publication data plate for the dump truck M51 only. Corresponding data for other vehicles covered by this manual are contained in paragraph 7.



RA PD 136147

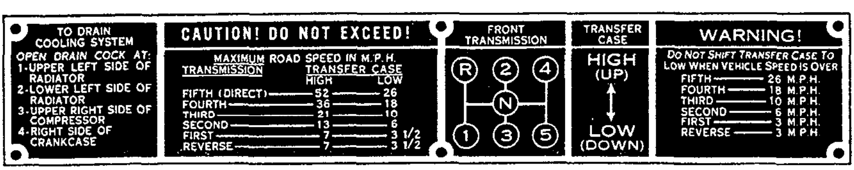
Figure 15. Servicing and publication data plate—model M51.

c. Instruction Plate. This plate (figs. 16 and 17), located at the left end of the instrument panel (Q, fig. 65), shows cooling system draining instructions, maximum allowable truck speeds when trans-



RA PD 135269

Figure 16. Instruction plate—models with 14 : 00 x 20 tires.

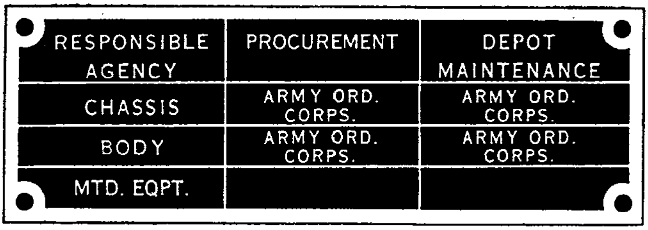


RA PD 135268

Figure 17. Instruction plate (models with 11 : 00 x 20 and 12 : 00 x 20 tires).

mission is shifted into its various positions, transmission shift diagram, and maximum allowable truck speeds for shifting the transfer to low or high positions.

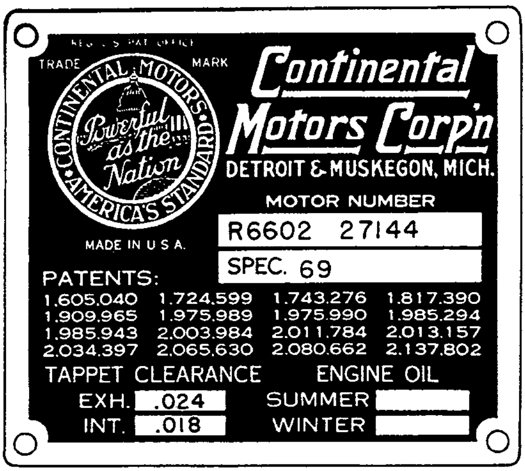
d. Responsible Agency Data Plate. This plate (fig. 18), located on the instrument panel to the right of the instrument cluster (G, fig. 65), shows the responsible agency procurement and depot maintenance data.



RA PD 135272

Figure 18. Responsible agency data plate.

e. Engine Nameplate. This plate (fig. 19), located on the top left side of the engine block toward the front of the engine (fig. 125), gives the engine serial number.



RA PD 203515

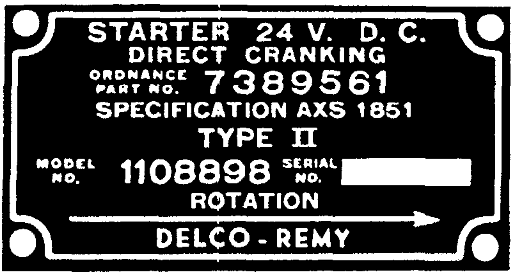
Figure 19. Engine nameplate.

f. Carburetor Nameplate. This plate (fig. 20), located on the front of the carburetor (H, fig. 119), gives the carburetor model number and part number.

RA PD 203518

Figure 20. Carburetor nameplate.

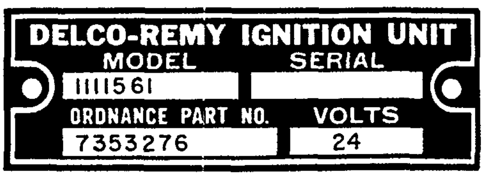
g. Starter Nameplate. This plate (fig. 21), located on the side of the starter housing (fig. 130), gives the model number, serial number, and direction of rotation of the armature.



RA PD 203516

Figure 21. Starter nameplate.

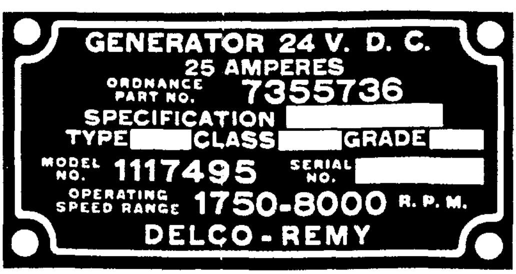
h. Distributor Nameplate. This plate (fig. 22), located on the side of the distributor drive housing (N, fig. 135), gives the model number, serial number, ordnance part number, and voltage of the unit.



RA PD 203517

Figure 22. Distributor nameplate.

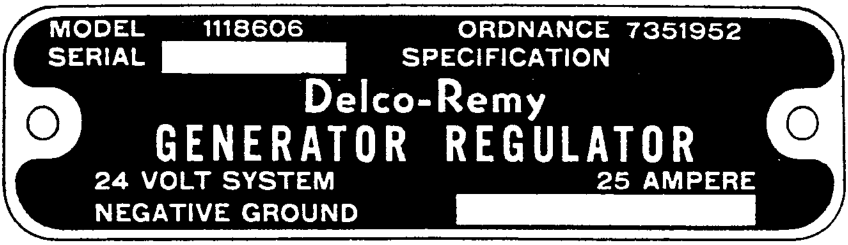
i. Generator Nameplate. This plate (fig. 23), located on the top right side of the generator (fig. 130), gives the ordnance part number, model number, and serial number of the unit.



RA PD 203519

Figure 23. Generator nameplate.

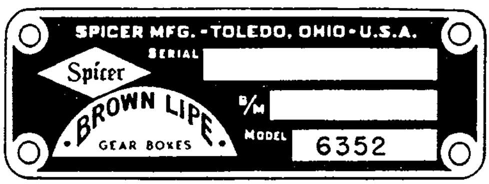
j. Generator Regulator Nameplate. This plate (fig. 24), located on the top of the regulator base (fig. 160), gives the ordnance part number, model number, and serial number of the units.



RA PD 203520

Figure 24. Generator regulator nameplate.

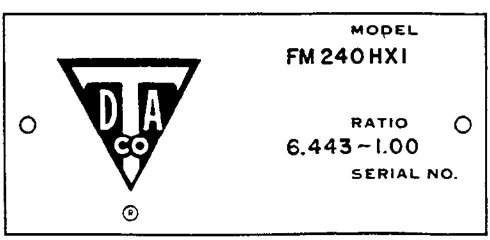
k. Transmission Nameplate. This plate (fig. 25), located on the left side of the transmission toward the rear (fig. 200), gives the model number and serial number of the unit.



RA PD 203521

Figure 25. Transmission nameplate.

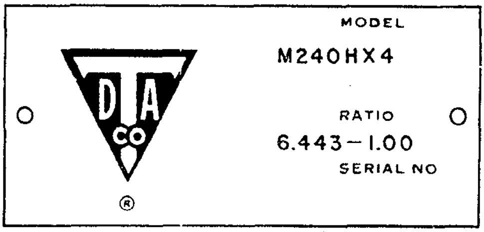
l. Front Axle Nameplate. This plate (fig. 26), attached to the front axle, gives the model number, serial number, and gear ratio of the unit.



RA PD 203522

Figure 26. Front axle nameplate.

m. Rear Axle Nameplate. This plate (fig. 27), attached to the rear axle, gives the model number, serial number, and gear ratio of the unit.



RA PD 203523

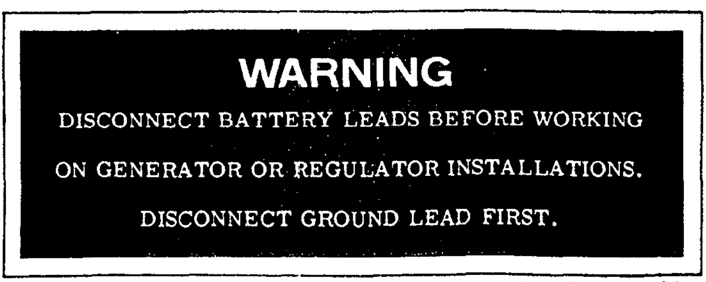
Figure 27. Rear axle nameplate.

n. Air Compressor Nameplate. This plate (fig. 28), located on the right side of the compressor cylinder block (fig. 154), gives the type number and serial number of the unit.

RA PD 203526

Figure 28. Air compressor nameplate.

o. Battery Disconnect Warning Plate. This plate (fig. 29), located on the side of the battery box (fig. 181), gives instructions regarding disconnecting battery leads when working on generator or generator regulator.



RA PD 203531

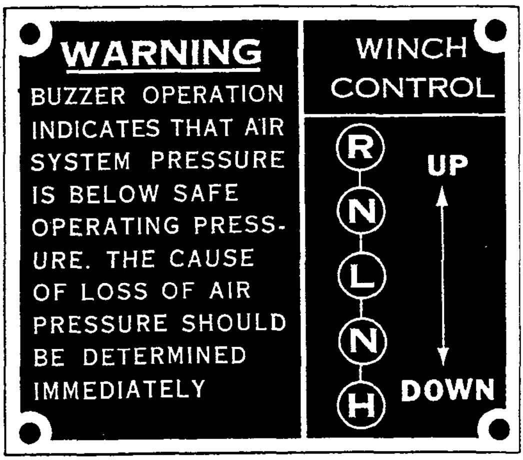
Figure 29. Battery disconnect warning plate.

p. Crankcase Ventilating Shutoff Valve Data Plate. This plate (fig. 30), located on the instrument panel to the right of the instrument cluster (F, fig. 65), gives instructions for operating the crankcase ventilating shutoff valves control before entering and leaving deep water.

RA PD 135271

Figure 30. Crankcase ventilating shutoff valves data plate.

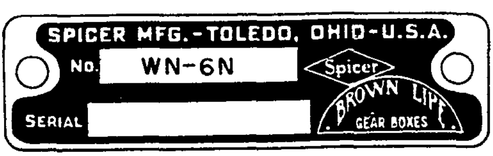
q. Low Air Pressure Warning and Winch Control Data Plate. This plate (fig. 31), located on the lower left end of the instrument panel (U, fig. 65), gives data on the air pressure warning system and the shifting diagram for the front winch control lever (par. 28).



RA PD 135273

Figure 31. Low air pressure warning and winch control data plate.

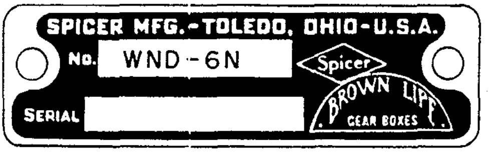
r. Power-Take-Off Nameplate. This plate (fig. 32), used on vehicles equipped with front winch except M51, located on the top of the power-take-off case (fig. 210), gives the model number and serial number of the unit.



RA PD 203524

Figure 32. Power-take-off nameplate—all models with front winch except M51.

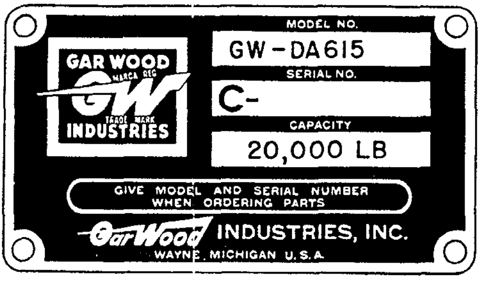
s. Power-Take-Off Nameplate. This plate (fig. 33), used on dump truck M51, located on the top of the power-take-off case (fig. 211), gives the model number and serial number of the unit.



RA PD 203525

Figure 33. Power-take-off nameplate—M51 only.

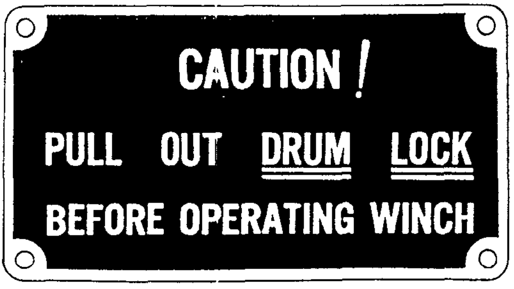
t. Front Winch Nameplate. This plate (fig. 34), located on the front of the level wind frame (L, fig. 71), gives the model number, serial number, and capacity of the unit.



RA PD 203527

Figure 34. Front winch nameplate—all models with front winch.

u. Front Winch Drum Lock Caution Plate. This plate (fig. 35), located on the upper left end of the winch end frame adjacent to the drum lock knob (j, fig. 71), cautions the operator to pull out the drum lock knob before operating the winch.



RA PD 136108

Figure 35. Front winch drum lock caution plate—all models with front winch.

v. Front Winch Clutch Lever Warning Plate. This plate (fig. 36), located on the upper left end of the winch end frame adjacent to the drum clutch lever (G, fig. 71), gives the operator important instructions regarding operation of the clutch lever.

RA PD 136109

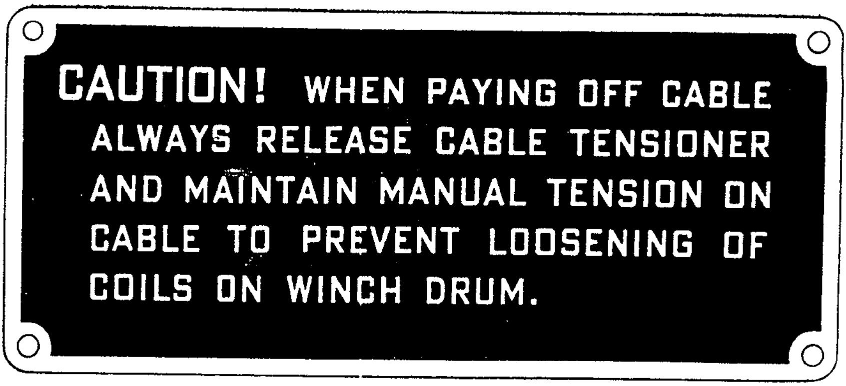
Figure 36. Front winch clutch lever warning plate—all models with front winch.

w. Front and Rear Winch Automatic Brake Caution Plate. This plate (fig. 37) located on the front of the winch automatic brake cover (Q, fig. 71), gives important instructions regarding the adjustment of the winch automatic safety brake.

RA PD 136111

Figure 37. Front and rear winch automatic brake caution plate—all models with winch.

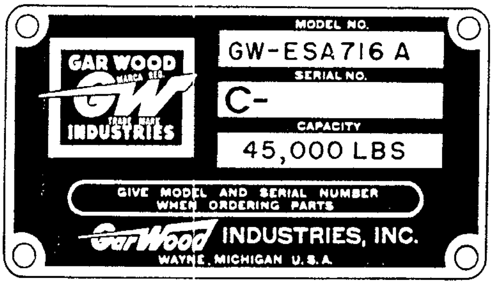
x. Front and Rear Winch Cable Tension Caution Plate. This plate (fig. 38), located on the front face of the level wind frame (fig. 71 and C, fig. 274), gives important instructions for unwinding the winch cable.



RA PD 136110

Figure 38. Front and rear winch cable tension caution plate—all models with winch.

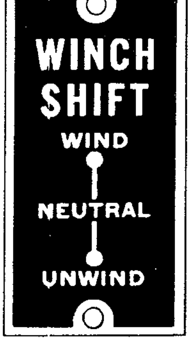
y. Rear Winch Nameplate. This plate (fig. 39), located on the rear of the level wind frame (B, fig. 274), gives the model number, serial number, and capacity of the unit.



RA PD 203528

Figure 39. Rear winch nameplate—model M62.

z. Rear Winch Shifting Instruction Plate. This plate (fig. 40), located adjacent to the rear winch shift lever (fig. 75) at the rear of the medium wrecker truck M62, gives shifting instructions for operating the rear winch.



RA PD 136113

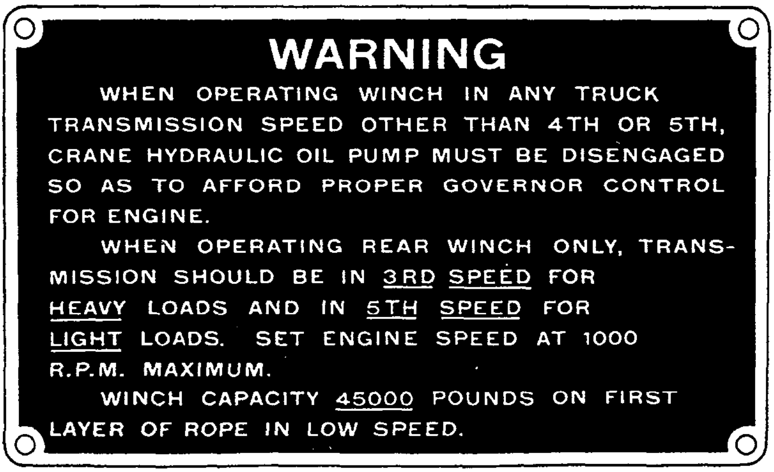
Figure 40. Rear winch shifting instruction plate—model M62.

aa. Winch Throttle Control Lever Instruction Plate. This plate (fig. 41), located adjacent to the throttle control lever (fig. 75) at the rear of the medium wrecker truck M62, gives instructions for operating the throttle control lever.

RA PD 136114

Figure 41. Winch throttle control lever instruction plate—model M62.

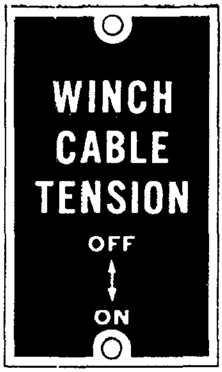
ab. Rear Winch Operation Warning Plate. This plate (fig. 42), located on the front of the wrecker body (fig. 74), gives important instructions regarding the selection of transmission gear ratios for rear winch operation.



RA PD 136115

Figure 42. Rear winch operation warning plate—model M62.

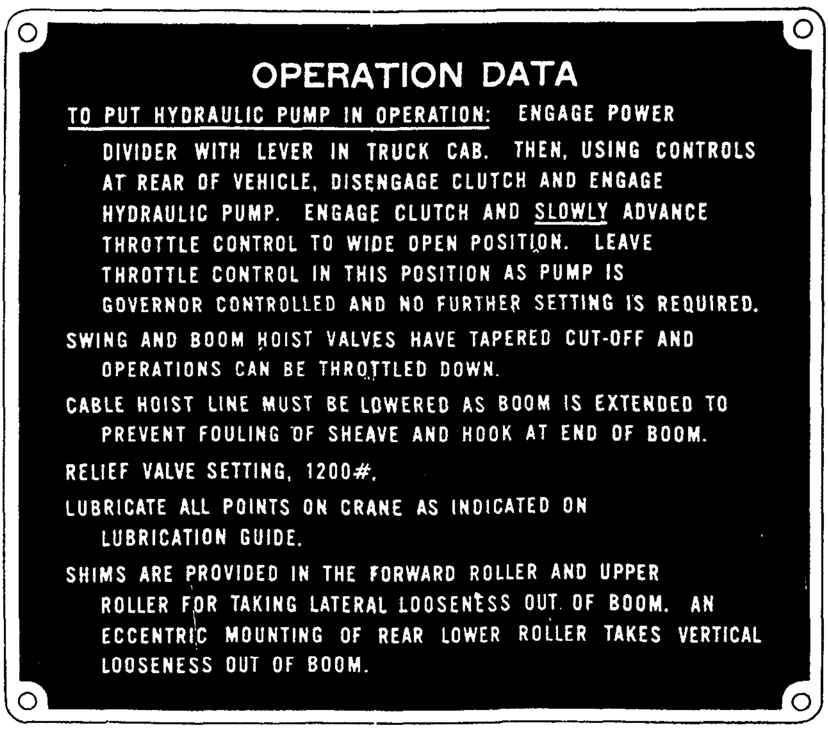
ac. Rear Winch Cable Tension Lever Instruction Plate. This plate (fig. 43), located adjacent to the cable tensioner valve lever (fig. 75) at the rear of the medium wrecker truck M62, gives instructions for operating the cable tensioner control valve lever.



RA PD 203498

Figure 43. Rear winch cable tension lever instruction plate—model M62.

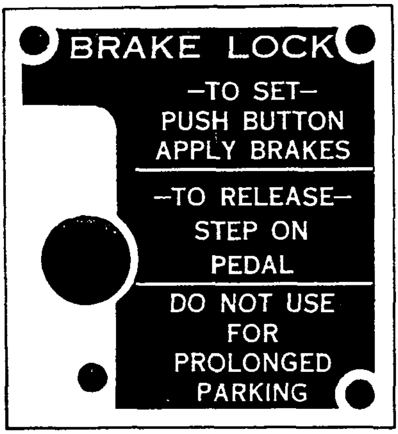
ad. Hydraulic Crane Operation Instruction Plate This plate (fig. 44), located on the control valve bank assembly cover (D, fig 80) in the crane operator's compartment on the medium wrecker truck M62, gives operating instructions and general data regarding the hydraulic crane.



RA PD 203506

Figure 44. Hydraulic crane operation instruction plate—model M62.

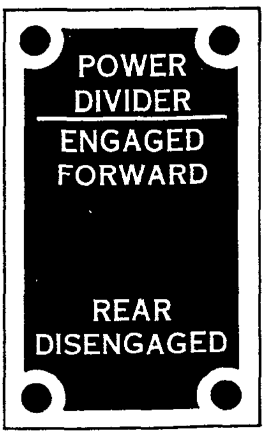
ae. Electric Brake Lock Data Plate. This plate (fig. 45), located on the instrument panel to the left of the instrument cluster (HH, fig. 65), gives instructions for operating the electric brake lock on the tractor wrecker truck M62 and medium wrecker truck M246.



RA PD 203530

Figure 45. Brake lock data plate—models M62 and M246.

af. Power Divider Control Data Plate. This plate (fig. 46), located on the instrument panel to the left of the instrument cluster (N, fig. 65), gives the shifting diagram for the power divider control lever used on the medium wrecker truck M62.



RA PD 203529

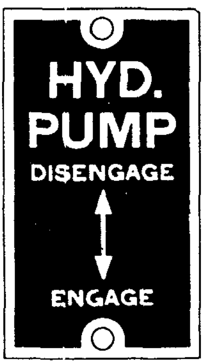
Figure 46. Power divider control data plate—model M62.

ag. Clutch Control Lever Instruction Plate. This plate (fig. 47), located adjacent to the clutch control valve (fig. 75) at the rear of the medium wrecker truck M62, gives operating instructions for the clutch control valve lever.

RA PD 136112

Figure 47. Clutch control lever instruction plate—model M62.

ah. Hydraulic Pump Control Lever Instruction Plate. This plate (fig. 48), located adjacent to the hydraulic pump control lever (fig. 75) at the rear of the medium wrecker truck M62, gives instruction for operating the hydraulic pump control lever.

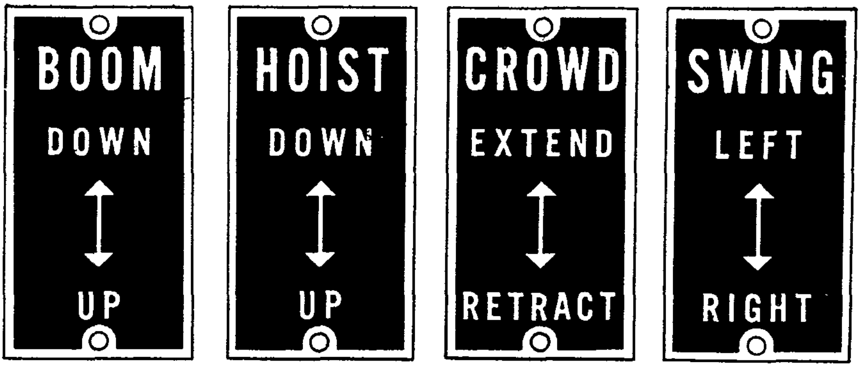


RA PD 203507

Figure 48. Hydraulic pump control lever instruction plate—model M62.

ai. Hydraulic Crane Control Lever Instruction Plates. These plates (fig. 49), located adjacent to the boom, hoist, crowd, and swing control valve levers on the control valve bank assembly cover in the crane operator's compartment (H, fig. 80 and L, fig. 88) on the medium wrecker truck M62 and tractor wrecker truck M246, give operating instructions for the crane control valve levers.

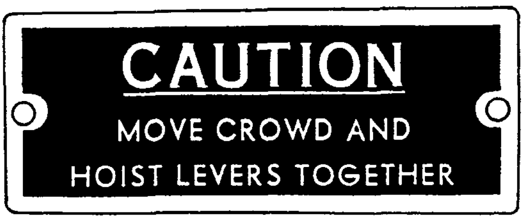
347797°—55——3



RA PD 203501

Figure 49. Hydraulic crane control lever instruction plates—models M62 and M246.

aj. Crowd and Hoist Levers Instruction Plate. This plate (fig. 50), located on the control valve bank assembly cover in the crane operator's compartment (L, fig. 80 and H, fig. 88) on the medium wrecker truck M62 and tractor wrecker truck M246, cautions the crane operator to operate the crowd and hoist control valve levers simultaneously to eliminate the possibility of jamming the cable block sheave into the boom head sheave.

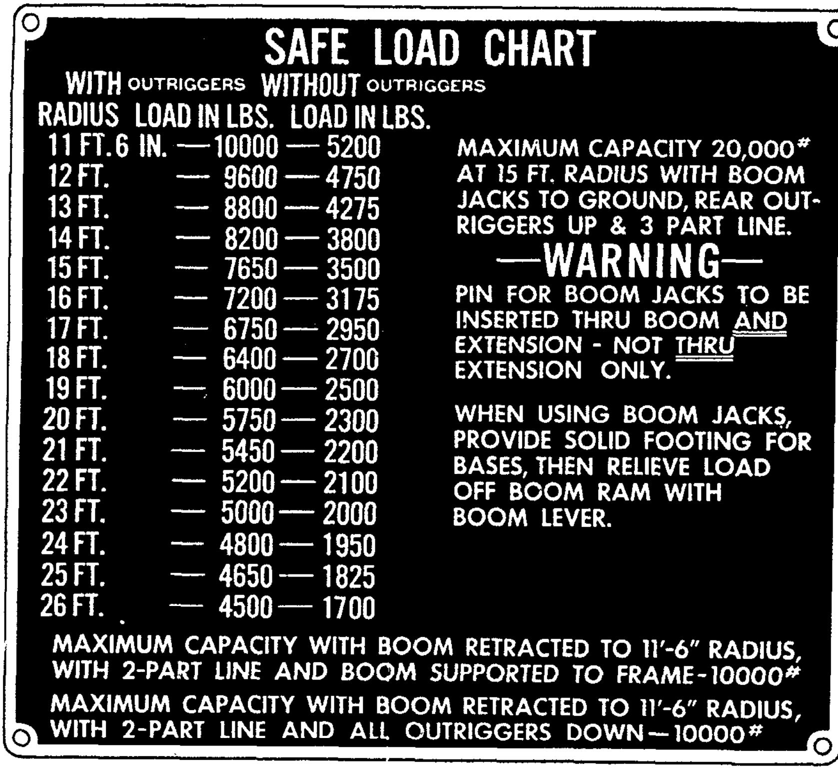


RA PD 203502

Figure 50. Crowd and hoist levers instruction plate—models M62 and M246.

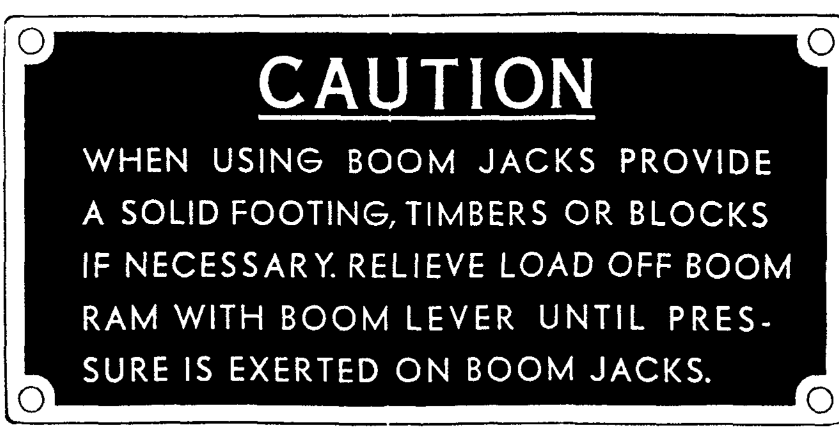
ak. Safe Load Data Plate. This plate (fig. 51), located on the control valve bank assembly cover (B, fig. 80) in the crane operator's compartment on the medium wrecker truck M62, gives the maximum allowable loads which can be lifted by the hydraulic crane at the various boom extended lengths.

al. Boom Jack Caution Plate. This plate (fig. 52), located on the control valve bank assembly cover in the crane operator's compartment (fig. 80) on the medium wrecker truck M62, gives instructions regarding use of boom jacks during crane operation.



RA PD 203509

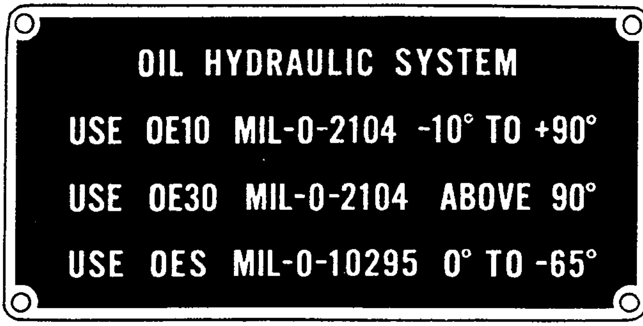
Figure 51. Safe load data plate—model M62.



RA PD 203508

Figure 52. Boom jack caution plate—model M62.

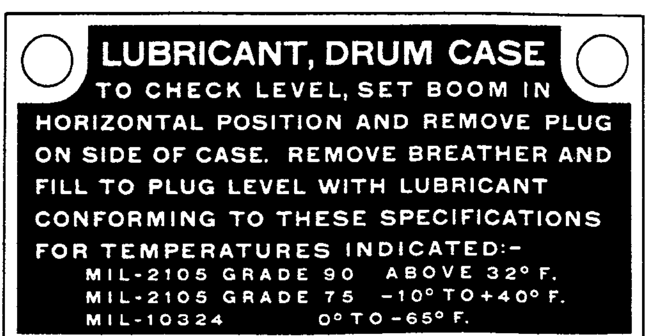
am. Hydraulic Oil Instruction Plate. This plate (fig. 53), located on the control valve bank assembly cover in the crane operator's compartment (M, fig. 80 and M, fig. 88) of the medium wrecker truck M62 and tractor wrecker truck M246, specifies the correct grade of oil for use in the crane hydraulic system for various weather conditions.



RA PD 136107

Figure 53. Hydraulic oil instruction plate—models M62 and M246.

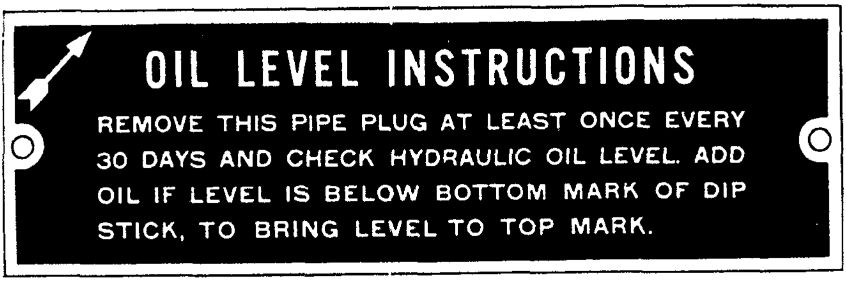
an. Cable Drum Gearcase Lubricant Plate. This plate (fig. 54), located on the right end of the drum gear housing (fig. 297) at the end of the crane boom assembly on the medium wrecker truck M62 and tractor wrecker truck M246, gives instructions regarding lubrication of the drum case.



RA PD 203499

Figure 54. Cable drum gearcase lubricant plate—models M62 and M246.

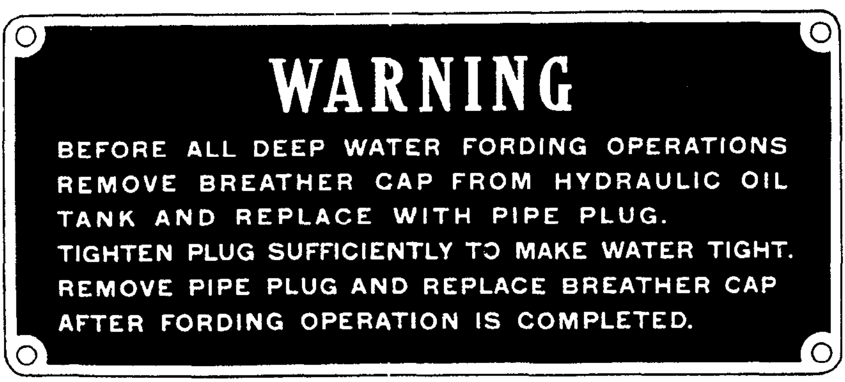
ao. Reservoir Oil Level Instruction Plate. This plate (fig. 55), located on the upper left end of the hydraulic crane oil reservoir (fig. 55), located on the upper left end of the hydraulic crane oil reservoir (fig. 90) adjacent to the reservoir filler plug, gives instructions for checking the lubricant level and filling the reservoir on the medium wrecker truck M62 and the tractor wrecker truck M246.



RA PD 203503

Figure 55. Reservoir oil level instruction plate—models M62 and M246.

ap. Before Deepwater Fording Warning Plate. This plate (fig. 56), located on the control valve bank assembly cover in the crane operator's compartment (N, fig. 80) on the medium wrecker truck M62, gives instructions for preparing the crane hydraulic reservoir for deep water fording.



RA PD 203510

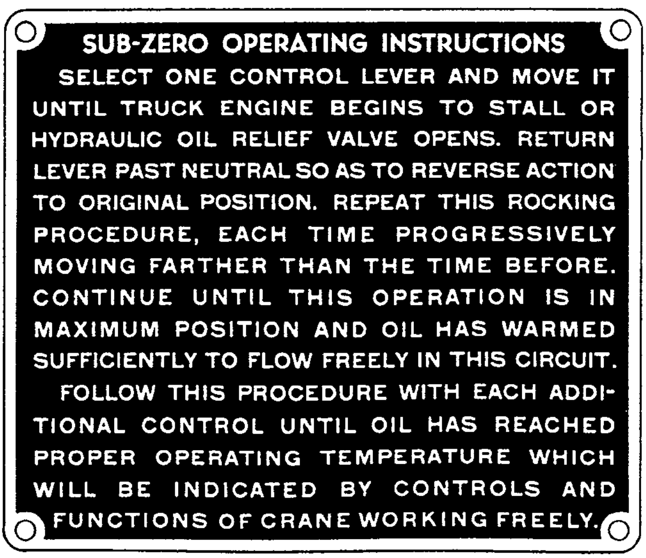
Figure 56. Before deepwater fording warning plate—model M62.

aq. After Deepwater Fording Warning Plate. This plate (fig. 57), located on the control valve bank assembly cover in the crane operator's compartment (A, fig. 80 and D, fig. 88) on the medium wrecker truck M62 and tractor wrecker truck M246, gives instruction for draining the pivot post ring gear housing after leaving deep water.

RA PD 203504

Figure 57. After deepwater fording warning plate—models M62 and M246.

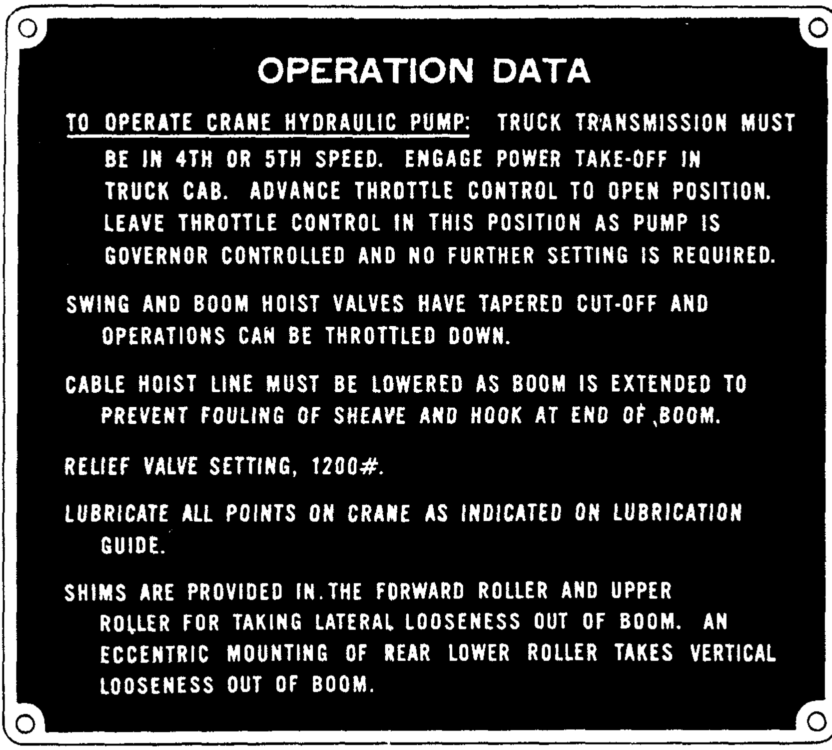
ar. Hydraulic Crane Winterization Operation Instruction Plate. This plate (fig. 58), located on the control valve bank assembly cover in the crane operator's compartment (E, fig. 80 and K, fig. 88), on the medium wrecker truck M62 and tractor wrecker truck M246, gives instructions for putting the crane in operation in subzero temperatures.



RA PD 203514

Figure 58. Hydraulic crane winterization operation instruction plate—models M62 and M246.

as. Hydraulic Crane Operation Instruction Plate. This plate (fig. 59), located on the control valve bank assembly cover (F, fig. 88) in the crane operator's compartment of the tractor wrecker truck M246, gives operating instructions and general data regarding the wrecker crane.



RA PD 203500

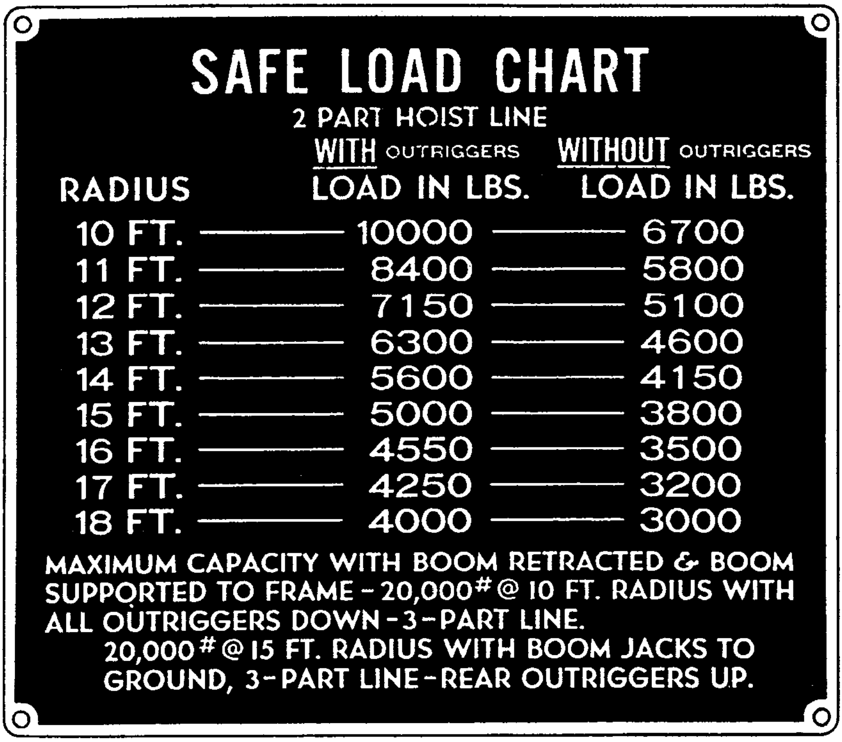
Figure 59. Hydraulic crane operation instruction plate—model M246.

at. Safe Load Data Plate. This plate (fig. 60), located on the control valve bank assembly cover in the crane operator's compartment (G, fig. 88) on the tractor wrecker truck M246, gives the maximum allowable loads which can be lifted by the hydraulic crane at the various boom extended lengths.

au. Hydraulic Reservoir and Swing Drive Deep Water Fording Warning Plate. This plate (fig. 61), located on the control valve bank assembly cover in the crane operator's compartment (N, fig. 88) on the tractor wrecker truck M246, gives instructions for preparing the hydraulic reservoir and swing drive for deep water fording.

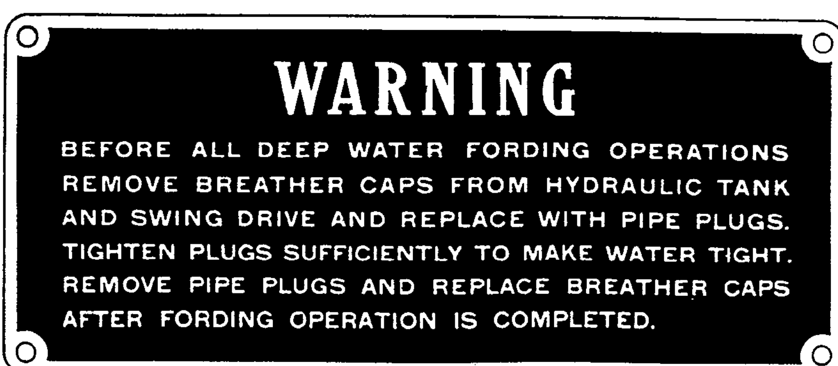
av. Hydraulic Crane Pivot Post Lock Pin Warning Plate. This plate (fig. 62), located on the control valve bank assembly cover in the crane operator's compartment (J, fig. 88) on the tractor wrecker truck M246, gives instructions regarding the use of the pivot post lockpin.

aw. Hydraulic Crane Swing Motor Drive Case Lubricant Plate. This plate (fig. 63), located on the top of the drive gearcase on the tractor wrecker truck M246 gives instructions for checking and filling the drive gearcase.



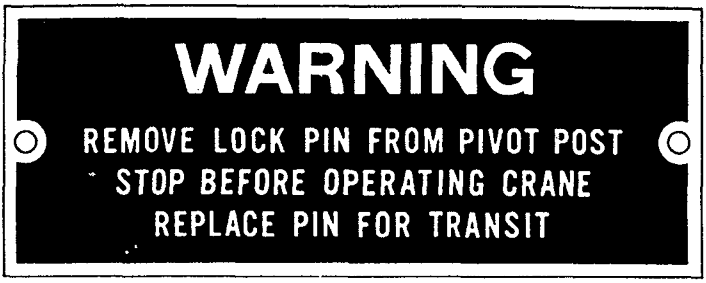
RA PD 203512

Figure 60. Safe load data plate—model M246.



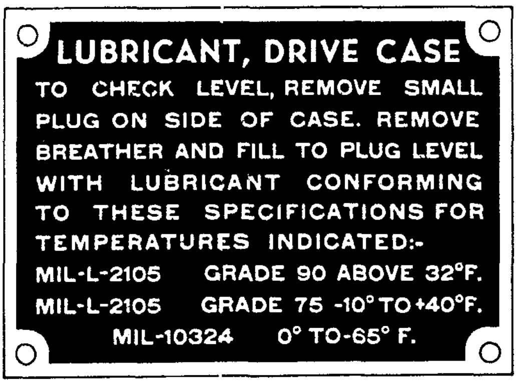
RA PD 203505

Figure 61. Hydraulic reservoir and swing drive deep water fording warning plate—model M246.



RA PD 203511

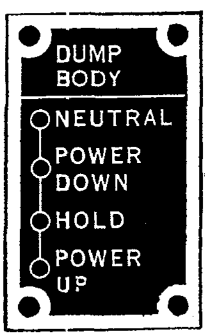
Figure 62. Hydraulic crane pivot post lockpin warning plate—model M246.



RA PD 203513

Figure 63. Hydraulic crane swing motor drive case lubricant plate—model M246.

ax. Dump Body Control Data Plate. This plate (fig. 64), located on the instrument panel to the left of the instrument cluster (N, fig. 65) on the dump truck M51, gives the shifting diagram for the dump body control lever.



RA PD 135270

Figure 64. Dump body control data plate—model M51.

7. Tabulated Data

a. General Data. The information contained in this paragraph applies to all models covered by this manual except as otherwise noted.

- Capacities:
  - Cooling system .... 44 qt
  - Crankcase (dry fill) .... 22 qt
  - Differentials (each) .... 12 qt
  - Fuel tank:
    - Models M40, M41, M54, M62, M139, M246 .... 78 gal
    - Models M51, M52, M61 .... 110 gal
  - Transfer case .... 5¼ qt
  - Transmission:
    - With power-take-off .... 11 qt
    - Less power-take-off .... 9 qt
  - Winch:
    - Front .... 2.6 pt
    - Rear .... 3 qt
- Crew 2
- Cylinders (in line) 6
- Dimensions
  - Height:
    - Models M40, M61 .... 102½ in.
    - Model M52 .... 103⅛ in.
    - Model M51 .... 110⅝ in.
    - Model M41 .... 111⅛ in.
    - Model M54 .... 116 in.
    - Models M139, M139C .... 120¾ in.
    - Model M62 .... 127⅛ in.
    - Model M246 .... 132 in.
  - Length:
    - With front winch:
      - Model M52 .... 273 in.
      - Model M51 .... 281⅝ in.
      - Models M40, M41 .... 309¾ in.
      - Model M54 .... 314¼ in.
      - Model M62 .... 348 in.
      - Model M246 .... 352 in.
      - Model M139 .... $273\frac{1}{16}$ in.
      - Model M61 .... 287¾ in.
    - Without front winch:
      - Model M52 .... 257½ in.
      - Model M51 .... 266⅛ in.
      - Model M139C .... 268 in.
      - Model M61 .... 272¼ in.
      - Models M40, M41 .... 294¼ in.
      - Model M54 .... 298¾ in.
  - Width:
    - Model M41 .... 96 in.
    - Models M40, M52, M54, M61, M62 .... 97 in.
    - Model M51 .... 97¼ in.
    - Model M246 .... $97\frac{11}{16}$ in.
    - Models M139, M139C .... 115 in.
- Electrical system .... 24 volts

Engine	Continental R6602
Ground clearance (under rear bogie torque rod):	
Models M40, M51, M52, M54, M62	10½ in.
Model M246	11 in.
Models M41, M139, M139C	13 in.
Loading height (empty):	
Model M41	54⅞ in.
Model M54	54⅞ in.
Model M51	58 in.
Number of batteries	2
Passengers (including crew)	
Model M41	16
Model M54	16
Pintle height (rear):	
Empty:	
Models M40, M51, M52, M54, M61, M62	29⅝ in.
Model M246	31⅜ in.
Model M41	32¼ in.
Model M139, M139C	33⅜ in.
Loaded:	
Models M40, M51, M52, M54, M61, M62	28¾ in.
Model M246	30⅜ in.
Model M41	32¼ in.
Model M139, M139C	32⅛ in.
Weight (all weights less crew):	
Gross (on highway):	
Model M41	34,834 lb
Model M40	39,501 lb
Model M54	39,945 lb
Model M61	41,242 lb
Model M51	42,663 lb
Model M52	43,996 lb
Model M62	45,325 lb
Model M246	48,830 lb
Model M139, M139C	47,366 lb
Gross (off highway):	
Model M40	29,501 lb
Model M41	29,834 lb
Model M54	29,945 lb
Model M61	30,043 lb
Model M51	32,663 lb
Model M52	33,996 lb
Model M139, M139C	37,366 lb
Model M62	40,325 lb
Model M246	44,830 lb
Net (with front winch):	
Model M40	17,501 lb
Model M61	18,043 lb
Model M52	18,996 lb
Model M41	19,834 lb
Model M54	19,945 lb
Model M51	22,663 lb
Model M139	27,366 lb
Model M246	32,830 lb
Model M62	33,325 lb

Weight (all weights less crew)—Continued

Net (without front winch):

Model M40	16,786 lb
Model M41	19,119 lb
Model M51	21,980 lb
Model M52	18,813 lb
Model M54	19,230 lb
Model M61	17,360 lb
Model M139C	26,591 lb

Payload (on highway):

Model M62	12,000 lb
Model M246	16,000 lb
Model M41	15,000 lb
Models M40, M51, M54, M61, M139, M139C	20,000 lb
Model M52	25,000 lb

Payload (off highway):

Model M62	7,000 lb
Models M40, M41, M51, M54, M61, M139, M139C	10,000 lb
Model M246	12,000 lb
Model M52	15,000 lb

Wheelbase:

Models M51, M52, M61	167 in.
Models M40, M41, M54, M62	179 in.
Models M139, M246, M139C	215 in.

b. Performance.

Allowable speed (Models M40, M51, M52, M54, M61, M62, M246):

	1st	*2d*	*3d*	*4th*	*5th*	*Reverse*
Transfer case—high range	7	13	21	36	52	7 mph
Transfer case—low range	3½	6	10	18	26	3½ mph

Allowable speed (Models M41, M139):

	1st	*2d*	*3d*	*4th*	*5th*	*Reverse*
Transfer case—high range	8	14	24	41	59	8 mph
Transfer case—low range	4	7	12	20	29	4 mph

Angle (with front winch):

Approach:

Models M40, M51, M52, M54, M61, M62, M246	37°
Model M41	40°
Model M139, M139C	41°

Departure:

Model M139, M139C	30°
Models M40, M54, M62	38°
Model M41	42°
Model M246	64°
Models M52, M61	68°
Models M51	69°

Cruising range (loaded at 30 mph):

Models M54, M62	214 miles
Model M40	217 miles
Model M246	229 miles
Model M139, M139C	241 miles
Model M41	248 miles
Model M52	300 miles
Model M61	307 miles
Model M51	488 miles

Engine horsepower (brake horsepower):	
At 2,800 rpm (less accessories)	224 hp
At 2,800 rpm (with accessories)	196 hp
Fording depth (max.)	30 in.
Fuel consumption (loaded)	4. 44 mpg
Grade ascending ability (max):	
Model M40	75. 63 percent
Model M41	67. 93 percent
Model M51	69. 69 percent
Model M52	77. 18 percent
Model M54	74. 50 percent
Model M61	77. 18 percent
Model M62	54. 70 percent
Model M139	45. 59 percent
Model M246	47. 62 percent
Recommended towed load (max on highway):	
All models except M52	30, 000 lb
Model M52	55, 000 lb
Recommended towed load (max off highway):	
Models M40, M41, M51, M54, M61, M139, M139c	15, 000 lb
Models M62, M246	20, 000 lb
Model M52	30, 000 lb
Turning circle (diam) right or left (min):	
With front winch:	
Models M51, M52, M61	39 ft 3 in.
Models M40, M41, M54, M62	41 ft 7 in.
Model M246	46 ft 8 in.
Model M139	47 ft ½ in.
Without front winch:	
Models M51, M52, M61	38 ft 9 in.
Models M40, M41, M54, M62	41 ft 1 in.
Model M246	46 ft 2 in.
Model M139c	46 ft 6½ in.

c. Detailed Data Reference. Additional detailed tabular data pertaining to individual components and systems are contained in the following paragraphs.

	Paragraph
Axle (front)	212
Axle (rear)	216
Batteries	152
Bodies:	
Dump	307
Fifth wheel	302
Wrecker (M62)	268
Wrecker (M246)	287
Brake system	219
Clutch	201
Compressed air system	231
Engine	106
Fuel system	119
Generating system	149
Ignition system	145
Power-take-off	208

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

8. Purpose

a. When a new or reconditioned vehicle is first received by the using organization, it is necessary for the organizational mechanics to determine whether the vehicle has been properly prepared for service by the supplying organization and is in condition to perform any mission to which it may be assigned when placed in service. For this purpose, inspect all assemblies, subassemblies, and accessories to be sure they are properly assembled, secure, clean, and correctly adjusted and/or lubricated. Check all tools and equipment (pars. 63–66) to be sure every item is present, in good condition, clean, and properly mounted or stowed.

b. In addition, completely check the operation of all new or reconditioned vehicles during the break-in period according to procedures in paragraph 10.

c. Whenever practicable, the vehicle driver will assist in the performance of these services.

9. Preliminary Services

a. General Procedures.

(1) Uncrate vehicle, if crated. Remove metal strapping, plywood, tape, seals, wrapping paper, and dehydrant bags. If any exterior surfaces are coated with rust-preventive compound, remove it with dry-cleaning solvent or volatile mineral spirits.

(2) Read Preparation Record for Storage or Shipment tag and follow all precautions checked thereon. This tag should be in the driver's compartment attached to the steering wheel or to the ignition switch.

(3) Crank engine slowly at least two revolutions, before turning ignition on, to test for hydrostatic lock. (This precaution is taken because there might be an excess of preservative oil in the combustion chambers or, possibly, coolant may have leaked into them.)

Note. If the vehicle has been driven to the using organization, most or all of the foregoing procedures should have already been performed.

b. Specific Procedures. Perform the Commander's D (6-month or 6,000-mile) (table IV) preventive maintenance service, with the variations listed in (1) through (6) below.

(1) Line out the other services on the worksheet (DA Form 461) and write in "New (or rebuilt) vehicle reception."

(2) Before starting engine, tighten cylinder-head nuts with a torque indicating wrench to the torque and in the sequence prescribed in paragraph 109*c*.

(3) Perform item 27, table IV, before starting the road test. If a processing tag (*a*(2) above) on the engine or vehicle states that the engine contains preservative oil that is suitable for 500 miles of operation, and of the correct seasonal viscosity, check the level but do not change the oil; otherwise change the oil. Lubricate all points, regardless of interval, except as noted in (6) below. Check the levels of the lubricant in all gearcases. If the gear lubricant is known to be of the correct seasonal grade, do not change it; otherwise change it.

(4) When the engine has been thoroughly warmed up to operating temperature, recheck the tightness of the cylinder-head nuts with a torque-indicating wrench to the torque and in the sequence prescribed in paragraph 109*c*.

(5) Item 35, table IV. Inspect breaker points; dressing should not be necessary.

(6) Item 39, table IV. Look at wheel bearings. If lubricating appears to be adequate, do not clean and repack. Do not adjust brakes unless necessary.

10. Break-In

a. General. Refer to paragraphs 44 through 50 for operating instructions. After the preliminary service has been performed, the break-in period (500 miles) may be accomplished in normal service of the vehicle under the supervision of a competent driver. The driver will be cautioned against excessive speeds, skipping speeds in shifting gears, rapid acceleration, or in any way loading the engine or power train to capacity during the break-in period. If the vehicle was driven to the using organization, include the mileage traveled in the break-in mileage. For operation and run-in of the dump body and hoist assembly (M51), front winch, rear winch (M62), and the wrecker crane assembly (M62 and M246), refer to paragraphs 51 through 56.

b. Specific Procedures.

(1) *Engine.* The engine must respond to controls and have maximum pulling power without unusual noises, stalling, misfiring, overheating, or unusual exhaust smoke.

(2) *Air pressure.* Observe if the brake air pressure builds up at a normal rate to the specified maximum limits and then cuts off (item 6, table IV). Also note if warning buzzer sounds while air pressure is below safe operating pressure.

(3) *Panel instruments and gages.* Observe all instruments and gages (fig. 65) frequently, noting whether they operate within the prescribed limits, temperatures, and pressures (pars. 14–43).

(4) *Horn and windshield wipers.* See that the horn and windshield wipers operate properly in response to manipulation of the controls in the operator's compartment (pars. 21 and 22).

(5) *Brake air-hydraulic cylinder operation.* With engine idling and truck stopped, depress brake pedal slowly and note if the air-hydraulic cylinder can be felt assisting the movement of the pedal. Poor or no booster action by the cylinder indicates that the compressed air system is inoperative.

(6) *Clutch.* Make sure clutch operates smoothly without chatter, grabbing, or slipping, and has sufficient free pedal travel (par. 202).

(7) *Transmission and transfer.* Observe operation of the gearshift mechanism to be sure that it operates smoothly and does not creep out of mesh.

(8) *Unusual noises.* Be on the alert continually for unusual noises that would indicate looseness of parts, damaged or malfunctioning units in the power train, cab, body, or wheels.

(9) *Steering.* Note any excessive pulling of the vehicle to either side of the road, wandering, or shimmy, and whether the steering hydraulic power unit is operating properly (par. 243).

(10) *Foot and handbrakes.* Footbrakes should stop truck smoothly without side pull within a reasonable distance with one-third reserve pedal travel. The handbrake must hold truck on a reasonable incline with one-third reserve adjustment.

(11) *Electric brake lock (M62 and M246).* Check operation of the electric brake lock by pressing the switch button (HH, fig. 65) on the instrument panel as the brake pedal is depressed. This will set the brakes and prevent the vehicle from moving. To release the lock, depress the brake pedal, which equalizes the pressure in the hydraulic lines, and the brakes will automatically release.

(12) *Air-brake system leaks.* With the air pressure at the governed maximum (105 to 120 psi as indicated by the air pressure gage (DD, fig. 65) on the instrument panel), stop the

engine. There should not be a noticeable drop in pressure within 1 minute.

(13) *Temperatures.* Cautiously hand-feel each brakedrum, wheel hub, and differential assembly (front and rear) for overheating. Look for excessive oil leaks.

(14) *Leaks.* Inspect within engine compartment and underneath the truck for oil, coolant, and fuel leaks, and determine their source.

c. Publications and Reports.

(1) *Publications.* See that the operator's manual, lubrication order, and Standard Form 91 (Operator's Report of Motor Vehicle Accident) are legible and properly stowed in truck.

(2) *Reports.* Forms, records, and reports will be accomplished as prescribed by TM 9–2810.

d. Service After 500 Miles. After 500 miles of vehicle operation, perform the Commander's C (1,000-mile or 60 days (table IV)) preventive maintenance service, with the variations in (1) and (2) below.

(1) Line out the other services on the worksheet (DA Form 461) and write in "New (or rebuilt) vehicle 500-mile service."

(2) Change the engine oil.

e. Service After 1,000 Miles. When the vehicle has been driven 1,000 miles, it will be placed on the regular preventive maintenance schedule and will be given the first regular Commander's C (1,000-mile or 60 days) preventive maintenance service.

11. Correction of Deficiencies

a. Ordinary deficiencies disclosed during the preliminary inspection and servicing or during the break-in period will be corrected by the using organization or a higher maintenance echelon.

b. Serious deficiencies, which appear to involve unsatisfactory design or material, will be reported on DA Form 468. The commander of the using organization will submit the completed form to the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM, or chief of appropriate technical service for other than ordnance equipment.

Section II. CONTROLS AND INSTRUMENTS

12. General

This section describes, locates, and illustrates the various controls and instruments provided for the proper operation of the 5-ton 6 x 6 trucks covered by this manual. For the use of these controls in the operation of these trucks, refer to paragraphs 44 through 50. For description and information on controls for the dump body and hoist assembly, fifth wheel assembly, front and rear mounted winches, and wrecker cranes, refer to paragraphs 51 through 56.

13. Steering Wheel

The steering wheel (P, fig. 65) controls the movement of the truck front wheels, which in turn controls the direction of travel of the vehicle, by means of a cam- and lever-type steering gear to which has been added a hydraulic power system. Rotation of the steering wheel to the right or to the left causes a corresponding movement of the front wheels.

14. Ignition Switch

The lever-type ignition switch (R, fig. 65) is mounted on the instrument panel to the driver's left. The switch level is moved clockwise to the ON position when starting the engine.

15. Starter Button

The engine starter is actuated by a starter button (CC, fig. 65) located on the floor of the operator's compartment forward of the accelerator pedal. Initial movement of the starter button engages the starter pinion with the flywheel. Further movement completes the electrical circuit from the battery to the starter, thereby causing the starter armature to rotate and crank the engine.

16. Choke Control

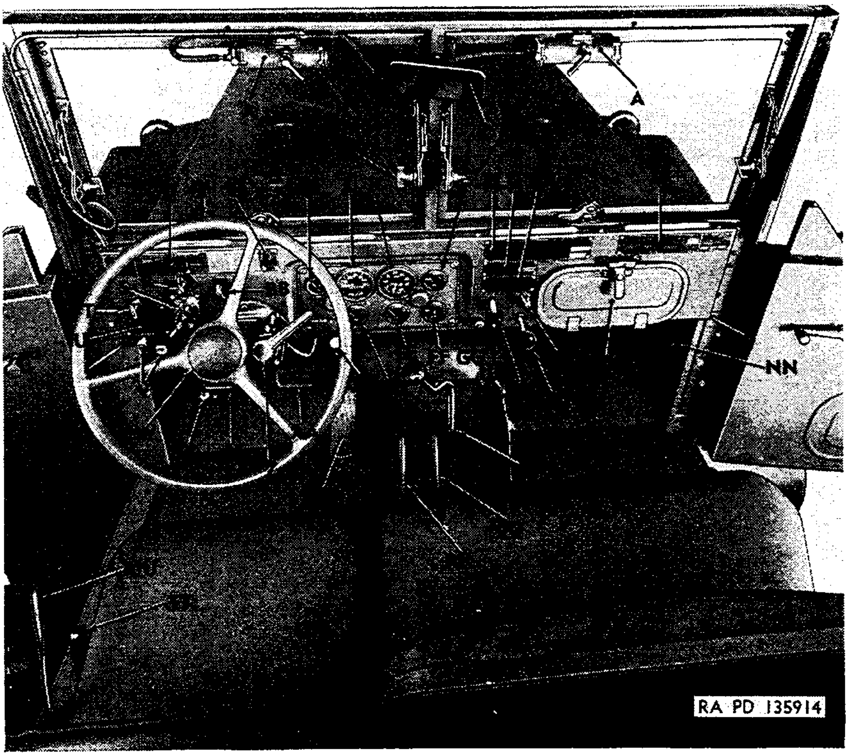
The choke control (GG, fig. 65) is located on the instrument panel to the right of the instrument cluster. When the control knob is pulled out, the choke valve plate in the carburetor closes. A return spring on the choke linkage returns the choke valve plate to the open position when the control knob is pushed in. The choke control is used when starting and operating a cold engine.

17. Accelerator Pedal

The accelerator pedal (SS, fig. 65) is located on the floor of the operator's compartment for operation by the driver's right foot. Depressing the pedal, which is linked to the throttle valve plate in the carburetor, will accelerate the engine to any desired speed up to governed speed. A return spring in the accelerator pedal linkage causes the throttle valve plate to move to its fully closed position when the accelerator pedal is completely released, allowing the engine to operate at a set idling speed.

18. Throttle Control

The throttle control (T, fig. 65) is located on the instrument panel to the driver's left. This control is linked to the carburetor and may be used instead of the accelerator to increase engine speed. Pulling out on the knob, which is automatically held in the OUT position by engagement of a locking device (fig. 72) on the back of the instru-



A—Windshield wiper
B—Windshield adjusting arm clamping screw
C—Rear view mirror
D—Servicing and publication data plate
E—Windshield locking handle
F—Crankcase ventilating shutoff valve data plate
G—Responsible agency data plate
H—Truck nameplate
J—Temperature gage
K—Tachometer
L—Speedometer
M—Fuel gage
N—Dump body control data plate (M51) or power divider control data plate (M62)
P—Steering wheel
Q—Instruction plate
R—Ignition switch
S—Light switch
T—Throttle control
U—Low air pressure warning and winch control data plate
V—Trouble light outlet
W—Horn button
X—Dimmer switch
Y—Clutch pedal
Z—Handbrake valve (trailer brakes)
AA—Brake pedal
BB—Warning light switch
CC—Starter button
DD—Air pressure gage
EE—Oil pressure gage
FF—Ammeter
GG—Choke control
HH—Electric brake lock switch button and data plate
JJ—Crankcase ventilating shut-off valves control
KK—Primer pump (early production vehicles only)
LL—Floodlight switch
MM—Map compartment
NN—Cowl ventilator
PP—Transmission gearshift lever
QQ—Transfer shift lever (early production vehicles) or winch control lever (late production vehicles)
RR—Winch control lever (early production vehicles) or transfer shift lever (late production vehicles)
SS—Accelerator pedal
TT—Handbrake lever
UU—Dump body control lever (M51) or power divider control lever (M62).

Figure 65. Instruments and controls.

ment panel with serrations on the control shaft, causes the throttle valve plate in the carburetor to open and increase the speed of the engine. Releasing the throttle control, by rotating the knob counter-clockwise so as to disengage the serrations on the shaft from the locking device, and moving the knob to the IN position causes the throttle valve plate in the carburetor to return to its fully closed position, allowing the engine to operate at a set idling speed.

19. Light Switch

a. General. The light switch (S, fig. 65) is located on the instrument panel to the driver's left. This switch (fig. 66) is a three-lever type with main switch, auxiliary switch, and mechanical switch levers. The main and auxiliary switches interlock to prevent the

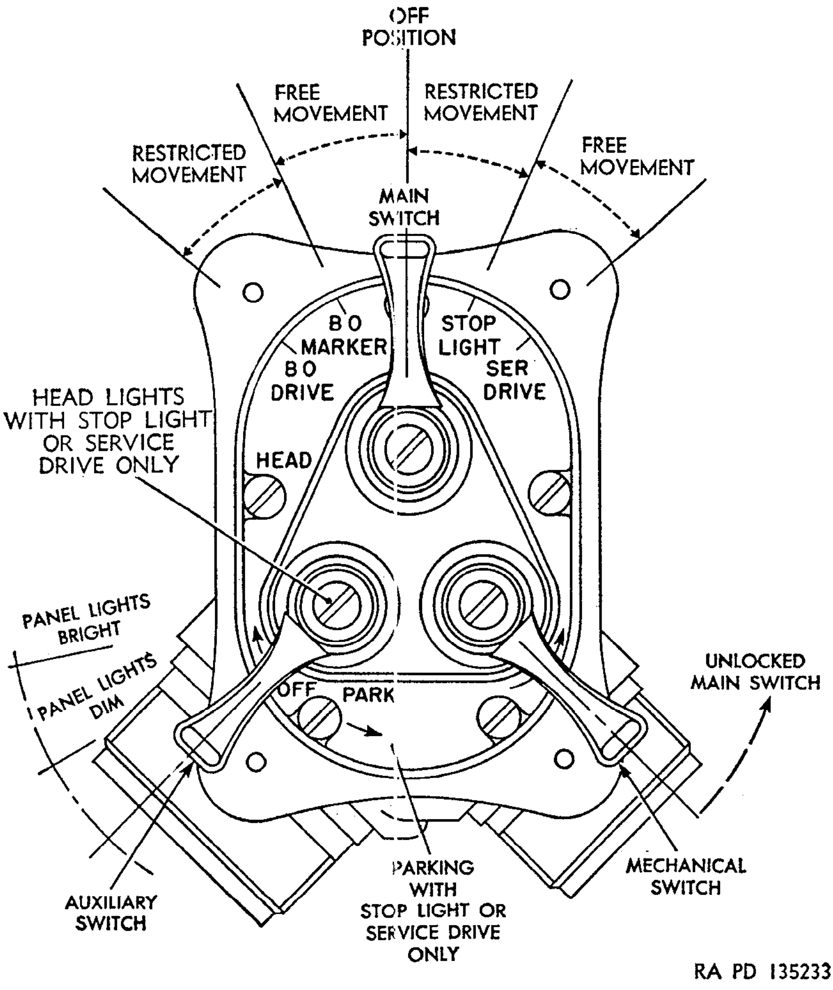


Figure 66. Light switch.

service headlights or parking lights from being turned on when the main switch lever is in blackout or daylight driving positions.

b. Main Switch. The five-position main switch (fig. 66) is located at the top with the lever pointing up when in the OFF position. This switch controls the blackout marker, blackout drive, service stop, and service drive lights when the lever is moved to the positions shown in figure 66. In order to move the main switch lever to the RESTRICTED MOVEMENT position shown in figure 66, the mechanical switch lever must first be moved counterclockwise and held in the UNLOCKED MAIN SWITCH position (fig. 66).

c. Auxiliary Switch. The four-position auxiliary switch (fig. 66) is located below and to the left of the main switch with the lever pointing 45° to the left when in the OFF position. This switch controls instrument cluster lights, service headlights, and parking lights. It is inoperative when the main switch lever is in the OFF position.

d. Mechanical Switch. The mechanical switch is located below and to the right of the main switch with the lever pointing 45° to the right. The main switch interlocks with this switch to prevent accidental turning on of the service stoplight or taillights. In order to move the main switch lever to the RESTRICTED MOVEMENT positions, the mechanical switch lever must first be moved counterclockwise and held in the UNLOCKED MAIN SWITCH position (fig. 66).

20. Dimmer Switch

The dimmer switch (X, fig. 65) is located on the floor of the operator's compartment for manipulation by the driver's left foot. The main switch lever must be in the SER DRIVE position and the auxiliary switch lever turned up to the PANEL LIGHTS BRIGHT or PANEL LIGHTS DIM position before this switch is operative (fig. 66). Depressing this switch alternately changes the headlights from bright to dim or dim to bright as required. A signal light, located on the lower left side of the instrument cluster, indicates when the high beam or bright lights are on.

21. Horn Button

The horn button (W, fig. 65) is located in the center of the steering wheel and is depressed to sound the electrically controlled air horn.

22. Windshield Wiper Control

The windshield wiper control (fig. 67) for the air-operated windshield wipers, is located on the instrument panel to the driver's left. The control button is rotated counterclockwise to start the wipers and clockwise to stop the wipers. Each windshield wiper (A, fig. 65) mounted at the top of the windshield frame, is provided with a lever for manual operation of the wiper blade.

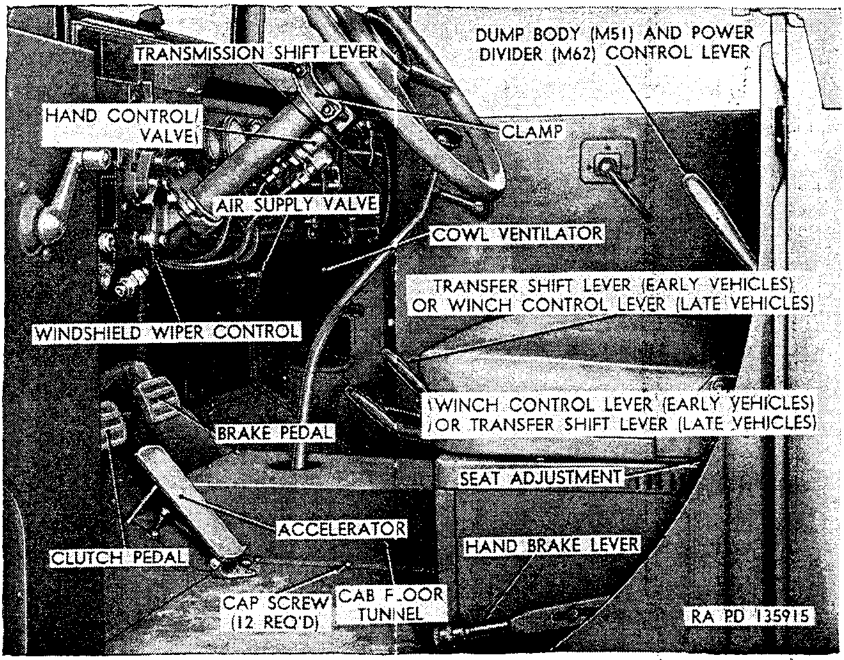


Figure 67. Driver's compartment—left side view.

23. Clutch Pedal

The clutch pedal (fig. 67) is located on the floor of the operator's compartment and is manipulated by the driver's left foot. The pedal is depressed to disengage the clutch to permit shifting of the transmission gears. A return spring in the clutch pedal linkage and springs inside the clutch assembly cause the clutch to return to the fully engaged position whenever the driver's foot is removed from the pedal.

24. Brake Pedal

The brake pedal (fig. 67) is located on the floor of the operator's compartment to the right of the clutch pedal and is manipulated by the driver's right foot. The pedal is depressed to apply the air-assisted hydraulic brakes. Return springs fastened to the brakeshoe and to the brake pedal linkage cause the brakes to be fully released whenever the driver's foot is removed from the pedal.

25. Handbrake Lever

The handbrake lever (fig. 67), located to the left of the driver's seat, is manipulated by the driver's left hand. The lever is pulled up to apply the handbrake and pushed down to release the handbrake.

26. Transmission Gearshift Lever

The transmission gearshift lever (PP, fig. 65) extends from the transmission through the cab floor tunnel and is manipulated by the driver's right hand. Shifting of the transmission gears is accomplished by moving this lever as indicated on the vehicle instruction plate (figs. 16 and 17) with the engine clutch in the disengaged position (par. 23).

27. Transfer Shift Lever

The transfer shift lever (QQ, fig. 65) (early production vehicles) (RR, fig. 65) (late production vehicles) is located between the driver's and assistant's seats and is manipulated by the driver's right hand. The lever is pulled up, as shown on vehicle instruction plate (figs. 16 and 17), to shift the transfer into HIGH range, or pushed down to shift into LOW range. Detailed instructions for shifting the transfer are given in paragraph 46.

28. Front Winch Control Lever

The front winch control lever (RR, fig. 65) (early production vehicles) (QQ, fig. 65) (late production vehicles) is located between the driver's and assistant's seats and is manipulated by the driver's right hand. Shifting instructions for this five-position lever are shown on the air pressure warning and winch control plate (fig. 21) located on the instrument panel.

29. Ammeter

The ammeter (FF, fig. 65), located in the lower right corner of the instrument cluster, indicates activity of the generating circuit. The ammeter should show a charge reading when the engine is first started.

30. Fuel Gage

The fuel gage (M, fig. 65), located in the upper left corner of the instrument cluster, is an electrically operated unit which indicates the level of gasoline in the fuel tank. The gage registers only when the ignition switch (par. 14) is in the ON position.

31. Temperature Gage

The temperature gage (J, fig. 65), located in the upper right corner of the instrument cluster, registers the temperature of the coolant in the cooling system. Normal operating temperature range of the coolant is 160° to 180° F.

32. Oil Pressure Gage

The oil pressure gage (EE, fig. 65), located in the right side and near the bottom of the instrument cluster, indicates oil pressure when the engine is running. Normal oil pressure when the engine is idling is 15 psi. Pressure readings may fluctuate as engine speed increases or decreases but a sudden drop or an unusual fluctuation of pressure reading indicates loss of oil pressure or faulty operation of gage. Stop engine and determine cause.

33. Air Pressure Gage

The air pressure gage (DD, fig. 65), located at the left side and near the bottom of the instrument cluster, indicates the air pressure in the compressed air system. The correct operating pressure range is from 110 to 115 psi.

34. Speedometer

The speedometer (L, fig. 65), located in the left side and near the top of the instrument cluster, indicates road speed of the truck in miles per hour and records total mileage traveled.

35. Tachometer

The tachometer (K, fig. 65), located in the right side and near the top of the instrument cluster, indicates operating speed of the engine in revolutions per minute. It is provided to assist the driver in keeping the engine operating speed within the range of maximum efficiency.

36. Electric Brake Lock Switch Button (M62 and M246)

The electric brake lock switch button and data plate (HH, fig. 65), located on the right and near the bottom of the instrument panel, is used to lock the vehicle service brakes in a hold position during operation of the wrecker crane. The electric brake lock is operated by depressing the brake pedal, pushing in on the brake lock switch button, and releasing the brake pedal. When the electric brake lock is in operation, depressing the brake pedal and releasing it will automatically release the lock.

37. Floodlight Switch (M62 and M246)

The floodlight switch (LL, fig. 65) is located to the right of the electric brake lock switch and directly below the fording instruction plate on the instrument panel. The switch lever is moved clockwise for the ON position and counterclockwise for the OFF position.

38. Warning Light Switch (M62 and M246)

The warning light switch (BB, fig. 65), located to the right of the ignition switch on the instrument panel, controls the red spotlight mounted on the left front fender which serves as a warning when operating the wrecker crane. The switch lever is moved clockwise to the ON position and counterclockwise to the OFF position.

39. Dump Body (M51) and Power Divider (M62) Control Lever

The dump body control lever or power divider control lever (fig. 67) is located to the left of the driver's seat. Shifting instructions for this lever when used to control the dump body hoist on dump truck (M51) are shown on the dump body control data plate (fig. 64) mounted on the instrument panel (N, fig. 65). Shifting instructions for this lever when used to control the power divider (par. 53*a*(3)) on medium wrecker truck (M62) (to operate the hydraulic crane or rear winch) are shown on the power divider control lever instruction plate (fig. 62) mounted on the instrument panel.

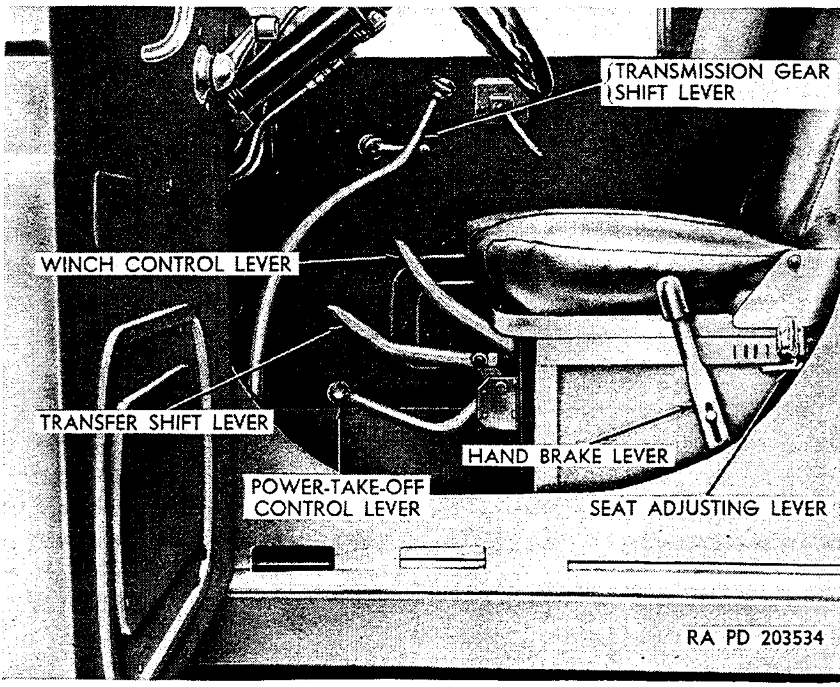


Figure 68. Driver's compartment—M246.

40. Transfer Power-Take-Off Control Lever (M246)

The transfer power-take-off control lever (fig. 68) is located to the left of the transfer shift lever in the driver's compartment of the tractor wrecker truck. Pulling up on this lever engages the power-take-off mounted on the rear of the transfer which powers the hydraulic pump used to operate the wrecker crane. Pushing down on this lever disengages the power-take-off.

41. Crankcase Ventilating Shutoff Valves Control Assembly

The crankcase ventilating shutoff valves control handle (JJ, fig. 65), on vehicles equipped with a manually controlled crankcase ventilating system (par. 106), is located on the instrument panel directly above the electric brake lock switch button. The handle is pulled out to close the crankcase ventilating system before all normal fording operations. The control handle is pushed in to allow the crankcase ventilating system to operate normally. For information regarding deep water fording, refer to paragraph 62.

42. Handbrake Valve (Trailer Brake Hand Control Valve)

The handbrake valve (Z, fig. 65) is located on the steering column with a lever extending from the column below the right side of the steering wheel. This lever, which is manipulated by the driver's right hand, is used to control the brakes on a towed vehicle.

43. Seat Adjusting Lever

The seat adjusting lever (fig. 68), located at the left side of the driver's seat, is manipulated by the driver's left hand. Lifting up on this lever releases the seat frame permitting forward or backward movement to any desired position. Releasing the lever locks the driver's seat in the desired position.

Section III. OPERATION UNDER USUAL CONDITIONS

44. General

This section contains instructions for the mechanical steps necessary to operate the 5-ton 6 x 6 vehicles under conditions of moderate temperatures and humidity. For operation under unusual conditions, refer to paragraphs 57 through 62.

45. Starting the Engine

a. Preliminary Procedures. Before attempting to start the engine, the driver must become familiar with the purpose and location of the various instruments and controls described in section II of this chapter.

Note. Perform the before-operation services outlined in paragraph 76 in conjunction with starting and warming up engine.

b. Specific Procedures.

(1) Make sure transmission gearshift lever and power-take-off shift lever (fig. 67) are in N (neutral) positions.

(2) Pull out choke control knob. In warm weather, or when engine is warm, use sparingly.

(3) Turn ignition switch lever clockwise to the ON position.

(4) Depress clutch pedal to disengage clutch and hold pedal down while engine is started.

(5) Step on starter button to start engine. Release as soon as engine starts.

Note. Starter should not be operated continuously for more than 30 seconds. If engine fails to start within 30 seconds, wait 10 to 15 seconds before trying again. If engine does not start after a reasonable period of time, determine cause and correct (par. 79). If necessary, engine may be started by towing (par. 48).

(6) If oil pressure gage does not show pressure within 30 seconds after engine starts, stop engine and investigate cause. The ammeter should show charge reading with all lights and accessories turned off. If ammeter does not show charge with engine running at fast idle, determine cause (par. 86).

(7) Release clutch pedal.

(8) Push choke control knob in to a point at which engine operates without misfiring. As engine warms up, push choke control knob all the way in.

(9) Operate the engine through a short warmup period whenever conditions permit. This warmup period allows time for the driver to observe the ammeter, oil pressure, and temperature gages, and check performance of the engine before the vehicle is placed in motion. If engine coolant temperature stays below or quickly rises above normal operating temperature range (par. 31), stop engine and determine cause (par. 82).

46. Driving the Vehicle

a. General. The purpose and use of the transmission and transfer must be understood by the driver before any attempt is made to operate the truck. The truck cannot be moved until the transfer shift lever (fig. 67) is in the HIGH or LOW range (par. 27). Although shifting of the transmission for forward or reverse motion automatically shifts the transfer for forward or reverse motion, transfer gear ratios (high or low range) are selected independently of the transmission gear ratios. The transfer provides additional gear ratios for traversing difficult terrain.

b. Placing Vehicle in Forward Motion.

(1) Depress the clutch pedal and move the transfer shift lever to HIGH range. Release clutch pedal.

(2) Depress clutch pedal and move the transmission gearshift lever (par. 26) to the "1" (first) speed forward position. Keep the clutch pedal depressed.

(3) Release the handbrake (par. 25).

(4) Depress accelerator pedal to increase engine speed slightly. Release clutch pedal slowly and further depress accelerator

pedal to prevent the engine from stalling as the truck starts to move.

Caution: The clutch must be either fully released or fully engaged (par. 201) while driving.

(5) When the road speed indicated on the speedometer (L, fig. 65) approaches the maximum road speed for "1" (first) gear shown on the vehicle instruction plate (figs. 16 and 17), depress the clutch pedal, move the transmission gearshift lever to "2" (second) speed forward position, and release clutch pedal.

Caution: Do not exceed maximum road speeds shown on instruction plate (figs. 16 and 17).

(6) Repeat (5) above for "3" (third), "4" (fourth), and "5" (fifth) speeds forward in successive stages.

(7) When necessary to shift transmission to a low gear, depress the clutch pedal, quickly move the transmission gearshift lever to the next lower gear position, increase engine speed, and release the clutch pedal slowly.

(8) When necessary to shift the transfer to LOW range, the speed of the truck must be reduced below the maximum speed of the gear ratio into which the shift will be made as shown on the vehicle instruction plate (figs. 16 and 17). Depress the clutch pedal, accelerate the engine, and release the clutch pedal. Depress the clutch pedal again and move the transfer shift lever (par. 27) to the LOW range. Release the clutch pedal and accelerate the engine to attain the desired road speed.

Note. The transfer may be shifted from LOW to HIGH range regardless of truck speed but the engine speed must be synchronized with the truck speed before releasing the clutch pedal.

Caution: While driving the truck, perform the during-operation services outlined in paragraph 76.

c. *Stopping Vehicle.*

(1) Remove foot from accelerator pedal and apply the brakes (par. 24). Do not pump brake pedal, but apply even pressure. This will permit the engine to assist in checking the speed of the truck.

(2) When truck speed has been reduced to engine idling speed, depress the clutch pedal and move the transmission gearshift lever to the N (*neutral*) position.

(3) When truck has come to a complete stop, apply the handbrake (par. 25).

Note. During halts, perform at-halt services (table III).

d. Reversing the Vehicle.

(1) Stop the truck (if in motion).

Caution: The truck must be completely stopped before moving the transmission gearshift lever to the reverse position.

(2) Depress the clutch pedal and move the transmission gearshift lever to the R (*reverse*) position.

Note. The transfer shift lever may be in either HIGH or LOW range.

(3) Release the clutch pedal and accelerate the engine.

47. Stopping the Engine

a. Stop the truck (par. 46*c*) if in motion.

b. Move ignition switch lever counterclockwise to the OFF position.

Note. At end of day's operation, perform after-operation services (table III).

48. Towing the Vehicle

a. Towing to Start.

(1) Attach sufficient length of tow chain or line from towing vehicle to towed vehicle to permit maneuverability of both vehicles.

(2) In towed truck, pull the throttle control knob out one-half to three-quarters of an inch and leave in this position (par. 18). If engine is not warmed up, pull choke control knob out part way. Place the transmission gearshift lever in the "5" (fifth) speed forward position. Place the transfer shift lever in the HIGH range position.

(3) Move the ignition switch lever clockwise to the ON position.

(4) Depress clutch pedal and hold clutch in disengaged position while truck is being towed for the first 100 feet. When towed truck reaches speed of approximately 10 mph, slowly engage clutch.

(5) Depress clutch pedal immediately after engine starts, signal towing vehicle to stop, apply brakes, and move the transmission gear shift lever to the (N) (neutral) position. Release clutch pedal.

(6) When truck has come to a complete stop, apply the handbrake and let engine operate through warmup period (par. 45*b*(9)).

b. Towing a Disabled Vehicle. Particular care must be exercised when towing damaged trucks to make certain that no additional damage occurs while truck is being towed.

(1) *Towing truck with all wheels on ground.*

(*a*) If the transfer on truck to be towed is not damaged, place the transmission and transfer gearshift levers in the (N) (neutral) positions. With this arrangement, only the transfer gears revolve when the vehicle is towed.

(*b*) If the transfer on the truck to be towed is damaged, disconnect the transfer-to-front-axle and the transfer-to-forward-rear-axle propeller shafts at the axles (par. 211).

Warning: Before disconnecting propeller shafts, raise one wheel on front axle and one wheel on each rear axle clear of ground to relieve torsional strain. Failure to observe this precaution may result in personnel injury.

(*c*) Secure disconnected ends of propeller shafts to truck frame. Place selflocking nuts and bolts in map compartment in cab.

(2) *Towing truck with front wheels off ground.* Whenever truck is to be towed with front wheels off ground, support front of truck in such a manner that wheels of both rear axles contact ground. Disconnect transfer-to-forward-rear-axle propeller shaft at forward rear axle companion flange (par. 211), observing "warning" in (1) (*b*) above. Secure disconnected end of propeller shaft to truck frame. Place salflocking nuts and bolts in map compartment in cab.

(3) *Towing truck with rear wheels off ground.* The truck should be towed backward only after other methods have proven unsatisfactory. Disconnect transfer-to-front-axle propeller shaft at front axle companion flange (par. 211), observing "warning" in (1) (*b*) above. Secure disconnected end of propeller shaft to truck frame. Place selflocking nuts and bolts in map compartment in cab.

c. Towing Vehicles That Will Tow In Only One Direction. Occasionally, conditions will exist that will permit towing the truck in only one direction. This condition is caused by the front axle being locked through the overrunning clutch in the transfer for one direction. Towing in that direction will cause the wheels to skid. This condition can be corrected ((1), (3) below).

(1) Jack up one front wheel to relieve the front axle of any binding torque load.

(2) Open drain cock on underside of air reservoir located on the outside of the left frame side rail immediately behind the left front fender. This will bleed the air system of all pressure and allow the overrunning clutch unit in the transfer to return to neutral.

(3) Close drain cock after pressure in compressed air system has been relieved, and lower front wheel. The front wheels will then run free in either direction.

49. Operation of the Light Switch

a. Off Position. When the main switch lever (fig. 66) is in the OFF position, all circuits, both blackout and service, are open and all lights are off.

b. Blackout Marker Position. Move main switch lever counterclockwise from OFF to the BO MARKER position. This energizes circuits for blackout marker lights (fig. 69), blackout stoplight (fig. 70), and blackout taillights. Move auxiliary switch lever clockwise from OFF position for dim or bright instrument panel lights.

c. Blackout Drive Position. Move mechanical switch lever counterclockwise to UNLOCKED MAIN SWITCH position and hold in that position while moving main switch lever counterclockwise from OFF to BO DRIVE position (fig. 66). This energizes circuits for blackout driving light (fig. 69), blackout marker lights, blackout stoplight, and blackout taillights. Move auxiliary switch lever clockwise from OFF position for dim or bright instrument panel lights.

d. Stoplight Position. Move mechanical switch lever counterclockwise to UNLOCKED MAIN SWITCH position and hold in that position while moving main switch lever clockwise from OFF to STOPLIGHT position (fig. 66). This energizes the circuit for the service stoplight (fig. 70) for operation during daylight hours. Move auxiliary switch lever clockwise from OFF for dim or bright instrument panel lights.

e. Service Drive Position. Move mechanical switch lever counterclockwise to UNLOCKED MAIN SWITCH position and hold in that position while moving main switch lever clockwise from OFF to STOPLIGHT position (fig. 66). Release mechanical switch lever and move main switch lever further to the right to SER DRIVE position. This energizes circuits for service headlights (fig. 69), service taillight (fig. 70), and service stoplight. Move auxiliary switch lever clockwise from OFF position for dim or bright instrument panel lights.

f. Parking Position. Move mechanical switch lever counterclockwise to UNLOCKED MAIN SWITCH position and hold in that position while moving main switch lever clockwise from OFF or STOPLIGHT position. Release mechanical switch lever and move main switch lever further to the right to SER DRIVE position. Move auxiliary switch counterclockwise from OFF to PARK position. This energizes circuits for parking lights (fig. 69), dim instrument panel lights, and service stoplight.

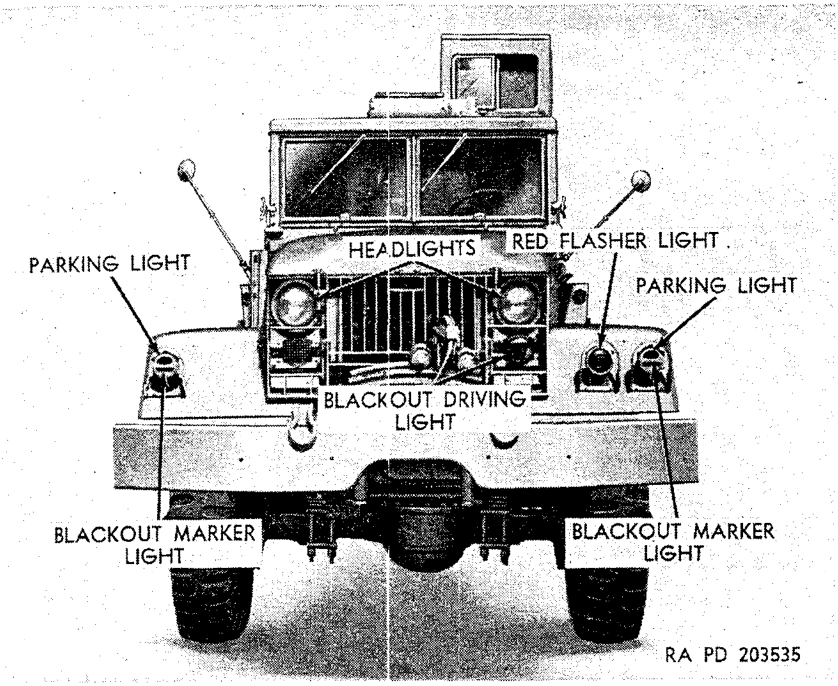


Figure 69. Lights mounted on front of truck.

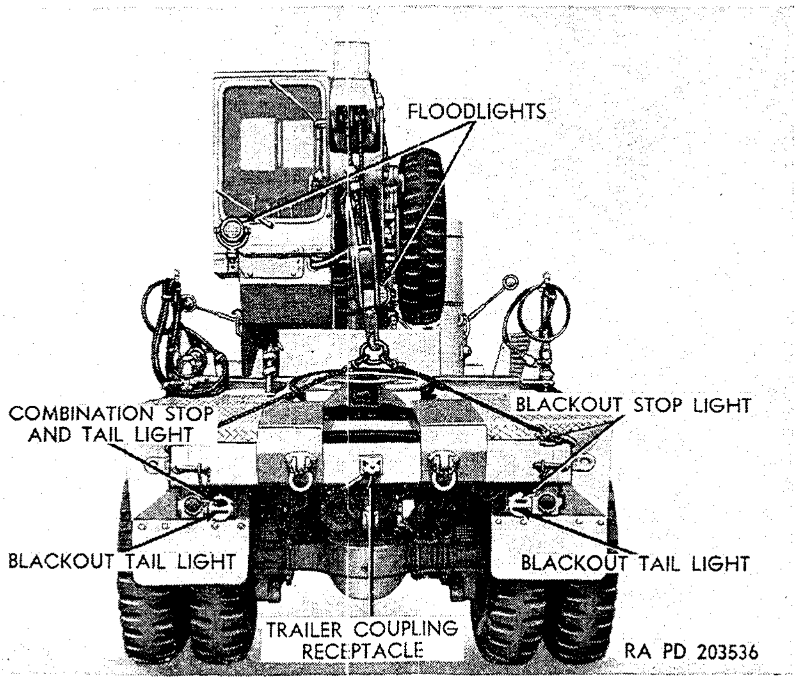


Figure 70. Lights mounted on rear of truck.

347797°-55——5

50. Driving Precautions

a. Maximum Road Speeds. The vehicle instruction plate (figs. 16 and 17) gives maximum speeds at which truck may be safely operated in various transmission gear ratios and transfer HIGH and LOW ranges. Do not exceed maximum road speeds. Shift transmission to next higher gear (par. 46*b*) when speed of truck approaches maximum road speed of gear being used.

b. Descending Steep Grades. When descending steep grades, do not allow truck to exceed maximum speed for gear ratio being used. Select a gear ratio (par. 46*b*(7)) that will keep truck speed below the maximum road speed for the gear ratio selected. In general, it is advisable to use the same gear ratio descending as would be used in ascending the same grade. Use brakes several times during descent to reduce speed of truck. Transfer may be shifted from LOW to HIGH range regardless of truck speed, but be sure to synchronize engine speed with truck speed before releasing clutch pedal (par. 46*b*(1)).

c. Ascending Steep Grades. When ascending steep grades, always shift into a lower gear before engine begins to labor. The transfer LOW range increases the number of speeds provided by the transmission.

Caution: When shifting transfer from HIGH to LOW range, truck speed must be reduced below the maximum speed of gear into which shift will be made. Make sure engine speed is synchronized with truck speed before clutch pedal is released.

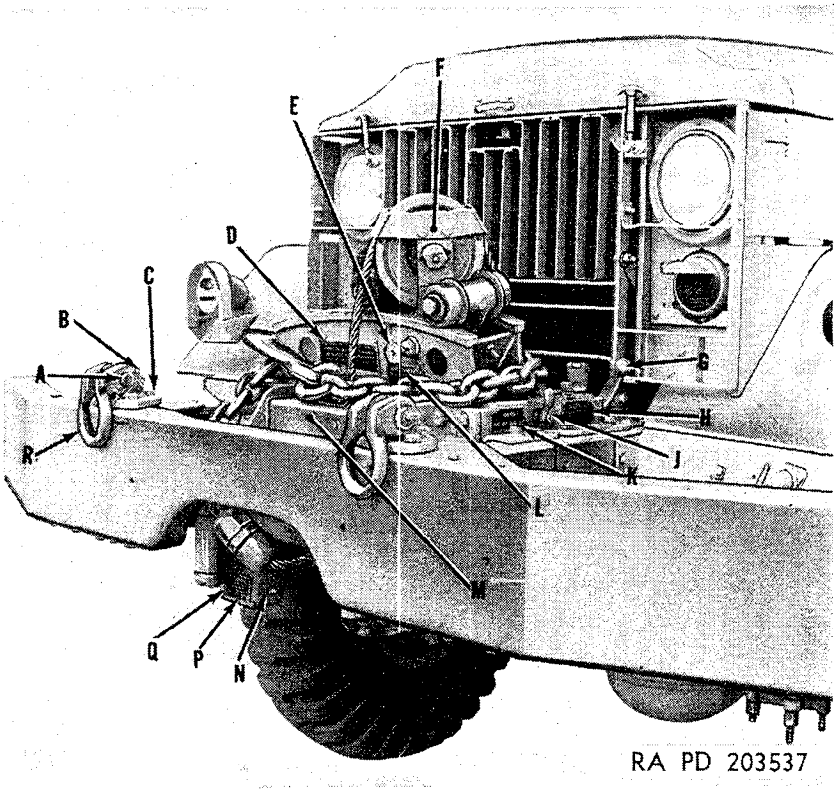
Section IV. OPERATION OF MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM

51. Front Winch

a. Description. The worm-geared, jaw-clutch drum front winch (fig. 71) is mounted at the front of the truck on support brackets attached to left and right frame side rail extensions. Power for operation of the front winch is obtained through a propeller shaft extending from a power-take-off mounted on the right side of the transmission. An internal, automatic safety brake is provided to sustain the winch load when the power-take-off is being shifted. Some vehicles are equipped with winches which do not have the level winding device illustrated in figure 71.

b. Controls.

(1) *Front winch control lever.* The front winch control lever (fig. 67) has three operating and two neutral positions. When this lever is in either of its two N neutral positions (fig. 31), the winch is inoperative regardless of the positions of the



A—Clevis pin
B—Clip
C—Bracket
D—Cable tension caution plate
E—Level wind lock knob
F—Level wind
G—Drum clutch lever
H—Clutch lever warning plate
J—Drum lock knob
K—Drum lock caution plate
L—Nameplate
M—Front winch
N—Automatic brake adjusting bolt
P—Automatic brake caution plate
Q—Brake cover
R—Lifting shackle

Figure 71. Left front view of front winch (with level wind) mounted on vehicle.

other controls. To operate this lever, disengage the engine clutch (par. 23), move the lever to the desired position (*down* as far as it will go for H (high), to the *center* of its range of travel for L (low), or *up* as far as it will go for R (reverse), and engage the engine clutch.

(2) *Drum clutch lever.* The drum clutch lever (G, fig. 71) is located at the upper left rear end of the winch. Moving this lever as far as it will go toward the winch disengages the drum jaw clutch. Moving this lever as far as it will go away from the winch engages the clutch.

(3) *Drum lock knob.* The drum lock knob (J, fig. 71) is located on the upper left end of the winch end frame. This control is used to lock the winch drum to prevent unwinding of the

cable when the winch is inoperative or when the truck is moving. To unlock the drum, the lock knob is pulled all the way out, rotated 90°, and released. To lock the drum, the lock plunger is alined with one of the holes in drum flange and the knob is rotated 90° and released so that the projections on the inner side of the knob fit into slots on the nut which secures the lock assembly to the winch end frame.

(4) *Level wind lock knob.* The level wind lock knob (E, fig. 71) is located on the front of the level wind frame, when winch is so equipped, and is used to prevent movement of the level wind when the winch is inoperative or when the truck is moving. To unlock the level wind, the lock knob is pulled all the way out, rotated 90°, and released. To lock the level wind, the lock plunger is alined with hole in level wind frame and the knob is rotated 90° and released so that the projections on the inner side of the knob fit into slots on the nut which secures the lock assembly to the level wind frame.

(5) *Throttle control lock.* The throttle control lock is a ratchet-type lock provided on the throttle control (par. 18) located on the left end of the instrument panel in the operator's compartment.

c. Operation.

(1) *Vehicle positioning.* Positioning the vehicle at the object of recovery for front winch recovery must be made in the proper manner. Proper alinement with the object of recovery is necessary to insure proper winding of the cable when the winch is not equipped with a level wind.

(2) *Unwinding wire rope.*

(*a*) Make sure winch control lever (fig. 67) is in N (neutral) position (fig. 3).

(*b*) Unlock winch drum *b*(3) above.

(*c*) Unlock level wind *b*(4) above.

(*d*) Make sure winch drum clutch is disengaged *b*(2) above.

(*e*) Pull on end of wire rope until required length has been unreeled.

Note. The winch has most power with all rope off the drum. Unwind as much rope as possible from winch drum before starting to pull.

Caution: Always wear gloves when handling wire rope. Never let rope run through the hands. Broken wires can cause painful injuries.

(3) *Pulling the load.*

(*a*) Engage drum clutch *b*(2) above.

(*b*) Start engine (par. 45) and move winch control lever (*b*(1) above) to L (low) for heavy load or to H (high) for light load. If in doubt, use L (low).

Note. Keep transmission in N (neutral) gear.

(*c*) After the winch begins to pull the load with the engine idling, pull out on the throttle control until the desired winch operating speed, according to the requirements of the load, is attained. Leave the throttle control in the LOCKED-OUT position (fig. 72).

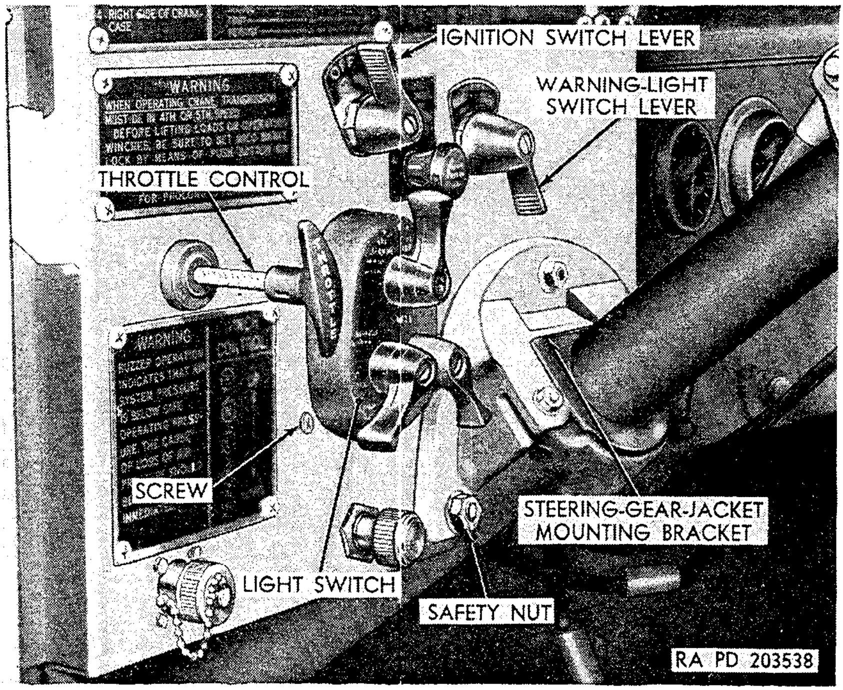


Figure 72. Throttle control in LOCKED-OUT position.

(4) *Pulling heavy load.* Ground spades (fig. 73) and snatch blocks are supplied with the M62 wrecker for excessively heavy loads. Figure 73 illustrates use of two-part line with single sheave snatch blocks. Brackets are provided at front end of frame for ground spades to help secure vehicle.

(5) *Stopping the winch.* To stop the winch, move the winch control lever (*b*(1) above) to N (neutral) (fig. 31).

(6) *Lowering load.* To lower load, move the winch control lever (*b*(1) above) to R (reverse) position (fig. 31).

(7) *Winding wire rope.*

(*a*) Place a load on the rope. If no load is available, attach rope to an anchor or tree.

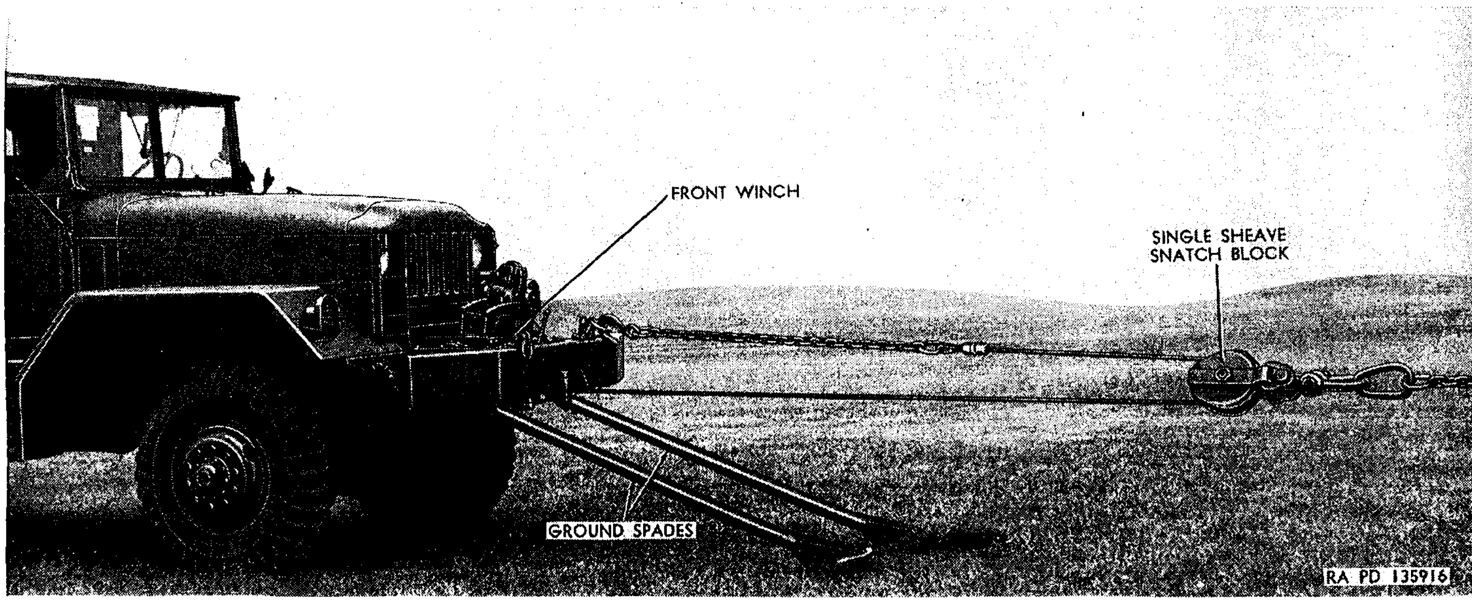


Figure 73. Ground spades positioned for front winch operation.

(*b*) Move winch control lever (*b*(1) above) to L (low) position. The winch will pull the truck forward, thus winding the rope on the drum. A very light pressure on the truck brake pedal by the operator while winding rope will insure a tight and neat wind.

Note. Make sure first layer of rope goes on drum in order and that each additional layer starts back across drum properly. If necessary, the rope can be hammered or pushed in place with a block of wood to insure the first layer being closely wrapped.

Caution: Always wear gloves when handling wire rope. Never let rope run through the hands. Broken wires can cause painful injuries.

(8) *Locking winch for traveling.*

(*a*) Make sure winch control lever is in (N) (neutral) position.

(*b*) Disengage drum jaw clutch (*b*(2) above).

(*c*) Lock winch drum (par *b*(3) above). If necessary, rotate drum by hand to allow lock plunger to engage the nearest hole on the drum flange.

(*d*) Lock level wind (*b*(4) above), if winch is so equipped. If necessary, move level wind by hand to allow lock plunger to engage hole in frame.

52. Rear Winch (M62)

a. Description. The rear winch (fig. 74) is a worm-geared horizontal-drum winch mounted on the rear of the truck. Power for operation of the rear winch is obtained through two propeller shafts extending from the power divider (par. 268*a*(4)) to a drive sprocket which is connected to the rear-winch drive shaft sprocket by a roller chain. An internal automatic safety brake is provided to sustain the winch load when the winch shift lever is being used to shift the power divider. All rear mounted winches are equipped with a level wind and pneumatically controlled cable tensioner.

b. Controls.

(1) *Controls in the cab.*

(*a*) *Power divider control levers.* Refer to paragraph 39.

(*b*) *Electric brake lock switch button.* Refer to paragraph 36.

(2) *Controls at the rear of the truck.*

(*a*) *Engine clutch control valve.* The two-position engine clutch control valve (fig. 75), located immediately forward of the rear winch, is an air valve which controls the air pressure inside a roto chamber (air cylinder) mounted on the right side of the transmission (par. 268*a*(3)) so as to permit operation of the engine clutch from the rear of the vehicle. Pushing the clutch control valve lever down

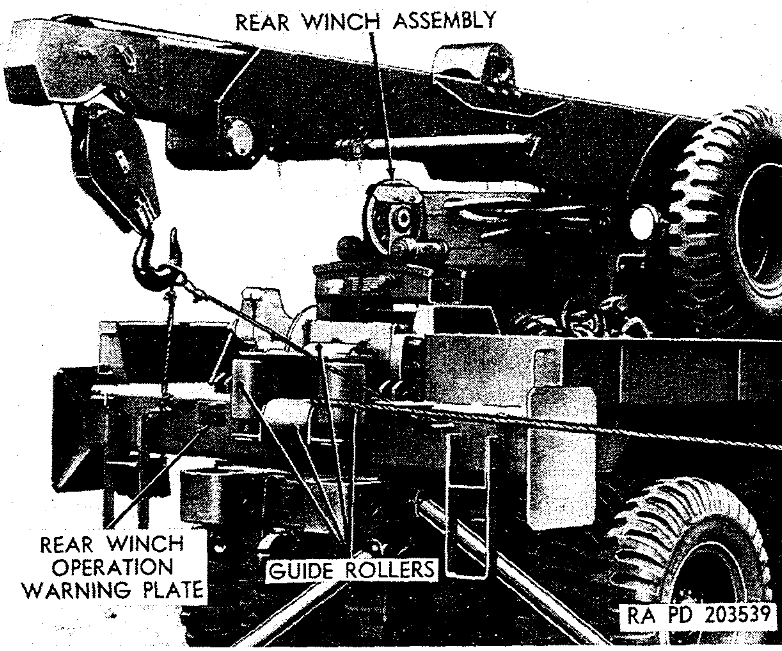


Figure 74. Right rear view of rear winch mounted on vehicle.

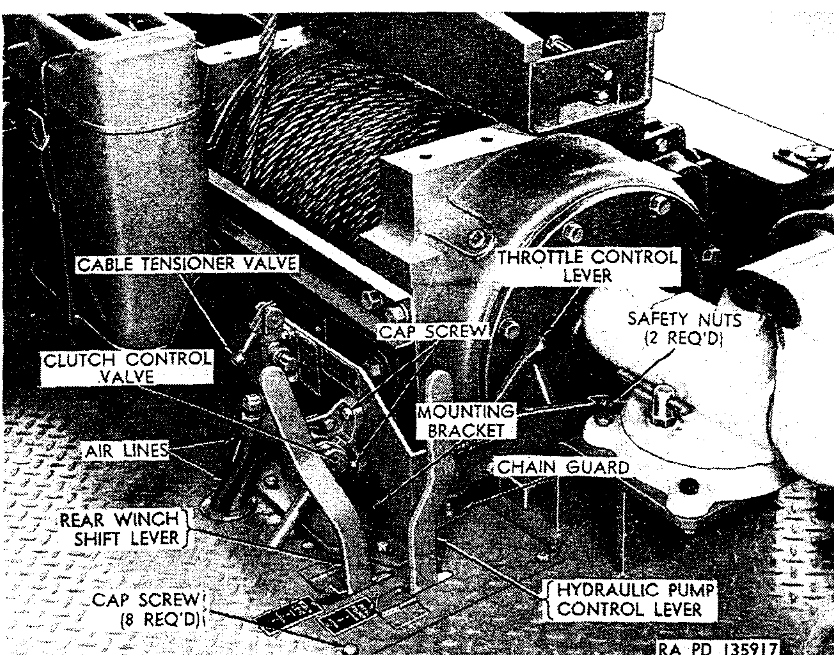


Figure 75. Rear winch controls—M62.

engages the engine clutch. Pulling the clutch control valve lever up disengages the engine clutch.

(*b*) *Rear winch shift lever. The three-position rear winch* shift lever (fig. 75), located to the left of the engine clutch control valve, is used to control the direction of rotation of the winch drum by shifting the winch drive shaft gears inside the power divider (par. 268*a*(4)). The lever is moved toward the front of the truck as far as it will go for UNWIND, moved to the center of its range of travel for NEUTRAL, and moved toward the rear of the truck as far as it will go for WIND (fig. 40).

(*c*) *Cable tensioner control valve.* The two-position cable tensioner valve (fig. 75), located to the right of the engine clutch control valve, is an air valve used to control the air pressure inside an air cylinder which exerts pressure on the winch cable by decreasing the gap between a pair of tensioner sheaves mounted on the front of the winch par. 268*a*(1)). The lever is pulled up as far as it will go to OFF (fig. 43) to release the pressure on the cable. Moving the lever down as far as it will go to ON applies pressure (tension) to the cable.

(*d*) *Throttle control lever.* The throttle control lever (fig. 75), located to the rear of the engine clutch control valve, is connected by a control rod to the throttle linkage in the engine compartment. This lever is used to control engine speed during rear winch operation. Moving the lever forward to OPEN (fig. 41) increases the engine speed. Moving the lever to CLOSED decreases the engine speed.

c. Operation.

(1) *Vehicle positioning.* The truck is most advantageously positioned when the load attachment point is directly behind the truck. However, guide rollers (fig. 74) at the rear of the winch permit pulling the load at any angle up to 90°, right or left, from the center line of the truck, and at any angle up to 60°, above or below, from the horizontal plane of the winch. The maximum rated pull (45,000 lb) is available only when sufficient cable is off the drum to completely expose the first layer.

(2) *Unwinding wire rope.*

(*a*) Start engine (par. 45).

(*b*) Set electric brake lock (par. 36).

(*c*) Engage power divider (par. 39).

(*d*) Set the throttle level (fig. 75) to give about 1,000 rpm no-load engine speed.

(*e*) Move clutch control valve lever (fig. 75) to DISENGAGE (fig. 47), move winch shift lever (fig. 75) to UNWIND (fig. 40) and move cable tension valve lever to OFF position (fig. 43).

(*f*) Move clutch control valve lever to ENGAGE position and walk out with hook until the required amount of cable is unwound. Move clutch control valve lever to DISENGAGE and move winch shift lever to NEUTRAL.

Note. Failure to maintain tension on cable while drum is turning will cause the cable to become snarled on the drum.

(3) *Pulling the load.*

(*a*) With the cable hooked to the load, move the cable tensioner control valve lever to ON position (fig. 43). Move winch shift lever to WIND (fig. 41) position and move clutch control valve lever to ENGAGE position (fig. 47). This is necessary to remove all slack from the cable before starting the winching operation.

Note. When drawing in slack cable, a close check must be maintained to avoid the formation of loops which will become kinks as the load pulls the cable taut.

(*b*) When all slack is removed from the cable, move the clutch control valve lever to DISENGAGE and move the winch shift lever to NEUTRAL. Move the cable tensioner control valve lever to OFF position. It is unnecessary to engage the cable tensioner while pulling a load so long as the load keeps the cable taut.

(*c*) Check the cable on the drum to be sure that it is closely and evenly wound. Be sure that the level wind is positioned so that the incoming cable will lay tight against the last turn on the drum.

Note. If necessary, the cable can be hammered or pushed into place with a block of wood to insure an even winding surface for the next layer of cable.

(*d*) Move the winch shift lever to WIND and move the clutch control valve lever to ENGAGE position.

(*e*) If necessary to stop the winch or change the direction of drum rotation in order to maintain control of the load, move the clutch control valve lever to DISENGAGE, move the winch shift lever to UNWIND, NEUTRAL, or WIND, as required, and move the clutch control valve lever to ENGAGE.

Note. Double clutching, using the clutch control valve lever, may be necessary to engage the gears in the power divider.

(*f*) Since the power required for operation of the rear winch generally is rather low, automatic governing of the engine is not necessary. However, if the winching load is excessively heavy, the engine speed may fluctuate and it will be necessary to move the throttle control lever (fig. 75) so as to increase the engine speed.

(4) *Pulling heavy load.* In order to stabilize the vehicle for heavy rear winching operations, attach ground spades (fig. 76) in the brackets provided at the rear of the truck frame. Attach the front winch cable to a tree or utility pole. Where no natural anchorage is convenient, ground anchors (fig. 77) should be used in series to form a suitable anchorage. Attach front winch cable to the stakes and draw cable tight. Single and double sheave snatch blocks are provided with wrecker equipment. Since the use of snatch blocks will relieve the load on the cable, one-part, two-part, three-part, or four-part lines should be rigged according to the requirements of the load.

53. Wrecker Crane (M62)

a. Description.

(1) *General.* The hydraulically powered crane mounted on the rear of the truck has an extendable boom (from 10 to 18 feet) which is capable of 360° rotation and approximately 45° elevation. Maximum allowable lifting loads are shown on the safe load data plate (fig. 51) located at the crane operator's station.

(2) *Pivot post and boom assembly.*

(*a*) The pivot post (fig. 78) and boom assembly is rotated 360° by a hydraulic double-acting piston-type swing motor (fig. 79) geared to the base of the pivot post. A removable stop plate positioned on the pivot post (fig. 78) contacts stops which are integral with the base plate (fig. 79) to limit rotation of the boom to 270°.

(*b*) The boom is raised and lowered hydraulically by a large-diameter vertically-mounted cylinder (fig. 78), which is connected between the base of the pivot post and the underside of the boom. In addition to the up and down angular movement of the boom, the outer end of the boom can be extended or retracted a distance of approximately eight feet by means of a hydraulic cylinder mounted horizontally inside the boom itself.

(*c*) Raising and lowering of the cable hook is controlled by a vane-type hydraulic motor in conjunction with a worm and drive gearset connected to the hoist drum mounted at the rear of the boom assembly.

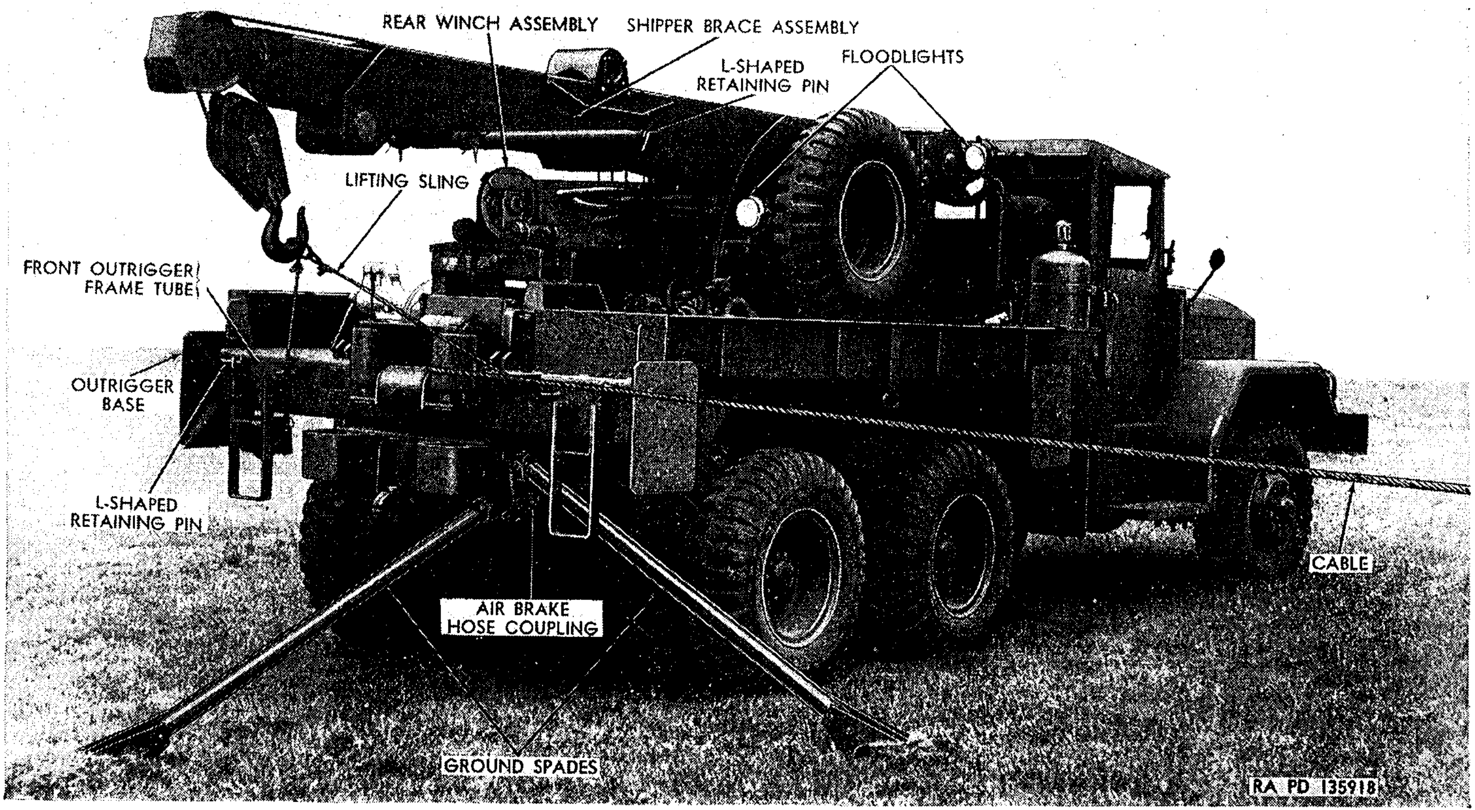


Figure 76. Ground spades positioned for rear winch operation—M62.

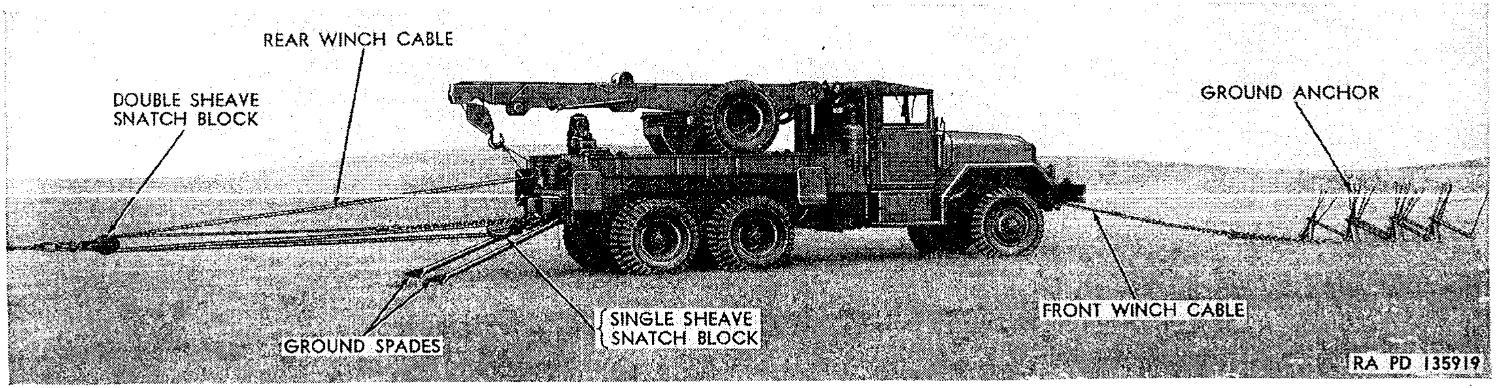


Figure 77. Ground spades and ground anchors positioned for heavy rear winch operation—M62.

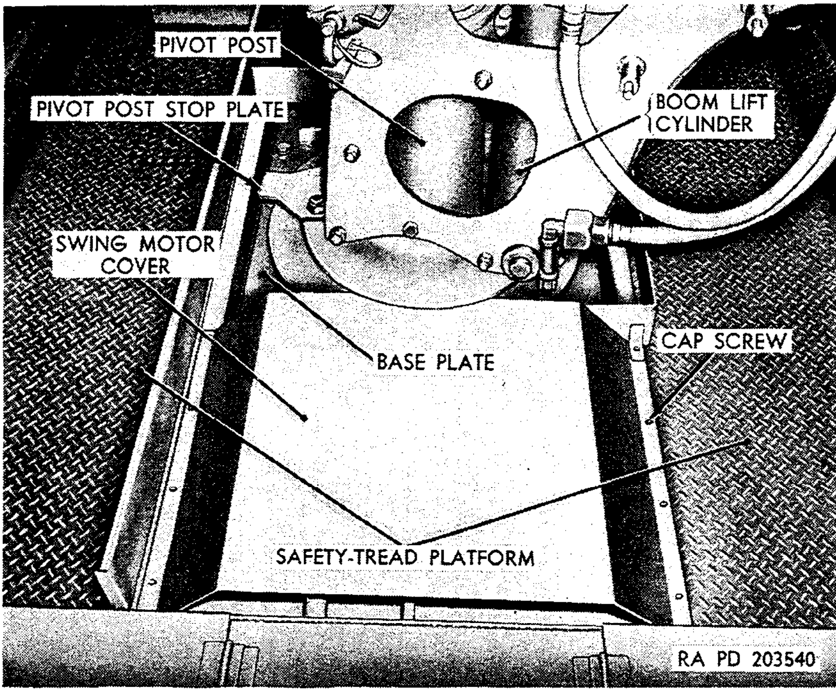


Figure 78. View of lower section of crane revolving structure.

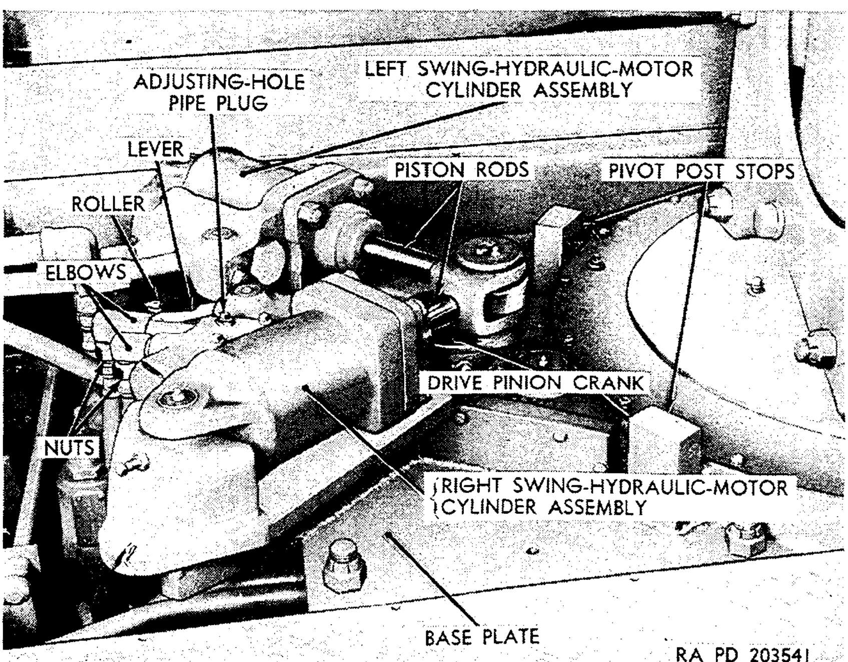
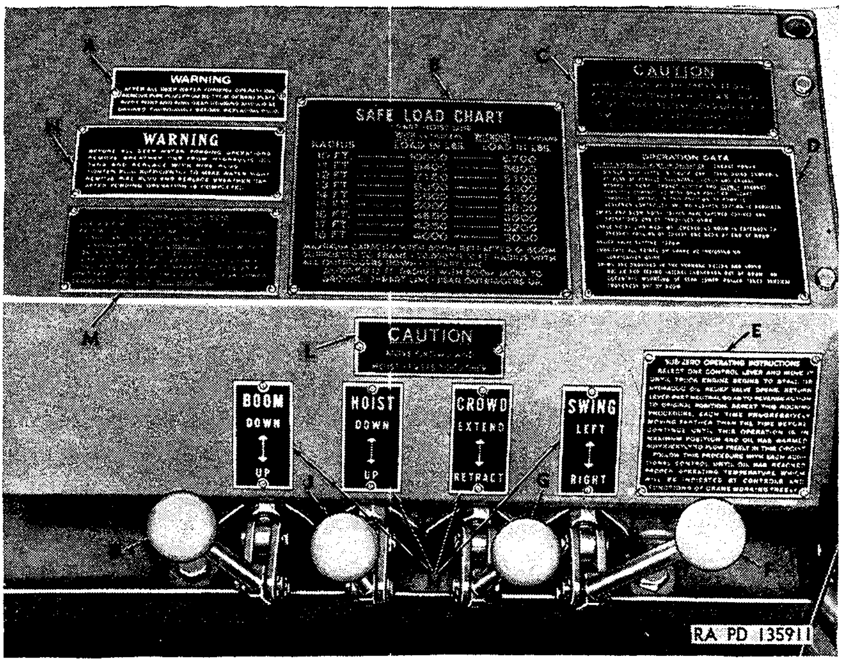


Figure 79. Crane (M62) hydraulic swing motor with cover removed.

(3) *Hydraulic pump and controls.* A vane-type hydraulic pump (par. 268*a*(6)) is used to power the hydraulic crane. The pump is set in motion by operating the hydraulic pump control lever (fig. 75) after the power divider is engaged (par. 39). To operate the hydraulic pump control lever, it is necessary to disengage the engine clutch, using the clutch control valve lever (par. 52*b*). A governor valve mounted on the power divider (par. 268*a*(4)) governs the engine speed at 1,500 rpm (full load) during crane operation.

(4) *Control valve bank assembly.*

(*a*) *General.* The control valve bank assembly (fig. 80), located in the operator's cab, is comprised of four hydraulic two-way valves bolted together to form a single unit. Each valve is equipped with a spring-loaded control lever which returns to the neutral position whenever the lever is released by the operator. Any two crane operations, such



A—After deepwater fording warning plate
B—Safe load data plate
C—Boom jack caution plate
D—Operation instruction plate
E—Winterization operation instruction plate
F—Swing control lever
G—Crowd control lever
H—Control lever instruction plate
J—Hoist control lever
K—Boom control lever
L—Crowd and hoist levers instruction plate
M—Hydraulic oil instruction plate
N—Before deepwater fording warning plate

Figure 80. Hydraulic crane control valve bank (M62).

as lifting the load and swinging the boom, elevating and extending the boom, et cetera, can be performed at the same time.

(*b*) *Boom control lever.* The boom control lever (K, fig. 80) controls the up and down angular movement of the boom. Pulling the lever toward the operator causes the boom point to go up. Pushing the lever away from the operator causes the boom point to go down.

(*c*) *Hoist control lever.* The hoist control lever (J, fig. 80) controls the raising and lowering of the cable hook. Pulling the lever toward the operator causes the cable hook to raise. Pushing the lever away from the operator causes the cable hook to lower.

(*d*) *Crowd control lever.* The crowd control lever (G, fig. 80) controls the extension and retraction of the boom assembly. Pulling the lever toward the operator causes the boom to retract. Pushing the lever away from the operator causes the boom to extend.

(*e*) *Swing control lever.* The swing control lever (F, fig. 80) controls the rotation of the pivot post and boom assembly. Pulling the lever toward the operator causes the boom point to swing to the right. Pushing the lever away from the operator causes the boom point to swing to the left.

(5) *Outriggers.* Four outriggers (fig. 81), two on each side of the wrecker crane body, are provided for handling heavy sidelifts which might otherwise cause the truck to tip over. These screw-jack-type outriggers, when not in use, collapse for storing and transporting within a frame tube located at the front and rear of the wrecker crane. When properly positioned (*c* below) for lifting loads as shown on the safe load instruction plate (fig. 42), the outriggers eliminate twisting strains on the truck chassis.

(6) *Shipper braces.* Two telescoping brace assemblies (fig. 81), one on each side, are provided for supporting the boom and shipper assembly from the rear of the crane frame for heavy (20,000 lb. maximum) direct rear lifts. When not in use, the brace assemblies are secured to the sides of the shipper.

(7) *Boom jacks.* Two adjustable boom jacks (fig. 82), one for each side of the boom assembly, are provided for supporting the boom from the ground for heavy (20,000 lb. maximum) side lifts or rear lifts as shown on the safe load instruction plate (fig. 42). When not in use, the boom jacks are stowed in the stowage box mounted on the crane platform to the left of the pivot post and boom assembly.

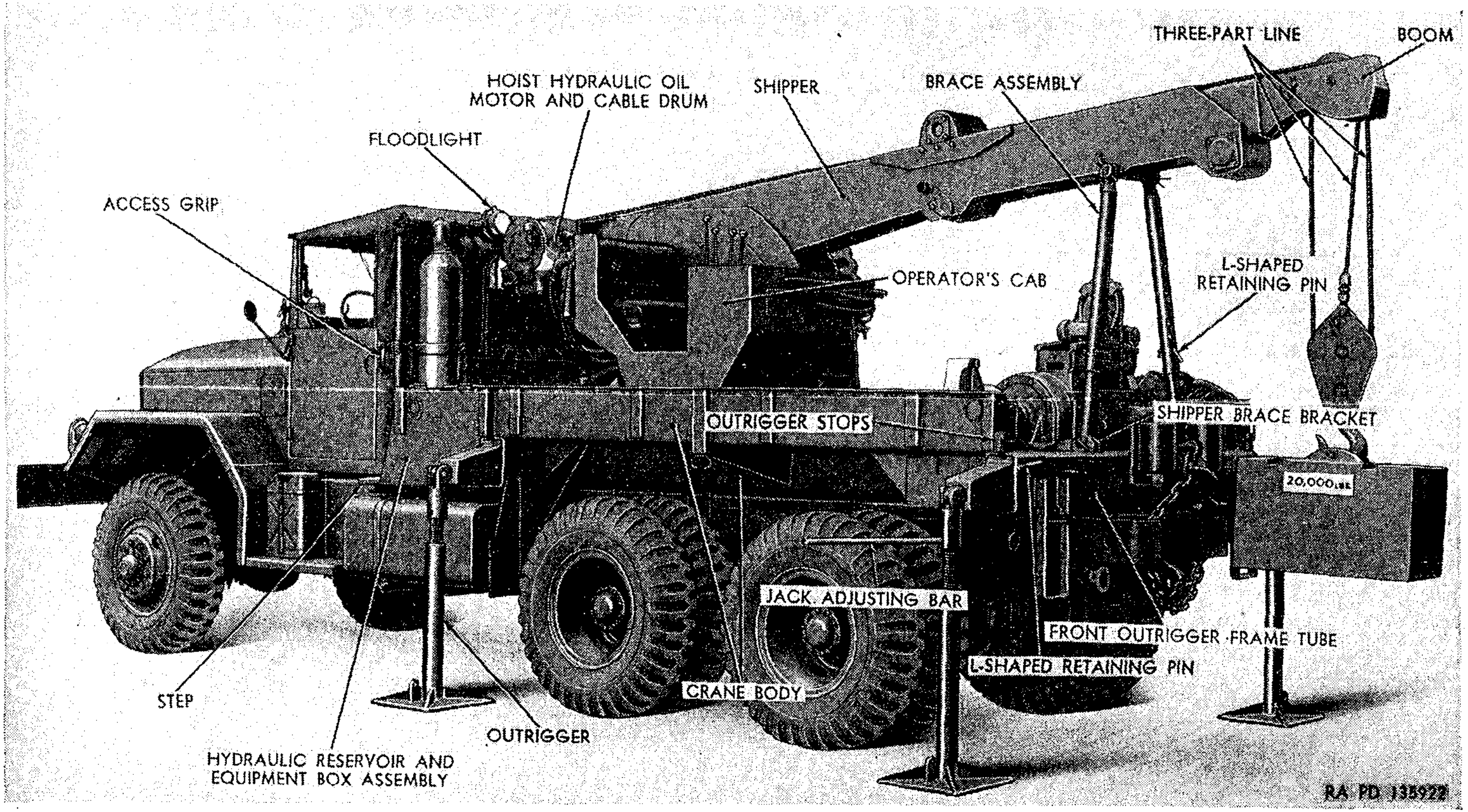


Figure 81. Medium wrecker truck M62 with outriggers down and shipper braces rigged.

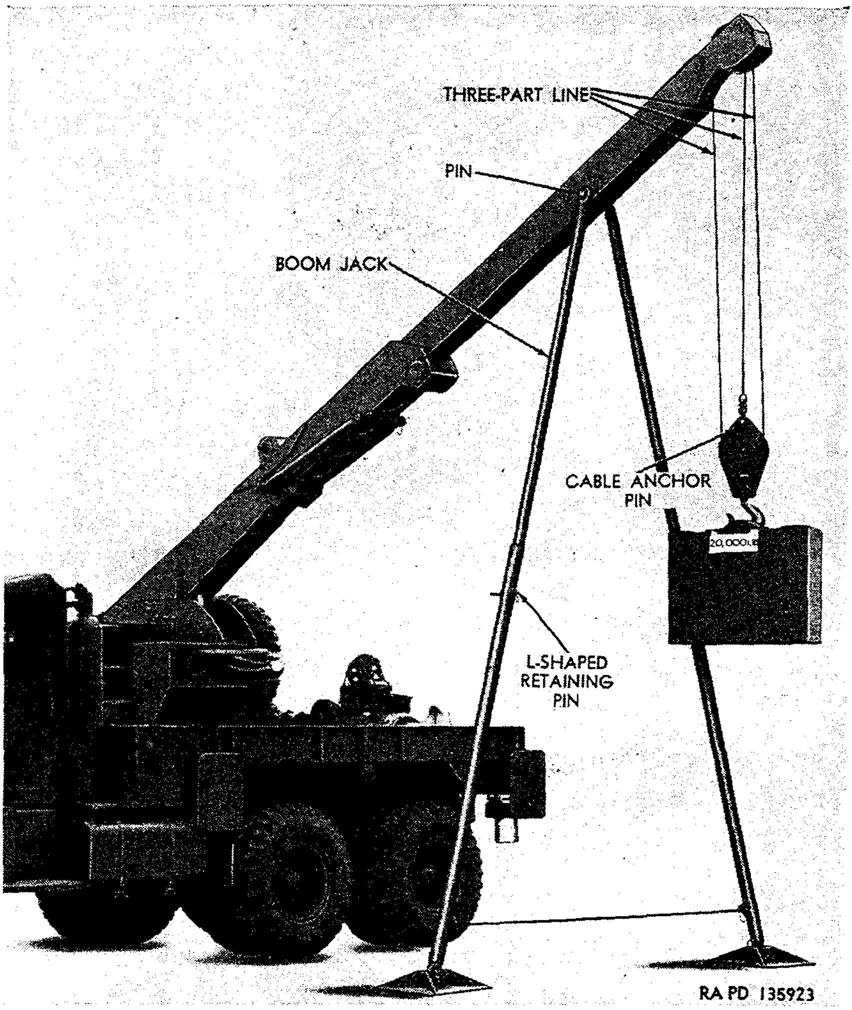


Figure 82. Boom jacks installed (M62).

(8) *Platform, toolbox, operator's compartment, and lights.*

(*a*) A large safety-tread platform (fig. 78) surrounds the crane revolving structure, with access grips and steps (fig. 81) at each end of the crane body.

(*b*) A tool or equipment box (fig. 81) which extends the width of the truck is mounted on the chassis behind the cab. The center portion of this box contains the hydraulic oil reservoir. Provisions are made for clamping oxygen and acetylene tanks to this equipment box, and additional space is provided between the welding tanks for special wrecking tools.

(c) Two floodlights on the truck (figs. 76 and 81) and one on the crane revolving structure are provided for night operation. A separate switch is provided on each light and all are connected to a master switch (par. 37) in the truck cab.

(d) The operator's cab (fig. 81) at the right of the pivot post and boom assembly has a seat for the operator and contains the control valve bank assembly (fig. 80). A canvas top is supplied which can be quickly removed and folded to a compact package.

b. Operation of Crane.

(1) *Preliminary procedures.*

(a) Position the truck with respect to the load so as to obtain the greatest possible mechanical advantage from the crane.

Note. As shown on the safe load instruction plate (fig. 42), the crane load capacity is inversely proportional to the length of the boom. Therefore, the truck should be positioned for a direct rear lift, whenever possible, with the shortest possible boom extension.

(b) Set electric lock (par. 36).

(c) Be sure the oil supply valve on the underside of the hydraulic oil reservoir between the reservoir and the hydraulic pump is open.

(d) Position outriggers, shipper supports, or boom jacks, and rig two-part or three-part line, according to the load requirements as determined from the safe load instruction plate (fig. 42). For detailed instructions, refer to *c* below.

(2) *Operating procedures.*

(a) With engine running, disengage the engine clutch (par. 23), move the transmission gearshift lever (PP, fig. 65) to "5" (fifth) gear position (figs. 16 and 17), and place the transfer shift lever (par. 27) in neutral position.

(b) Move the power divider control lever (fig. 67) forward to ENGAGED position (fig. 46). Engage the engine clutch.

(c) Disengage the engine clutch from the rear of the vehicle using the clutch control valve lever (par. 52*b*(2)(*a*)), and move the hydraulic pump control lever (fig. 75) forward to ENGAGE position. Engage the engine clutch.

(d) Pull the throttle control lever (fig. 75) forward to OPEN position.

Note. Engine speed will be governed at 1,500 rpm (full load) by the governor valve located on the front of the power divider.

Warning: Do not attempt to operate the crane at a low engine idle speed since the hydraulic vane-type pump will not provide proper operating pressure at low pump shaft speeds.

(*e*) Push the hoist control lever (J, fig. 80) in the crane operator's compartment forward to unwind cable and lower the hook.

Caution: Do not pay out cable after the hook has reached the ground or the load. Continued rotation of the drum will loosen cable from the groove in the drum.

(*f*) With the cable hook secured to the load, operate the boom, hoists, crowd, and swing control levers (*a*(4) above) as necessary to move the load to the desired position.

Caution: When operating the crowd control lever so as to extend the boom, be careful not to jam the crane block into the boom sheaves. Pushing the crowd and hoist control levers away from the operator together will eliminate this possibility and will cause the cable hook to maintain a constant distance from the boom head as the boom is extended.

c. Positioning Crane Supports.

(1) *Outriggers.* To position the outriggers (fig. 81), remove the L-shaped retaining pin (fig. 76) at the end of one of the outrigger frame tubes. Pull out on the outrigger base (fig. 76) until the frame hits the stop (fig. 81). Lower the outrigger to the vertical position, aline the retaining pinholes in the frame tube, and insert the L-shaped retaining pin (fig. 81). Insert the jack adjusting bar (fig. 81) provided in stowage in one of the holes near the top of the outrigger, and turn out the adjusting screw until a slight pressure of the base against the ground is obtained. Repeat the above procedure at the other three corners of the wrecker body.

Note. Outriggers are not positioned while using boom jacks.

(2) *Shipper brace assemblies.* To rig the brace assemblies (fig. 76), remove the L-shaped retaining pin securing the bottom end of one of the brace assemblies to the side of the shipper. Remove the L-shaped retaining pin used to secure the male brace inside the female brace, and position the lower end of the brace assembly between the uprights of the bracket (fig. 81) attached to the front outrigger frame tube. Secure the bottom end of the brace assembly to the bracket with the L-shaped retaining pin which was removed from the side of the shipper (fig. 76). Repeat the above procedure for the brace assembly on the opposite side of the shipper line. Line up the retaining pinholes in the male and female braces and insert L-shaped retaining pins

(fig. 81). Lower the shipper slightly (*a*(4) (*b*) above) to remove the load from the boom hydraulic elevating mechanism.

(3) *Boom jacks.* To rig the boom jacks (provided in stowage box mounted on the crane platform to the left of the pivot post and boom assembly), lower the boom and extend it (*a*(4) (*d*) above) to expose the holes for the boom jack pin (fig. 82). With boom in the horizontal position, secure the boom jacks to the boom with the pin provided in stowage. Elevate the boom and aline the holes in the boom jack inner and outer members. Insert retaining pins (fig. 82) in boom jacks to maintain extended positions. Lower the boom slightly to remove the load from the boom hydraulic elevating mechanism.

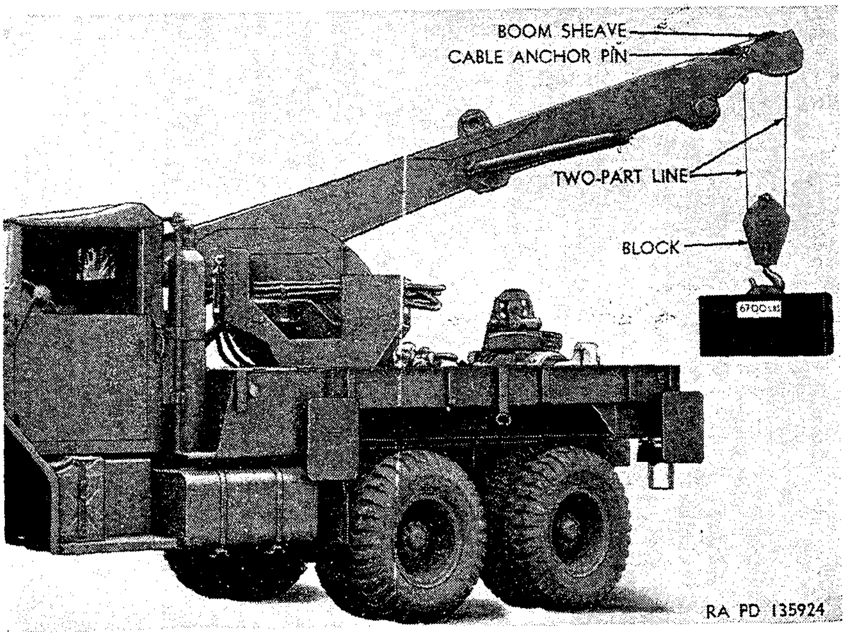


Figure 83. Crane rigged with two-part line (M62).

d. Rigging Crane Lines.

(1) *Two-part line* (fig. 83). To rig a two-part line, pass the crane hoist cable over one of the boom sheaves, around the crane block sheave, and secure the cable end to the boom head with the cable anchor pin.

(2) *Three-part line* (fig. 82). To rig a three-part line, pass the crane hoist cable over one of the boom sheaves, around the crane block sheave, over the second boom sheave, and secure the cable end to the crane block with the cable anchor pin.

e. Securing Crane for Traveling. To secure the wrecker crane for traveling, center the shipper and boom assembly horizontally, with

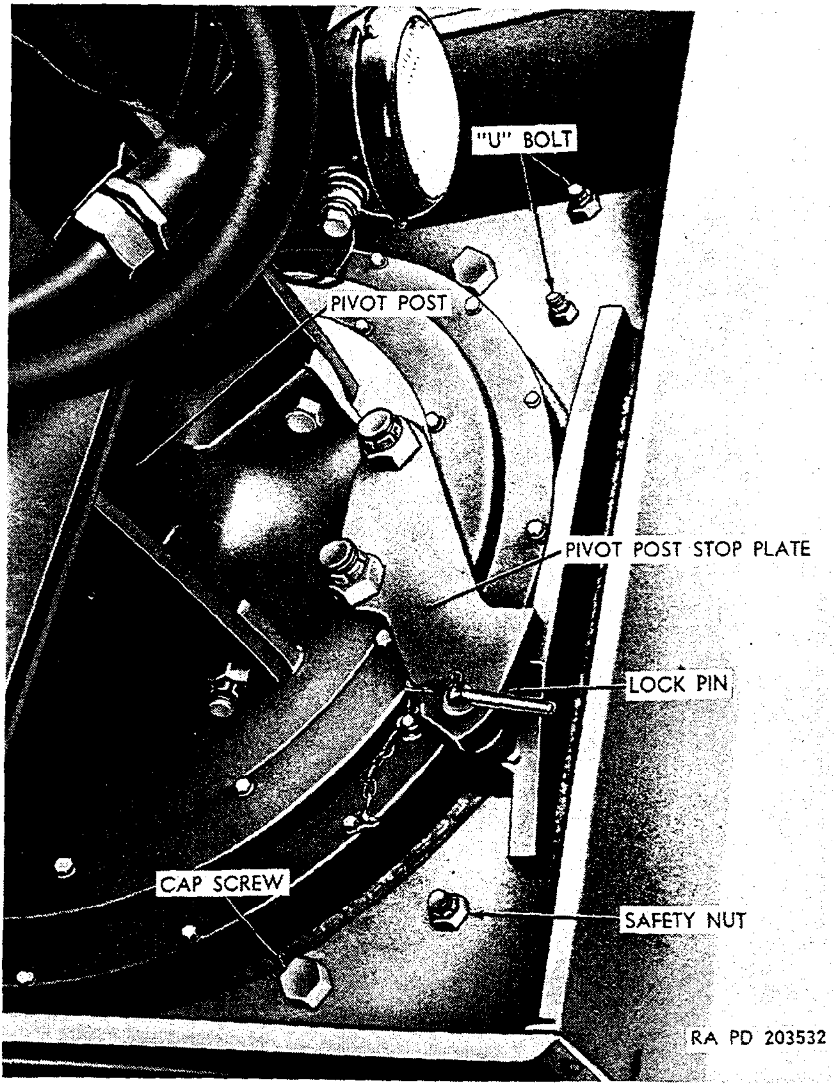


Figure 84. Lower section of crane pivot post and base plate (M246)—left rear view.

the boom fully retracted, over the rear of the truck. Secure the lifting sling (fig. 76) provided in stowage to the cable hook and to the eyes attached to the front outrigger frame tube (fig. 76). Raise the cable hook as necessary to remove all slack from the lifting sling. Move the hydraulic pump control lever (fig. 75) toward the rear of the truck to the DISENGAGE position (fig. 48). Be sure the clutch control valve lever (fig. 75) is in the ENGAGE position (fig. 47). Move the power divider control lever in the cab (fig. 67) toward the rear of the truck to the DISENGAGED position (fig. 46).

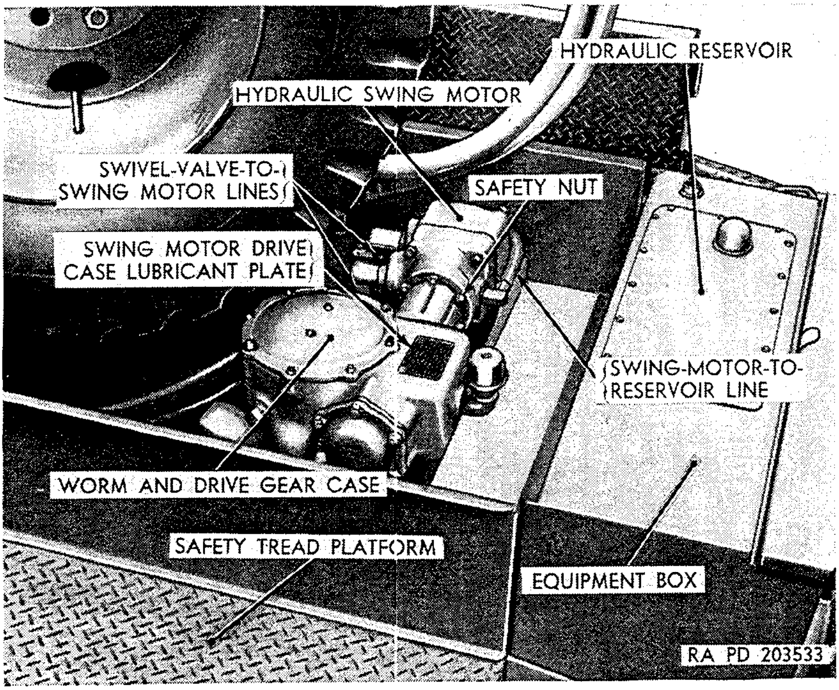


Figure 85. Crane hydraulic swing motor (M246).

f. Preparation for Storage and Shipment. Before storing or shipping the 5-ton wrecker crane, lubricate the unit completely (par. 67). In addition, cover both front and bottom boom rollers, as well as the track or surface on which these rollers operate, with preservative lubricating oil. The same material should be used on all hydraulic cylinder piston rods projecting beyond the packing gland. If the unit is to be removed from operation for a period exceeding 30 days, do not drain the oil reservoir and hydraulic system unless required for weight reduction in transportation or to comply with safety regulations.

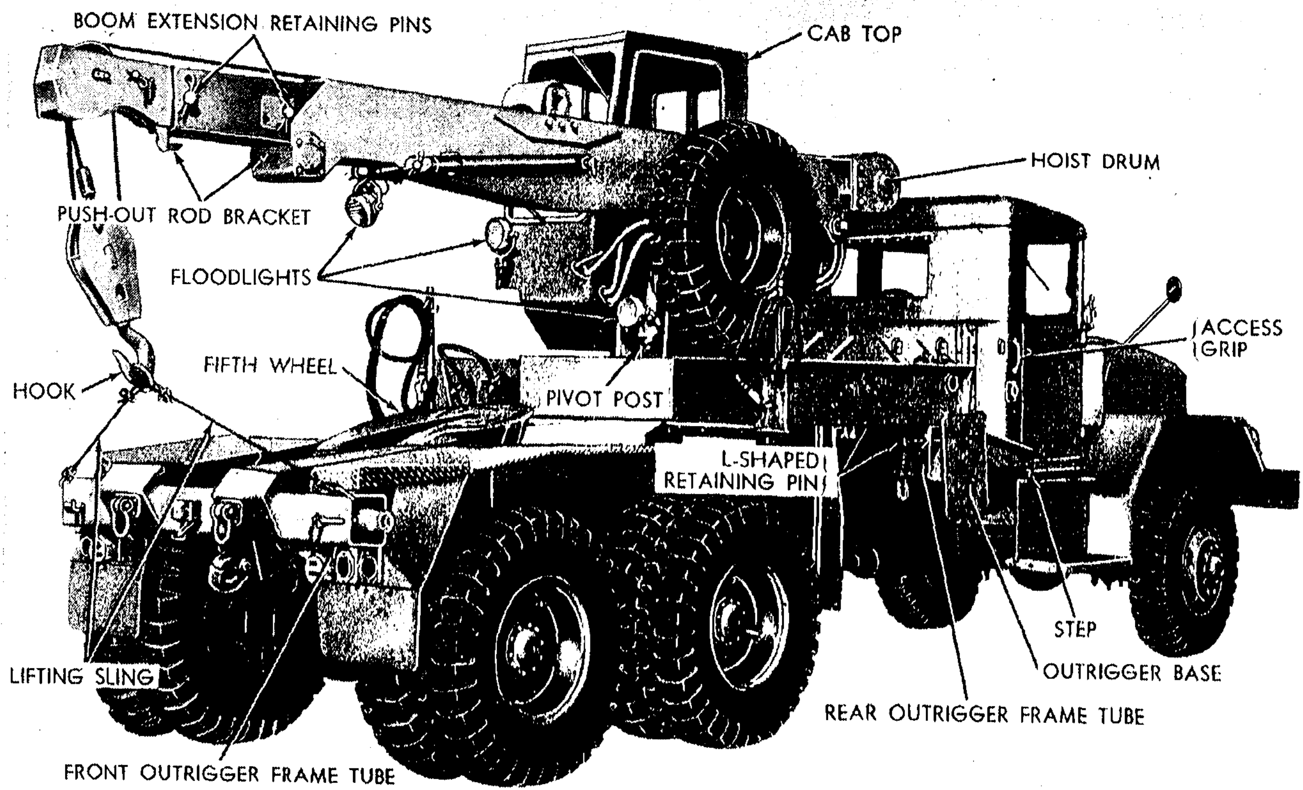
54. Wrecker Crane (M246)

a. Description.

(1) *General.* The hydraulically powered crane mounted on the rear of the tractor wrecker truck M246 has a three position extendable boom (from $11\frac{1}{2}$ feet, to 19 feet to 26 feet), which is capable of 360° rotation and approximately 45° elevation. Maximum allowable lifting loads are shown on the safe load data plate (fig. 51) located at the crane operator's station.

(2) *Pivot post and boom assembly.*

(*a*) The pivot post (fig. 84) and boom assembly is rotated 360° by a vane-type hydraulic motor (fig. 85) in conjunction with a worm and gear reducer geared to the base of the


BOOM EXTENSION RETAINING PINS
CAB TOP
HOIST DRUM
PUSH-OUT ROD BRACKET
FLOODLIGHTS
ACCESS GRIP
FIFTH WHEEL
HOOK
PIVOT POST
L-SHAPED RETAINING PIN
STEP
LIFTING SLING
OUTRIGGER BASE
REAR OUTRIGGER FRAME TUBE
FRONT OUTRIGGER FRAME TUBE

RA PD 363701

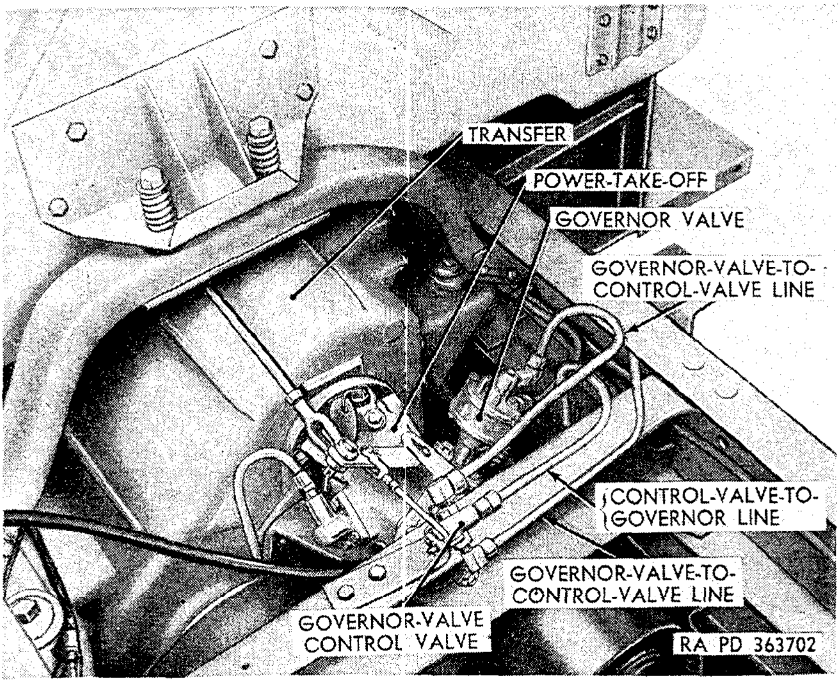


Figure 87. Power-take-off mounted on rear of transfer (M246 only)—top left rear view.

pivot post. A removable stop plate (fig. 84) is normally used to limit the amount of boom rotation to 270°. A lock-pin (fig. 84), which can be inserted through a hole in the stop plate and into a hole in the crane base plate, is provided for locking the crane for transporting.

(*b*) The boom is raised and lowered by a large-diameter vertically-mounted hydraulic cylinder, the same as that illustrated in figure 78 for the medium wrecker truck M62, which is connected between the base of the pivot post and the underside of the boom. In addition to the up and down angular movement of the boom, the outer end of the boom can be extended or retracted a distance of approximately 14 feet by a hydraulic cylinder mounted horizontally inside the boom.

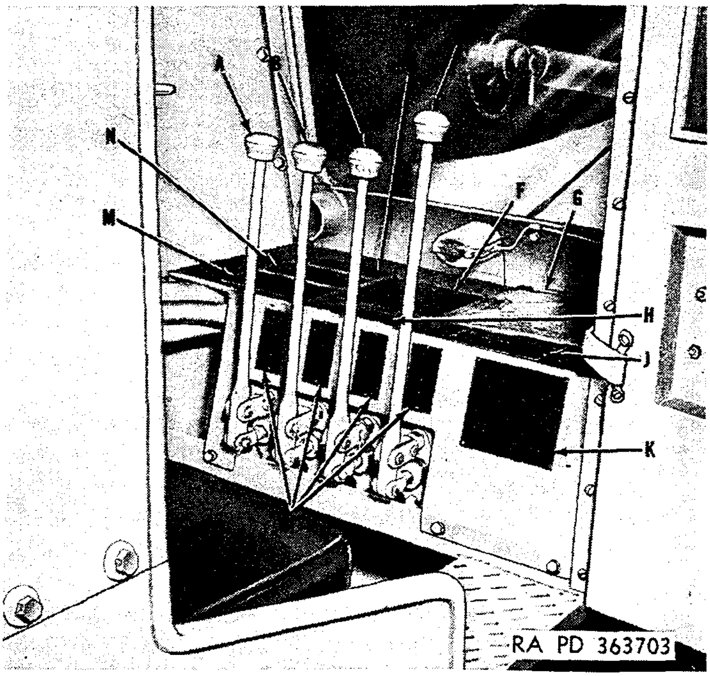
(*c*) Raising and lowering of the cable hook is controlled by a vane-type hydraulic motor in conjunction with a worm and drive gearset connected to the hoist drum (fig. 86) mounted at the rear of the boom assembly.

(3) *Hydraulic pump and controls.* The vane-type pump attached to the underside of the rear outrigger frame tube (fig. 86) is driven by a propeller shaft from the power-take-off (fig. 87) mounted on the rear of the transfer. The shift

lever (par. 40) for engaging the power-take-off sets both the power-take-off and crane hydraulic pump in motion. To engage the power-take-off, it is necessary to disengage the engine clutch (par. 23). A governor valve mounted on the power-take-off governs the engine speed at 1,500 rpm (full load) during crane operation.

(4) *Control valve bank assembly.* The control valve bank assembly (fig. 88), located in the operator's cab, is comprised of four hydraulic two-way valves bolted together to form a single unit. Each valve is equipped with a spring-loaded control lever which returns to the NEUTRAL position whenever the lever is released by the operator. For a detailed description of the control levers, refer to paragraph 53*a*(4) (*b*), through (*e*).

(5) *Outriggers.* Refer to paragraph 53*a*(5).



A—Boom control lever
B—Hoist control lever
C—Crowd control lever
D—After deepwater fording warning plate
E—Swing control lever
F—Operation instruction plate
G—Safe load data plate
H—Crowd and hoist levers instruction plate
J—Pivot post lockpin warning plate
K—Winterization operation instruction plate
L—Control lever instruction plate
M—Hydraulic oil instruction plate
N—Hydraulic reservoir and swing drive deepwater fording warning plate

Figure 88. Hydraulic crane (M246) control valve bank.

(6) *Shipper supports.* Refer to paragraph 53*a*(6).

(7) *Boom jacks.* Refer to paragraph 53*a*(7).

(8) *Platform, toolbox, operator's compartment, and lights.*

(*a*) A large safety-tread platform (fig. 85) surrounds the crane revolving structure, with access grips (fig. 86) and steps at the rear on each side of the wrecker body.

(*b*) A tool or equipment box (fig. 85) is mounted to the rear of the crane hydraulic swing motor. The front center portion of this box contains the hydraulic oil reservoir.

(*c*) Three floodlights (fig. 86) on the crane revolving structure are provided for night operation. A separate switch is provided on each light and all are connected to a master switch (par. 37) in the truck cab.

(*d*) The operator's cab at the right of the pivot post and boom assembly has a seat for the operator and contains the control valve bank assembly (fig. 88). The cab top (fig. 86) can be removed quickly and knocked down into a flat and compact package.

b. Operation of Crane.

(1) *Preliminary procedures.*

(*a*) Position the truck (par. 53*b* (v) (*a*)).

(*b*) Set the electric brake lock (par. 36).

(*c*) Be sure the oil supply valve on the underside of the hydraulic oil reservoir between the reservoir and the pump is open.

(*d*) Remove the pivot post lockpin (fig. 84).

(*e*) Position outriggers, shipper supports, or boom jacks, and rig two-part or three-part line, according to load requirements as determined from the safe load data plate (fig. 51). For detailed instructions, refer to *c* and *d* below.

(2) *Operating procedures.*

(*a*) Disengage the engine clutch (par. 23), move the transmission gearshift lever (fig. 68) to "5" (fifth) gear position (figs. 16 and 17), and place the transfer shift lever (fig. 68) in the NEUTRAL position.

(*b*) Pull the power-take-off control lever (fig. 68) up as far as it will go to ENGAGE position. Engage the engine clutch.

(*c*) Pull the throttle control knob out as far as it will go and leave in LOCKED-OUT position (fig. 72).

Note. The truck engine speed will be governed at 1,500 rpm (full load) by the governor valve (fig. 87) located on the right side of the power-take-off mounted on the rear of the transfer.

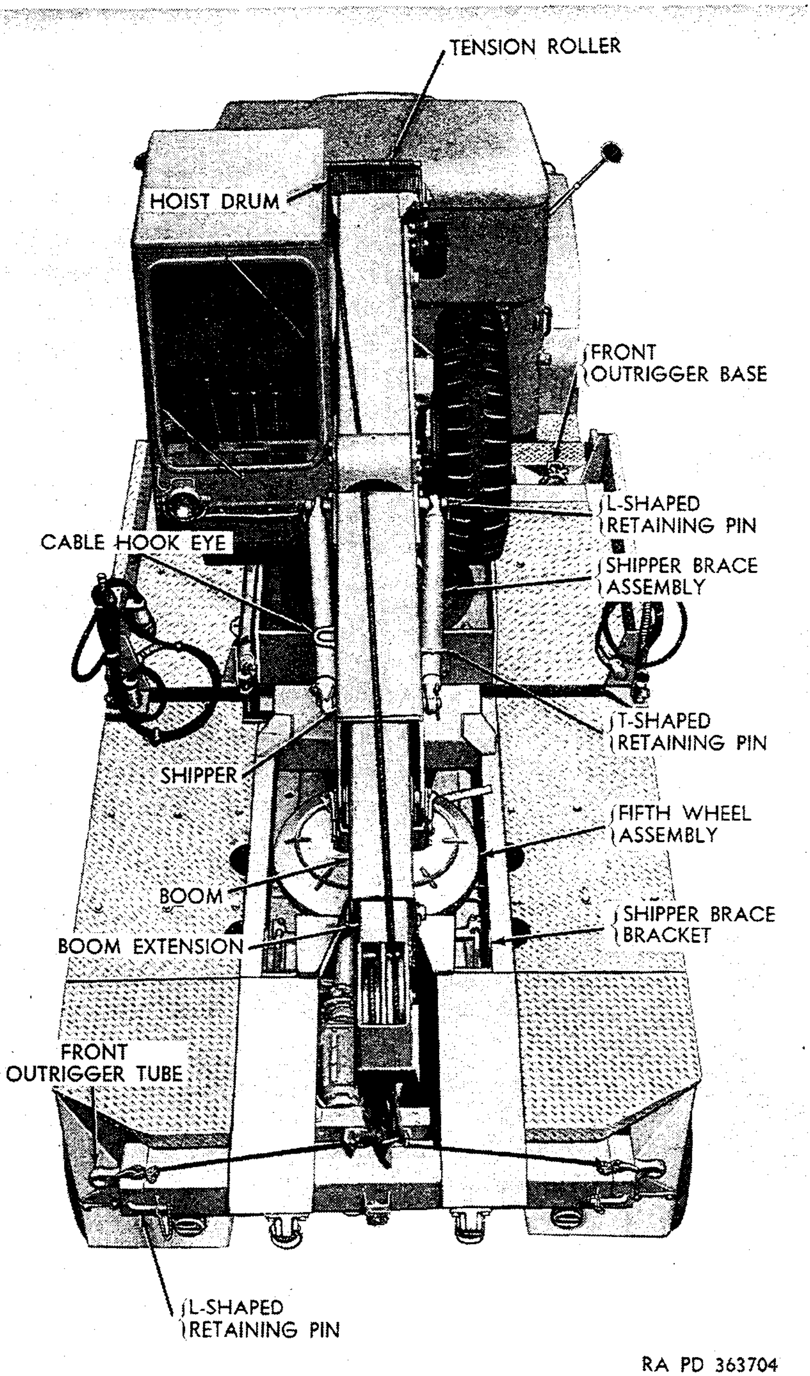


Figure 89. Top rear view of tractor wrecker truck M246.

(*d*) Push the hoist control lever (B, fig. 88) in the crane operator's compartment forward to unwind cable and lower the hook.

Caution: Do not pay out cable after the hook has reached the ground. Continued rotation of the drum will loosen cable from the groove in the drum.

(*e*) With the cable hook secured to the load, operate the boom, hoist, crowd, and swing control levers (par. 53*a*(4)) as necessary to move the load to the desired position.

Caution: When operating the crowd control lever so as to extend the boom, be careful not to jam the crane block into the boom head sheave. Pushing the crowd and hoist control levers away from the operator together will eliminate this possibility and will cause the cable hook to maintain a constant distance from the boom head as the boom is extended.

For detailed instructions on extending and retracting the boom extension (fig. 89), refer to *e* below.

c. Positioning Crane Supports.

(1) *Outriggers.* Position the front outriggers (fig. 86) by removing the two outrigger bases (fig. 90), one on each side of

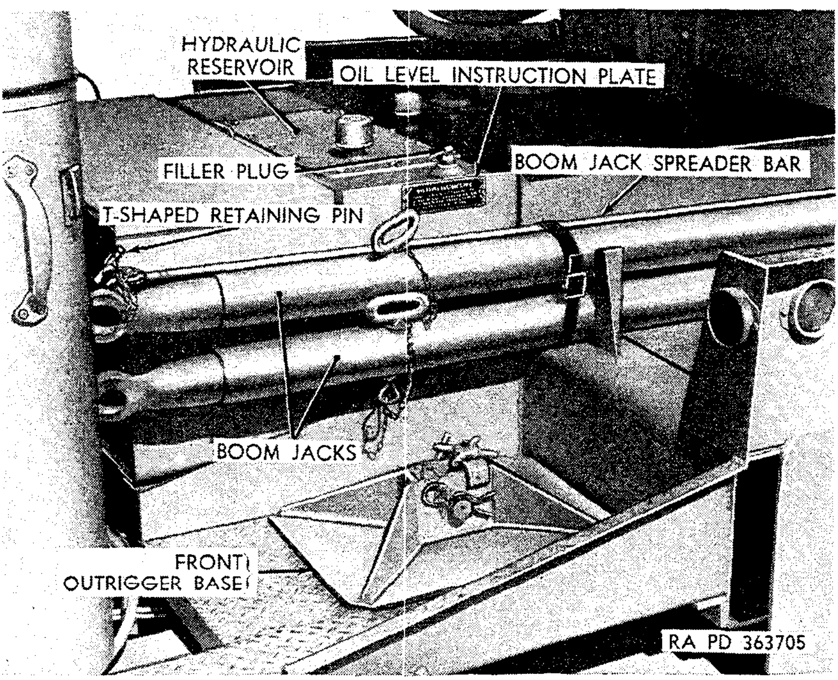


Figure 90. View of right front section of wrecker body—M246.

the equipment box, and attaching the bases to the left and right front outrigger tubes (fig. 89), par. 53*c*(1)).

(2) *Shipper brace assemblies* (fig. 89). To rig the brace assemblies, remove the **L**-shaped retaining pin securing the bottom end of one of the brace assemblies to the side of the shipper. Remove the **T**-shaped retaining pin used to secure the male brace inside the female brace, and position the lower end of the brace assembly between the uprights of the shipper brace bracket attached to the crane body on either side of the fifth wheel assembly. Secure the bottom end of the brace assembly to the bracket with the **L**-shaped retaining pin which was removed from the side of the shipper. Repeat the above procedure for the brace assembly on the opposite side of the shipper. Line up the retaining pinholes in the male and female braces and insert the **T**-shaped retaining

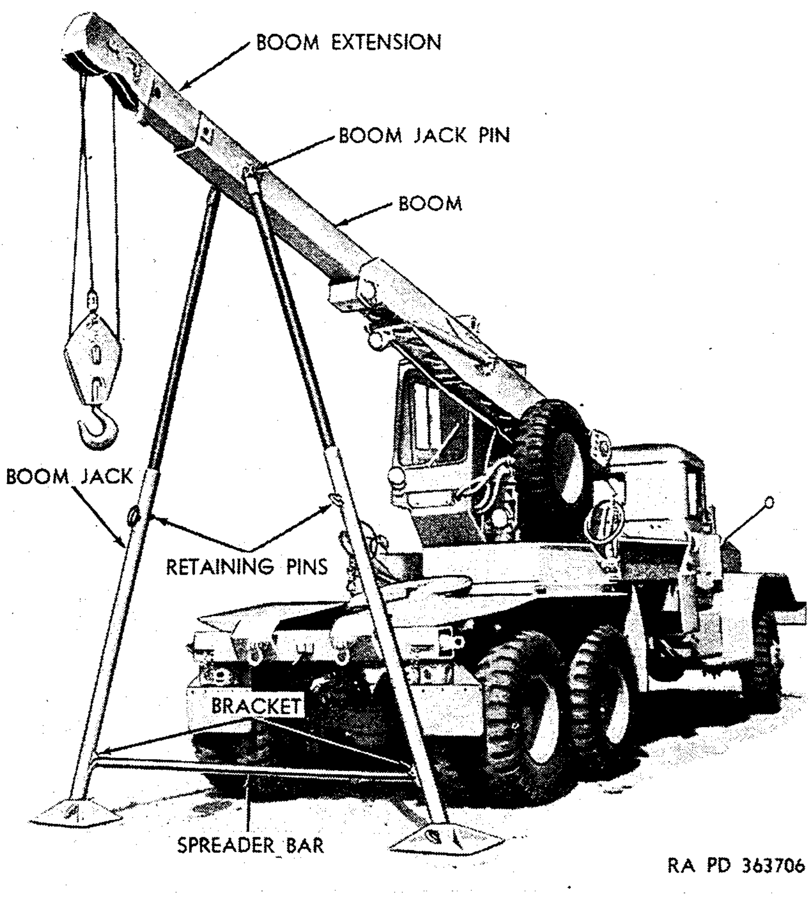


Figure 91. Right rear view of tractor wrecker truck M246 with boom jacks rigged.

pins. Lower the shipper slightly to remove the load from the boom hydraulic elevating mechanism.

(3) *Boom jacks.* To rig the boom jacks (fig. 91), provided in stowage rack alongside the hydraulic reservoir and equipment box (fig. 90), extend the boom to expose the holes (approximately four feet from the boom end) for the boom jack pin. With the boom in its fully lowered position, secure the boom jacks to the boom with the pin provided in stowage.

Caution: The boom jack pin must go through both boom and boom extension.

Attach the spreader bar (fig. 90) provided in stowage to the brackets (fig. 91) at the lower ends of the boom jacks and secure with T-shaped retaining pins. Elevate the boom and aline the holes in the boom jack inner and outer members. Insert retaining pins (figs. 90 and 91) in boom jacks to maintain extended positions. Lower the boom slightly to remove the load from the boom hydraulic elevating mechanism.

d. Rigging Crane Lines.

(1) *Two-part line.* Refer to paragraph 53*d*(1).

(2) *Three-part line.* Refer to paragraph 53*d*(2).

e. Extending and Retracting Boom Extension.

(1) To push out the boom extension (fig. 89), remove the two boom extension retaining pins (fig. 86) used to secure the boom extension inside the boom. Using the crowd control lever (C, fig. 88) in the crane operator's cab, extend the boom to its maximum length. Place the boom extension push-out rod (fig. 92), assembled from three pieces provided in stowage, between the V-shaped push-out rod brackets (fig. 86) at the end of shipper and on end of extension. Retract the boom slowly, pushing out the boom extension, until holes in boom and extension line up. Insert boom extension retaining pins in holes and remove the push-out rod.

(2) To retract the boom extension, remove the two boom extension retaining pins. Using the hoist control lever (B, fig. 88) in the crane operator's compartment, slowly raise the crane block until the block contacts the boom sheave. Continue to hold the hoist control lever in the UP position until the crane cable pulls the boom extension to its fully retracted position. Line up the holes in the boom and boom extension and install the boom extension retaining pins.

Caution: The entire operation of extending and retracting the boom extension should be done with care to prevent damage to the crane.

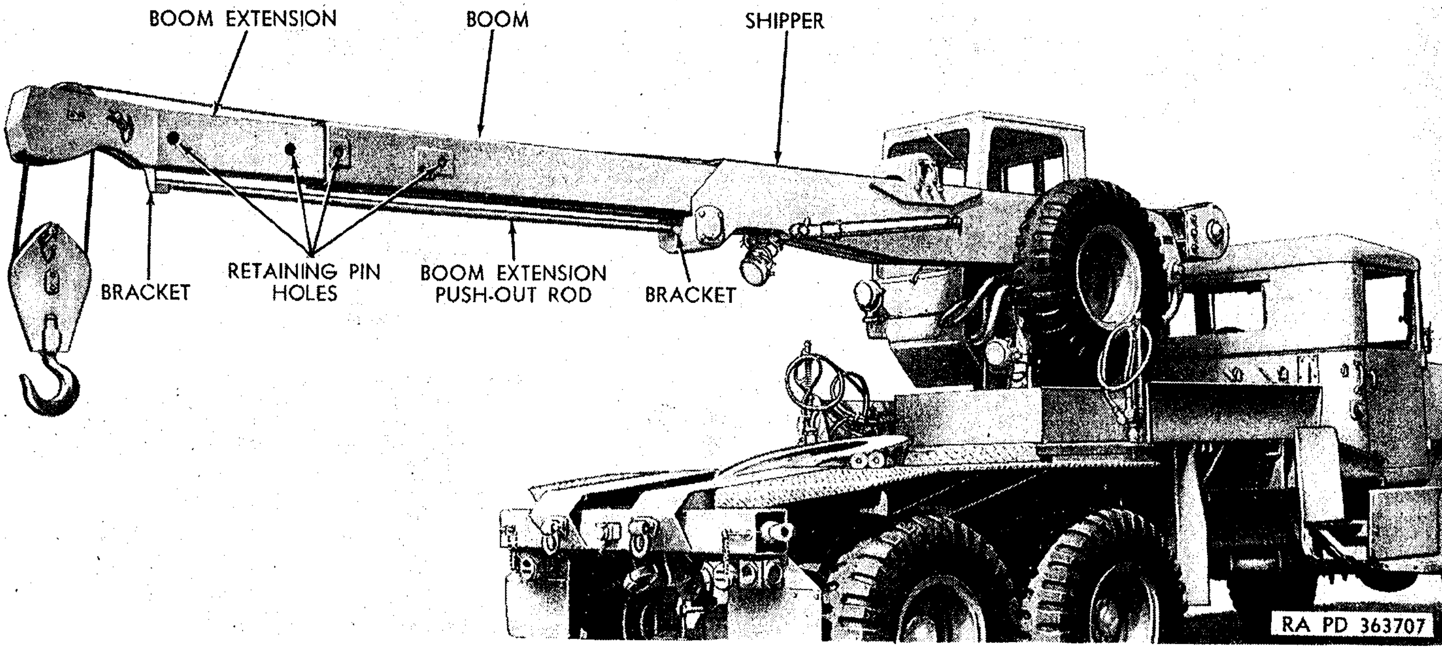


Figure 92. Tractor wrecker truck M246 with push-out rod in place for extending boom extension.

f. Securing the Crane for Traveling.

(1) *Without fifth wheel trailer.* To secure the wrecker crane for traveling without fifth wheel trailer, center the shipper and boom assembly horizontally, with the boom fully retracted, over the rear of the truck. Insert the pivot post lockpin (fig. 84) to stabilize the crane revolving structure and relieve the load on the swing drive gear train. Rig the shipper supports (*c*(2) above). Secure the lifting sling (fig. 86) to the cable hook and to the front outrigger frame tube. Raise the cable hook as necessary to remove all slack from the lifting sling. Move the power-take-off control lever (fig. 68) down as far as it will go to the DISENGAGED position. Release the throttle control (par. 18).

(2) *With fifth wheel trailer.* To secure the wrecker crane for traveling with fifth wheel trailer, proceed as in (1) above but do not rig shipper supports or stabilize cable hook with lifting sling. To prevent the cable hook from scraping the top of the trailer toolbox, insert the hook in the eye provided on the side of the shipper (fig. 93).

g. Preparation for Storage and Shipment. Refer to paragraph 53*f*.

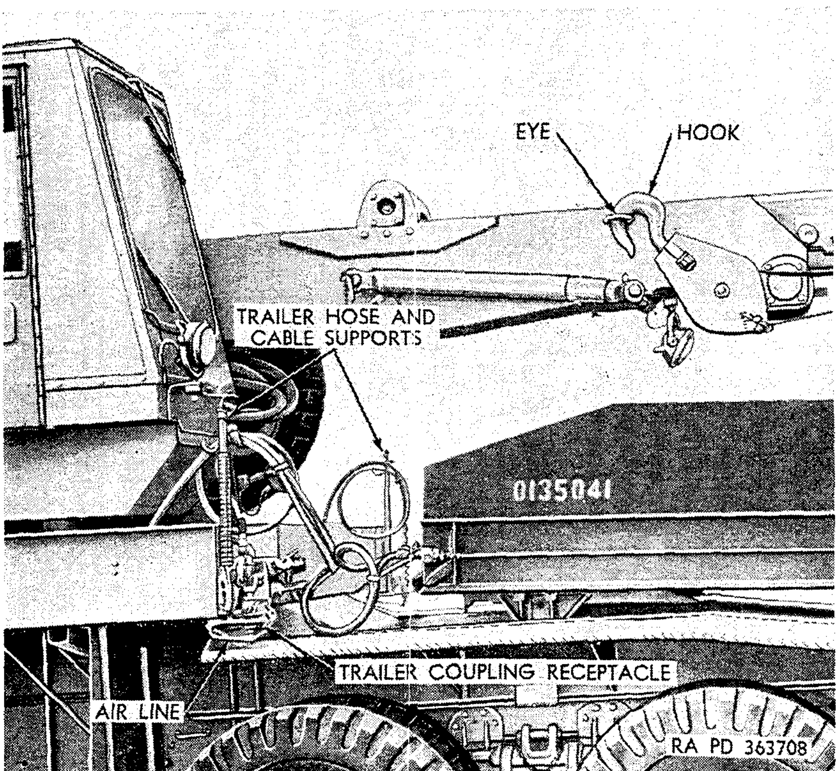


Figure 93. Wrecker crane (M246) secured for traveling with fifth wheel trailer.

347797°—55——7

55. Dump Body and Hoist Assembly (M51)

a. Description.

(1) *Dump body.* The dump body (fig. 94) mounted on the rear of the dump truck M51 is of all-steel welded construction with a universal-type tailgate which may be opened at either the top or the bottom. This construction permits operation of the truck as either a regular, rocker-type, or spreader-type dump. The front end of the body is equipped with a reinforced steel-plate cab shield which extends over and protects the truck cab during operation. The dump body, which has a capacity of 5 cubic yards, is hinged to the rear of the subframe which is mounted directly on the truck chassis.

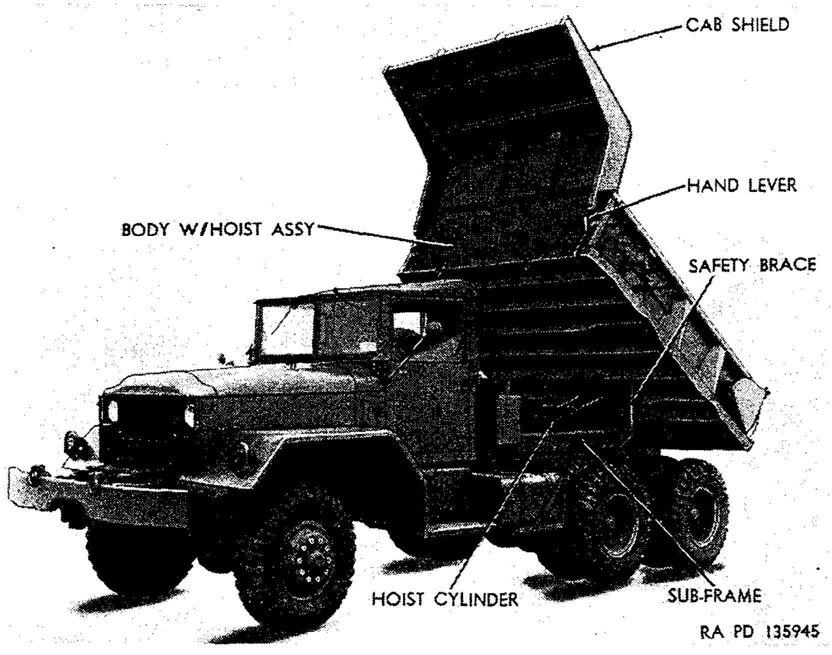


Figure 94. Dump truck M51 with body in raised position.

(2) *Hoist assembly.* The hoist assembly used to raise and lower the dump body is comprised of a pair of double-acting hydraulic cylinders, a positive-displacement gear-type hydraulic pump, a hydraulic oil reservoir, and connecting high pressure-type hoses. The hydraulic pump, which is mounted on the underside of the reservoir built into the forward end of the subframe (fig. 94), is driven by a propeller shaft connected to a power-take-off (par. 208) mounted on the lower right side of the transmission. Operation of the hoist assembly is controlled by the dump body control lever (fig. 67)

located to the left of the driver's seat. Shifting instructions for this lever are shown on the dump body control data plate (fig. 64) mounted on the instrument panel (N, fig. 65).

b. Operation As a Regular Dump.

(1) Position truck for dumping, and stop the truck (par. 46*c*).

(2) Pull the tailgate-control-rod hand lever (fig. 94) forward and down as far as it will go to unlock the tailgate.

(3) Disengage the engine clutch (par. 23).

(4) Release the lock on the dump body control lever (par. 39) and move the lever to the POWER-UP position.

Caution: The vehicle must be stopped and the clutch disengaged in order to shift the hand control lever out of NEUTRAL to engage the power-take-off and hoist pump. However, after these units have once been engaged, the hand control lever may be operated through its entire operating range for whichever body function is desired until the lever is returned to the NEUTRAL position.

(5) With the engine running at idling speed, engage the clutch and the dump body will raise.

Note. When the dump body reaches its limit of travel, it automatically stops.

(6) To lower the body, move the dump body control lever to the POWER-DOWN position.

(7) After the body is completely lowered, move the dump body control lever to the NEUTRAL position and lock it.

Note. It is important that the operator keep the dump body control lever in the locked position at all times when the hoist is not being operated.

(8) Push the tailgate-control-rod hand lever up and back as far as it will go to lock the tailgate (fig. 95) in the closed position.

c. Operation As a Rocker-Type Dump.

(1) Position truck for dumping, and stop the truck (par. 46*c*).

(2) Unfasten the harness hooks (fig. 95) used to secure the tailgate wings to the sides of the dump body, and swing the tailgate wings to the rear.

(3) Remove the retaining pins (fig. 95) which secure the tailgate upper hinge pins to the upper hinge brackets (one on each side), and lower the tailgate (fig. 96) so that the hinge pins engage the grooves in the tailgate wings.

(4) Perform operations described in *b*(3) through (7) above.

(5) Push the tailgate up and secure it to the upper hinge brackets with the retaining pins (fig. 95).

(6) Swing the tailgate wings forward and secure them to the sides of the dump body with the harness hooks.

d. Operation As a Spreader-Type Dump.

(1) Position truck for dumping, and stop the truck (par. 46*c*).

(2) Thread the tailgate chains (fig. 97), one on each end of the tailgate, around the hook at the lower corner of each end of the tailgate and through the hole at the lower end of each rear corner brace. Adjust the chain length to limit the tailgate opening (and thereby restrict the flow of material to be spread) as desired.

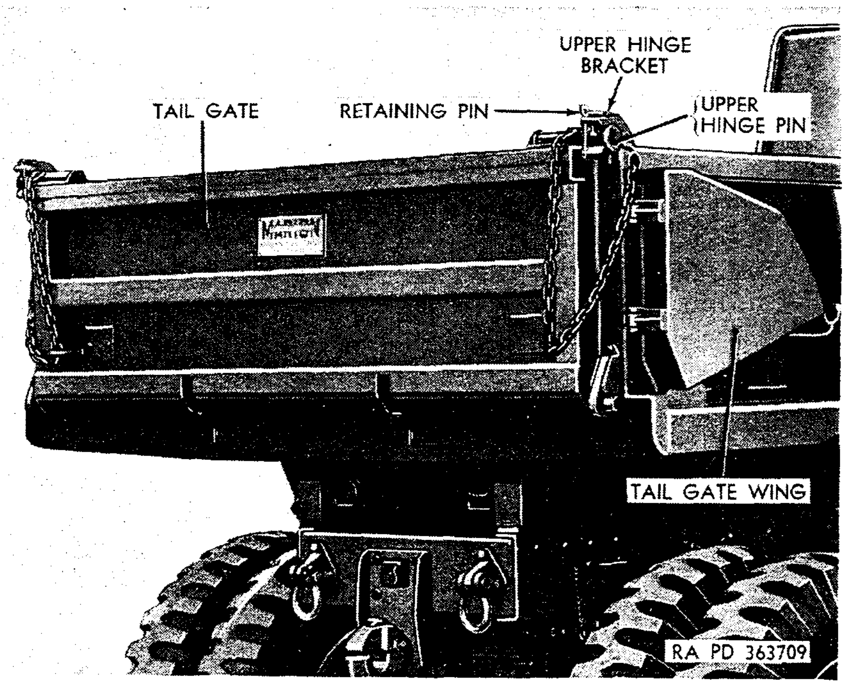


Figure 95. Dump body tailgate in closed position.

(3) Perform operations described in *b*(3), (4), and (5) above.

(4) When the dump body has raised two or three feet, move the dump body control lever to the HOLD position.

(5) Pull the hand lever (fig. 94) forward and down as far as it will go. In this condition, the material should just start to spill out under the tailgate.

(6) Disengage the engine clutch, and place the transmission gearshift lever in the "1" (first) speed forward position and the transfer shift lever in the L (low) range position.

(7) Increase the engine speed slightly and slowly engage the clutch to set the truck in motion.

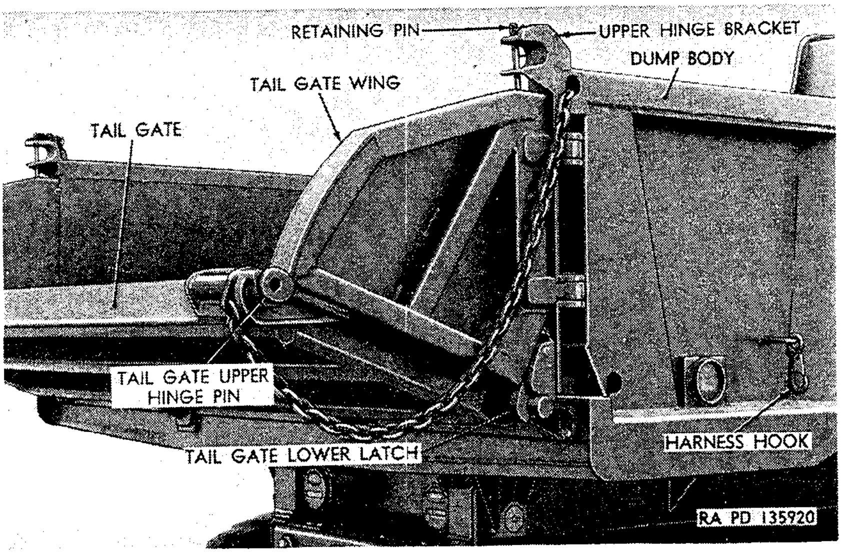


Figure 96. Dump body tailgate arranged for rocker operation.

(8) Raise the dump body at intervals by alternately moving the dump body control lever to the POWER-UP position (fig. 64) and then back to HOLD as required to cause free flow of material from under the tailgate.

(9) When unloaded, move the dump body control lever to the POWER-DOWN position (fig. 64) to lower the body to its traveling position.

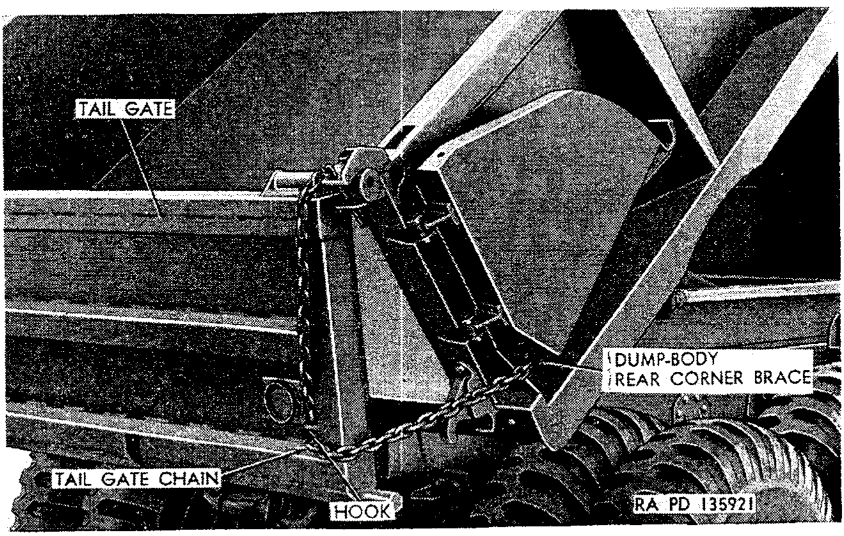


Figure 97. Dump body tailgate arranged for spreader operation.

(10) Stop the truck (par. 46*c*). Move the dump body control lever to the NEUTRAL position (fig. 46) and lock it.

Caution: Never leave the hoist assembly engaged while the truck is driven to and from a job location.

(11) Push the hand lever up and back as far as it will go to lock the tailgate (fig. 95) in the closed position.

56. Fifth Wheel (M52 and M246)

a. Description. The semitrailer coupler, commonly termed the fifth wheel, is mounted on the rear of the tractor truck M52 and tractor wrecker truck M246 on the crane body over the tandem rear axles. Flexibility of coupling is obtained by pivoting the base of the fifth

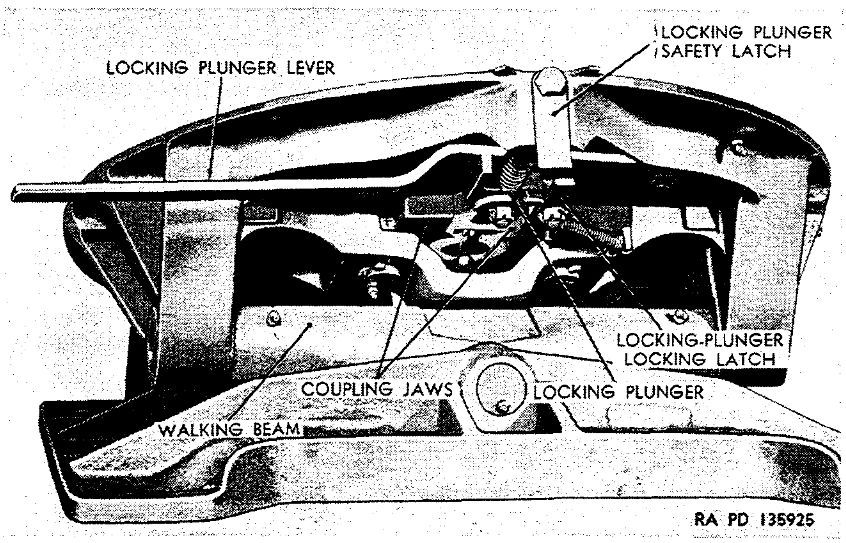


Figure 98. Fifth wheel assembly removed from vehicle—front view.

wheel (fig. 98) to a walking beam which in turn is pivoted to the sub-base. This construction permits movement of the fifth wheel in all planes.

b. Operation.

(1) *Coupling.*

(*a*) Swing the locking plunger safety latch (fig. 98) aside and push the locking plunger lever toward the front of the truck until the locking plunger locking latch drops into position so that the lever remains locked in the forward position. This operation sets the coupling jaws for coupling.

(*b*) Back the truck under the front of the trailer so that the kingpin secured to the underside of the trailer front end slides into the V-shaped opening at the rear of the fifth wheel. Continue to back the truck until the movement of the kingpin causes the left coupling jaw to release the locking plunger locking latch, thereby causing the locking plunger to lock the coupling jaws about the kingpin. The locking plunger safety latch should fall to the position shown in figure 98.

Note. Refer to technical manual of trailer to be hauled for correct preparation of vehicle for coupling and uncoupling operations.

(2) *Uncoupling.*

(*a*) Swing the locking plunger safety latch aside and push the locking plunger lever toward the front of the truck, the same as for coupling (1(*a*) above).

(*b*) Drive the truck forward and out from under the front of the trailer.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

57. General Conditions

a. In addition to the operating procedures described for usual conditions, special instructions of a technical nature for operating and servicing this vehicle under unusual conditions are contained or referred to herein. In addition to the normal preventive maintenance service, special care in cleaning and lubrication must be observed where extremes of temperature, humidity, and terrain conditions are present or anticipated. Proper cleaning, lubrication, and storage and handling of fuels and lubricants not only insure proper operation and functioning, but also guard against excessive wear of the working parts and deterioration of the materiels.

b. TM 21–300 contains very important instructions on driver selection, training, and supervision and TM 21–305 prescribes special driving instructions for operating wheeled vehicles under unusual conditions.

Caution: It is imperative that the approved practices and precautions be followed. A detailed study of these technical manuals is essential for use of this materiel under unusual conditions.

c. Refer to paragraph 69 for lubrication under unusual conditions, to tables III and IV, for preventive maintenance checks, and to paragraphs 106 through 333 for maintenance procedures.

d. When chronic failure of materiel results from subjection to extreme conditions, report of the condition should be made on DA Form 468 (par. 2).

58. Extreme Cold Weather Conditions

a. General Problems.

(1) Extensive preparation of materiel scheduled for operation in extreme cold weather is necessary. Generally, extreme cold will cause lubricants to thicken, freeze batteries or prevent them from furnishing sufficient current for cold weather starting, crack insulation and cause electrical short circuits, prevent fuel from vaporizing and properly combining with air to form a combustible mixture for starting, and will cause the various construction materials to become hard, brittle, and easily damaged or broken.

(2) The cooling system must be prepared and protected for temperatures below +32° F. in accordance with instruction in TM 9–2855 on draining and cleaning the system and the selection, application, and checking of antifreeze compounds to suit the anticipated conditions.

(3) TM 9–2855 also describes the method of correcting specific gravity readings for batteries exposed to extreme cold.

(4) For description of operations in extreme cold, refer to FM 31–70 and FM 31–71 as well as to TM 9–2855.

Caution: It is imperative that the approved practices and precautions be followed. TM 9–2855 contains information which is specifically applicable to this vehicle as well as to all other vehicles. It must be considered an essential part of this manual, not merely an explanatory supplement to it.

b. Winterization Equipment. Special equipment is provided for the vehicle when protection against extreme cold weather (0° to −65° F.) is required. This equipment is issued as specific kits. Each kit contains a technical bulletin which provides information on description, installation instructions, and methods of use. TM 9–2855 contains general information on winterization equipment and processing.

c. Fuel, Lubricants, and Antifreeze Compounds (Storage, Handling, and Use).

(1) The operation of equipment at arctic temperatures will depend to a great extent upon the condition of the fuels, lubricants, and antifreeze compounds used in the equipment. Immediate effects of careless storage and handling or improper use of these materials are not always apparent, but any deviation from proper procedures may cause trouble at the least expected time.

(2) In arctic operations, contamination with moisture is a source of many difficulties. Moisture can be the result of snow get-

ting into the product, condensation due to "breathing" of a partially filled container, or moisture condensed from warm air in a partially filled container when a product is brought outdoors from room temperature. Other impurities will also contaminate fuels and lubricants so their usefulness is impaired.

(3) Refer to TM 9–2855 for detailed instruction on storage, handling, and use.

59. Extreme Cold Weather Operation

a. General.

(1) The driver must always be on the alert for indications of the effect of cold weather on the vehicle.

(2) The driver must be very cautious when placing the vehicle in motion after a shutdown. Thickened lubricants may cause failure of parts. Tires frozen to the ground or frozen to the shape of the flat spot while underinflated must be considered. One or more brakeshoes may be frozen fast and require preheating to avoid damage to the braking surfaces. After warming up the engine thoroughly, place transmission in first gear and drive vehicle slowly about 100 yards, being careful not to stall the engine. This should heat gears and tires to a point where normal operation can be expected.

(3) Constantly note instrument readings. If instrument readings consistently deviate from normal, stop the vehicle and investigate the cause.

b. At Halt or Parking.

(1) When halted for short shutdown periods, the vehicle should be parked in a sheltered spot out of the wind. If no shelter is available, park so that the vehicle does not face the wind. For long shutdown periods, if high ground is not available, prepare a footing of planks or brush. Chock in place if necessary.

(2) When preparing a vehicle for shutdown periods, place control levers in the neutral position to prevent them from possible freezing in an engaged position. Freezing may occur when water is present due to condensation.

(3) Clean all parts of the vehicle of snow, ice, and mud as soon as possible after operation. Refer to table III, for detailed after-operation procedures. If the winter front and side covers are not installed, be sure to protect all parts of the engine and engine accessories against entrance of loose, drifting snow during the halt. Snow flurries penetrating the

engine compartment may enter the crankcase filler vent, et cetera. Cover and shield the vehicle but keep the ends of the canvas paulins off the ground to prevent them from freezing to the ground.

(4) If no power plant heater is present, the battery should be removed and stored in a warm place.

(5) Refuel immediately in order to reduce condensation in the fuel tanks. Prior to refueling, open fuel tank drains and drain off any accumulated water.

(6) Immediately after engine "shut-down," start the power plant heater and check to be sure it operates effectively. The heater should avoid the necessity of removing the battery to warm storage, and is designed to operate unattended during overnight stops. Instructions for operation of winterization equipment is contained in pamphlet packed with kit.

(7) Correct tire inflation pressure is prescribed in table I.

(8) When drain plugs have been removed or drain cocks opened to remove liquid from the cooling system of any equipment, the drains will be inspected to be sure none are obstructed. If the drain holes have become obstructed by foreign material, a soft wire should be used to clear the holes of the obstruction. This is particularly important before leaving a vehicle that has had the engine drained to protect the block from freezing. The draining of an engine cooling system to prevent freezing will be done only when no approved antifreeze solution is available.

60. Operation in Extreme Hot Weather Conditions

a. General. Continuous operation of the vehicle at high speed or long hard pulls in low gear positions on steep grades or in soft terrain may cause the vehicle to register overheating. Avoid the continuous use of low gear ratios whenever possible. Continuously watch the temperature and halt the vehicle for a cooling-off period whenever necessary and the tactical situation permits. Frequently inspect and service cooling unit, oil filter, and air cleaner. If the engine temperature consistently rises above 200° F., look for dust, sand, or insects in radiator fins and blow out any accumulation with compressed air or water under pressure. Flush cooling system if necessary.

b. At Halt or Parking.

(1) Do not park the vehicle in the sun for long periods, as the heat and sunlight will shorten the life of the tires. If possible, park vehicle under cover to protect it from sun, sand, and dust.

(2) Cover inactive vehicles with paulins if no other suitable shelter is available. Where entire vehicle cannot be covered, protect window glass against sand etching, and protect engine compartment against entry of sand.

(3) Correct tire inflation pressure is prescribed in table I.

(4) Vehicles inactive for long periods in hot humid weather are subject to rapid rusting and accumulation of fungi growth. Make frequent inspections and clean and lubricate to prevent excessive deterioration.

61. Operation on Unusual Terrain

a. General.

(1) Vehicle operation on snow or ice and in deep mud requires the use of tire chains. Tire chains must be installed in pairs (front and rear) to prevent power train damage and wear. Select a gear ratio low enough to move vehicle steadily and without imposing undue driving strain on engine and power train. However, racing of the engine for extended periods must be avoided.

Note. Avoid excessive clutch slippage.

(2) Operators must at all times know the position in which the front wheels are steering, as the vehicle may travel straight ahead even though the wheels are cramped right or left. A piece of string tied to the front portion of the steering wheel rim in STRAIGHT AHEAD position will indicate to the driver whether the front wheels are "ploughing." This ploughing action may cause the vehicle to stall, or suddenly veer to right or left.

(3) If one or more wheels become mired and others spin, it may be necessary for the vehicle to be winched or towed by a companion vehicle or to jack up the wheel which is mired and insert planking or matting beneath it. Do not jam sticks or stones under a spinning wheel, as this only forms an effective block and will wear the tire tread unnecessarily.

(4) Operation in sand requires daily cleaning of air cleaners and fuel and oil filters. Engine vents and other exposed vents should be covered with cloth.

(5) At high altitudes, coolant in vehicles boils at proportionately lower points than 212° F., thus it will be necessary to keep a close watch on the engine temperature during the summer months.

b. Recommended Tire Pressures. Recommended tire pressures for the vehicles covered by this manual are listed in table I.

Table I. Recommended Tire Pressure

Truck model	Highway	Cross country	Mud, sand and snow
M40	70	35	15
M41	45	45	15
M51	70	35	15
M52	70	35	15
M54	70	35	15
M61	70	35	15
M62	70	35	15
M139, M139C	45	45	15
M246	75	35	15

c. After-Operation Procedures. Remove accumulations of ice, snow, and mud from under the fenders and from the radiator core; engine compartments, steering knuckles and arms, brake cylinder boots and hoses, crankcase breather oil filters, air cleaners, and electrical connections.

Caution: Exercise care when removing such accumulations in order to prevent damage to the affected parts.

d. Fifth Wheel Adjustment. Adjustment of wedges on fifth wheels of vehicles so equipped must be made prior to and after cross-country operations. Adjusting wedges are used in the fully locked position when vehicle is on the highway. For cross-country use, the adjusting wedges should be in the fully withdrawn position.

62. Fording Operations

a. General. In fording, vehicles may be subjected to water varying in depth from only a few inches to a depth sufficient to completely submerge the vehicle. Factors to be considered are spray-splashing precautions, normal fording capabilities, deepwater fording using fording kits, and accidental complete submersion.

b. Normal Fording. Fording of bodies of water up to a maximum vehicle fording depth of 30 inches (par. 7) is based on the standard vehicle with waterproofing protection provided for critical units when manufactured, but without deepwater fording kit. Observe the precautions in (1) through (6) below.

(1) Make sure that battery cell vent caps are snug.

(2) Do not exceed the known fording limits of the vehicle.

(3) The engine must be operated at maximum efficiency before attempting to ford.

(4) Shift transmission into lowest speed positions. Close crankcase ventilating system (par. 41). Speed up engine to overcome the possibility of a "stall" when the cold water chills

the engine. Enter the water slowly. Should the engine stall while submerged, it may be started in the usual manner.

(5) All normal fording should be at speeds of from 3 to 4 mph to avoid forming a "bow wave". Avoid using the clutch if possible because frequent use while submerged may cause the clutch to slip. If the ford is deep enough for the spinning fan blades to catch water, loosen the fan belt before crossing, otherwise, they may throw water over the electrical units. The brakes will usually be "lost" but in some cases may "grab" after emergence. Applying the brakes a few times after dry land has been reached will help dry out the brake linings.

(6) If accidental complete submersion occurs, the vehicle will be salvaged, temporary preservation applied as outlined in paragraph 71, and then sent to the ordnance maintenance unit as soon as possible for necessary permanent maintenance.

c. Deepwater Fording. Refer to TM 9–2855 for general information, descriptions, and methods of use of deepwater fording kits, and general procedures for the operation of vehicles so equipped.

d. After-Fording Operations. Immediately after vehicle emerges from the water, push in the crankcase ventilating shutoff valve control handle, mounted on the instrument panel, to allow the crankcase ventilating system to operate normally and relieve crankcase pressure. Open all drain holes in body. Also, at the earliest opportunity, check the engine oil level and check for presence of water in the crankcase. Heat generated by driving will evaporate or force out most water which has entered at various points. Also, any *small* amount of water which has entered the crankcase either through leakage or due to condensation will usually be dissipated by the ventilating system. Refer to paragraph 76 for maintenance operations after fording.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR OPERATION AND ORGANIZATIONAL MAINTENANCE

63. General

Tools, equipment, and spare parts are issued to the using organization for maintaining the materiel. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stored in the chest and/or roll provided for them.

64. Parts

Spare parts are supplied to the using organization for replacement of those parts most likely to become worn, broken, or otherwise unserviceable providing replacement of these parts is within the scope of organizational maintenance functions. Spare parts, tools, and equipment supplied for the 5-ton 6 x 6 trucks covered by this manual are listed in Department of the Army Supply Manual ORD 7 SNL G–744, which is the authority for requisitioning replacements.

65. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this materiel are authorized for issue to 1st echelon by ORD 7 SNL G–744. Common tools and equipment for 2d echelon are listed in ORD 6 SNL J–7, Sections 1, 2, and 3; ORD 6 SNL J–10, Section 4; and are authorized for issue by TA and TOE.

66. Special Tools and Equipment

Certain tools and equipment specially designed for operation and organizational maintenance, repair, and general use with the materiel are listed in table II for information only. This list is not to be used for requisitioning replacements.

Table 11. Special Tools and Equipment for Operation and Organizational Maintenance

Item	Identifying No.	References		Use
		Fig.	Par.	
ARBOR, alining clutch	7950131	100 199	203	Installing clutch pressure plate assembly.
FIXTURE, axle	E7357514	99 225 235	215 218	Removing and installing front and rear axles (Use w/Jack—7950143).
FIXTURE, transfer case.	7357524	99 206	207	Removing and installing transfer (Use w/Jack—7950143).
FIXTURE, transmission.	7357539	99 201	205	Removing and installing transmission. (Use w/Jack—7950143).
JACK, hydraulic, parallelogram-type, 1-ton capacity.	7950143	99 201 205 206 207 225 234 235	205 207 215 218	Removing and installing transmission, transfer, and front and rear axles (Use w/fixtures — 7357539, 7357524, and E7357514).
SLING, lifting engine	7950564	100 150	114	Removing and installing power plant.
WRENCH, wheel nut	7076968	100 258	242	Removing, installing, and adjusting wheel bearings.

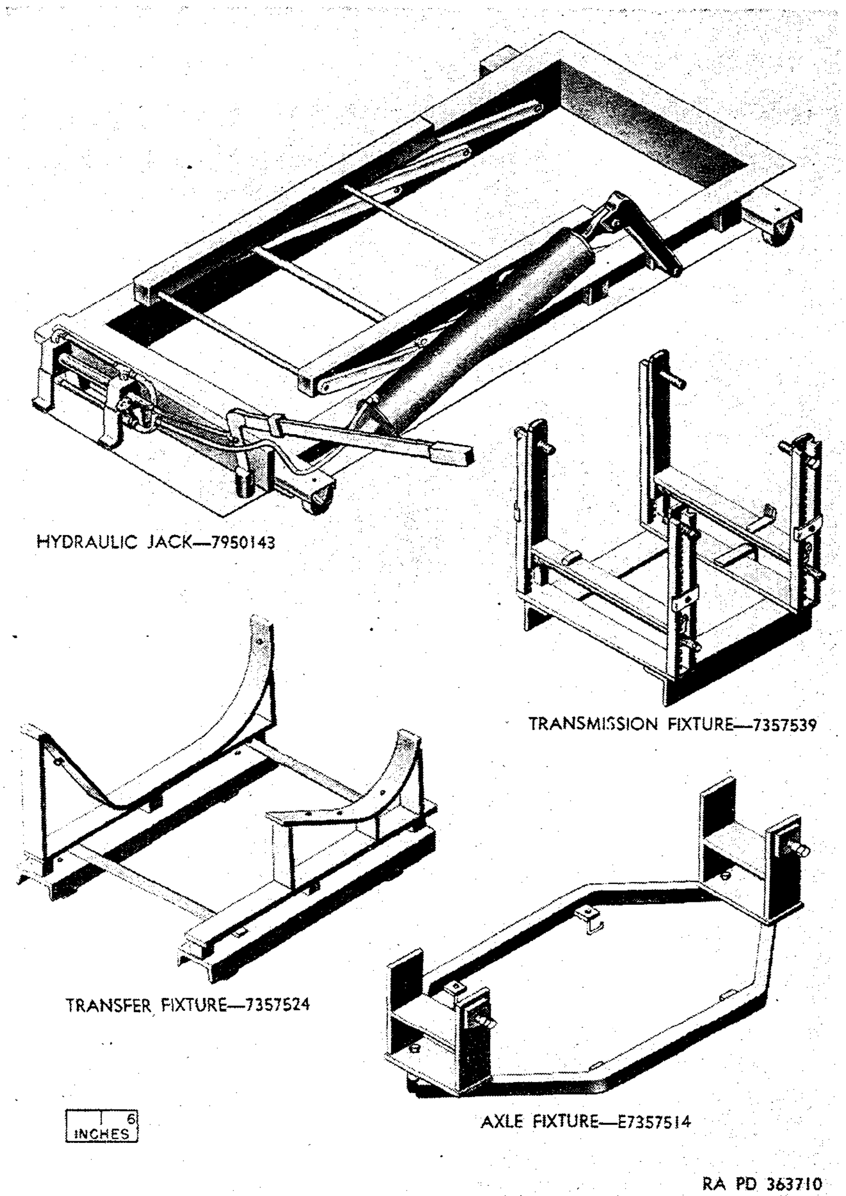


Figure 99. Hydraulic jack and fixtures.

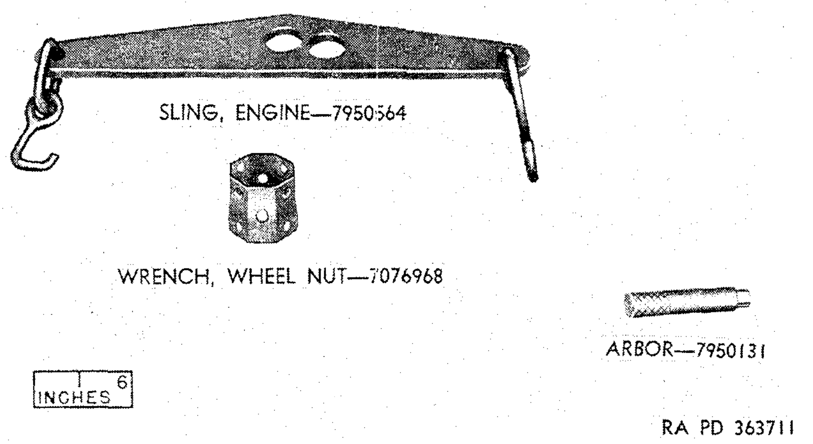


Figure 100. Special tools.

Section II. LUBRICATION AND PAINTING

67. Lubrication Order

Lubrication Order 9–8028 (figs. 101–106) prescribes cleaning and lubricating procedures as to locations, intervals, and proper materials for these vehicles. This order is issued with each vehicle and is to be carried with it at all times. In the event the vehicle is received without a copy, the using organization will immediately requisition one. See DA Pam 310–4 for lubrication order of current date. Lubrication which is to be performed by ordnance maintenance personnel is listed on the lubrication order in the NOTES.

68. General Lubrication Instructions

a. General. Any special lubricating instructions required for specific mechanism or parts are covered in the pertinent section.

b. Usual Conditions. Service intervals specified on the lubrication order are for normal operation and where moderate temperature, humidity, and atmospheric conditions prevail.

c. Lubrication Equipment. Each vehicle is supplied with lubrication equipment adequate for its maintenance. Clean this equipment both before and after use. Operate the lubricating guns carefully and in such a manner as to insure a proper distribution of the lubricant.

d. Points of Application.

(1) Lubricating fittings, grease cups, oilers, and oilholes are shown in figures 107 through 114 and are referenced to the lubrication order. Wipe these devices and the surrounding surfaces clean before and after lubricant is applied.

347797°—55——8

LC 19-75AA-8

LUBRICATION ORDER

LO 9-8028

14 March 1955 (Supersedes LO 9-8028, 14 November 1953)

TRUCK, 5-TON 6x6 (INTERNATIONAL)

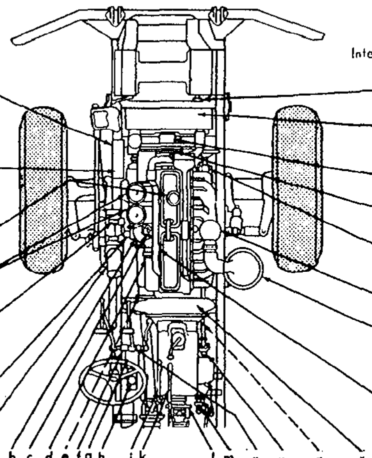
M39, M40, M41, M51, M52, M54, M55, M61, M62, M63, M64, M139, M246

Reference: ORD 7 SNL G 744

Intervals are based on normal operation. Reduce to compensate for abnormal operation and severe conditions or contaminated lubricants. During inactive periods, intervals may be extended commensurate with adequate preservation. Relubricate after washing or fording.

Clean fittings before lubricating. Clean parts with THINNER, paint, volatile mineral spirits (TPM) or SOLVENT, dry cleaning (SD). Dry before lubricating. Lubricate dotted arrow points on both sides of the equipment.

		Lubricant	Interval
D, Fig 107	Steering Gear Hydraulic System Reservoir Fill and Level (Check level) (See note 9)	OE	W
E, Fig 107	Steering Gear Hydraulic System Reservoir Drain (Drain and refill) (See note 9)		S
CC, Fig 107	Crankcase Fill	OE	
H, Fig 108	Oil Filters (See note 3)		I
F, Fig 107	Steering Gear Case Fill and Level (Check level) (Fill to 1 inch below filler plug level)	GO	I
L, Fig 108	Carburetor Governor Rotor Shaft (See note 6)	PL	I



Interval	Lubricant		
M	GAA	Winch Universal Joint	
S	PL	Winch Propeller Shaft Shear Pin (See note 11)	
I	GAA	Front Engine Mounting	AA, Fig
I	GAA	Water Pump	BB, Fig
I	OE	Air Compressor Air Cleaner (See note 1)	
I	GAA	Carburetor Throttle Shaft	GG, Fig
D	OE	Air Cleaner (Check level) (See note 1)	HH, Fig
6		Crankcase Drain (Drain and refill. Cap. 22 qt.) (See note 2)	N, Fig

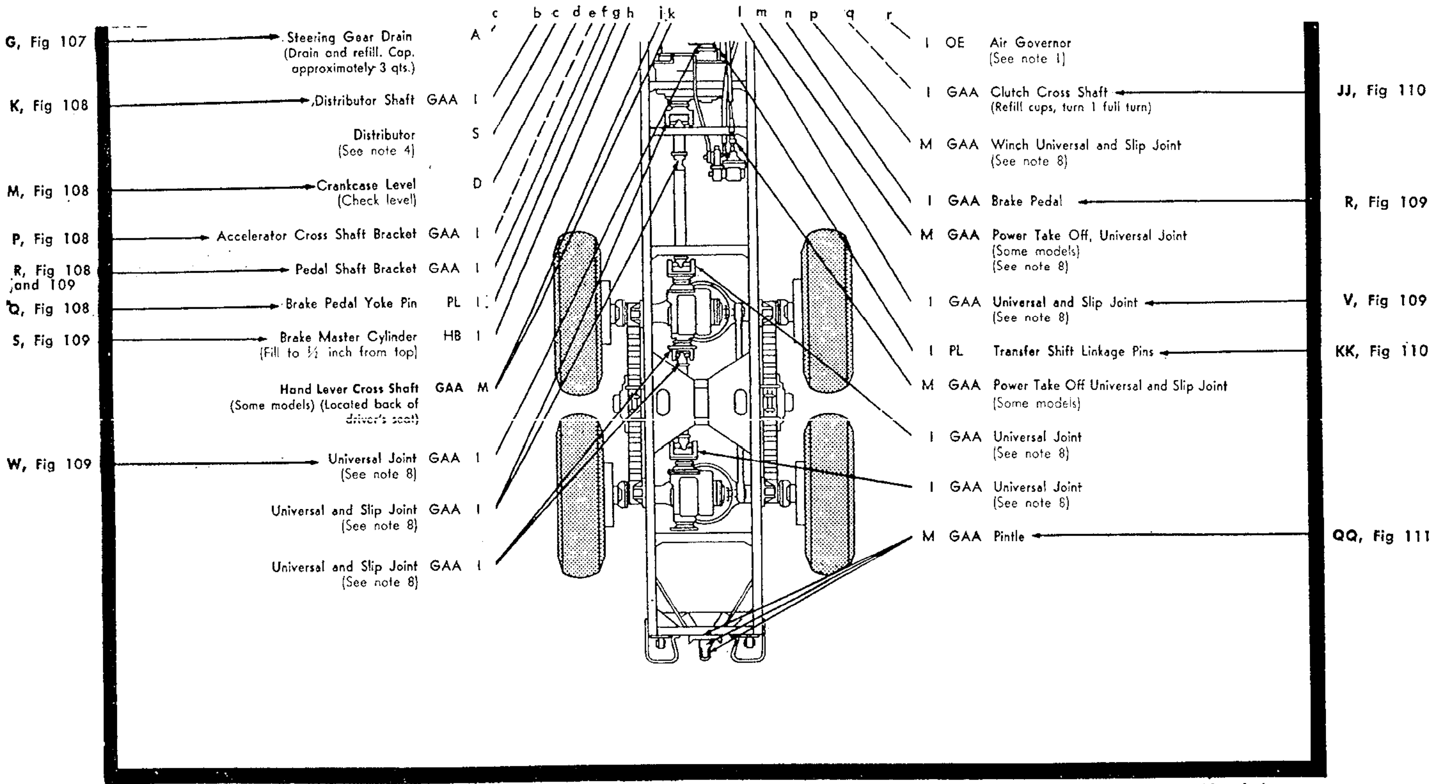
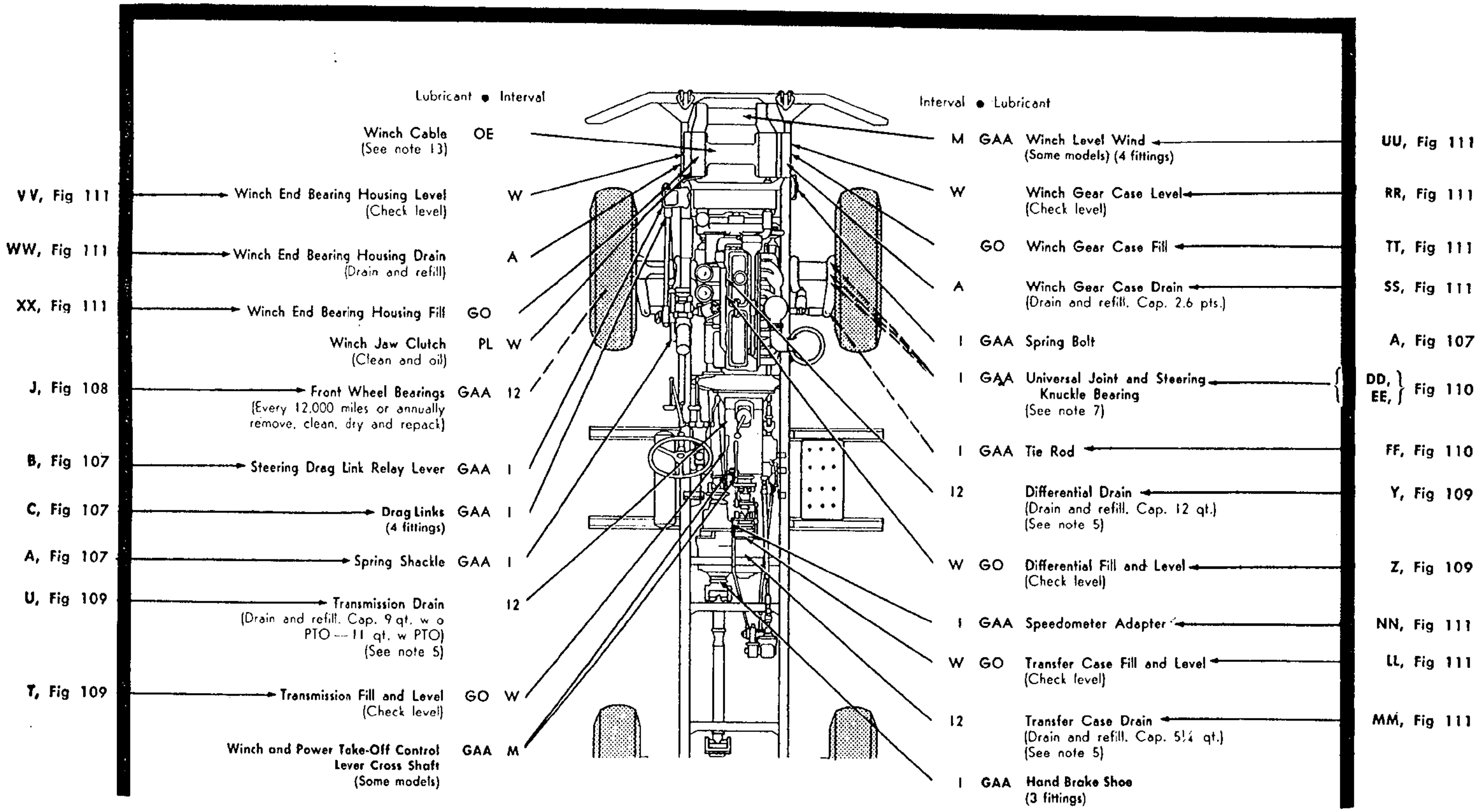
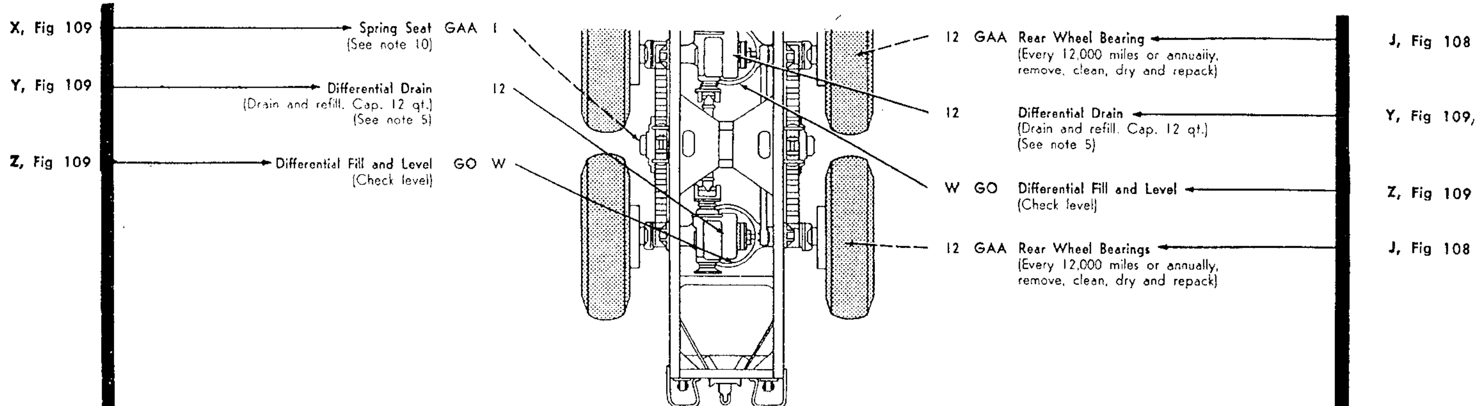


Figure 101. Chassis lubrication order—section I.


Lubricant • Interval
Winch Cable (See note 13) OE
VV, Fig 111 Winch End Bearing Housing Level (Check level) W
WW, Fig 111 Winch End Bearing Housing Drain (Drain and refill) A
XX, Fig 111 Winch End Bearing Housing Fill GO
Winch Jaw Clutch (Clean and oil) PL W
J, Fig 108 Front Wheel Bearings (Every 12,000 miles or annually remove, clean, dry and repack) GAA 12
B, Fig 107 Steering Drag Link Relay Lever GAA I
C, Fig 107 Drag Links (4 fittings) GAA I
A, Fig 107 Spring Shackle GAA I
U, Fig 109 Transmission Drain (Drain and refill. Cap. 9 qt. w o PTO — 11 qt. w PTO) (See note 5) 12
T, Fig 109 Transmission Fill and Level (Check level) GO W
Winch and Power Take-Off Control Lever Cross Shaft (Some models) GAA M
Interval • Lubricant
M GAA Winch Level Wind (Some models) (4 fittings) UU, Fig 111
W Winch Gear Case Level (Check level) RR, Fig 111
GO Winch Gear Case Fill TT, Fig 111
A Winch Gear Case Drain (Drain and refill. Cap. 2.6 pts.) SS, Fig 111
I GAA Spring Bolt A, Fig 107
I GAA Universal Joint and Steering Knuckle Bearing (See note 7) DD, EE, Fig 110
I GAA Tie Rod FF, Fig 110
12 Differential Drain (Drain and refill. Cap. 12 qt.) (See note 5) Y, Fig 109
W GO Differential Fill and Level (Check level) Z, Fig 109
I GAA Speedometer Adapter NN, Fig 111
W GO Transfer Case Fill and Level (Check level) LL, Fig 111
12 Transfer Case Drain (Drain and refill. Cap. 5¼ qt.) (See note 5) MM, Fig 111
I GAA Hand Brake Shoe (3 fittings)



KEY

LUBRICANTS	EXPECTED TEMPERATURES		
	above +32° F	+40° F to −10° F	0° F to −65° F
OE-Oil, Lubr, engine	OE 30	OE 10	OES
Steering gear hydraulic system **Dump hydraulic reservoir** Crane hydraulic tank	OE 10*	OE 10	OES
GO-Lubricant, Gear, universal	GO 90	GO-75	GOS
GAA-Grease, lubr, automotive and artillery	GAA	GAA	GAA
HB-Fluid, hydraulic, brake	HB	HB	HBA
PL-Oil, lubr, preservative	PL (Med)	PL (Special)	PL (Special)

(*) (See note 14)

	LUBRICANTS	INTERVALS
For Arctic Operation Refer to TM 9-2855	OES-OIL, lubr, engine, sub-zero	D—Daily W—Weekly M—Monthly S—Semi-annually A—Annually 1—1,000 Miles 6—6,000 Miles 12—12,000 Miles
	GOS-Lubricant, gear, universal, sub-zero	
	HBA-Fluid, hydraulic, brake, arctic	
	CW-Lubricant, chain, exposed gear and wire rope	

LO 9-8028

RA PD 363632

Figure 102. Chassis lubrication order—section II.

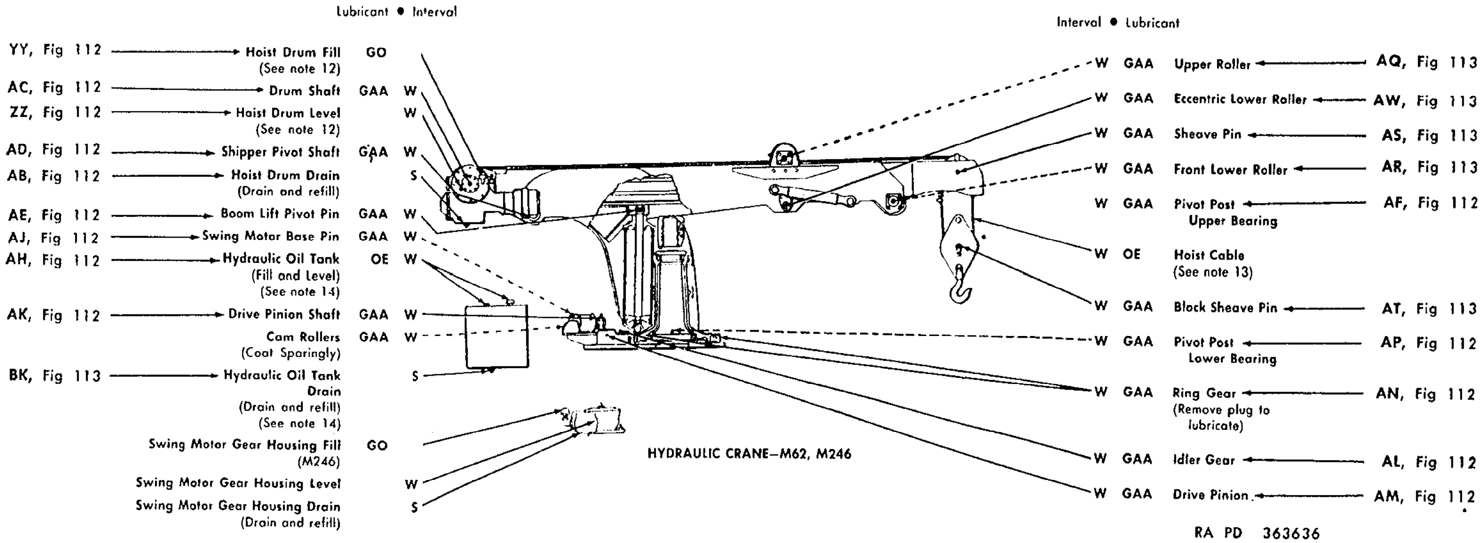


Figure 103. Hydraulic crane lubrication order—M62 and M246.

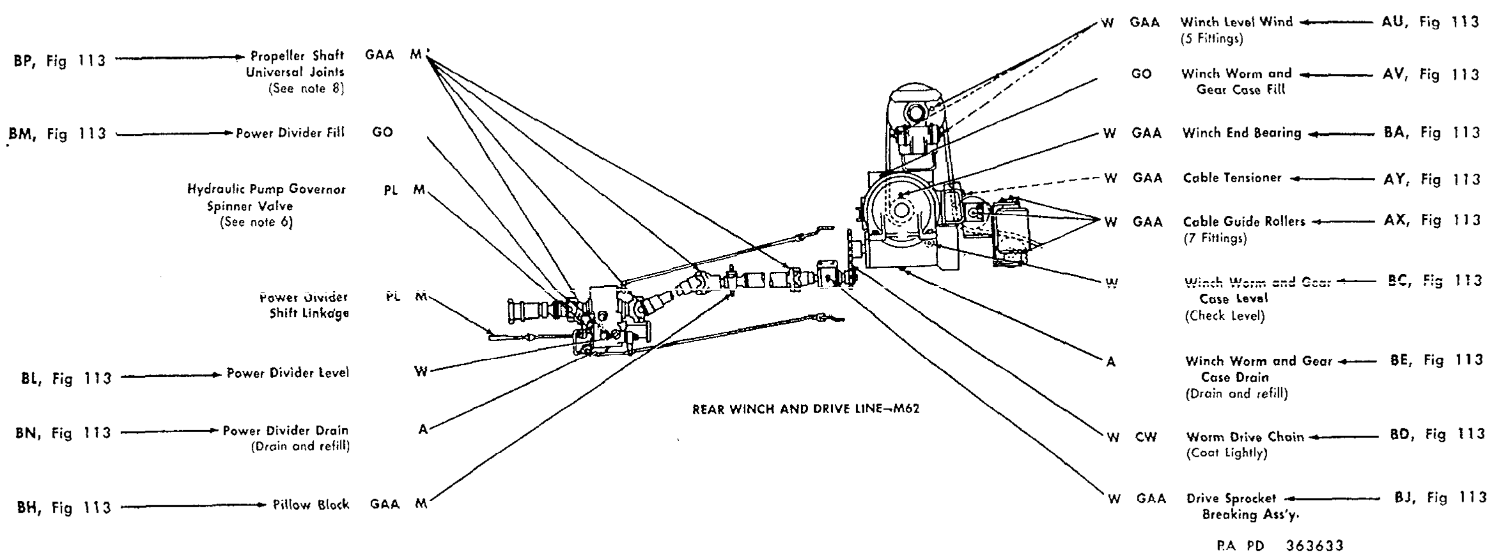
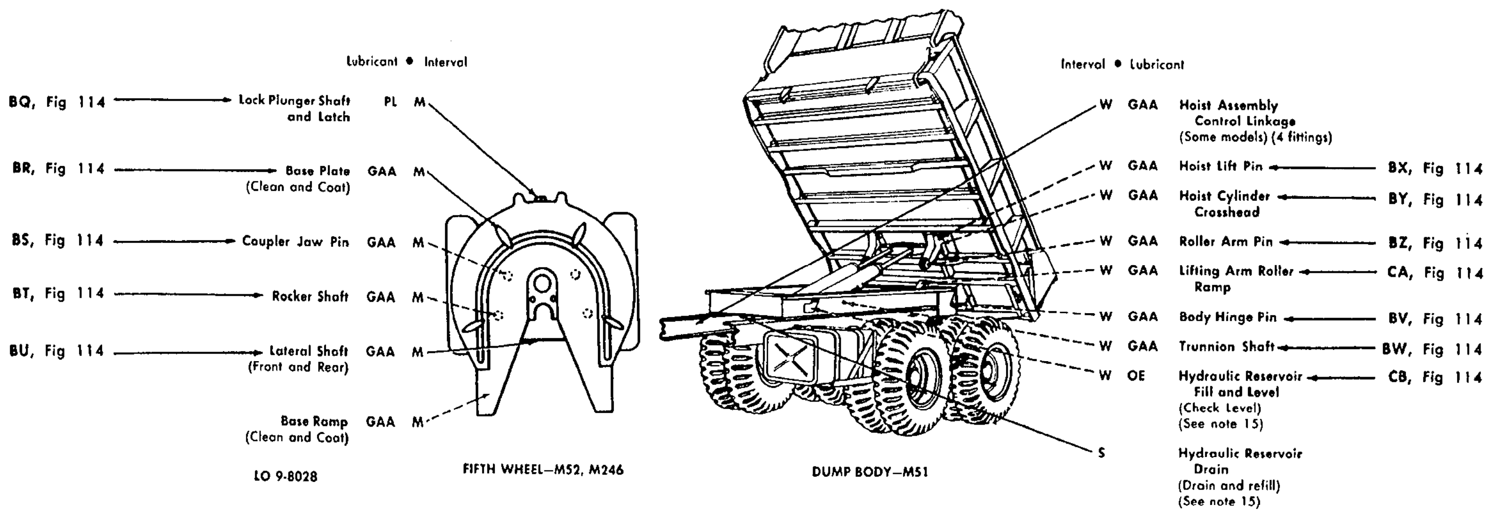


Figure 104. Rear winch lubrication order—M62.



RA PD 363634

Figure 105. Fifth wheel (M52) and dump body (M51) lubrication order.

(2) A $\frac{3}{4}$-inch red circle should be painted around all lubricating fittings and oilholes.

(3) Clean and lubricate unsealed bearings as in (*a*), (*b*), and (*c*) below.

(*a*) Wash all of the old lubricant out of the bearings and from the inside of the hubs with volatile mineral spirits or dry-cleaning solvent and dry the parts thoroughly.

Caution: Bearings must not be dried or spun with compressed air. See TM 37–265 for care and maintenance of bearings.

(*b*) Pack the bearings by hand or with a mechanical packer introducing the lubricant carefully between the rollers. Do not smear grease only on the outside of the bearings and expect it to work in. Great care must be exercised to insure that dirt, grit, lint, or other contaminants are not introduced into the bearings. If the bearings are not to be installed immediately after repacking, they should be wrapped in clean oilproof paper to protect them from contaminants.

(*c*) After the bearings are properly lubricated, pack the hub with a sufficient amount of lubricant to uniformly fill it to the inside diameters of the inner and outer bearing races. Coat the spindles and hubcaps with a thin layer of lubricant (not over $\frac{1}{16}$ inch) to prevent rusting. Do not fill the hubcaps to serve as grease cups under any circumstances. They should be lightly coated however, to prevent rusting.

Note. For normal operation, lubricate wheel bearings at 12,000 miles or at annual intervals, whichever comes first.

c. Reports and Records.

(1) Report unsatisfactory performance of prescribed petroleum fuels, lubricants, or preserving materials, using DA Form 468.

(2) Maintain a record of lubrication of the vehicle on DA Form 461.

69. Lubrication Under Unusual Conditions

a. Unusual Conditions. Reduce service intervals specified on the lubrication order, by lubricating more frequently to compensate for abnormal or extreme conditions, such as high or low temperatures, prolonged periods of high speed operation, continued operation in sand or dust, immersion in water, or exposure to moisture. Any one of these operations or conditions may cause contamination and quickly destroy the protective qualities of the lubricants. Intervals may be extended during inactive periods commensurate with adequate preservation.

—NOTES—

1. AIR CLEANERS AND BREATHERS—(Oil bath-type). Daily replenish to bead level with OE, crankcase grade. Every 1,000 miles, clean oil reservoir and refill with OE as above. Disassemble, clean all parts, refill with OE as above whenever crankcase oil is changed. For desert or extremely dusty operation, disassemble, clean all parts and refill with OE once every operating day or more frequently if required. (Mesh type) For normal operation, wash and reoil at indicated intervals with OE. For desert or extremely dusty operation, wash and reoil once every operating day or more frequently if required.

2. CRANKCASE—Drain every 6,000 miles or semi-annually. Drain only after operation. Refill to FULL mark on gage. Run engine a few minutes and re-check oil level. For proper operation on heavy duty oil, engine thermostat must be functioning properly to maintain engine coolant temperature at +140° F minimum. CAUTION: Be sure pressure gage indicates oil is circulating.

3. OIL FILTER—Every 1,000 miles, remove plug in bottom of case and drain sediment. Every 6,000 miles or semi-annually, while crankcase is being drained, remove, clean inside of case and install new element.

8. PROPELLER SHAFT UNIVERSAL AND SLIP JOINTS —Every 1,000 miles, remove filler plug at each joint and install pressure fitting, fill using low pressure gun. Remove fitting and reinstall plug. Every 6,000 miles, remove, clean, dry, inspect and refill. Do not overfill.

9. STEERING HYDRAULIC SYSTEM RESERVOIR—Fill and maintain 3/4 full. Do not fill completely.

10. REAR SPRING SEAT BEARINGS—Loosen screws on bearing cap, lubricate through fitting until lubricant appears around cap, tighten cap screws.

11. WINCH PROPELLER SHAFT SHEAR PIN — Semi-annually disconnect front universal joint, remove shear pin and universal joint from shaft, clean, dry and coat end of shaft and inside of universal joint collar with PL to prevent rusting.

12. HOIST DRUM—Weekly, check level, drain semi-annually. Set boom in horizontal position and remove plug in side of case. Remove breather and fill drum to level of plug hole. Install plug. Clean and install breather.

15. DUMP BODY HYDRAULIC RESERVOIR—Weekly remove filler plug, gage and screen, clean and install screen, replenish with oil to third mark from top on the gage with body down in traveling position. Install gage and plug. Raise and lower body several times slowly and recheck oil. CAUTION: Remove filler plug slowly to release pressure. Do not overfill.

16. OIL CAN POINTS—Every 1,000 miles or monthly, lubricate hinges and latches, carburetor linkage, transfer and power take-off shift linkage, clutch and brake pedal linkage, hand brake control and winch propeller shaft shear pin with PL.

17. DO NOT LUBRICATE—Springs, clutch release bearing, generator, starter or shock absorbers.

18. LUBRICATED AT TIME OF DISASSEMBLY BY ORDNANCE PERSONNEL—Clutch pilot bearing, clutch release bearing carrier, speedometer flexible shaft, winch swivel sheave frame bearing and tachometer flexible shaft.

4. DISTRIBUTOR—Every 6,000 miles or semi-annually, remove distributor, remove oil reservoir plug from lower housing. Fill reservoir with OE. Clean and install plug. Wipe breaker cam lightly with GAA and lubricate breaker arm pivot and wick under rotor with 1 or 2 drops of PL.

5. GEAR CASE—Drain every 12,000 miles or annually. Drain only when hot after operation. Fill to plug level before operation. Clean vents weekly and after operation in mud or water. (W/o PTO, without power take-off, W/PTO, with power take-off.)

6. CARBURETOR GOVERNOR ROTOR SHAFT — Remove plug and lubricate felt with several drops of PL.

7. FRONT WHEEL UNIVERSAL JOINTS AND STEERING KNUCKLE BEARINGS—Remove plug on universal joint housing, fill to level of plug opening. Install plug. Every 12,000 miles or annually, remove, clean, dry and repack. Do not disassemble constant velocity universal joints.

13. WINCH AND CRANE HOIST CABLES—After each operation, clean and oil with used crankcase oil or OE. Weekly if cable has not been used, coat outer coils. Monthly, unwind entire cable, clean and oil. Semi-annually, if cable is not generally used, unwind entire cable, clean and soak, by means of a brush, with PL (Special). Wipe off excess and coat cable with CW. Coat winch drum also with CW before rewinding cable on drum.

14. CRANE HYDRAULIC OIL TANK—Weekly, with boom in horizontal position, remove plug from top of tank, if level is below bottom mark on gage, replenish to top mark. Semi-annually remove plug from bottom of tank and drain. To completely drain system, operate crane several times, disconnect hydraulic lines and let drain. Clean and install plug, connect hydraulic lines. Refill tank with 33 gallons of oil, operate crane several times to completely fill system, check level. Fill to TOP mark on bayonet type gage. (*) In temperatures of 90° F or above, use OE-30.

Copy of this lubrication order will remain with the equipment at all times; instructions contained herein are mandatory and supersede all conflicting lubricating instructions dated prior to the date of this lubrication order.

BY ORDER OF THE SECRETARY OF THE ARMY AND THE AIR FORCE:

M. B. RIDGWAY,
General, United States Army,
Chief of Staff

OFFICIAL:
JOHN A. KLEIN
Major General, United States Army,
The Adjutant General

N. F. TWINING,
Chief of Staff,
United States Air Force

OFFICIAL:
K. E. THIEBAUD,
Colonel, United States Air Force,
Air Adjutant General

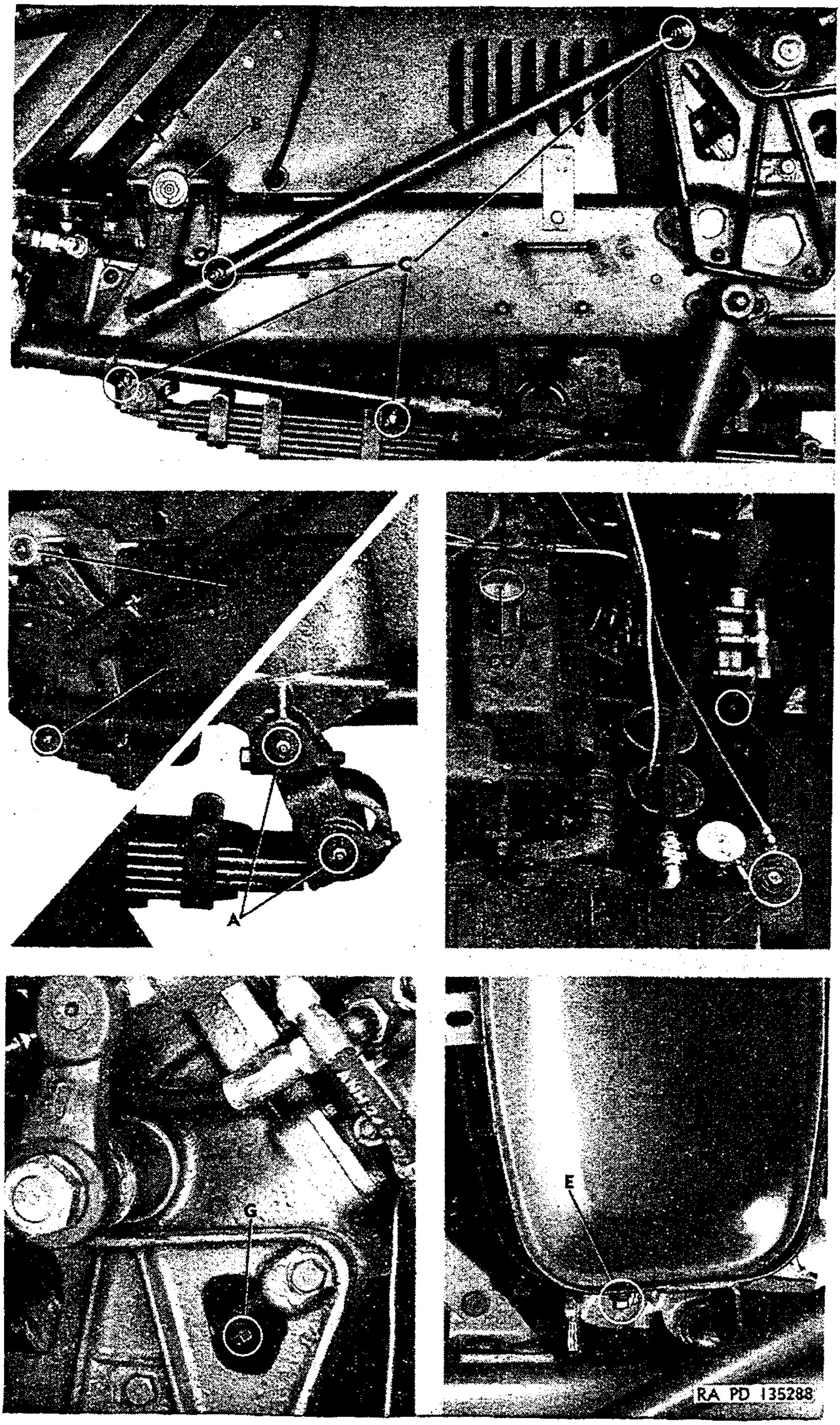


Figure 107. Localized lubrication points (A–G).

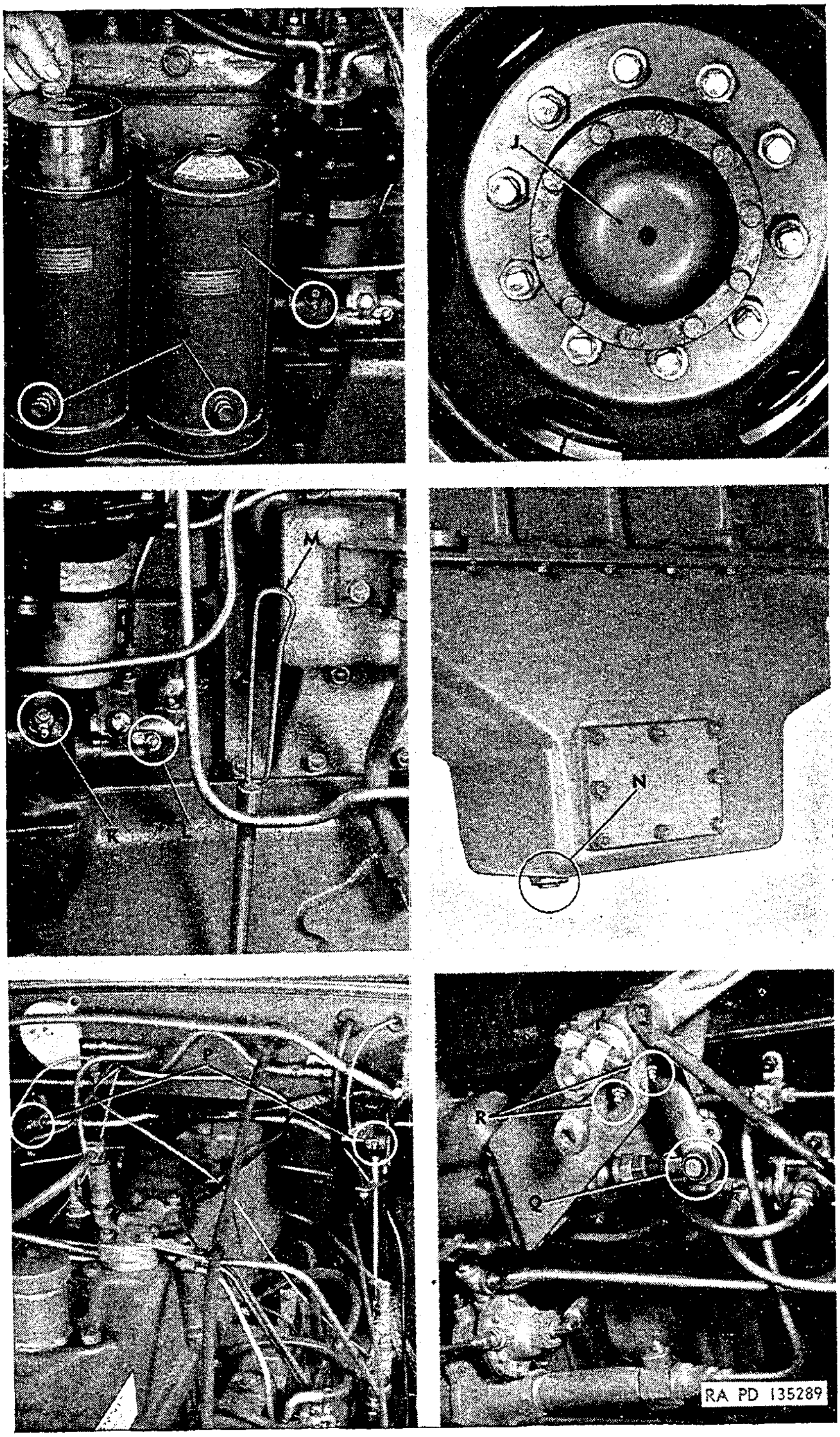


Figure 108. Localized lubrication points (H–R).

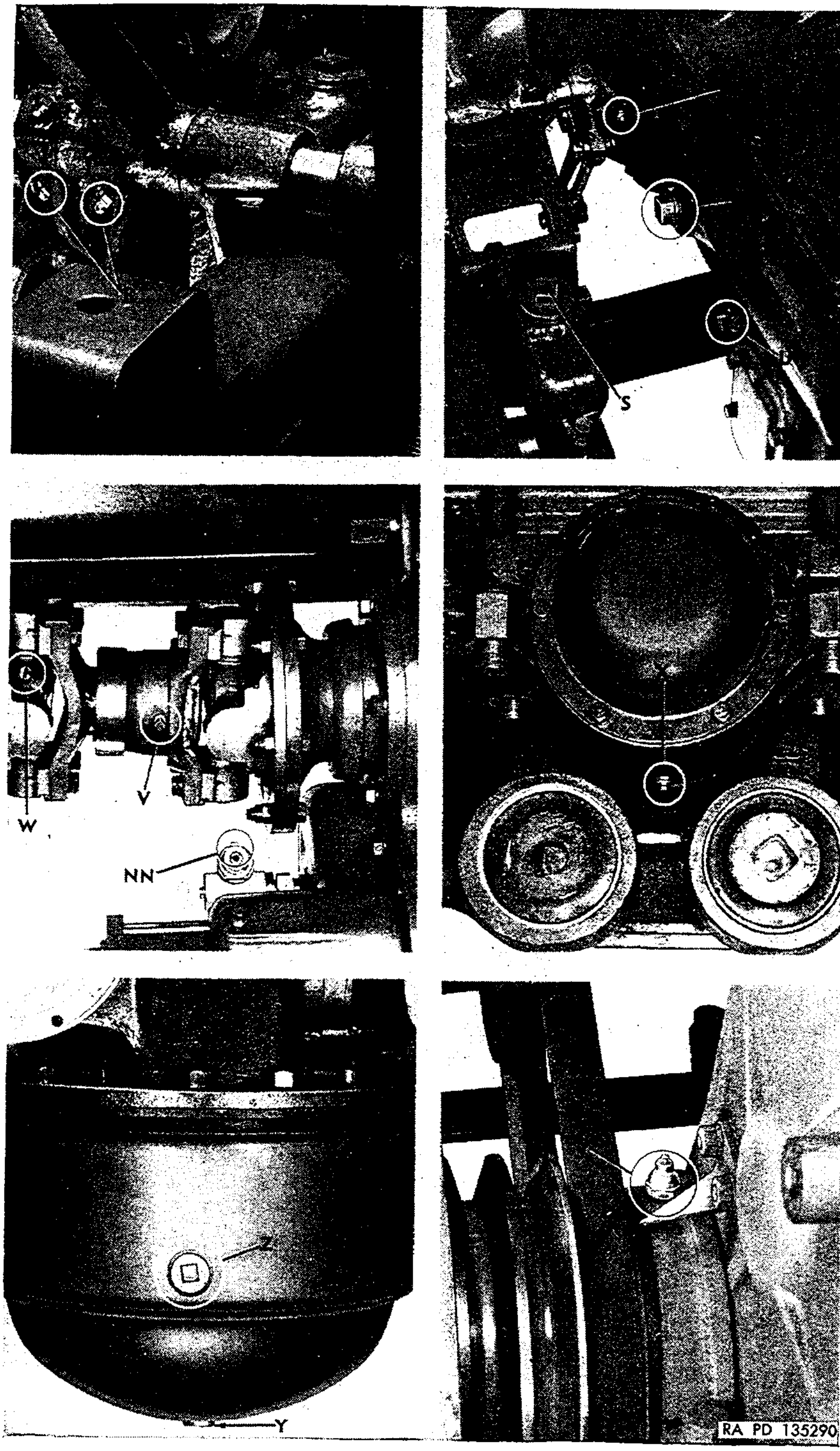


Figure 109. Localized lubrication points (R–AA).

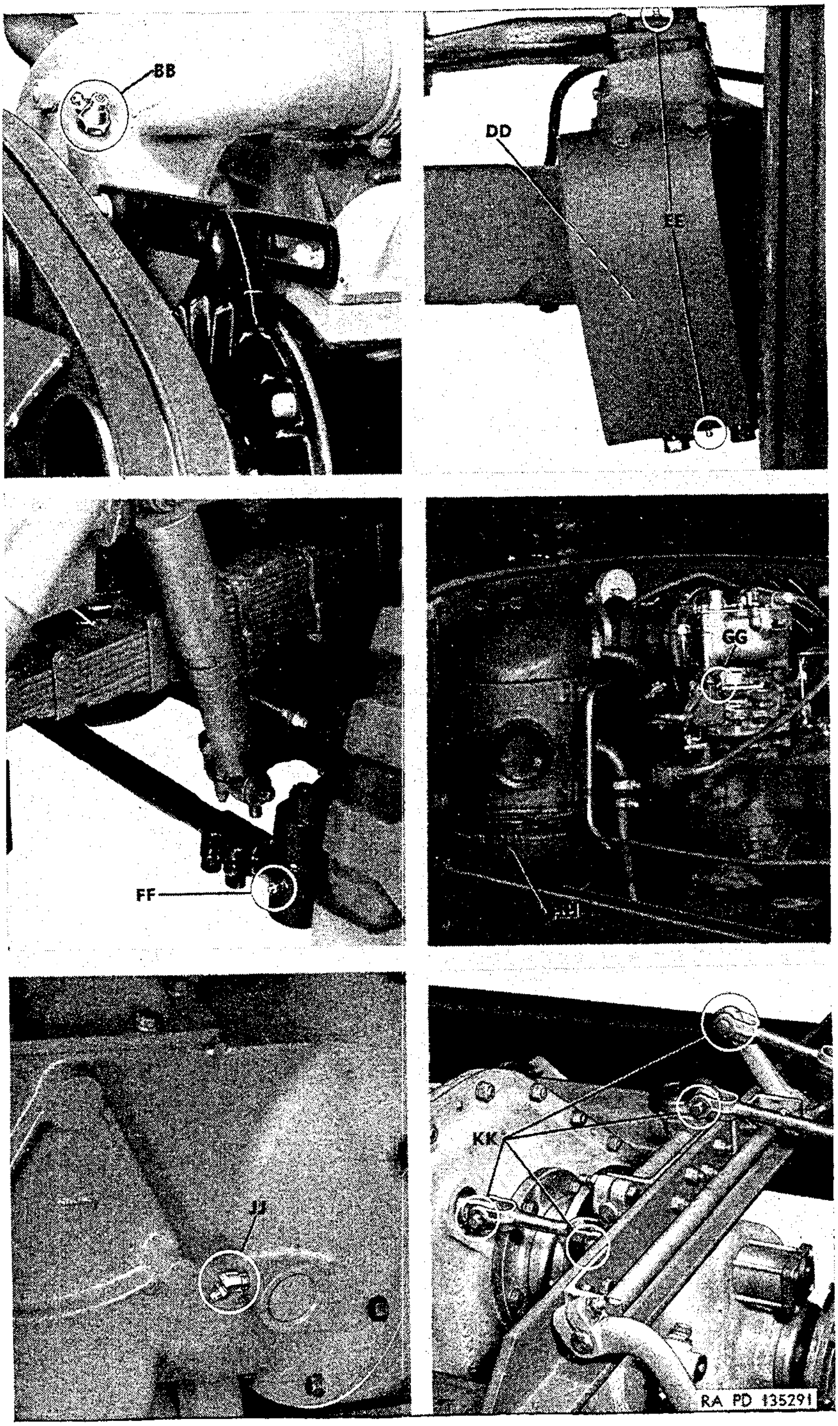


Figure 110. Localized lubrication points (BB–KK).

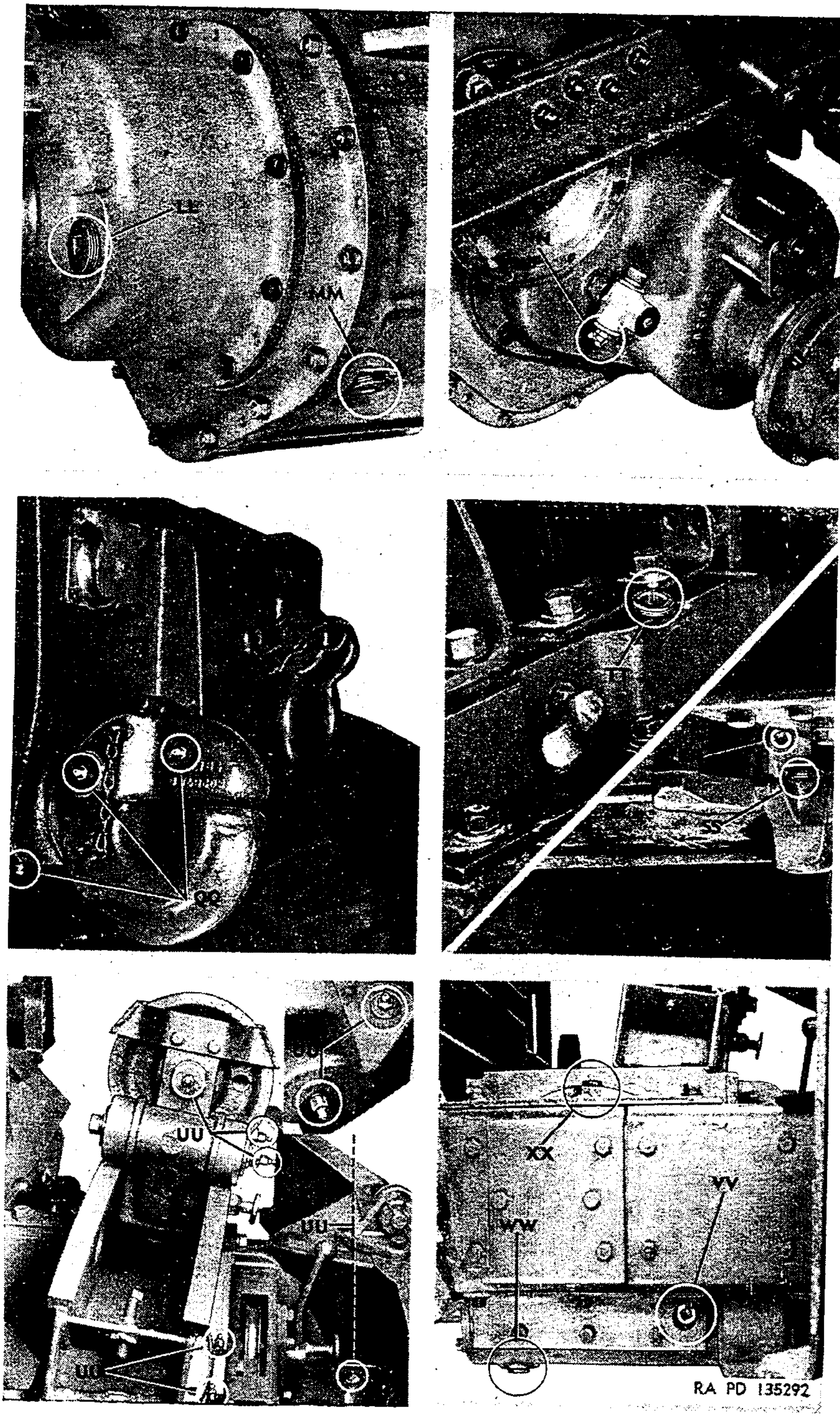


Figure 111. Localized lubrication points (LL–XX).

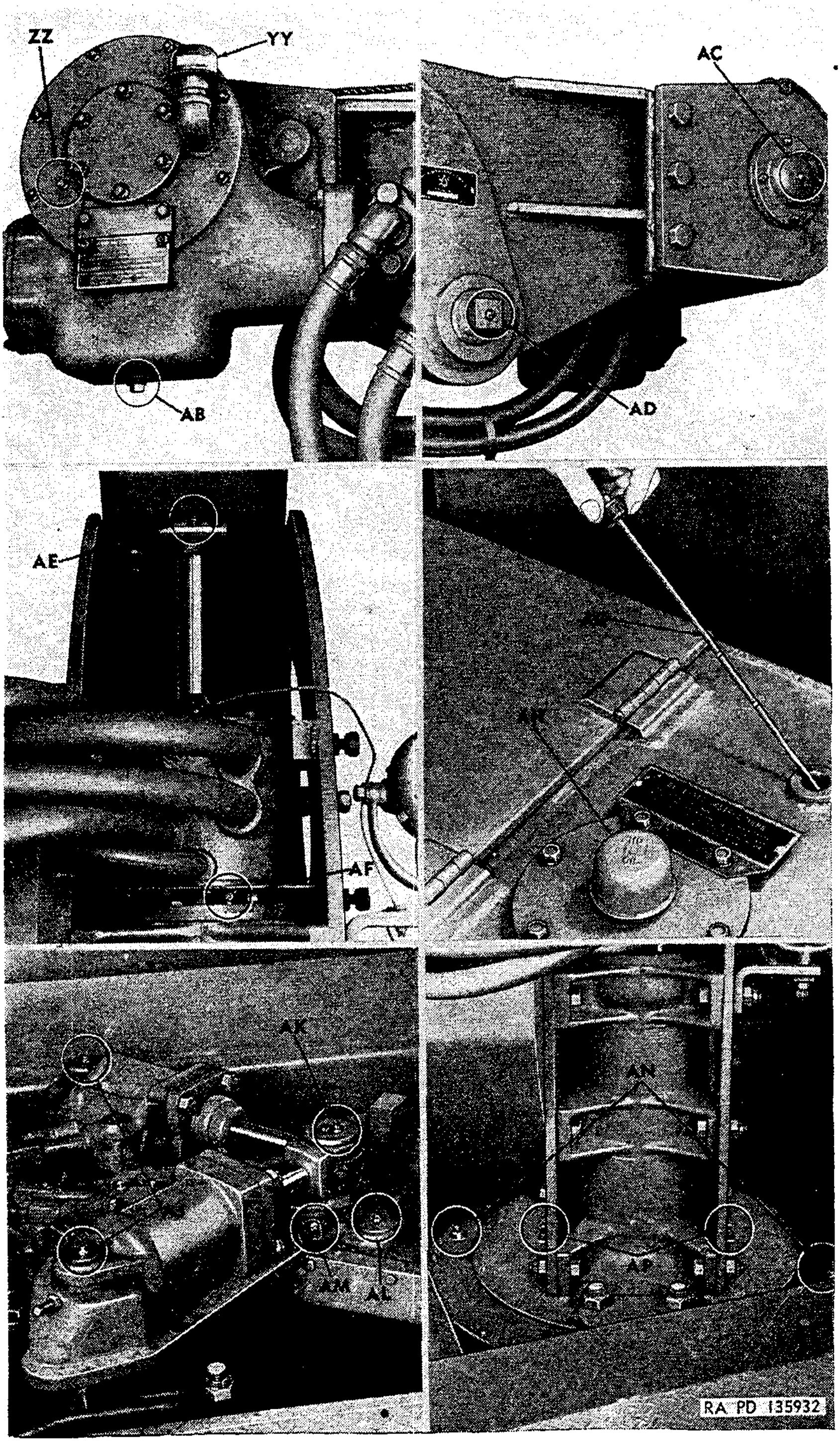


Figure 112. Localized lubrication points (YY–AP).

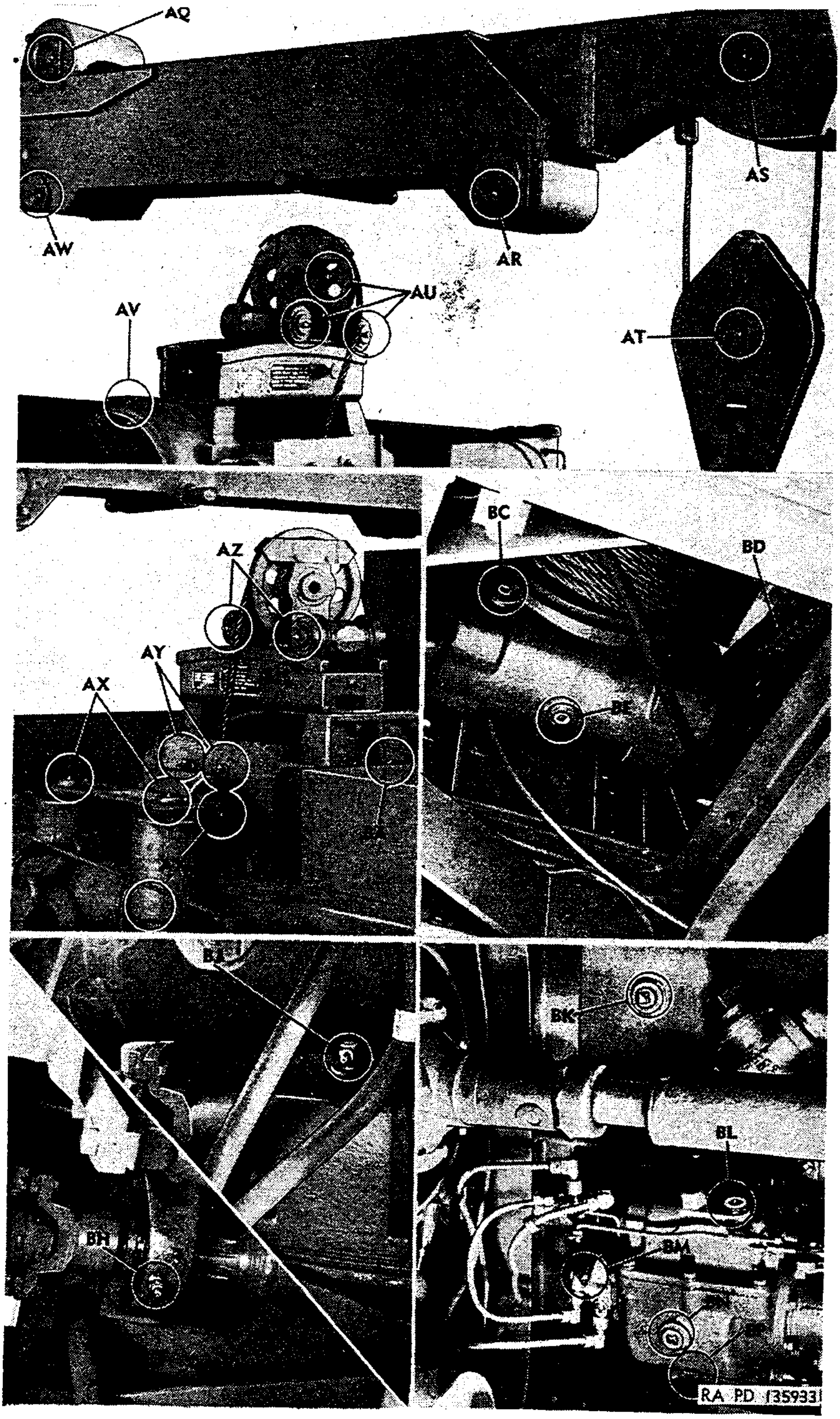


Figure 113. Localized lubrication points (AQ–BP).

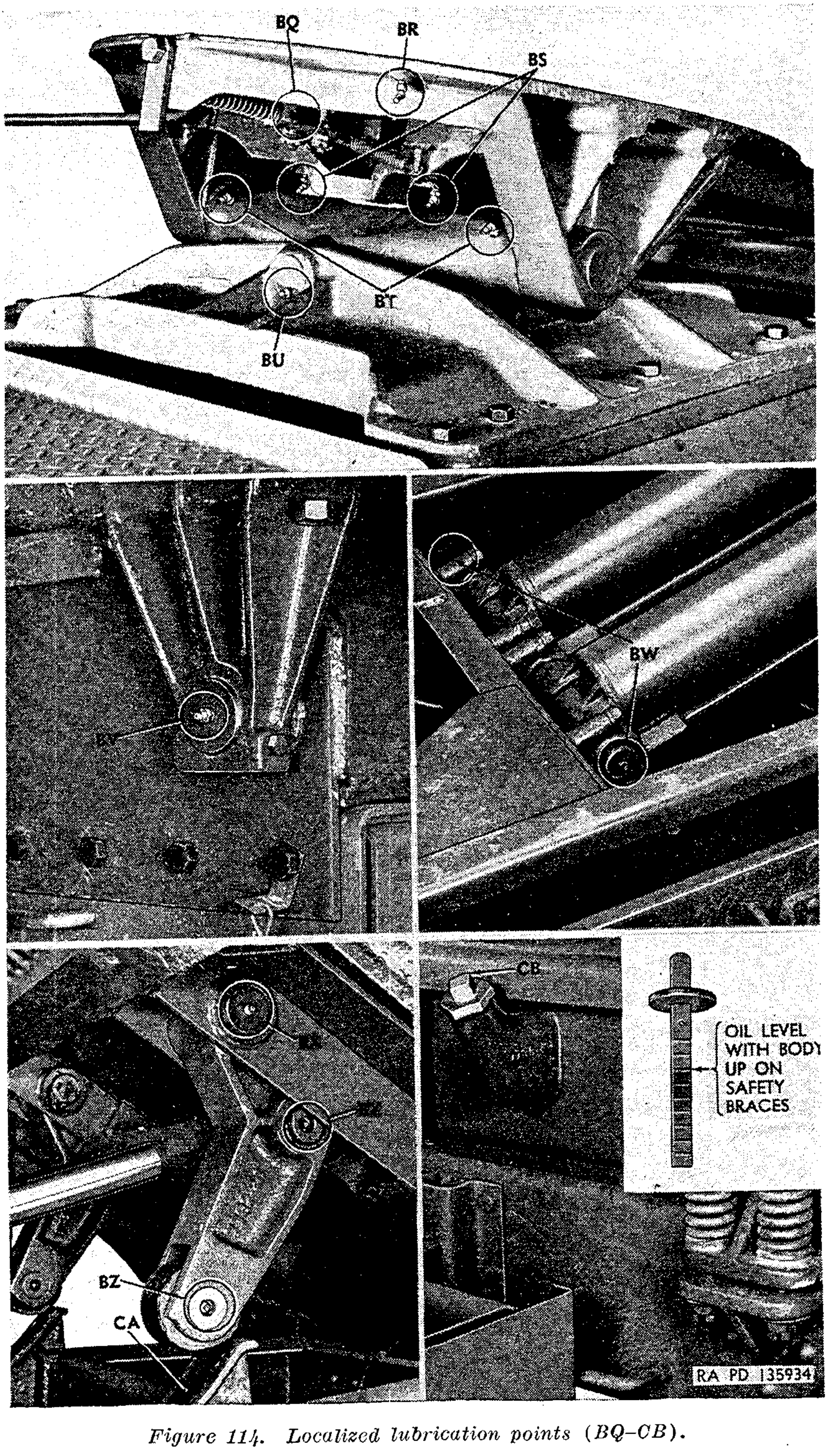


Figure 114. Localized lubrication points (BQ–CB).

b. Changing Grade of Lubricants. Lubricants are prescribed in the Key of figure 102 in accordance with three temperature ranges; above +32° F., +40° to −10° F., and from 0° to −65° F. Change the grade of lubricant whenever weather forecast data indicate that air temperatures will be consistently in the next higher or lower temperature range or when sluggish starting caused by lubricant thickening occurs. No change in grade will be made when a temporary rise in temperature is encountered.

c. Maintaining Proper Lubricant Levels. Lubricant levels must be observed closely and necessary steps taken to replenish in order to maintain proper levels at all times.

70. Lubrication for Continued Operation Below 0° F.

a. General. Refer to TM 9–2855 for instruction on necessary special preliminary lubrication of the vehicle.

b. Preparation of Wrecker Crane (M62 and M246) for Subzero Temperatures.

(1) Extreme care should be exercised in the preparation of the wrecker crane for operation in severe cold weather conditions with emphasis being placed on the flushing and cleaning of all old lubricants from the system.

(2) All hoses leading to hydraulic cylinders and oil motors should be disconnected. The cylinders and piston-type motor should then be actuated by external means through their full cycle of operation so as to void the system of all old oil. Remove the drain plug from bottom of hydraulic oil reservoir and drain completely.

(3) Remove drain plugs from bottom of hoist drum worm and drive gearcase, and on the medium wrecker M62, remove drain plugs from the power divider and rear winch assemblies. Drain and flush thoroughly so as to remove all old gear lubricants from gears and housings.

(4) Remove drain plug from bottom of base plate and pivot post ring gear cover plates. Remove all old general purpose grease from drive pinion, idler gears and housings, and flush and clean them thoroughly.

(5) Remove sheaves from boom head and crane block. Thoroughly flush and clean sheave needle bearings.

(6) After removing all old lubricants from entire crane, install all parts and plugs, and refill entire system with hydraulic oil and lubricants conforming to specifications shown on lubrication order (par. 67) covering a temperature range of from 0° to −65° F.

71. Lubrication After Fording Operations

a. After any fording operation, in water 12 inches deep or over, lubricate all chassis points to cleanse bearings of water or grit, as well as any other points required in accordance with paragraph 76 for maintenance operations after fording.

b. If the vehicle has been in deep water for a considerable length of time or was submerged beyond its fording capabilities, precautions must be taken as soon as practicable to avoid damage to the engine and other vehicle components as in (1), (2), and (3) below.

(1) Perform a complete lubrication service (par. 67).

(2) Inspect engine crankcase oil. If water or sludge is found, drain the oil and flush the engine with preservative engine oil PE–30. Before putting in new oil, drain the oil filters and install new filter elements (par. 111).

Note. If preservative engine oil is not available, engine lubricating oil OE–30 may be used.

(3) Operation in bodies of salt water increases rusting and corrosion, especially on unpainted surfaces. It is most important to remove all traces of salt water and salt deposits from every part of the vehicle. For assemblies which have to be disassembled, dried, and relubricated, perform these operations as soon as the situation permits. Wheel bearings must be disassembled and repacked after each submersion. Regardless of the temporary measures taken, the vehicle must be delivered as soon as practicable to the ordnance maintenance unit.

72. Lubrication After Operation Under Dusty or Sandy Conditions

After operation under dusty or sandy conditions, clean and inspect all points of lubrication for fouled lubricants and relubricate as necessary.

Note. A lubricant which is contaminated by dust and sand makes an abrasive mixture that causes rapid wear of parts.

73. Painting

Instructions for the preparation of the materiel for painting, methods of painting, and materials to be used are contained in TM 9–2851. Instructions for camouflage painting are contained in FM 5–20B. Materials for painting are listed in ORD 7 SNL G–744.

Section III. PREVENTIVE MAINTENANCE SERVICES

74. General

a. Responsibilities and Intervals. Preventive maintenance services are the responsibility of the using organization. These services consist generally of daily operator's services (daily A services) performed by the operator or crew, and of biweekly services (biweekly B services) performed by the crew (under supervision of the squad, section, and platoon leaders); and of the scheduled services to be performed by organizational maintenance personnel (C and D services). Intervals are based on normal operations. Reduce intervals for abnormal operations or severe conditions. Intervals during inactive periods may be extended accordingly.

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

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

(2) The inspection of a unit to see that it is "correctly assembled" is usually an external visual inspection to see whether it is assembled in its normal position in the vehicle.

(3) Inspection of a unit to determine if it is "secure" is usually an external visual examination or a check by hand, wrench, or pry-bar for looseness. Such an inspection must include any brackets, lockwashers, locknuts, locking wires, or cotter pins used.

(4) By "excessively worn" is meant worn beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection.

75. Cleaning

a. General. Any special cleaning instructions required for specific mechanisms or parts are contained in the pertinent section. General cleaning instructions are as in (1) through (4) below.

(1) Use dry-cleaning solvent or volatile mineral spirits to clean or wash grease or oil from all parts of the vehicle.

(2) A solution of one part grease-cleaning compound to four parts of dry-cleaning solvent or volatile mineral spirits may be used for dissolving grease and oil from engine block, chassis, and other parts. Use cold water to rinse off any solution which remains after cleaning.

(3) After the parts are cleaned, rinse and dry them thoroughly. Apply a light grade of oil to all polished metal surfaces to prevent rusting.

(4) Before installing new parts, remove any preservative materials, such as rust-preventive compounds, protective grease, etcetera; prepare parts as required (oil seals, etc); and for those parts requiring lubrication, apply the lubricant prescribed in the lubrication order (par. 67).

(5) Nameplates, caution plates, and instruction plates made of steel rust very rapidly. When they are found to be in a rusty condition, they should be thoroughly cleaned and heavily coated with an application of lacquer.

b. General Precautions in Cleaning.

(1) Dry-cleaning solvent and volatile mineral spirits are inflammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. Use only in well ventilated places.

(2) These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin or a mild irritation.

(3) Avoid getting petroleum products, such as dry-cleaning solvent, volatile mineral spirits, engine fuels, or lubricants on rubber parts, as they will deteriorate the rubber.

(4) The use of Diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.

76. Preventive Maintenance by Driver or Operator(s) Services

a. Purpose. To insure efficient operation, it is necessary that the vehicle be systematically inspected at intervals every day it is operated, and also weekly, so defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. Any defects or unsatisfactory operating characteristics beyond the scope of the driver or operator(s) to correct must be reported at the earliest opportunity to the designated individual in authority.

b. Services. Driver or operator's preventive maintenance services are listed in table III. Every organization must thoroughly school its personnel in performing the maintenance procedures for this vehicle as set forth in this manual.

Intervals					Procedure
Daily "A"				Bi-weekly "B"	
Before-operation	During-operation	At-the-halt	After-operation		
					USUAL CONDITIONS
					Caution: Place all tags describing condition of vehicle in the driver's compartment in a conspicuous location so that they will not be overlooked.
X	-----	X	X	X	*Fuel, oil, water.* Check fuel, oil, and water levels. Check spare containers for contents. **Caution:** If water is added in cold weather, test solution with a hydrometer to determine if there is sufficient antifreeze. If it is necessary to add water to a radiator while the engine is overheated, run the engine at idling speed and slowly add the water.
X	-----	-----	-----	X	*Tires.* Gage tires for correct pressure (par. 61). Recommended tire pressures are indicated on servicing and publication data plate (fig. 15) located on instrument panel.
		X	X	X	Remove penetrating objects such as nails or glass. Remove stones between duals. Note any apparent loss of air, unusual wear, or missing valve caps.
X	-----	X	X	X	*Leaks, general.* Look under vehicle and in engine compartment for fuel, engine-oil, water, or brake fluid leaks.
X	-----	-----	-----	------	*Vehicle equipment.* Visually inspect fire extinguishers and vehicle publications, including Standard Form 91 and DA Form 461.
				X	See that fire extinguishers are charged and sealed.
X	-----	-----	X	X	Operate lights, horn (if tactical situation permits), and windshield wipers. Visually inspect mirrors, reflectors, body, towing connections, doors, paulins, and tools, etcetera.
				X	Check for any tampering or damage that may have occurred since last inspection.
X	X	-----	-----	------	*Instruments.* Observe for normal readings (pars 12–43) during warmup and during operation of vehicle. **Caution:** If oil pressure is zero or excessively low, shut off engine immediately and investigate cause.
	X	-----	-----	------	*General operation.* Be alert for any unusual noises or improper operation of steering, clutch, brakes, or gear shifting.

Intervals					Procedure
Daily "A"				Bi-weekly "B"	
Before-operation	During-operation	At-the-halt	After-operation		
					USUAL CONDITIONS—Continued
		X	X	X	*Operating faults.* Investigate and correct or report any faults noted during operation.
			X	------	*Fuel filters.* Check fuel filter (par. 124) for leaks.
				X	Remove the drain plug and remove all water and sediment from the filler.
		X	X	X	*Springs and suspensions.* Look at springs, suspensions, shock absorbers, and torque rods to see if they have been damaged.
			X	X	*Air reservoirs.* Drain condensation (par. 235).
			X	X	*Lubricate.* Lubricate items specified on lubrication order (par. 67).
			X	X	*Clean.* Clean glass, vision devices, and inside of vehicle. Wipe off exterior of vehicle.
				X	Wash vehicle, clean engine and engine compartment.
				X	*Battery.* Clean, Check water level. Inspect terminals for corrosion tightness, and coating of grease.
				X	*Assemblies and belts.* Inspect assemblies such as carburetor (fig. 131), generator (fig. 130), heater, compressor (fig. 131), starter (fig. 130), and water pump (fig. 163) for looseness of mountings, or connections. Press drive belts to determine if tension is correct (par. 137).
				X	*Electrical wiring.* Visually, inspect electrical wiring, conduits, and shielding.

77. Preventive Maintenance by Organizational Maintenance Mechanics

a. Intervals. The indicated frequency of the prescribed preventive maintenance services is considered a minimum requirement for normal operation of vehicle. Under unusual operating conditions, such as extreme temperatures, dust or sand, or extremely wet terrain, it may be necessary to perform certain maintenance services more frequently.

b. Driver or Operator Participation. The driver or operators should accompany vehicle and assist the mechanics while periodic organizational preventive maintenance services are performed. Ordinarily, the driver should present the vehicle for a scheduled preventive maintenance service in a reasonably clean condition.

c. Special Services. These are indicated by item numbers in the columns which show the interval at which the services are to be performed, and show that the parts or assemblies are to receive certain mandatory services. For example, an item number in one or both columns opposite a *Tighten* procedure means that the actual tightening of the object must be performed. The special services are as in (1) through (5) below.

(1) *Adjust.* Make all necessary adjustments in accordance with instructions contained in the pertinent section of this manual, information contained in changes to the subject publication or technical bulletins.

(2) *Clean.* Clean the unit as outlined in paragraph 75 to remove all lubricant, dirt, and other foreign material.

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

(4) *Serve.* This usually consists of performing special operations, such as replenishing battery water, draining and refilling units with oil, and changing or cleaning the oil filters, air cleaner, or cartridges.

(5) *Tighten.* All tightening operations should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice. Use a torque-indicating wrench where specified. Do not overtighten, as this may strip threads or cause distortion. Tightening will always be understood to include the correct installation of lockwashers, locknuts, locking wire, or cotter pins to secure the tightened nut or bolt.

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

e. DA Form 461. The numbers of the preventive maintenance procedures that follow are identical with those outlined on DA Form 461. Certain items on the form that do not apply to these vehicles are not included in the procedures in this manual. In general, the sequence of items on the form is followed, but in some instances there is deviation for conservation of the mechanic's time and effort.

f. Procedures. Table IV lists the services to be performed by the organizational mechanic or maintenance crew at the designated intervals. Each page of the table has two columns at its left edge for designated intervals of every 1,000 miles (C service) and 6 months or 6,000 miles, *whichever occurs first* (D service). Very often it will be found that a particular procedure does not apply to both scheduled intervals. In order to determine which procedure to follow, look down the column corresponding to the maintenance procedure and wherever an item number appears, perform the operations indicated opposite the number.

Table IV. Organizational Mechanic or Maintenance Crew C and D Preventive Maintenance Services

INTERVAL		Procedure
C (every 1,000 miles)	D (6,000 miles or 6 months, whichever occurs first)	
		INSPECTION AND ROAD TEST
		Before Operation. Fuel, oil, water, antifreeze, tires, instruments, leaks, general visual inspection of vehicle and equipment. Perform the before-operation service (par. 76).
1	1	*Panel instruments, switches, and gages, oil pressure, ammeter, speedometer, tachometer, temperature, fuel, air pressure, ignition switch, and other controls* (fig. 65). Note generator output on the ammeter immediately after starting engine, before generator regulator has reduced the charging rate. Observe all instruments for normal readings (pars. 12–43). Notice if the ignition switch (R, fig. 65) operates freely and makes positive contact, and check other controls for normal operation (pars. 12–43).
2	2	*Horns, mirrors, and windshield wipers* (fig. 65). Sound horn to see if signal is normal (if tactical situation permits). Test windshield wipers for satisfactory operation. Examine mirrors and reflectors.
3	3	*Engine—idle, acceleration, power, noise, governed speed.* In warming up the engine, observe if it starts easily (par. 45), and if action of choke and hand throttle are satisfactory (par. 122). Notice if idling speed is correct (par. 121). Listen for any unusual noises at idle and higher speeds. *Note.* Perform item 6 during warmup period. Listen for any unusual noises when the engine is under load. Speed up the vehicle, on a level stretch, to see if it will reach, but not exceed, the specified governed speed (par. 126).

Table IV. Organizational Mechanic or Maintenance Crew C and D Preventive Maintenance Services—Continued

INTERVAL		Procedure
C (every 1,000 miles)	D (6,000 miles or 6 months, whichever occurs first)	
		INSPECTION AND ROAD TEST—Continued
4	4	*Steering—free play, bind, wander, shimmy, side pull, column and wheel.* With the vehicle moving straight ahead, see if the steering wheel has excessive free play and if there is any tendency to wander, shimmy, or pull to the side. Turn the steering wheel through its entire range and note any bind. Examine steering column and wheel.
5	5	*Clutch—free travel, drag, noise, chatter, grab, slip.* See of clutch pedal has specified free travel (par. 202) and if action of pedal return spring is satisfactory. Note whether clutch disengages completely or has a tendency to drag. Observe smoothness of engagement and tendency to chatter, grab, or slip and any unusual noise. With transmission in neutral, depress and release clutch pedal, listening for defective release bearing.
6	6	*Air pressure—buildup, governor, cutoff, and low-pressure indicator.* During the warmup period, run the engine at fast idle (about 1,000 rpm) and observe if the air pressure builds up at a normal rate and if the governor cuts off the compressor at the specified upper limit (120 psi). Operate the brake to reduce air pressure and observe if the governor cuts in the compressor at the specified lower limit (65 psi). Reduce the pressure sufficiently to see if the low-pressure warning signal is operating (when air pressure is below 65 psi). Inspect for leaks in the air-brake system by stopping the engine when the air pressure is at a maximum and noticing if there is any appreciable drop on the air-pressure gage within 1 minute.
7	7	*Brakes—(foot, hand, and trailer)—braking effect, feel, side pull, noise, chatter, pedal travel, hand control.* See if brake pedal has specified free travel (par. 220) and if action of return spring is satisfactory. Observe if pedal goes too close to floor. Make several stops noting side pull, noise, chatter, or any other unusual conditions. Notice if air-hydraulic brake cylinder is assisting satisfactorily (par. 219). Observe if handbrake holds and is properly adjusted (par. 228). Apply trailer brakes alone and observe if they operate effectively. Air brakes—disconnect hoses from towing vehicle and see if trailer brakes apply.
8	8	*Generator, starter and switch—action, noise, speed.* Notice if the starter switch requires only normal pressure, and if the starter engages smoothly without unusual noise and turns the engine with adequate cranking speed. Examine generator brushes (par. 150).

Table IV. Organizational Mechanic or Maintenance Crew C and D Preventive Maintenance Services—Continued

INTERVAL		
C (every 1,000 miles)	D (6,000 miles or 6 months, whichever occurs first)	Procedure
		INSPECTION AND ROAD TEST—Continued
9	9	*Transmission and transfer—lever action, declutching, vibration, noise.* Shift transmission and transfer into all speeds, observing any unusual stiffness of the shift levers, tendency to slip out of speed, unusual noise, or excessive vibration. Make similar observations with front drive declutching mechanism (par. 206).
10	10	*Unusual noises—attachments, cab, body and wheels, power train.* At all times during the road test, be alert for unusual or excessive noises that may indicate looseness, defects, or deficient lubrication in these components.
11	11	*Lamps—head, tail, body, running, stop, and blackout.* During stops in the road test, test the operation of these exterior and interior lights and light switches (par. 49). Notice if headlights appear to be properly aimed (par. 154). Note condition of lights and safety reflectors.
		MAINTENANCE OPERATIONS
25	25	*Temperatures—brakedrums, hubs, axles, transmission, transfer, differentials.* Immediately after the road test, feel these units cautiously. An overheated wheel hub and brakedrum indicates an improperly adjusted, defective, or dry wheel bearing (par. 242) or a dragging brake (par. 220). An abnormally cool condition indicates an inoperative brake (par. 220). An overheated gear case indicates internal maladjustment, damage, or lack of lubrication (par. 67). *Note.* It is normal for hypoid rear axles and transfers to run quite hot after the vehicle has run a considerable distance. If these particular units are too hot for the hand to be placed upon them, it is not necessarily a sign of malfunctioning. If they are adequately lubricated and did not howl during the road test, assume they are all right.
	25	Inspect propeller shafts. Tighten universal joint assembly and flange units (par. 210).
26	26	*Leaks—engine oil, fuel, water, axles, housing, transmission, transfer and all other components carrying fluids, oil, or grease.* Make general observations in the engine compartment, and underneath the vehicle for oil, water, fuel, and exhaust leaks. Look at spark plug, manifold, and cylinder-head gaskets. ***Caution:*** Do not tighten the cylinder head or manifold unless there is evidence of looseness or leakage. If cylinder head requires tightening, use a torque-indicating wrench and tighten in the sequence and to the torque specified in paragraph 109.

Table IV. Organizational Mechanic or Maintenance Crew C and D Preventive Maintenance Services—Continued

INTERVAL		Procedure
C (every 1,000 miles)	D (6,000 miles or 6 months, whichever occurs first)	
		MAINTENANCE OPERATIONS—Continued
27	27	*Lubrication—lubricate vehicle in accordance with lubrication order.* Coordinate with inspection and disassembly operations to avoid duplication.
27	27	During lubrication, inspect tires for unusual wear, penetrating objects, and proper matching (par. 241).
	27	Rotate and match tires according to tread design and degree of wear. See TM 31–200 for acceptable limits in matching tires. Tighten axle flange nuts (par. 242).
28	28	*Batteries—specific gravity.* Make hydrometer test of electrolyte in each cell and record specific gravity in space provided on DA Form 461.
29	29	*Battery—voltage.* Perform high-rate discharge test according to instructions accompanying test instrument. Record voltage of each cell in space provided on DA Form 461.
	29	After battery test, clean top of battery, coat terminals lightly with grease, repaint carrier if corroded. Look to see if battery requires water. *Note:* If distilled or approved water is not available, clean water, preferably rain water, may be used.
	30	*Compression.* Test compression (par. 109) in each cylinder, with throttle and choke wide open, and record in space provided on DA Form 461. It is preferable to make compression test with engine at operating temperature.
	31	*Breather caps and ventilators.* Inspect carburetor, governor, breather, and crankcase-ventilator caps and air cleaner. Inspect brake air-hydraulic cylinder (fig. 156), compressor (fig. 154), compressor drive belt (fig. 154), and compressor air governor (A, fig. 122).
	31	Clean and service these items in accordance with lubrication order (par. 67).
32	32	*Radiator—Core, shell, hose, cap and gasket, and coolant level cock.* Inspect these items, noticing particularly if the radiator core is clogged with foreign matter or if fins are bent. Test the operation of the cap and coolant level cock (fig. 162). Observe coolant level and examine coolant for contamination. In cold weather, test coolant with a hydrometer to see if it contains sufficient antifreeze.
	32	If need is indicated, drain radiator and block, clean, flush, refill, and add inhibitor, unless antifreeze, which contains inhibitor, is used (par. 134). Tighten radiator mountings and hose clamps.

Table IV. Organizational Mechanic or Maintenance Crew C and D Preventive Maintenance Services—Continued

INTERVAL		
C (every 1,000 miles)	D (6,000 miles or 6 months, whichever occurs first)	Procedure
		MAINTENANCE OPERATIONS—Continued
32	33	*Water pump, fan, drive belts, and pulleys.* Inspect pulleys and fan for alinement and belts for tension (par. 137). Notice if water pump packing gland is leaking.
	34	*Valve mechanism—clearance, cover gaskets.* Gage valve tappet clearance (par. 108) and look for broken or weak valve springs if need is indicated by engine performance, low compression, or tappet noise. If clearance is found insufficient (par. 108), adjust, and recheck compression. Inspect cover gaskets.
	35	*Spark plugs—clean and adjust, distributor, cap, rotor, points, shaft, advance units, coil and wiring, ignition timing.* Remove and inspect spark plugs (par. 148). Inspect distributor cap, rotor, and breaker points (fig. 176). Test distributor shaft for looseness by hand feel. Test ignition coil and distributor capacitor with high-tension ignition-circuit tester, if available, according to instructions accompanying test instrument. Using neon timing light, observe if ignition timing is correct (par. 146) and if spark advances automatically as engine is accelerated.
	35	Clean spark plugs and adjust gaps (par. 148). Dress distributor points and adjust gap (par. 147). If points are badly pitted, replace both points and capacitor (par. 147).
	36	*Manifold and manifold gaskets.* Inspect these items. Look particularly for signs of leakage at the manifold gaskets.
37	37	*Carburetor, choke, throttle, linkage, fuel filter, screen, and lines.* Inspect these items, noticing particularly if the shafts and linkage operate freely and are not excessively worn. Observe if the choke valve plate opens fully when the control is released (par. 122) and if the throttle valve plate opens fully when the accelerator is fully depressed (par. 122).
	37	Make an engine vacuum test (par. 110) and adjust carburetor idle mixture (par. 121). Test fuel pump pressure (par. 123).
	37	Clean the element and sediment bowl of fuel filter (par. 124); drain water and sediment from fuel tanks if there is evidence of contamination, using a container to catch the drainings (par. 125*b*). If need was indicated in the road test, adjust the governed speed at this time (par. 126).
	38	*Exhaust pipe and muffler.* Inspect; listen for excessive or unusual noises and look for exhaust leaks.
	38	Tighten mountings.
	39	*Brakeshoes—linings, links, guides, anchors, supports, cylinders, cams, hose, and air chambers.* Inspect brake hoses and air chambers and test linkage for freedom of action. Drain water from air-brake reservoirs (par. 235).

Table IV. Organizational Mechanic or Maintenance Crew C and D Preventive Maintenance Services—Continued

INTERVAL		Procedure
C (every 1,000 miles)	D (6,000 miles or 6 months, whichever occurs first)	
		MAINTENANCE OPERATIONS—Continued
37	39	Wheel bearings will be disassembled, cleaned, and repacked in *every second* 6,000-mile inspection or annually. If the wheel bearings are due for repacking, remove wheels and hubs (par. 242) and examine brakedrums, shoes, linings, links, guides, anchors, supports, retractor springs, cylinders, and cams. Clean the backing plates (fig. 246) and tighten the backing plate bolts. Clean and inspect wheel bearings (par. 242). If the wheel bearings are not due for repacking, remove the drums (par. 242) and inspect the internal brake components *only*. Adjust brakes (par. 220).
	40	*Cab—doors, hardware, glass, top and frame, curtains and fasteners, seats, upholstery, trim, safety straps, and paint.* Inspect these items, paying particular attention to cab or body mountings; include springs. Test operation of doors, windows, windshield, ventilators, hood hinges, and fasteners. Observe seat mountings and upholstery. Make a general inspection of body, including glass, panels, tops, fenders, running boards, tailgate, chains, stakes, bows, paulins, curtains, and brush guard. Examine condition of paint and legibility of markings and identification and caution plates.
	40	Tighten cab and body mounting bolts. Loosen the steering-column clamp before tightening cab mounting bolts and tighten afterward. Tighten spring U-bolts (figs. 224 and 230).
	41	*Fifth wheel—subbase and holddown bolts.* Inspect these items. Test operation of kingpin lock (par. 56).
	41	Tighten all assembly and mounting bolts.
	42	*Bumpers—front and rear, pintle hook.* Inspect these items. Test operation of pintle hook and notice if the lockpin is attached with a chain.
	44	*Winches—power-take-off.* Inspect power-take-off, winch drive shaft, and shear-pin (figs. 272 and 276). Examine winch cable. Test operation of winch (front, par. 51; rear, par. 52).
	44	Clean and oil winch cable in accordance with lubrication order (par. 67).
	44	*Hydraulic crane-control valve bank, cylinders, hoist drum and worm and drive gearset, hoses, power divider, pump, pumpl governor control valve, shipper and boom assembly, swing motors, and drive shafts.* Inspect these items. Look particularly for leaks at hydraulic pump shafts, cylinder piston rods, and hose connections. Observe if governor control valve on power divider (M62) or power-take-off (M246) holds engine at 1,600 rpm. Operate crane through full range of move-

Table IV. Organizational Mechanic or Maintenance Crew C and D Preventive Maintenance Services—Continued

INTERVAL		Procedure
C (every 1,000 miles)	D (6,000 miles or 6 months, whichever occurs first)	
		MAINTENANCE OPERATIONS—Continued
		ments (M62, par. 53; M246, par. 54), noticing whether pump control linkage and control valve levers operate freely and without sticking. Inspect shipper and boom assembly for bent or broken components. Examine condition of paint and legibility of markings and identification and caution plates.
------	44	*Dump body and hoist assembly-control linkage, cylinders, drive shaft, hoses, pump mounting.* Inspect these items. Look particularly for leaks at hydraulic pump shaft, cylinder piston rods, and hose connections. Operate hoist assembly through full range of movement (par. 55). Tighten all body and hoist assembly mounting bolts.
		FINAL ROAD TEST
		Perform final road test as outlined under ROAD TEST at beginning of this table. Pay special attention to any items which have been repaired or adjusted.
		UNUSUAL CONDITIONS
		Maintenance operations and road tests as prescribed under usual conditions will apply equally well under unusual conditions for operations for all occasions except in extreme cold weather. Intervals are necessarily shortened in extreme cold weather servicing and maintenance. Vehicles subjected to salt water immersion or complete submersion are evacuated to ordnance maintenance unit as soon as possible after exposure (par. 71).

Section IV. TROUBLESHOOTING

78. Scope

a. This section contains troubleshooting information and tests for locating and correcting some of the troubles which may develop in the vehicle. Troubleshooting is a systematic isolation of defective components by means of an analysis of vehicle trouble symptoms, testing to determine the defective component and applying the remedies. Each symptom of trouble given for an individual unit or system is followed by a list of probable causes of the trouble and suggested procedures to be followed.

b. This manual cannot cover all possible troubles and deficiencies that may occur under the many conditions of operation. If a specific trouble, test, and remedy therefor are not covered herein, proceed to isolate the system in which the trouble occurs and then locate the defective component. Do not neglect use of any test instruments such as voltmeter, ammeter, test lamp, hydrometer, and pressure and vacuum gages that are available (par. 65). Standard automotive theories and principles of operation apply in troubleshooting the vehicle. Question vehicle driver or operator to obtain maximum number of observed symptoms. The greater the number of symptoms of troubles that can be evaluated, the easier will be the isolation of the defect.

79. Engine

a. Engine Will Not Turn When Starter Switch Is Actuated.

(1) *Defective starter.* Refer to paragraph 83.

(2) *Mechanical seizure of parts.* Notify ordnance maintenance personnel.

(3) *Hydrostatic lock.* Check radiator for coolant level. The cylinder chambers may be filled with coolant caused by defective cylinder head gasket. Replace cylinder-head gasket (par. 109).

Caution: Do not attempt towing of vehicle when mechanical seizure or hydrostatic lock is evident until condition is corrected.

b. Engine Turns but Will Not Start.

(1) *Combustion chambers flooded with fuel.* If the choke has been used excessively, fuel may flood the combustion chamber causing engine not to start. Push choke all the way in, open throttle plate, and crank engine to clean out excessive fuel. If flooding continues, check fuel system (par. 80).

(2) *Inoperative fuel system.* Test fuel pump (par. 123).

(3) *Carburetor choke inoperative.* Adjust choke control (par. 122).

(4) *Spark not reaching plugs.* Remove one spark plug cable and hold terminal three-eighths of an inch from cylinder head while cranking engine with ignition switch on. If spark is not evident, check ignition system (par. 84).

(5) *Faulty batteries.* Test batteries for charge and voltage (par. 153). Replace or recharge battery as indicated. Also check for loose and corroded battery terminals. Clean and tighten terminals.

c. Lack of Power.

(1) *Engine overheating.* Refer to cooling system (par. 82).

(2) *Choke control not fully in.* Push choke all the way in.

(3) *Faulty ignition system.* Refer to ignition system (par. 84).

(4) *Fuel system restricted with dirt or foreign matter.* Troubleshoot fuel system (par. 80).

(5) *Leak at intake manifold and carburetor gaskets.* Pour a small quantity of oil on edges of intake manifold and carburetor gaskets. Crank engine with starter. A sucking sound will be heard if defective gaskets are present. Replace manifold gaskets (par. 110) or carburetor gasket (par. 121).

(6) *Incorrect governor setting.* Check the tachometer on the instrument panel and note if governor limits engine speed to less than 2,800 rpm. If this condition exists, notify ordnance maintenance personnel.

(7) *Improper valve adjustment.* Check and adjust valve clearances (par. 108).

(8) *Valves sticking.* Remove rocker arm covers (par. 108) and apply penetrating oil to valve stems. If the valves do not free themselves or broken valve springs are located, replace cylinder head assembly (par. 109).

d. Engine Will Not Idle.

(1) *Carburetor out of adjustment.* Adjust carburetor (par. 121).

(2) *Choke plate partially closed.* Refer to paragraph 122.

(3) *Leaking manifold gasket.* Refer to *c*(5) above.

(4) *Spark plugs fouled or incorrect gap setting.* Test by shorting out each spark plug. When defective plug is located, stop engine and remove spark plug cable. Start engine and hold spark plug wire terminal against engine block. If noticeable difference in engine performance results, the spark plug is operating satisfactory. If no difference is noticed, remove, clean, and adjust or replace spark plugs (par. 148).

(5) *Fuel system restricted with foreign matter.* Refer to *b*(2) above.

(6) *Improper valve adjustment.* Refer to *c*(7) above.

(7) *Valves sticking.* Refer to *c*(8) above.

(8) *Faulty ignition system.* Troubleshoot ignition system (par. 84).

(9) *Loose or corroded wiring.* Remove wiring and inspect wire terminals for corroded condition. Remove corrosion and install. Tighten all connections.

e. Engine Overheats.

(1) Insufficient collant in system. Inspect coolant level in radiator (par. 134). If the coolant level is low, inspect for loose mounting at radiator connections, engine connections,

oil cooler mounting, water manifold mountings, and core plugs. Tighten all loose connections and fill radiator to coolant level cock.

(2) *Loose fan belts.* Adjust fan belts (par. 137).

(3) *Oil level low.* Low oil level will cause engine to overheat. Inspect oil level and fill to proper level (par. 112).

(4) *Obstructions in radiator core.* Inspect core for any obstructions and clean with brush or wash foreign matter from core.

(5) *Late ignition timing.* Check ignition timing and make necessary adjustments (par. 146).

(6) *Clogged cooling system.* Clean cooling system (par 134).

f. Engine Operation Rough.

(1) *Oil level too high in crankcase.* Check oil level in crankcase and drain excessive oil to proper level (par. 112). This condition will cause fouled spark plugs which in turn affects engine operation.

(2) *Defective spark plugs.* Refer to *d*(4) above.

(3) *Intake manifold gasket leaking.* Refer to *c*(5) above.

(4) *Loose carburetor mounting.* Tighten carburetor mounting nuts.

(5) *Leaking cylinder head gasket.* Tighten cylinder-head cap screws (fig. 126) evenly and in proper sequence to 110 foot-pounds torque maximum. If leakage is still evident, replace gasket (par. 109).

(6) *Loose or corroded wiring.* Refer to *d*(9) above.

(7) *Broken valve springs, sticking valves, or improper valve adjustment.* Refer to *c*(7) and (8) above.

(8) *Defective ignition system.* Troubleshoot ignition system (par 84).

(9) *Uneven engine cylinder compression.* After checking (7) above, check compression of each cylinder (par. 109).

(10) *Water in fuel.* Drain and clean fuel filter (par. 124). If excessive water is evident, drain tanks and refill (par. 125).

g. Unusual Noises.

(1) *General.* The following unusual noises are caused by internal components of the engine and will require notifying ordnance maintenance personnel unless otherwise specified. Make certain oil in crankcase is at proper level (par. 112). Lack of oil will also cause the conditions in (2) through (8) below.

(2) *Crankshaft knocks.* These are usually detected as dull, heavy, metallic knocks which increase in frequency as the speed and load on the engine is increased. This is most audible when engine is pulling hard, on acceleration, or when engine is cold.

(3) *Connecting rod noises.* Connecting rod noises are usually a light pound or knock of much less intensity than main bearing knocks. The noise is usually evident with the engine idling and becomes louder when engine speed is slightly increased.

(4) *Piston noises.* The most common piston noise is "slap" due to the piston rocking from side to side in the cylinder. Piston slap usually causes a hollow, muffled bell-like sound or a click. Slight piston noises that occur with a cold engine and disappear after the engine is warm do not warrant replacement.

(5) *Piston pin noises.* Piston pin noise is the result of excessive piston pin clearance. This is characterized by a sharp, metallic double knock, generally audible with the engine idling.

(6) *Valve and tappet noises.* Noisy valve action has a characteristic clicking noise occurring usually at regular intervals. The frequency of valve action noise is generally less than other engine noise. If one or two of the valves are noisy, the clicking sound will be intermittent. Adjust valve clearance (par. 108).

(7) *Timing gear noise.* Timing gear noise is usually detected by a high-pitched whining noise and will increase in pitch as engine speed (rpm) is increased. Minor timing gear noise does not warrant replacement. If the noise continues to increase, notify ordnance maintenance personnel.

(8) *Loose engine accessory mounting.* Inspect all engine accessories such as generator, starter, water pump and fan blades, and air compressor for loose mounting bolts. Tighten all loose mountings.

80. Fuel System

a. Carburetor and Intake Manifold.

(1) *Lack of fuel at carburetor.*

(*a*) *Empty gas tank.* Check fuel gage (M, fig. 65) on instrument panel with ignition switch turned on. Also visually inspect fuel level in tank to be sure that gage is operating properly. If tank is empty, fill with fuel (par. 125).

(*b*) *Pinched or broken fuel lines.* Replace or repair damaged lines (par. 128).

(*c*) *Dirt in fuel lines.* Remove and clean fuel lines.

(*d*) *Defective fuel pump.* Disconnect fuel line from inlet side of carburetor. Crank engine with starter. If fuel does not flow freely, check fuel pump (*b*(2) below).

(*e*) *Dirt in filter.* Clean filter (par. 124).

(*f*) *Loose connections.* Tighten all fuel line connections.

(2) *Flooding condition at carburetor.*

(*a*) *Dirt on needle valve seat.* Tap bowl sharply. If the flooding does not stop, replace carburetor (par. 121).

(*b*) *Closed choke valve.* Refer to paragraph 122.

(*c*) *Improper float level or worn needle valve.* Improper float level or worn needle valves will cause flooding condition. Replace carburetor (par. 121).

(3) *Carburetor in need of adjustment.* Adjust carburetor (par. 121).

b. Fuel Pump.

(1) *Lack of fuel at pump inlet.* Inspect as outlined in *a*(1) above.

(2) *Defective fuel pump.* Perform fuel pump pressure test (par. 123).

(3) *Leaks at fuel pump.*

(*a*) *Loose inlet or outlet connections.* Tighten connections.

(*b*) *Loose cover screws.* Tighten screws alternately and if leakage still persists, replace fuel pump (par. 123).

c. Fuel Filter.

(1) *Leakage at fuel filter.* Tighten line connections and sediment bowl (par. 124).

(2) *Dirt in filter.* Remove bowl, clean element, and install bowl (par. 124).

(3) *Defective gasket.* Replace filter bowl gasket (par. 124).

d. Low Fuel Pressure.

(1) *Air leaks at fuel lines or pump.* Tighten all connections.

(2) *Clogged fuel lines.* Remove, clean, and install lines.

(3) *Dirt in filter.* Remove bowl, clean element, and install bowl (par. 124).

(4) *Defective fuel pump.* Refer to *b*(2) above.

81. Exhaust System

a. Excessive Noise.

(1) *Broken or split muffler or muffler connections.* Examine muffler and connections and if found defective, replace (par. 131).

(2) *Leaking exhaust pipe flange sealing ring.* Examine cylinder block for carbon streaks, or hold hand close to joint between exhaust manifold center section and exhaust pipe to determine whether escaping exhaust gases can be felt. Replace exhaust pipe flange sealing ring (par. 130).

(3) *Broken, split, or pinched exhaust pipe or tailpipe.* Replace damaged exhaust pipe (par. 130) or tailpipe (par. 132).

b. Odor of exhaust fumes in driver's compartment. Leaky gaskets or broken exhaust manifold, muffler, or tailpipe will allow exhaust fumes to reach driver's compartment.

Warning: Replace defective exhaust system parts (*a*(1), (2), or (3) above) as soon as possible since the exhaust gas (carbon monoxide) is poisonous.

82. Cooling System

a. Overheating.

(1) *Lack of coolant in system.* Remove radiator cap and check to be sure that radiator is filled to coolant level cock (fig. 162). If coolant level is low, check (2) below before filling.

Caution: Carefully remove radiator cap when engine is overheated. The cooling system operates under pressure and radiator cap must be turned slowly to relieve the pressure before complete removal.

(2) *Coolant leaks.* Inspect the cooling system (radiator hoses, water pump, and thermostat housing) for leaks. If leaks are found, correct by tightening the connections affected or if this is not possible, replace defective gaskets or parts (pars. 133–140).

(3) *Loose fan belts.* Accelerate engine rapidly. If belts squeal on pulleys during acceleration, belt tension is insufficient. Belt tension can also be tested by applying a light pressure on belts at point midway between water pump and generator pulleys. Refer to paragraph 137 for proper adjustment of fan belts.

(4) *Broken fan belts.* Replace belts (par. 137).

(5) *Clogged cooling system.* Refer to *a*(1), (2), and (3) above. If cooling system is properly filled, does not leak, and water pump is operating properly, overheating may be caused by a clogged system. Check for restrictions at deteriorated hoses and defective thermostats ((6) below). If overheating persists, clean cooling system (par. 134).

(6) *Defective thermostats.* Remove thermostats (par. 138). Test thermostats by placing units in a pan of hot water. Valves should start to open at 160° F. and be fully open at 180° F. Replace defective thermostats (par. 138).

b. Overcooling. Failure of the coolant to reach normal operating temperature range (160° to 180° F.) within reasonable length of time after engine is started, indicates improper operation of one or both thermostats. Remove thermostats (par. 138). Test each unit as outlied in *a*(6) above. Replace defective thermostats (par. 138). If this does not correct condition, either the water temperature gage or sending unit may be inoperative. Troubleshoot temperature gage and sending unit (par. 87).

83. Starting System

a. Starter Inoperative.

(1) *Rundown battery.* Turn on headlights. They should burn with brilliance. Engage starter. If lights go out when starter button is depressed, it indicates loose connection at battery terminals. Clean and tighten battery terminals. If lights dim as starter button is depressed and starter operates slowly, battery may be run down. Check battery with hydrometer (par. 153).

(2) *Open circuit to starter.* This is indicated when the starter button (CC, fig. 65) is depressed and the lights stay bright with no cranking action. Inspect wiring from manual switch (M, fig. 138) mounted on top of starter to magnetic switch (Q, fig. 145) mounted on frame right side rail. Replace defective wiring and tighten all connections. If the circuit still cannot be closed, notify ordnance maintenance personnel.

(3) *Mechanical seizure of engine.* Seizure of components of the engine assembly will prevent starter action. Refer to troubleshooting of the engine assembly (par. 79).

(4) *Broken teeth on engine flywheel or starter drive assembly.* If depressing the starter buton (CC, fig. 65) causes the starter to run free without cranking the engine, indications are that teeth are broken from starter ring gear or starter drive assembly. Replace starter assembly (par. 142). If replacement of the starter does not correct the condition, notify ordnance maintenance personnel.

b. Defective Starter.

(1) *Damaged starter.* Turn light switch on and depress starter button. If the lights dim considerably and starter operates slowly or drags, with a fully charged battery (par. 153), there is indication of bent armature shaft which permits armature to drag on pole shoes and loose pole shoe screws which will reduce cranking performance. Replace starter (par. 142). Pull commutator end cover (fig. 194) from front end of starter and inspect commutator for burned condition, broken brush springs, and worn brushes which prevent good contact between brushes and commutator. If evidence of any of these conditions is found, replace the starter (par. 142).

(2) *Starter noises.* Unusual noises warn of impending trouble and timely remedy of causes may prevent further damage to the starter. Worn shaft bearings, sprung shaft, chipped flywheel ring gear teeth or starter drive gear teeth, dry bearings, and loose mountings will cause unusual noises from the starting motor. Tighten loose mountings. Other unusual

noises from items listed will require starter replacement (par. 142).

84. Ignition System

a. Coil.

(1) *General.* Ignition coils do not normally require any service except to keep all terminals and connections clean and tight. In addition, the coil should be kept reasonably clean but not submitted to steam cleaning. If poor ignition performance is obtained and the coil is suspected of being the cause, the coil may be tested as follows:

(2) *Spark gap test.* The spark gap test should always be used comparatively. That is, a coil known to be good should be compared with the questionable coil. Both coils should be at the same temperature and identical test leads must be used. Replace defective coil (par. 147).

(3) *Metered instrument tester.*

(*a*) *Preliminary tests.* Before the testing instrument is used, a lamp with test points should be applied to check the coil for open or grounded circuits. To test an open primary circuit, put the test points on the two primary terminals. If the lamp does not light, the primary circuit is open. To check secondary circuit, put one test point in the high tension terminal and the other at one of the primary terminals. If no spark will occur, the secondary is open.

(*b*) *Meter test.* The metered test is usually so designed as to permit testing of the coil without making any connections to the secondary terminals. This eliminates certain variables caused by altitude, atmospheric or spark gap electrode conditions which are usually present in this type of test. Details of the testing procedures and manner in which the various testers are used will be found in the tester operating instructions. Replace defective coil (par. 147).

b. Condenser. Poor ignition performance can also be caused by a defective condenser. Look for broken condenser lead or loose mounting. Tighten connections. In order to test an ignition condenser, a special tester must be used. Such a tester will check the condenser for insulation breakdown, low insulation resistance, high series resistance and capacity. All four characteristics will affect ignition performance. Details of testing procedure are found in tester operating instructions. When condenser tester is not available, test is limited to replacement of condenser (par. 147).

c. Distributor.

(1) *Corroded terminals and loose wires.* Cables and wires should be examined carefully for brittle or cracked insulation and broken strands. Defective insulation will permit missing or

cross firing of the engine. All connections should be clean and tight.

(2) *Cracked cover and cap and broken or burned rotor.* Inspect the distributor cover, cap, and rotor for cracked, broken, or burned condition. If any evidence of cracked or damaged condition is found, replace damaged component (par. 147).

(3) *Contact points.* Inspect distributor contact points, and replace points (par. 147), if necessary.

(4) *Overlubricated.* Inspect distributor mechanism for evidence of overlubricating which is conducive to rapid burning of points. Wipe mechanism dry with clean cloth.

(5) *Centrifugal advance mechanism.* The centrifugal advance can be checked for freeness by turning the breaker cam in the direction of rotation and then releasing it. The advance springs should return cam to original position without sticking. Replace distributor and coil assembly (par. 147) if sticking condition is evident.

(6) *Coil and condenser.* For suspected irregularities in the coil or condenser, refer to *a* and *b* above.

85. Batteries and Lighting System

a. General. When checking or troubleshooting the battery and lighting system, refer to the vehicle wiring diagram (fig. 188). Most common source of light failures on the lighting system are due to discharged battery, or grounded or shorted cables.

b. Lighting.

(1) *One lamp will not light.* This condition is the result of an open circuit or grounded wire between the lamp ground and feed wire junction. Check as follows:

(*a*) *Burned out or broken filaments.* Replace lamp.

(*b*) *Loose or corroded ground connections.* Clean and tighten ground connection.

(*c*) *Corroded contacts or terminals.* Remove lamps and clean terminals.

(*d*) *Broken wire or frayed insulation.* Replace defective wiring (par. 164).

(*e*) *Grounded or shorted terminal.* Adjust or relocate terminals to prevent grounding.

(*f*) *Defective stoplight switch* (*stoplight only*). Replace stoplight switch (par. 182).

(2) *Two or more lamps will not light.* The cause of this condition will be located between the main light switch and the individual lamp junctions. Inspect (1) (*a*) through (*f*) above at each defective lamp. After inspecting the above items and lamps will not light, replace light switch (par. 178).

(3) *All lamps will not light.*

(a) *Discharged battery.* Make a hydrometer test of battery (par. 153).

(b) *Corroded or disconnected battery or ground terminal.* Inspect terminals and mountings. Clean terminals and tighten mountings (par. 153).

(c) *Defective light switch.* Replace light switch (par. 178).

(d) *Broken circuits within wiring harness.* If, after replacing light switch, lamps do not light, there may be broken circuits within the wiring harness. Since the wiring and terminals are sealed or inclosed and connected with inaccessible multiple terminals the wiring harness assemblies should be replaced. The inclosed-type terminals do not permit attaching jumper leads around suspected circuit. Notify ordnance maintenance personnel.

(4) *Flickering of lamps.* Flickering of lamps is caused by loose connections at lamp wire terminal, grounded exposed wire, or loose terminals. Isolate the flickering to one, two or more, or all lamps as outlined in (1) through (3) above. Inspect, remove corrosion, and tighten wiring harness to lamp affected. Also inspect lamp for defective filament. Replace defective lamp. If the flickering is still present, the trouble may consist of a broken wire within the harness. Refer to (3) (*d*) above.

(5) *Lamps are dim.*

(a) *Discharged battery.* Test battery (par. 153).

(b) *Low electrolyte level.* Fill battery to proper level (par. 153).

(c) *Loose or corroded ground connection at battery or lamp.* Remove corrosion and tighten mountings (par. 153).

(6) *Frequent lamp failure.*

(a) *Defective voltage regulator.* Frequent burning out of lamps is the result of high voltage at lamps. This is caused by a defective or improperly adjusted generator regulator. Replace regulator (par. 151) or notify ordnance maintenance personnel.

(b) *Corroded battery terminals.* Corroded terminals will cause resistance at battery and force generator to operate at higher voltage. This condition will subject lamps to excessive voltage, resulting in burning out of lamps. Remove corrosion and tighten terminals (par. 153).

c. *Batteries.*

(1) *General.* The batteries are the heart of the electrical system and are the logical point to start an examination for potential troubles. The batteries are in good condition when

leaving the factory; however, storage and improper care will cause batteries to fail. If premature failure results after new batteries are installed, then it must be caused by improper care or operation.

(2) *Overheating.* The most prevalent cause of early failure is overheating caused by a faulty regulator which permits excessive current delivery to batteries. Overheating decomposes the water and leaves acid more concentrated which is harmful to plates and separators. Replace regulator (par. 151) or notify ordnance maintenance personnel.

(3) *Undercharging.* If the battery remains undercharged over a period of time, the plates sulphate, harden and buckle which, in turn, will cause a short circuit within the battery. Batteries should not stand idle in more than 75 percent discharged condition for a long period of time. Replace batteries (par. 153).

(4) *Lack of water.* If water is not replaced as soon as level falls below the top of separators, the acid will reach a high concentration and damage separators which, in turn, will impair performance of battery. Add water to correct level (par. 153).

(5) *Loose battery mountings.* Loose mountings will allow battery to bounce causing breakage of container or sealing compound to open up and acid to leak over cells. Vibration may cause plates to break loose from mounting causing short circuits. Tighten holddown clamps.

Caution: Overtightened holddown clamps may distort or crack case.

(6) *Frequent charge necessary.*

(*a*) *Insufficient charge rate.* Troubleshoot generating system (par. 86).

(*b*) *Slipping fan belts.* Adjust fan belts (par. 137).

(*c*) *Corroded battery terminals.* Remove cables, clean terminals and cables, and install (par. 153).

(*d*) *Short circuit in charging circuit.* Troubleshoot generating system (par. 86).

(*e*) *Defective regulator.* Replace regulator (par. 151) or notify ordnance maintenance personnel.

(*f*) *Excessive use of electrical units.* Use of electrical units without operating the charging system will discharge battery. Limit use of electrical units when charging system is inoperative. Recharge or replace battery (par. 153).

(*g*) *Worn out, inefficient battery.* Replace batteries (par. 153).

(7) *High water loss.*

(*a*) *Too high charging rate.* Troubleshoot generating system (par. 86).

(*b*) *Leaking or cracked battery case.* Replace battery (par. 153).

(*c*) *Defective regulator.* Refer to (6)*e* above.

(8) *Battery will not take full charge.* If the charging system is in good condition, water at proper level, and terminals do not show signs of corrosion, the battery can be considered worn out. Spilled electrolyte, internal short circuit, and impure electrolyte are probable causes. Replace battery (par. 153).

86. Generating System

a. General. Since the generator and regulator functions are directly related, both units must be considered when checking symptoms of failure of the generating system. Early production vehicles are equipped with ammeter gages and later production vehicles are equipped with voltmeters. Troubleshoot the voltmeter or ammeter gage (par. 87*a*) before making any repairs to the charging system.

b. Fully Charged Battery and a High Charging Rate.

(1) *Poor ground connection at regulator.* Tighten regulator mounting.

(2) *High battery temperature.* In extreme hot climate, high temperature will reduce the resistance of the battery to a charge so that it will accept a high charging rate although voltage regulator setting is normal.

(3) *Improper voltage regulator setting.* Notify ordnance maintenance personnel.

(4) *Grounded generator field circuit.* Notify ordnance maintenance personnel or replace generator (par. 150).

c. Low Battery and Low or No Charging Rate.

(1) *Loose connections, frayed, or damaged cables.* Tighten loose connections and replace damaged cables (par. 153).

(2) *Defective battery.* Refer to paragraph 85.

(3) *Incorrect generator regulator setting.* Notify ordnance maintenance personnel or replace regulator (par. 151).

(4) *Broken circuits within wiring harness.* Refer to paragraph 85*b*(3)(*d*).

d. Unsteady or Low Output.

(1) *Drive belts loose.* Adjust belts (par. 137).

(2) *Worn brushes.* Remove inspection plug (fig. 136) and check for worn brush condition, burned commutator bars, or loose connections. If evidence of any of these conditions is found, replace generator (par. 150).

(3) *Damaged generator.* Inspect generator (par. 150*a*).

(4) *Broken circuits within wiring harness.* Refer to paragraph 85*b*(3)(*d*).

e. Noisy Generator.

(1) *Loose mountings.* Tighten generator mountings.

(2) *Loose drive pulley.* Tighten pulley retaining nuts. If pulley is still loose, replace generator (par. 150).

(3) *Worn or dirty bearings.* Replace generator (par. 150).

(4) *Lack of lubrication.* Replace generator (par. 150).

(5) *Loose fan belts.* Adjust belts (par. 137).

87. Instruments, Gages, Switches, and Sending Units

a. Ammeter or Voltmeter Inoperative.

(1) *General.* The early production vehicles are equipped with ammeters indicating charging rate. On later production vehicles, the voltmeter was used indicating the voltage condition of the battery.

(2) *Defective ammeter.* Turn the ignition switch on and the ammeter should register slightly on the discharge side. Also turn on headlights to increase the discharge rate and the gage should register accordingly. If no action of the needle takes place, refer to paragraph 85*b* (3) (*d*) on broken circuits. If the ammeter reading is doubtful, check gage with a comparable new gage. Replace defective ammeter (par. 169).

(3) *Defective voltmeter.* Since the voltmeter registers the charged condition of the battery, inspect battery (par. 153). If the battery check indicates fully charged, the voltmeter should register in the green indicating good battery voltage. If the voltmeter is not registering correctly with battery test, check presence of voltage at meter by disconnecting positive lead at meter and installing a laboratory-type voltmeter. Turn ignition switch on to check presence of voltage. If no reading is obtained, it indicates a broken circuit. Refer to paragraph 85*b* (3) (*d*). If the voltage is present, make a comparison test with a known good voltmeter. Replace defective voltmeter, using same procedures as for ammeter (par. 169).

b. Defective Fuel Gage.

(1) *Lack of fuel in tank.* Fill fuel tank (par. 125). With the tank full, the gage should register in the full position with ignition switch on.

(2) *Faulty fuel gage.*

(*a*) To determine whether voltage is present at the gage, disconnect positive lead from fuel gage and install voltmeter. Check for presence of 24 volts. If no reading is obtained, the circuit is either open or grounded. Refer to paragraph 85*b* (3) (*d*). If correct reading is obtained, proceed as in (*b*) below.

(*b*) Check operation of fuel gage by substituting a known good gage. If the substitute gage registers correct level of fuel in the tank, the original gage is defective. Replace fuel gage (par. 170). If the substitute gage does not register correct fuel level, proceed as in (*c*) below.

(*c*) Disconnect lead from fuel tank sending unit and check for presence of 24 volts ((*a*) above). If no reading is obtained, the cable is either broken or grounded. Repair or replace cable (par. 164) as required. If correct reading is obtained, the fuel gage sending unit is inoperative.

(3) *Defective fuel gage sending unit.* After isolating the trouble to the sending unit by performing (2) above, make a comparison test of the sending unit by replacing with a known good unit. If found defective, replace sending unit (par. 188).

c. Oil Pressure Gage Inoperative.

(1) *Oil level low.* Check crankcase oil level (par. 112).

(2) *Defective oil pressure gage.* Check oil pressure gage (*b*(2) above). If the trouble cannot be isolated, check sending unit.

(3) *Defective oil pressure gage sending unit.* If the defect is not discovered in the oil pressure gage or the wiring, then make a comparison test of the sending unit by replacing with a known good unit. If found defective, replace sending unit (par. 189).

d. Temperature Gage Inoperative.

(1) *Thermostats sticking open.* If the vehicle is being operated in cold weather, the thermostats may stick open and cause overcooling. Place a paulin or winter front cover over the radiator and run engine at fast idle. If temperature gage registers increased temperature, thermostats are at fault. Check thermostats (par. 82*a*(6)). If temperature gage does not register increased temperature, check wiring and temperature gage sending unit ((3) below).

(2) *Faulty temperature gage.* Check voltage and temperature gage cables (*b*(2) above). If correct reading is obtained, the temperature gage sending unit is inoperative. Check temperature gage sending unit ((3) below).

(3) *Defective temperature gage sending unit.* If (2) above does not disclose the defect in the temperature gage or wiring, make a comparison of the sending unit by replacing with a known good unit. If found defective, replace sending unit (par. 192).

e. Defective Air Pressure Gage. Inspect air system (fig. 248) to make certain that air pressure is not escaping. Run engine at fast idle to buildup pressure in the system. The warning buzzer stops at approximately 65 psi and the gage should register accordingly. Maximum pressure is set at 120 psi and compressor governed accordingly. If the gage does not register correctly, check wiring (*b*(2) above). Also make a comparison test with a known good gage. Replace air pressure gage (par. 168) if found defective.

f. Defective Speedometer.

(1) *Broken or kinked flexible shaft core.* Disconnect speedometer flexible shaft assembly (par. 167*a*(3)). Move vehicle and note if the drive core turns. If the core does not turn, replace flexible shaft (par. 174).

(2) *Faulty speedometer.* Replace speedometer (par. 174) with a known good unit. Test by operating vehicle. If the speedometer is still inoperative, proceed as in (3) below.

(3) *Broken or stripped speedometer drive gear.* If the speedometer flexible shaft and the speedometer are in good condition, or if replacement of these parts fails to correct condition, the speedometer drive gear may be stripped or broken. Notify ordnance maintenance personnel.

g. Defective Tachometer. The tachometer is driven in the same manner as the speedometer except the power is obtained from the distributor drive housing instead of the transfer. Trouble-shoot tachometer in same manner as the speedometer (*f* above).

h. Instrument Panel Lights Fail to Light.

(1) *Burned out lamp.* Replace defective lamp (par. 173*c*).

(2) *Loose or faulty cable.* Examine cable connections at instrument panel light and light switch for evidence of looseness or faulty cable. Tighten terminal connections or replace defective cable. Inspect condition of cable connecting instrument panel light to light switch; if cable is found to be frayed, broken, or in otherwise unsatisfactory condition, replace cable.

(3) *Faulty instrument panel light assembly.* If conditions (1) and (2) above were checked and lights do not burn, instrument panel light assembly is faulty. Replace instrument panel light assembly (par. 173).

88. Radio Interference Suppression

a. General.

(1) Special radio receiver equipment and electrical meters, with technical knowledge of their use, are required in order to locate a test area free of radio interference, as well as to check out the various sources of trouble on the vehicle.

(2) When radio interference, resulting from the operation of this vehicle is reported or experienced, a number of minor checks can be made which may lead to correction of the difficulty. If after these checks are made and the remedy ap-

plied, the difficulty still exists, it will be necessary to notify ordnance maintenance personnel.

(3) As a preliminary check, the vehicle should be moved to a location which is comparatively free from high tension lines, machinery, electric welding equipment, other vehicles, or electronic equipment which could be a source of interference.

(4) With engine not operating and vehicle immobile, turn on radio, and check noise level. If noise level is too high, because of atmospheric or other outside causes, and if tactical situation will permit, delay further checking until such time as a moderate noise level prevails.

Note. If vehicle to be checked for insufficient radio interference suppression is not radio-equipped, checks should be conducted from a radio-equipped vehicle located within 5 feet of the vehicle to be tested.

(5) With engine operating but vehicle not in motion, turn on radio and check noise level. Notice type of noise evident under this condition. Check bond strap (ground strap) applications for breakage, fraying, tooth-type lockwasher application and tighten nuts and bolts utilized to secure bonds. Bond (ground strap) locations are listed in (*a*) through (*c*) below.

(*a*) Engine to cab cowl (fig. 137).

(*b*) Engine to chassis frame crossrail (fig. 148).

(*c*) Chassis crossrail to front fender and to radiator (figs. 148 and 130).

b. Radio Interference With Vehicle Not in Motion, but With Engine Running.

(1) With engine running at a medium fast speed (about 1,000 rpm), turn off the ignition switch. If the radio interference is eliminated at the instant the ignition switch is turned off, the interference may be attributed to a component of the ignition system, and the following actions should be taken to correct the conditions:

(*a*) Tighten all high tension lead connectors (fig. 188). Check to ascertain that the shields are not broken or frayed.

(*b*) Tighten all coil-distributor nuts and bolts. Replace spark plugs (par. 148) one at a time, checking noise level after changing each plug. If the interference continues, replace ignition distributor and coil assembly (par. 147).

(2) If interference is in the form of irregular clicking noises that continue a few seconds after turning off ignition switch, it may be attributed to the generator regulator and the actions in (*a*) through (*c*) below should be taken to correct conditions.

(*a*) Tighten all retaining nuts on shielded leads both at regulator and at generator ends.

(*b*) Inspect shielding of leads to ascertain that no breakage or fraying has occurred.

(*c*) Tighten all regulator mounting bolts, both at firewall and at regulator mounting bracket, making sure that all tooth-type lockwashers are in place. If interference continues, replace regulator (par. 151).

(3) If interference is a whining noise that varies in pitch with engine speed and continues but at a lowering pitch for a few seconds after ignition is turned off, it may be attributed to the generator. Tighten all nuts and bolts on generator mounting bracket and generator adjusting arm, making sure that all tooth-type lockwashers are in place. If interference persists, replace generator (par. 150).

89. Clutch

a. Clashing of Gears and Vehicle Creeping When Clutch Is Disengaged.

(1) *Excessive pedal clearance.* Idle engine, depress clutch pedal to fully released position and allow time for drive disk to stop. Move transmission gearshift lever into "1" (first) or R (reverse) gear position. If the shift cannot be made without a severe clashing of gears, or if there is a jumping movement or creeping of the vehicle after engagement of the gears, with the clutch fully released, the clutch pedal linkage may be improperly adjusted. Adjust clutch linkage (par. 202). If adjustment of linkage does not correct condition, proceed as outlined in (2) below.

(2) *Clutch control valve does not fully release clutch (M62 only).* With the clutch control valve lever in ENGAGED position (fig. 47), inspect linkage at roto chamber (fig. 146) for piston rod free travel (par. 270). If the free travel is not evident, adjust linkage.

(3) *Defective clutch assembly.* If, after adjusting linkage, clutch does not disengage, the trouble may be caused by a cracked or warped driven disk or defective components in the pressure plate assembly. Notify ordnance maintenance personnel.

b. Clutch Slips.

(1) *Insufficient pedal free travel.* Adjust clutch linkage (par. 202). If adjustment of the linkage does not correct the condition, proceed as outlined in (2) below.

(2) *Improper adjustment of clutch control valve at roto chamber (M62 only).* Adjust linkage (*a*(2) above).

(3) *Defective clutch assembly.* After making adjustment ((1) and (2) above) and slippage is still evident, the cause will be

in the clutch assembly itself. The trouble can be caused by grease or oil on the driven disk, or broken and weak springs in the clutch pressure plate assembly. Notify ordnance maintenance personnel.

c. Clutch Chatters or Squeals When Released.

(1) *Improperly adjusted linkage.* Adjust linkage (par. 202).

(2) *Loose power plant connections.* Inspect transmission mountings, propeller shafts, universal joints, and engine mountings for loose connections. Tighten all loose connections. If tightening does not correct condition, the trouble will be in the clutch assembly itself and the troubles may be caused as shown in (3), (4), and (5) below.

(3) *Oil or grease soaked driven disk.* Notify ordnance maintenance personnel.

(4) *Worn clutch release bearing.* Notify ordnance maintenance personnel.

(5) *Dry clutch pilot bearing.* Notify ordnance maintenance personnel.

d. Stiff Pedal Pressure.

(1) *Insufficient lubrication.* Lubricate clutch linkage (par. 67).

(2) *Damaged or bent clutch linkage.* Inspect clutch linkage (fig. 196) for damage or bent components. Minor repairs can be made. However, if extensive damage has been done to linkage, notify ordnance maintenance personnel.

(3) *Binding clutch release bearing.* If procedures in (1) and (2) above do not correct condition, the clutch release bearings sleeve may be binding on the input shaft bearing cover. Notify ordnance maintenance personnel.

e. Clutch Control Valve Does Not Fully Release Clutch (M62 Only). With the engine running and throttle control lever at rear of vehicle set to give about 1,000 rpm no-load engine speed, move rear winch cable tensioner control valve to OFF position (fig. 43). Air pressure should read 105 to 120 psi. Move clutch control valve lever to DISENGAGE position (fig. 47) and allow time for clutch to stop. Move winch shift lever to UNWIND position (fig. 40). If shift cannot be made without clashing power divider gears, the roto chamber piston rod free travel is excessive. Adjust linkage (par. 270).

90. Transmission

a. Noisy.

(1) *Insufficient lubricant.* Check level and add lubricant (par. 67).

(2) *Improperly mounted power-take-off.* If the vehicle is so equipped, check mounting of power-take-off as possible cause of noise. Loose mounting nuts will reflect the noise through the transmission. Tighten mounting nuts (par. 209).

(3) *Binding in control cover.* A binding in the control cover may cause noisy transmission due to bent shift forks not permitting full engagement of gears.

(4) *Defective transmission assembly.* If procedures in (1), (2), and (3) above do not correct the noisy condition and transmission mountings are secure, start engine and with transfer in neutral, operate transmission through various ranges. When it is determined the noise is from internal components, replace transmission (par. 205).

b. Hard Shifting.

(1) *Clutch dragging.* Disengage clutch and shift transmission from neutral to low gear ratio. Verify by shifting through all ranges. If clashing of gears is present, clutch linkage is out of adjustment. Adjust linkage (par. 202).

(2) *Binding in control cover.* Binding may be caused by bent shift forks or rails. Operate transmission through various ranges and if binding is evident, replace transmission (par. 205).

c. Slipping Out of Gear.

(1) *General.* There are many factors which may cause the transmission to slip out of gear. Since it is extremely difficult to test a mounted transmission, it is for the most part necessary to disassemble the transmission to determine the specific cause. Replace transmission (par. 205) or notify ordnance maintenance personnel.

(2) *Weak or broken poppet springs.* Shift transmission into various ranges. A definite spring load should be evident when each range is engaged. The lack of spring load is an indication of broken or weak poppet springs. Replace transmission (par. 205) or notify ordnance maintenance personnel.

(3) *Bent shift forks.* Bent shift forks will not permit complete engagement of gears resulting in slipping out of gear. Replace transmission (par. 205).

91. Transfer

a. Unusual Noises and Vibrations.

(1) *Loose mountings.* Tighten all loose mountings (par. 207).

(2) *Lack of lubricant.* Lack of lubricant will cause unusual noises. Check lubricant level (par. 67).

(3) *Gear and bearing noises.* Road test vehicle in order to isolate the noise to the transfer. Noisy gears and bearings require replacement of the assembly. Replace transfer (par. 207).

b. Hard Shifting. Clean and lubricate linkage (par. 67). Also inspect linkage for damaged or binding condition. Replace damaged shift rods and adjust linkage (par. 207). With the linkage in adjustment and lubricated, if the hard shifting is still evident due to internal causes, replace transfer (par. 207).

c. Lubricant Leaks.

(1) *Too much lubricant.* Drain to proper level (par. 67).

(2) *Defective seals.* If leakage is evident around input and output shafts, the shaft seals are worn out or defective. Notify ordnance maintenance personnel.

(3) *Leakage at cover gaskets.* Tighten cover retaining cap screws and if leakage persists, notify ordnance maintenance personnel.

d. Slips Out of Gear.

(1) *General.* Refer to paragraph 90*c*(1).

(2) *Gears do not fully engage.* Adjust linkage to obtain full travel of shift rails (par. 207).

(3) *Weak or broken poppet springs.* Shift transfer and note definite spring load when shift is made. If the spring and poppet ball action is not evident, notify ordnance maintenance personnel.

e. Inoperative Overrunning Clutch. The overrunning clutch is shifted by compressed air in conjunction with the transmission in forward or reverse gear. Check air shift lines (fig. 144) to make certain all connections are tight and not damaged. If the overrunning clutch fails to deliver power to front axle, notify ordnance maintenance personnel.

92. Power-Take-Off

a. Transmission Mounted.

(1) *Noisy power-take-off.* Inspect loose mountings. Also inspect propeller shafts from power-take-off which may transfer noise to power-take-off. Tighten mounting nuts.

(2) *Defective power-take-off.* After noisy condition has been isolated to the power-take-off, remove the assembly (par. 209) and inspect for worn, loose, or broken gears. If evidence of any of these conditions is found, replace the power-take-off (par. 209).

b. Transfer Mounted.

(1) *Lubricant leakage at output shaft.* Replace power-take-off (par. 209).

(2) *Noisy power-take-off.* This condition is usually due to lack of lubricant at the power-take-off assembly. Inspect lubricant line from lower transfer case to power-take-off oil pump (M62 and M246). Tighten connection or replace damaged lines. Evidence of internal damage requires replacement of the unit. Replace power-take-off (par. 209).

c. Loose Bearings and Output Shaft. Turn output shaft by hand. Looseness indicates worn bearings or output shaft. Replace power-take-off (par. 209).

d. Unable to Engage Power-Take-Off (M246 only). Adjust linkage (par. 209). After adjusting linkage, if power-take-off cannot be engaged, the clutch collar may be seized on shaft or the shift fork may be broken. Replace power-take-off (par. 209).

93. Propeller Shafts

a. Noise and Vibration.

(1) *Foreign matter clinging to shaft.* Dirt and foreign matter clinging to shaft will throw shaft out of balance and cause vibration. Remove dirt and foreign matter from shaft.

(2) *Insufficient lubrication.* Lubricate all universals and slip joints (par. 67).

(3) *Worn universal joints and components.* Turn propeller shaft by hand and note any looseness at universals or slip joints. Repairs are limited to replacement of the complete shaft assembly. If joints show signs of wear or looseness, replace propeller shaft (par. 211).

(4) *Bent or sprung propeller shaft tube.* Propeller shafts are accurately balanced before installation. Any bent or sprung condition cannot be straightened. Replace propeller shaft assembly (par. 211).

b. Lubricant Leakage. Evidence of lubricant leakage at slip joints and universals indicates damaged or worn seals. Replacement of seals requires rebuild of the joint assembly. Notify ordnance maintenance personnel or replace propeller shaft assembly (par. 211).

94. Front Axle Assembly

a. Noisy Front Axle.

(1) *General.* Noises arising from the differential are extremely difficult to locate and may arise in other components of the power train. Backlash attributed to worn or incorrectly adjusted internal components, such as, improper gear lash, worn differential bearings, axle shaft and drive flange splines, or loose ball drive joints, can be a source of noise. Any evidence of these conditions will require replacement of the front axle assembly (par. 215).

(2) *Continuous hum.*

(*a*) *Wheel bearings out of adjustment.* Loose wheel bearings will cause a continuous hum. Adjust wheel bearings (par. 242).

(*b*) *Insufficient lubrication.* Lubricate wheel bearings and front axle assembly (par. 242).

(3) *Continuous snapping noise.* A snapping noise in the differ-

ential is indication of broken teeth in differential gears. Replace front axle assembly (par. 215).

b. Lubricant Leakage. Tighten all mounting bolts. Evidence of leakage at shaft seals will require replacement of the axle assembly (par. 215). If leakage exists at drive flanges, replace drive flange gasket (par. 214).

c. Front Axle Shifted.

(1) *Broken spring leaf.* Inspect each front spring assembly for broken leaves. If broken leaves are located, replace spring assembly (par. 252).

(2) *Broken center bolt.* Note location of spring leaves. Broken center bolt will cause leaves and axle assembly to shift. Evidence of broken center bolt requires replacement of front spring assembly (par. 252).

(3) *Loose or Broken* **U**-*Bolts.* Inspect **U**-bolts for looseness or damage. Check (4) below before replacing damaged **U**-bolts or tightening loose **U**-bolts.

(4) *Shifted front axle assembly.* The axle assembly is located by spring center bolt doweled to the spring mounting seat. Make certain center bolt is doweled to seat before tightening **U**-bolts.

d. Bind in Front Axle.

(1) *Lack of lubrication.* Lubricate front axle steering knuckles, tie rod ends and drag links (par. 67).

(2) *Binding in One Steering Knuckle.* Raise front wheels to clear ground and disconnect drag link at front axle (par. 249). Turn wheels and tie rod from side to side. If binding is evident, disconnect one end of tie rod from steering knuckle. Test each wheel, turning from side to side individually. If binding continues and lubrication does not free the steering knuckle, replace front axle assembly (par. 215).

e. Improper Front Wheel Alinement.

(1) *Tires not inflated equally.* Tires that are not inflated equally will cause uneven tread wear and affect wheel alinement. Check tire pressures with an accurate gage and inflate to correct specifications (par. 61).

(2) *Incorrect toe-in.* Check toe-in of front wheels (par. 213).

Note. Tie-rod ends are tack welded to the tie rod after proper adjustment at assembly.

If toe-in is incorrect, notify ordnance maintenance personnel.

(3) *Incorrect camber or caster.* Checking of front wheel camber and caster requires special equipment. There is no adjustment for camber or caster (par. 213).

f. *Shimmy and Wandering.*

(1) *Front axle shifted.* Refer to *c* above.

(2) *Tires not inflated equally.* Refer to *e*(1) above.

(3) *Improper front wheel bearing adjustment.* Adjust wheel bearings (par. 242).

(4) *Lack of lubrication.* Lubricate front axle assembly (par. 67).

(5) *Looseness at front axle.* Raise front wheels to clear ground. Move wheels from side to side and up or down. Note any evidence of looseness in the tie rod and drag link ends. Adjust loose tie rod or drag link ends (par. 249). If the looseness is located in the steering knuckles, replace front axle assembly (par. 215).

(6) *Looseness in steering gear.* Troubleshoot steering gear assembly (par. 99).

g. Defective Brakes. Troubleshoot brakes (par. 96).

95. Rear Axle

a. Noisy Rear Axles.

(1) *General.* Refer to paragraph 94*a*(1).

(2) *Continuous axle noise.*

(*a*) *Improperly inflated or unevenly worn tires.* Inspect condition of tire treads for uneven wear. Match duals with tires of approximately the same outside diameter. Check air pressure with an accurate gage. Inflate tires to specification (par. 61).

(*b*) *Improperly adjusted wheel bearings.* Adjust wheel bearings (par. 242).

(*c*) *Lack of lubricant.* Lubricate axle assembly and wheel bearings (par. 67).

b. Looseness in Rear Axle. In order to determined if the trouble is located in the forward rear or rear rear axle assembly, remove axle shafts from one axle and in this manner removing the drive load from that axle drive train which will affect the sound. After the defective axle has been determined, turn propeller shaft by hand and observe any looseness in universal or slip joints and flanges. Raise one wheel and rotate back and forth to make certain the lash is within the axle assembly. If looseness is evident, replace axle assembly (par. 218).

c. Twisted or Broken Axle Shafts. Remove axle shaft assembly (par. 217). Examine for twisted or broken condition. Replace defective shafts (par. 217).

d. Defective Brakes. Troubleshoot brakes (par. 96).

96. Footbrakes

a. Brake Pedal Goes to Floorboard.

(1) *Insufficient fluid in brake master cylinder reservoir.* Check level of fluid in master cylinder reservoir. Add brake fluid, if necessary (par. 67). Inspect underneath truck for signs

of fluid leaks at master cylinder, air-hydraulic cylinder, wheel cylinders, and brake lines. Tighten line connections or replace defective parts as required.

(2) *Improper brakeshoe adjustment.* Remove brakedrums and inspect condition of brakeshoe linings. If linings are not excessively worn (so as to permit brake lining rivets to score drums), install drums and adjust shoes. If linings are excessively worn and drums are scored, replace brakeshoes and drums as required (par. 226).

(3) *Improper brake pedal adjustment.* Check brake pedal free travel (par. 220) and adjust brake pedal linkage, if necessary.

(4) *Air in hydraulic system.* Bleed the hydraulic system (par. 221).

b. One Wheel Drags.

(1) *Improper brake adjustment.* Adjust brakes (par. 220).

(2) *Distorted or damaged wheel cylinder.* Remove hub and drum assembly (par. 242). If leakage, distortion, or other damage to wheel cylinder is evident, replace wheel cylinder (par. 225).

(3) *Brakeshoes seized to anchor pins.* Remove hub and drum assembly (par. 242). Remove brakeshoes (par. 226). Clean and lubricate the anchor pins and install brakeshoes (par. 226).

(4) *Weak or broken brakeshoe return spring.* Replace brakeshoe return spring (par. 226).

(5) *Loose wheel bearings.* Adjust bearings (par. 242).

(6) *Obstruction in hydraulic line.* Remove hydraulic line and clean. Reinstall line and bleed the brakes (par. 221).

c. Wheel Locks.

(1) *Out-of-round brakedrums.* Replace brakedrums (par. 242).

(2) *Loose wheel bearings.* Adjust wheel bearings (par. 242).

(3) *Loose linings.* Remove hub and drum assembly (par. 242). Inspect for loose rivets in linings. If the linings are loose on the shoes, replace brakeshoes (par. 226).

(4) *Loose anchor bolts.* Tighten anchor bolts (par. 220*c*).

d. All Wheels Drag.

(1) *Improper brake adjustment.* Adjust brakes (par. 220).

(2) *Damaged wheel cylinders.* Refer to *b* (2) above.

(3) *Restricted port in master cylinder.* If the brake pedal returns to released position and all wheels drag after brake application, dirt in the master cylinder may restrict the return port. Flush the hydraulic system by bleeding the brakes (par. 221). If this does not correct condition, replace master cylinder (par. 223) and bleed hydraulic system (par. 221).

(4) *No free pedal travel.* Adjust brake linkage (par. 220).

(5) *Weak or broken brake pedal return spring.* Replace return spring (par. 226).

(6) *Insufficient lubrication.* Lubricate linkage (par. 67).

e. Insufficient Brakes, No Pedal Reserve.

(1) *Oil soaked linings.* Replace brakeshoes (par. 226).

(2) *Glazed lining.* Replace brakeshoes (par. 226).

(3) *Improper brakeshoe adjustment.* Adjust brakes (par. 220).

(4) *Improper pedal adjustment.* Adjust brakepedal (par. 220).

f. Grabbing Brakes.

(1) *Grease-soaked linings.* Replace brakeshoes (par. 226).

(2) *Improper shoe adjustment.* Adjust brakes (par. 220).

(3) *Loose anchor pins.* Tighten anchor pins (par. 220).

g. Side Pull.

(1) *Grease soaked linings.* Replace brakeshoes (par. 226).

(2) *Improper shoe adjustment.* Adjust brakes (par. 220).

(3) *Loose anchor pins.* Tighten anchor pins (par. 220).

(4) *Clogged or crimped wheel lines.* Remove, clean, or replace damaged wheel line.

(5) *Front spring* **U**-*bolts loose.* Aline front axle (par. 94*c*(4)) and tighten **U**-bolts.

(6) *Tires not properly inflated.* Inflate tires to specified pressure (par. 61).

(7) *Water and mud in brakes.* Remove hub and drums (par. 242) clean, and install.

h. Squealing Brakes.

(1) *Loose lining rivets.* Replace brakeshoes (par. 226).

(2) *Foreign material embedded in lining.* Remove foreign matter from lining. Any extensive damage will require replacement of brakeshoe (par. 226).

(3) *Dirt in brakedrums.* Remove hub and drums (par. 242) and clean drums.

i. Overheating Brakes.

(1) *Dragging brakes.* Adjust brakes (par. 220).

(2) *High spots on drums.* Replace brakedrums (par. 242).

(3) *Tight wheel bearings.* Adjust wheel bearings (par. 242).

(4) *Dirt and grime on drums.* Clean brakedrums (par. 75).

j. Brake Pedal Action Springy or Spongy.

(1) *Improper brakeshoe adjustment.* Check and adjust brakeshoe to brakedrum clearance (par. 220).

(2) *Air in hydraulic system.* Bleed hydraulic brake system (par. 221).

(3) *Insufficient brake fluid.* If the brake fluid level is low in the master cylinder, check the hydraulic brake system for leaks before filling to proper level (par. 223) and bleed hydraulic system (par. 221).

k. Faulty Compressed Air System.

(1) *Warning buzzer fails to shut off.* The warning buzzer shuts off at approximately 65 psi. Failure to do so indicates lack of air pressure in the air system. Check compressed air system (fig. 248) for leaks (par. 232).

(2) *Air pressure gage fails to register.* Refer to paragraph 87*e*.

(3) *Loose compressor drive belt.* Check and adjust compressor drive belt tension (par. 233).

(4) *Obstruction at air compressor strainer (intake).* Clean air compressor strainer (par. 233).

(5) *Improper compressor unloader valve clearance adjustment.* Check and adjust compressor unloader valve clearance (par. 233).

(6) *Inoperative air compressor air governor.* If procedures in (1) through (4) above do not correct condition, the compressor governor may be out of adjustment or defective. Replace governor (par. 234).

(7) *Defective air compressor.* If replacement of the air governor does not correct condition, the air compressor itself is defective. Replace air compressor (par. 233).

l. Power Brake Application Is Slow.

(1) *Low air pressure.* Refer to *k* above.

(2) *Loss of air pressure with brakes applied.* Refer to *k* above.

(3) *Restricted air lines.* Remove air lines and check for restrictions. Use figure 248 to locate lines. Clean or replace defective air lines.

m. Power Brake Releases Too Slowly.

(1) *Inoperative hydraulic brake system.* Refer to *d* above.

(2) *Faulty air-hydraulic cylinder.* If procedures in *b* through *k* above do not correct condition, the air-hydraulic cylinder is faulty. Replace brake air-hydraulic cylinder (par. 224).

97. Handbrake

a. Weak Braking Action With Brake Lever In Up Position.

(1) *Improper brake cable adjustment.* Adjust brake cable (par. 228).

(2) *Defective brakeshoe linings.* Inspect condition of inner and outer brakeshoe linings. If worn, damaged, or grease soaked, replace brakeshoes (par. 230).

b. Handbrake drags.

(1) *Lack of lubrication.* Lubricate anchor pins and linkage ((4) below).

(2) *Improper brake cable adjustment.* Adjust handbrake cable (par. 228).

(3) *Weak or broken brakeshoe retracting spring.* Check brakeshoe retracting spring to be sure it has sufficient tension to

retract shoes so as to fully release brake. If weak or broken, replace spring (par. 230).

(4) *Brakeshoe seizing on anchor pins.* With brakeshoe retracting spring removed, check brakeshoes for free movement on anchor pins. If binding or seizing is evident, remove shoe assembly (par. 230) and lubricate anchor pins. Install shoe assembly (par. 230).

98. Wheels and Tires

a. Wheel Wobbles.

(1) *Loose wheel mountings.* Tighten wheel mounting nuts (fig. 255).

(2) *Bent wheel.* Replace wheel (par. 241).

(3) *Obstruction between wheel disk and hub.* Remove wheel and tire assembly and note any foreign material between hub and rim which will not permit good mounting. Clean surfaces between hub assembly and wheel and install wheel and tire assembly (par. 241).

(4) *Improper wheel bearing adjustment.* Inspect and adjust or replace wheel bearings (par. 242).

b. Uneven Tire Wear.

(1) *Unequally inflated tires.* Check air pressure in tires, using an accurate pressure gage. Inflate tires to specifications (par. 61.)

(2) *Improper front wheel alinement.* Refer to paragraph 94*e*.

(3) *Improper wheel bearing adjustment.* Refer to *a*(4) above.

(4) *Bent wheel.* Replace wheel (par. 241).

(5) *Unequal tire diameters (rear duals only).* Tires of different outside diameters mounted in duals will cause uneven tire wear. Always match rear duals of equal outside diameters.

99. Steering Gear Assembly

a. General. Many complaints of steering difficulties are falsely charged to the steering gear assembly. Therefore, in order to isolate the steering gear from the front axle, wheels, and connections, the drag link should be disconnected from the pitman arm at the gear housing assembly before attempting to diagnose complaints concerning the steering gear. This will permit accurate observation of steering gear operation.

b. Hard Steering.

(1) *Inoperative hydraulic system.* Check fluid level in steering gear hydraulic reservoir. Fill to correct level (par. 67). In order to perform a quick check of the hydraulic system, start engine and operate at approximately 1,000 rpm. With the vehicle standing still, the operator should be able to turn front wheels to the wheel stops in both directions when the

hydraulic steering system is operating properly. If the system is inoperative, the operator will be unable to turn the wheels. Notify ordnance maintenance personnel if this condition exists.

(2) *Insufficient lubrication.* Lubricate steering mechanism (par. 67).

(3) *Bind in steering gear.* With the drag link disconnected, revolve steering wheel from one extreme to the other. If rough spots, bumps, or noises are encountered, or tightness is felt, steering gear is faulty. Replace steering gear assembly (par. 245).

(4) *Steering gear jacket misalinement.* Refer to paragraph 245 for correct alinement of the steering gear jacket.

(5) *Hard steering originating at front axle.* If the steering gear asssembly does not reveal any evidence of hard steering with the drag link disconnected, the trouble will be in the front axle and linkage. Troubleshoot front axle assembly (par. 94).

c. Wandering.

(1) *Tie rod and drag link ends loose.* Adjust ends (par. 249).

(2) *Front axle shifted.* Refer to paragraph 94*c*.

(3) *Loose wheel mountings on hubs.* Tighten wheel mounting nuts.

(4) *Incorrect wheel bearing adjustments.* Adjust wheel bearings (par. 242).

(5) *Brakes drag.* Adjust brakes (par. 220).

(6) *Improper steering gear adjustment.* With drag links disconnected, revolve steering wheel from one extreme to the other. If tightness in straight ahead or midposition is evident, adjust steering gear (par. 245).

d. Shimmy.

(1) *Loose wheel mounting on hubs.* Tighten wheel mounting nuts.

(2) *Tie rod or drag link ends loose.* Adjust ends (par. 249).

(3) *Loose wheel bearings.* Adjust wheel bearings (par. 242).

(4) *Obstruction between hub and wheel.* Refer to paragraph 98*a*(3).

e. Leaks in the Steering Gear Assembly. Tighten all connections (fig. 269) and cover retaining screws. If leakage is still evident, notify ordnance maintenance personnel.

100. Springs and Shock Absorbers

a. Shock Absorber (Front Only). It is difficult to determine a defective shock absorber due to the size of the vehicle. Evidence of ineffective damping out of road shock or a continuous "bobbing" of the vehicle front end after passing over deep ruts or holes in the road would indicate the need for a shock absorber check. The shock absorber in question should be removed (par. 252) and manually operated. If the shock absorber works freely, it is considered defective and must be replaced. Indications of fluid leakage, crushed or otherwise damaged condition will require replacement.

b. Springs.

(1) *Insufficient flexibility.*

(*a*) *Frozen spring shackles.* Lubricate spring shackles (par. 67) making sure grease goes all the way around hanger and shackle pins. Replace pins (par. 252) that cannot be freed.

(*b*) *Frozen front spring pins.* Lubricate front spring pins (par. 67), making sure grease goes all around pin. Replace spring pin (par. 252) that cannot be freed.

(*c*) *Defective shock absorber (front only).* Refer to *a* above.

(2) *Springs too flexible.*

(*a*) *Overlubricated.* Clean excess grease from sides of springs.

(*b*) *Broken spring leaves.* Replace spring assembly (par. 252).

(*c*) *Defective shock absorber.* Refer to *a* above.

(3) *Noisy spring mountings.*

(*a*) *Worn spring hanger or shackle pins.* Use pry bar to test for worn spring hanger or shackle pins. Replace worn pins (par. 252).

(*b*) *Broken spring assembly.* Examine spring assembly for broken leaves, particularly at the center section where breakage could be caused by loose U-bolts, and at the front hanger eye, where breakage could be caused by tight or frozen rear shackle pins. Replace broken spring assemblies (par. 252).

(*c*) *Loose U-bolts.* Tighten U-bolts after making certain spring center bolt is piloted in spring seat pad.

101. Front Winch

a. Winch Drum Does Not Turn.

(1) *Broken shearpin.* Check front winch drive shaft to be sure that it is in motion when power-take-off is engaged. If drive shaft turns, check at drive shaft front universal joint for broken shearpin. Replace shearpin, if necessary (par. 259). If drive shaft does not turn, proceed as in (3) below.

(2) *Faulty drum clutch.* If replacement of shearpin does not correct condition (when drive shaft turns with power-take-off engaged), damage to the drum clutch or shifting mechanism is indicated. Replace winch (par. 258).

(3) *Power-take-off inoperative.*

(*a*) *Damaged control linkage components.* Inspect control linkage and replace damaged components.

(*b*) *Improper control linkage adjustment.* Check operation of control linkage and adjust (par. 209).

b. Winch Does Not Sustain Load. Adjust automatic brake (par. 257). If no improvement is noted, replace winch (par. 258).

c. Excessive Heat at Brake Case. Adjust automatic brake (par. 257).

d. Drum Spins Too Fast When Unwinding Wire Rope by Hand. Adjust drum drag brake (par. 257). If no improvement is noted, replace winch (par. 258).

102. Rear Winch (M62 Only)

a. Winch Drum Does Not Turn.

(1) *Broken shearpin.* Check winch drive chain to be sure that it is in motion when winch shift lever is in WIND or UNWIND position (fig. 40) with engine running and power divider engaged. If drive chain is in motion, check at driven sprocket hub (fig. 276) for broken shearpin. Replace shearpin, if necessary (par. 265*k*). If drive chain is not in motion, adjust winch shift linkage (par. 263). If drive chain is broken, replace broken link and adjust chain (par. 265).

(2) *Power divider inoperative.*

(*a*) *Damaged control linkage components.* Inspect control linkage and replace damaged components, if necessary (par. 272).

(*b*) *Improper control linkage adjustment.* Check operation of control linkage and adjust, if necessary (par. 272).

b. Winch Does Not Sustain Load. Adjust automatic brake (par. 263). If no improvement is noted, replace winch (par. 264).

c. Excessive Heat at Brake Cover. Adjust automatic brake (par. 263).

d. Noisy Operation. Noisy operation may be caused by insufficient lubrication. Add lubricant (par. 67).

e. Level Wind Does Not Wind Cable Evenly on Winch Drum. Adjust cable tensioner (par. 263*b*).

103. Hydraulic Crane Assembly (M62 and M246)

a. Lack of Power.

Note. Be sure transmission is in fifth speed to provide a direct drive to pump for proper pump speed (rpm).

(1) *Oil level low in hydraulic reservoir.* Check hydraulic oil level and add oil if necessary (par. 67).

(2) *Oil supply valve not fully open.* Inspect oil supply valve (fig. 296 for M62 or fig. 316 for M246) to make certain valve is in open position.

(3) *Incorrect governor setting.* If governor cuts off below the no-load governed engine speed of 1,600 rpm ($\pm$50 rpm) when the hydraulic pump is in operation, the governor valve is improperly adjusted. Adjust the governor valve (par. 271*a*).

(4) *Leaks in the hydraulic system.* Refer to figure 293 (M62) or figure 315 (M246) and inspect the entire hydraulic system for leaks. Operate each of the control levers at the control valve bank through a complete cycle in order to pressurize each hydraulic circuit. Tighten all connections where leaks are evident. Replace defective lines.

(5) *Defective relief valve.* Test oil pressure relief valve (par. 273). If found weak or defective, replace valve (par. 273).

b. Crane Does Not Lift Smoothly.

(1) *Oil level low in hydraulic reservoir.* Refer to *a*(1) above.

(2) *Air in the hydraulic system.* Operate crane through full range of movements several times to expel any air in the hydraulic system.

(3) *Engine speed erratic.* Refer to *d* below.

(4) *Defective relief valve.* Refer to *a*(5) above.

c. Swing Motor Does Not Rotate Crane Smoothly.

(1) *Defective valve at control bank.* Operate the control valve lever. Any evidence of sticking or erratic operation requires replacement of the control valve bank (par. 281).

(2) *Swing motor out of time (M62 only).* Inspect and adjust swing motor timing (par. 275).

(3) *Swing motor valve spool sticking in body (M62 only).* With the swing motor cover removed, rotate the crane and note if the swing motor control valve levers are in constant contact with actuating rollers. If the levers do not contact rollers at all times, the spool is sticking in the swing-motor valve chamber. Replace swing motor (par. 275).

(4) *Vane motor and worm drive assembly inoperative (M246 only).* The model M246 only incorporates a vane-type motor and worm drive assembly to rotate the crane super structure. Notify ordnance maintenance personnel if any evidence of malfunction is encountered in this assembly.

d. Engine Speed Erratic During Crane Operation.

(1) *Air leaks in governor lines.* Troubleshooting of air leaks is limited to visual inspection of all governor line connections. Leaks in the vacuum lines will cause engine speed (rpm) to exceed maximum setting. Tighten all connections on governor valve lines (figs. 87 and 277).

(2) *Defective governor-valve control valve.* Inspect movement of the governor-valve control valve to make certain the lines to governor valve at distributor drive housing on engine are com-

pletely closed when hydraulic pump control lever is in the ENGAGE position (fig. 48). Adjust linkage to obtain complete valve action.

(3) *Improper hydraulic pump governor valve adjustment.* Adjust hydraulic pump governor valve (par. 271 for M62 or par. 209 for M246). If engine speed is still erratic after check (4) below, replace governor valve.

(4) *Carburetor out of adjustment.* Adjust carburetor (par. 121).

e. Noisy Hydraulic Pump.

(1) *Oil level in hydraulic reservoir low.* If the oil level is low, crane will not operate smoothly and pump will have a high pitched noise caused by starvation. If the oil level is low, check the complete hydraulic system (fig. 293 for M62 or fig. 315 for M246) for leaks. Fill reservoir to proper level (par. 67).

(2) *Oil supply valve partially closed.* Check the oil supply valve (fig. 296 for M62 or fig. 316 for M246) to make certain the valve is in fully open position.

(3) *Defective hydraulic pump.* If (1) and (2) above do not correct the condition, and noisy hydraulic pump is still evident, replace hydraulic pump (par. 273 or 288).

f. Defective Control Valve Bank Assembly. If sticking of crane control valves becomes evident by failure of the levers at the control valve bank assembly to return to the NEUTRAL position after operation, the control valve bank assembly is defective. Replace control valve bank assembly (par. 281 or 296), or notify ordnance maintenance personnel.

g. Leaks at Hydraulic Connections. Refer to *a*(4) above.

h. Hydraulic Pump Does Not Engage.

(1) *Shift linkage out of adjustment (M62 only).* Inspect the linkage between power divider (fig. 277) and hydraulic pump control lever (fig. 276) at rear of the vehicle for damaged or bent condition. Straighten and adjust linkage (par. 272) to obtain correct shifting action at power divider.

(2) *Shift linkage out of adjustment (M246 only).* Inspect linkage from inside of cab to power-take-off at rear of transfer and adjust (par. 209) to obtain efficient shifting action.

104. Dump Body and Hoist Assembly

a. Dump Body. Troubleshooting of the dump body consists of visual inspection of bent components or broken welds. Repairs are limited and can be made on the vehicle by straightening or welding.

b. Hoist Assembly.

(1) *Hoist assembly does not raise dump body.*

(*a*) *Oil level low in the hydraulic oil reservoir.* Check hydraulic oil level and add oil as required (par. 67).

(*b*) *Leak in the hydraulic system.* Inspect all hydraulic lines and connections at pump, control valve, and cylinder for leaks. Tighten all loose connections. If leakage is evident at piston packing glands, tighten glands. If leakage is still evident, notify ordnance maintenance personnel.

(*c*) *Damaged control linkage.* Inspect control linkage (fig. 324) and replace damaged components. Make certain all actuating levers are clamped tight to their respective cross-shafts. Adjust linkage (par. 311).

(*d*) *Power-take-off inoperative.* Check operation of power-take-off control linkage and adjust ((*c*) above). If power-take-off is still inoperative, troubleshoot power-take-off (par. 92).

(*e*) *Hydraulic pump inoperative.* Check the hydraulic pump drive shaft (C, fig. 324) to be sure that it is in motion when power-take-off is engaged. If the drive shaft turns, after checking (*c*) and (*d*) above, the hydraulic pump is inoperative. Replace hydraulic pump assembly (par. 310).

(2) *Hoist assembly does not raise dump body smoothly.*

(*a*) *Air in hydraulic system.* Refer to Notes figure 106.

(*b*) *Oil level low in reservoir.* Check hydraulic oil level in reservoir. If the level is low, inspect for leaks in the system and then fill to specified level (par. 67).

(3) *Hoist assembly raises body to full dump position, but does not power down.*

(*a*) *Improper control linkage adjustment.* Refer to (1)(*c*) above.

(*b*) *Leak in the hydraulic system.* Refer to (1)(*b*) above.

(4) *Noisy hydraulic pump.*

(*a*) *Oil level low in hydraulic reservoir.* If the oil level is low, hoist assembly will not operate smoothly and pump will have a high pitched noise caused by starvation. Check oil level and add as required (par. 67).

(*b*) *Leak at pump shaft.* Tighten pump packing gland. If leak cannot be corrected by tightening, replace pump assembly (par. 310), or notify ordnance maintenance personnel.

(*c*) *Defective pump.* If condition cannot be corrected by filling reservoir to proper level, the pump is defective. Replace hydraulic pump (par. 310).

(5) *Leak at hydraulic cylinder piston rods.* Tighten cylinder packing gland. If leak cannot be corrected by tightening gland, replace cylinder (par. 309), or notify ordnance maintenance personnel.

105. Tractor Truck (M52 and M246)

a. Fifth Wheel Assembly. Troubleshooting of the fifth wheel assembly consists of visual inspection for cracked or broken components and to see that the unit is securely mounted. If unit is found to be insecurely mounted, tighten mounting screws (fig. 319). If examination reveals cracked or broken parts, or if unit does not couple or uncouple properly, replace fifth wheel assembly (par. 303), or notify ordnance maintenance personnel.

b. Approach Plates (M52 only). Inspect the approach plates for bent or cracked condition. Also inspect for loose mounting bolts. Tighten all mounting bolts (fig. 320) if badly bent or cracked, replace approach plate assembly (par. 304).

c. Deck Plate (M52 Only). Troubleshooting of the deck plate is limited to visual inspection for cracks, loose clamp bolts, and damaged plate. Plate can be repaired by welding, but broken clamps must be replaced (par. 305).

Section V. ENGINE DESCRIPTION AND MAINTENANCE IN VEHICLE

106. Description and Data

a. Description.

(1) *Engine.* The engine (figs. 115 and 116) is a six-cylinder, four-cycle, water-cooled, valve-in-head type, which is mounted at the front of the vehicle between the frame side rails. For detailed description of engine accessories which are components of the fuel, exhaust, cooling, starting, ignition, and compressed air systems, refer to the appropriate sections of this chapter.

(2) *Engine mountings.* The front of the engine is bolted at each side with cushion-type mountings (fig. 117) to the front mounting support, which is bolted to the frame No. 1 cross member. The flywheel housing at the rear of the engine is bolted to cushion-type mountings (fig. 118) attached to the frame left and right side rails.

(3) *Intake and exhaust manifolds.* Both exhaust and intake manifolds (N and P, fig. 119) are assembled to the right side of the front and rear cylinder heads. The intake manifold is cast in one piece and is held in proper alinement with the intake ports in the cylinder heads by two dowel pins. The exhaust manifold is comprised of three sections, the two end sections being attached to the center section by two ground joints. A steel spacer is located between the center sections of the intake and exhaust manifolds.

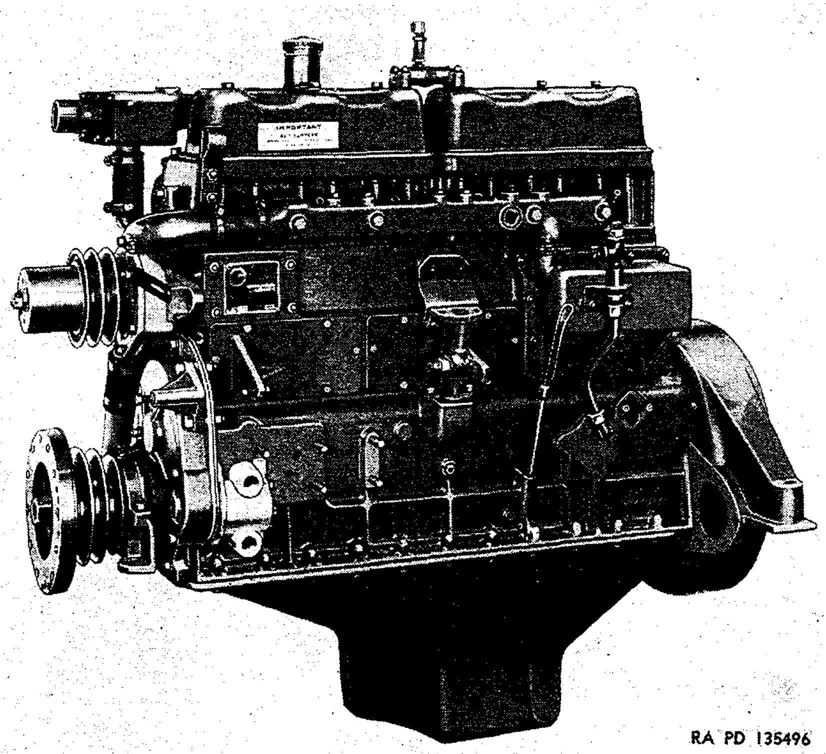


Figure 115. Left front view of engine—less accessories.

(4) *Engine lubrication.* Positive pressure lubrication of all moving internal engine parts is provided by a gear-type oil pump (fig. 120) mounted inside the crankcase and driven off the camshaft. Normal oil pressure with the engine running at idling speed is 15 psi. Normal oil pressure with the engine running at 1,500 to 1,800 rpm is approximately 50 psi. In addition to the oil filters ((5) below) and oil pan ((6) below), the engine lubrication system also includes an oil cooler, mounted on the left side of the engine crankcase, to prevent overheating of the engine oil.

(5) *Oil filters.* Two replaceable-element oil filters (fig. 117) are mounted on the left side of the engine. When the engine is running, a portion of the engine oil is continuously passed through the filtering elements and returned to the crankcase.

(6) *Oil pan.* The oil pan (fig. 118) is a cast aluminum unit flanged to conform to the crankcase. An oil-tight joint between the oil pan and crankcase is obtained by use of a flange gasket. A magnetic-type drain plug (fig. 118) is located at the bottom of the oil pan.

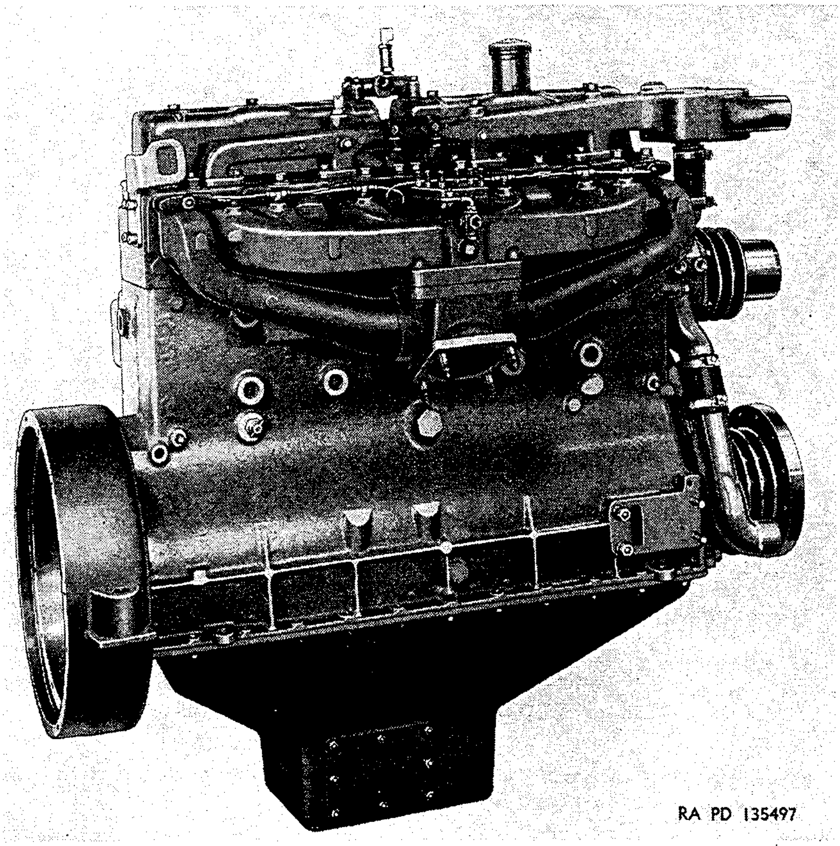


Figure 116. Right rear view of engine—less accessories.

(7) *Crankcase ventilation.* Positive crankcase ventilation is provided by lines connecting the air cleaner (fig. 121), crankcase, distributor, metering valve, rocker arm covers (front and rear), and intake manifold. This insures a constant supply of clean dust-free air to the crankcase. The line (vacuum) from the metering valve to the intake manifold removes any harmful gases that may be present in the crankcase. On some vehicles, crankcase ventilation is manually controlled by crankcase ventilating shutoff valves (par. 41). On other vehicles, the two shutoff valves are not included as standard equipment (but as components of the deep water fording kit) and the crankcase ventilating lines are open at all times.

b. Engine Nomenclature. The term "front" refers to the fan end of the engine; "rear" refers to the flywheel end of the engine. The terms "left" and "right" are used with reference to viewing the engine from the rear of flywheel end and looking toward the front or fan end. Cylinders are numbered from the front to the rear of the engine.

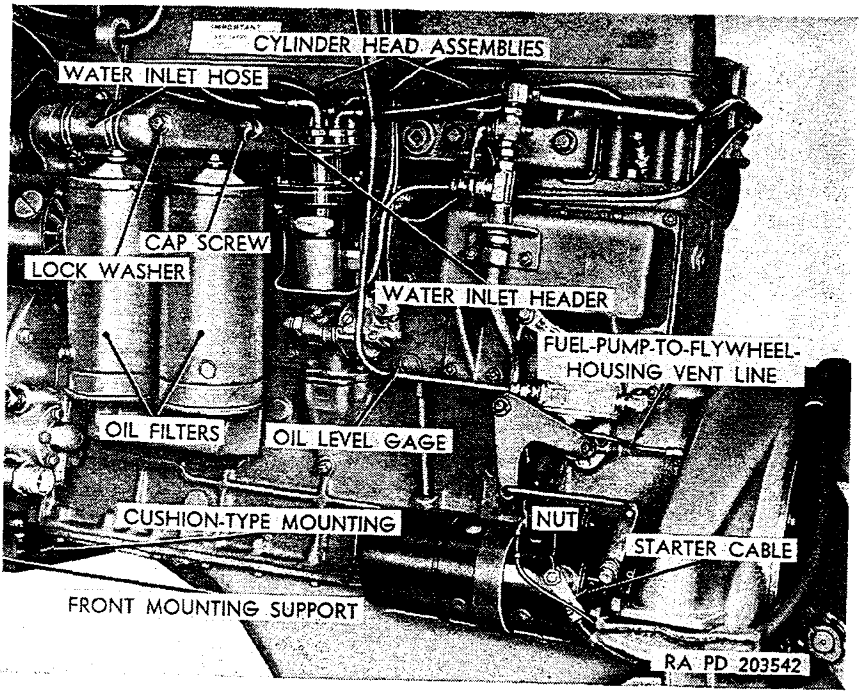


Figure 117. View of left rear section of engine.

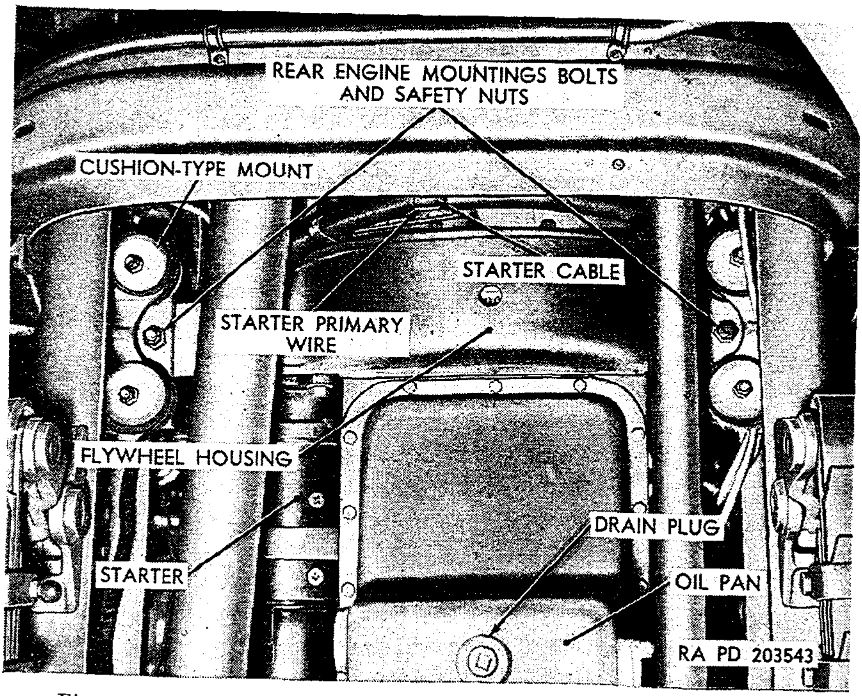
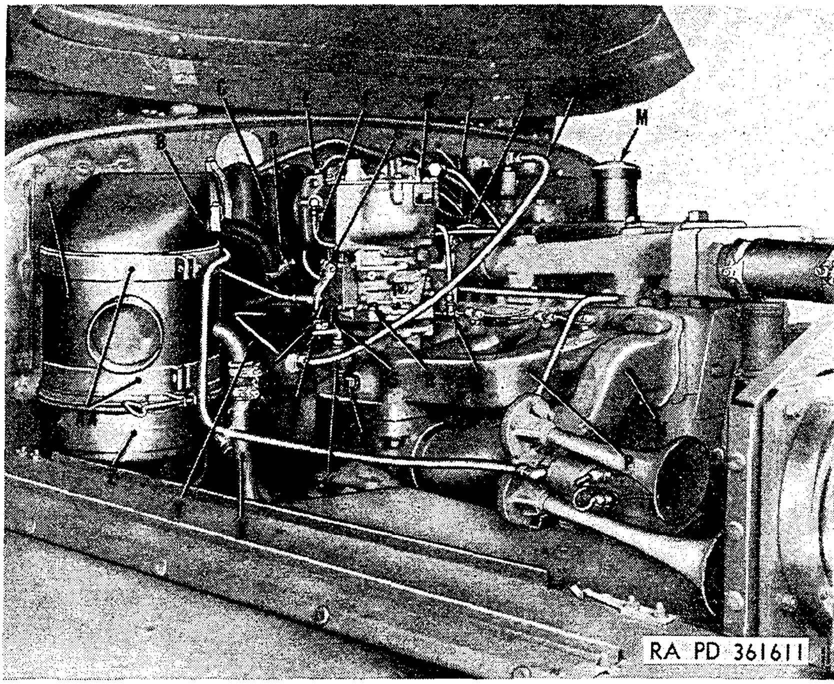


Figure 118. View of rear section of engine from under side of vehicle.



A—Air cleaner body
B—Air cleaner outlet hose
C—Air-cleaner-to-carburetor inlet hose
D—Hose clamp
E—Hose clamp
F—Carburetor-to-governor-valve line.
G—Throttle valve plate lever
H—Carburetor nameplate
J—Fuel-pump-to-carburetor line
K—Governor-valve-to-governor line
L—Vacuum line
M—Oil filler cap
N—Exhaust manifold
P—Intake manifold
Q—Cylinder head priming tee
R—Safety nut
S—Bracket
T—Pipe plug
U—Crankcase ventilating shutoff valve
V—Shutoff valve lever
W—Shutoff valve control wire
X—Air-cleaner-to-air-compressor-intake line.
Y—Distributor vent line
Z—Oil cup
AA—Mounting bands

Figure 119. Carburetor and manifolds installed on right side of engine.

c. Tabulated Data.

Make	Continental
Model	R6602
Type	6-cylinder valve-in-head
Bore	4⅞ in
Stroke	5⅜ in
Piston displacement	602 cu in
Compression ratio	6.4 : 1
Maximum governed speed (no load)	2,950 rpm
Maximum governed speed (full load)	2,800 rpm
Engine weight (without accessories)	1,633 lbs
Crankshaft rotation (looking at front end)	clockwise
Firing order	1–5–3–6–2–4
Valve clearance, intake (hot) (below serial No. 33093).	0.020 in
Valve clearance, intake (hot) (above serial No. 33092).	0.018 in

Valve clearance, exhaust (hot) (all engines) ---- 0.024 in
Valve, exhaust ---------------------------------- positive rotating
Valve, intake ----------------------------------- nonrotating

107. Operations Performed With Engine in Vehicle

All organizational maintenance operations listed below can be performed with engine installed in the truck. Refer to specific paragraphs as noted for detailed instructions.

a. Air Cleaner. Service or replace (par. 120).

b. Air Compressor. Replace (par. 233).

c. Air Compressor Governor. Service or replace (par. 234).

d. Carburetor. Adjust or replace (par. 121).

e. Engine Speed Governor Valve. Adjust and seal or replace (par. 126).

f. Compression Test. Perform (par. 109).

g. Cylinder Head Assembly. Replace (par. 109).

h. Cylinder Head Gasket (front or rear). Replace (par. 109).

i. Distributor. Replace (par. 147).

j. Distributor Breaker Points. Adjust or replace (par. 147).

k. Distributor Capacitor (Condenser). Replace (par. 147).

l. Drive Belts. Adjust or replace (par. 137).

m. Fan Assembly. Replace (par. 137).

n. Fuel Filter. Service or replace (par. 124).

o. Fuel Lines and Connections. Repair or replace (par. 128).

p. Fuel Pump. Test or replace (par. 123).

q. Fuel Tank. Replace (par. 125).

r. Generator. Replace (par. 150).

s. Generator Regulator. Replace (par. 151).

t. Ignition Coil. Replace (par. 147).

u. Ignition Timing. Refer to paragraph 146.

v. Ignition Wiring. Replace (par. 164).

w. Manifold (Intake and Exhaust). Replace (par. 110).

x. Manifold Gaskets (Intake and Exhaust). Replace (par. 110).

y. Oil Filter Assembly. Replace (par. 111).

z. Oil Filter Element. Replace (par. 111).

aa. Radiator Assembly. Service, clean (par. 134) or replace (par. 135).

ab. Radiator Hose. Replace (par. 140).

ac. Rocker Arm Cover. Replace (par. 108).

ad. Spark Plugs. Clean and adjust, or replace (par. 148).

ae. Starter. Replace (par. 142).

af. Thermostat. Replace (par. 138).

ag. Vacuum Test (Intake Manifold). Perform (par. 110).

ah. Valves. Adjust (par. 108).

ai. Water Headers (Inlet and Outlet). Replace (par. 139).

aj. Water Pump. Replace (par. 136).

ENGINE LUBRICATION SYSTEM

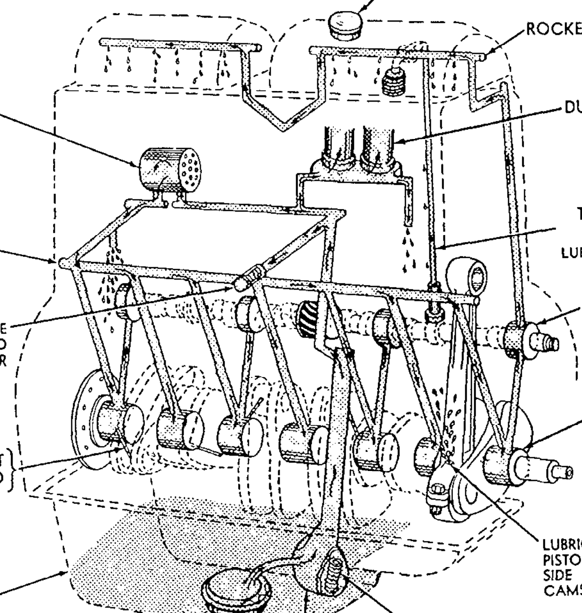


Figure 120. Engine lubrication system.

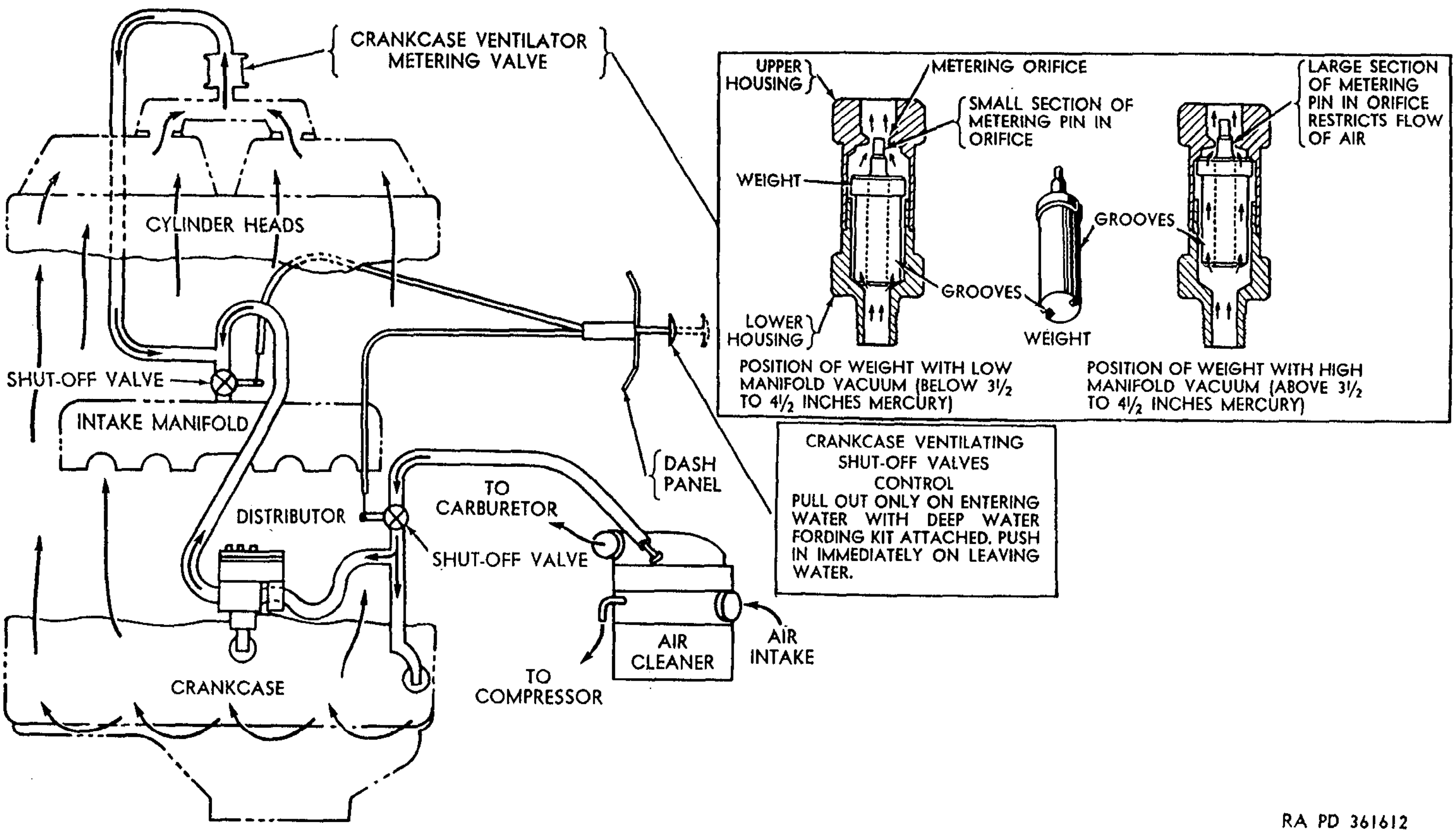
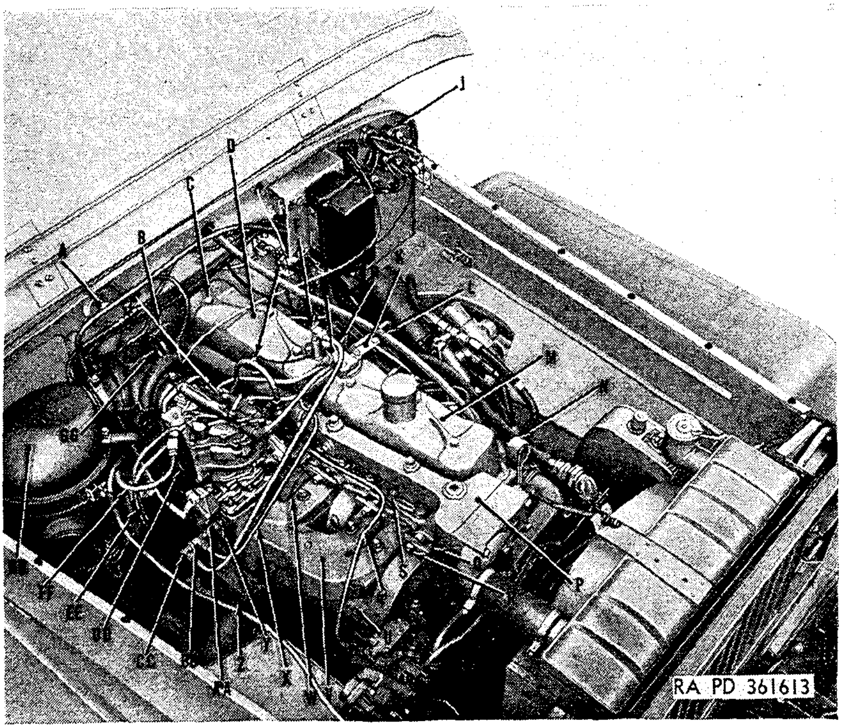


Figure 121. Crankcase ventilating lines and shutoff valves.



A—Air governor
B—Choke control
C—Cap screw
D—Rear rocker arm cover
E—Temperature gage sending unit
F—Crankcase ventilating metering valve.
G—Crankcase ventilating line connector.
H—Vacuum line
J—Circuit breaker
K—Mounting bracket
L—Closed clip
M—Front rocker arm cover
N—Lifting eye
P—Water outlet header assembly
Q—Manifold clamp
R—Hex nut
S—Hex nut
T—Air-Compressor-to-governor line
U—Exhaust manifold
V—Intake manifold
W—Heat shield
X—Distributor vent line
Y—Nipple
Z—Exhaust pipe mounting flange
AA—Coupling
BB—Tee
CC—Elbow
DD—Carburetor - to - governor - valve line
EE—Governor - valve - control - valve-to-governor line.
FF—Carburetor - to - governor - valve line
GG—Lifting eye
HH—Air cleaner

Figure 122. Top right view of engine installed in vehicle.

108. Valve Clearance Adjustment

Note. The key letters noted in parentheses are in figure 122, except where otherwise indicated.

a. Preliminary. Start engine (par. 45) and run until normal operating temperature (160° to 180° F.) is reached.

b. Valve Rocker Arm Cover Removal.

(1) Stop engine (par. 47).

(2) Disconnect vacuum line at crankcase ventilating metering valve (F) and remove four retaining nuts and lockwashers

securing crankcase ventilating line connector (G) to front and rear valve rocker arm covers. Remove connector and discard gaskets.

(3) Remove three cap screws (C) and washers from front and rear rocker arm covers (D and M) and remove covers from cylinder heads.

(4) Remove and discard rocker arm cover gaskets.

(5) If engine is equipped with crankcase ventilating shutoff valve (U, fig. 119), pull out shutoff valves control handle (par. 41) to prevent excessive air leakage through vacuum line into intake manifold, which would prevent engine from idling properly.

(6) If engine is not equipped with shutoff valve, proceed as in (*a*), (*b*), and (*c*) below.

(*a*) Disconnect vacuum line (H) from elbow at intake manifold.

(*b*) Disconnect distributor vent line (X) from tee at intake manifold.

(*c*) Tape elbow and tee openings to prevent excessive air leakage into manifold, which would prevent engine from idling properly.

c. Valve Clearance Adjustment.

(1) Start engine and check temperature gage (par. 31) to be sure that engine coolant is still at normal operating temperature.

(2) With engine idling, insert feeler gage between valve stem cap (fig. 123) and valve actuating ball socket at each valve to check for proper clearance (par. 106*c*).

(3) If clearance is incorrect, using a wrench and screwdriver, loosen valve-adjusting-screw-jam nut (fig 123) and turn adjusting screw (clockwise to decrease, counterclockwise to increase) until proper clearance is obtained.

(4) Hold screw in adjusted position, tighten jam nut, and again check clearance.

(5) Repeat (2), (3), and (4) above until all valves are adjusted to recommended clearance.

d. Valve Rocker Arm Cover Installation.

(1) Stop engine.

(2) Place new rocker arm cover gaskets in position on front and rear cylinder heads, and install front and rear rocker ram covers (D and M).

(3) Install the six cover retaining cap screws (C) (three to each cover), making sure that a copper washer is installed on each cap screw, and tighten.

(4) Install a new crankcase-ventilating-line-connector gasket on each rocker arm cover, position connector on studs, and install four lockwashers and retaining nuts. Tighten nuts.

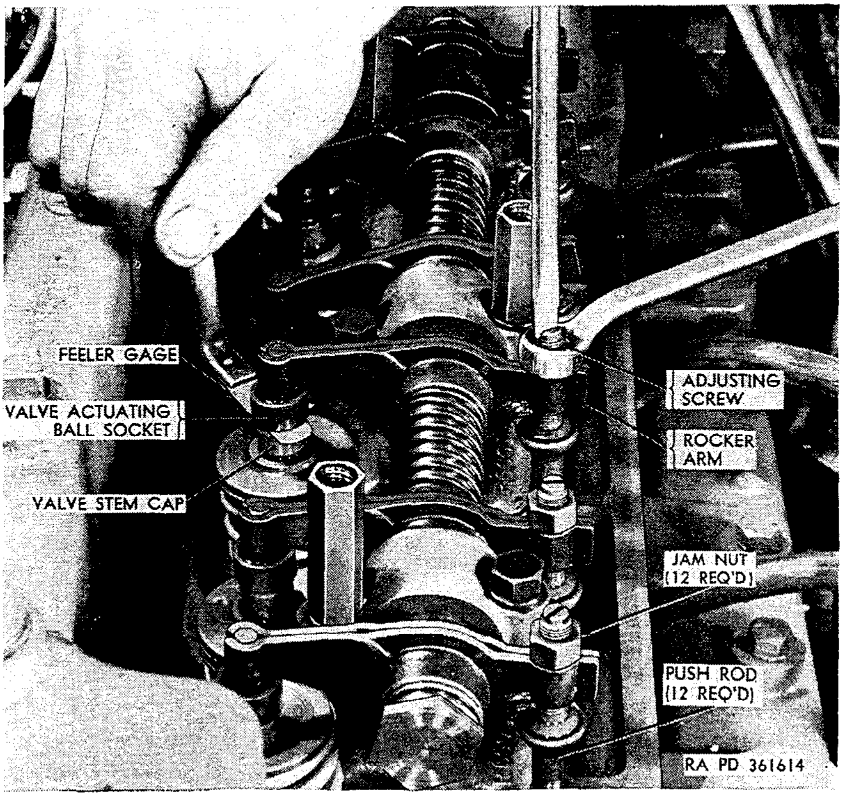


Figure 123. Adjusting valve clearance.

(5) If engine is equipped with crankcase ventilating shutoff valve (U, fig. 119), push fording valve control handle in (par. 41); otherwise, proceed as in (6) below.

(6) If engine is not equipped with shutoff valve, proceed as in (*a*), (*b*), and (*c*) below.

(*a*) Remove tape from elbow and tee openings at intake manifold.

(*b*) Connect distributor vent line (X) at tee on intake manifold.

(*c*) Connect vacuum line (H) at elbow on intake manifold.

(7) Connect vacuum line to crankcase ventilating shutoff valve (U, fig. 119).

(8) Start engine and examine entire assembly for oil leaks.

109. Cylinder Head Assemblies (Front and Rear)

a. Compression test.

(1) Check battery (par. 153) to be sure that it is fully charged.

(2) Remove all spark plugs (par. 148) from upper left side of engine.

(3) Pull out throttle control knob (T, fig. 65) as far as it will go and leave in *locked-out* position.

(4) Insert compression gage in No. 1 spark-plug hole, depress starter button to crank engine, and note maximum compression indicated by gage.

Caution: Do not crank engine more than is necessary to obtain a maximum reading.

(5) If pressure in cylinder is appreciably below normal (120 to 130 psi), pour one teaspoonful of engine oil through the spark plug hole onto the top of the piston to prevent loss of compression temporarily and repeat (4) above.

Note. Low compression brought up to normal by oil sealing indicates piston, piston ring, or cylinder sleeve wear or damage. Low compression not brought up to normal by this method indicates valve or cylinder-head gasket leakage.

(6) Repeat (4) above for each remaining cylinder, and repeat (5) above, if necessary.

(7) Install spark plugs (par. 148).

(8) Release throttle control (par. 18).

b. Removal.

(1) Remove intake and exhaust manifolds (par. 110).

(2) Remove water inlet header and water-outlet-header assembly (par. 139).

(3) Remove valve rocker arm covers (par. 108*b*).

(4) Remove 12 cap screws (fig. 124) securing 6 valve rocker arm shaft supports (fig. 123) to top of front and rear cylinder heads, and remove front and rear rocker arm assemblies.

Note. Place "front" and "rear" identification tags on rocker arm assemblies to facilitate installation. Although rocker arm assemblies are of identical construction, best results are obtained by installing each rocker arm assembly on the same cylinder head from which removed.

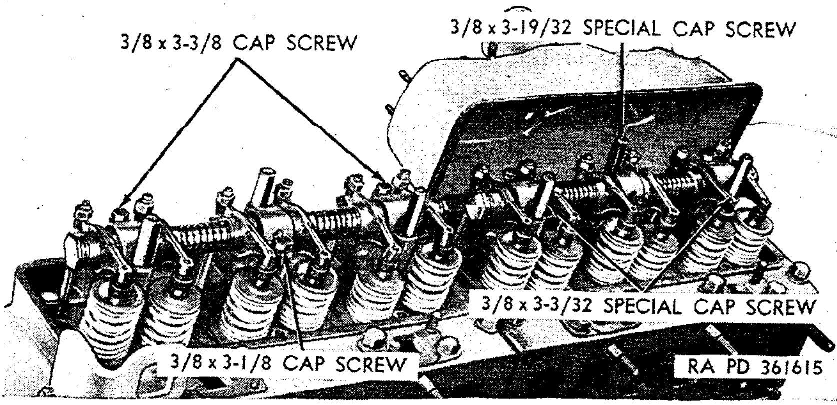


Figure 124. Top right view of engine with manifolds and rocker arm covers removed.

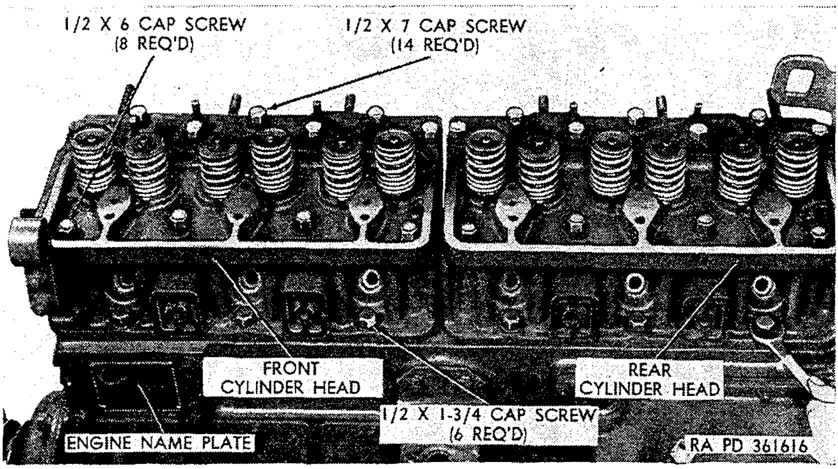


Figure 125. View of left side of engine showing location of head bolts.

(5) Lift 12 valve push rods (fig. 123) from front and rear cylinder heads, and remove 12 valve stem caps from intake and exhaust valves.

(6) Remove water pump retaining nut and washer from stud on front end of front cylinder head.

(7) Remove 28 cylinder-head screws (14 from each head) (fig. 125), and lift front and rear cylinder head assemblies from crankcase. Remove and discard both cylinder head gaskets.

c. Installation.

(1) Clean gasket surfaces on both cylinder heads (front and rear) and crankcase.

(2) Install new front and rear cylinder head gaskets, being careful to position them correctly over the locating dowel pins on the top face of the crankcase.

Note. The cylinder head gaskets are marked for correct installation. The marking reads: THIS SIDE UP AT FAN END—THIS SIDE DOWN AT FLYWHEEL END. It is imperative that the gaskets be installed in this manner to assure lubrication of rocker arm assemblies.

(3) Place front and rear cylinder head assemblies in position on crankcase and install the 28 cylinder head screws (fig. 125). Using a torque wrench, tighten the head bolts to 110 pound-feet (maximum) in the sequence shown in figure 126.

(4) Install water pump retaining nut and washer on stud on front end of front cylinder head, tighten nut.

(5) Insert 12 valve push rods (fig. 123) in holes in front and rear cylinder heads, and install 12 valve stem caps on intake and exhaust valves.

(6) Place front and rear rocker arm assemblies in position on top of front and rear cylinder heads, install four 3/8 x 3/32

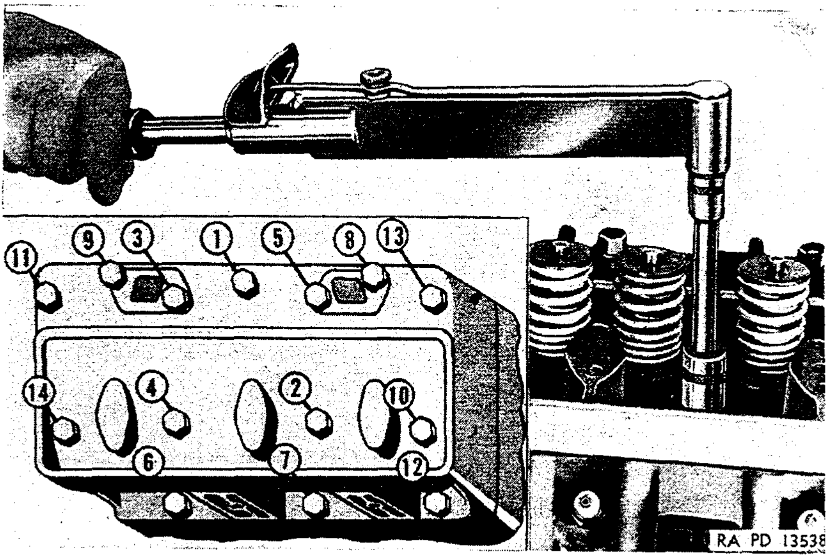


Figure 126. Cylinder head bolt tightening sequence.

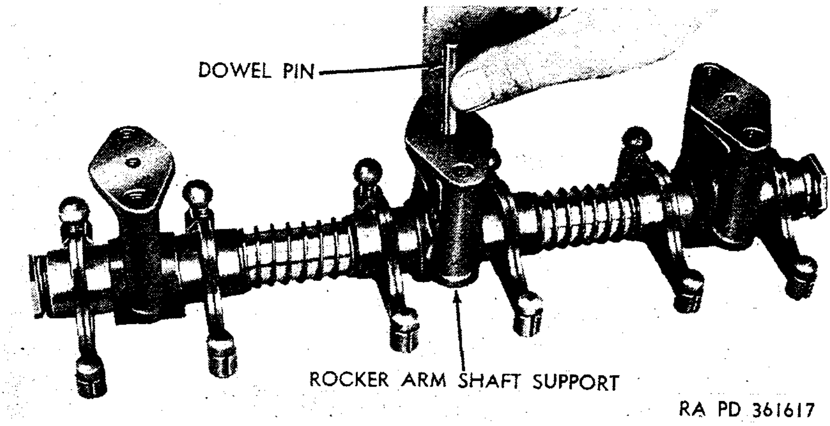


Figure 127. Rocker arm shaft dowel pin installation.

special cap screws (fig. 124), two ⅜ x 3$^{19}/_{32}$ special cap screws, four ⅜ x 3⅜ cap screws, and two ⅜ x 3⅛ cap screws in holes in rocker arm shaft supports; tighten cap screws to 25 to 35 pound-feet.

Note. When positioning rocker arm assemblies, be sure dowel pin (fig. 127) is inserted in hole in bottom of center rocker arm shaft support.

(7) Install water-inlet header and water-outlet header assemblies (par. 139, omitting *a* (2) (*h*) and *b* (2) (*j*).

(8) Install intake and exhaust manifolds (par. 110, omitting *b* (12).

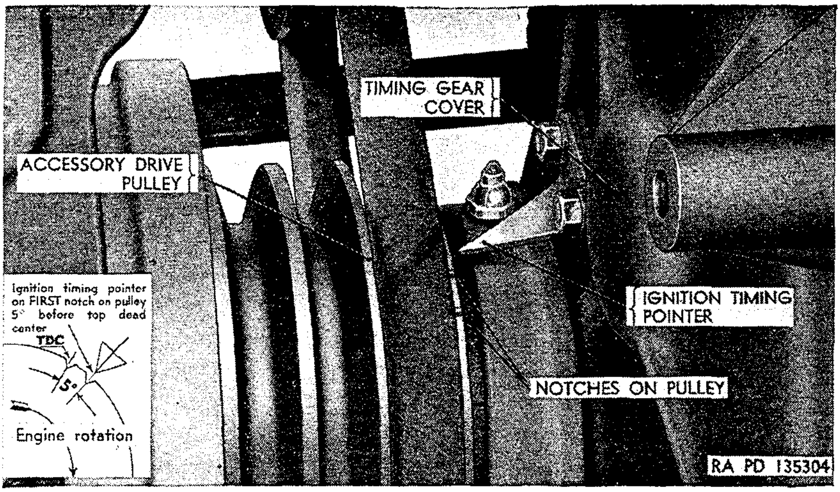


Figure 128. Ignition timing indicator.

(9) Observing position of valve rocker arms, turn engine in small increments by momentarily depressing and releasing starter button until both valves (intake and exhaust) at No. 1 cylinder are closed and ignition timing pointer (fig. 128) is alined with top dead center mark on crankshaft pulley. Adjust clearances of valves at No. 1 cylinder (par. 108). Working in firing order sequence (par. 106*c*), repeat the above procedure for initial valve adjustment at each remaining cylinder.

(10) Start engine (par. 45).

(11) After engine is thoroughly warmed up, using a torque wrench, tighten the cylinder-head bolts to 110 pound-feet (max) in the sequence shown in figure 126.

(12) With engine idling, check valve clearance and adjust, if necessary (par. 108).

(13) Install valve rocker arm covers (par. 108).

(14) Before stopping engine, make final check for leaks in cooling and exhaust systems.

110. Intake and Exhaust Manifolds

a. Manifold Vacuum Test.

(1) Remove pipe plug (T, fig. 119) at right side of intake manifold center section and install vacuum gage in pipe plug hole.

(2) Start engine (par. 45).

(3) With engine running at normal idling speed (par. 121*a*), observe manifold vacuum indicated by gage. A steady gage reading of 18 to 21 inches of mercury indicates normal mani-

347797°—55——13

fold vacuum. A gage reading fluctuating between 10 and 15 inches of mercury indicates valve or cylinder-head gasket leakage. A steady low gage reading indicates carburetor spacer or gasket leakage.

(4) Accelerate and decelerate the engine quickly, observing the minimum and maximum gage readings. Failure of the manifold vacuum to drop to approximately 2 inches and to rise to at least 24 inches as engine speed decreases and increases indicates diluted engine oil, faulty piston rings, or abnormal restriction of the carburetor, air cleaner, or exhaust system.

Note. The vacuum gage reading in (3) above apply to sea level. These readings will be reduced by approximately 1 inch of mercury for each 1,000 feet of altitude above sea level.

(5) Stop engine (par. 47).

(6) Unscrew vacuum gage at right side of intake manifold center section. Install pipe plug (T, fig. 119) in threaded hole, and tighten plug.

b. Removal.

(1) Disconnect vacuum line (L, fig. 119 or H, fig. 122) and distributor vent line (Y, fig. 119 or X, fig. 122) at intake manifold.

(2) Disconnect crankcase-ventilating-shutoff valve control (par. 114*e*(8)).

(3) Remove carburetor (par. 121).

(4) Unscrew connector at cylinder head priming tee (Q, fig. 119) and remove primer-pump-to-priming-tee tube from tee (vehicles equipped with primer pump (par. 119*a* only)).

(5) Disconnect both ends of air-compressor-to-governor line (T, fig. 122) and remove the line.

(6) Loosen four nuts on exhaust pipe mounting studs and turn mounting flange (Z, fig. 122) counterclockwise (viewed from top) until large holes in flange are alined with washers under mounting nuts. Flange will then slip over mounting nuts and washers, releasing exhaust pipe from exhaust manifold.

(7) Remove 13 nuts (R, fig. 122) (six on upper side and seven on lower side of intake and exhaust manifold assembly) from manifold studs on right side of front and rear cylinder head assemblies. Remove manifold clamps (Q, fig. 122) and heat shield (W, fig. 122).

(8) Remove remaining two nuts from upper front and rear manifold studs and remove manifold assembly. Remove and discard manifold gaskets.

(9) Remove three cap screws and washers from lower side of exhaust-manifold center section, separate intake and ex-

haust manifolds, and remove steel spacer at center of intake manifold.

(10) Remove exhaust-manifold end sections with packing rings (3 rings on each end section) from center section.

c. Installation.

(1) Thoroughly clean gasket surfaces on manifolds and front and rear cylinder heads, and install new gaskets on manifold studs.

(2) With three packing rings in place on inner end of each exhaust-manifold end section, insert end sections in front and rear ports of center section.

(3) Install steel spacer between assembly flanges of intake and exhaust manifolds, and install three cap screws with washers in flanges from lower side of exhaust-manifold center section. Do not tighten cap screws ((6) below).

(4) Using a straightedge, twist exhaust-manifold end sections until mounting flanges are alined (flat in same plane) with intake-manifold mounting flanges.

(5) Position manifold assembly on manifold studs on right side of front and rear cylinder head assemblies and secure with two hex nuts (R, fig. 122), one each on upper front and rear manifold studs.

(6) Position heat shield (W, fig. 122) and manifold clamps on upper and lower manifold studs and install remaining 13 mounting nuts. Tighten nuts to 80 to 90 pound-feet torque. Tighten cap screws securing exhaust manifold to intake manifold to 80 to 90 pound-feet torque.

(7) Install new exhaust-pipe-to-manifold sealing ring at upper end of exhaust pipe, slip exhaust pipe mounting flange (Z, fig. 122) over the nuts and washers on exhaust pipe mounting studs, and rotate flange clockwise (viewed from top) so that small holes in flange are alined with washers under mounting nuts. Tighten nuts.

(8) Install air-compressor-to-governor line (T, fig. 122).

(9) Connect primer-pump-to-priming-tee tube to cylinder-head priming tee (Q, fig. 119) at left of carburetor, and tighten connector (vehicles equipped with primer pump only).

(10) Install carburetor (par. 121).

(11) Connect vacuum line (L, fig. 119 or H, fig. 122) and distributor vent line (Y, fig. 119 or X, fig. 122) at intake manifold.

(12) Connect crankcase ventilating shutoff valve control (par. 115*d*(6)) and adjust shutoff valves (par. 115*h*(3)).

(13) Start engine and run until normal operating temperature is reached. Check tightness of all mounting nuts and bolts and connections.

111. Oil Filters

a. *Oil Filter Element Replacement* (fig. 129).

(1) Remove drain plugs from sides of filter bodies, and drain oil and accumulated sludge from filters.

(2) Loosen filter cover retaining nuts, remove covers and springs, and lift elements from filter bodies and discard.

(3) Clean inside of filter bodies and covers with dry-cleaning solvent or volatile mineral spirits.

(4) Install drain plugs and new filter elements on cover retaining studs.

(5) Position cover springs on top of filter elements, position filter body covers over retaining studs, and press down on covers to compress springs and install retaining nuts on studs. Tighten nuts.

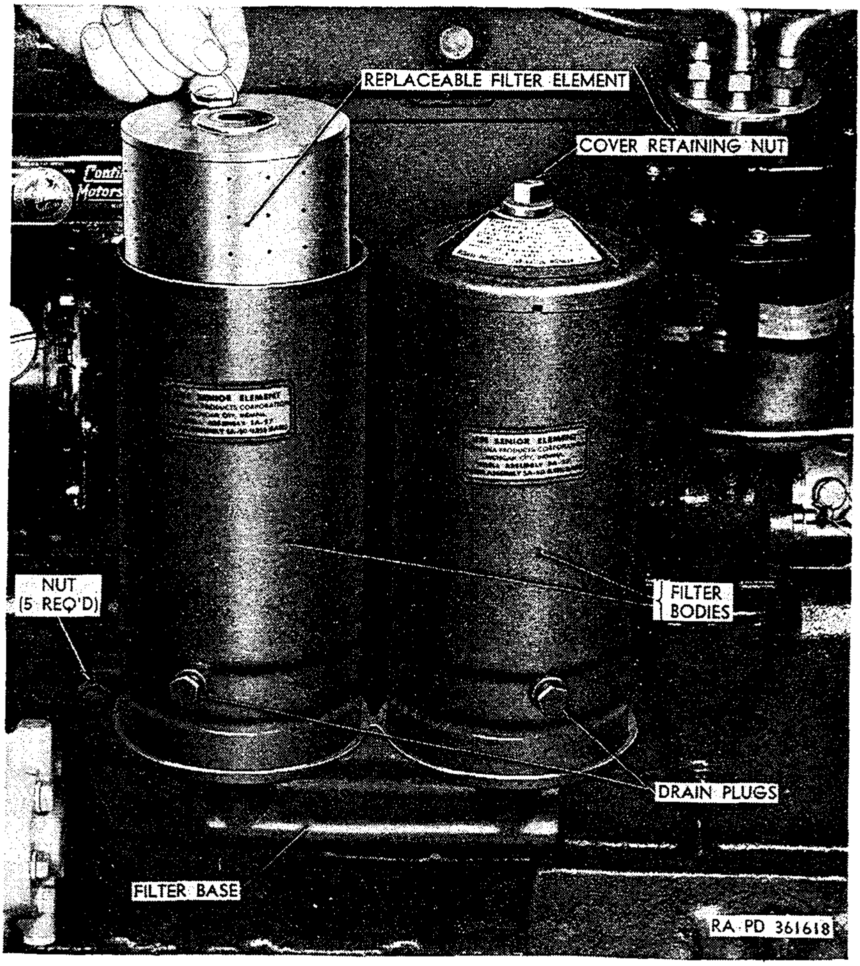


Figure 129. Replacing oil filter elements.

(6) Start engine and run until normal operating temperature (160° to 180° F.) is reached. Examine filters thoroughly for oil leaks.

b. Removal. Remove five nuts and lockwashers at filter base (fig. 129) and slide filter assembly off mounting studs. Remove and discard filter mounting gasket.

c. Installation.

(1) Thoroughly clean gasket surfaces on crankcase and filter base, and install new gasket on oil filter mounting studs at lower left side of crankcase.

(2) Position oil filter assembly on mounting studs and install five lockwashers and nuts. Tighten nuts.

(3) Start engine and run until normal operating temperature (160° to 180° F.) is reached. Examine entire oil filter assembly for oil leaks.

112. Oil Pan

a. General. A bayonet-type oil level gage (fig. 117) is provided for determining the quantity of engine oil in the oil pan. There are two types of bayonet-type gages in use on the vehicles covered by this manual, both of which are equipped with a waterproof screw cap for sealing the gage hole at all times except when checking the engine oil level. The blade of one type of gage is marked: DO NOT SCREW DOWN TO CHECK OIL and SCREW DOWN TIGHTLY AFTER CHECKING. The other type of gage has no instructions on the blade.

b. Checking Oil Level. Check oil level frequently ((1), (2), and (3) below).

(1) With engine stopped, unscrew waterproof screw cap on gage from oil gage pipe mounted on lower left side of crankcase, and remove gage.

(2) Wipe oil from gage blade, using a clean cloth to prevent contamination of the engine oil with dirt or other foreign matter, and note whether blade is plain or marked (*a* above).

(3) Insert gage in oil gage pipe ((*a*) and (*b*) below).

(*a*) If blade contains markings (*a* above), push gage into oil gage pipe as far as it will go without engaging threads on waterproof screw cap.

(*b*) If blade is unmarked insert gage in oil gage pipe as far as it will go and screw waterproof screw cap down tightly.

(4) Remove gage from gage pipe and note engine oil level indicated on blade.

(5) Insert gage in gage pipe as far as it will go and screw waterproof screw cap down tightly.

(6) If (1), (2), (3), and (4) above indicate incorrect engine oil level (par. 67), add oil as necessary (*c* below).

c. Filling. To fill oil pan, remove oil filler cap (M, fig. 119) and pour oil through filler neck on front rocker arm cover.

Section VI. POWER PLANT REMOVAL AND INSTALLATION

113. Coordination With Ordnance Maintenance Unit

Refer to paragraph 2.

Note. Modified carburetor is used on medium wrecker truck M62 and tractor wrecker truck M246.

114. Removal

a. Description. The power plant (figs. 130 and 131) consists of the radiator, engine, engine accessories, clutch, and transmission. Although removal and installation of the power plant is best accomplished by three men, including crane or hoist operator, one mechanic may perform all disconnect or connect operations.

b. Preliminary Procedures.

(1) *Position vehicle.* Place vehicle under suitable engine lifting equipment. Arrange to have tools and supports available for use when needed. Block wheels to prevent vehicle from moving.

(2) *Open engine compartment* (fig. 132). Pull upward and outward on hood holddown catches (A) to release front end of hood panel (B). Raise panel as far as it will go and engage left windshield holddown catch (E) with eye of top panel hook (D) to lock panel in raised position. Release latches (F) at front of left and right hood side panels (G), and slide side panels forward to disengage hinges (H) and remove.

(3) *Drain compressed air system.* Refer to paragraph 235*a*.

(4) *Disconnect battery ground cable* (fig. 133). Remove cap screw and tooth-type lockwasher from outside of frame right side rail under right rear corner of truck cab, and remove battery ground cable. Thoroughly tape end of cable to eliminate hazard of accidental grounding. Replace cap screw and tooth-type lockwasher to prevent loss.

c. Disconnect Procedures at Front of Vehicle.

(1) *Remove front winch level wind* (vehicles equipped with front winch only). Refer to paragraph 260.

(2) *Remove brush guard* (fig. 134). Loosen nut and bolt at left and right frame brackets and at left and right brush guard braces. Pull brush guard forward and lift from truck.

(3) *Remove radiator upper shield.* Refer to paragraph 135*a*(6).

d. Disconnect Procedures at Left Side of Engine.

(1) *Disconnect tachometer flexible shaft.* Unscrew connector securing tachometer flexible shaft (Q, fig. 135) to tachometer

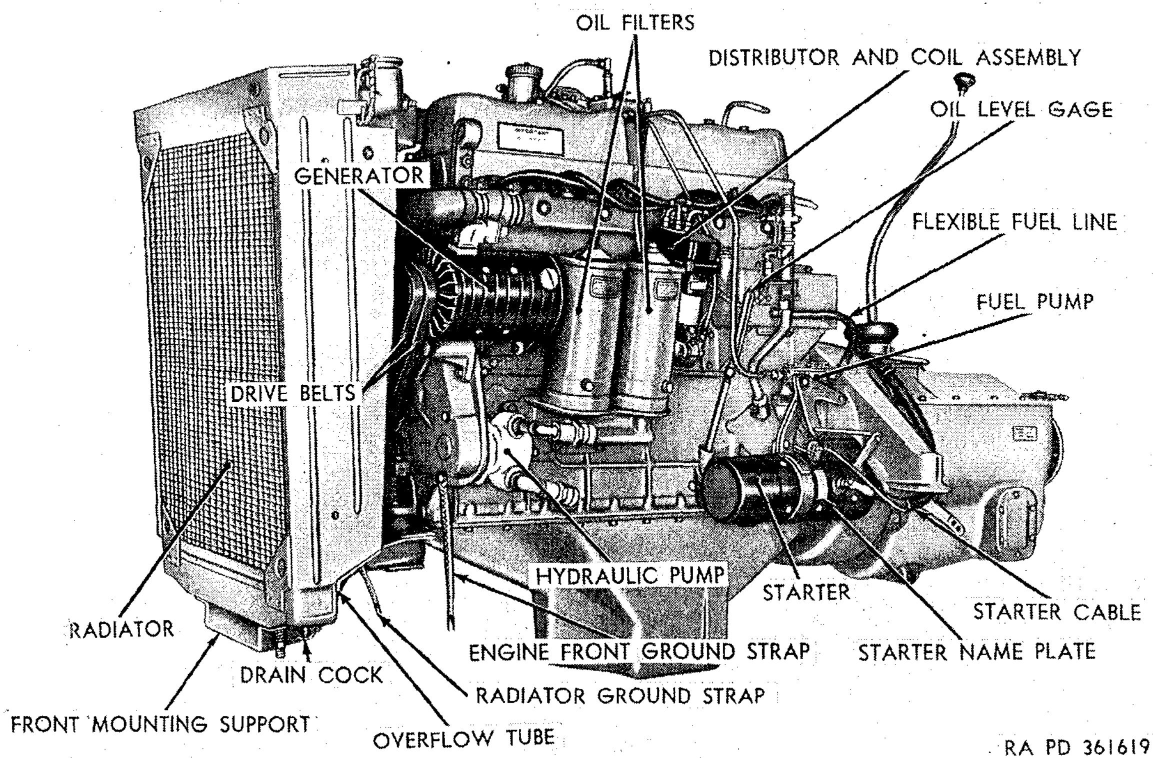


Figure 130. Left front view of power plant—removed from vehicle.

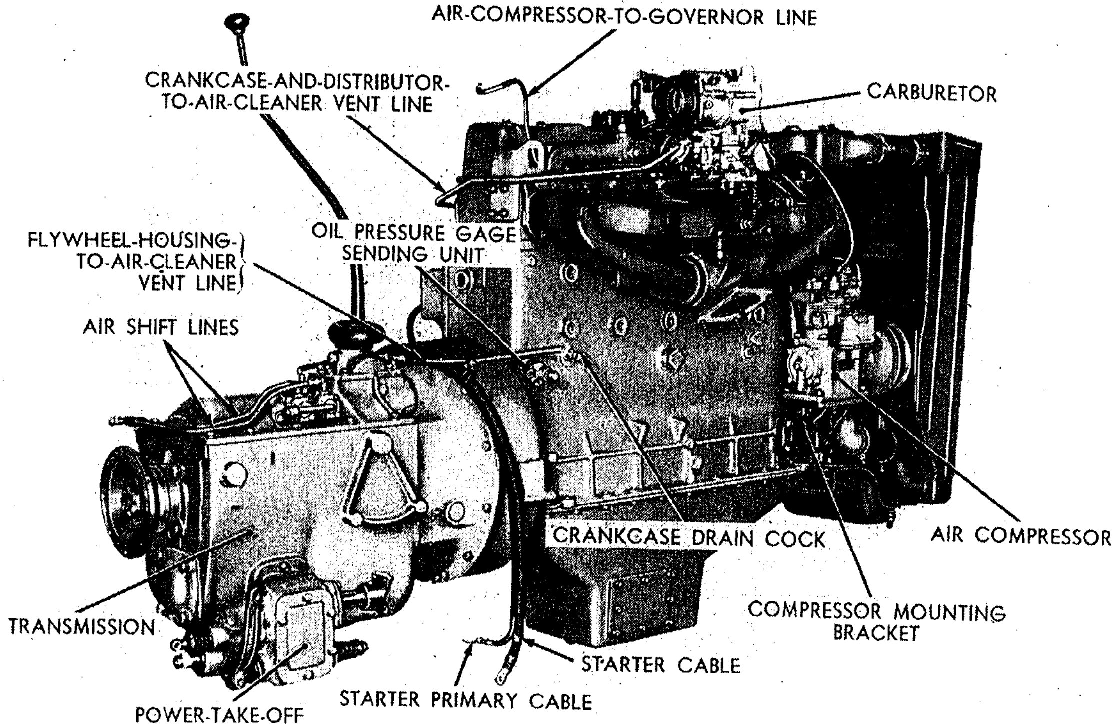
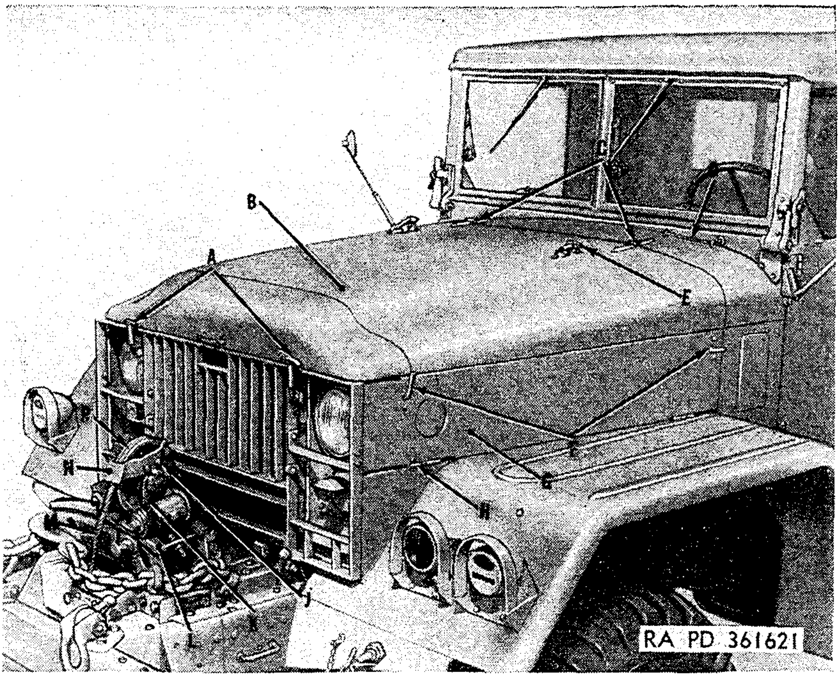


Figure 131. Right rear view of power plant—removed from vehicle.



A—Top panel holddown catch
B—Hood top panel
C—Hinge
D—Top panel hook
E—Windshield holddown catch
F—Latch
G—Side panel
H—Hinge
J—Cap screw
K—Swivel sheave frame
L—Trolley track
M—Winch cable
N—Cable guard
P—Swivel sheave

Figure 132. View of left front section of truck.

sending unit (P, fig. 135) at front of distributor drive housing, and pull shaft from sending unit.

(2) *Disconnect distributor primary wire.* Unscrew connector (E, fig. 135) and remove distributor primary wire (F, fig. 135) from rear of distributor, and remove primary-wire-support-clip from mounting bracket attached to crankcase ventilating line connector (G, fig. 122).

(3) *Disconnect generator-to-regulator cable* (fig. 136). Unscrew generator-to-regulator cable connector at receptacle on top of generator and disconnect cable.

(4) *Disconnect steering gear hydraulic lines.* Unscrew self-sealing couplings (W, fig. 135) from inlet and outlet at steering gear hydraulic pump (V, fig. 135) and disconnect steering gear hydraulic lines.

(5) *Disconnect engine rear ground strap.* Remove nut and tooth-type lockwasher from stud at front of cab cowl, and remove engine rear ground strap (H, fig. 135 and fig. 137).

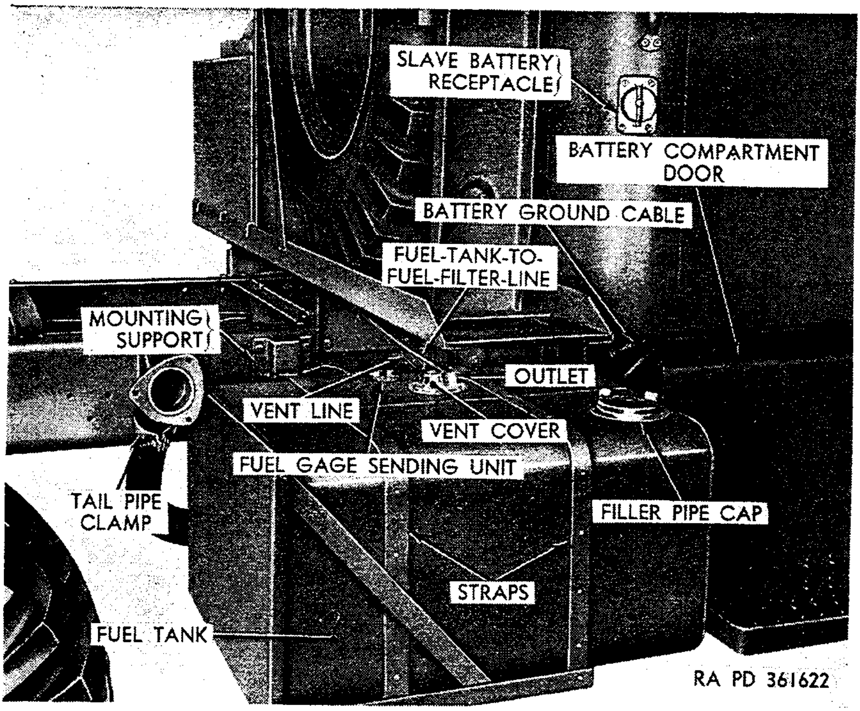


Figure 133.—View of lower right rear corner of truck cab.

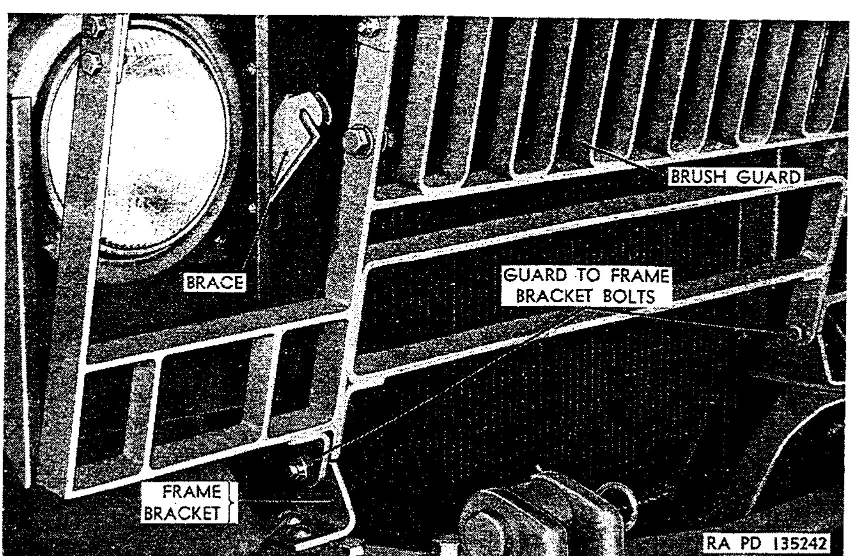
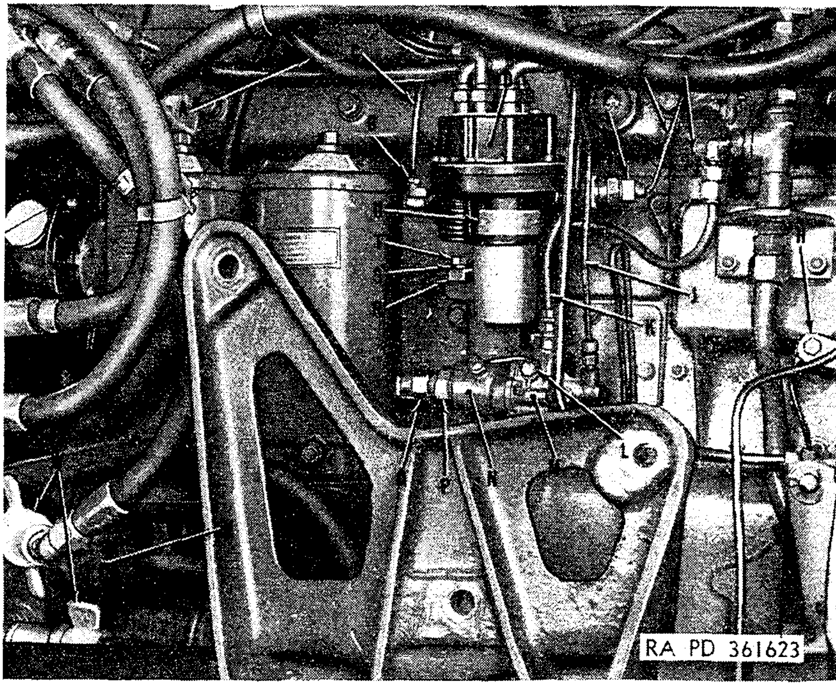


Figure 134. Brush guard mountings.



A—Spark plug cable
B—Nut
C—Distributor vent line
D—Distributor and coil assembly
E—Connector
F—Distributor primary wire
G—Oil cooler water inlet seal
H—Engine rear ground strap
J—Carburetor-to-governor-valve line
K—Governor-valve-to-governor line
L—Adjusting hole plug
M—Governor valve assembly
N—Distributor drive housing
P—Tachometer sending unit
Q—Tachometer flexible shaft
R—Mounting clamp
S—Lockwasher
T—Cap screw
U—Distributor nameplate
V—Steering gear hydraulic pump
W—Self-sealing couplings

Figure 135. View of lower left side of engine.

(6) *Disconnect starter linkage.* Remove cotter pin and yoke pin securing starter control rod (C, fig. 138) to bellcrank (R, fig. 138). Pull control rod upward into cab and secure in this position.

(7) *Disconnect crankcase-ventilating-shutoff-valve control* (vehicles equipped with manually controlled crankcase ventilating system (par. 106*a*(7)) only). Loosen screw securing shutoff valve control wire (fig. 137) to shutoff valve lever and remove wire from lever. Remove two retaining nuts and washers from studs at top rear of water inlet header and remove shutoff valves control mounting bracket (fig. 137).

(8) *Disconnect fuel pump inlet line.* Unscrew nut (J, fig. 138) at junction of fuel-pump-to-fuel-filter flexible line (K, fig. 138) and fuel-pump-to-fuel-filter rigid line (H, fig. 138) and disconnect lines.

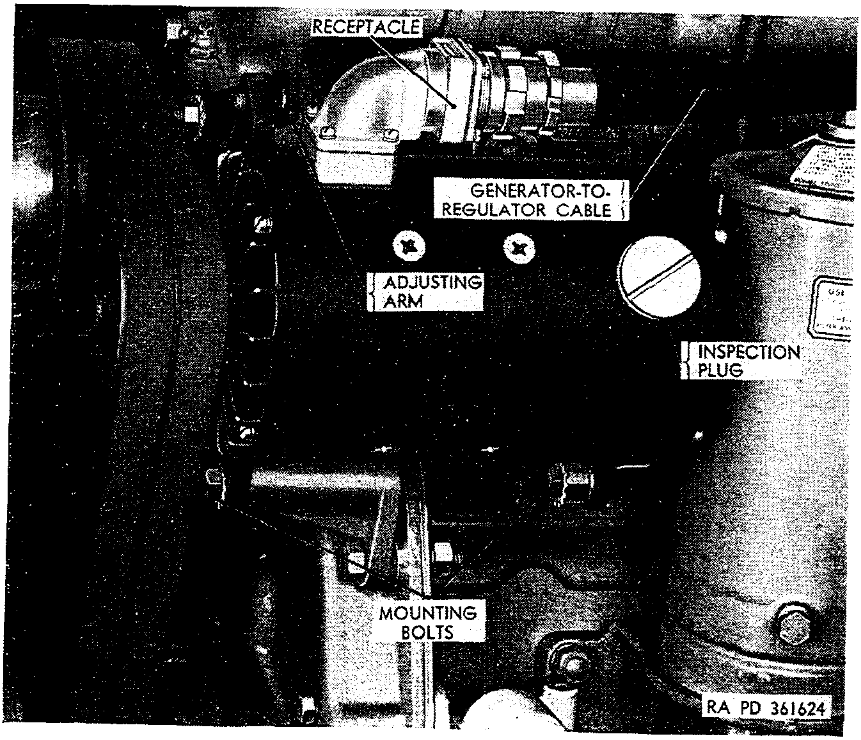


Figure 136.—View of generator installed on front left side of engine.

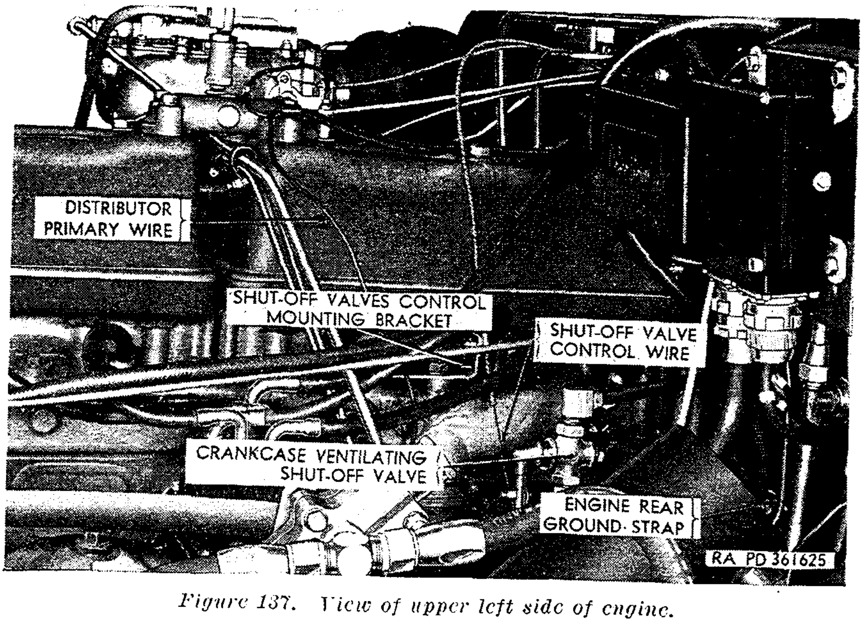
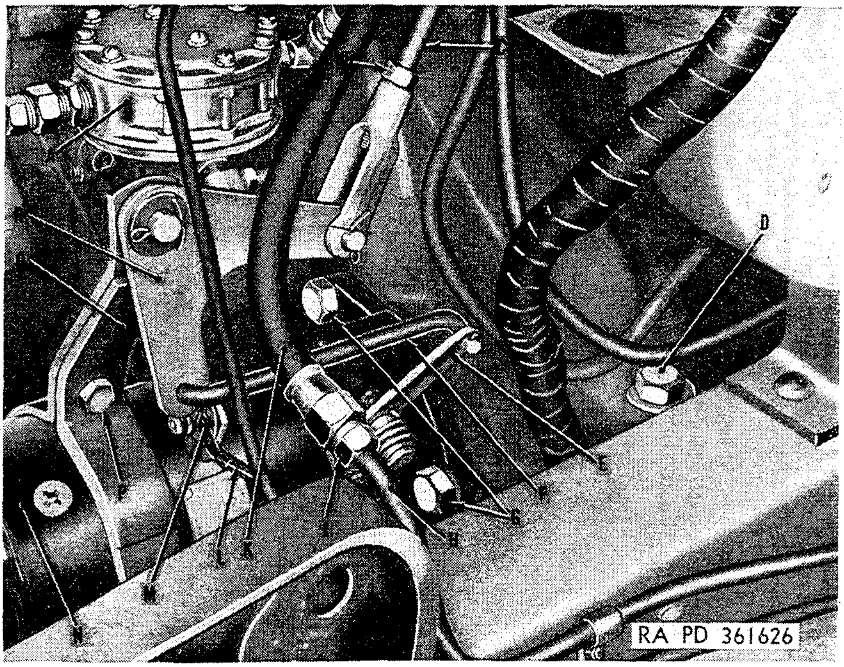


Figure 137. View of upper left side of engine.



A—Fuel pump
B—Nut
C—Control rod
D—Cap screw
E—Lever
F—Control link
G—Cap screw
H—Fuel-pump-to-fuel-filter rigid line
J—Nut
K—Fuel-pump-to-fuel-filter flexible line
L—Starter switch primary wire
M—Manual switch
N—Starter
P—Cap screw
Q—Bracket
R—Bellcrank

Figure 138. Starter and fuel pump installed on rear left side of engine.

e. Disconnect Procedures at Right Side of Engine.

(1) *Disconnect air-compressor-to-governor line.* Unscrew nut on left side of air compressor governor (A, fig. 122) and remove air-compressor-to-governor line (T, fig. 122) from governor.

(2) *Disconnect engine temperature gage sending unit.* Disconnect bayonet-type connector at temperature gage sending unit (E, fig. 122) on top of rear water outlet header.

(3) *Disconnect flywheel-housing-to-air-cleaner vent line* (vehicles equipped with flywheel housing ventilating system only). Loosen hose clamp securing flywheel-housing-vent line at rear lower right side of engine (fig. 131 or 139) to air cleaner outlet hose, and remove hose from line.

Note. On some vehicles, the vent line is connected to the top right front face of the flywheel housing (fig. 139). On other vehicles, the the vent line is connected to the top of the transmission shifter housing forward of the housing cover (fig. 131). Current production models are not equipped with a flywheel-housing-to-air-cleaner vent line.

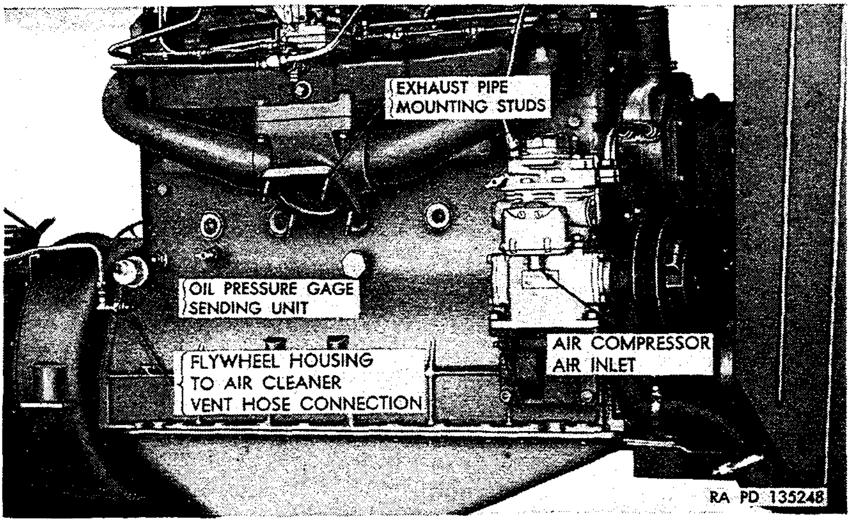


Figure 139. Right side of engine.

(4) *Disconnect air-cleaner-to-carburetor-inlet hose.* Loosen hose clamp (E, fig. 119) securing air-cleaner-to-carburetor inlet hose (C, fig. 119) to carburetor air inlet sleeve, and remove hose from sleeve.

(5) *Disconnect throttle-cross-shaft-to-carburetor rod.* Refer to paragraph 121*b*(2).

(6) *Disconnect choke control wire and conduit.* Refer to paragraph 121*b*(8).

(7) *Disconnect primer pump injection line* (vehicles equipped with fuel primer pump only). Refer to paragraph 110*b*(3).

(8) *Disconnect crankcase-ventilating-shutoff-valve control* (vehicles equipped with manually controlled crankcase ventilating system (par. 106*a*(5)) only). Loosen screw on top of shutoff valve lever (V, fig. 119) and remove shutoff-valve control wire (W, fig. 119). Loosen nut and bolt securing clip to control supporting bracket (S, fig. 119) and remove control.

(9) *Disconnect crankcase-and-distributor-to-air-cleaner vent line* (Y, fig. 119 and fig. 131). Loosen hose clamp at junction of air cleaner outlet hose and crankcase-and-distributor vent line, and remove hose from line.

(10) *Disconnect air-compressor-to-air-reservoir line* (fig. 140). Unscrew flare nut at top rear of air compressor cylinder head and remove air-compressor-to-air-reservoir line.

(11) *Disconnect air-cleaner-to-air-compressor-intake line* (vehicles equipped with air-cleaner-to-air-compressor-intake line only) (X, fig. 119 and fig. 140). Loosen hose clamp at bottom of air-compressor air strainer and remove air-cleaner-to-air-compressor-intake line from strainer intake sleeve.

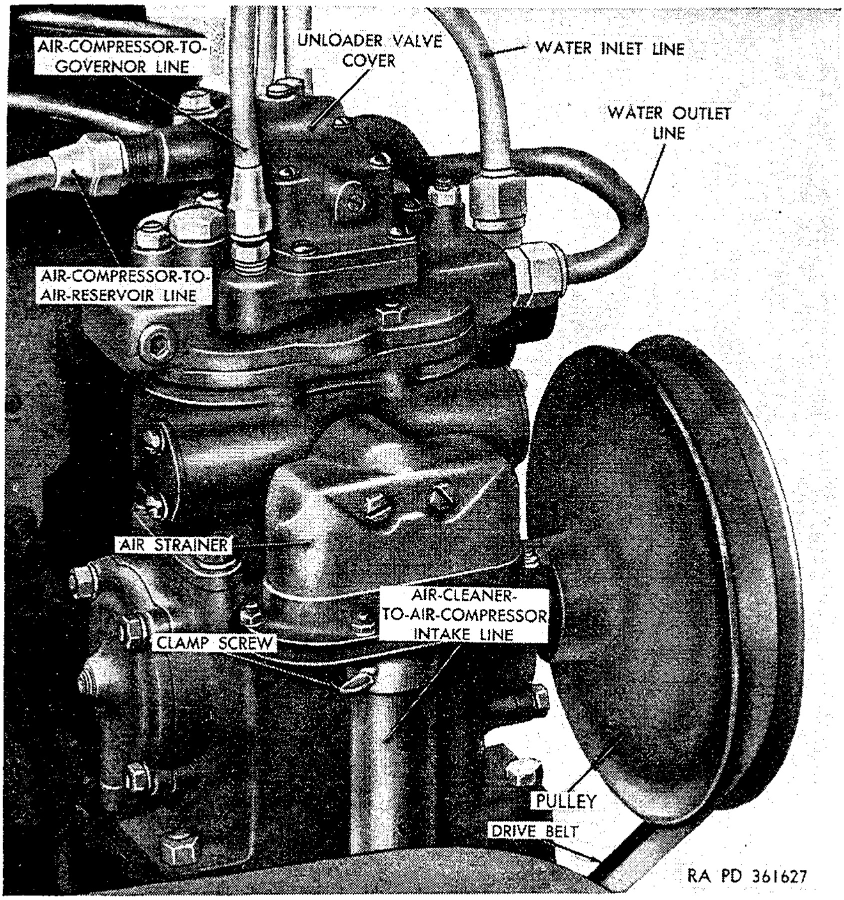


Figure 140. Air compressor.

(12) *Disconnect engine exhaust pipe.* Loosen four nuts on exhaust pipe mounting studs and turn mounting flange (Z, fig. 122) so that large holes are alined with washers under mounting nuts. Slide flange over mounting nuts and washers, and remove exhaust pipe from exhaust manifold. Remove and discard exhaust-pipe-to-exhaust-manifold sealing ring.

(13) *Disconnect engine oil pressure gage sending unit.* Rotate bayonet-type connector at oil pressure gage sending unit (fig. 131) on rear right side of crankcase counterclockwise and remove oil pressure gage cable from sending unit.

f. Disconnect Procedures Under Vehicle.

(1) *Remove power-take-off.* Refer to paragraph 209*d* (M51 only) or paragraph 209*b* (vehicles equipped with front winch only).

(2) *Disconnect transmission-to-transfer propeller shaft* (fig. 141). Remove eight safety nuts and bolts securing universal

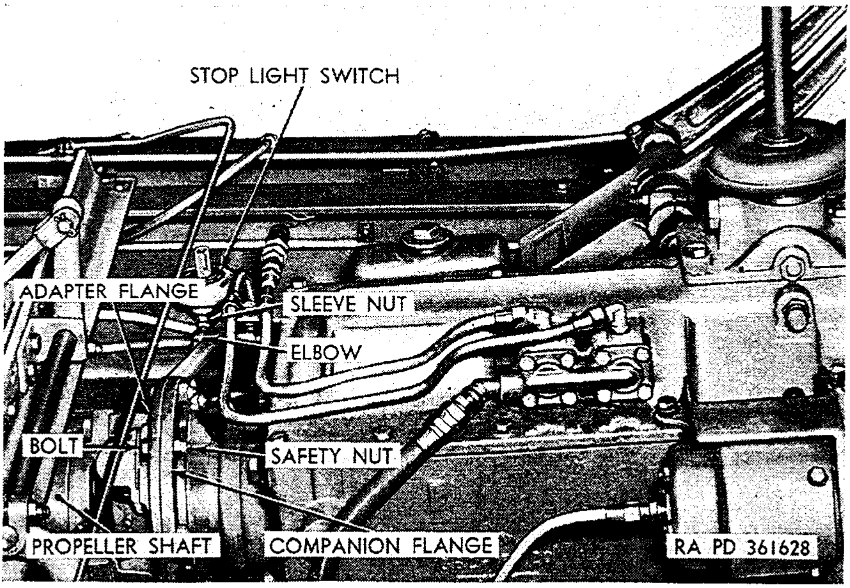


Figure 141. View of right rear section of transmission and transmission-to-transfer propeller shaft.

joint journal adapter flange to companion flange at rear of transmission, and disconnect transmission-to-transfer propeller shaft.

Warning: Before disconnecting propeller shaft, raise the wheels on one side of both rear axles to relieve torsional strains.

(3) *Disconnect clutch linkage* (figs. 142 and 143). Pull outward on clutch-control-rod-adjusting-yoke pin at lower end of clutch control rod and remove adjusting yoke from clutch release lever.

(4) *Disconnect transmission-to-tranfer air shift lines* (fig. 144). Unscrew connectors at junction of rigid and flexible air shift lines and disconnect transmission-to-transfer air shift lines.

(5) *Disconnect brake pedal return spring* (fig. 142). Disconnect brake pedal return spring from bracket on left rear side of engine flywheel housing.

(6) *Disconnect engine starter cable.* Remove nut from terminal on top of starter magnetic switch (Q, fig. 145), located on inside of frame right side rail, and remove starter cable (fig. 131) from terminal.

Note. On some vehicles, the starter cable and starter primary cable extend from the starter to the magnetic switch over the top of the clutch housing (fig. 131). On other vehicles, the cables extend from the starter to the magnetic switch around the bottom of the clutch housing (fig. 118).

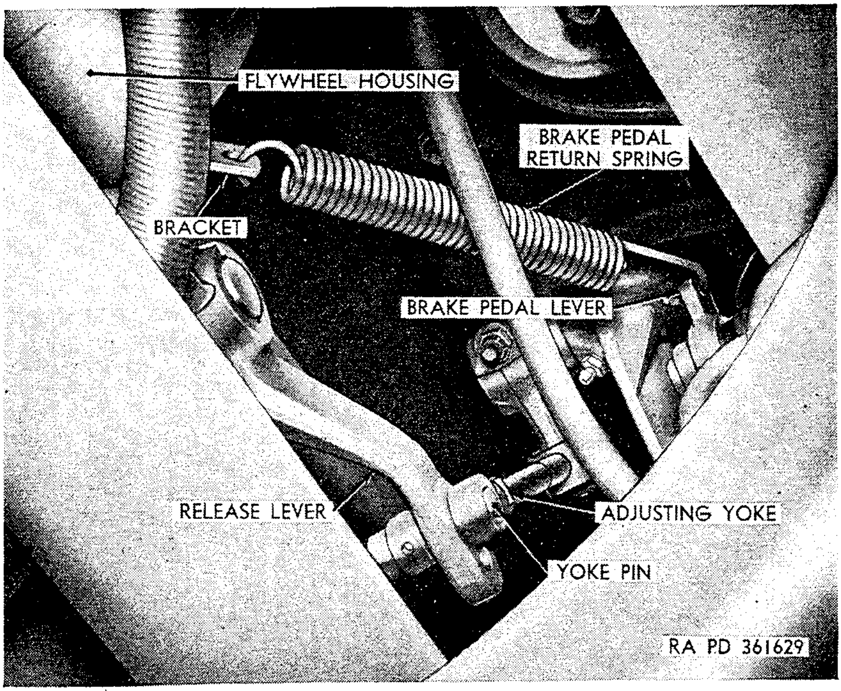


Figure 142. View of clutch linkage from under side of vehicle.

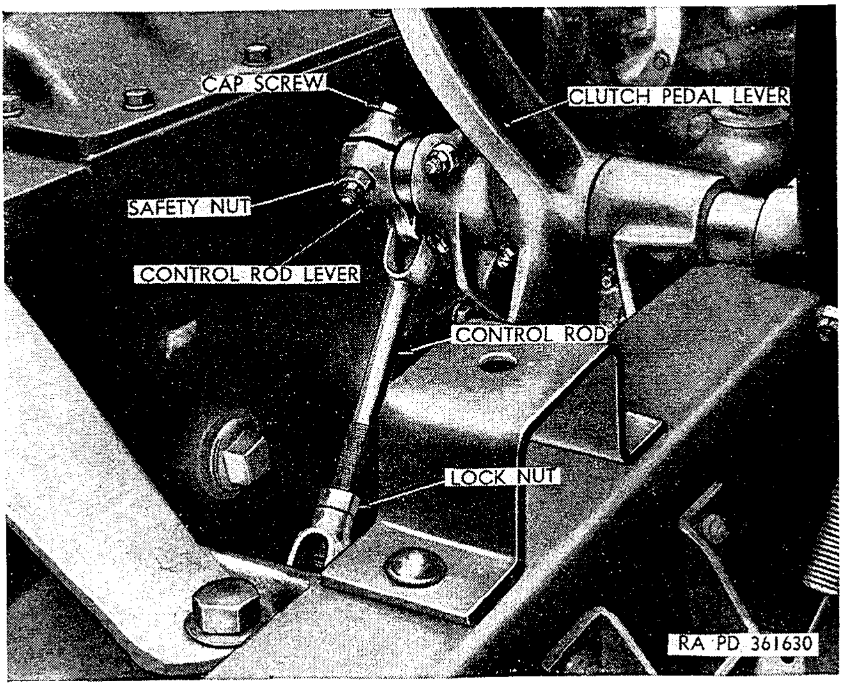


Figure 143. Left front view of clutch pedal lever and control rod.

347797°—55——14

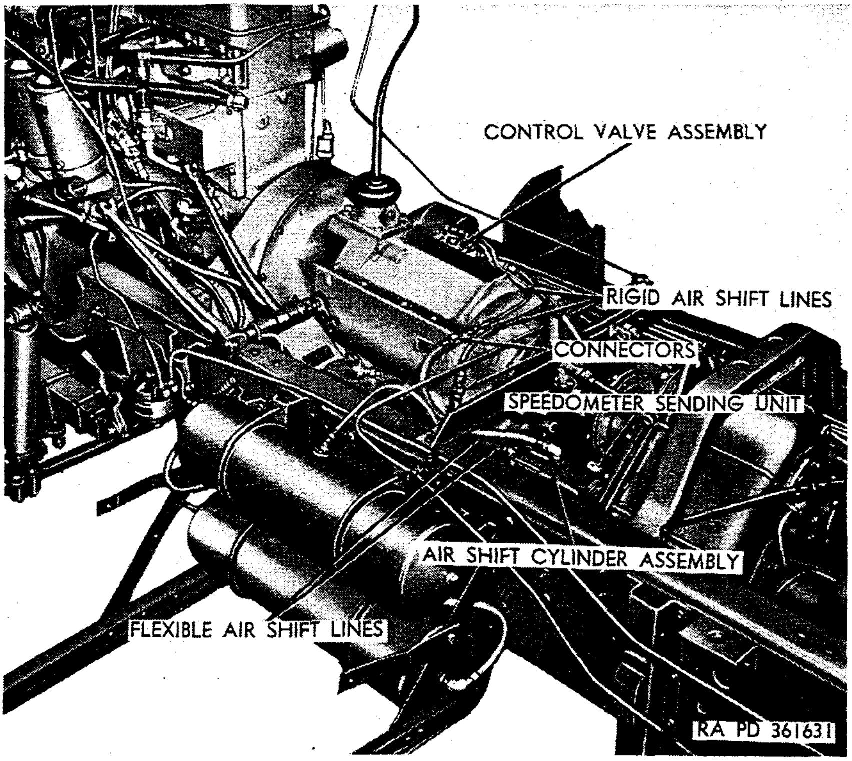


Figure 144. Top view of rear section of power plant (installed) from left side of vehicle.

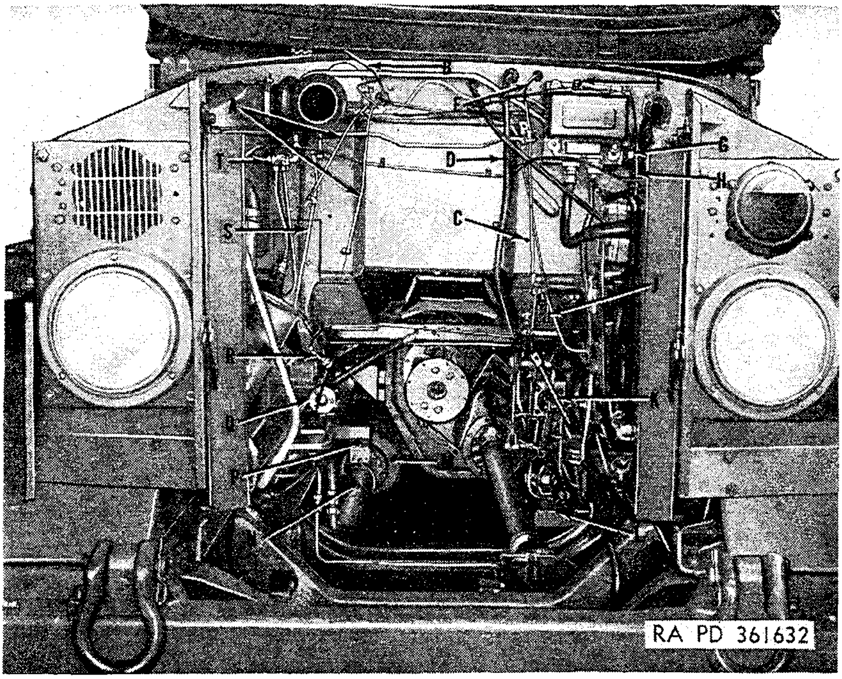
(7) *Disconnect engine starter primary cable.* Remove nut from upper terminal on left side of starter magnetic switch (Q, fig. 145) and remove primary cable (fig. 131) from terminal.

(8) *Remove engine rear mounting plate cap screws.* Remove two self-locking nuts from cap screws (D, fig. 138) securing mounting bosses on left and right sides of flywheel housing to engine rear mounts (fig. 118).

(9) *Disconnect clutch-control-valve-to-roto chamber air line* (M62 only). Unscrew nut securing air line (fig. 146) to rear of roto chamber, and remove air line connecting roto chamber to clutch control valve at rear of vehicle.

(10 *Remove engine front mounting support cap screws* (fig. 147). Remove five cap screws and lock washers from engine front mounting.

(11) *Disconnect front ground straps.* Loosen ground strap retaining bolt (H, fig. 148) at top left side of frame front cross member and pull engine front ground strap (K, fig. 148) and radiator ground strap (fig. 130) away from cross member.



A—Crankcase ventilating shutoff valves control
B—Choke control
C—Engine rear ground strap stud
D—Speedometer flexible shaft
E—Throttle control
F—Distributor primary wire support clip
G—Temperature gage cable connector
H—Distributor primary wire
J—Starter control rod
K—Brake master cylinder
L—Brake air-hydraulic cylinder
M—Muffler
N—Exhaust pipe clamp
P—Front muffler
Q—Starter magnetic switch
R—Oil pressure gage cable
S—Throttle - cross - shaft - to - carburetor rod
T—Coupling and elbow assembly

Figure 145. Front view of engine compartment with power plant removed.

g. Disconnect Procedures Inside Cab.

(1) *Remove cab floor tunnel.* Remove 12 cap screws (fig. 67) securing cab floor tunnel to cab floor, and remove tunnel.

(2) *Remove gearshift lever.* (fig. 149). Turn shift-lever-retainer cap screw outward (counterclockwise) one-half inch and lift gearshift lever and retainer from gear shifter housing cover.

Note. Cover opening in gear shifter housing cover to prevent entrance of dirt and foreign matter.

h. Removal Procedures.

(1) *Attach engine sling.* With engine sling (fig. 100) supported by suitable overhead hoisting equipment, insert hooks on ends of sling in lifting eyes (N and GG, fig. 122) at left front end of front cylinder head and right rear end of rear cylinder head.

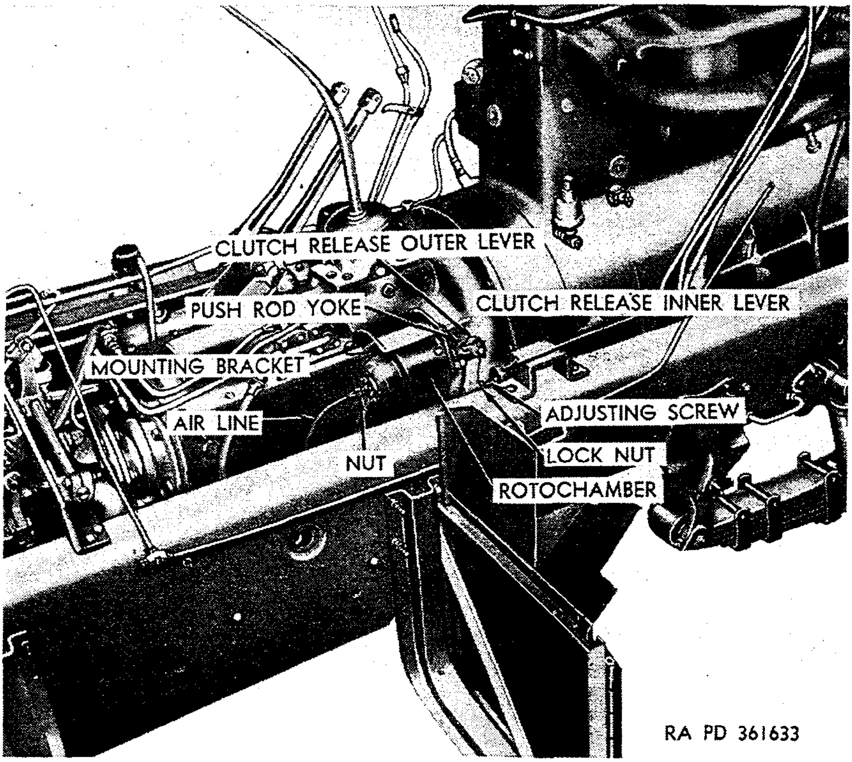


Figure 146. View of upper right front section of transmission with roto chamber.

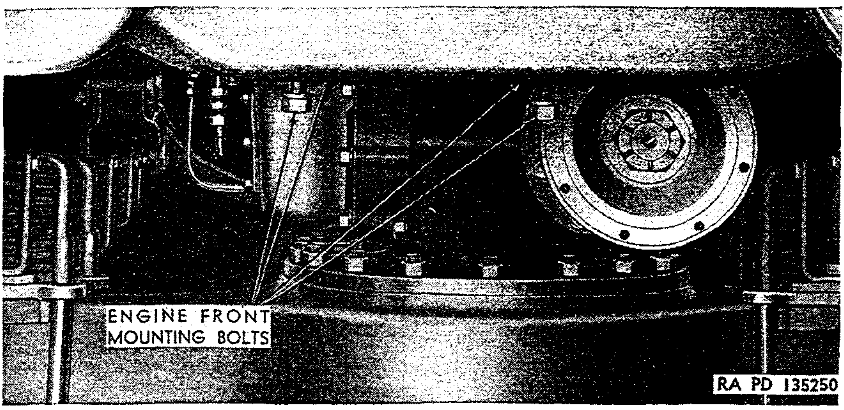
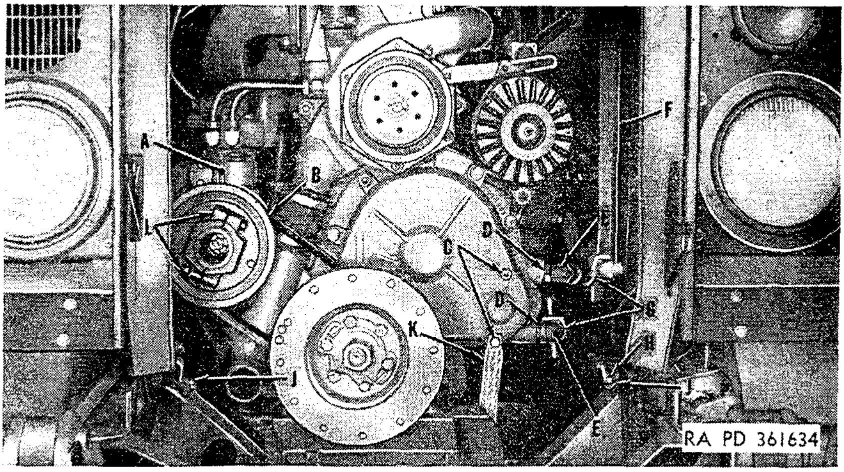


Figure 147. Engine front mounting.

(2) *Check power plant disconnect points.* Check to be sure that all disconnect procedures have been accomplished and that all accessories and lines are clear of power plant.

(3) *Remove power plant.* Carefully lift power plant, using a series of short lifts, until radiator and front engine support bracket will clear front of vehicle. Continue to raise power



A—Air compressor
B—Compressor drive pulley
C—Cap screw
D—Bushing
E—Elbow
F—Steering gear hydraulic oil reservoir
G—Self-sealing coupling
H—Ground strap retaining bolt
J—Front fender ground strap
K—Engine front ground strap
L—Cap screws

Figure 148. Front view of engine with radiator removed.

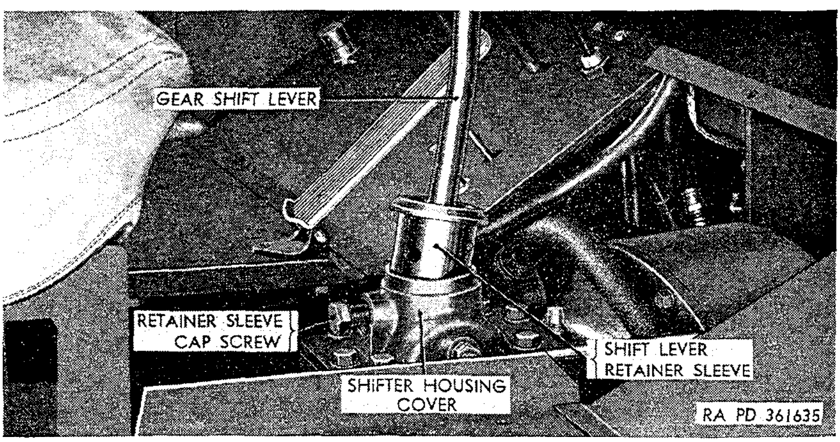


Figure 149. Removing gearshift lever.

plant slowly, at the same time, moving it forward (fig. 150), until the power plant is free of the vehicle.

Caution: Do not rest weight of engine on oil pan; to do so may crack or crush the oil pan.

115. Installation

a. Preliminary Procedures.

(1) *Inspect power plant.* Check the following parts and accessories included with the power plant, giving particular at-

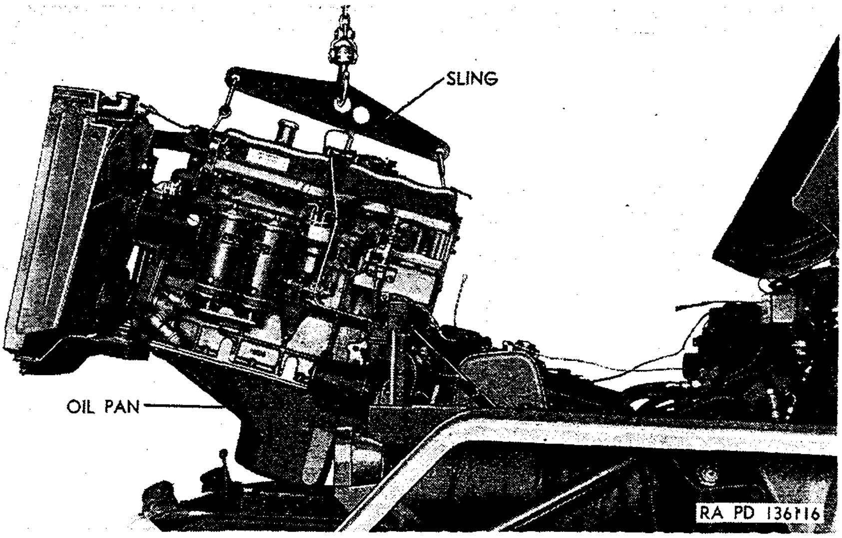


Figure 150. Lifting power plant from truck.

tention to any components replaced after removal of the power plant from the vehicle, to be sure that adjustment and/or installation were accomplished correctly:

(*a*) *Air compressor.* Refer to paragraph 233.
(*b*) *Carburetor.* Refer to paragraph 121.
(*c*) *Distributor.* Refer to paragraph 147.
(*d*) *Fuel pump.* Refer to paragraph 123.
(*e*) *Generator.* Refer to paragraph 150.
(*f*) *Oil filters.* Refer to paragraph 111.
(*g*) *Radiator.* Refer to paragraph 135.
(*h*) *Starter.* Refer to paragraph 142.
(*i*) *Steering gear hydraulic pump.* Refer to paragraph 247.
(*j*) *Transmission.* Refer to paragraph 205.

(2) *Attach engine sling.* With engine sling (fig. 100) supported by suitable engine lifting equipment, insert hooks on ends of sling in lifting eyes (N and GG, fig. 122) at left front end of front cylinder head and right rear end of rear cylinder head.

b. *Installation Procedures.*

(1) *Lift power plant into truck.* Lift power plant high enough to clear front of truck and move part way into engine compartment (fig. 150). Check to be sure that all lines and accessories are clear of power plant. Continue to lower power plant slowly, at the same time, moving it further into the engine compartment, until mounting bosses on left and right sides of flywheel housing are directly above, but not sup-

ported by, the engine rear mounts attached to the left and right frame side rails.

Note. Do not rest power plant solidly on engine mounts until (2) (*a*) and (*b*) below are accomplished.

(2) *Aline power plant and install mounting bolts.*

(*a*) With tension on engine lifting sling, aline holes in engine front mounting support with holes in front cross member and install four lockwashers and cap screws (fig. 147), turning screws in only four or five threads.

(*b*) With tension on engine lifting sling, aline holes in flywheel housing mounting bosses with engine rear mounts, insert two cap screws (D, fig. 138), one on each side, and loosely install safety nuts (fig. 118) on cap screws.

(*c*) Completely lower power plant, tighten front mounting cap screws, and tighten nuts on rear mounting cap screws. Remove engine lifting sling from engine.

c. Connect Procedures Under Vehicle.

(1) *Connect transmission-to-transfer propeller shaft.* Position universal joint journal adapter flange (fig. 141) against companion flange at rear of transmission, aline mounting bolt holes in flange and adapter, and insert eight bolts in holes. Install eight safety nuts on bolts and tighten.

(2) *Install power-take-off.* Refer to paragraph 209*e* (M51 only) or paragraph 209*c* (vehicles equipped with front winch only).

(3) *Connect transmission-to-transfer air shift lines.* Connect flexible air shift lines (fig. 144) attached to left front of transfer case to rigid air shift lines at top rear of transmission. Tighten connectors.

(4) *Connect clutch linkage.* Position yoke on lower end of clutch control rod over clutch release lever and secure with yoke pin (fig. 142).

(5) *Connect brake pedal return spring.* Insert lower end of brake pedal return spring in hole in bracket (fig. 142) on left rear side of engine flywheel housing.

(6) *Connect engine starter primary cable.* Install starter primary cable (fig. 131) on upper terminal on left side of starter magnetic switch (Q, fig. 145) and secure with terminal nut.

(7) *Connect engine starter cable.* Install starter cable (fig. 131) on terminal on top of starter magnetic switch (Q, fig. 145) and secure with terminal nut.

(8) *Connect clutch-control-valve-to-roto chamber air line* (M62 only). Position clutch-control-valve-to-roto chamber air line (fig. 146) at rear of roto chamber, and tighten connector.

(9) *Connect front ground straps.* Slide terminals on ends of radiator ground strap and engine front ground strap (fig.

130) under head of ground strap retaining bolt (H, fig. 148) and tooth-type lockwasher at top left side of frame front cross member. Tighten bolt.

d. Connect Procedures at Right Side of Engine.

(1) *Connect engine oil pressure gage sending unit.* Insert bayonet-type connector on oil-pressure-gage cable (R, fig. 145) in terminal socket on oil pressure gage sending unit (fig. 131), and rotate connector clockwise to lock connector pins in socket slots.

(2) *Connect engine exhaust pipe.* Install new exhaust-pipe-flange sealing ring at upper end of exhaust pipe, slip exhaust pipe mounting flange (Z, fig. 122) over the four nuts and washers on exhaust pipe mounting studs, and rotate flange so that small holes are alined with washers under mounting nuts. Tighten nuts.

(3) *Connect air-cleaner-to-air-compressor-intake line (vehicles equipped with air - cleaner - to - air - compressor - intake line only).* Slide front end of air-cleaner-to-air-compressor-intake line (X, fig. 119) over intake sleeve at compressor air strainer (fig. 140), and tighten clamp screw.

(4) *Connect air-compressor-to-air-reservoir line.* Connect air-compressor-to-air-reservoir line (fig. 140) at top rear of air compressor cylinder head, and tighten flare nut.

(5) *Connect crankcase-and-distributor-to-air-cleaner vent line.* Slide air cleaner outlet hose (B, fig. 119) over end of crankcase-and-distributor-to-air-cleaner vent line (fig. 131) and tighten hose clamp (D, fig. 119).

(6) *Connect crankcase-ventilating-shutoff-valve control (vehicles equipped with manually controlled crankcase ventilating system* (par. 106*a*(7)) *only).* Position shutoff-valve control on bracket (S, fig. 119) at right rear of carburetor mounting flange, secure with clip, and tighten nut on clip retaining bolt. Insert shutoff-valve control wire (W, fig. 119) in hole in shutoff-valve-lever swivel pin but do not tighten retaining screw.

(7) *Connect primer pump injection line (vehicles equipped with fuel primer pump only).* Connect line from primer pump to cylinder-head priming tee (Q, fig. 119) at left of carburetor, and tighten connector.

(8) *Connect choke control.* Refer to paragraph 121*c*(3).

(9) *Connect throttle-cross-shaft-to-carburetor rod.* Refer to paragraph 121*c*(9).

(10) *Connect air-cleaner-to-carburetor-inlet hose.* Slide air-cleaner-to-carburetor-inlet hose (C, fig. 119) over air inlet sleeve on rear of carburetor, and tighten hose clamp (E, fig. 119).

(11) *Connect flywheel-housing-to-air-cleaner vent line (vehicles equipped with flywheel housing ventilating system only).* Slide air cleaner outlet hose over flywheel-housing-vent line (fig. 131 or 139) at rear lower right side of engine and tighten hose clamp.

(12) *Connect engine temperature gage sending unit.* Insert cable connector (G, fig. 145) on end of temperature gage cable in terminal socket on temperature gage sending unit (E, fig. 122) and rotate connector clockwise to lock connector pins in socket slots.

(13) *Connect air-compressor-to-governor line.* Connect air-compressor-to-governor line (T, fig. 122) to left side of air governor (A, fig. 122), and tighten connector.

e. Connect Procedures at Left Side of Engine.

(1) *Connect fuel pump inlet line.* Connect fuel-pump-to-fuel-filter flexible line (N, fig. 138) to fuel-pump-to-fuel-filter rigid line (L, fig. 138), and tighten connector nut.

(2) *Connect crankcase-ventilating-shutoff-valve control (vehicles equipped with manually controlled crankcase ventilating system* (par. 106*a*(7)) only). Install shutoff-valve-control mounting bracket (fig. 137) on studs at top rear of water inlet header and secure with two retaining nuts and washers. Insert shutoff-valve control wire (fig. 137) in hole in shutoff-valve-lever swivel pin but do not tighten retaining screw.

(3) *Connect starter linkage.* Release starter control rod (par. 114*d*(6)), position yoke on bellcrank (R, fig. 138), and secure with yoke pin and cotter pin.

(4) *Connect engine rear ground strap.* Position terminal on end of engine rear ground strap (H, fig. 135) on stud (C, fig. 145), at front of cab cowl, and install tooth-type lockwasher and nut on stud. Tighten nut.

(5) *Connect steering gear hydraulic lines.* Connect steering gear hydraulic lines (fig. 151) to inlet and outlet connections at steering gear hydraulic pump (fig. 130), and tighten self-sealing couplings (fig. 135).

(6) *Connect generator-to-regulator cable.* Connect generator-to-regulator cable to receptacle on top of generator (fig. 136) and tighten connector.

(7) *Connect distributor primary wire.* Install distributor primary wire support clip (F, fig. 145) on left front breather connector retaining nut and lockwasher. Insert distributor primary wire (F, fig. 135) in primary lead-in at rear of distributor and tighten connector.

(8) *Connect tachometer flexible shaft.* Insert end of tachometer flexible shaft (fig. 151) in tachometer sending unit (fig. 135) at front of distributor drive housing and tighten connector.

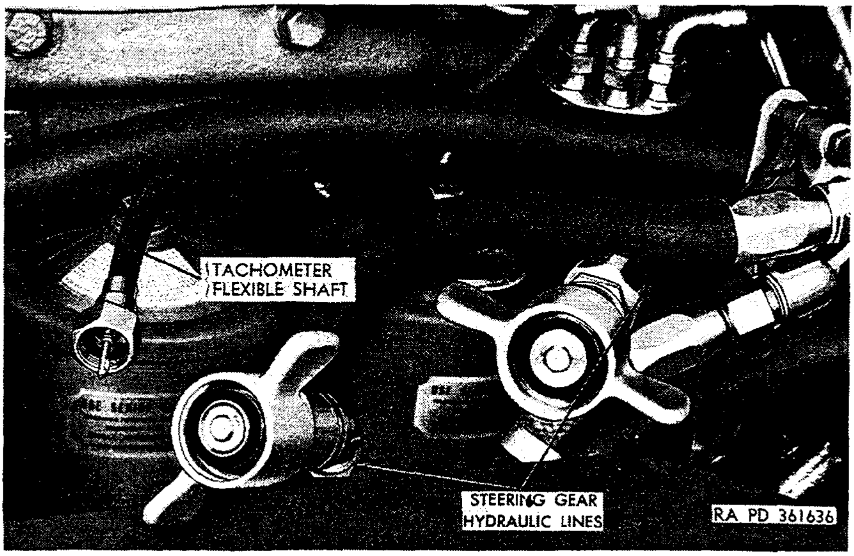


Figure 151. Steering gear hydraulic lines and tachometer drive cable (disconnected) at left side of engine.

f. Connect Procedures at Front of Vehicle.

(1) *Install radiator upper shield.* Refer to paragraph 135*b*(6).

(2) *Install brush guard.* Slide guard-to-frame-bracket bolts (fig. 134) on bottom of brush guard into slots in top of left and right frame brackets. Push top of brush guard toward rear of truck and engage slots in left and right braces with bolts in brush guard. Tighten guard-to-frame-bracket nuts and bolts and guard-to-brace nuts and bolts.

(3) *Install front winch level wind (vehicles equipped with front winch only).* Install front winch level wind (fig. 152) (par. 260).

g. Connect Procedures Inside Cab.

(1) *Install gearshift lever.* Install gearshift lever (fig. 149) and retainer, with hole in retainer toward rear of truck, in opening in top of gearshifter housing cover, aline hole in rear of retainer with retainer cap screw, and turn cap screw in as far as it will go. Position rubber lever grommet (removed with lever and retainer assembly) on shoulder of shifter housing cover to prevent entrance of dirt and foreign matter.

(2) *Install cab floor tunnel.* Position cab floor tunnel (fig. 67) over opening in cab floor, and install 12 cap screws. Tighten screws.

h. Adjustment and Service Procedures.

(1) *Adjust carburetor choke control.* Refer to paragraph 122*a*.

(2) *Adjust carburetor throttle control.* Refer to paragraph 122*c*.

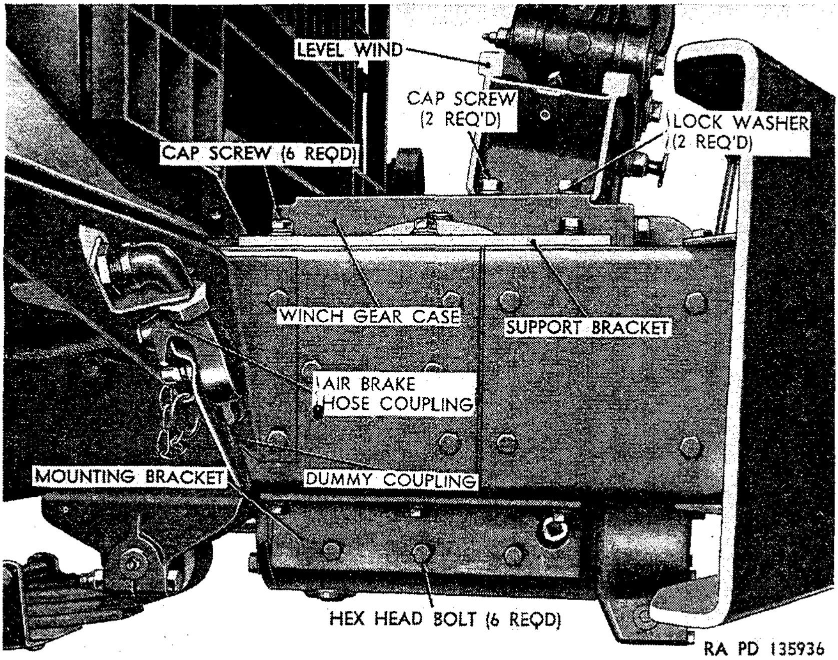


Figure 152. Installed view of front winch and level wind installed from right side of truck.

(3) *Adjust crankcase ventilating shutoff valves.* Adjust crankcase ventilating shutoff valves as follows (vehicles equipped with manually controlled crankcase ventilating system (par. 106*a*(7) only):

(*a*) Push crankcase ventilating shutoff valves control (JJ, fig. 65) in against instrument panel as far as it will go.

(*b*) Move levers on both crankcase ventilating shutoff valves (U, fig. 119 and fig. 137) to the open position.

(*c*) Tighten screws securing shutoff valves control wires to swivel pins at shutoff valve levers.

(4) *Connect battery ground cable* (fig. 133). Remove cap screw and tooth-type lockwasher from outside of frame right side rail under right rear corner of truck cab. Remove tape from battery ground cable terminal, position terminal on frame side rail, and install cap screw and lockwasher. Tighten cap screw.

i. Inspection and Test.

(1) *Check power plant connect points.* Check to be sure that all connect procedures have been accomplished.

(2) Start engine (par. 45) and check power plant controls for proper operation and observe instruments for normal readings.

(3) If operation of engine, controls, and instruments is satisfactory, proceed as in *j* below. If (2) above discloses any evidence of malfunctioning, proceed as outlined in paragraphs 78 through 92.

j. Hood Installation (fig. 132).

(1) Position left and right hood side panels so as to engage hinges (H), push top edges of panels toward engine, and engage front and rear latches (F) to lock panels in raised position.

(2) Remove left windshield holddown catch (E) from eye of top panel hook, lower hood top panel (B) to closed position, and engage hood top panel holddown catches (A) to lock hood in closed position.

k. Record of Replacement. Record the replacement on DA Form 478, Organizational Equipment File.

Section VII. ENGINE REMOVAL AND INSTALLATION

116. Coordination With Ordnance Maintenance Unit

Refer to paragraph 2.

117. Removal

a. General. Removal or replacement of the engine requires removal of the power plant.

b. Remove Power Plant. Refer to paragraph 114.

c. Remove Transmission. Refer to paragraph 205.

d. Remove Clutch. Refer to paragraph 203.

e. Remove Radiator. Refer to paragraph 135.

f. Remove Engine Accessories. Remove the following engine parts and accessories which are not included with the engine assembly:

(1) *Remove engine front ground strap.* Remove bottom cap screw (C, fig. 148) and tooth-type lockwasher from front of timing gear cover and remove engine front ground strap (K, fig. 148).

(2) *Remove steering gear hydraulic pump.* Remove remaining cap screw (C, fig. 148) from front of timing gear cover and remove steering gear hydraulic pump (fig. 130) from rear of crankcase end plate.

(3) *Remove engine rear ground strap.* Remove cap screw and tooth-type lockwasher at center of oil cooler housing and remove engine rear ground strap (H, fig. 135). Replace cap screw and lockwasher to prevent loss.

(4) *Remove air compressor.*

(*a*) Unscrew connectors (fig. 153) at right side of water pump housing, and remove water inlet line and water outlet line from housing.

(*b*) Remove four nuts (fig. 154) and lockwashers from compressor bracket mounting studs at front lower right side

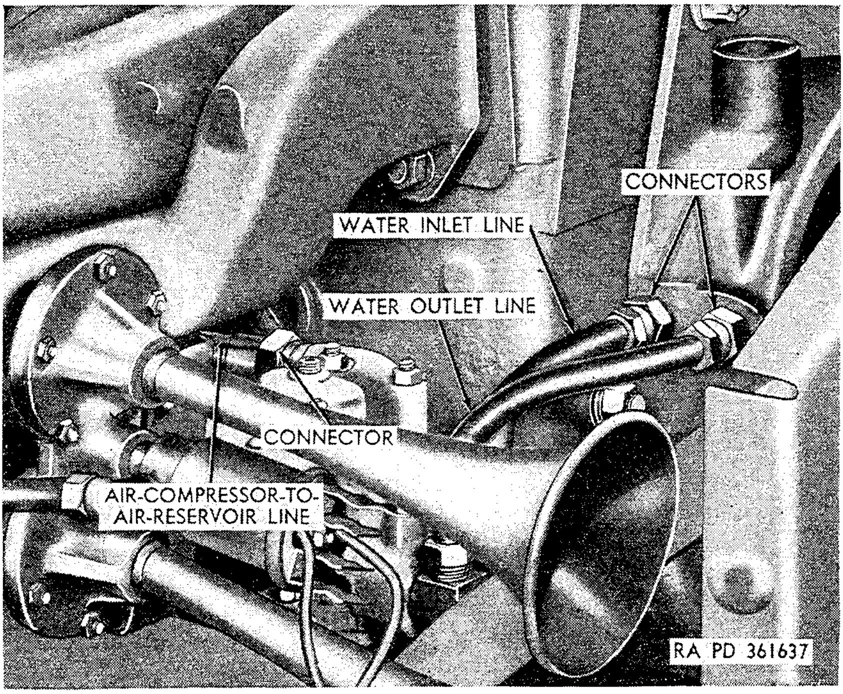


Figure 153. Air compressor lines and connectors.

of crankcase, remove drive belt from compressor pulley, and slide compressor and bracket off mounting studs. Remove and discard mounting bracket gasket.

(5) *Remove fan assembly.* Refer to paragraph 137.

(6) *Remove fuel pump inlet line.* Unscrew nut from elbow at rear of fuel pump (A, fig. 138) and remove fuel-pump-to-fuel-filter flexible line (K, fig. 138).

(7) *Remove starter cable and primary wire assembly.* Remove nut from left terminal stud on front of starter manual switch (M, fig. 138), remove primary wire (L, fig. 138), and replace nut on stud to prevent loss. Remove nut (fig. 117) and washer from terminal stud on left side of starter housing, remove starter cable, and replace nut and washer on stud to prevent loss.

(8) *Remove oil pressure gage sending unit* (fig. 139). Unscrew oil pressure gage sending unit from threaded hole at rear lower right side of crankcase.

118. Installation

a. Install Engine Accessories. Install the following engine parts and accessories which are not included with the engine assembly:

(1) *Install oil pressure gage sending unit* (fig. 139). Screw threaded end of oil pressure gage sending unit in hole at rear lower right side of crankcase.

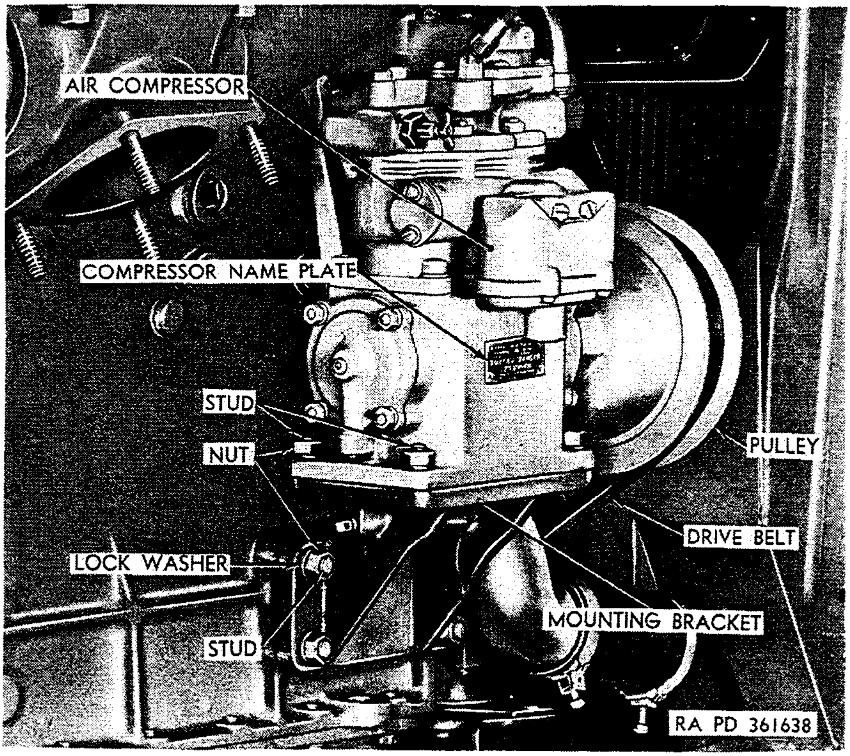


Figure 154. Air compressor mounting.

(2) *Install starter cable and primary wire assembly.* Remove nut from left terminal stud on front of starter manual switch (M, fig. 138), install primary wire (L, fig. 138) on stud, and install terminal nut on stud and tighten. Remove terminal nut (fig. 117) and washer from terminal stud on left side of starter housing, install starter cable terminal on stud, and install terminal nut and washer on stud. Tighten nut.

(3) *Install fuel pump inlet line.* Screw threaded end of fuel-pump-to-fuel-filter flexible line (K, fig. 138) in elbow at rear of fuel pump (A, fig. 138).

(4) *Install fan assembly.* Refer to paragraph 137.

(5) *Install air compressor.*

(*a*) Install new mounting bracket gasket on studs (fig. 154) at front lower right side of crankcase, and slide compressor and mounting bracket on studs.

(*b*) Place drive belt (fig. 154) on compressor pulley, and install four washers and nuts on mounting bracket studs. Tighten nuts.

(*c*) Screw connectors (fig. 153) on water inlet and outlet lines into connectors installed in right side of water pump housing, and tighten.

(6) *Install engine rear ground strap.* Remove cap screw and washer at center of oil cooler housing, install ground strap (H, fig. 135) on cap screw, and install cap screw at center of oil cooler housing.

(7) *Install steering gear hydraulic pump.* Position steering gear hydraulic pump (fig. 130) on rear of crankcase end plate and install upper cap screw (C, fig. 148) in front of timing gear cover. Do not tighten cap screw.

(8) *Install engine front ground strap.* Position engine front ground strap (K, fig. 148) at lower hole in front of timing gear cover and install tooth-type lockwasher and cap screw (C, fig. 148). Tighten both upper and lower cap screw.

b. Install Radiator. Refer to paragraph 135.

c. Install Clutch. Refer to paragraph 203.

d. Install Transmission. Refer to paragraph 205.

e. Install Power Plant. Refer to paragraph 115.

Section VIII. FUEL SYSTEM

119. Description and Data

a. Description.

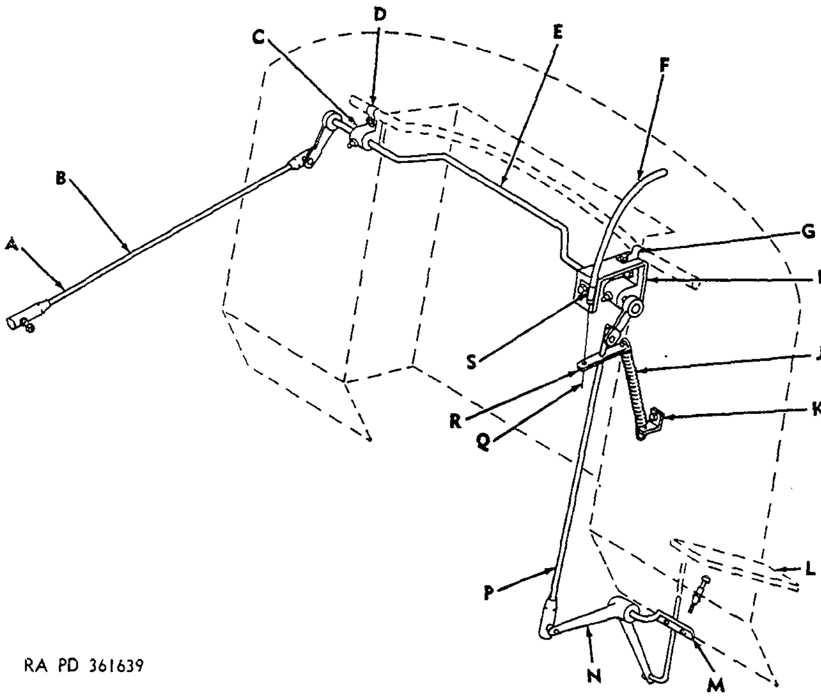
(1) *General.* The fuel system for the vehicles covered by this manual consists of an air cleaner, carburetor (with integral engine speed governor) carburetor controls and linkage, fuel lines, fuel pump, fuel filter, fuel tanks, governor valve, and primer pump. In addition, a separate governor valve is provided on the medium wrecker truck M246 for controlling engine speed during wrecker crane operation.

(2) *Air cleaner.* The oil-bath-type air cleaner (GG, fig. 122), mounted on the right front side of the cab cowl, is connected to the intake sleeve at the rear of the carburetor by a molded rubber hose. Separate hoses and lines connect the air cleaner to the crankcase, distributor, steering gear fluid reservoir, brake master cylinder, fuel tanks, and, on some vehicles, to the transmission and air compressor. This insures that only clean air is admitted to the engine and accessories for combustion and/or ventilation.

(3) *Carburetor.* The downdraft-type dual concentric carburetor (fig. 131) is mounted at the top center of the intake manifold. The engine-speed governor is an integral part of the carburetor and is actuated by an external governor valve ((8) below).

(4) *Carburetor controls and linkage.*

(*a*) *Carburetor throttle controls* (figs. 65 and 155). Movement of the carburetor throttle valve plates is controlled



A—Ball joint
B—Throttle-cross-shaft-to-carburetor rod.
C—Throttle cross-shaft bracket.
D—Wiring harness clip.
E—Throttle cross shaft.
F—Throttle control.
G—Wiring harness clip.
H—Throttle cross-shaft bracket.
J—Return spring.
K—Return spring clip.
L—Accelerator pedal.
M—Lever bracket.
N—Accelerator - pedal-rod-to-throttle-cross-shaft-link lever.
P—Throttle - cross - shaft-to-accelerator-pedal-rod-lever rod.
Q—Throttle control wire.
R—Cross-shaft link clip.
S—Throttle-control-supporting-bracket clip.

Figure 155. Carburetor throttle control linkage.

by either the accelerator pedal or the throttle control, both of which are connected to the throttle linkage mounted on the front side of the cab cowl.

(*b*) *Carburetor choke control.* Movement of the carburetor choke valve plate is controlled by the choke control (GG, fig. 65) which extends from the instrument panel to the choke valve plate lever at the left side of the carburetor.

(5) *Fuel pump* (A, fig. 138). The diaphragm-type fuel pump, mounted on the lower left side of the crankcase, is mechanically operated by the engine camshaft. The fuel pump is equipped with a hand-operated priming lever to permit manual pumping of fuel to the carburetor when the engine is stopped.

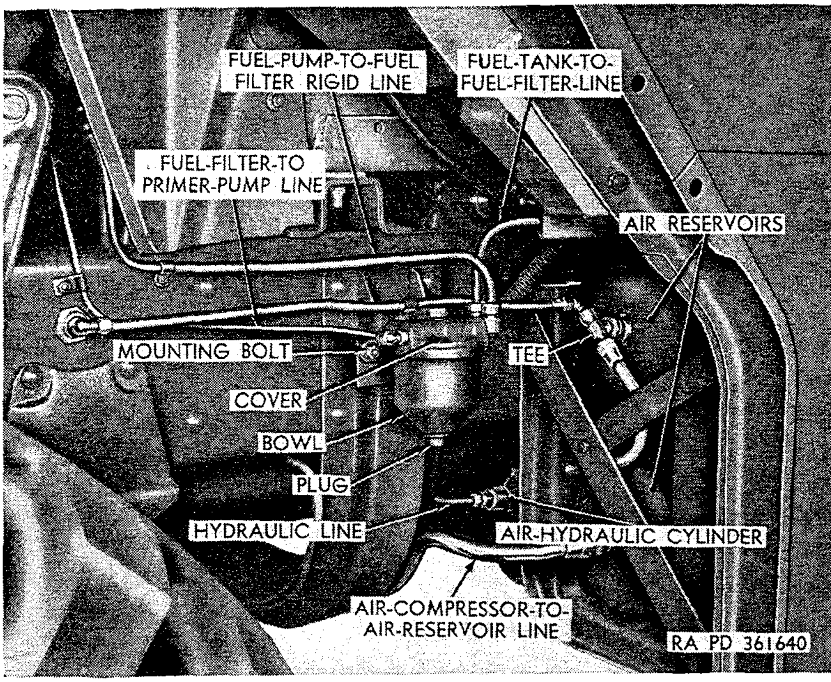


Figure 156.—Fuel filter installed under left front fender.

(6) *Fuel filter* (fig. 156). The fuel filter, mounted on the outside of the frame right side rail under the left front fender, consists of a removable strainer element encased in a metal bowl.

(7) *Fuel tanks* (fig. 133). The fuel tanks are mounted on supports bolted to the left and/or right frame side rails and are secured by two metal straps. Models M51, M52, and M61 are equipped with two 55-gallon capacity tanks. Models M40, M41, M54, M62, M139, M139c, and M246 are equipped with one 78-gallon capacity tank.

(8) *Governor valves.*

(*a*) *Engine-speed governor valve* (M, fig. 135). The engine-speed governor valve is mounted on the rear of the distributor drive housing. Adjustment of this valve determines the speed (rpm) at which the engine-speed governor closes the carburetor throttle valve plates to prevent operation of the engine at excessive speeds.

(*b*) *Pump governor valve* (M62). Refer to paragraph 268*a*(4).

(*c*) *Pump governor valve* (M246). Refer to paragraph 268*a*(4).

(9) *Primer pump.* The plunger-type manually operated primer pump (KK, fig. 65) is mounted on the instrument panel and

is connected to the fuel filter and intake manifold fuel injection line.

Note. The primer pump is not furnished as standard equipment on current production vehicles.

b. Data.

(1) *Air cleaner.*

Make	Donaldson
Model number	B-1006

(2) *Carburetor.*

Make	Holley
Model number	885 JJSG

(3) *Fuel pump.*

Make	AC
Type	BF
Model number	1539627

(4) *Fuel filter.*

Make	AC
Type	T-2
Model number	1595849

(5) *Fuel tanks.*

Make	Michiana
Model number:	
(55 gal)	D-10061
(70 gal)	D-10125

(6) *Governor valves.*

Make	Holley
Model:	
Engine speed governor valve	79R-264A
Pump governor valve (M62 only)	79R-290A
Pump governor valve (M246 only)	79R-290A

(7) *Primer pump.*

Make	Dole valve
Model number	PR-26

120. Air Cleaner

a. Servicing. Servicing of the air cleaner consists of draining, cleaning, and filling the oil cup, and of cleaning the filter mesh inside the body of the cleaner as shown in (1) through (8) below.

(1) Support oil cup (Z, fig. 119) at bottom of air cleaner and loosen thumb screw sufficiently to release oil cup from retaining clamp Remove cup from air cleaner body (A, fig. 119).

(2) Pour old oil from cup and clean cup (par. 75).

(3) Fill oil cup with clean oil to correct level (par. 67).

(4) Remove air cleaner body (A, fig. 119) from cab cowl (*b* below).

(5) Submerge air cleaner body in dry-cleaning solvent (par. 75) and rapidly move cleaner body up and down in solvent to clean filter mesh inside cleaner body.

(6) Remove air cleaner body from dry-cleaning solvent and let drip dry.

(7) When dry, install air cleaner body on right front side of cab cowl (*c* below).

(8) Position oil cup at bottom of air cleaner body and tighten oil-cup-retaining-clamp thumb screw.

b. Removal.

(1) Remove oil cup (*a*(1) above).

(2) Loosen hose clamp securing air-cleaner-to-carburetor-inlet hose (C, fig. 119) to air-cleaner outlet sleeve, and remove hose.

(3) Loosen hose clamp at upper end of air-cleaner-to-air-compressor intake line (X, fig. 119) and remove line from air cleaner outlet tube (vehicles equipped with air-cleaner-to-air-compressor intake line hose only).

(4) Loosen hose clamp at upper end of air cleaner outlet hose (B, fig. 119) and remove from air cleaner outlet tube.

(5) Unscrew three connectors from coupling-and-elbow assembly (T, fig. 145) at left side of air cleaner body, and disconnect three vent lines.

(6) Remove two screws and nuts, one each from upper and lower air cleaner mounting bands (AA, fig. 119), spread bands to permit removal of cleaner body (A, fig. 119), and remove cleaner body from cab cowl.

c. Installation.

(1) Position air cleaner body (A, fig. 119) on right front side of cab cowl, draw ends of upper mounting band together, install screw in holes in ends of band, install horn-line retaining clip on screw, install nut and tighten.

(2) Position three vent lines at coupling-and-elbow assembly (T, fig. 145) at left side of air cleaner body, and tighten connectors.

(3) Slide upper end of air cleaner outlet (B, fig. 119) on outlet tube at left side of air cleaner, and tighten hose clamp.

(4) Slide air-cleaner-to-air-compressor intake line (X, fig. 119) on outlet tube at front of air cleaner, and tighten hose clamp (vehicles equipped with air-cleaner-to-air-compressor intake line hose only).

(5) Slide air-cleaner-to-carburetor inlet hose (C, fig. 119) on outlet sleeve at left side of air cleaner, and tighten hose clamp.

(6) Install oil cup (*a*(8) above).

121. Carburetor

a. Adjustment.

(1) *Throttle adjusting screw adjustment.* The throttle adjusting screw (fig. 157), which controls the degree of throttle

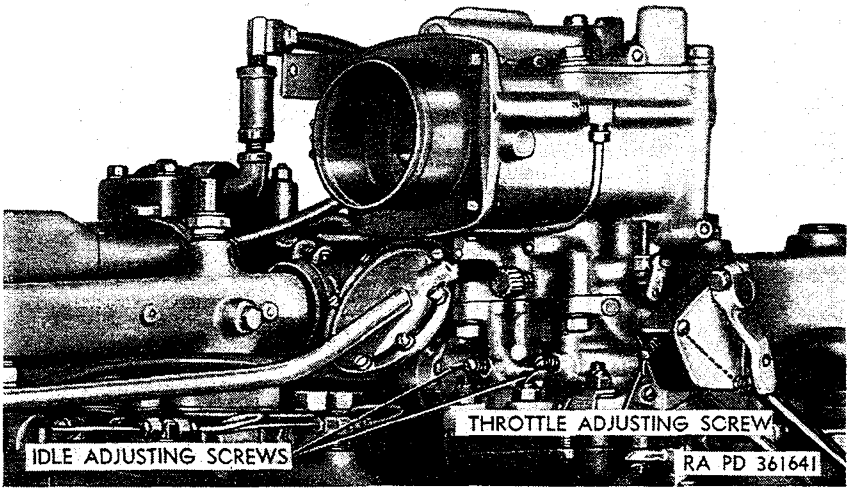


Figure 157. Right rear view of carburetor installed on engine.

valve plate opening when the throttle valve lever is in the idling position, is adjusted as stated in (*a*), (*b*), and (*c*) below.

(*a*) Start engine (par. 45).

(*b*) Check to be sure that the accelerator pedal is completely released and that the throttle control and choke control (T and GG, fig. 65) are pushed in against the instrument panel as far as they will go.

(*c*) Turn throttle adjusting screw (fig. 157) (clockwise to increase or counterclockwise to decrease engine idle speed) until the tachometer indicates engine idle speed of 400 rpm.

(2) *Idle adjusting screw adjustment* (*with vacuum gage*).

(*a*) Remove pipe plug (T, fig. 119) at right side of intake manifold, and install vacuum gage in pipe plug hole.

(*b*) Adjust throttle adjusting screw ((1) above).

(*c*) Turn idle adjusting screws (fig. 157), one at a time, until vacuum gage indicates highest steady manifold vacuum. Turning the idle adjusting screws in (clockwise) provides a leaner idle mixture, and turning the idle adjusting screws out (counterclockwise) provides a richer idle mixture.

(*d*) Check the idle adjusting screw settings (*1* and *2* below).

1. Turn one idle adjusting screw in (clockwise), counting the number of turns, until the needle valve on the end of the screw just touches the valve seat; then turn the adjusting screw out (counterclockwise) the same number of turns.

Caution: Do not turn the idle adjusting screw in far enough to jam the needle valve on the end of the screw against the valve seat. If this occurs, the needle valve will be damaged and will require replacement of the idle adjusting screw before satisfactory engine idle adjustment can be made.

2. Repeat operation (1 above) for other idle adjusting screw.

Caution: Both idle adjusting screws must be turned out the same number of turns (to provide equal clearance between the valve seats and adjusting-screw needle valves) to prevent poor performance in the engine speed range just above idling speed.

(*e*) If the idle mixture adjustment ((*c*) and (*d*) above) results in an increase in idling speed great enough to require resetting the throttle adjusting screw ((1) above), the idle adjusting screws must also be reset.

(*f*) When engine idle adjustment is satisfactory, stop the engine (par. 47).

(*g*) Unscrew vacuum gage at right side of intake manifold center section, install pipe plug (T, fig. 119) in threaded hole and tighten pipe plug securely.

(3) *Idle adjusting screw adjustment* (*without vacuum gage*).

(*a*) Adjust throttle adjusting screw ((1) above).

(*b*) Turn one idle adjusting screw (fig. 157) in (clockwise) until engine speed begins to drop; then turn the adjusting screw out (counterclockwise), counting the number of turns, until the engine speed again begins to drop.

(*c*) Set the idle adjusting screw halfway between the two points determined in (*b*) above.

(*d*) Repeat procedures (*b*) and (*c*) above for other idle adjusting screw, being sure that it is set equally with the first screw. Refer to (2) (*d*)*1* above for "caution."

(*e*) If idle mixture adjustment ((*b*), (*c*), and (*d*) above) results in an increase in idling speed great enough to require resetting the throttle adjusting screw, the idle adjusting screws must be reset. Refer to (2) (*d*) *2* above for "caution."

b. Removal.

(1) Loosen hose clamp (E, fig. 119) securing air-cleaner-to-carburetor-inlet hose (C, fig. 119) to air inlet sleeve on carburetor, and remove hose from sleeve.

(2) Remove nut from ball stud at back side of throttle valve plate lever (G, fig. 119), and remove throttle-cross-shaft-to-carburetor rod (B, fig. 155) from lever. Replace nut on ball stud to prevent loss.

(3) Unscrew connector securing fuel-pump-to-carburetor line (J, fig. 119) to elbow at front of carburetor, and remove line.

(4) Unscrew connector securing governor-valve-to-governor line (K, fig. 119) to governor air inlet at left side of carburetor, and remove line (all models except M62 and M246).

(5) Unscrew connector securing governor-valve-control-valve-to-governor line (EE, fig. 122) to governor air inlet at left side of carburetor, and remove line (M62 and M246).

(6) Unscrew connector securing carburetor-to-governor-valve line (F, fig. 119) to elbow at right rear of carburetor, and remove line (all models except M62 and M246).

(7) Unscrew connector securing carburetor-to-governor-valve line (DD, fig. 122) to tee at right rear of carburetor, and remove line (M62 and M246 only).

(8) Unscrew connector securing carburetor-to-governor-valve line (FF, fig. 122) to tee at right rear of carburetor, and remove line (M62 and M246 only).

(9) Loosen choke-lever-swivel screw (fig. 158) securing choke control wire to choke valve plate lever at left side of carburetor. Loosen choke-lever-bracket-clamp screw, and remove choke control from lever and bracket.

(10) Remove six safety nuts (R, fig. 119) from carburetor mounting studs at carburetor base, and remove carburetor from

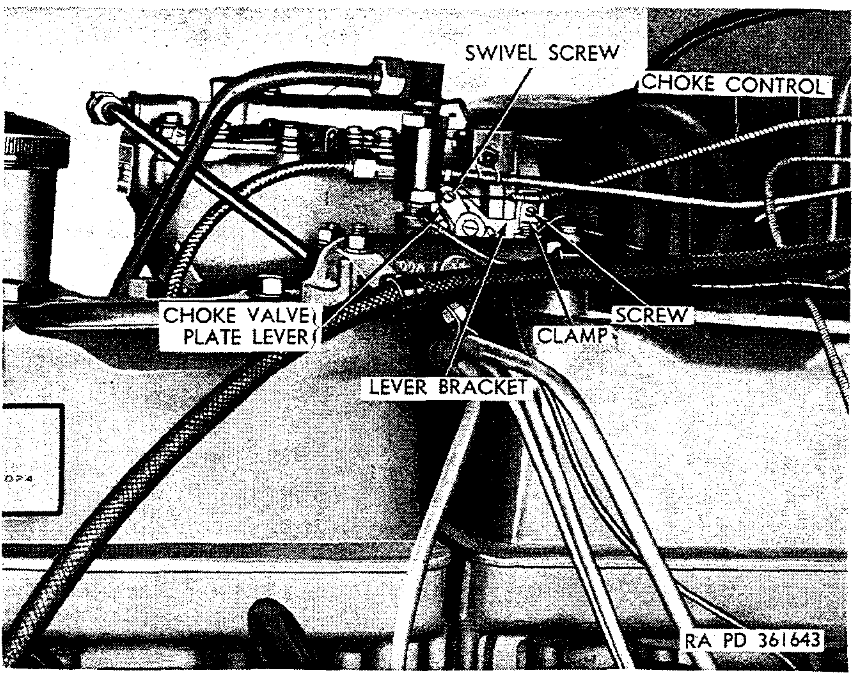


Figure 158. Top left rear view of carburetor installed on engine.

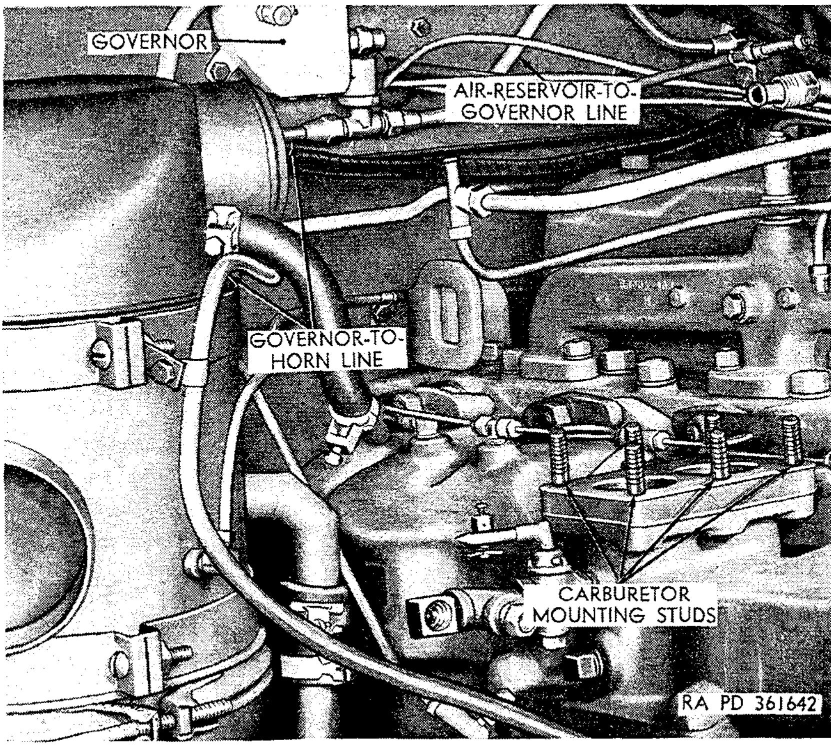


Figure 159. Upper right rear section of engine with carburetor removed.

intake manifold (P, fig. 119). Remove and discard carburetor-to-manifold gasket.

c. Installation.

Note. When installing new or rebuilt carburetor on M62 or M246, coordinate with ordnance maintenance personnel.

(1) Install new carburetor-to-manifold gasket on carburetor mounting studs (fig. 159) on top of intake manifold center section.

(2) Position carburetor on mounting studs on top of intake manifold, install six safety nuts (R, fig. 119) on studs, and tighten.

(3) Insert choke control wire in hole in end of choke lever swivel but do not tighten swivel screw. Position choke control (fig. 159) under choke-lever-bracket clamp and tighten clamp screw.

(4) Position carburetor-to-governor-valve line (F, fig. 119) at elbow at right rear of carburetor, and tighten connector (all models except M62 and M246).

(5) Position carburetor-to-governor-valve line (DD, fig. 122) at tee at right rear of carburetor, and tighten connector (M62 and M246 only).

(6) Position carburetor-governor-valve line (FF, fig. 122) at tee at right rear of carburetor, and tighten connector (M62 and M246 only).

(7) Position governor-valve-control-valve-to-governor line (EE, fig. 122) at governor air inlet on left side of carburetor, and tighten connector (M62 and M246 only).

(8) Position governor-valve-to-governor line (K, fig. 119) at governor air inlet on left side of carburetor, and tighten connector (all models except M62 and M246).

(9) Position fuel pump-to-carburetor line (J, fig. 119) at elbow at front of carburetor, and tighten connector.

(10) Remove nut from ball stud at end of throttle-cross-shaft-to-carburetor rod (B, fig. 155), insert ball stud in hole at end of throttle valve lever (G, fig. 119), install nut on stud and tighten.

(11) Slide air-cleaner-to-carburetor-inlet hose (C, fig. 119) over air inlet sleeve at rear of carburetor, and tighten hose clamp (E, fig. 119).

(12) Adjust choke control (par. 122*a*).

(13) Adjust throttle control (par. 122*c*).

(14) Adjust carburetor (*a* above).

122. Carburetor Controls and Linkage

a. Choke Control.

(1) *General.* The choke control is in proper adjustment when the choke control valve plate inside the carburetor air horn is in the wide-open position and the control knob (GG, fig. 65) is in against the instrument panel as far as it will go.

Note. A line is provided on the left end of the choke valve plate shaft to indicate the position of the valve plate.

(2) Adjustment.

(*a*) Loosen swivel screw (fig. 158) securing choke control wire to choke lever.

(*b*) Push choke control (GG, fig. 65) in against instrument panel as far as it will go.

(*c*) Move upper end of choke valve plate lever (fig. 158) forward as far as it will go and tighten swivel screw.

(3) *Removal.*

(*a*) Loosen swivel screw (fig. 158) securing choke control wire to choke valve plate lever.

(*b*) Loosen choke-lever-bracket-clamp screw (fig. 158) and remove choke control from choke valve plate lever and lever bracket.

(*c*) Remove nut and lockwasher from choke control at back side of instrument panel, and pull chose control assembly from cab cowl and front of instrument panel.

(4) *Installation.*

(*a*) Insert choke control (GG, fig. 65) in hole in instrument panel and install lockwasher and retaining nut on choke control at back side of instrument panel. Position choke control knob so that lettering on face of knob is in horizontal position and tighten retaining nut.

(*b*) Push free end of control wire conduit through hole in rubber grommet in cab cowl.

(*c*) Pull free end of choke control (fig. 158) (from front side of cab cowl) until choke control wire reaches choke valve plate lever. Position control under lever-bracket clamp, and insert end of control wire in hole in choke valve plate lever swivel.

(*d*) With choke control (GG, fig. 65) in against instrument panel as far as it will go, move upper end of choke valve plate lever (fig. 158) forward as far as it will go, and tighten swivel screw and lever-bracket-clamp screw.

b. Throttle Control Linkage.

(1) *General.* The throttle control linkage is in proper adjustment when movement of accelerator pedal through its full range of travel causes the throttle valve plate lever to move through its full range of travel.

(2) *Adjustment.*

(*a*) Adjust throttle adjusting screw (par. 121*a*(1)).

(*b*) Remove nut from ball stud at back side of throttle valve plate lever (G, fig. 119) and remove throttle-cross-shaft-to-carburetor rod (B, fig. 155) from throttle valve plate lever.

Note. When the throttle-cross-shaft-to-carburetor rod is removed from the throttle valve plate lever, the lever will be moved automatically to the WIDE-OPEN throttle position due to action of the governor spring inside the engine speed governor mounted on the left side of the carburetor.

(*c*) Depress accelerator pedal (SS, fig. 65) until underside of pedal contacts the head of the pedal stop screw, and hold pedal in the completely depressed position.

(*d*) Raise the front end of the throttle-cross-shaft-to-carburetor rod and check to see whether the ball stud can be inserted in hole at lower end of throttle valve plate lever without changing the length of the rod.

Caution: Do not move the lower end of the throttle valve plate lever toward the rear of the truck in order to insert the ball stud.

(*e*) If necessary, adjust length of throttle-cross-shaft-to-carburetor rod (*1* and *2* below), otherwise, proceed as in (*f*) below.

1. Loosen jam nut at rear of ball joint (A, fig. 155) on forward end of throttle-cross-shaft-to-carburetor rod (B, fig. 155), and turn ball joint (clockwise to shorten or counterclockwise to lengthen the control rod) until ball stud can be connected to throttle valve plate lever without moving either the rod or lever.

2. Tighten jam nut at rear of ball joint. Release accelerator pedal.

(*f*) Insert ball stud on front end of throttle-cross-shaft-to-carburetor rod in hole at lower end of throttle valve plate lever, install nut on stud at back side of lever, and tighten nut.

c. Throttle Control.

(1) *General.* The throttle control is in proper adjustment when the throttle control linkage is properly adjusted (*b* above) and the throttle control (T, fig. 65) can be pulled out approximately one-eighth inch before starting to actuate the throttle valve plate lever (G, fig. 119) on right side of carburetor.

(2) *Adjustment.*

(*a*) Adjust throttle control linkage (*b* above).

(*b*) Loosen screw securing collar (fig. 160) to throttle control wire.

(*c*) Position collar on throttle control wire (fig. 160) so that clearance of approximately one-eighth inch is maintained between top surface of collar and underside of cross-shaft-link clip when throttle valve plate lever (G, fig. 119) is in the idling position and the throttle control knob (T, fig. 65) is in against the instrument panel as far as it will go.

(*d*) Tighten throttle-control-wire-collar screw.

(3) *Removal.*

(*a*) Loosen screw securing collar (fig. 160) to throttle control wire and remove collar.

(*b*) Loosen nut and bolt securing throttle-control-supporting-bracket clip (S, fig. 155) to supporting bracket, and remove control from clip.

(*c*) Pull free end of throttle (fig. 160) through rubber bushing in cab cowl and into cab.

(*d*) Remove jam nut and lockwasher from throttle control (T, fig. 65) at back side of instrument panel, and pull throttle control from front of instrument panel.

(4) *Installation.*

(*a*) Insert throttle control (T, fig. 65) in hole in instrument panel and install lockwasher and jam nut on throttle control at back side of instrument panel. Position throttle control knob so that lettering on face of knob is in vertical position and tighten jam nut.

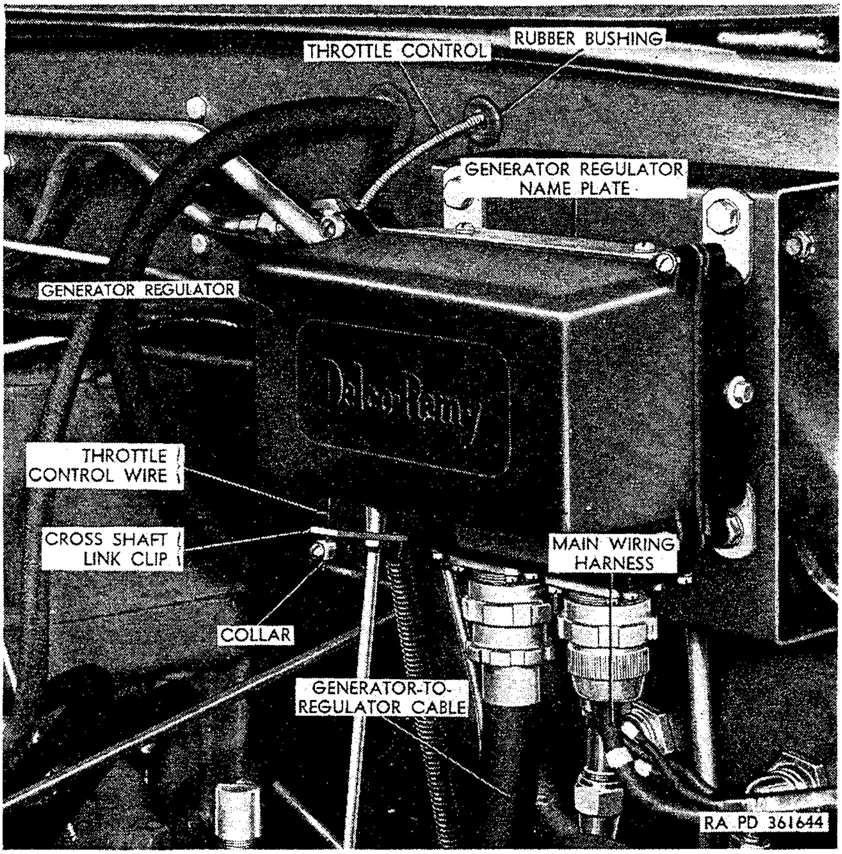


Figure 160. Front view of top right section of cab cowl.

(*b*) Push free end of throttle control (fig. 160) through bushing in cab cowl.

(*c*) Position control under throttle-control-supporting-bracket clip (S, fig. 155) push control wire (fig. 160) through hole in forward end of cross-shaft-link clip, and tighten nut and bolt securing clip to supporting bracket.

(*d*) Install collar (fig. 160) on control wire, and adjust throttle control ((1) above).

123. Fuel Pump

a. Testing. Condition of the fuel pump can be determined by two tests, both of which are performed while the unit is installed on the engine ((1) and (2) below).

(1) *Pressure test.*

(*a*) Unscrew connector at lower end of fuel-pump-to-carburetor line (J, fig. 119) and remove line from outlet side of fuel pump (A, fig. 138).

(*b*) Install pressure gage at outlet side of fuel pump.

(*c*) Start engine (par. 45) and set throttle at 900 rpm. Observe fuel pump pressure indicated by gage. If pressure indicated by gage is within specified limits (4 to 5 psi), proceed as in (*e*) and (*f*) below; otherwise, replace fuel pump.

(*d*) Stop engine (par. 47).

(*e*) Remove pressure gage from outlet side of fuel pump, position fuel-pump-to-carburetor line at pump outlet, and tighten connector.

(*f*) Perform capacity test ((2) below).

(2) *Capacity test.*

(*a*) Unscrew connector at upper end of fuel-pump-to-carburetor line (J, fig. 119) from elbow at front of carburetor and remove line.

(*b*) Attach a bleeder hose to upper end of fuel-pump-to-carburetor line and support outlet of bleeder hose at, or slightly higher than, carburetor level.

(*c*) Holding a container under bleeder hose outlet, start engine. Operate engine for 45 seconds after fuel starts to flow into container, and stop engine.

(*d*) Measure quantity of fuel pumped into container during test period.

(*e*) If fuel pump capacity is satisfactory (at least 1 pint in 45 seconds of operation), proceed as in (*f*) below; otherwise, replace fuel pump.

(*f*) Remove bleeder hose from upper end of fuel-pump-to-carburetor line, position line at elbow at front of carburetor, and tighten connector.

b. Removal.

(1) Unscrew connector at lower end of fuel-pump-to-carburetor line (J, fig. 119) and remove line from outlet side of fuel pump (A, fig. 138).

(2) Unscrew nut (J, fig. 138) at junction of fuel-pump-to-fuel-filter flexible line (K, fig. 138) and fuel-pump-to-fuel-filter rigid line (H, fig. 138) and disconnect lines.

(3) Unscrew connector on front end of fuel-pump-to-flywheel-housing-vent line (fig. 117) from elbow at lower left side of fuel pump, and remove line.

(4) Support fuel pump and remove socket-head screw and hex-head nut securing fuel pump to crankcase.

(5) Remove fuel pump from mounting stud, and remove and discard mounting gasket.

(6) Unscrew fuel-pump-to-fuel-filter flexible line from elbow at inlet side (rear) of fuel pump.

c. Installation.

(1) Screw threaded end of fuel-pump-to-fuel-filter flexible line (K, fig. 138) in elbow at inlet side (rear) of fuel pump (A, fig. 138).

(2) Place new fuel-pump-mounting gasket on stud at rear lower left side of crankcase, position fuel pump on stud, and install socket-head screw in front fuel-pump mounting hole. Install hex-head nut on fuel-pump mounting stud and tighten nut and socket-head screw.

(3) Position front end of fuel-pump-to-flywheel-housing-vent line (fig. 117) at elbow on lower left side of fuel pump, and tighten connector.

(4) Connect fuel-pump-to-fuel-filter flexible line to fuel-pump-to-fuel-filter rigid line (H, fig. 138), and tighten connector.

(5) Position lower end of fuel-pump-to-carburetor line (J, fig. 119) at outlet on front of fuel pump and tighten connector.

124. Fuel Filter

(fig. 156)

a. Servicing. Servicing of the fuel filter consists of draining the filter bowl and cleaning the strainer element.

(1) *Draining filter bowl.* Remove drain plug from bottom of filter bowl and allow bowl to drain. Install drain plug at bottom of bowl.

(2) *Cleaning strainer element.*

(*a*) Support filter bowl. Remove cap screw from top of filter cover and remove bowl from cover. Pour contents from bowl.

(*b*) Pull strainer element assembly from filter bowl mounting tube.

(*c*) Clean strainer element assembly and inside of filter bowl with dry-cleaning solvent or volatile mineral spirits (par. 75).

(*d*) Install strainer element assembly on filter bowl mounting tube.

(*e*) Position filter bowl and gasket at underside of filter cover. Install bowl retaining cap screw, and tighten.

b. Removal.

(1) Unscrew connector at lower end of fuel-pump-to-fuel-filter rigid line from elbow at rear of fuel filter and remove line.

(2) Unscrew connector at front end of fuel-tank-to-fuel-filter line from elbow at rear of fuel filter and remove line.

(3) Unscrew connector at lower end of fuel-filter-to-primer-pump line from elbow at front of fuel filter and remove line (vehicles equipped with primer pump only).

(4) Remove two mounting bolts, nuts, and lockwashers securing fuel filter to mounting bracket attached to frame No. 2 cross member, and remove fuel filter assembly.

c. *Installation.*

(1) Position fuel filter assembly at mounting bracket attached to frame No. 2 cross member, and install two mounting bolts, lockwashers, and nuts.

(2) Position front end of fuel-tank-to-fuel-filter line at elbow at rear of fuel filter, and tighten connector.

(3) Position lower end of fuel-pump-to-fuel-filter rigid line at elbow at rear of fuel filter, and tighten connector.

(4) Position lower end of fuel-filter-to-primer-pump line at elbow at front of fuel filter, and tighten connector (vehicles equipped with primer pump only).

125. Fuel Tank

(fig. 133)

a. *Filling.*

(1) Wipe dirt from top of tank around filler pipe cap, and remove cap from filler pipe.

(2) Fill tank until fuel level is approximately 2 inches below top filler pipe.

Warning: When filling tank, be sure that the hose nozzle or container is clean and that the nozzle or container contacts filler pipe to carry off static electricity.

Caution: Do not overfill as room for expansion must be provided.

(3) Install filler pipe cap.

Caution: Be sure that filler-pipe-cap gasket seals tightly.

b. *Draining.*

(1) Place a suitable clean container with capacity equal to that of fuel tank under drain opening in bottom of fuel tank.

(2) Remove drain plug from bottom of fuel tank and allow contents of tank to drain into container.

(3) Install drain plug at bottom of fuel tank.

c. *Removal.*

(1) Drain fuel tank (*b* above).

(2) Rotate bayonet-type connector at fuel gage sending unit counterclockwise and remove fuel gage cable from sending unit.

(3) Unscrew connector at tank end of fuel-tank-to-fuel-filter line from outlet at top of fuel tank, and remove line.

(4) Unscrew connector at tank end of fuel-tank-vent line from vent cover at top of fuel tank, and remove line.

(5) Remove two nuts and lockwashers, one each from bottom end of front and rear fuel tank straps, and pull T-bolt secured to bottom end of each strap free of holes in mounting supports.

(6) Remove fuel tank.

d. Installation.

(1) Position fuel tank on the two mounting supports bolted to left and/or right frame side rail (par. 119*a*(7)).

(2) Position front and rear fuel tank straps on tank, insert T-bolt at lower end of each strap in hole in outer end of each (front and rear) mounting support, and install lockwasher and nut on each T-bolt. Tighten nuts.

(3) Position fuel tank-vent line at vent cover on top of fuel tank and tighten connector.

(4) Position fuel-tank-to-fuel-filter line at outlet on top of fuel tank and tighten connector.

(5) Insert bayonet-type connector on end of fuel gage cable in terminal socket on fuel gage sending unit, and rotate connector clockwise to lock pins on connector in slots in socket.

(6) Fill fuel tank (*a* above) and look under tank for any indication of fuel leakage.

126. Engine Speed Governor Valve

Note. The key letters noted in parentheses are in figure 135, except where otherwise indicated.

a. Coordination with Ordnance Maintenance Unit. Refer to paragraph 2.

b. Adjustment.

(1) Start engine (par. 45).

(2) When engine coolant temperature reaches normal operating range (par. 31), depress accelerator pedal as far as it will go (until underside of pedal contacts pedal stop), and observe engine revolutions per minute indicated by tachometer (K, fig. 65), which is the engine speed at which the governor valve (M) actuates the engine speed governor.

(3) Stop engine (par. 47).

(4) If engine governed speed (no-load) determined in (2) above is not within the range of satisfactory governor operation (1,950 to 2,950 rpm), or if engine governed speed is too low, adjust governor valve as follows:

Caution: Excessive engine speeds cause undue strains and rapid wearing of engine parts; therefore, the governor valve must be adjusted to allow the engine not to exceed a maximum no-load speed of 2,950 rpm.

(*a*) Remove adjusting hole plug seal located at the left side of the governor valve (M).

Note. Do not break pipe connection seal.

(*b*) Remove valve adjusting hole plug (L).

(*c*) With ignition off, crank the engine until the adjusting screw inside the governor valve is alined with the adjusting hole.

(*d*) Insert a screwdriver in the adjusting hole and turn the adjusting screw clockwise to increase engine governed speed or counterclockwise to decrease engine governed speed. One full turn of the adjusting screw in either direction will result in a change in the engine governed speed of approximately 150 rpm.

(*e*) Check governor valve adjustment ((1), (2), and (3) above).

(*f*) If necessary, repeat (*c*), (*d*), and (*e*) above until governor valve adjustment is satisfactory.

(*g*) Install adjusting hole plug (L) in adjusting hole, and attach a new locking wire and lead seal to the adjusting hole plug and the fin adjacent to the adjusting hole of the governor valve housing.

c. Removal.

(1) Remove seal, unscrew connector at lower end of carburetor-to-governor-valve line (J) and remove line from air inlet at rear of governor valve (M).

(2) Unscrew connector at lower end of governor-valve-to-governor line (K) and remove line from air outlet at top of governor valve.

(3) Remove two cap screws and lockwashers securing governor valve assembly to rear of distributor drive housing (N), and remove the assembly. Remove and discard the valve-to-distributor-bracket gasket.

d. Installation.

(1) Clean gasket surfaces of distributor drive housing (N) and governor valve assembly (M). Place a new gasket on distributor drive housing, position governor valve at rear of housing, and secure with two cap screws and lockwashers.

Note. When positioning governor valve at rear of distributor drive housing, be sure that end of drive shaft (inside housing) engages slot in end of governor valve shaft.

(2) Position lower end of governor-valve-to-governor line (K) at air outlet on top of governor valve, and tighten connector.

(3) Position lower end of carburetor-to-governor-valve line (J) at air inlet at rear of governor valve, and tighten connector.

(4) Attach a new locking wire and lead seal to the fin adjacent to the air inlet and the connector at the lower end of the carburetor-to-governor-valve line.

(5) Adjust the governor valve (*b* above).

127. Primer Pump (Vehicles Equipped With Primer Pump Only)

a. Removal.

(1) Disconnect inlet and outlet fuel lines from primer pump body at back side of instrument panel.

(2) Unscrew packing nut from pump body and pull plunger from pump.

(3) Remove lock nut from pump body and withdraw pump body from mounting bracket.

b. Installation.

(1) Install rear lock nut on pump body.

(2) Insert pump body in mounting bracket hole, and install front lock nut.

(3) Connect inlet and outlet fuel lines.

(4) Insert plunger into pump body, being careful not to cut or curl the washer, and tighten plunger packing nut.

128. Fuel Lines

When replacing any of the fuel lines or fittings, coat all threaded connections with a liquid-type gasket cement before installation, and tighten all connections. In addition, be sure that mounting clips are installed where necessary and that lines are securely mounted.

Section IX. EXHAUST SYSTEM

129. Description

The exhaust system for the vehicles covered by this manual consists of an exhaust pipe, muffler, and tail pipe. The exhaust pipe is connected to the exhaust manifold by a mounting flange which is secured to the manifold by four mounting studs and nuts. A sealing ring installed between the exhaust pipe and the exhaust manifold prevents exhaust gas leakage at this point. The muffler, which is flanged at each end to match flanges on the exhaust pipe and tail pipe, is secured to the exhaust pipe by four mounting bolts and to the tail pipe by three mounting bolts. The entire exhaust system is supported by clamps and brackets attached to the frame right side rail.

130. Exhaust Pipe

a. Removal.

(1) Remove four nuts and bolts securing flange at rear of exhaust pipe (N, fig. 145) to flange at front of muffler (M, fig. 145).

(2) Remove nut and bolt from bottom of front muffler clamp (P, fig. 145) spread clamp, and remove rear end of exhaust pipe from front of muffler. Remove and discard exhaust-pipe-to-muffler gasket.

(3) Disconnect exhaust pipe from exhaust manifold (par. 114*e*(12)).

b. Installation.

(1) Connect exhaust pipe to exhaust manifold (par. 115*d*(2)).

(2) Place new gasket on rear flange of exhaust pipe (N, fig. 145), position flange at flange on front of muffler (M, fig. 145), and install four mounting bolts and nuts. Tighten nuts.

(3) Position front muffler clamp (P, fig. 145) on rear of exhaust pipe, install bolt and nut at bottom of clamp, and tighten.

131. Muffler

a. Removal.

(1) Remove four nuts and bolts securing flange at front of muffler (M, fig. 145) to flange at rear of exhaust pipe (N, fig. 145).

(2) Remove three nuts and bolts securing flange at rear of muffler (fig. 161) to flange at front of tail pipe.

(3) Remove nut and bolt from bottom of muffler support clamp (fig. 161), spread clamp, and remove muffler. Remove and discard exhaust-pipe-to-muffler gasket and muffler-to-tail-pipe-flange gasket.

b. Installation.

(1) Place new gasket on flange on rear of exhaust pipe (N, fig. 145), position muffler front flange against exhaust pipe rear flange, install four nuts and bolts, and tighten.

(2) Position muffler support clamp (fig. 161) on rear of muffler, install nut and bolt at bottom of clamp, and tighten.

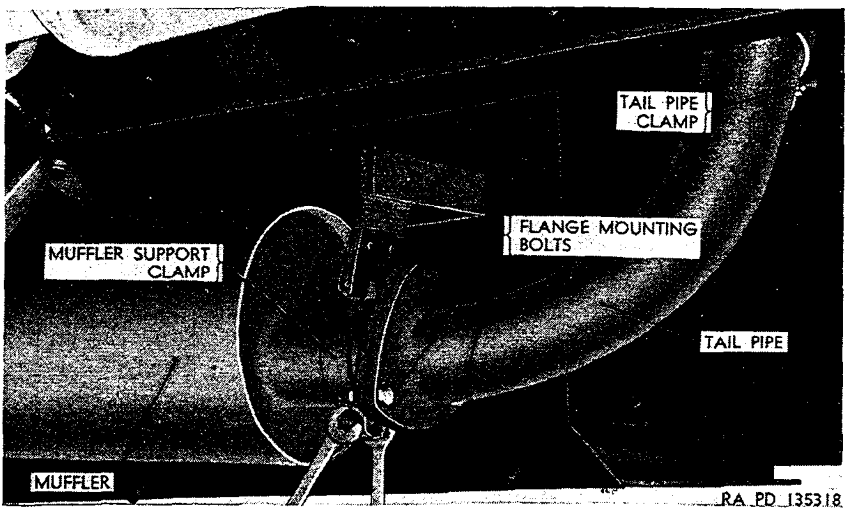


Figure 161. Muffler support and tail pipe mounting.

(3) Place new gasket on flange on front of tail pipe (fig. 161), position flange and gasket against muffler rear flange, install three nuts and bolts, and tighten.

132. Tail Pipe

(fig. 161)

a. Removal.

(1) Remove three nuts and bolts securing flange at front of tail pipe to flange at rear of muffler.

(2) Remove nut and bolt from tail-pipe clamp, spread clamp, and remove tail pipe. Remove and discard tail-pipe-to-muffler gasket.

b. Installation.

(1) Position tail pipe in tail-pipe clamp, and install bolt and nut in holes at ends of clamp.

(2) Place new gasket at flange on front of tail pipe, position flange and gasket at flange on rear of muffler, and install three nuts and bolts, and tighten.

(3) Tighten tail-pipe clamp nut and bolt.

Section X. COOLING SYSTEM

133. Description

a. General. The cooling system for the vehicles covered by this manual consists of a radiator, water pump, fan, drive belts, thermostat housing, thermostats, water inlet and outlet headers, and hose, lines, and fittings for connecting the cooling system components to the engine and air compressor.

b. Radiator. The radiator (fig. 130), which is vertically mounted forward of the engine, consists of a fan-and-tube-type core with drain cock and a tank with pressure-type filler cap (fig. 162), coolant level cock, and overflow tube. The bottom of the radiator is secured to the engine front mounting support (fig. 130) by two bolts and nuts, and the top of the radiator is secured in the vertical position by a stay rod (fig. 162) connected to the radiator and the front of the thermostat housing.

c. Water pump. The centrifugal-type water pump (fig. 163), is located at the front of the engine on two studs (one on the crankcase and one on the front cylinder head) and secured by two nuts and one cap screw. The pump is driven by the fan pulley (fig. 164), mounted on the front end of the pump drive shaft, which is connected to the engine crankshaft pulley by a pair of matched drive belts.

d. Fan. The six-bladed fan (fig. 165) is mounted on the front face of the fan pulley by six cap screws and lockwashers.

e. Thermostats. Two metal bellows-type thermostats (fig. 166), which control the temperature of the coolant in the cooling system

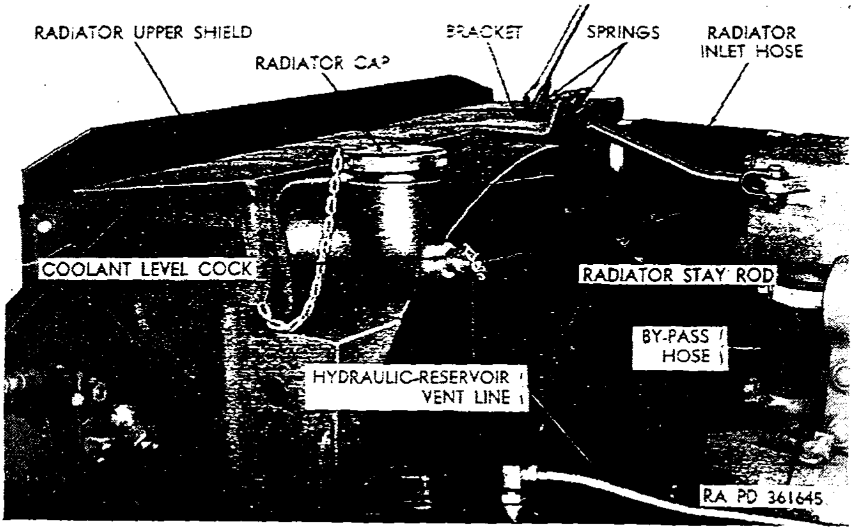


Figure 162. Left rear view of upper section of radiator.

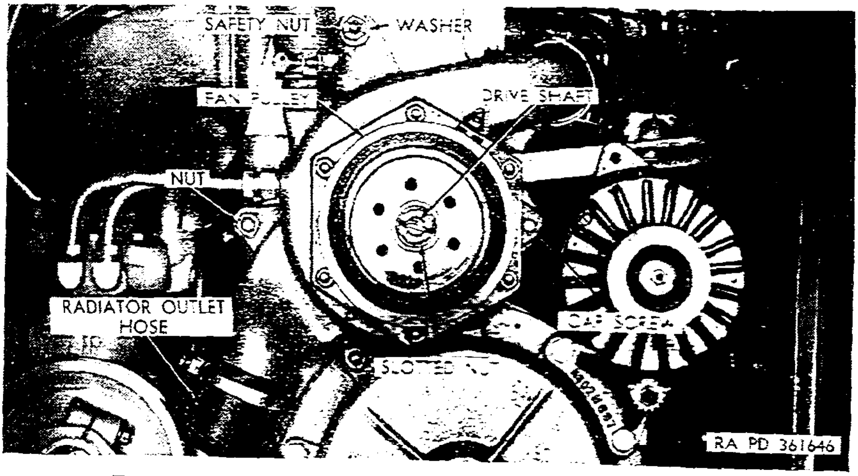


Figure 163. Front view of water pump with fan removed.

while the engine is running, are mounted inside the thermostat housing. Each thermostat is equipped with a valve which is fully closed whenever the coolant temperature is below 160° F. thereby preventing the flow of coolant from the engine to the radiator or to the water pump. Consequently, when the thermostat valves are fully closed, the temperature of the coolant rises rapidly since it is not subjected to the cooling action of the radiator. As the coolant temperature rises above 160° F., the thermostat valves gradually open, permitting a gradually increased flow of coolant from the engine to the radiator and pump until the coolant temperature reaches 180° F. At this temperature, the valves are in the fully-open position, permitting unrestricted circulation of the coolant.

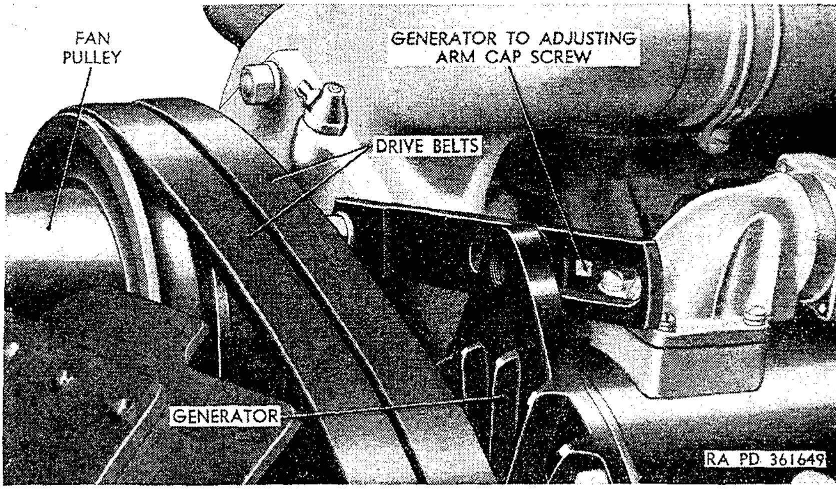


Figure 164. Drive belts installed on fan pulley.

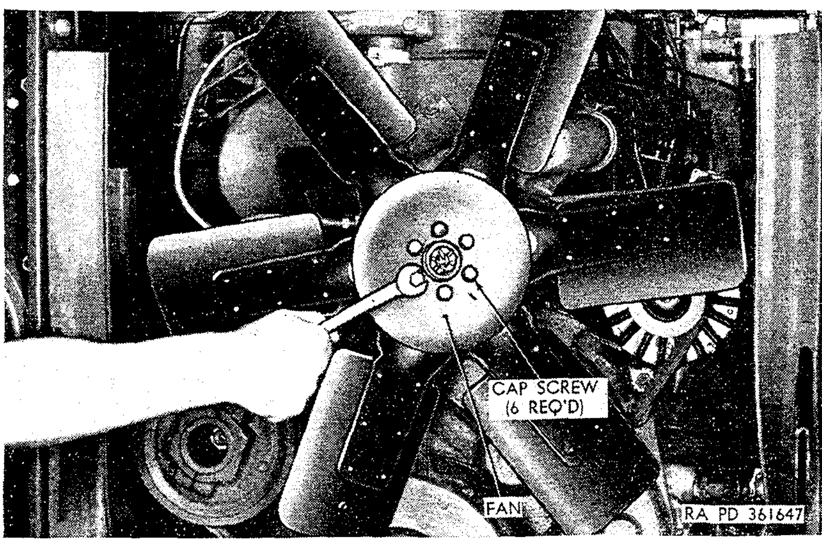


Figure 165. Front view of fan installed on fan pulley.

f. Water Inlet Header. The water inlet header (fig. 117) is located on the left side of the front and rear cylinder head assemblies and is connected by a hose to the outlet at the upper left side of the water pump housing. The water inlet header is also connected to the oil cooler (fig. 120) at the left rear side of the engine by the oil cooler water inlet seal (G, fig. 135).

g. Water Outlet Header. The water outlet header assembly (F, fig. 122), comprised of a front and rear section connected by a hose, is mounted on the right side of the front and rear cylinder head assemblies and is connected at the front to the thermostat housing.

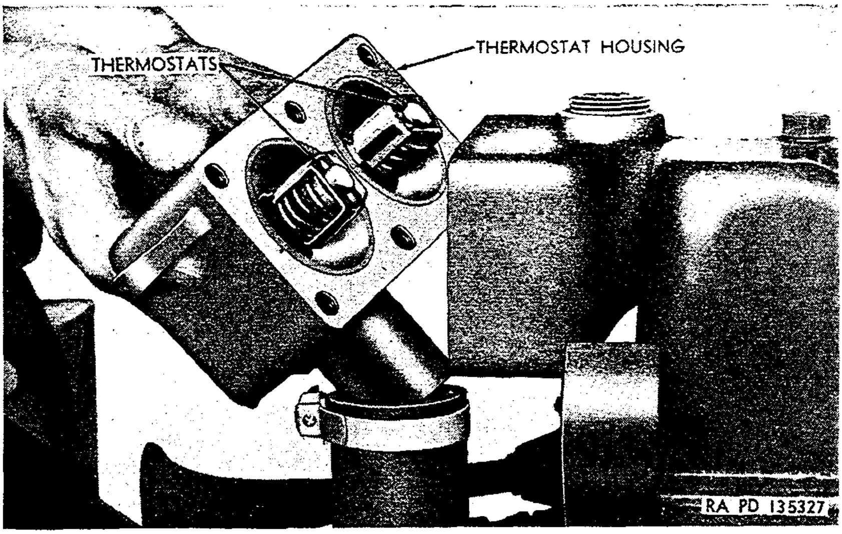


Figure 166. Removing thermostat housing from water outlet header.

134. Cooling System

a. General. Air circulating through the cooling system, as well as exhaust gas leakage into the system, causes rapid corrosion and rust formation which will eventually clog the system and cause overheating and loss of cooling liquid level in the radiator, leaky water pump, or loose fittings and hose connections. Exhaust gas may be blown into the cooling system past one or both of the cylinder heads or the block.

b. Air Suction Test. Bring level of coolant to level cock (fig. 162) of radiator. Drain out three pints of coolant to prevent overflow during test. Be sure radiator cap is in good condition and will make an air-tight seal. Attach a length of rubber tubing to the lower end of overflow tube (fig. 130), making sure that this connection is air tight. Run engine until temperature gage stops rising and remains stationary. Without changing engine speed, place end of rubber tubing in a bottle of water. Be sure there are no kinks or sharp bends in the tubing to restrict air flow. Watch for bubbles in the water. Bubbles indicate that air is being drawn into the cooling system. Correct condition by tightening cylinder-head bolts, water pump mounting bolts, hose clamps, and all fittings. Examine all hose carefully, and if cracked, swollen, or deteriorated in any way, replace hose.

c. Exhaust Gas Leakage Test. Start test with engine cold. Remove fan drive belts (par. 137) to prevent operation of water pump. Remove thermostats (par. 138), install thermostat housing without thermostats or water outlet hose, and add water to level of housing outlet. Start engine, accelerate several times and watch for bubbles in water in thermostat housing. The appearance of bubbles or a sudden rise of cooling liquid indicates exhaust gas leakage into cooling system. Make test quickly before cooling liquid reaches boiling point as steam bubbles will give misleading results. Correct condition by replacing cylinder-head gaskets (par. 109) and repeat test. If leaks are still evident, it indicates a cracked cylinder head or cylinder sleeve. Report to ordnance maintenance personnel. Install thermostats (par. 138). Install and adjust fan drive belts (par. 137). Fill radiator.

d. Preventive Cleaning. In order to efficiently clean the cooling system of rust, scale, or sludge, use a cleaner, followed by a neutralizer to stop action of cleaner. Cleaning compound 51–C–1568–500 provides cleaner and neutralizer enough to clean a cooling system of 4-gallon capacity. Neutralizing, and flushing after neutralizing, is very important, as cleaner contains a strong acid which, if not completely removed, will attack the parts of the cooling system. Also, precautions should be taken not to spill any cleaning compound on skin, clothing, or truck paint.

Caution: Do not pour cold water into cooling system when engine temperature is above 200° F. Also, cold water poured into cooling system, regardless of engine temperature, will close thermostats and not allow engine water jackets and passages to completely fill. Whenever filling system with cold water, always run engine until normal operating temperature is reached (thermostats open), then add water until coolant reaches coolant level cock (fig. 162).

(1) *Drain system.* Run engine at fast idle until normal engine temperature (at least 165° F) is reached to stir up any loose rust, scale, et cetera. Stop engine. Remove radiator cap (fig. 162), open radiator drain cock (fig. 130) and crankcase drain cock (fig. 131), and allow cooling system to drain.

(2) *Clean system.* Close radiator and crankcase drain cocks. Place a clean container under overflow tube (fig. 130) to catch any overflow, which may be needed to maintain proper level in the radiator. Be sure temperature of engine is below 200° F. Pour cleaning compound (one container to every four gallons of cooling system capacity) into radiator, then fill system with water. Install pressure-type cap on radiator. Start engine and run it at fast idle to heat solution to at least 180° F. Use a cardboard to cover radiator if necessary, but do not allow coolant to boil. Continue to run engine at least 30 minutes. Stop engine, remove radiator cap, open radiator and crankcase drain cocks, and allow system to drain completely.

(3) *Neutralize system.* Close radiator and crankcase drain cocks. Pour neutralizer (one container to every four gallons of cooling system capacity) into radiator, then fill system with water and install radiator cap. Start engine and run it at a fast idle, using radiator cover as necessary, to heat solution

to at least 180° F. Continue to run engine at least 10 minutes. Stop engine, remove radiator cap, open radiator and crankcase drain cocks, and allow system to drain completely.

(4) *Flush system.* Close radiator and crankcase drain cocks. Fill system with clean fresh water (soft if possible); then install radiator cap. Start engine and run it at a fast idle, using radiator cover as necessary, to bring engine operating temperature to at least 180° F. Continue to run engine for at least 5 minutes. Remove radiator cap, open radiator and crankcase drain cocks, and allow system to drain. If water is discolored to any extent, repeat this flushing operation.

Caution: Do not flush system by inserting a hose in the radiator with the engine running and the drain cocks open. This procedure will close thermostats and stop circulation of coolant through the engine.

(5) *Clean radiator, cap, overflow tube, and drain cocks.* Clean cap by spraying a stream of water (hot if possible) through the holes in the valve cage while moving the pressure valve up and down with a blunt wooden instrument or a pencil. Clean out overflow pipe with a stream of water. Clean out dirt, trash, and insects imbedded in the air passages of the radiator, using compressed air or a stream of water; but do not use steam.

Caution: Do not hold air or water hose too close to the radiator or use too great pressure as damage to radiator may result. Clean out any stoppage in drain cocks with a soft wire.

(6) *Fill system.* Close radiator and crankcase drain cocks; then fill system to suit climatic conditions as follows: if above 32° F., almost fill the system with clean fresh water (soft if possible) and add a corrosion inhibitor; then fill with water until coolant level is evident at level cock (fig. 162). If there is a possibility that climate below 32° F. will be encountered, fill system about one-third full, add antifreeze enough for the lowest expected temperature (table V, par. 328); then fill until coolant is evident at level cock. Install radiator cap, start engine, and run it at a fast idle until temperature gage shows normal operating temperature; then stop engine and check coolant level, adding water as necessary.

(7) *Rust preventives.* The cooling system must be free of rust and scale to maintain efficiency of the system. Use of inhibitors or rust preventives reduces or prevents corrosion of metals and prevents formation of scale. Inhibitors are not cleaners and do not remove rust or scale already formed. Treating the cooling system with an inhibitor consists of adding an inhibitor to the coolant. The inhibitor should be re-

newed periodically and especially if the system has been cleaned or flushed.

135. Radiator

a. Removal.

(1) Remove brush guard (par. 114c(2)).

(2) Drain cooling system (par. 134*d*).

(3) Loosen self-locking nut at front end of radiator stay rod (fig. 162), and pull front end of stay rod upward and remove from slotted bracket on top of radiator.

(4) Loosen front clamp on radiator inlet hose (fig. 162).

(5) Loosen rear clamp on radiator outlet hose (fig. 163).

(6) Loosen two nuts and bolts securing radiator upper shield (fig. 162) to the left and right headlight support brackets, and pull upper shield forward and remove from brackets.

(7) Loosen bolt (H, fig. 148) at top left side of frame front cross member and pull radiator ground strap (fig. 130) away from cross member.

(8) Remove two radiator mounting nuts (fig. 167), washers, and springs from underside of engine front mounting support.

(9) Lift off radiator assembly (fig. 168).

b. Installation.

(1) Be sure that the two radiator support spacers are installed on the left and right mounting studs on the bottom of the radiator, and insert the radiator mounting studs in the holes in the engine front mounting support (fig. 130).

(2) Install springs (fig. 167), washers, and nuts on the radiator mounting studs from the underside of the engine front mount-

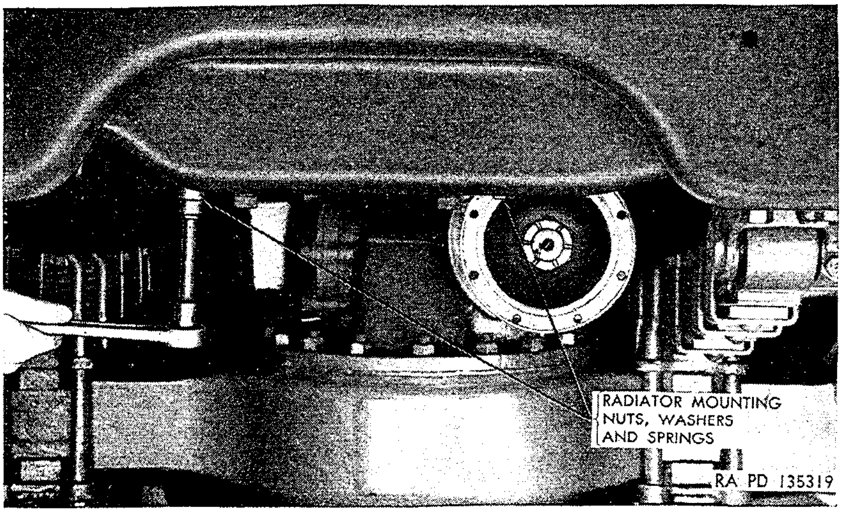


Figure 167. Radiator mounting.

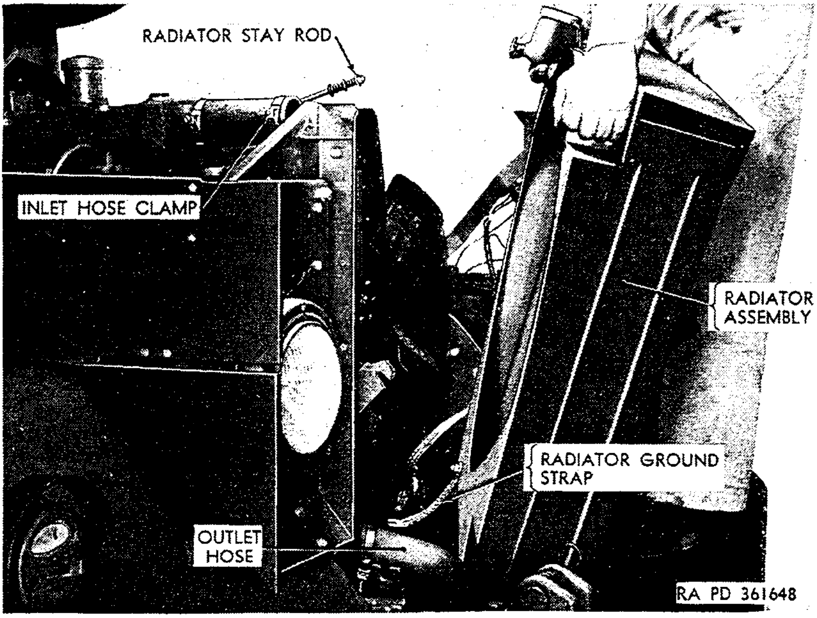


Figure 168. Lifting off radiator assembly.

ing support. Tighten nuts evenly but do not tighten enough to completely compress springs.

(3) Slide radiator ground strap terminal under head of ground strap retaining bolt (H, fig. 148) and tooth-type lockwasher at top left side of frame front cross member, and tighten bolt.

(4) Slide rear end of radiator-outlet-hose elbow over end of water-pump water inlet, and tighten hose clamp.

(5) Spread the two washers between the springs (fig. 162) on front end of radiator stay rod and slide rod into slot in bracket at top of radiator. Tighten self-locking nut on end of stay rod but do not tighten enough to completely compress springs.

(6) Slide slotted ends of radiator upper shield (fig. 162) under head of bolt and lockwasher on left and right headlight support brackets, and tighten nuts and bolts.

(7) Slide front end of radiator inlet hose (fig. 162) on radiator inlet, and tighten hose clamp.

(8) Install brush guard (par. 115*f*(2)).

(9) Fill cooling system (par. 134*d*(6)).

136. Water Pump

a. Removal.

(1) Remove fan and drive belts (par. 137).

(2) Loosen front hose clamp on water inlet hose (fig. 117).

(3) Loosen upper hose clamp on radiator outlet hose (fig. 163).

(4) Unscrew connectors (fig. 153) at right side of water pump housing, and remove air-compressor water inlet and outlet lines from water pump housing.
(5) Remove nut (fig. 163) and lockwasher securing water pump to stud at right front end of crankcase, and remove cap screw securing water pump to bracket at front left end of crankcase.
(6) Support water pump and remove safety nut (fig. 163) and washer from stud at front end of front cylinder head. Remove pump from water inlet and outlet hoses and front of engine.

b. Installation.
(1) Position water pump on studs on right front end of crankcase and front end of front cylinder head, install nut (fig. 163) and lockwasher on crankcase stud, install self-locking nut and washer on cylinder head stud, and tighten nuts.
(2) Install cap screw (fig. 163) to secure pump to left front end of crankcase, and tighten.
(3) Position air-compressor water inlet and outlet lines (fig. 153) at right side of water pump housing, and tighten connectors.
(4) Slide upper end of radiator outlet hose (fig. 163) on water pump inlet, and tighten hose clamp.
(5) Slide front end of water inlet hose (fig. 117) on water pump outlet, and tighten hose clamp.
(6) Install fan and drive belts (par. 137).

137. Fan and Drive Belts

a. Fan.
(1) *Removal.*
(*a*) Drain cooling system (par. 134).
(*b*) Loosen nut and bolt (fig. 134) at left and right frame brackets and at left and right brush guard braces, and tilt upper end of brush guard forward.
(*c*) Remove radiator upper shield (par. 135*a*(6)).
(*d*) Remove radiator stay rod from radiator (par. 135*a*(3)).
(*e*) Loosen front hose clamp on radiator inlet hose (fig. 162) and tilt upper end of radiator forward.
(*f*) Remove six cap screws (fig. 165) and lockwashers securing fan to fan pulley hub, and remove fan.

(2) *Installation.*
(*a*) Position fan (fig. 165) at front of fan pulley hub, and install six cap screws and lockwashers and tighten.
(*b*) Push upper end of radiator toward rear of vehicle and install radiator stay rod (par. 135*b*(5)).
(*c*) Slide front end of radiator inlet hose (fig. 162) on radiator inlet, and tighten hose clamp.
(*d*) Install radiator upper shield (par. 135*b*(6)).

(*e*) Push top of brush guard toward rear of vehicle and engage slots in left and right braces (fig. 134) with bolts in brush guard. Tighten guard-to-frame-bracket nuts and bolts and guard-to-brace-nuts and bolts.

(*f*) Fill cooling system (par. 134).

b. Drive Belts.

(1) *Adjustment.* Drive belt adjustment should be made on new engines when vehicle has traveled 100 miles. Check drive belt tension by applying slight pressure individually to each belt at a point midway between the fan and generator pulleys. Belt deflection at this point should be between one-eighth and one-quarter inch. If belt deflection is found to be less than one-eighth inch or more than one-quarter inch, adjust belt tension as follows:

(*a*) Loosen generator-to-adjusting-arm cap screw (fig. 164).

(*b*) Insert end of rim-tool-and-wheel-nut-wrench handle—41–H–1541–10 (fig. 169), or 30-inch bar, between crankcase and generator so that lower end of handle will bear against crankcase at a point directly below front cap screw on valve-tappet-chamber front cover.

(*c*) Pull upper end of handle away from engine with a pull of 50 pounds and, keeping handle in this position, tighten the generator-to-adjusting arm cap screw. This procedure will place both belts under proper tension and allow belt deflection specified in *b*(1) above.

(2) *Removal.*

(*a*) Loosen generator-to-adjusting arm cap screw (fig. 164) and move generator as far as it will go toward engine.

(*b*) Remove front belt from generator, fan, and crankshaft pulleys, and lift belt over fan.

(*c*) Remove rear belt ((*b*) above).

Note. Belts must always be replaced in pairs.

(3) *Installation.*

(*a*) Place rear drive belt (fig. 164) over fan and then over crankshaft, fan, and generator pulleys.

(*b*) Install front drive belt ((*a*) above).

(*c*) Adjust drive belts ((1) above).

c. Fan Pulley.

(1) *Removal.*

(*a*) Remove fan (*a*(1) above).

(*b*) Remove drive belts (*b*(2) above).

(*c*) Remove cotter pin, slotted nut (fig. 163), lockwasher, and plain washer from front end of water pump drive shaft, and remove fan pulley from shaft.

(2) *Installation.*

(*a*) Slide fan pulley (fig. 163) on front end of water pump

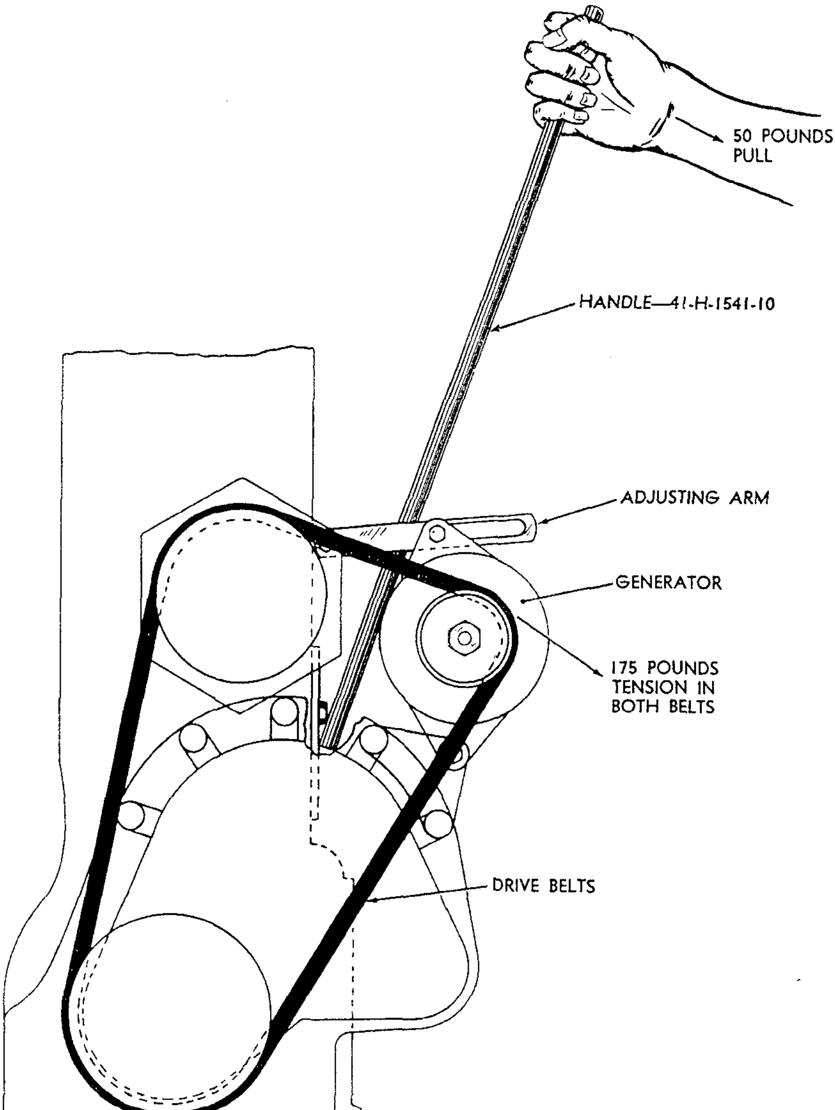


Figure 169. Adjusting drive belts.

drive shaft, and install plain washer, lockwasher, slotted nut, and cotter pin on end of shaft.

(*b*) Install drive belts (*b*(3) above).

(*c*) Install fan (*a*(2) above).

138. Thermostats

a. Removal.

(1) Drain cooling system (par. 134).

(2) Loosen rear clamp on radiator inlet hose (fig. 170).

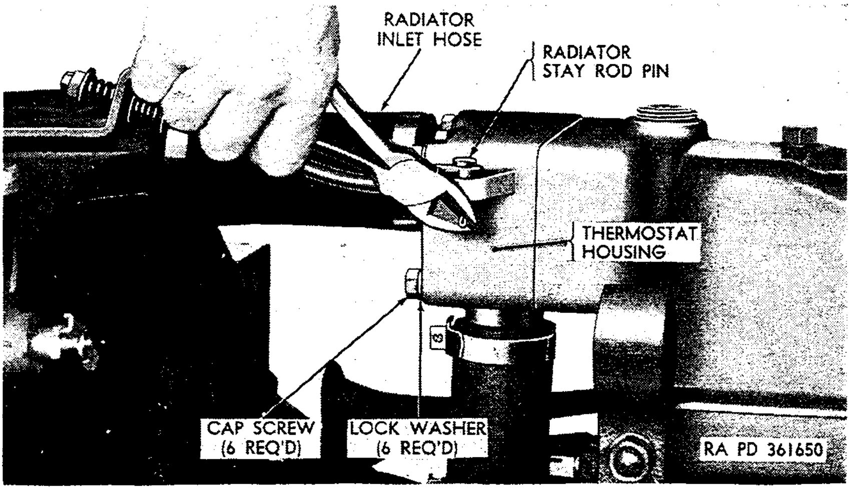


Figure 170. Removing radiator stay rod from thermostat housing.

(3) Loosen upper clamp on by-pass hose (fig. 170).
(4) Remove cotter pin and radiator stay rod pin (fig. 170) securing stay rod to thermostat housing, and remove stay rod.
(5) Remove six cap screws (fig. 170) and lockwashers at front of thermostat housing, and remove housing from by-pass hose and from radiator inlet hose. Remove and discard thermostat-housing-to-water-outlet-header gasket.
(6) Pull thermostats (fig. 166) from housing.

b. Installation.

(1) Clean gasket surfaces on thermostat housing (fig. 166) and water outlet header, and install new gasket on front of header, using a liquid-type gasket cement.
(2) Make sure that rubber seals are in place on the two thermostats and place thermostats in housing.
(3) Slide outlet on front of thermostat housing (fig. 170) into rear of radiator inlet hose, slide outlet on bottom of thermostat housing into by-pass hose, position thermostat housing at front of water outlet header, and install six cap screws and lockwashers. Tighten cap screws.
(4) Position rear end of radiator stay rod at bracket on left side of thermostat housing (fig. 170), and install radiator-stay-rod pin and cotter pin.
(5) Tighten rear clamp on radiator inlet hose (fig. 170) and upper clamp on by-pass hose.
(6) Fill cooling system (par. 134).

139. Water Heaters

a. Water Inlet Header.

(1) *Removal.*

(*a*) Drain cooling system (par. 134).

(*b*) Disconnect spark plug cables from spark plugs (par. 148).

(*c*) Loosen rear clamp on water inlet hose (fig. 117).

(*d*) Remove four cap screws (fig. 117) and lockwashers securing the water inlet header to the front and rear cylinder heads.

(*e*) Loosen clamp securing outlet at rear of water inlet header in oilcooler waterinlet seal (G, fig. 135).

(*f*) Pull front end of water inlet header free of water inlet hose, pull rear end of header free of oilcooler waterinlet seal, and remove header from engine. Discard the four cylinder head-water-inlet-port gaskets.

(2) *Installation.*

(*a*) Clean gasket surfaces on front and rear cylinder head assemblies and on water inlet header (fig. 117).

(*b*) Install four new gaskets on left side of cylinder head assemblies at water inlet ports, using a liquid-type gasket cement.

(*c*) Slide front end of water inlet header into water inlet hose (fig. 117), and slide water outlet on rear end of water inlet header into oilcooler waterinlet seal (G, fig. 135).

(*d*) Position water inlet header on side of front and rear cylinder head assemblies, and install four cap screws (fig. 117) and lockwashers. Tighten cap screws.

(*e*) Tighten rear water inlet hose clamp and oil cooler water inlet seal clamp.

(*f*) Connect spark plug cables to spark plugs (par. 148).

(*g*) Fill cooling system (par. 134).

(*h*) Start engine and examine entire assembly for coolant leaks.

b. *Water Outlet Header Assembly.*

(1) *Removal.*

(*a*) Drain cooling system (par. 134).

(*b*) Remove carburetor (par. 121*b*).

(*c*) Loosen rear clamp on radiator inlet hose (fig. 162) and upper clamp on bypass hose (fig. 162).

(*d*) Disconnect both ends of air-compressor-to-governor air line (T, fig. 122), and remove the line.

(*e*) Remove eight hex nuts (S, fig. 122) from water-outlet header retaining studs.

(*f*) Remove water outlet header assembly (P, fig. 122), and remove and discard the four cylinder-headwater-outlet-port gaskets.

(*g*) Remove thermostats (par. 138).

(*h*) Loosen the two hose clamps securing the front and rear water outlet headers inside their connecting hose, and separate the headers from the hose.

(2) *Installation.*

(*a*) Clean gasket surfaces on front and rear cylinder head assemblies and on water-outlet header assembly (P, fig. 122), and position new gaskets on water-outlet-header-retaining studs.

(*b*) Insert ends of front and rear water outlet headers inside connecting hose, and tighten hose clamps.

(*c*) Install thermostats in thermostat housing, and attaching housing to front water outlet header (par. 138).

(*d*) Slide water outlet on front of thermostat housing into radiator inlet hose (fig. 162), and slide water outlet on bottom of thermostat housing into by-pass hose. Position water outlet header assembly on retaining studs on right top side of cylinder heads.

(*e*) Install eight hex nuts (S, fig. 122) on retaining studs, and tighten.

(*f*) Tighten rear radiator-inlet-hose clamp and upper by-pass hose clamp.

(*g*) Install air-compressor-to-governor air line (T, fig. 122).

(*h*) Install carburetor (par. 121*c*).

(*i*) Fill cooling system (par. 134).

(*j*) Start engine and examine entire assembly for coolant leaks.

140. Hose, Lines, and Fittings

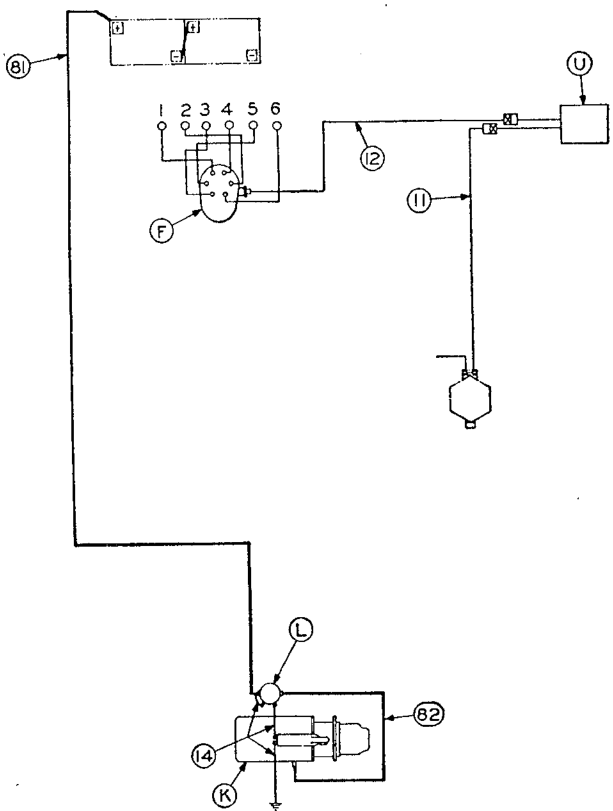
The cooling system components are connected by hoses as follows: water-pump-to-water-inlet-header, rear-water-outlet-header-to-front-water-outlet-header, thermostat-housing-to-radiator, thermostat-housing-to-water-pump, radiator-to-water-pump-water-inlet, water-pump-water-inlet-to-water-pump-housing. In addition, an inlet and outlet line connects the air-compressor head to the water pump. Removal of connecting hose or lines requires draining of the cooling system. When installing lines or fittings, coat all connections with liquid-type gasket cement before installation. Make sure all hose clamps and connections are tight.

Section XI. STARTING SYSTEM

141. Description and Data

a. Description.

(1) *General.* The starting system (fig. 171) consists of the starter (fig. 130) and starter controls, which include the starter linkage (fig. 138), magnetic switch (Q, fig. 145), and starter cable (fig. 131). The starter, which is energized by operation of the starter button (CC, fig. 65), provides the



CIRCUIT NO.	CABLE GAUGE	CIRCUIT DESCRIPTION
12	14	IGNITION SWITCH TO IGNITION COIL
14	14	MAGNETIC STARTER SWITCH TO STARTER SWITCH
81	0	BATTERY TO MAGNETIC STARTER SWITCH
82	0	MAGNETIC STARTER SWITCH TO STARTER MOTOR
11	12	CIRCUIT BREAKER TO IGNITION SWITCH (FEED)

PARTS DESCRIPTION

F COIL & DISTRIBUTOR
K STARTER MOTOR
L MAGNETIC STARTER SWITCH
U IGNITION SWITCH

NOTE
ALL NUMBERS SHOWN ON DRAWING CORRESPOND TO ORDNANCE CIRCUIT NUMBERS TABBED TO WIRES

CONNECTOR ⊠

RA PD 135259

Figure 171. Starting and ignition circuit diagram.

347797°—55——17

initial rotation and operation of engine components required to draw a combustible fuel-air mixture from the carburetor into the cylinders.

(2) *Starter.* The waterproof starter (N, fig. 138) is secured to the front left side of the flywheel housing by three cap screws (G, fig. 138) and lockwashers. Initial movement of the starter button causes the drive pinion on the rear end of the starter armature to engage the ring gear bolted to the engine flywheel. Depressing the starter button further closes the contacts in the manual switch (M, fig. 138) mounted on top of the starter. The circuit thus completed in the manual switch in turn energizes the starter magnetic switch (Q, fig. 145), thereby completing the circuit from the battery to the starter, which causes the starter armature to rotate and crank the engine.

b. Tabulated Data.

(1) *Starter.*

Make	Delco Remy
Ordnance number	7731426
Manufacturer's number	DR-1108898
Voltage	24 volt

(2) *Magnetic switch.*

Make	Delco Remy
Ordnance number	7402335
Manufacturer's number	DR-1119751

142. Starter

Note. The key letters noted in parentheses are in figure 138, except where otherwise indicated.

a. Removal.

(1) Disconnect battery ground cable (par. 114*b*(4)).

(2) Remove two terminal stud nuts at front of manual switch (M) on top of starter, and remove the two cables, one from each terminal.

(3) Remove nut and lockwasher securing starter cable (fig. 117) to starter, and remove starter cable.

(4) Remove cotter pin and yoke pin securing control rod (C) to bellcrank (R), and remove control rod yoke from bellcrank.

(5) Remove three cap screws (G) and lockwashers securing starter to front of flywheel housing, pull starter forward, and remove from engine. Remove and discard starter mounting gasket.

(6) Remove cotter pin securing starter control link (F) to lever (E), and remove link from lever.

(7) Remove cap screw (P) and safety nut clamping bracket (Q). Spread bracket, and slide bracket with bellcrank and starter control link over end of starter.

b. Installation.

(1) Slide bracket (Q) with bellcrank (R) and starter control link (F) on starter, and loosely clamp bracket to starter with cap screw (P) and safety nut.

(2) Insert rear end of starter control link in hole in upper end of lever (E), and secure with cotter pin.

(3) Position starter with new mounting gasket on front of flywheel housing, and install three cap screws (G) and lockwashers. Using a torque wrench, tighten cap screws to 145 to 155 pound-feet torque.

(4) Sliding bracket (Q) on starter, aline bellcrank and yoke at lower end of control rod (C), and tighten cap screw and nut clamping bracket to starter.

(5) Position control rod yoke on bellcrank, and secure with yoke pin and cotter pin.

(6) Install starter cable (fig. 117) on terminal stud at left side of starter, install nut on stud, and tighten.

(7) Install two cable terminals on terminal studs at front of manual switch (M), install two nuts, one on each stud, and tighten.

(8) Connect battery ground cable (par. 115*h*(4)).

143. Starter Linkage

Note. The key letters noted in parentheses are in figure 138, except where otherwise indicated.

a. Removal.

(1) Remove cotter pin and yoke pin securing control rod (C) to bellcrank (R), and remove rod from bellcrank.

(2) Remove cotter pin securing control link (F) to lever (E), and remove link from lever.

(3) Remove cap screw (P) and safety nut clamping bracket (Q) to starter (N). Spread bracket, and slide bracket with bellcrank and control link over end of starter.

(4) Remove cotter pin securing front end of control link to bellcrank and remove link from bellcrank.

(5) Remove cotter pin and washer securing bellcrank to bracket (Q), and remove bellcrank from bracket.

(6) Remove two cap screws and safety nuts securing control rod mounting plate to underside of toeboard, and remove mounting plate and control rod (C) from toeboard.

b. Installation.

(1) Position control rod mounting plate with control rod (C) on underside of toeboard, and secure with two cap screws and safety nuts.

(2) Position bellcrank (R) on pin at upper end of bracket (Q), and secure with washer and cotter pin.
(3) Insert one end of control link (F) in hole in lower end of bellcrank, and secure with cotter pin.
(4) Slide bracket (Q) with bellcrank and control link on starter (N), and loosely clamp bracket to starter with cap screw (P) and safety nut.
(5) Sliding bracket on starter, aline bellcrank and yoke at lower end of control rod (C), and tighten cap screw and nut clamping bracket to starter.
(6) Position control rod yoke on bellcrank, and secure with yoke pin and cotter pin.
(7) Insert rear end of starter control link in hole in upper end of lever (E), and secure with cotter pin.

144. Magnetic Switch

a. Removal.

(1) Remove nut and washer securing starter cable (fig. 131) to terminal stud on top of magnetic switch (Q, fig. 145), and remove cable from terminal stud.
(2) Remove nut and washer securing starter primary cable (fig. 131) to upper terminal stud on left side of magnetic switch, and remove wire from terminal stud.
(3) Remove nut and washer securing battery cable to terminal stud on bottom of magnetic switch, and remove cable from terminal stud.
(4) Remove four cap screws and safety nuts securing magnetic switch to inside of frame right side rail, and remove magnetic switch from side rail.

b. Installation.

(1) Position starter magnetic switch (Q, fig. 145) on inside of frame right side rail, and secure with four cap screws and safety nuts.
(2) Install battery cable on terminal stud at bottom of magnetic switch, and secure with washer and nut.
(3) Install primary cable on upper terminal stud at left side of magnetic switch, and secure with washer and nut.
(4) Install starter cable (fig. 131) on terminal stud at top of magnetic switch, and secure with washer and nut.

Section XII. IGNITION SYSTEM

145. Description and Data

a. Description.

(1) *General.* The ignition system (fig. 171) consists of the distributor and coil assembly (D, fig. 135), spark plugs, spark plug cables, and distributor primary wire (F, fig. 135). The

ignition coil converts low voltage electrical current from the batteries to high voltage current, which is delivered to the spark plugs through individual cables in timed sequence at intervals controlled by the distributor. The fuel-air mixture inside the combustion chambers (par. 141*a*) is ignited by sparks resulting from the high voltage current supplied by the coil jumping an air gap between two electrodes at the end of each spark plug, thereby causing the engine to operate by means of internal combustion.

(2) *Ignition distributor and coil assembly.* The waterproof distributor and coil assembly (D, fig. 135) is secured to the top of the distributor drive housing, which is located on the left side of the crankcase, by two mounting clamps, lockwashers, and cap screws. Rotation of the breaker cam inside the distributor alternately makes and breaks contact between the distributor contact points, thereby opening and closing the circuit from the battery to the ignition coil. This causes high voltage surges in the coil, which are delivered through the distributor rotor, distributor cap, and spark plug cables to the spark plugs.

(3) *Spark plugs.* The spark plug consists of a metal shell with integral electrode, a center electrode, and an insulator to insulate the center electrode from the metal shell. When the spark plug is screwed into the threaded hole in the left side of the cylinder head, the two electrodes extend into the combustion chamber. The center electrode is directly connected to the distributor through the spark plug cable, and the other electrode is grounded through the metal shell to the engine cylinder head.

b. Distributor Data.

Make	Delco Remy
Model	1111561
Ordnance number	7353276
Rotation (viewing drive end)	clockwise
Breaker point pressure	17–21 oz
Breaker point opening	0.022 in
Voltage	24 volt

146. Ignition Timing

a. General. Efficient operation of the engine requires delivery of a spark in the combustion chamber when piston is 5 degrees before top dead center on the compression stroke. The procedure for adjusting the distributor to enable it to deliver the high tension spark to the spark plugs in proper relation to the position of the pistons is given in *b* below.

b. Checking and Correcting Timing.

(1) Unscrew nut securing No. 1 spark plug cable to spark plug

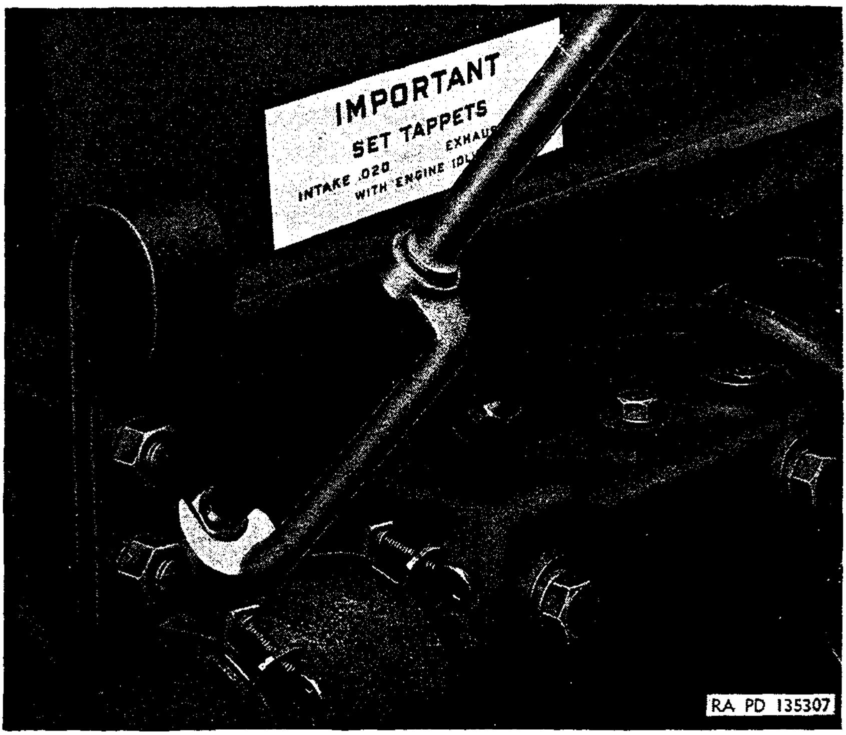


Figure 172. Removing spark plug cable.

(fig. 172) and remove cable from plug. Install spark plug adapter in top of spark plug, position spark plug cable at end of adapter, and tighten cable retaining nut.

(2) Unscrew connector securing main wiring harness (fig. 160) to main harness terminal at generator regulator and remove the harness from the regulator. Install adapter in main harness terminal, position harness at end of adapter (fig. 173), and tighten connector.

(3) Disconnect battery ground cable (par. 114*b*(4)).

(4) Fasten timing light clips to spark plug adapter, generator regulator adapter (either terminal), and to suitable ground (fig. 174). Use 24-volt timing light.

(5) Chalk-mark notch (fig. 128) on the crankshaft pulley to permit easy observation.

(6) Connect battery ground cable (par. 115*h*(4)).

(7) Start engine and, with engine running at idling speed, direct beam of timing light at timing pointer (fig. 128). The relation of timing notches on crankshaft pulley to timing pointer can be seen by flashes of the timing light as the pulley rotates. Timing is correct when pointer points to the 5-degree or first notch on the pulley as the light flashes.

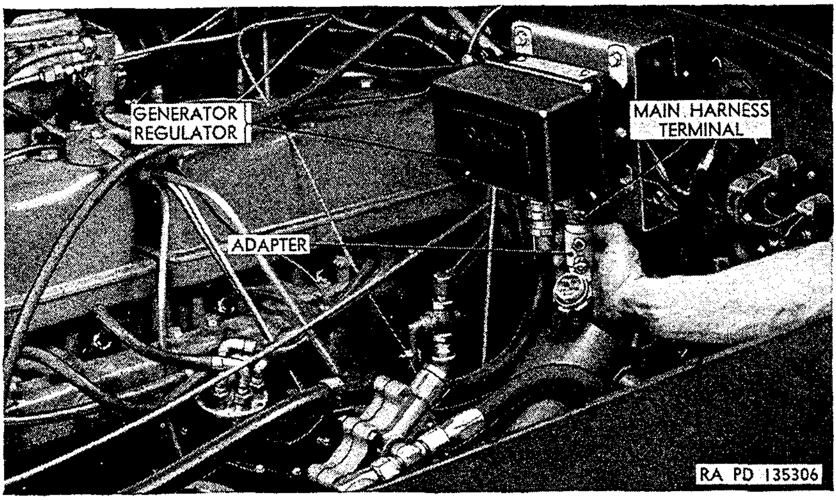


Figure 173. Installing timing adapter at generator regulator.

(8) If timing is incorrect, correct (*a*) and (*b*) below.

(*a*) Loosen cap screws (T, fig. 135) at two clamps securing distributor to top of distributor drive housing, and rotate distributor until timing pointer and 5-degree notch coincide when timing light flashes. Clockwise rotation of distributor will advance spark, and counterclockwise rotation will retard spark.

Note. It is unnecessary to disconnect the distributor vent line since the line will flex sufficiently to allow close adjustment.

(*b*) When timing is correct, tighten the two cap screws (T, fig. 135) at distributor clamps.

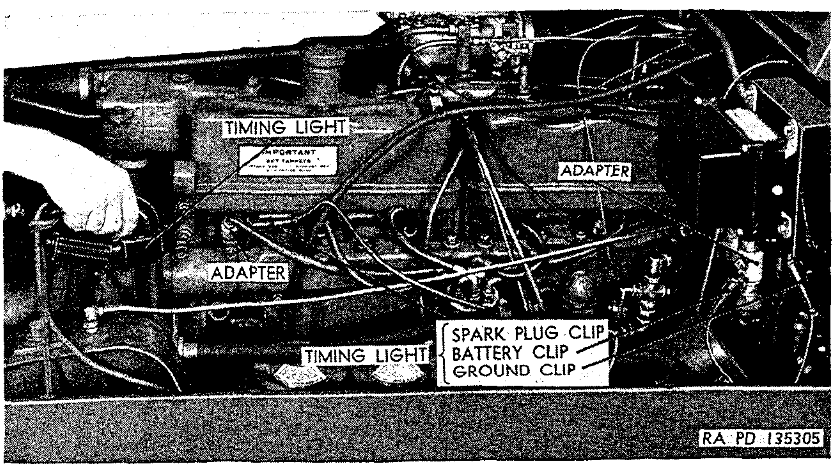


Figure 174. Timing light connected to adapters (installed in ignition circuit).

(9) Stop engine and disconnect battery ground cable (par. 114*b*(4)).

(10) Remove timing light clips from spark plug adapter, generator regulator adapter, and from ground.

(11) Remove cable from adapter at No. 1 spark plug, remove adapter, and connect cable to plug. Tighten nut.

(12) Remove main wiring harness from adapter at generator regulator, remove adapter from main harness terminal, and connect harness (fig. 160) to regulator terminal. Tighten connector.

(13) Connect battery ground cable (par. 115*h*(4)).

147. Ignition Distributor and Coil Assembly

a. Distributor Contact Points.

(1) *Inspection and test.*

(*a*) *Inspect points.* Remove eight screws and lockwashers securing distributor cover assembly to distributor (fig. 175), and remove cover. Remove and discard cover gasket. Lift rotor from breaker cam assembly (fig. 176), push breaker lever away from cam, and examine contact points for pitting, burning, or wear. If the points are slightly pitted or burned, dress them with a contact point dresser

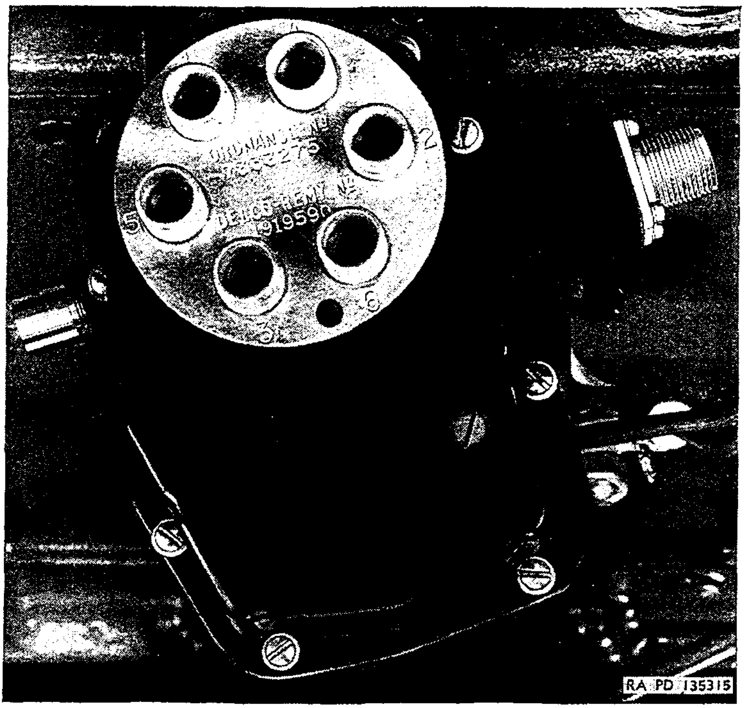


Figure 175. Top view of cover assembly installed on distributor.

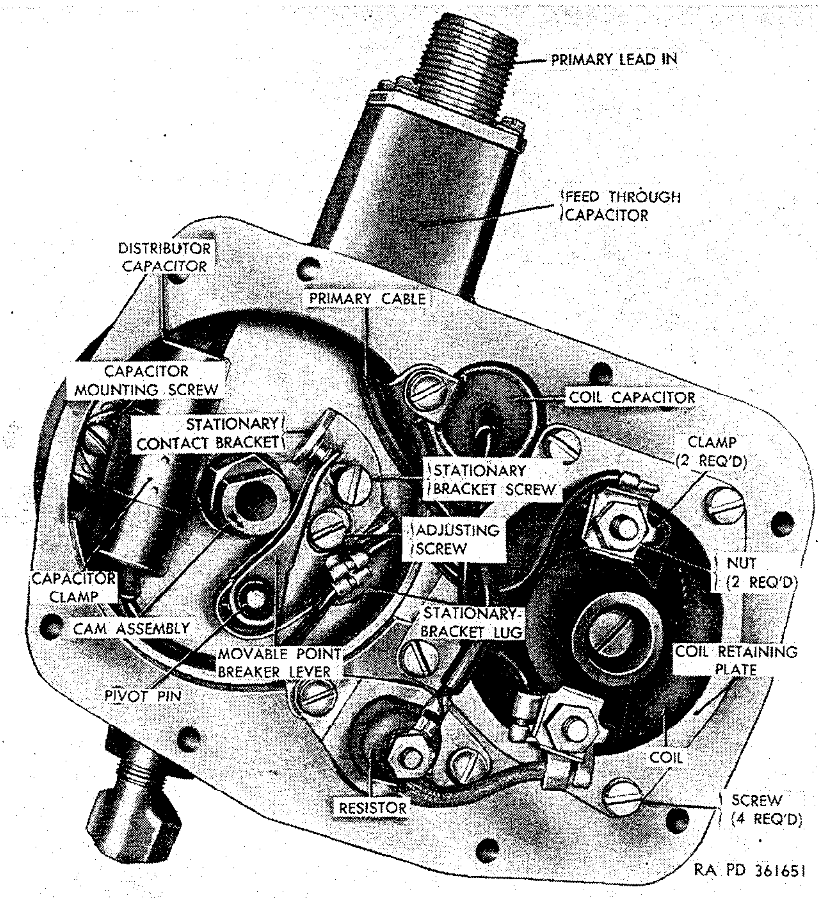


Figure 176. Top view of distributor with cover removed.

or grade 2/20 flint paper, remove the filings with compressed air, and adjust point gap ((2) below).

Caution: Do not use emery cloth to dress points.

If the points are badly pitted, burned, or worn, replace points ((3) and (4) below). If the points are badly pitted, also replace capacitor (condenser) (*b* below), as it is probably the cause of the pitting. If contact points are found to be in satisfactory condition, proceed as in (*b*) below.

(*b*) *Test breaker lever spring tension.* With cover and rotor removed, hook spring scale (fig. 177) at end of breaker lever as close as possible to contact point, and pull breaker lever away from cam, noting pull on scale required to separate contact points. It is important that pull on scale required to open points be from 17 to 21 ounces. If scale reading indicates improper breaker lever spring tension, replace distributor point set ((3) and (4) below). If scale indicates

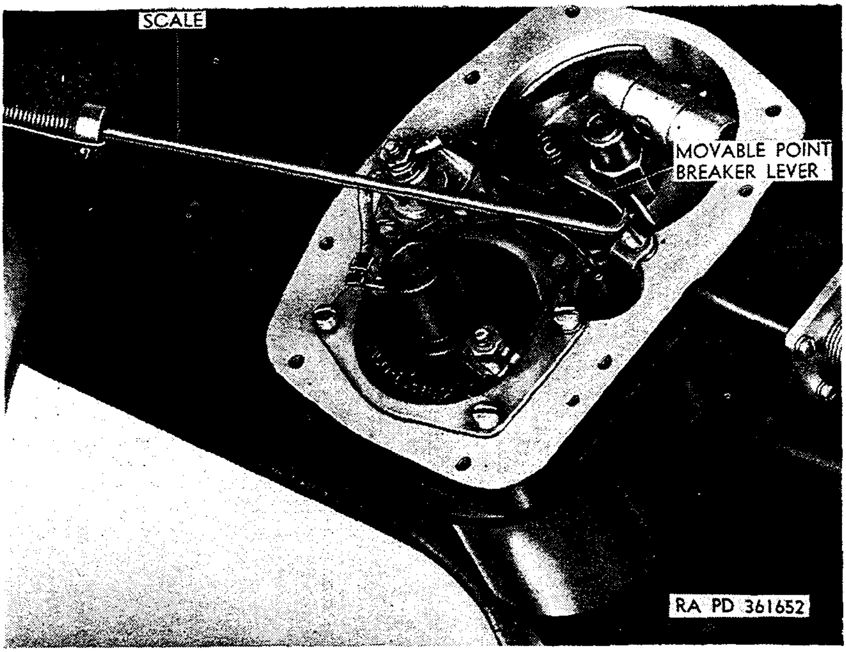


Figure 177. Checking distributor breaker lever spring tension.

proper spring tension, install rotor on breaker cam, place new gasket on top of distributor housing, position cover on distributor, and install eight screws and lockwashers. Tighten screws.

(2) *Breaker point gap adjustment.*

(*a*) Turn engine in small increments using starter (by momentarily depressing starter button with ignition switch in the OFF position) until high point of cam assembly (fig. 176) holds breaker lever so as to maintain maximum gap between contact points.

(*b*) Using a feeler gage (fig. 178), check the maximum gap between the contact points, being sure that the points are correctly alined and are not sufficiently pitted to cause measurement of the gap between the point faces to be inaccurate. It is important that the gap between the points be 0.022 inch. If the gap requires adjustment, loosen the stationary bracket screw (fig. 176) and turn the adjusting screw (fig. 176) until correct gap is obtained. Tighten stationary bracket screw.

(3) *Removal.*

(*a*) Remove eight screws and lockwashers securing distributor cover assembly to distributor (fig. 175) and remove cover. Remove and discard cover gasket.

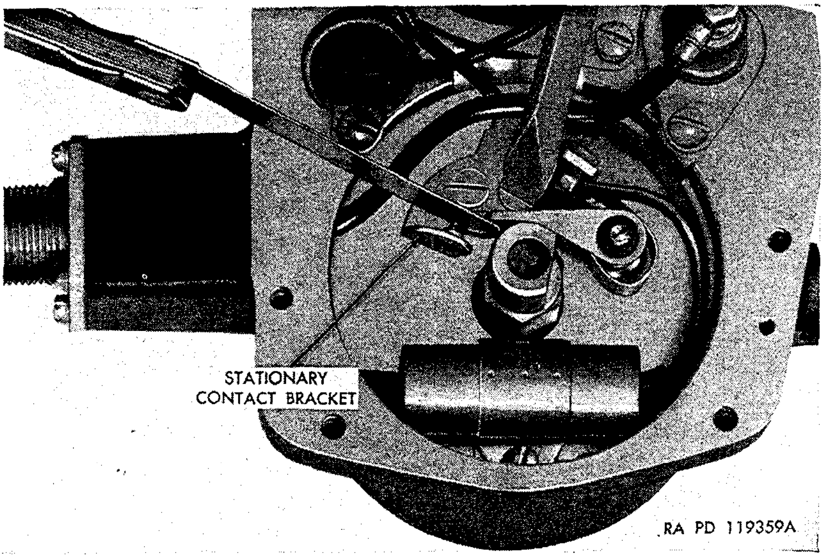


Figure 178. Checking and setting distributor contact point gap.

(*b*) Remove rotor from cam assembly (fig. 176).

(*c*) Remove screw and nut securing breaker-plate-capacitor cable terminal and stationary-bracket-to-coil cable terminal to stationary bracket lug (fig. 176), and remove cables from lug.

(*d*) Lift breaker lever (fig. 176) from pivot pin.

(*e*) Remove stationary bracket screw (fig. 176) and lift stationary bracket from pivot pin.

(4) *Installation.*

(*a*) Position stationary bracket (fig. 176) on pivot pin and install stationary bracket screw. Do not tighten screw.

(*b*) Place two drops of engine oil on pivot pin (fig. 176) and position breaker lever on pivot pin so that the breaker lever spring is on the side of the stationary-bracket lug (fig. 176) toward the cam assembly.

(*c*) Position breaker-plate-capacitor cable terminal and stationary-bracket-to-coil cable terminal at stationary bracket lug and insert terminal screw in lug. Install nut on screw and, holding breaker lever spring down so notch in spring makes good contact with terminal screw, tighten.

(*d*) Adjust breaker point gap ((2) above).

(*e*) Place one or two drops of engine oil on felt wick in center of cam assembly, and place a trace of general purpose grease (par. 67) on cam.

Caution: Do not overlubricate to prevent lubricant from getting on contact points.

(*f*) Install rotor on cam assembly.

(*g*) Place new gasket on top of distributor housing, position cover on distributor, and install eight screws and lockwashers (fig. 175). Tighten screws.

b. Distributor Breaker Plate Capacitor (*Condenser*) (fig. 176).

(1) *Removal.* Remove screw and nut securing breaker-plate-capacitor cable terminal to stationary bracket lug and remove cable. Remove screw and lockwasher securing capacitor clamp to breaker plate, and lift capacitor and clamp from plate. Slide clamp off capacitor.

(2) *Installation.* Slide capacitor clamp on capacitor and position capacitor and clamp on breaker plate. Insert screw and lockwasher in hole in clamp and breaker plate and tighten screw. Position capacitor cable terminal and stationary-bracket-to-coil cable terminal at stationary bracket lug, and insert terminal screw in lug. Install nut on screw and, holding breaker lever spring down so notch in spring makes good contact with terminal screw, tighten.

c. Ignition Coil (fig. 176).

(1) *Removal.* With distributor cover removed, remove two nuts and clamps from terminals on top of coil and remove the three cables from the terminals. Remove four screws securing coil retaining plate to distributor housing and remove plate. Lift coil from distributor housing and remove and discard coil gasket from recess in housing.

(2) *Installation.* Place a new coil gasket in recess in distributor housing, and install coil in housing. Position coil retaining plate on top of coil, install four screws in holes in plate, and tighten.

Note. Before tightening screws, be sure that the positive (+) terminal on top of coil is toward front of truck.

Position resistor-cable terminal and coil-capacitor-cable terminal on positive (+) terminal on top of coil, and install clamp and nut on terminal. Position stationary-bracket-to-coil-cable terminal on negative (−) terminal on top of coil, and install clamp and nut on terminal. Tighten both terminal nuts.

d. Distributor and Coil Assembly.

Note. The key letters noted in parentheses are in figure 135, except where otherwise indicated.

(1) *Removal.*

(*a*) Unscrew connectors on lower ends of spark cables and remove cables from distributor cover.

(*b*) Unscrew connector (E) from primary lead-in at rear of distributor (D) and remove primary wire (F).

(*c*) Unscrew nut (B) from elbow at front of distributor and remove distributor vent line (C).

(*d*) Remove two cap screws (T), lockwashers (S), and distributor mounting clamps (R) from top of distributor drive housing (N) and lift distributor from housing. Remove and discard distributor mounting gasket.

(2) *Installation.*

(*a*) Turn engine in small increments using starter (by momentarily depressing starter button with ignition switch in the OFF position) until crankshaft pulley stops so that top dead center (TDC) timing mark (fig. 128) is in line with ignition timing pointer.

(*b*) Remove cover and rotor from distributor and turn distributor shaft until lobe of cam trailing flat on cam assembly opens breaker points. Place a straightedge (fig. 179) against this flat and turn shaft until straightedge crosses edge of distributor housing between scribed marks.

(*c*) Install new mounting gasket on top of distributor drive housing (N) and position distributor and coil assembly (D) on housing, engaging coupling at lower end of distributor shaft with coupling on upper end of drive shaft inside housing. Position the two distributor mounting clamps (R) on top of drive housing, and install two cap screws (T) and lockwashers. Tighten cap screws.

(*d*) Adjust breaker point gap (*a*(2) above).

(*e*) Install rotor on breaker cam, position distributor cover on housing, being sure that cover gasket is in place, and in-

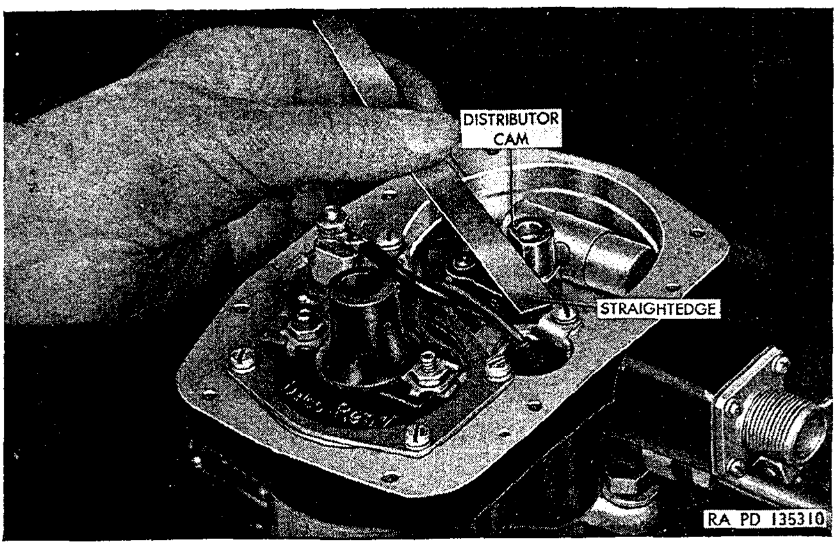


Figure 179. Positioning distributor breaker cam for distributor installation.

stall eight screws and lockwashers (fig. 175). Tighten screws securely.

(*f*) Position distributor primary wire (F) at primary lead-in on rear of distributor and tighten connector (E).

(*g*) Position distributor vent line (C) at elbow on front of distributor and tighten nut (B).

(*h*) Insert ends of spark plug cables in cable sockets (corresponding to spark plub numbers in distributor cover (fig. 175), and tighten connectors.

(*i*) Check ignition timing and correct, if necessary (par. 146*b*).

148. Spark Plugs

a. Removal. Loosen nut securing spark plug cable to No. 1 spark plug, using suitable wrench (fig. 172), and pull cable from spark plug. Unscrew plug, using spark plug wrench or deep socket, and remove plug from recess in cylinder head. Remove and discard spark plug gasket. Repeat above steps for remaining spark plugs.

b. Cleaning. Use standard spark plug cleaning equipment to clean spark plugs. If electrodes are excessively burned, install new spark plugs.

c. Adjustment. Use a round feeler gage to check for proper gap between electrodes. Adjust gap to 0.030 inch by bending side electrode only.

d. Installation. Place a new gasket on spark plug and screw plug into threaded hole in side of cylinder head. Tighten plug against gasket (25 to 28 pound-feet torque), using spark plug wrench or deep socket. Position spark plug cable at end of spark plug, and tighten connector. Repeat above steps for remaining spark plugs.

Section XIII. GENERATING SYSTEM

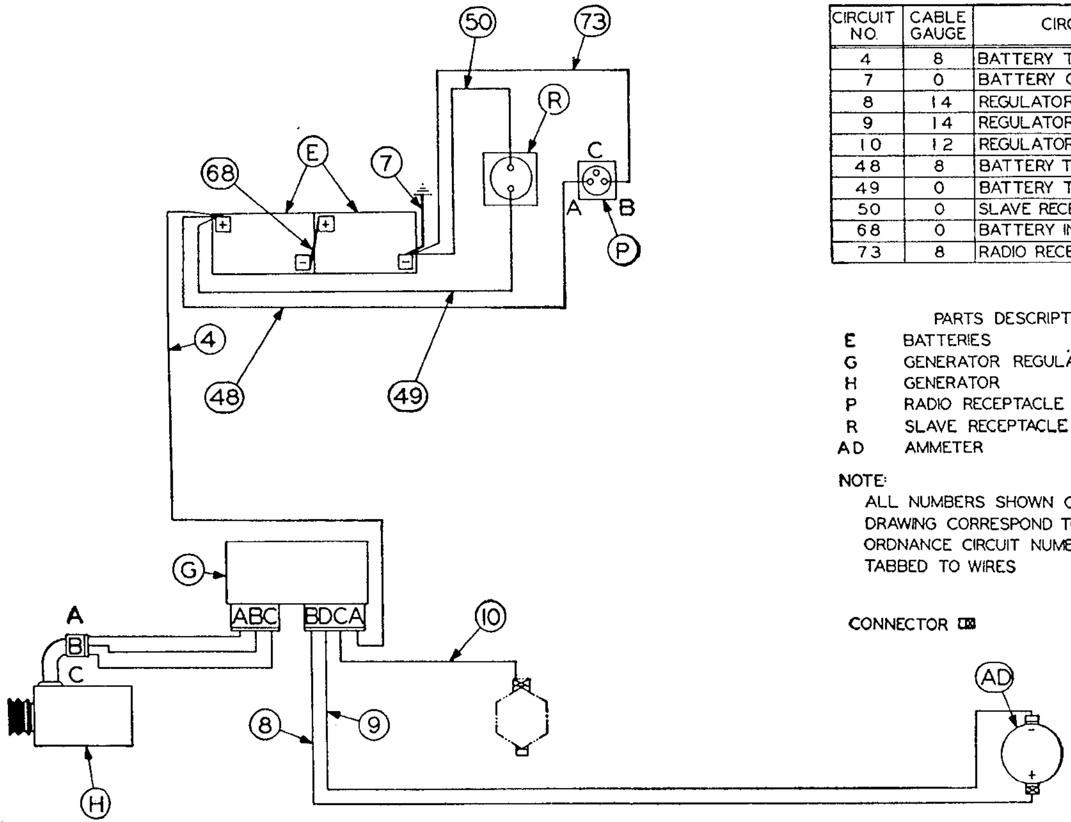
149. Description and Data

a. Description.

(1) *General.* The generating system (fig. 180) consists of the generator, generator regulator, and connecting cable. The purpose of the generating system is to maintain a full charge in the batteries and to furnish current for the ignition and lighting systems when the speed of the engine permits.

(2) *Generator.* The watertight generator (fig. 136) is a four-pole, four-brush, shunt unit. The generator is mounted on the left side of the crankcase and is driven by belts from the crankshaft pulley.

(3) *Generator regulator.* The watertight generator regulator (fig. 160) consists of a voltage regulator, a current regulator, and a cutout relay, all mounted on the same base and enclosed



CIRCUIT NO.	CABLE GAUGE	CIRCUIT DESCRIPTION
4	8	BATTERY TO REGULATOR 'A' TERMINAL
7	0	BATTERY GROUND
8	14	REGULATOR TO AMMETER (+)'B' TERMINAL
9	14	REGULATOR TO AMMETER (-)'D' TERMINAL
10	12	REGULATOR (SHUNT) TO CIRCUIT BREAKERS
48	8	BATTERY TO RADIO RECEPTACLE (FEED)
49	0	BATTERY TO SLAVE RECEPTACLE (+)
50	0	SLAVE RECEPTACLE TO BATTERY (-)
68	0	BATTERY INTERCONNECTING CABLE
73	8	RADIO RECEPTACLE TO BATTERY (GROUND)

PARTS DESCRIPTION

E	BATTERIES
G	GENERATOR REGULATOR
H	GENERATOR
P	RADIO RECEPTACLE
R	SLAVE RECEPTACLE
AD	AMMETER

NOTE:
ALL NUMBERS SHOWN ON DRAWING CORRESPOND TO ORDNANCE CIRCUIT NUMBERS TABBED TO WIRES

CONNECTOR

RA PD 135258

Figure 180. Generating system diagram.

by the same cover. The generator regulator is mounted on a bracket attached to the front left side of the cab cowl.

b. Data.

(1) *Generator.*

Make	Delco-Remy
Model	1117495
Ordnance number	7355736
Armature rotation (viewing drive end)	clockwise
Voltage	24-volt

(2) *Generator regulator.*

Make	Delco-Remy
Model	1118606
Ordnance number	7351952
Type	vibrating
Voltage	24-volt

150. Generator

a. Inspection. Remove generator inspection plug (fig. 136) and inspect commutator. If commutator is rough, out of round, burned, or has high mica, replace generator (*b* and *c* below). Install inspection plug and tighten.

Caution: When installing inspection plug, be sure that gasket is seated properly to prevent leakage.

b. Removal (fig. 136). Unscrew generator-to-regulator cable connector at receptacle on top of generator, and pull cable from receptacle. Loosen the two generator mounting bolts. Remove generator-adjusting-arm cap screw and push generator toward crankcase as far as it will go. Remove drive belts from pulley. Remove mounting bolts and remove generator from mounting brackets.

c. Installation. Position generator (fig. 136) at brackets on side of crankcase, and install the two mounting bolts, one at each end. Install nut on rear mounting bolt but do not tighten. Place drive belts on generator pulley. Install adjusting arm cap screw. Adjust drive belts (par. 137*b*). Unscrew generator-to-regulator cable connector at receptacle on bottom of generator regulator (fig. 160), remove cable, and polarize generator (*d* below). Install generator-to-regulator cable and tighten connector at each end.

d. Polarization. Whenever a new or rebuilt generator or generator regulator is installed, the generator must be polarized *before the engine is started.* To polarize the generator, connect a jumper wire to "A" terminal at generator regulator and momentarily touch other end of jumper wire to "B" terminal at generator. Remove jumper wire.

151. Generator Regulator
(fig. 160)

a. Test. The usual testing methods for generator regulators are not applicable to the regulator installed on the vehicles covered by this manual because of the totally enclosed construction of the charging system components and the watertight wiring harness and fittings. Therefore, if the ammeter shows a high charging rate when batteries are partially discharged, replace the regulator.

b. Removal. Unscrew generator-to-regulator cable connector at receptacle on bottom of regulator and pull cable from receptacle. Unscrew main wiring harness connector at receptacle on bottom of regulator and pull harness from receptacle. Remove four regulator mounting nuts, lockwashers, and bolts, and remove regulator.

c. Installation. Position generator regulator at mounting bracket on front left side of cab cowl, and install four mounting bolts, lock washers, and nuts. Tighten nuts. Position main wiring harness at left receptacle on bottom of regulator and tighten connector. Polarize generator (par. 150*d*). Position generator-to-regulator cable at right receptacle on bottom of regulator and tighten connector.

Section XIV. BATTERIES AND LIGHTING SYSTEM

152. Description and Data

a. Description.

(1) *General.* The batteries and lighting system consists of the batteries, vehicle service lights, and vehicle blackout lights. Vehicle service lights include the headlights, parking lights, stoplights, and taillight. Vehicle blackout lights include the blackout driving light, blackout marker lights, blackout stoplight, and blackout taillights. Both service and blackout lights are controlled by the light switch (par. 19) on the instrument panel. In addition, the medium wrecker truck M62 and tractor wrecker truck M246 are equipped with three floodlights and a red flasher light for night crane operation.

(2) *Batteries.* Two 12-volt, lead-acid-type batteries (fig. 181), located in a compartment directly under the right cab door (fig. 133), are connected in series to supply the 24-volt electrical current required to start and operate the engine and lights when current requirements exceed generator output par. 149*a*(1)). These batteries are of the submersible-type with special vent plugs which prevent entrance of water into the cells when the batteries are submerged. The terminals are waterproofed with heavy asbestos grease after the batteries are installed. Waterproof cables and harness assemblies (par. 163) are used to connect the batteries to the starter, generator regulator, slave battery receptacle, and radio receptacle.

(3) *Headlights.* The service headlights (fig. 69), mounted in panels on each side of the radiator, are waterproof, double-

347797°—55——18

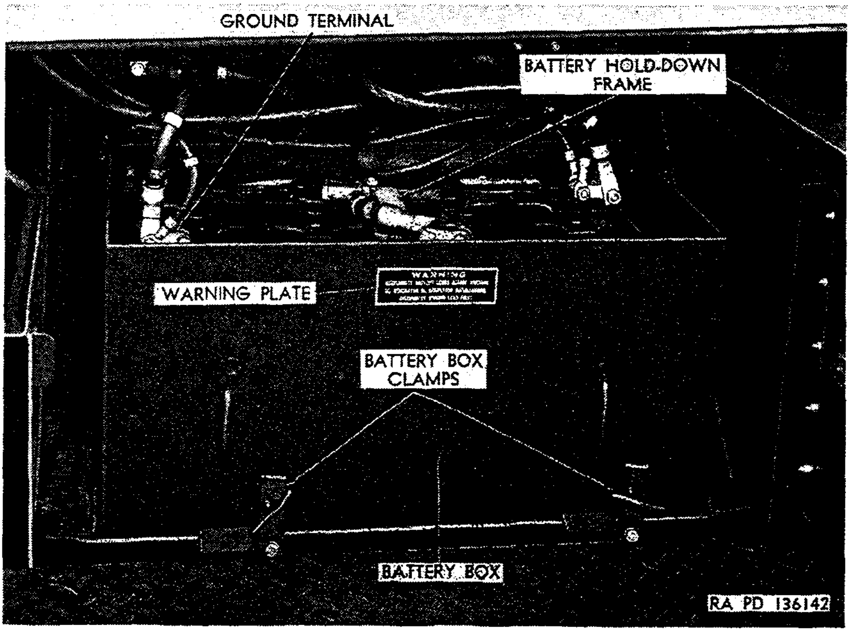


Figure 181. Battery installation.

filament, sealed-beam lamp-units. High ("bright") or low ("dim") beam is selected by the dimmer switch (par. 20) on the cab floor.

(4) *Parking lights.* Parking lights (fig. 69) are single-filament, bayonet-base lamps installed in waterproof light units mounted on the left and right front fenders.

(5) *Stoplight and taillight.* The stoplight and taillight are single-filament, bayonet-base lamps installed in a waterproof light unit (fig. 70) mounted at the left rear corner of the vehicle.

(6) *Blackout driving light.* The blackout driving light (fig. 69) is a waterproof, sealed-beam lamp-unit which provides diffused light of low intensity. On vehicles equipped with front winch, the blackout driving light is mounted directly below the left headlight. On vehicles not equipped with front winch, the blackout driving light is mounted directly above the left headlight.

(7) *Blackout marker lights.* Blackout marker lights (fig. 69) are single-filament bayonet-base lamps installed in the same waterproof light units as the parking lights ((4) above).

(8) *Blackout stoplight.* The blackout stoplight (fig. 70) is a single-filament, bayonet-base lamp installed in a waterproof light unit mounted at the right rear corner of the vehicle.

(9) *Blackout taillights.* The two blackout taillights are single-filament, bayonet-base lamps. One lamp is installed in the

same light unit as the service stop and taillights, and the other lamp is installed in the same light unit as the blackout stoplight.

(10) *Slave battery receptacle.* The slave battery receptacle (fig. 133), which is installed at the right rear corner of the cab, is wired in parallel with the batteries (fig. 180). It is used to charge the batteries from an external source or to connect additional electrical power from an external source to operate electrical components.

(11) *Radio receptacle.* The radio receptacle is located in the cab behind the companion seat and provides power connection for radio.

Note. The radio receptacle is not furnished as standard equipment on late production vehicles.

(12) *Trailer coupling receptacle.* The trailer coupling receptacle (fig. 70) is a four-terminal connector mounted at the rear of the vehicle directly above the pintle hook. This receptacle provides a means of connecting stoplights and taillights on trailer with those on truck.

b. Battery Tabulated Data.

Make	Delco-Remy
Model	6TN23
Ordnance number	7716710
Voltage	12
Plates per cell	23
Number of batteries used	2

153. Batteries and Cables

a. Servicing.

(1) *Specific gravity test.* The state of charge in each of the battery cells is determined by checking the specific gravity of the electrolyte (battery fluid) in the cells. Use a hydrometer and thermometer and correct hydrometer reading for temperature in accordance with table VIII. A corrected specific gravity reading of 1.285 in each cell indicates a fully charged battery. A specific gravity reading of 1.225 or less in each cell indicates that battery must be recharged or replaced.

(2) *Voltage test.* Perform high-rate discharge test according to instructions accompanying test instrument.

(3) *Adding water.* The water in the electrolyte solution will evaporate at high temperatures or with excessive charging rates. Inspect the electrolyte level and add distilled or clean water, when necessary, to bring electrolyte level to three-fourths of an inch above the separators.

(4) *Cleaning.* The top of the battery must be kept clean. Tighten vent plugs and clean battery with a brush dipped in an alkaline solution such as ammonia or a solution of bicarbonate of soda and water. After foaming stops, flush top of battery with clean water. If terminals and cable clamps are corroded, disconnect cable and clean as described above for top of battery. Connect cables and waterproof battery terminals by packing with heavy asbestos grease, which is identified by the symbol GK.

b. Removal. Open battery compartment door (fig. 133). Loosen wingnuts on two battery box clamps (fig. 181) and unhook clamps from box. Pull battery box out onto step. To remove front battery, disconnect cables (4, 48, and 49, fig. 180) from positive (+) terminal post and cable (68, fig. 180) from negative (−) terminal post. To remove rear battery, disconnect cable (68, fig. 180) from positive (+) terminal post and cables (7, 50, and 73, fig. 180) from negative (−) terminal post. Remove battery holddown frame and lift batteries, one at a time, from battery box.

c. Installation. Position batteries in battery box with positive (+) terminals of both batteries toward front of truck. Install battery holddown frame. Connect cables (7, 50, and 73, fig. 180) to rear-battery negative (−) terminal post. Connect cable (68, fig. 180) to rear-battery positive (+) terminal post and to front-battery negative (−) post. Connect cables (4, 48, 49, and 81, fig. 180) to front-battery positive (+) terminal post. Waterproof battery terminals by packing with heavy asbestos grease (GK). Slide battery box (fig. 181) into battery compartment, position battery box door, and tighten wing nuts on the two battery box clamps. Close battery compartment door (fig. 133). Test battery installation (*d* below).

d. Battery Installation Test. Test battery installation by turning on ignition switch and service headlights. If ammeter shows discharge, battery installation is correct. If ammeter shows charge reading, reverse battery cables.

Note. Perform above test with engine stopped.

154. Headlights

a. Sealed-Beam Lamp-Unit Removal.

(1) Remove three mounting screws from headlight rim (fig. 182) and remove rim.

(2) Remove three screws attaching retaining ring (fig. 183) to headlight body, and remove ring.

(3) Pull sealed-beam lamp-unit from headlight body and disconnect cables at waterproof connectors (fig. 183).

b. Sealed-Beam Lamp-Unit Installation.

(1) Connect three cables at waterproof connectors (fig. 183) and position lamp-unit in headlight body.

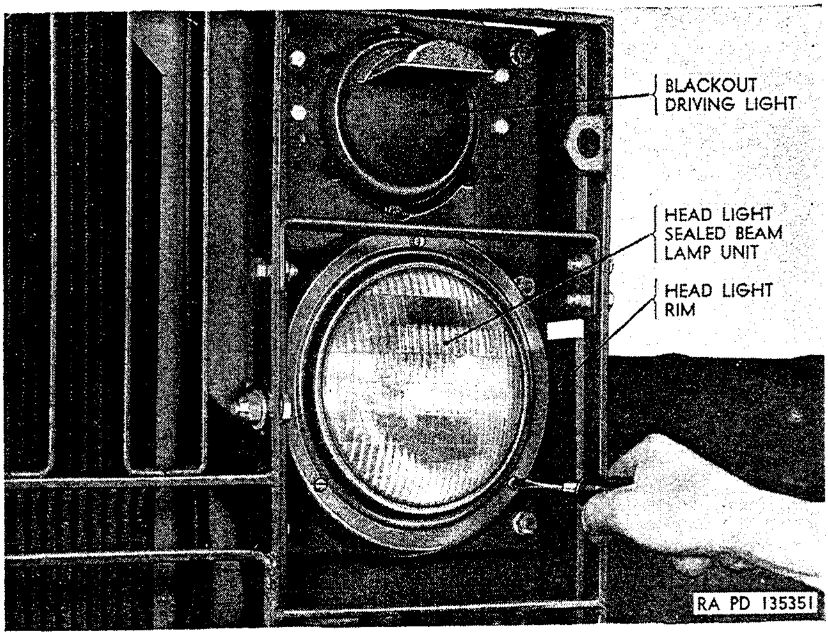


Figure 182. Removing headlight rim.

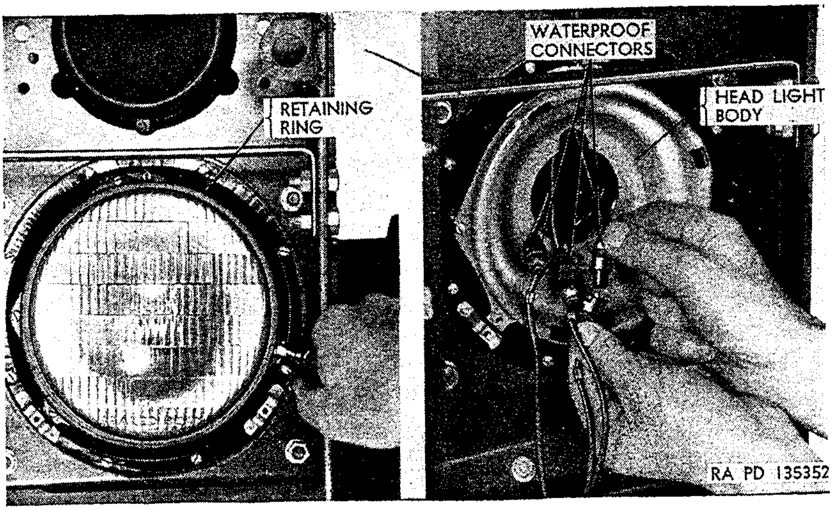


Figure 183. Removing headlight retaining ring and sealed-beam lamp-unit.

(2) Position retaining ring (fig. 183), install three screws, and tighten.

(3) Position headlight rim (fig. 182), install three screws, and tighten.

c. Adjustment. Adjustment of the headlights is readily accomplished with a headlight aiming chart. Cover one headlight while adjusting the other. Remove headlight rim (fig. 182). Turn vertical adjusting screw (fig. 184) to change direction of beam vertically, and turn horizontal adjusting screw (fig. 184) to change direction of beam horizontally.

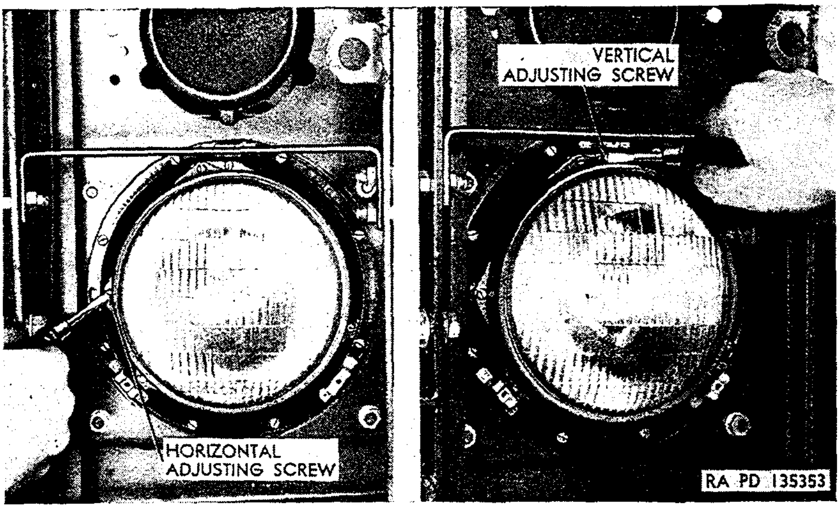


Figure 184. Adjusting headlight.

155. Parking Lights

a. Removal.

(1) Remove six screws securing blackout-marker-light door (fig. 185) to light body.

(2) Remove blackout-marker light door and door seal gasket.

(3) Push lamp in and turn counterclockwise to remove lamp from socket.

Note. Three lamps are installed inside parking-and-blackout-marker light units. The third lamp is for use as a directional light, but is not presently included in the wiring circuit.

b. Installation.

(1) Insert base of lamp in socket and turn lamp clockwise to lock in socket.

(2) Operate light switch (par. 49*f*) to test parking lights.

(3) Install door seal gasket in groove in blackout-marker-light door (fig. 185), position door at front of light body, and install six screws. Tighten screws.

156. Stoplight and Taillight

a. Lamp Removal. The procedures for removing service stoplight and taillight are the same as those for removing parking lights (par. 155*a*).

b. Lamp Installation. The procedures for installing service stoplight and taillight are the same as those for installing parking lights (par. 155*b*).

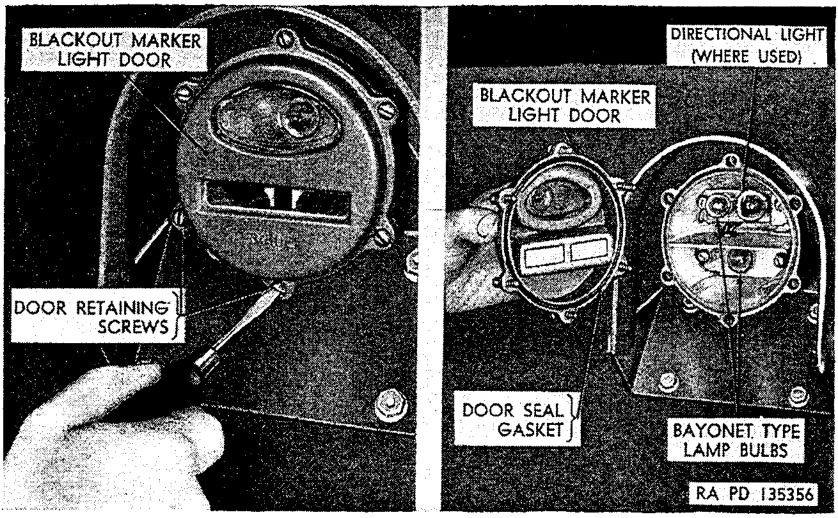


Figure 185. Removing parking lamp and blackout marker lamp.

157. Blackout Driving Light

a. Removal.

(1) Remove three door-retaining screws (fig. 186) from blackout driving light door.

(2) Pull door and sealed-beam lamp-unit assembly forward and remove waterproof connectors from connector clips (fig. 186).

(3) Disconnect waterproof connectors (fig. 187).

(4) Remove three lamp-unit retaining springs (fig. 187) and remove lamp unit from door.

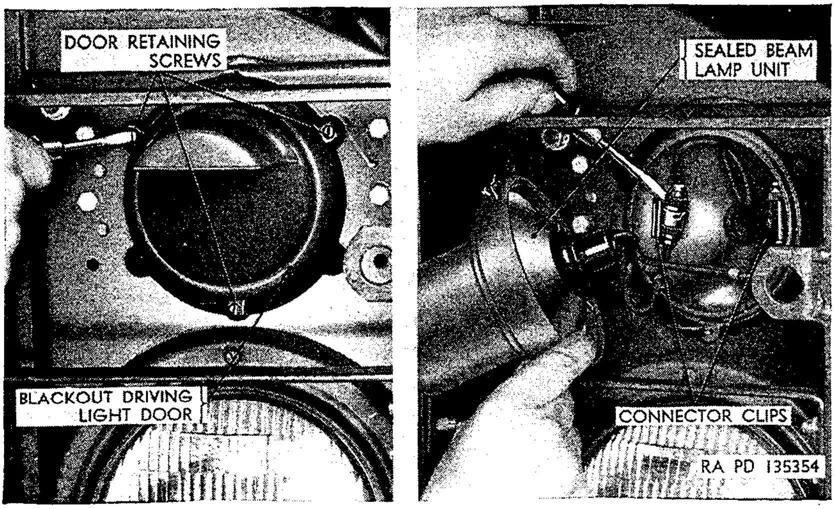


Figure 186. Removing blackout driving light.

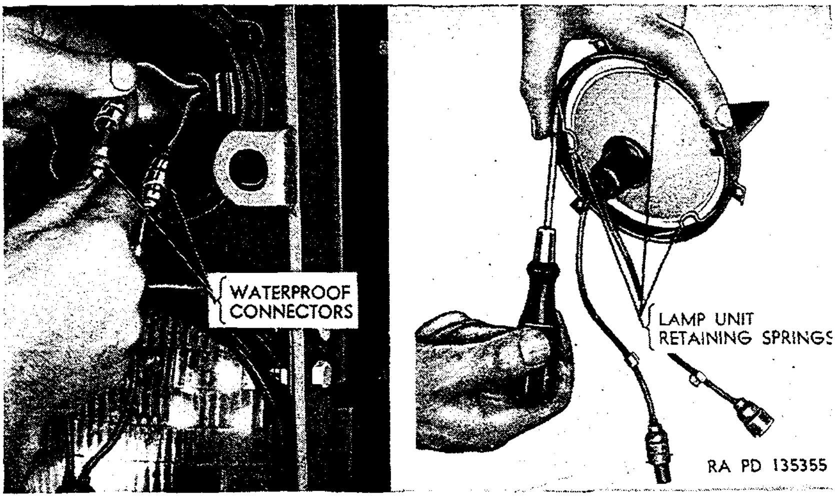


Figure 187. Removing sealed-beam.

b. Installation.

(1) Position sealed-beam lamp-unit in blackout-driving-light door (cover) and secure with three retaining springs (fig. 187).

(2) Connect lamp-unit cables to wiring harness cables (fig. 187) and fasten cable connectors in connector clips (fig. 186).

(3) Position door (fig. 186) and lamp unit assembly on front of light body and install three door-retaining screws. Tighten screws.

(4) Operate light switch (par. 49*f*) to test blackout driving light.

158. Blackout Marker Lights, Blackout Stoplight, and Blackout Taillights

a. Removal. The procedures for removing blackout marker lights, blackout stoplight, and blackout taillights are the same as those for removing parking lights (par. 155*a*).

b. Installation. The procedures for installing blackout marker lights, blackout stoplight, and blackout taillights are the same as those for installing parking lights (par. 155*b*).

159. Slave Battery Receptacle

a. Removal. Remove four cap screws securing slave battery receptacle (fig. 133) to right rear corner of cab. Pull receptacle away from cab and disconnect two cables (49 and 50, fig. 180) at connectors.

b. Installation. Connect the two receptacle cables to the two cables (49 and 50, fig. 180) inside the cab at connectors. Position receptacle (fig. 133) on side of cab and install four cap screws. Tighten screws.

160. Radio Receptacle

a. Removal. Remove four nuts, lockwashers, and bolts securing radio receptacle (par. 152*a*(11)) to bracket. Remove receptacle from bracket and disconnect two cables at connectors.

b. Installation. Connect the two receptacle cables to the cables (48 and 73, fig. 180) in the cab. Position receptacle on bracket and install four bolts, lockwashers, and nuts. Tighten nuts.

161. Trailer Coupling Receptacle

a. Removal. Remove four nuts, lockwashers, and bolts securing trailer coupling receptacle (fig. 70) to mounting. Disconnect cables at connectors behind receptacle. Push receptacle to rear and remove from vehicle.

b. Installation. Connect cables at connectors behind trailer coupling receptacle (fig. 70). Position receptacle on mounting and install four bolts, lockwashers, and nuts. Tighten nuts.

Section XV. WIRING CIRCUITS AND HARNESSES

162. Coordination With Ordnance Maintenance Unit

Refer to paragraph 2.

163. Description

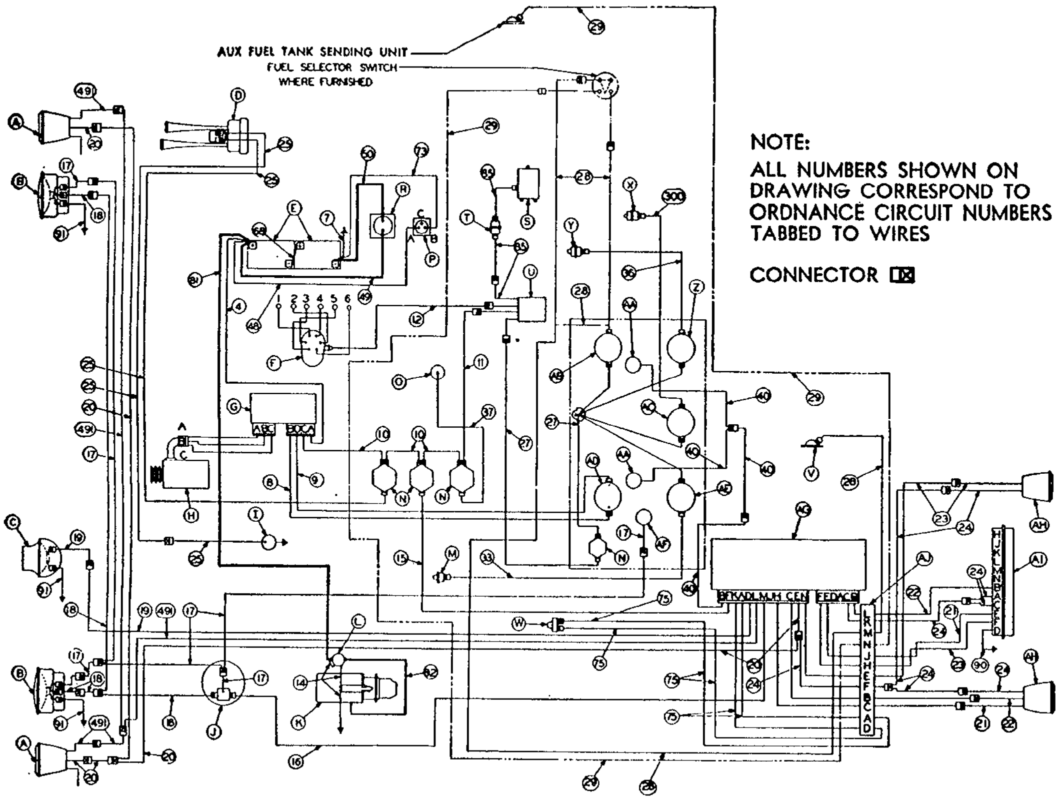
a. General. The electrical system (fig. 188) for the vehicles covered by this manual is a 24-volt system which is totally enclosed and waterproof. Detailed descriptions and organizational maintenance instructions for the components of the complete electrical system are covered in the following paragraphs:

	Paragraphs
Starting system	141–144
Ignition system	145–148
Generating system	149–151
Batteries and lighting system	152–161
Instrument cluster, switches, circuit breakers, sending units, and horn	165–194
Radio interference suppression	195–200

b. Circuits. Each cable for each circuit is tagged at both ends with a number corresponding to one of the circuit numbers shown in figure 188.

c. Wiring and Harnesses.

(1) *Wiring.* All cables are covered with rubber insulation, and some cables in engine compartment are also shielded with tinned-copper braid over loom to prevent electrical interference when using radio equipment (par. 195). Cable ends are always soldered, using rosin flux solder (never *acid* flux), to their connecting plug, socket, or terminal. Two types of cable connectors are used on these vehicles. One is a plug-



PARTS DESCRIPTION

- A B.O. MARKER & PARKING LIGHTS
- B HEAD LIGHTS
- C B.O. DRIVING LIGHT
- D HORN
- E BATTERIES
- F COIL & DISTRIBUTOR
- G GENERATOR REGULATOR
- H GENERATOR
- I HORN BUTTON
- J DIMMER SWITCH
- K STARTER MOTOR
- L MAGNETIC STARTER SWITCH
- M TEMPERATURE SENDING UNIT
- N CIRCUIT BREAKERS
- O AUX. POWER OUTLET
- P RADIO RECEPTACLE
- R SLAVE RECEPTACLE
- S LOW AIR PRESSURE BUZZER
- T LOW AIR PRESSURE SWITCH
- U IGNITION SWITCH
- V FUEL TANK SENDING UNIT
- W STOP LIGHT SWITCH
- X LOW AIR PRESSURE SENDING UNIT
- Y OIL PRESSURE SENDING UNIT
- Z OIL PRESSURE GAGE
- AA PANEL LIGHTS
- AB FUEL GAGE
- AC AIR GAGE
- AD AMMETER
- AE TEMPERATURE GAGE
- AF HIGH BEAM INDICATOR LIGHT
- AG LIGHT SWITCH
- AH TAIL AND STOP LIGHT
- AI TRAILER CONNECTION RECEPTACLE
- AJ DASH RECEPTACLE

Figure 188. Wiring diagram.

and receptacle-type, with the receptacle encased by a metal sleeve and the plug secured to the receptacle by a retaining nut screwed onto the sleeve so as to form a watertight housing for the connector. The other is a bayonet-type connector, with two interlocking bells enclosing an insulated connector and two rubber bushings which form a watertight joint.

(2) *Harnesses.* When a group of cables lead from one general location on these vehicles to another, the cables are bound together to form a harness. Three main harnesses are used on these vehicles. One harness extends from the generator regulator to the circuit breakers, ammeter, and batteries (circuits 4, 8, 9, and 10, fig. 188). Another harness extends from the light switch to the instrument cluster, circuit breaker, and all lights (circuits 15, 16, 19, 20, 21, 22, 23, 24, 40, 75, and 491, fig. 188). The remaining harness extends from the light switch to the trailer coupling receptacle (circuits 21, 22, 23, and 24, fig. 188).

164. Wiring and Harnesses

a. Removal. All electrical cables and harnesses are removed in essentially the same manner. Disconnect the cable (single or multiple) at both ends, remove cable from clamps securing it to various points on the vehicle, and remove cable. To disconnect plug- and receptacle-type connectors, unscrew the connector retaining nut, and pull the plug from the receptacle. To disconnect bayonet-type connectors, rotate one of the connector halves counterclockwise, and pull connector apart.

b. Installation.

(1) *Plug- and receptacle-type connectors.* Position cable (or harness) and secure to vehicle with clamps where provided. Install plugs in receptacle, and tighten connector retaining nuts.

Note. Before installing connector plugs, make sure that rubber sealing gaskets and/or rings are in place. Also make sure that locating key and keyway are alined before attempting to insert plug. Do not force plug. If key and keyway are properly alined, plug pins will enter receptacle sockets without having to be forced. Do not twist or kink cable.

(2) *Bayonet-type connectors.* Position cable and secure to vehicle with clamps where provided. Insert small bell in end of large bell and rotate clockwise to lock bells together.

Note. Before assembling two halves of bayonet-type connectors, make sure that rubber bushings are in place and correctly positioned. If they are not correctly positioned, it will be practically impossible to assemble the connector or to obtain a good electrical connection.

Section XVI. INSTRUMENT CLUSTER, SWITCHES, CIRCUIT BREAKERS, SENDING UNITS, AND HORN

165. Coordination With Ordnance Maintenance Unit

Refer to paragraph 2.

166. Description

a. Instrument Cluster. The instrument cluster (fig. 189), which is secured to the instrument panel in the cab by four quick-disconnect panel lock screws, consists of the instrument mounting plate with the instruments, gages, and lights in (1) through (9) below attached.

(1) Air pressure gage
(2) Ammeter
(3) Fuel gage
(4) Headlight high beam indicator light
(5) Oil pressure gage
(6) Panel lights
(7) Speedometer
(8) Tachometer
(9) Temperature gage

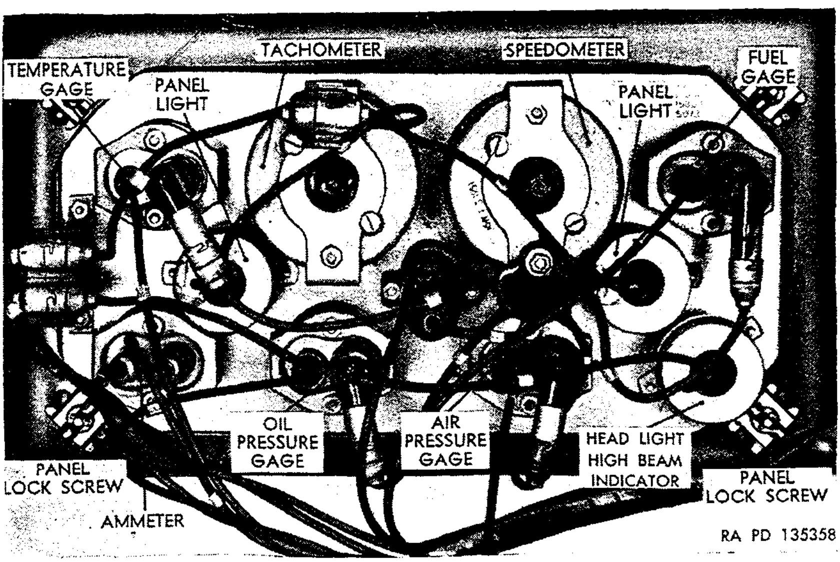
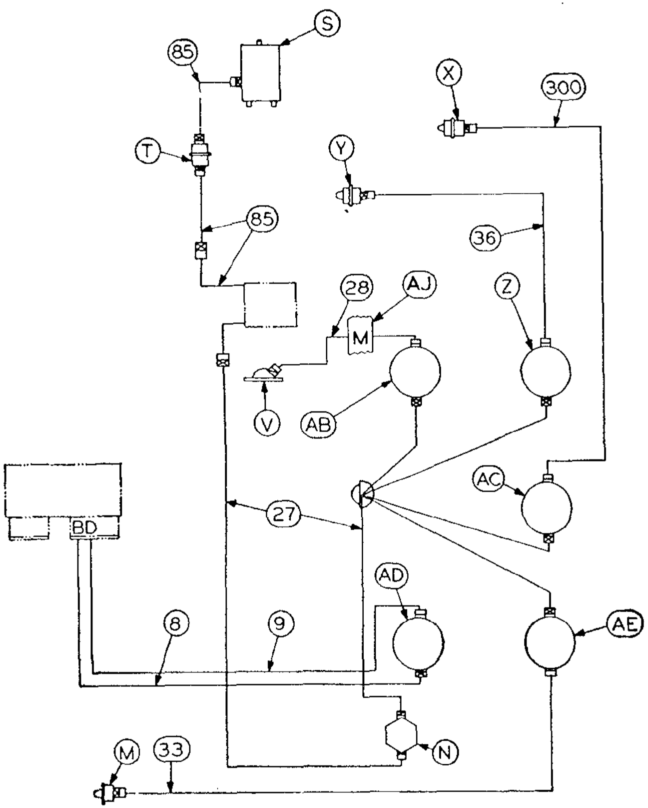


Figure 189. View of back side of instrument cluster.

b. Gages. The speedometer (fig. 189) and tachometer are mechanically operated units which are connected by flexible shaft assemblies to their sending units (*c* below). All other gages in the instrument cluster are electrically operated and are connected by electrical cables to their sending units (*c* below). Circuits to all gages are fed through the ignition switch (fig. 190), which causes gages to be activated only



CIRCUIT NO.	CABLE GAUGE	CIRCUIT DESCRIPTION
8	14	REGULATOR TO AMMETER (+) "B" TERMINAL
9	14	REGULATOR TO AMMETER (-) "D" TERMINAL
27	14	IGNITION SW. TO CIRCUIT BREAKER TO INSTRUMENTS
28	14	FUEL SENDING UNIT TO GAGE (LEFT TANK)
33	14	TEMPERATURE SENDING UNIT TO GAGE
36	14	OIL PRESSURE SENDING UNIT TO GAGE
85	14	IGNITION SW. TO LOW AIR PRESS. SW. & BUZZER
300	14	AIR PRESSURE SENDING UNIT TO GAGE

	PARTS DESCRIPTION
M	TEMPERATURE SENDING UNIT
N	CIRCUIT BREAKER
S	LOW AIR PRESSURE BUZZER
T	LOW AIR PRESSURE SWITCH
V	FUEL TANK SENDING UNIT
X	LOW AIR PRESSURE SENDING UNIT
Y	OIL PRESSURE SENDING UNIT
Z	OIL PRESSURE GAUGE
AB	FUEL GAGE
AC	AIR GAGE
AD	AMMETER
AE	TEMPERATURE GAGE
AJ	DASH RECEPTACLE

CONNECTOR ⊠

NOTE:
ALL NUMBERS SHOWN ON DRAWING CORRESPOND TO ORDNANCE CIRCUIT NUMBERS TABBED TO WIRES

RA PD 135256

Figure 190. Diagram of gage and sending unit electrical circuits.

when the ignition switch is in the ON position. Figure 190 illustrates gage wiring circuits.

c. *Sending Units.*

(1) The air pressure gage sending unit, which is connected in the air-reservoir-to-air-governor line, is mounted behind the instrument panel on the back of the cab cowl. It is a rheostat-type resistance unit which automatically varies the resistance in the gage circuit (circuit No. 300, fig. 190) according to variations in the pressure in the compressed air system.

(2) The fuel gage sending unit (fig. 133), mounted on the top of the fuel tank, is a rheostat-type resistance unit which automatically varies the resistance in the gage circuit (circuit No. 28, fig. 190) to correspond to movement of a float inside the fuel tank.

(3) The oil pressure gage sending unit (fig. 139), which is mounted on the lower right side of the engine crankcase, is a rheostat-type resistance unit. It automatically varies the resistance in the gage circuit (circuit No. 36, fig. 190) according to variations in the pressure in the engine lubrication system.

(4) The speedometer sending unit (fig. 144), mounted on the front of the transfer, is a mechanical unit which is connected to the speedometer by a flexible shaft (D, fig. 145).

(5) The tachometer sending unit (P, fig. 135), mounted on the front of the distributor drive housing, is a mechanical unit which is connected to the tachometer by a flexible shaft (Q, fig. 135).

(6) The temperature gage sending unit (E, fig. 122), which is mounted on top of the rear water outlet header, is a rheostat-type resistance unit. It automatically varies the resistance in the gage circuit (circuit No. 33, fig. 190) according to variations in the temperature of the engine coolant.

(7) The low air pressure sending unit, which is connected in the air-reservoir-to-air-governor line, is mounted behind the instrument panel on the back of the cab cowl. The unit contains a spring-loaded switch which remains closed, completing the circuit to the low air pressure warning buzzer, whenever the pressure in the compressed air system is less than 65 psi. When the pressure in the system exceeds 65 psi, the switch inside the sending unit opens, causing the circuit to the low air pressure warning buzzer to be incomplete.

d. *Switches.*

Note. The key letters noted in parentheses are in figure 65, except where otherwise indicated.

(1) The ignition switch (R), light switch (S), electric brake lock switch (HH), horn button (switch) (W), dimmer switch (X), warning light switch (BB), and floodlight switch (LL) are manually operated.

(2) The stoplight switch (fig. 141), connected in the compressed air system (par. 231) is air operated. When the brake pedal is depressed, fluid forced from the master cylinder (par. 219) opens a valve inside the air-hydraulic brake cylinder (par. 219), admitting compressed air into the line to the stoplight switch.

e. Panel Lights. The two panel lights (fig. 189) illuminate all the gages in the instrument cluster. These lights are controlled by the light switch (par. 49).

f. Headlight High Beam Indicator Light. The headlight high beam indicator light (fig. 189) is connected in the headlight high beam circuit (circuit No. 17, fig. 188), causing it to light only when the high beam circuit is energized by the dimmer switch (J, fig. 188).

g. Air Pressure Warning Buzzer. The low air pressure warning buzzer is mounted on the back side of the instrument panel. The circuit to the buzzer (circuit No. 85, fig. 188) is completed whenever the switch inside the low air pressure sending unit (*c*(7) above) is closed and the ignition switch is ON.

h. Horn. The waterproof horn assembly (fig. 191), mounted on a bracket bolted to the right front fender, is an electrically-controlled air-operated unit. Depressing the horn button (W, fig. 65) completes the circuit to the solenoid mounted between the horn projectors. The solenoid opens an air valve which permits compressed air to pass through the horn body. The compressed air causes a pair of diaphragms inside the dual horn body to vibrate rapidly, thereby "sounding" the horn.

i. Circuit Breakers. Four automatic-reset-type circuit breakers (J, fig. 122), mounted on the upper left end of the cab cowl, protect the various electrical circuits (fig. 188).

167. Instrument Cluster

a. Removal (fig. 189).

(1) *Remove panel lock screws.* Remove the four panel lock screws securing the instrument cluster to the instrument panel, and pull the cluster away from the panel.

(2) *Disconnect gage and light cables.* Disconnect bayonet-type connectors securing gage-to-circuit-breaker cable to gages and lights at back of instrument cluster.

(3) *Disconnect speedometer and tachometer flexible shafts.* Unscrew nut securing speedometer flexible shaft to speed-

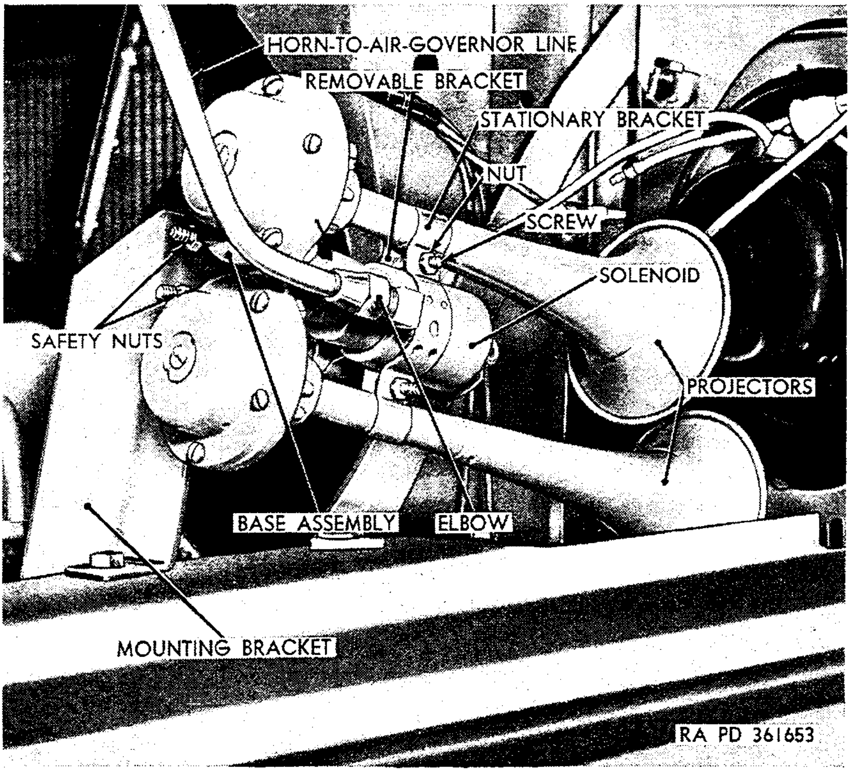


Figure 191. Horn installed on right front fender (solenoid with mounting brackets).

ometer, and pull shaft end from speedometer. Support instrument cluster, and unscrew nut securing tachometer flexible shaft to tachometer. Pull shaft end from tachometer, and remove instrument cluster from vehicles.

b. Installation (fig. 189).

(1) *Connect tachometer and speedometer flexible shafts.* Position instrument cluster at opening in instrument panel, insert end of tachometer flexible shaft in tachometer, and tighten connector nut. Insert end of speedometer flexible shaft in speedometer, and tighten connector nut.

(2) *Connect gage and light cables.* Connect bayonet-type connectors on gage and light cables to gages and lights at back of instrument cluster. Refer to figure 190 for matching of gages with circuit number tags on cables.

(3) *Install panel lock screws.* Position instrument cluster on front of instrument panel, and install four panel lock screws. one at each corner of instrument mounting plate.

168. Air Pressure Gage

(fig. 189)

a. Removal.

(1) Remove four panel lock screws securing instrument cluster to instrument panel, and pull cluster away from panel.

(2) Disconnect two bayonet-type electrical connectors, and remove cables from back of air pressure gage.

(3) Remove two nuts and lockwashers from gage mounting studs, remove mounting bracket from studs, and remove air pressure gage from front of instrument cluster.

b. Installation.

(1) Insert air pressure gage in opening in front of instrument cluster. Install mounting bracket on gage studs at back of instrument cluster. Install two lockwashers and nuts on studs, and tighten nuts.

(2) Connect bayonet-type connectors on the two gage cables to back of gage.

(3) Position instrument cluster on front of instrument panel, and install four panel lock screws, one at each corner of instrument mounting plate.

169. Ammeter or Indicator

a. Removal. Procedure for removing ammeter is same as for air pressure gage. Refer to paragraph 168*a*.

Note. If vehicle is equipped with a charge indicator instead of ammeter, indicator will only have one electrical connection.

b. Installation. Procedure for installing ammeter is same as for air pressure gage. Refer to paragraph 168*b*.

170. Fuel Gage

a. Removal. Procedure for removing fuel gage is same as for air pressure gage. Refer to paragraph 168*a*.

b. Installation. Procedure for installing fuel gage is same as for air pressure gage. Refer to paragraph 168*b*.

171. Headlight High Beam Indicator Light

a. Removal (fig. 189).

(1) Remove four panel lock screws securing instrument cluster to instrument panel, and pull clster away from panel.

(2) Disconnect bayonet-type connector at clip on left (viewing back side of cluster) side of instrument mounting plate.

(3) Remove two screws and lockwashers from front side of instrument cluster, and remove indicator light from back side of cluster.

347797°—55——19

b. Installation (fig. 189).

(1) Position headlight high beam indicator light on back side of instrument cluster, and install two screws and lockwashers at front side of cluster.

(2) Connect bayonet-type connector on light cable to connector at clip on left (viewing back side of cluster) side of instrument mounting plate.

(3) Position instrument cluster on front of instrument panel, and install four panel lock screws, one at each corner of instrument mounting plate.

c. Lamp Replacement.

(1) Remove headlight high beam indicator light (*a* above).

(2) Press body and cover assembly together, turn body counterclockwise, and separate body and cover.

(3) Remove bayonet-base lamp from socket. Discard lamp.

(4) Install new bayonet-base lamp in socket.

(5) Install light body in cover, press body and cover together, and turn body clockwise to engage body retaining pins in cover slots.

(6) Install headlight high beam indicator light (*b* above).

172. Oil Pressure Gage

a. Removal. Procedure for removing oil pressure gage is same as for air pressure gage. Refer to paragraph 168*a*.

b. Installation. Procedure for installing oil pressure gage is same as for air pressure gage. Refer to paragraph 168*b*.

173. Panel Lights

(fig. 189)

a. Removal.

(1) Remove four panel lock screws securing instrument cluster to instrument panel, and pull cluster away from panel.

(2) Disconnect bayonet-type connector at clip secured to tachometer mounting stud.

(3) Remove four screws and lockwashers from front side of instrument cluster, and remove left and right panel lights from back side of instrument cluster.

b. Installation.

(1) Position one panel light on back of instrument cluster, and install two screws and lockwashers at front side of cluster.

(2) Repeat (1) above for other panel light.

(3) Connect bayonet-type connector on light cables to connector at clip secured to tachometer mounting stud.

(4) Position instrument cluster on front of instrument panel, and install four panel lock screws, one at each corner of instrument mounting plate.

c. Lamp Replacement. Procedure for replacing panel light lamp is same as for headlight-high-beam-indicator-light lamp. Refer to paragraph 171*c*.

174. Speedometer

a. Removal (fig. 189).

(1) Remove four panel lock screws securing instrument cluster to instrument panel, and pull cluster away from panel.

(2) Unscrew nut securing speedometer flexible shaft to speedometer, and pull shaft end from speedometer.

(3) Remove nut and washer securing instrument-cluster-gage wiring harness to stud at bottom of speedometer, and remove harness from stud.

(4) Remove instrument-cluster-gage-wiring-harness stud and lockwasher from lower speedometer mounting stud. Remove nut and lockwasher from upper speedometer mounting stud, remove speedometer mounting bracket from studs, and remove speedometer from front of instrument cluster.

b. Installation (fig. 189).

(1) Insert speedometer in opening in front of instrument cluster. Install mounting bracket on speedometer studs at back of instrument cluster. Install lockwasher and nut on upper stud, and tighten nut.

(2) Install lockwasher and instrument-cluster-gage-wiring-harness stud on lower speedometer mounting stud, and tighten stud. Position instrument-cluster-gage wiring harness on stud, and install washer and nut on stud. Tighten nut.

(3) Insert end of speedometer flexible shaft in speedometer, and tighten connector nut.

(4) Position instrument cluster on front of instrument panel, and install four panel lock screws, one at each corner of instrument mounting plate.

c. Flexible Shaft Removal.

(1) Unscrew nut securing flexible shaft (D, fig. 145) to speedometer (fig. 189), and pull shaft end from speedometer.

(2) Unscrew nut securing flexible shaft to speedometer sending unit (fig. 144) on front of transfer, and pull shaft end from sending unit.

(3) Remove four closed clips securing flexible shaft in position, remove flexible shaft from vehicle, and remove closed clips from flexible shaft.

d. Flexible Shaft Installation.

(1) Install four closed clips on speedometer flexible shaft (D, fig. 145), position flexible shaft in vehicle, and secure with the four closed clips.

Note. When positioning flexible shaft in vehicle, be sure that end with driving key is at sending unit on transfer.

(2) Insert end of flexible shaft in sending unit (fig. 144), and tighten connector nut.

(3) Insert square end of flexible shaft in speedometer (fig. 189), and tighten connector nut.

175. Tachometer

a. Removal (fig. 189).

(1) Remove four panel lock screws securing instrument cluster to instrument panel, and pull cluster away from panel.

(2) Unscrew nut securing tachometer flexible shaft to tachometer, and pull shaft end from tachometer.

(3) Remove bayonet-type electrical connector from clip secured to upper tachometer mounting stud. Remove nut, lockwasher, and connector clip from upper stud.

(4) Remove nut and lockwasher from lower tachometer mounting stud, remove mounting bracket from studs, and remove tachometer from front of instrument cluster.

b. Installation (fig. 189).

(1) Insert tachometer in opening in front of instrument cluster. Install mounting bracket on tachometer mounting studs at back of instrument cluster. Install lockwasher and nut on lower stud, and tighten nut.

(2) Install connector clip, lockwasher, and nut on upper tachometer mounting stud, and tighten nut. Insert panel light cable bayonet-type connector in clip.

(3) Insert end of tachometer flexible shaft in tachometer, and tighten connector nut.

(4) Position instrument cluster on front of instrument panel, and install four panel lock screws, one at each corner of instrument mounting plate.

c. Flexible Shaft Removal.

(1) Unscrew nut securing tachometer flexible shaft (Q, fig. 135) to tachometer (fig. 189), and pull shaft from tachometer.

(2) Unscrew nut securing flexible shaft to tachometer sending unit (P, fig. 135) at front of distributor drive housing, and pull shaft end from sending unit.

(3) Remove cap screw and nut securing closed clip (L, fig. 122) to mounting bracket (K, fig. 122) bolted to breather connector. Pull flexible shaft from rubber grommet in cab cowl, and re-

move shaft from vehicle. Remove closed clip from flexible shaft.

d. Flexible Shaft Installation.

(1) Install closed clip (L, fig. 122) on tachometer flexible shaft (Q, fig. 135), and insert end of shaft through grommet in cab cowl. Position closed clip on mounting bracket (K, fig. 122) attached to breather connector, and secure with cap screw and nut. Tighten nut.

Note. When positioning flexible shaft in vehicle be sure that end with driving key is at sending unit on front of distributor drive housing.

(2) Aline key on end of flexible shaft with keyway in sending unit, insert end of shaft in unit, and tighten connector nut.

(3) Insert square end of flexible shaft in tachometer (fig. 189), and tighten connector nut.

176. Temperature Gage

a. Removal. Procedure for removing temperature gage is same as for removing air pressure gage. Refer to paragraph 168*a*.

b. Installation. Procedure for installing temperature gage is same as for air pressure gage. Refer to paragraph 168*b*.

177. Ignition Switch

a. Removal.

(1) Disconnect battery ground cable (par. 114*b* (4)).

(2) Remove screw from front of ignition switch lever (fig. 72), and pull lever from switch shaft.

(3) Remove hex nut and tooth-type lockwasher from switch body at front of instrument panel, and remove switch from back of panel.

(4) Disconnect bayonet-type connectors on switch cables, and remove switch from vehicle.

b. Installation.

(1) Connect bayonet-type connectors on switch cables to battery, gage, and coil cable and circuit breaker connectors. Note that the three terminal cables from switch are numbered with circuit marker sleeves and make connections as shown below:

Terminal No.	Circuit	Circuit terminal mark
1	Battery	A
2	Temperature gage	A
	Oil pressure gage	B
	Fuel gage	A
3	Ignition coil	B

(2) Position switch on back side of instrument panel with switch body extending through hole in panel, and install tooth-type lockwasher and hex nut on switch body. Tighten nut.

(3) Install switch lever (fig. 72) on switch shaft, and secure with screw.

(4) Connect battery ground cable (par. 115*h*(4)).

c. Testing. Disconnect all terminals. Connect one terminal of test light or buzzer to battery cable and test continuity of all terminals.

178. Light Switch

(fig. 72)

a. Removal.

(1) Unscrew nuts securing two wiring harness plugs to receptacles on bottom of light switch at back side of instrument panel, and pull both harness plugs from receptacles.

(2) Remove four screws from front of instrument panel, and remove switch from back of panel.

b. Installation.

(1) Position light switch on back side of instrument panel, with electrical receptacles pointing down and switch housing extending through opening in instrument panel. Install four screws, and tighten.

(2) Insert two wiring harness plugs in receptacles on bottom of light switch, and tighten both plug retaining nuts.

179. Electric Brake Lock and Switch

a. Electric Brake Lock Removal (fig. 192).

(1) Disconnect bayonet-type connector securing brake lock cable to brake-lock-switch-to-brake-lock harness, and separate cable and harness.

(2) Unscrew two sleeve nuts securing brake hydraulic lines to front and rear of brake lock, and remove lines from lock.

(3) Remove safety nut and cap screw securing brake lock to inside of frame left side rail, and remove lock from vehicle.

b. Electric Brake Lock Installation (fig. 192).

(1) Position electric brake lock on inside of frame left side rail, and secure with cap screw and safety nut.

(2) Position brake hydraulic lines at front and rear of brake lock, and tighten the two sleeve nuts.

(3) Connect bayonet-type connector on brake lock cable to brake-lock-switch-to-brake-lock-harness connector.

(4) Bleed brakes (par. 221), if necessary.

c. Electric Brake Lock Switch Removal.

(1) Remove two screws from front of instrument panel, and remove electric brake lock switch (HH, fig. 65) from back of panel.

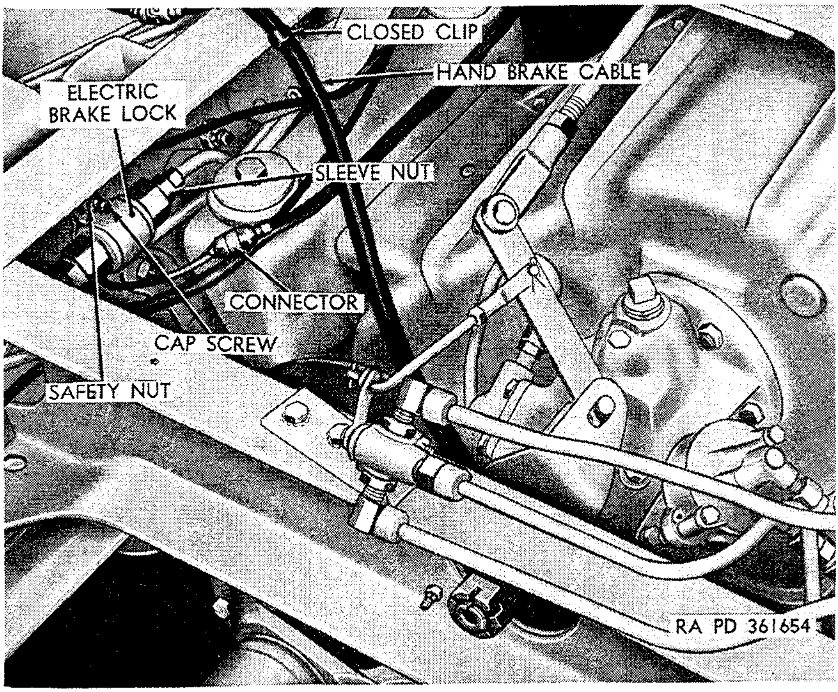


Figure 192. Electric brake lock mounted on frame left side rail.

(2) Disconnect two bayonet-type connectors securing harness cables to back of switch, and remove switch.

d. Electric Brake Lock Switch Installation.

(1) Connect two bayonet-type connectors on harness cables to connectors on back of electric brake lock switch button and data plate (HH, fig. 65).

(2) Position switch on back of instrument panel with switch button extending through hole in panel, and secure with two screws.

180. Horn Button (Switch)

a. Removal.

(1) Holding steering wheel stationary, press down on horn button (W, fig. 65), turn button in either direction, and release. Lift button from steering wheel hub.

(2) Remove contact button cup, spring, and cap from center of steering wheel.

(3) Remove three screws securing horn button plate to hub. Leave horn wire in position, and remove plate from hub.

b. Installation.

(1) Position horn button plate in center of steering wheel hub, and secure with three screws.

(2) Install contact button cap, spring, and cup on horn button plate.

(3) Position horn button (W, fig. 65) in center of steering wheel hub, press down on button, and turn in either direction until button flange is locked in rubber retainers on horn button plate. Release horn button.

181. Dimmer Switch

a. Removal.

(1) From inside of cab, remove two screws securing dimmer switch (X, fig. 65) to underside of toeboard.

(2) Disconnect three bayonet-type connectors on switch cables, and remove switch from vehicle.

b. Installation.

(1) Position dimmer switch (X, fig. 65) on underside of toeboard, and secure with two screws from inside of cab.

(2) Connect three bayonet-type connectors on switch cables. Refer to figure 188.

182. Stop Light Switch

(fig. 141)

a. Removal.

(1) Disconnect two bayonet-type connectors at top of stop light switch.

(2) Unscrew sleeve nut on brake hydraulic line from elbow at bottom of switch.

(3) Remove two cap screws and safety nuts securing switch to inside of frame left side rail, and remove switch from vehicle.

b. Installation.

(1) Position stop light switch on inside of frame left side rail, and secure with two cap screws and safety nuts.

(2) Position brake hydraulic line at elbow on bottom of switch, and tighten sleeve nut on elbow.

(3) Connect two bayonet-type connectors on harness cables to terminal connectors on top of switch. Refer to figure 187.

(4) Bleed brakes (par. 221), if necessary.

183. Low Air Pressure Warning Buzzer

a. Removal.

(1) Disconnect terminal connections at buzzer.

(2) Remove three screws, lockwashers, and nuts securing buzzer to back side of instrument panel, and remove buzzer.

b. Installation.

(1) Position low air pressure warning buzzer on back side of instrument panel, and secure with three screws, lockwashers, and nuts.

(2) Connect low air pressure sending unit cable to buzzer terminal.

184. Warning Light Switch (M62 and M246 Only)

a. Removal.

(1) Remove screw from front of warning light switch lever (BB, fig. 65), and pull lever from switch shaft.

(2) Remove hex nut, tooth-type lockwasher, and indicating plate from switch body at front of instrument panel. Remove switch from back of panel.

(3) Disconnect two switch-cable bayonet-type connectors from harness cable connectors, and remove switch from vehicle.

b. Installation.

(1) Position warning light switch (BB, fig. 65) on back side of instrument panel with switch body extending through hole in panel.

(2) Install indicating plate, lockwasher, and hex nut on switch body, and tighten nut.

(3) Connect the two switch cable connectors to harness cable connectors. Refer to figure 188.

(4) Install switch lever (fig. 72) on switch shaft, and secure with screw.

185. Floodlight Switch (M62 and M246 Only)

a. Removal. Procedure for removing floodlight switch (LL, fig. 65) is same as for warning light switch. Refer to paragraph 184*a*.

b. Installation. Procedure for installing floodlight switch is same as for warning light switch. Refer to paragraph 184*b*.

186. Circuit Breakers

(J, fig. 122)

a. Removal.

(1) Disconnect two bayonet-type connectors on harness cables from circuit-breaker terminal connectors.

(2) Remove two screws, lockwashers, and nuts securing breaker to left front side of cab cowl, and remove breaker from cowl.

b. Installation.

(1) Position circuit breaker on left front side of cab cowl, and secure with two screws, lockwashers, and nuts.

(2) Connect two harness cable connectors to circuit-breaker terminal connectors.

187. Air Pressure Gage Sending Unit

a. Removal.

(1) Disconnect bayonet-type connector on air-pressure-gage-to-sending-unit cable from terminal connector at sending unit.

(2) Unscrew sending unit from air manifold installed in air-reservoir-to-air-governor line on the back of the cab cowl behind the instrument panel, and remove sending unit from vehicle.

b. Installation.

(1) Screw threaded end of air pressure gage sending unit into threaded hole in air manifold at back side of cab cowl behind instrument panel.

(2) Connect bayonet-type connector on air-pressure-gage-to-sending-unit cable to terminal connector on sending unit.

188. Fuel Gage Sending Unit

(fig. 133)

a Removal.

(1) Disconnect bayonet-type connector on fuel-gage-to-fuel-gage-sending-unit cable from terminal connector at sending unit.

(2) Remove five screws and washers securing sending unit to top of fuel tank, and remove sending unit from tank. Remove and discard fuel tank sending unit gasket.

b. Installation.

(1) Install new fuel tank sending unit gasket at opening in top of fuel tank.

(2) Insert fuel gage sending unit in opening in tank, and secure with five screws and washers.

(3) Connect bayonet-type connector on fuel-gage-to-fuel-gage sending-unit cable to terminal connector on sending unit.

189. Oil Pressure Gage Sending Unit

(fig. 139)

a. Removal. Procedure for removing oil pressure gage sending unit is same as for air pressure gage sending unit. Refer to paragraph 187*a*.

b. Installation. Procedure for installing oil pressure gage sending unit is same as for air pressure gage sending unit. Refer to paragraph 187*b*.

190. Speedometer Sending Unit

a. Removal.

(1) Unscrew nut securing flexible shaft (D, fig. 145) to speedometer sending unit (fig. 144) on front of transfer, and pull shaft end from sending unit.

(2) Unscrew coupling nut securing sending unit to transfer, and remove unit from transfer.

b. Installation.

(1) Insert speedometer-sending-unit drive shaft in opening at front of transfer, and tighten coupling nut.

(2) Insert end of speedometer flexible shaft (D, fig. 145) in sending unit (fig. 144), and tighten connector nut.

191. Tachometer Sending Unit

a. Removal.

(1) Unscrew nut securing tachometer flexible shaft (Q, fig. 135) to sending unit (P, fig. 135) at front of distributor drive housing, and pull shaft end from sending unit.

(2) Unscrew nut (bearing retainer) securing tachometer sending unit to distributor drive housing (N, fig. 135), and remove unit from housing.

b. Installation.

(1) Insert tachometer sending unit (P, fig. 135) in opening at front of distributor drive housing (N, fig. 135) so that drive shaft engages slot in end of governor control valve shaft, and tighten nut (bearing retainer).

(2) Aline key on end of tachometer flexible shaft (Q, fig. 135) with keyway in drive shaft, insert end of flexible shaft in sending unit, and tighten connector nut.

192. Temperature Gage Sending Unit

(E, fig. 122)

a. Removal. Procedure for removing temperature gage sending unit is same as for air pressure gage sending unit. Refer to paragraph 187*a*.

b. Installation. Procedure for installing temperature gage sending unit is same as for air pressure gage sending unit. Refer to paragraph 187*b*.

193. Low Air Pressure Sending Unit

a. Removal.

(1) Disconnect bayonet-type connector on low-air-pressure-sending-unit-to-air-pressure-warning-buzzer cable at terminal connector on top of sending unit mounted on back side of cab cowl behind instrument panel.

(2) Disconnect bayonet-type connector on ignition-switch-to-low-air-pressure-sending-unit cable at terminal connector on bottom of sending unit.

(3) Unscrew nut securing air line from air manifold to right side of sending unit, and remove line from unit. Unscrew nut securing air line from air manifold to rear of sending unit, and remove line from unit.

(4) Remove two cap screws and washers securing sending unit to back side of cab cowl, and remove sending unit from vehicle.

b. Installation.

(1) Position low air pressure sending unit on back side of cab cowl behind instrument panel, and secure with two cap screws and lockwashers.

(2) Position line from air manifold at threaded opening in right side of sending unit, and tighten connector nut. Position line from air manifold at threaded opening in rear of sending unit, and tighten connector nut.

(3) Connect bayonet-type connector on ignition-switch-to-low-air-pressure-sending-unit cable to terminal connector on bottom of sending unit.

(4) Connect bayonet-type connector on low-air-pressure-sending-unit-to-air-pressure-warning-buzzer cable to terminal connector on top of sending unit.

194. Horn

a. Solenoid Removal (Type With Mounting Brackets) (fig. 191).

(1) Remove two bayonet-type connectors from clips on left side of solenoid, and disconnect both connectors.

(2) Unscrew connector securing horn-to-air-governor line to elbow at base of solenoid, and remove line from elbow.

(3) Unscrew elbow from base of solenoid.

(4) Loosen two nuts and screws clamping solenoid mounting brackets to projectors, and unscrew both projectors from horn base assembly.

(5) Unscrew solenoid from horn base assembly.

b. Solenoid Installation (Type With Mounting Brackets) (fig. 191).

(1) Screw threaded end of solenoid into threaded hole in horn base assembly, and aline solenoid mounting brackets with projector holes in base assembly.

(2) Position both projectors between ends of solenoid mounting brackets, and screw both projectors into horn base assembly. Tighten the two screws and nuts clamping brackets to projectors.

(3) Install elbow in base of solenoid.

(4) Position horn-to-air-governor line at elbow, and tighten connector.

(5) Connect bayonet-type connectors on the two solenoid cables to wiring harness connectors, and secure connectors in clips on left side of solenoid. Refer to figure 188.

c. Solenoid Removal (Type Without Mounting Brackets) (fig. 193).

(1) Remove two bayonet-type connectors from clips on front of solenoid, and disconnect both connectors.

(2) Unscrew connector securing horn-to-air-governor line to elbow at base of solenoid, and remove line from elbow.

(3) Unscrew elbow from base of solenoid.

(4) Loosen locknut on threaded section of solenoid base, and unscrew solenoid from horn base assembly.

d. Solenoid Installation (Type Without Mounting Brackets) (fig. 193).

(1) Screw threaded end of solenoid into threaded hole in horn base assembly, and tighten locknut.

(2) Install elbow in base of solenoid.

(3) Position horn-to-air-governor line at elbow, and tighten connector.

(4) Connect bayonet-type connectors on the two solenoid cables to wiring harness connectors, and secure connectors in clips on front of solenoid.

e. Horn Removal (figs. 191 and 193).

(1) Remove two bayonet-type connectors from clips on solenoid, and disconnect both connectors.

(2) Unscrew connector securing horn-to-air-governor line to elbow at base of solenoid, and remove line from elbow.

(3) Remove two safety nuts and cap screws securing horn base assembly to mounting bracket, and remove horn from vehicle.

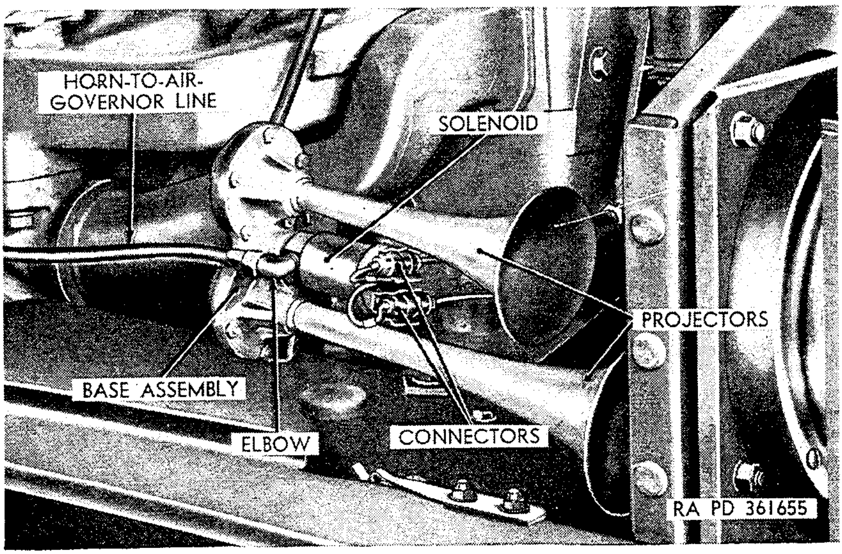


Figure 193. Horn installed on right front fender (solenoid without mounting brackets).

f. Horn Installation (figs. 191 and 193).

(1) Position horn base assembly on mounting bracket at right front fender, and secure with two cap screws and safety nuts.

(2) Position horn-to-air-governor line at elbow, and tighten connector.

(3) Connect bayonet-type connectors on the two solenoid cables to wiring harness connectors, and secure connectors in clips on solenoid.

Section XVII. RADIO INTERFERENCE SUPPRESSION

195. Purpose

a. Radio interference suppression is the elimination or minimizing of the electrical disturbances which interfere with radio reception or disclose the location of the vehicle to sensitive electrical detectors. It is important that electrical disturbances in vehicles with, as well as vehicles without, radios be suppressed properly to prevent interference with radio reception of neighboring vehicles.

b. Suppression in this vehicle is accomplished by the use of resistor suppressors and capacitors (condensers). In addition, metal parts in the vicinity of the engine are formed into a shield by the use of braided bond straps and tooth-type lockwashers, confining electrical disturbances so they cannot disturb receiving equipment. Wiring that may carry interfering surges to a point where interference will affect radio reception is shielded.

196. Description

The systems listed in *a*, *b*, and *c* below have been treated to accomplish suppression of radio interference.

a. Starting System. Starter suppression is accomplished by a capacitor located inside the commutator end cover.

b. Ignition System. Distributor suppression is accomplished by a feed-through capacitor (condenser) installed in the primary lead-in (fig. 176) at the rear of the distributor housing. Spark plugs are integrally shielded with resistor-suppressors. High tension cables running from the distributor to the spark plugs are individually shielded by tinned-copper braid over loom.

c. Generating System. Generator suppression is accomplished by a capacitor installed on the output lead. Generator regulator suppression is accomplished by capacitors mounted inside the regulator.

197. Starting System Radio Suppression

a. Description. The starter capacitor (fig. 194) is mounted on the front end of the starter frame and is connected to one of the brush holders.

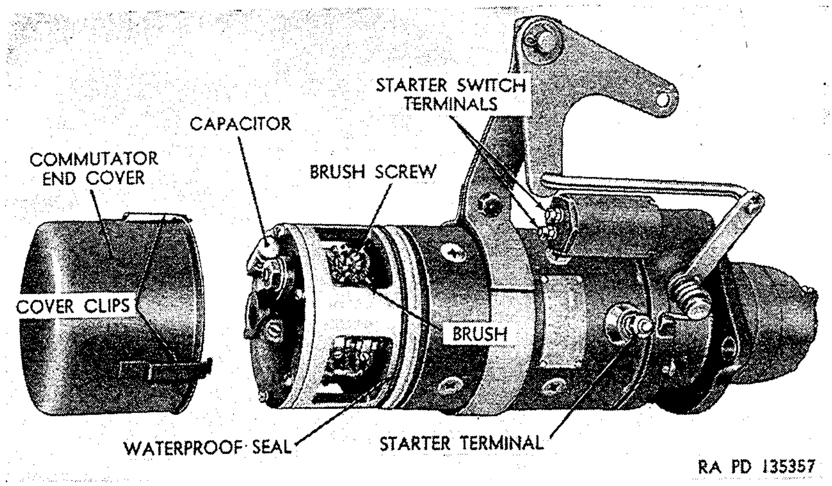


Figure 194. Starter with cover removed.

b. Maintenance.

(1) *Capacitor removal* (fig. 194).

(*a*) Remove commutator end cover by raising clips from grooves in starter frame and pulling cover toward front of vehicle.

(*b*) Disconnect capacitor cable from terminal on brush holder.

(*c*) Remove screw and washer securing capacitor to front of starter frame, and remove capacitor.

(2) *Capacitor installation* (fig. 194).

(*a*) Position capacitor at front end of starter frame and install mounting screw and washer.

(*b*) Connect capacitor cable to terminal on brush holder through groove in starter frame.

(*c*) Slide commutator end cover on front end of starter, and snap cover clips in groove in frame.

198. Ignition System Radio Suppression

a. Description. The ignition distributor and coil assembly (fig. 176) is integrally shielded and suppressed with a 0.25 mfd feed-through capacitor installed in the primary lead-in, a 5,000 ohm resistor-suppressor in each tower, and a 10,000 ohm resistor-suppressor integral to the rotor. Each spark plug is integrally shielded with a 10,000 ohm insert-type resistor-suppressor. Each high tension cable is individually shielded by rubber-covered woven metallic hose terminating in threaded fittings.

b. Maintenance.

(1) *Coordinate with ordnance maintenance unit.* Refer to paragraph 2 for information on coordination with an ordnance maintenance unit.

(2) *Distributor capacitor removal.*

(*a*) Unscrew connector (E, fig. 135) from primary lead-in at rear of distributor, and remove primary wire (F, fig. 135) from receptacle.

(*b*) Remove eight screws and lockwashers securing distributor cover assembly to distributor (fig. 175), and remove cover. Remove and discard cover gasket.

(*c*) Remove four screws and lockwashers securing primary lead-in (fig. 176) to rear of distributor housing.

(*d*) Remove nut and lockwasher from terminal stud at top of resistor (fig. 176), and remove feed-through capacitor cable from stud.

(*e*) Pull lead-in receptacle, receptacle mounting gasket, and capacitor from distributor housing. Pull lead-in receptacle from capacitor.

(3) *Distributor capacitor installation.*

(*a*) Install primary lead-in on pin (terminal) at end of feed-through capacitor, and slide receptacle mounting gasket over capacitor.

(*b*) Insert feed-through capacitor cable in opening at rear of distributor housing, position primary lead-in at rear of housing, and install four screws and lockwashers. Tighten screws.

(*c*) Install feed-through capacitor cable on terminal stud at top of resistor (fig. 176), and install lockwasher and nut on stud.

(*d*) Place new gasket on top of distributor housing, position cover on distributor, and install eight screws and lockwashers (fig. 175). Tighten screws.

(*e*) Position distributor primary wire (F, fig. 135) at primary lead-in on rear of distributor, and tighten connector (E, fig. 135).

(4) *Spark plug suppressor replacement.* Spark plug suppressors are built into the spark plugs. If interference is caused by spark plugs, the spark plugs must be replaced (par. 148).

(5) *Spark plug cable replacement.* If rubber or metallic shielding on spark plug cables is damaged in any way, the spark plug cables must be replaced.

199. Generating System Radio Suppression

a. Description. The generator is integrally shielded and suppressed by a 0.25 mfd feed-through capacitor at the battery terminal connection. The generator regulator is integrally shielded and suppressed by three 0.01 mfd feed-through capacitors and one 0.01 mfd capacitor.

A 4-ohm resistor is applied in series with the 0.01 mfd capacitor at the field terminal.

b. Maintenance.

(1) *Generator capacitor replacement.* Since generator capacitor replacement requires disassembly of the generator, the capacitor will not be removed while the generator is mounted on the vehicle. Notify ordnance maintenance personnel.

(2) *Generator-regulator capacitor replacement.* Since generator-regulator capacitor replacement requires disassembly of the regulator, the capacitors will not be removed while the regulator is mounted on the vehicle. Notify ordnance maintenance personnel.

200. Fasteners and Bond Straps

Five bond straps are used to unite all parts and thereby form a shield about the entire power plant. These bond straps (ground straps) are located as follows: left front fender to left side of front cross member, left side of front cross member to timing gear cover on front of engine, left side of front cross member to radiator frame, right side of front cross member to right front fender, and oil cooler housing on left side of engine to cab cowl. Tooth-type lockwashers are installed at all bond strap connections. It is important that all straps be in good condition, that all tooth-type lockwashers be installed, and that all retaining cap screws and nuts be tightened to form a good ground connection.

Section XVIII. CLUTCH

201. Description and Data

a. Description. The clutch (fig. 195) is a single-plate, dry-disk unit secured to the rear of the engine flywheel by 12 cap screws. When installed in the power plant, the clutch is completely enclosed by the flywheel housing and the clutch housing, which is bolted to the front of the transmission (par. 204). The purpose of the clutch is to connect and disconnect the engine and transmission, thereby permitting operation of the engine when the vehicle is standing still, as well as permitting the selection of different transmission gear ratios when the vehicle is in motion. Depressing the clutch pedal (fig. 196) causes the release fork to move the release bearing forward on the transmission input shaft and contact the release levers. Pressure of the bearing on the release levers relieves pressure of the compression springs on the pressure plate. Therefore, when the clutch pedal is fully depressed with the linkage properly adjusted, the clutch is fully released. When the clutch pedal is fully released, the clutch is fully engaged.

347797°—55——20

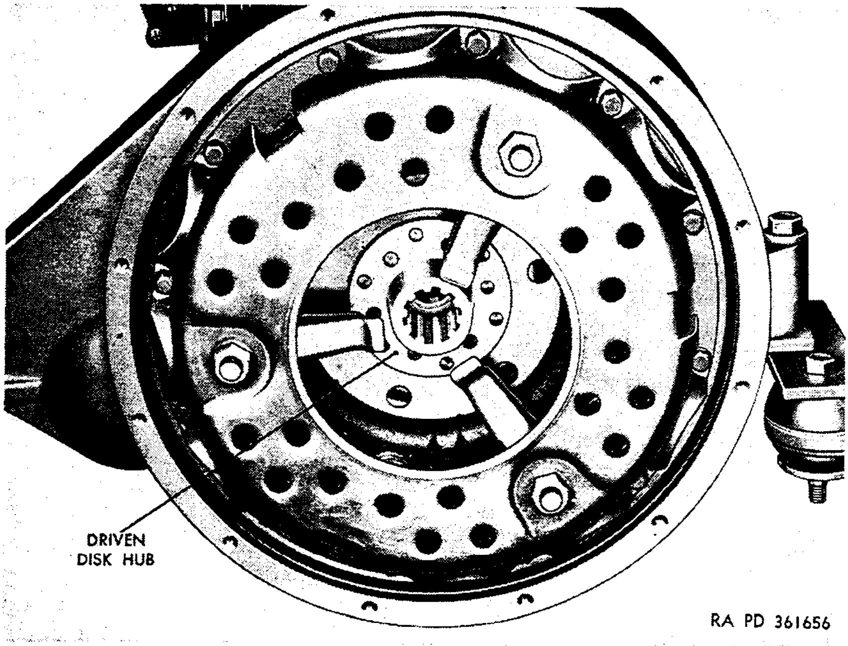


Figure 195. Clutch assembled to engine flywheel.

b. Data.

Make	Rockford
Model	15TT
Type	single dry plate
Size	15 in.
Weight	75 lb

202. Adjustment

a. General. The clutch pedal must have a movement of at least two inches before the clutch begins to disengage. This movement is called clutch pedal free travel. Whenever natural wear on the clutch facing causes the free travel to be less than two inches, the clutch must be adjusted (*b* below). A properly adjusted clutch will take hold (engage) gradually, not slip, and will release instantly when the clutch pedal is depressed.

b. Clutch Pedal Linkage Adjustment.

(1) Loosen locknut (fig. 143) on control rod.

(2) Pull outward on adjusting-yoke pin (fig. 142) at lower end of control rod, and remove adjusting yoke from release lever.

Note. Pin does not completely come out of yoke.

(3) Turn adjusting yoke on control rod as necessary to obtain correct pedal free travel. To increase free travel, turn yoke counterclockwise to lengthen control rod. To decrease free travel, turn yoke clockwise to shorten control rod.

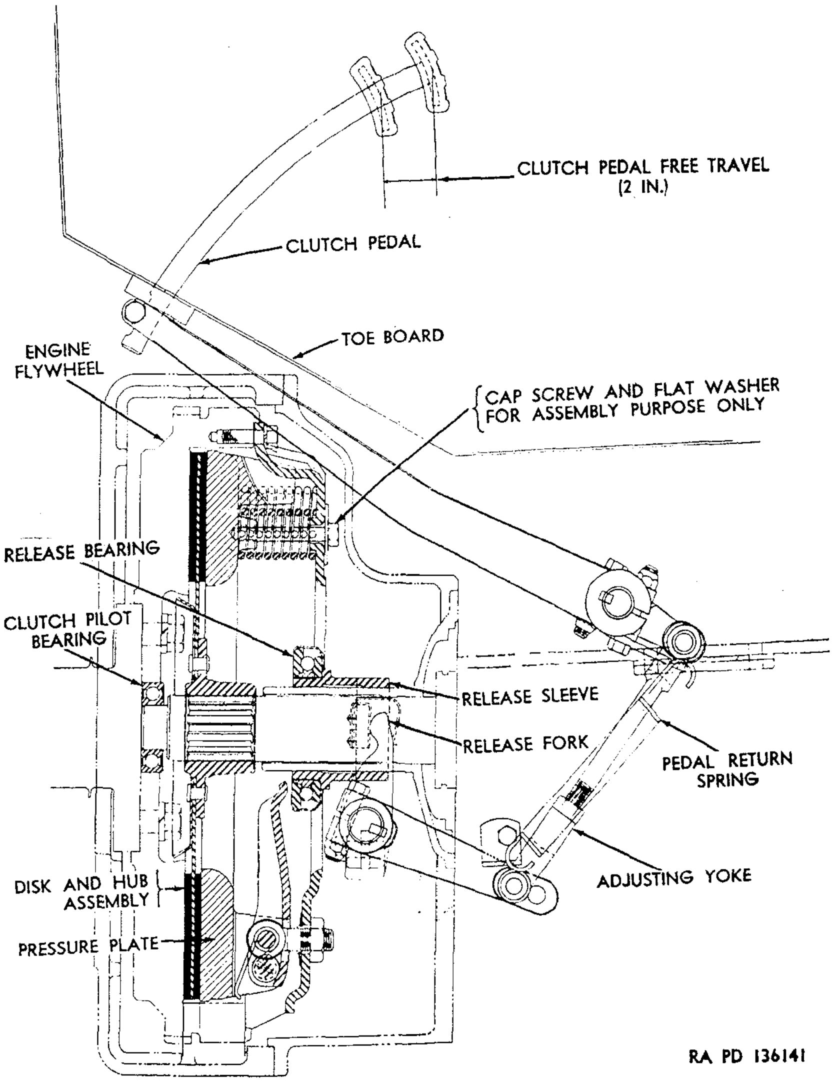


Figure 196. Diagram of clutch and control linkage.

(4) Position yoke (fig. 142) on clutch release lever and install yoke pin.

(5) Unhook lower end of clutch pedal return spring from bracket on outside of frame left side rail.

(6) Depress clutch pedal and note pedal free travel (fig. 196).

(7) If pedal free travel determined in (6) above is still incorrect, repeat (2), (3), (4), and (6) above until correct free travel is obtained.

(8) Tighten locknut (fig. 143) on control rod.

(9) Hook lower end of clutch pedal return spring (fig. 142) on bracket on outside of frame left side rail.

(10) Adjust roto chamber (par. 270) (M246 only).

203. Clutch Removal and Installation

a. Coordinate With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Clutch Pressure Plate Assembly Removal.

(1) Remove transmission (par. 205).

(2) Install three retaining cap screws and washers (fig. 197) in holes pressure plate cover to prevent disassembly of clutch components after removal from flywheel. Turn cap screws down until screwheads and washers contact cover, but do not tighten.

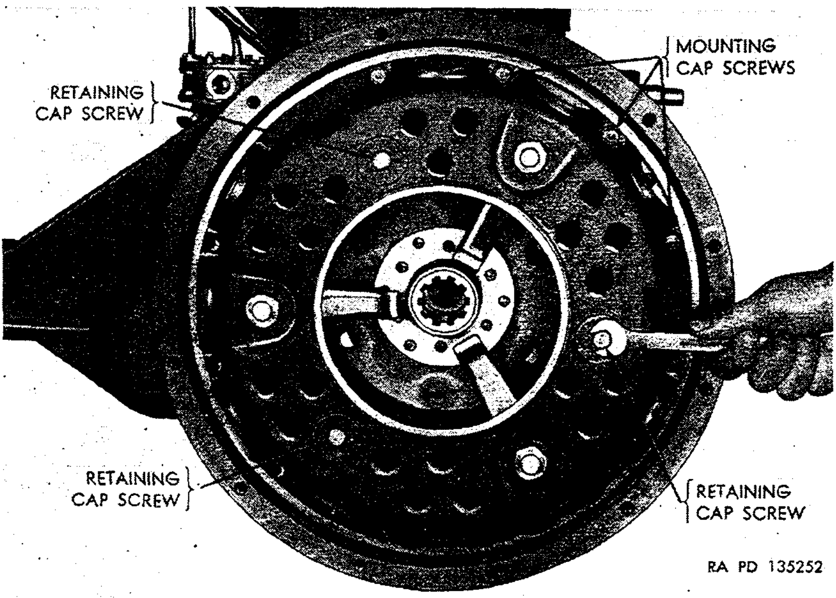


Figure 197. Installing clutch retaining cap screws.

(3) Remove 12 cap screws and lockwashers (fig. 197) securing clutch pressure plate assembly to flywheel. Lift pressure plate assembly and disk assembly from flywheel.

(4) Using a suitable puller, remove clutch pilot bearing from flywheel (fig. 198).

c. Clutch Pressure Plate Assembly Installation.

(1) Inspect clutch pilot bearing by holding inner race with the fingers and turning outer race. If roughness or sticking is evident, replace the bearing.

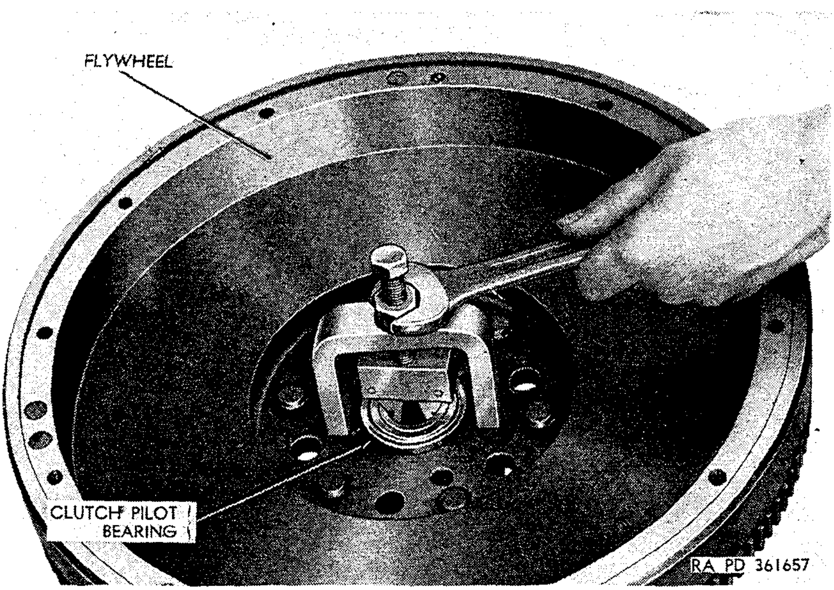


Figure 198. Removing clutch pilot bearing.

(2) Pack bearing with artillery and automotive grease (GAA) and install bearing in recess in flywheel.

Note. A spacer ring installed in crankshaft bore will position bearing in flywheel.

(3) Place disk assembly (fig. 196) in position against flywheel with long end of disk hub toward rear.

(4) Position pressure plate assembly against flywheel, making sure that the white paint spot on the pressure plate cover is as close as possible to the letter "L" stamped on the flywheel. Install loosely 12 mounting cap screws and lockwashers (fig. 197) in pressure plate cover and flywheel.

(5) Insert small end of clutch alining arbor (figs. 100 and 199) through driven disk hub into pilot bearing. Holding arbor in this position, tighten mounting cap screws. Withdraw alining arbor.

(6) Remove the three clutch-retaining cap screws and washers (fig. 197).

Caution: Removal of these cap screws is extremely important. Clutch will not operate properly with retaining cap screws installed.

(7) Install transmission (par. 205).

d. Clutch Release Bearing and Sleeve Assembly Removal.

(1) Remove transmission (par. 205).

(2) Loosen cap screw and safety nut securing release lever to left end of release lever shaft (fig. 200), and slide lever and locating key off shaft.

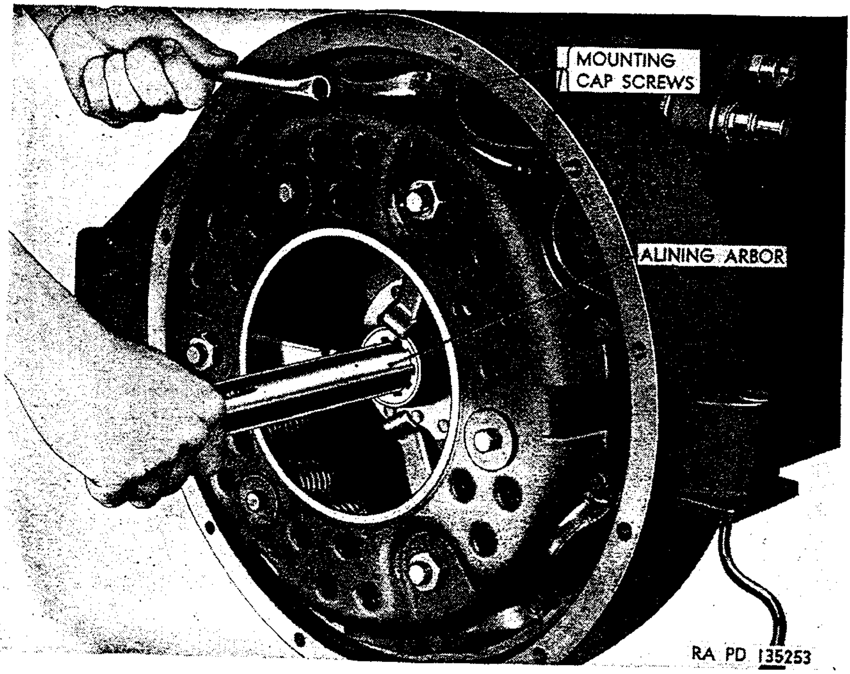


Figure 199. Using alining arbor to install clutch.

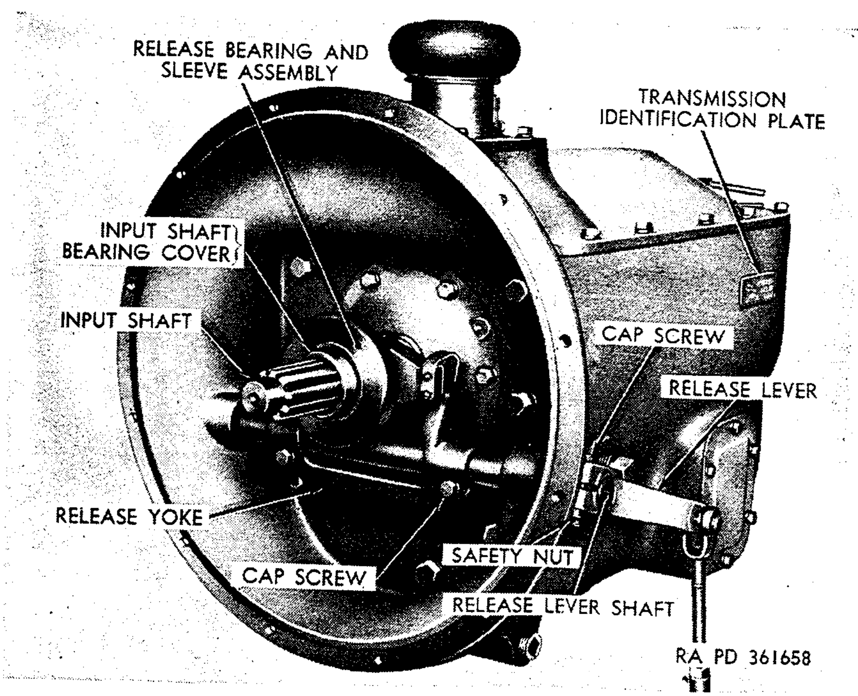


Figure 200. Left front view of transmission and clutch release mechanism.

(3) Loosen two cap screws securing release yoke to the release lever shaft (fig. 200) and remove release lever shaft, keys, and yoke from clutch housing.

(4) Slide release bearing and sleeve assembly forward and remove from transmission input shaft (fig. 200).

e. Clutch Release Bearing and Sleeve Assembly Installation (fig. 200).

(1) Start release lever shaft through hole in left side of clutch housing, making sure that shaft oil seal is installed in hole and in good condition.

(2) Place a small amount of artillery and automotive grease (GAA) in bore of release bearing sleeve and slide release bearing and sleeve assembly onto input shaft bearing cover.

(3) Hold release yoke in position and slide release shaft through yoke and into shaft hole in right side of clutch housing.

(4) Install locating keys, and tighten two cap screws to lock yoke on release lever shaft.

(5) Install release lever and locating key on left end of release lever shaft, and tighten cap screw and selflocking nut.

(6) Install transmission (par. 205).

Section XIX. TRANSMISSION

204. Description and Data

a. Description. The transmission (fig. 131) is a manually shifted, synchromesh, selective-gear-type with five forward speeds and one reverse speed. It is mounted on the flywheel housing at the rear of the crankcase and is removed from the engine after the power plant is removed from the vehicle (par. 114). Transmission gear ratios are selected by a conventional gearshift lever (PP, fig. 65) located in the cab. Some vehicles are equipped with a vent line extending from the shifter housing on top of the transmission to the air cleaner. Other vehicles have a cap installed on the vent line fitting at the front of the shifter housing, and the vent line is included in the deep-water fording kit. On vehicles equipped with either a front winch or dump body, a power-take-off assembly (par. 208) is mounted on the lower right side of the transmission.

b. Transmission Data.

Make	Spicer
Model	6352
Type	synchromesh
Gear ratios:	
First	7.31 : 1.00
Second	4.08 : 1.00
Third	2.41 : 1.00
Fourth	1.43 : 1.00
Fifth	1.00 : 1.00
Reverse	7.33 : 1.00

205. Transmission Removal and Installation

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Remove power plant (par. 114).

(2) Disconnect flywheel-housing-to-air-cleaner vent line (fig. 131) from tee at front of shifter housing on top of transmission (vehicles equipped with flywheel housing ventilating system only).

(3) Position hydraulic jack (fig. 99) with transmission fixture installed, and raise until weight of transmission is just supported by jack (fig. 201).

(4) Remove 12 cap screws (fig. 201) and lockwashers securing transmission to flywheel housing. Carefully pull transmission away from flywheel housing.

Caution: Be sure that transmission is properly supported and pulled straightaway from engine. Otherwise the clutch driven disk may be distorted sufficiently to prevent free removal of the transmission input shaft (fig. 200) from the driven disk hub (fig. 195).

(5) Remove gasket from clutch-housing mounting flange and discard.

(6) Remove roto chamber (M62 only) (par. 270).

c. Installation.

(1) Clean gasket surfaces on flywheel housing and clutch housing, and install new gasket on clutch-housing mounting flange.

(2) With transmission supported by hydraulic jack (fig. 201), position transmission at rear of engine so that splines on front end of input shaft (fig. 200) are alined with splines in hub (fig. 195) of clutch driven disk assembly.

(3) Carefully move transmission toward engine, with input shaft entering driven disk hub, until clutch housing contacts flywheel housing.

(4) Aline holes in clutch-housing mounting flange with holes in flywheel housing flange, and install 12 cap screws (fig. 201) and lockwashers in holes. Tighten cap screws.

(5) Connect flywheel-housing-to-air-cleaner vent line (fig. 131) to tee at front of shifter housing (vehicles equipped with flywheel housing ventilating system only).

(6) Remove hydraulic jack and install power plant (par. 115).

(7) Install roto chamber (M62 only) (par. 270).

(8) Lubricate transmission (par. 67).

d. Record of Replacement. Record the replacement on DA Form 478.

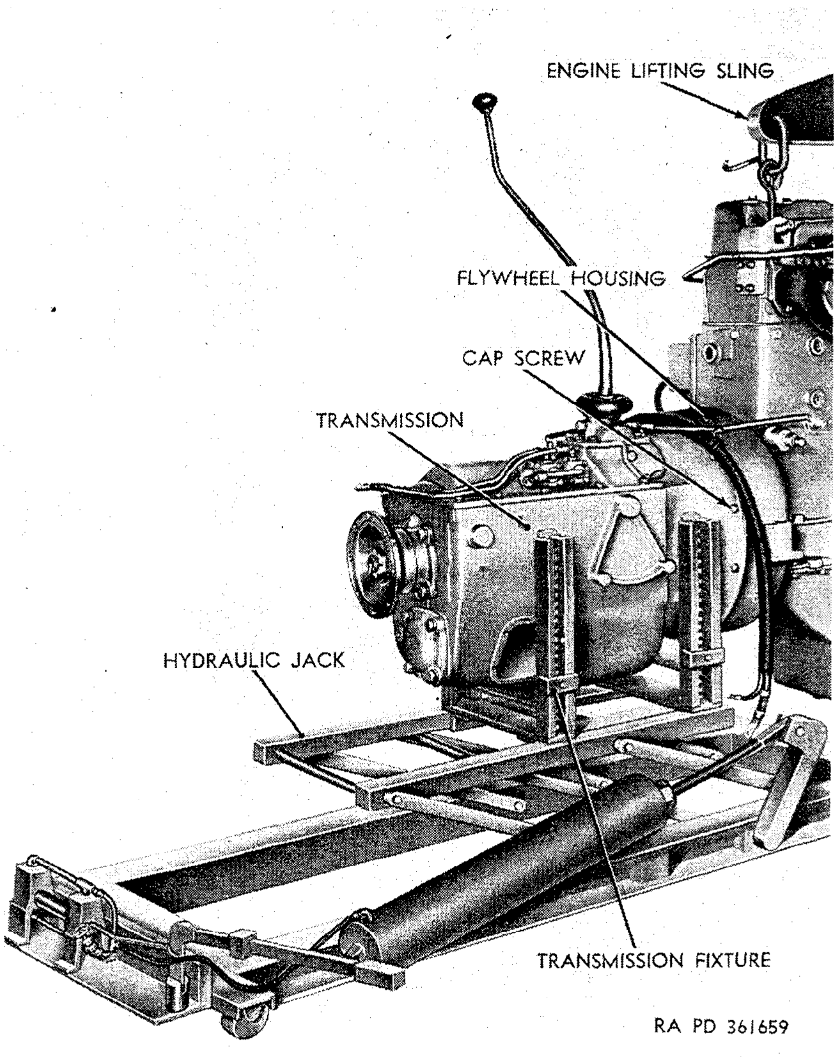


Figure 201. Supporting transmission with hydraulic jack.

Section XX. TRANSFER

206. Description and Data

a. Description. The transfer (fig. 87) is a two-speed gearbox with one input and two output shafts. It is mounted between the frame side rails to the rear of the transmission, with a propeller shaft (fig. 141) connecting the input shaft to the transmission main shaft. The front and rear output shafts are connected to the front and rear axles by propeller shafts. Transfer gear ratios (HIGH and LOW range) are manually selected by a shift lever (fig. 67) independently of the transmission gear ratios. Differences in the ratios of the gears in the gear trains used to transmit power from the input shaft to the output shafts cause the speed (rpm) of the front output shaft to be less than that of the rear output shaft. In addition, an overrunning clutch (sprag unit) installed on the front output shaft permits the front axle and front propeller shaft to turn at a higher speed than the front output shaft. When the speed (rpm) of the front and rear axles is the same, as during normal forward motion of the vehicle with all wheels turning at the same speed, the overrunning clutch on the front output shaft automatically eliminates delivery of power to the front axle. When the speed of the rear axles exceeds that of the front axle, as during spinning or slipping of the rear wheels, the overrunning clutch on the front output shaft causes power also to be transmitted to the front axle. An air shift cylinder assembly (fig. 144) on the front of the transfer, which is controlled by an air valve actuated by the transmission shift lever, automatically shifts the overrunning clutch to transmit forward or reverse motion as selected by the transmission. On the medium wrecker truck M62 and the tractor wrecker truck M246, a power-take-off is mounted on the rear of the transfer (par. 208).

b. Transfer Data.

Make	Timken
Model	T–138
Ratios:	
Rear output shaft:	
Low range	2.024 : 1.00
High range	1.00 : 1.00
Front output shaft:	
Low range	2.163 : 1.00
High range	1.068 : 1.00

207. Transfer Removal and Installation

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal (All Models Except M51, M62, and M246).

(1) Remove right front wheel and tire assembly from front axle (par. 241).

(2) Remove tailpipe (par. 132).

(3) Remove four cap screws securing slip yoke (fig. 202) at front end of transfer-to-forward-rear-axle propeller shaft to universal joint journal, and remove yoke from journal.

Warning: Before removing cap screws from slip yoke raise the wheels on one side of both rear axles to relieve torsional strains.

Secure front end of propeller shaft to frame left side rail to avoid interference when removing transfer.

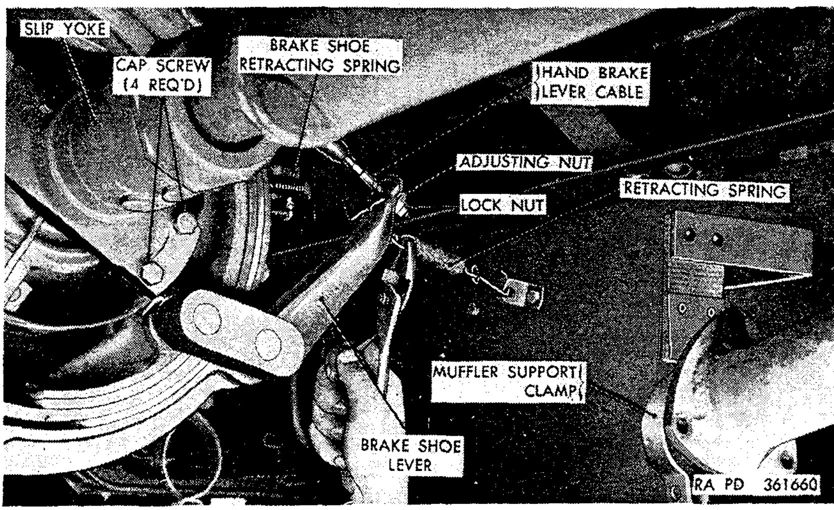


Figure 202. Universal joint and handbrake mechanism at rear of transfer.

(4) Remove 12 cap screws (fig. 67) securing cab floor tunnel to cab floor, and remove tunnel.
(5) Disconnect transmission-to-transfer propeller shaft from transfer-input-shaft companion flange (fig. 203). Refer to paragraph 211.
(6) Remove cotter pin from end of control-rod-yoke pin (fig. 204), remove yoke pin, and remove control rod from shifter shaft.
(7) Unscrew connector securing speedometer flexible shaft (D, fig. 145) to sending unit (fig. 144) on front of transfer, and pull shaft from sending unit.

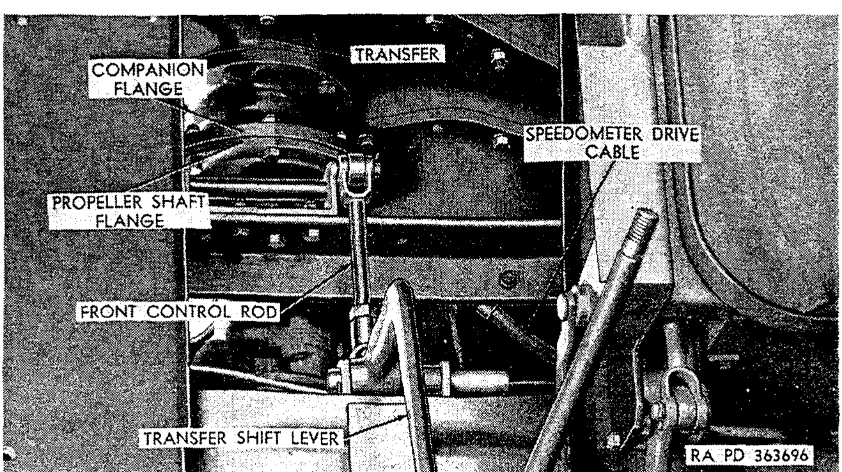


Figure 203. Top view of transfer front end from inside of cab.

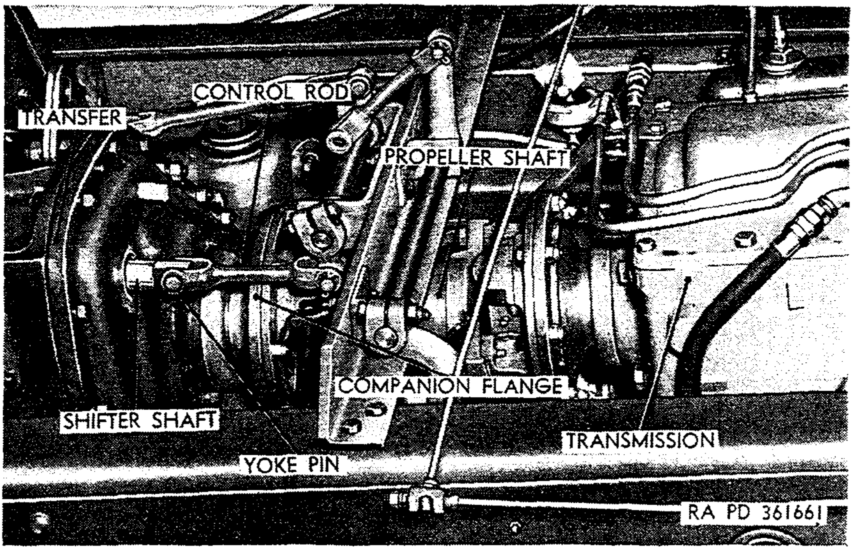


Figure 204. Transmission-to-transfer propeller shaft and shift linkage.

(8) Unscrew connectors (fig. 144) at junction of rigid and flexible air shift lines and disconnect lines.

Note. Place identification tags on air shift lines to facilitate assembly.

(9) Disconnect transfer-to-front-axle propeller shaft at front-output-shaft companion flange (par. 211). Secure rear end of propeller shaft to frame left side rail.

(10) Unhook retracting spring from brakeshoe lever (fig. 202) at rear of transfer. Remove adjusting nut and locknut from handbrake cable, and remove cable from brakeshoe lever.

(11) Position hydraulic jack (fig. 99) with transfer fixture under transfer, and raise jack until weight of transfer is just supported by jack (fig. 205).

(12) Remove three cap screws securing transfer to right mounting bracket (fig. 205), and remove four cap screws securing transfer to left mounting bracket.

(13) Lower jack to permit removal of transfer from underneath truck (fig. 206).

(14) Turn hydraulic jack until right side of transfer is parallel to forward rear axle (fig. 207), and pull jack and transfer from under right side of truck.

(15) Remove eight nuts (fig. 205) and washers from cap screws securing universal joint journal adapter to rear-output-shaft companion flange, and remove adapter from flange.

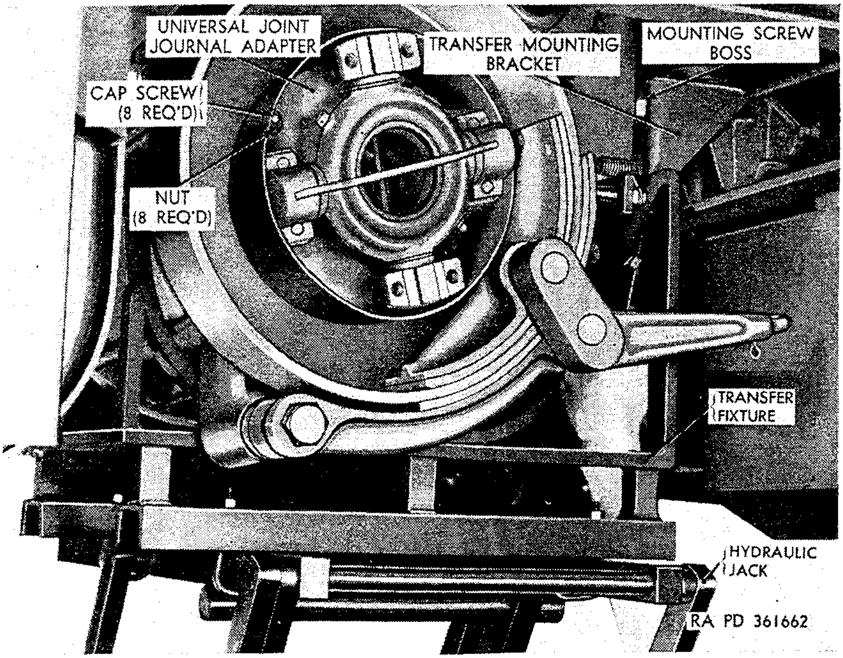


Figure 205. Supporting transfer with hydraulic jack.

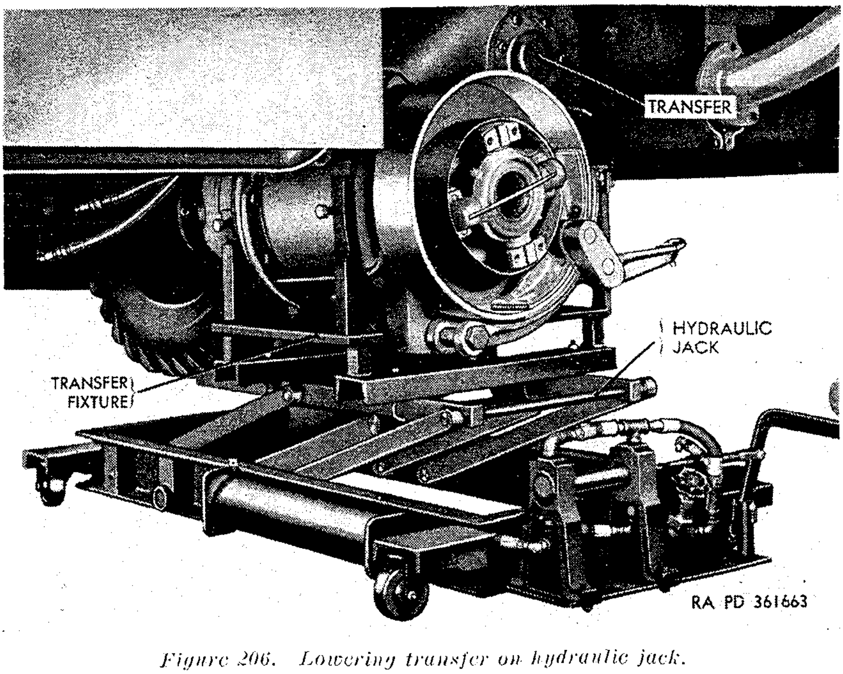


Figure 206. Lowering transfer on hydraulic jack.

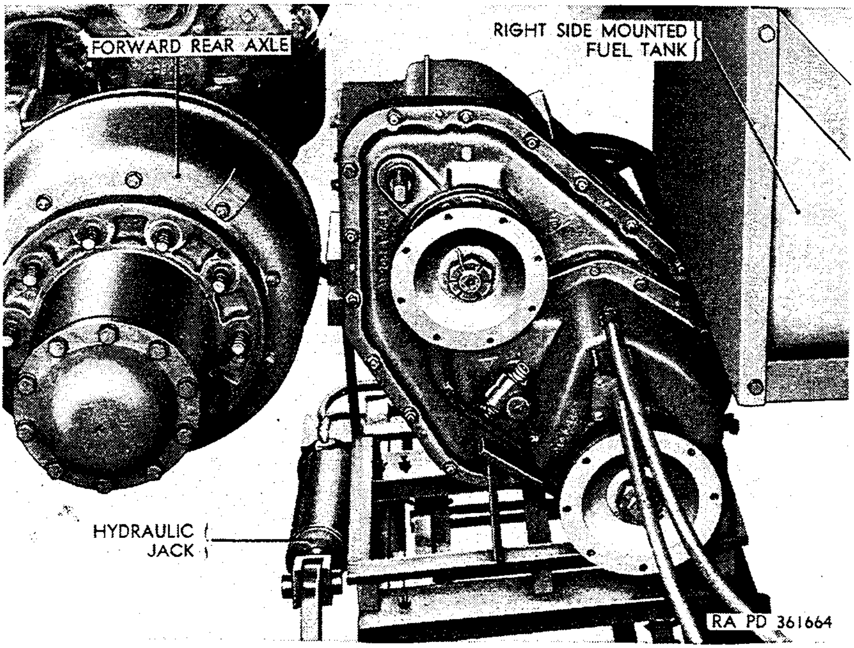


Figure 207. Pulling transfer from under right side of truck.

c. *Installation (All Models Except M51, M62, and M246).*

(1) Position universal joint journal adapter (fig. 205) on cap screws at rear-output-shaft companion flange, install eight nuts and washers on cap screws, and tighten nuts.

(2) With transfer supported in lowered position on hydraulic jack, push jack and transfer under right side of truck immediately forward of and parallel to forward rear axle (fig. 207).

(3) Turn jack until front of transfer is toward front of truck, raise jack, and aline mounting screw bosses (fig. 205) on left and right sides of transfer case with left and right transfer mounting brackets.

(4) Install three cap screws in holes in right mounting bracket and mounting screw boss, and install four cap screws in holes in left mounting bracket and mounting screw boss. Tighten cap screws. Lower jack and remove from underneath truck.

(5) Hook end of retracting spring (fig. 202) in eye provided on brakeshoe lever. Insert end of handbrake cable in hole at upper end of brakeshoe lever, and install adjusting nut on end of cable. Adjust handbrake (par. 228) and install lock-nut on end of cable.

(6) Position slip yoke (fig. 202) on front end of transfer-to-forward-rear-axle propeller shaft at universal-joint journal, and

install four cap screws in holes in slip yoke and journal bearings.

(7) Position flange on rear end of transfer-to-front-axle propeller shaft at companion flange on front output shaft, and install eight bolts and selflocking nuts. Tighten nuts.

(8) Connect flexible air shift lines (fig. 144) attached to left front of transfer to rigid air shift lines at top rear of transmission. Tighten connectors.

(9) Insert end of speedometer flexible shaft (D, fig. 145) in sending unit (fig. 144) on front of transfer, making sure that key on end of shaft is alined with keyway in sending unit, and tighten connector.

(10) Position control rod yoke on front end of shifter shaft (fig. 204), and secure with yoke pin and cotter pin.

(11) Adjust transfer shift linkage as in (*a*) through (*e*) below.

(*a*) Remove cotter pin and yoke pin securing front control rod (fig. 203) to transfer shift lever.

(*b*) Move transfer shifter shaft (fig. 204) toward the rear of the vehicle as far as it will go.

(*c*) Place the transfer shift lever (fig. 203) in the HIGH RANGE (par. 27).

(*d*) If the front control rod yoke can be attached to the transfer shift lever without moving either the control rod or lever, proceed as in (*e*) below. Otherwise, loosen the locknut on the control rod, and turn yoke on the rod until the yoke can be attached to the shift lever.

(*e*) Position the front control rod yoke on the shift lever, install the yoke pin, and secure with cotter pin. Tighten the locknut on the control rod against the yoke.

(12) Connect transmission-to-transfer propeller shaft to transfer-input-shaft companion flange (fig. 203). Refer to paragraph 211.

(13) Position cab floor tunnel (fig. 67) over opening in cab floor, and install 12 cap screws. Tighten screws.

(14) Install tailpipe (par. 132).

(15) Install right front wheel and tire assembly on front axle (par. 241).

(16) Lower rear wheels.

(17) Record the replacement on DA Form 478.

d. Removal (Dump Truck M51 Only).

(1) Perform *b*(1), (2), and (3) above.

(2) Remove power-take-off-to-hydraulic-hoist-pump propeller shaft (par. 211).

(3) Perform *b*(4) through (15) above.

e. Installation (Dump Truck M51 Only).

(1) Perform *c*(1) through (4) above.

(2) Install power-take-off-to-hydraulic-hoist-pump propeller shaft (par. 211).

(3) Perform *c*(5) through (17) above.

f. Removal (Medium Wrecker Truck M62 Only).

(1) Perform *b*(1), (2), and (3) above.

(2) Disconnect power-take-off-to-power-divider propeller shaft at universal joint yoke (fig. 208) on power-take-off (par. 211).

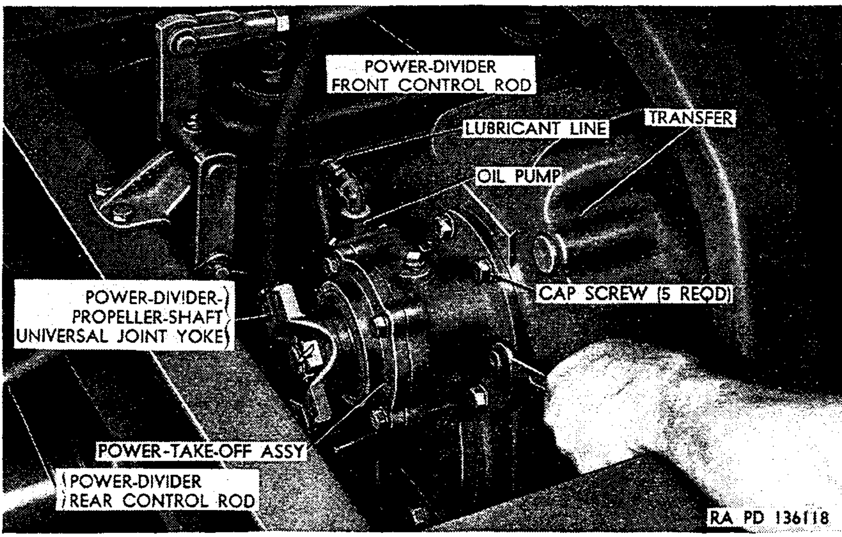


Figure 208. Power-take-off mounted on transfer—M62 only.

(3) Perform *b*(4) through (15) above.

(4) Remove power-take-off (par. 209*f*).

g. Installation (Medium Wrecker Truck M62 Only).

(1) Install power-take-off (par. 209*g*).

(2) Perform *c*(1) through (4) above.

(3) Connect power-take-off-to-power-divider propeller shaft at universal joint yoke (fig. 208) on power-take-off (par. 211).

(4) Perform *c*(5) through (17) above.

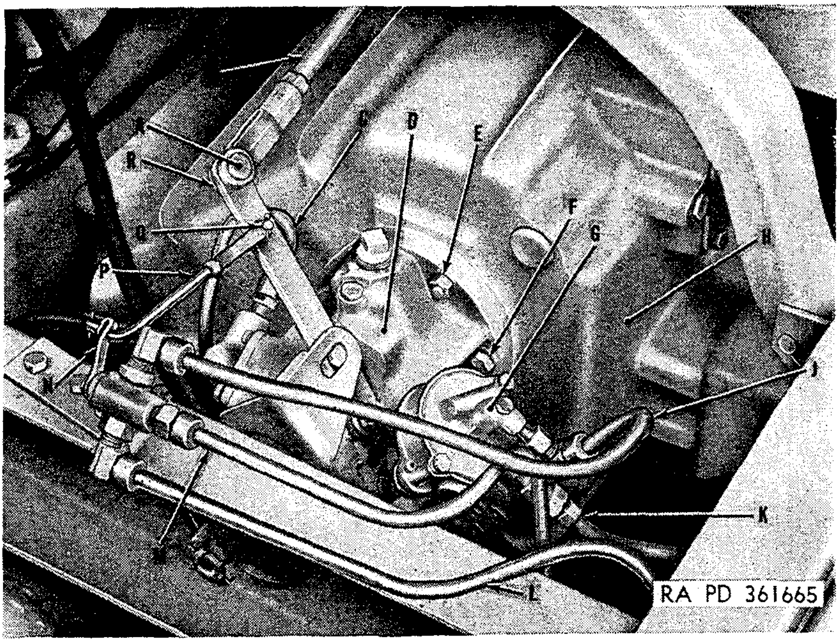
h. Removal (Tractor Wrecker Truck M246 Only).

Note. The key letters noted in parentheses are in figure 209.

(1) Perform *b*(1), (2), and (3) above.

(2) Unscrew connector securing governor-valve-to-control-valve line (J) to elbow installed in outlet port of governor valve (G). Remove the line from the governor valve.

(3) Unscrew connector securing carburetor-to-governor-valve line (K) to inlet port of governor valve (G). Remove the line from the governor valve.



A—Yoke pin
B—Rear control rod
C—Lubricant line
D—Power-take-off
E—Hex-head nut
F—Cap screw
G—Governor valve
H—Transfer
J—Governor-valve-to-control-valve line
K—Carburetor-to-governor-valve line
L—Governor-valve-to-control-valve line
M—Control-valve-to-governor line
N—Governor-valve control valve lever
P—Control-valve control rod
Q—Yoke pin
R—Shift lever

Figure 209. Power-take-off mounted on transfer—M246 only.

(4) Remove cotter pin and yoke pin (Q) securing governor-valve-control-valve control rod (P) to the power-take-off shift lever (R). Remove the control rod from the shift lever.

(5) Remove cotter pin and yoke pin (A) securing power-take-off rear control rod (B) to power-take-off shift lever (R). Remove the control rod from the shift lever.

(6) Disconnect power-take-off-to-hydraulic-pump propeller shaft (par. 211) at transfer.

(7) Perform *b* (4) through (15) above.

(8) Remove power-take-off (par. 209*h*).

i. Installation (Tractor Wrecker Truck M246 Only).

Note. The key letters noted in parentheses are in figure 209, except where otherwise indicated.

(1) Install power-take-off (par. 209*i*).

(2) Perform *c* (1) through (4) above.

(3) Connect power-take-off-to-hydraulic-pump propeller shaft (par. 211) at transfer.

(4) Adjust and connect power-take-off rear control rod (B) (*a*) through (*d*) below.

(*a*) Pull power-take-off control lever (fig. 68) up and back as far as it will go.

(*b*) Move the power-take-off shift lever (R) forward as far as it will go.

(*c*) If the rear control rod yoke can be attached to the shift lever without moving either the rod or the lever, proceed as in (*d*) below. Otherwise, loosen the locknut on the rear control rod (B) and turn the yoke on the rod until the yoke can be attached to the shift lever.

(*d*) Position the control rod yoke on the shift lever, install the yoke pin (A), and secure with cotter pin. Tighten the locknut against the rear control rod yoke.

(5) Adjust and connect the control-valve control rod (P) (*a*), (*b*), and (*c*) below.

(*a*) With power-take-off shift lever (R) in its extreme forward position, move the governor-valve control valve lever (N) forward as far as it will go.

(*b*) If the control-valve control rod (P) can be attached to the shift lever (R) without moving either the rod or lever, proceed as in (*c*) below. Otherwise, loosen the locknut on the control rod and turn the yoke on the control rod until the yoke can be attached to shift lever.

(*c*) Position the control rod yoke on the shift lever, install the yoke pin (Q), and secure with cotter pin. Tighten the locknut against the control rod yoke.

(6) Position carburetor-to-governor-valve line (K) at inlet port on side of governor valve (G), and tighten connector.

(7) Position governor-valve-to-control-valve line (J) at elbow installed in governor valve outlet port, and tighten connector.

(8) Perform *c*(5) through (17) above.

Section XXI. POWER-TAKE-OFF SYSTEMS

208. Description and Data

a. Description.

(1) *General.* Four models of power-take-off, when required for operation of auxiliary equipment, are used on the vehicles covered by this manual. Two models are mounted on the lower right side of the transmission (par. 204), one of which is used to power the front winch (par. 256), while the other is used to power both the front winch and the dump-body hoist hydraulic pump (par. 307). The other two power-take-offs are mounted on the rear of the transfer (par. 206),

one of which is used on the medium wrecker truck M62 to operate the power divider (par. 268), while the other is used on the tractor wrecker truck M246 to power the wrecker crane hydraulic pump (par. 287).

(2) *Power-take-off (mounted on transmission) (all vehicles equipped with front winch except M51).* The power-take-off (fig. 210) mounted on the transmission for powering the front winch only is a three speed (two *wind* speed and one *unwind* speed) unit. The output shaft on the front of the unit is connected to the input shaft on the rear of the winch (par. 256) by a propeller shaft. The power-take-off is controlled by a lever (par. 28) in the cab.

(3) *Power-take-off (mounted on transmission) (dump truck M51 only).* The power-take-off mounted on the transmission (par. 204) for powering the front winch and the dump-body hydraulic hoist pump is equipped with two output shafts, one on the front and one on the rear of the unit. The front output shaft has three operating speeds, ((2) above), and is controlled by a lever (par. 28) in the cab. The rear output shaft speed varies with the speed of the engine. Operation of this shaft is controlled by a separate lever (par. 39) in the cab.

(4) *Power-take-off (mounted on transfer) (medium wrecker truck M62 only).* The power-take-off mounted on the rear of the transfer (par. 206) of the medium wrecker truck

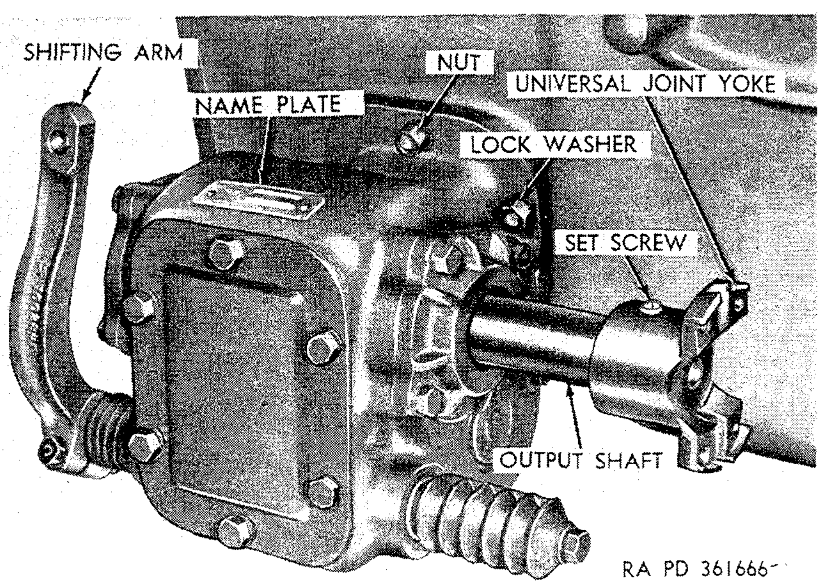


Figure 210. Transmission mounted power-take-off (all models except M51).

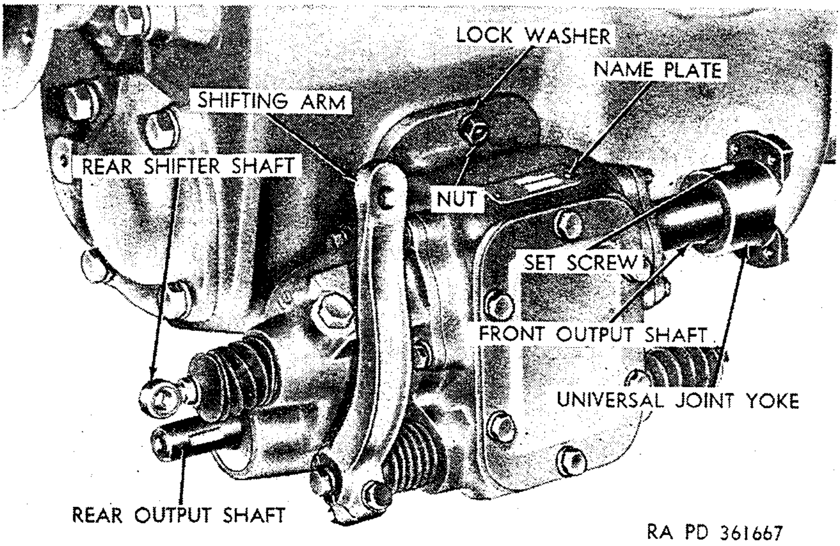


Figure 211. Transmission mounted power-take-off (dump truck M51 only).

M62 is a constant-running unit used to transmit power from the engine (through the transmission and transfer) to the power divider (par. 268). The output shaft at the rear of the power-take-off, which is connected to the input shaft on the front of the power divider by a propeller shaft, rotates whenever the engine is running with the clutch engaged and the transmission gearshift lever in any position except NEUTRAL. Output shaft speed at all times varies with the speed of the engine. However, during crane or rear winch operation, engine speed is governed at a maximum of 1,500 rpm by a governor valve (par. 268) mounted on the power divider and connected to the engine speed governor. When the crane or rear winch is not in operation, the transmission of power from the power-take-off to the power divider is interrupted by disengaging the gears inside the power divider by operation of a lever (par. 39) in the cab.

(5) *Power-take-off (mounted on transfer) (tractor wrecker truck M246 only).* The power-take-off (D, fig. 209) mounted on the rear of the transfer of the tractor wrecker truck M246 is used to power the crane hydraulic pump (par. 287) attached to the underside of the rear outrigger frame tube. The output shaft on the rear of the power-take-off is connected to the input shaft on the front of the hydraulic pump by a propeller shaft. During operation of the power-take-off, which is controlled by a lever (par. 40) in the cab, output shaft speed varies at all times with the speed of the engine. However, during power-take-off operation, speed of

the engine is governed at 1,600 rpm (no-load) by a governor valve (G, fig. 209) mounted on the power-take-off and connected to the engine speed governor.

b. Data.

(1) *Power-take-off (all models except M51).*

Drive	transmission
Make	Spicer
Model	WN-6N
Ordnance number	7409588
Output shaft	front

(2) *Power-take-off (dump truck M51 only).*

Drive	transmission
Make	Spicer
Model	WND-6N
Ordnance number	7409589
Output shaft	front and rear

(3) *Power-take-off (medium wrecker M62 only).*

Drive	transfer
Make	Timken-Detroit Axle Co
Model	TD-P138A
Ordnance number	8327112
Output shaft	rear

(4) *Power-take-off (tractor wrecker truck M246 only).*

Drive	transfer
Make	Timken-Detroit Axle Co
Model	TD-P138B
Ordnance number	8332626
Output shaft	rear

209. Power-Take-Off Removal and Installation

a. Coordination with Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal (Transmission-Mounted Power-Take-Off) (All Vehicles Equipped With Front Winch Except M51) (fig. 210).

(1) Drain transmission.

(2) Remove cotter pin from end of power-take-off-control-rod yoke pin, remove yoke pin, and remove control rod from power-take-off shifting arm.

(3) Loosen hex-socket setscrew in universal joint yoke on output shaft at front of power-take-off.

(4) Remove six nuts and lockwashers securing power-take-off to transmission. Slide power-take-off free of mounting studs.

(5) Tap yoke on output shaft lightly to remove front winch propeller shaft from power-take-off.

(6) Remove and discard power-take-off mounting gasket.

Note. Exercise care to prevent dirt from entering either transmission or power-take-off while performing other operations.

c. Installation (Transmission-mounted Power-Take-Off) (All Vehicles Equipped With Front Winch Except M51) (fig. 210.

(1) Clean gasket surfaces on transmission and power-take-off and install new gasket on studs on transmission.

(2) Aline key on front output shaft with keyway in yoke on rear of front winch propeller shaft, and tap lightly on yoke to slide it onto output shaft.

(3) Position power-take-off on mounting studs on side of transmission, and install six lockwashers and nuts on studs. Tighten nuts to 30 to 40 pound-feet torque.

(4) Drive yoke onto front output shaft until inner end of key is flush with end of yoke, and tighten hex-socket setscrew in yoke.

(5) Adjust and connect power-take-off control rod (*a*) through (*d*) below.

(*a*) Move power-take-off shifting arm forward as far as it will go.

(*b*) Move the power-take-off-control-rod front yoke toward the shifting arm as far as it will go.

(*c*) If the yoke can be assembled to the shifting arm without moving either the control rod or the shifting arm, proceed as in (*d*) below. Otherwise, loosen the locknut on the control rod and turn the yoke on the rod until the yoke can be attached to the shifting arm.

(*d*) Position the control rod yoke on the shifting arm, install the yoke pin, and secure with cotter pin. Tighten the locknut on the control rod against the yoke.

(6) Fill transmission (par. 67).

(7) Record the replacement on DA Form 478.

d. Removal (Transmission-Mounted Power-Take-Off) (Dump Truck M51 Only).

(1) Perform *b* (1), (2), and (3) above.

(2) Remove cotter pin from end of power-take-off-cross-shaft-rod yoke pin, remove yoke pin, and remove cross-shaft rod from rear shifter shaft (fig. 211).

(3) Cut locking wire on setscrew securing universal joint yoke to rear output shaft (fig. 211), and loosen setscrew.

(4) Perform *b* (4) and (5) above.

(5) Tap yoke on rear output shaft lightly to remove hydraulic-hoist-pump propeller shaft from power-take-off.

(6) Remove and discard power-take-off mounting gasket.

Note. Exercise care to prevent dirt from entering either transmission or power-take-off while performing other operations.

e. Installation (Transmission-Mounted Power-Take-Off) (Dump Truck M51 Only).

(1) Perform *c*(1) and (2) above.

(2) Aline key on rear output shaft (fig. 211) with keyway in yoke on front of hydraulic-hoist-pump propeller shaft, and tap lightly on yoke to slide it onto output shaft.

(3) Perform *c*(3), (4), and (5) above.

(4) Drive yoke onto rear output shaft until inner end of key is flush with end of yoke, tighten hex-socket set screw in yoke, and lock set screw in position with wire.

(5) Adjust and connect cross shaft rod to rear shifter shaft (fig. 211) using same procedures as in *c*(5) above.

(6) Perform *c*(6) and (7) above.

f. Removal (Transfer-Mounted Power-Take-Off) (Medium Wrecker Truck M62 Only).

(1) Remove transfer (par. 207). Due to the location of the power-take-off on the vehicle, the transfer must be removed to facilitate power-take-off removal. Figure 208 illustrates location of the power-take-off on the rear of the transfer.

(2) Unscrew connector securing lubricant line to oil-pump elbow at top left of power-take-off (fig. 208), and remove line from oil pump.

(3) Remove five cap screws (fig. 208) and lockwashers and one hex-head nut and lockwasher securing power-take-off to transfer case.

(4) Slide power-take-off from mounting stud (fig. 212), and remove and discard power-take-off mounting gasket. Figure 212 illustrates power-take-off removed with transfer installed in vehicle and hydraulic oil reservoir and stowage box assembly removed.

g. Installation (Transfer-Mounted Power-Take-Off) (Medium Wrecker Truck M62 Only).

(1) Clean gasket surfaces on power-take-off (fig. 212) and transfer, and install new gasket on power-take-off mounting flange.

(2) Aline splines on power-take-off shaft with splines in shaft coupling sleeve (fig. 212), and slide power-take-off on mounting stud.

(3) Install five cap screws (fig. 208) with lockwashers in holes in power-take-off mounting flange, and install hex-head nut and lockwasher on mounting stud. Tighten cap screws and nut.

(4) Position lubricant line (fig. 208) at elbow on top of oil pump and tighten connector.

(5) Install transfer (par. 207).

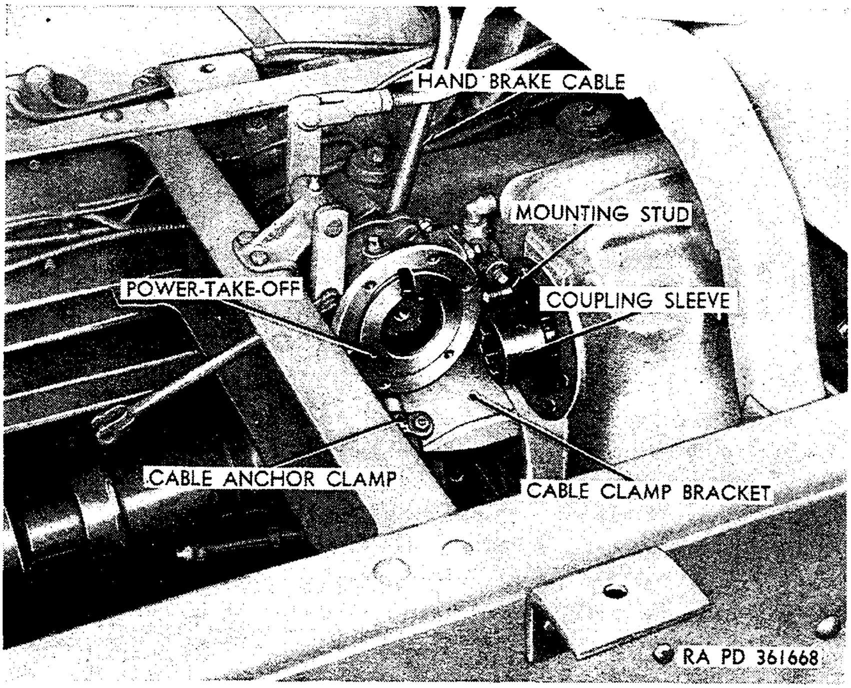


Figure 212. Power-take-off removed from transfer—M62.

h. Removal (Transfer-Mounted Power-Take-Off) (Tractor Wrecker Truck M246 Only).

(1) Remove transfer (par. 207). Due to the location of the power-take-off on the vehicle, the transfer must be removed to facilitate power-take-off removal. Figure 209 illustrates location of the power-take-off with the transfer installed but with the hydraulic oil reservoir and stowage box removed from the vehicle.

(2) Unscrew connector securing lubricant line (C, fig. 209) to oil pump on left side of power-take-off (D, fig. 209).

(3) Remove five cap screws (F, fig. 209) and lockwashers and one hex-head nut (E, fig. 209) and lockwasher securing power-take-off to transfer case.

(4) Slide power-take-off from mounting stud, and remove and discard power-take-off mounting gasket.

i. Installation (Transfer-Mounted Power-Take-Off) (Tractor Wrecker Truck M246 Only).

(1) Clean gasket surfaces on power-take-off (D, fig. 209) and transfer, and install new gasket on power-take-off mounting flange.

(2) Aline splines on power-take-off shaft with splines in shaft coupling sleeve on transfer input shaft, and slide power-take-off on mounting stud.

(3) Install five cap screws (F, fig. 209) with lockwashers in holes in power-take-off mounting flange, and install hex-head nut (E, fig. 209) and lockwasher on mounting stud. Tighten cap screws and nut.
(4) Position lubricant line (C, fig. 209) at fitting on top of oil pump, and tighten connector.
(5) Install transfer (par. 207).
(6) Test and adjust governor valve (G, fig. 209) mounted on power-take-off, using same procedures as for adjusting governor valve mounted on power divider (par. 271*a*).

Section XXII. PROPELLER SHAFTS

210. Description

a. General. Four propeller shafts with universal joint assemblies (fig. 213) are used to transmit power from the transmission to the transfer and front and rear axles. These propeller shafts, designated according to the units which they connect, are as follows: transmission-to-transfer, transfer-to-front-axle, transfer-to-forward-rear-axle, and forward-rear-axle-to-rear-rear-axle. In addition, the following propeller shafts are used to transmit power for operation of auxiliary equipment: power-take-off-to-front-winch (all vehicles equipped with front winch), power-take-off-to-hydraulic-hoist-pump (M51 only), power-take-off-to-power-divider (M62 only), and power-take-off-to-crane-hydraulic-pump (M246 only).

b. Propeller Shafts. Each propeller shaft assembly (fig. 241) is comprised of a propeller shaft and a slip yoke assembly, which permits telescopic action of the shaft during rotation. The propeller shaft consists of a tube with a universal joint yoke welded to one end and a splined shaft welded to the other end. The slip yoke assembly consists of an internally splined tube with a universal joint yoke welded to the end opposite the splined hole. The two sections are assembled by inserting the splined shaft on the end of the propeller shaft into the splined hole in the end of the slip yoke assembly. A universal joint (*c* below) installed at each end of the propeller shaft permits angular movement during rotation of the shaft.

c. Universal Joints. The universal joint (figs. 215 and 216) installed at each end of the propeller shaft consists of a journal with four journal bearings, two of which are secured with cap screws to the propeller shaft yoke. The other two journal bearings are secured by cap screws either to a yoke (fig. 215) installed on the driven shaft, or to an adapter flange (fig. 216) which is bolted to a companion flange installed on the driven shaft.

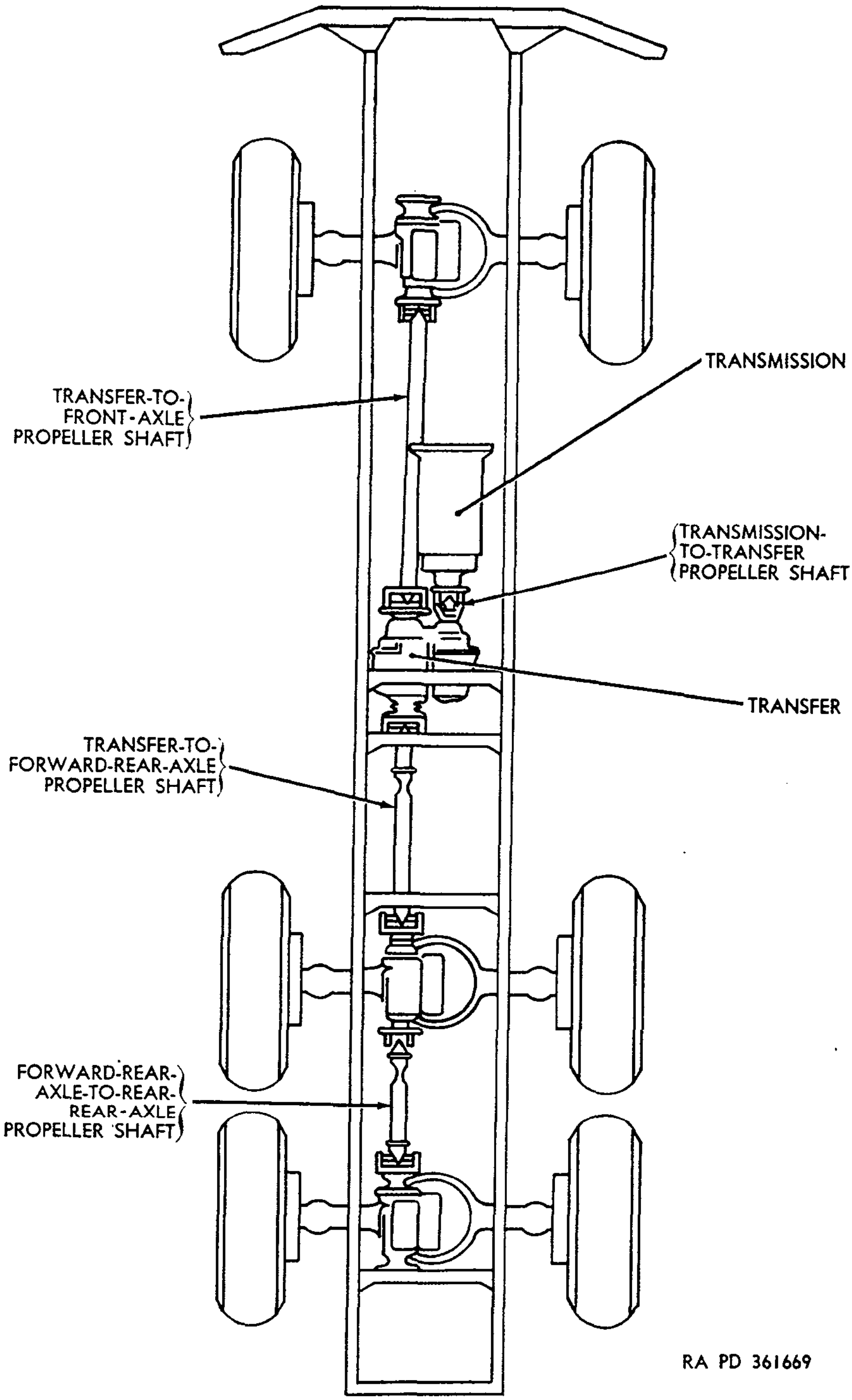


Figure 213. Diagram of axle driving propeller shafts.

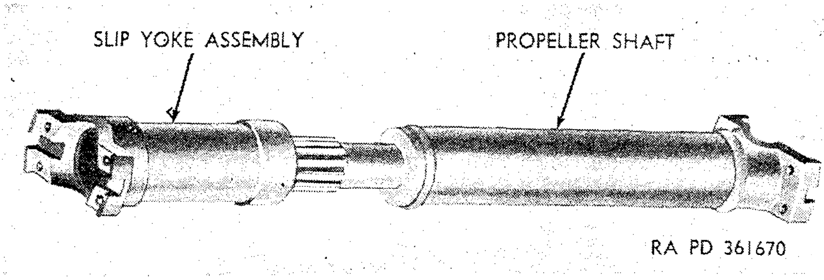


Figure 214. Propeller shaft assembly.

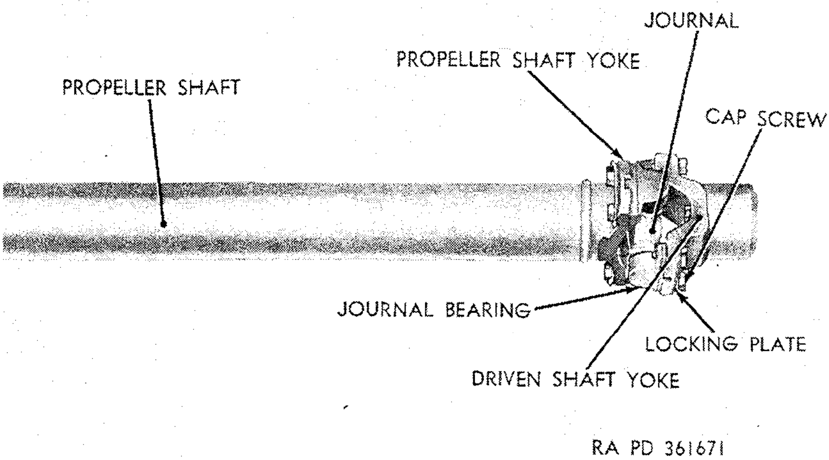


Figure 215. Yoke-mounted universal joint.

211. Propeller Shaft Removal and Installation

a. Removal (With Yoke-Mounted Universal Joints).

(1) Bend down two locking plates, remove four cap screws securing two journal bearings (two cap screws from each bearing) to driven shaft yoke, and remove propeller shaft and journal assembly from yoke (fig. 215).

(2) Repeat (1) above at other end of propeller shaft assembly, and remove propeller shaft assembly from vehicle.

(3) Bend down two locking plates, remove four cap screws securing two journal bearings (two cap screws from each bearing) to propeller shaft yoke, and remove journal and bearing assembly from propeller shaft.

(4) Repeat (3) above at other end of propeller shaft assembly.

b. Installation (With Yoke-Mounted Universal Joints).

(1) Position journal and bearing assembly at propeller shaft yoke, position locking plate on yoke, and install two cap

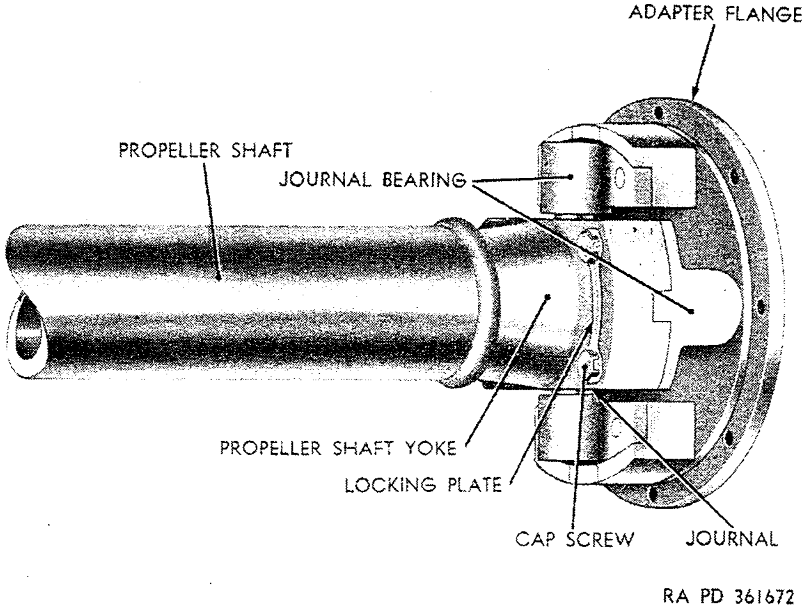


Figure 216. Flange-mounted universal joint.

screws in holes in locking plate, yoke, and journal bearing (fig. 215).

(2) Position locking plate over holes in other arm of yoke, and install two cap screws in holes in locking plate, yoke, and journal bearing. Tighten cap screws, and bend locking plates up flat against cap screw heads.

(3) Repeat (1) and (2) above at other end of propeller shaft assembly.

(4) Position journal and bearing assembly on end of propeller shaft assembly at driven shaft yoke, position locking plate on yoke, and install two cap screws in holes in locking plate, yoke, and journal bearing.

Note. Always install propeller shafts so that slip yoke is at power input end of shaft assembly.

(5) Position locking plate over holes in other arm of yoke, and install two cap screws in holes in locking plate, yoke, and journal bearing. Tighten cap screws, and bend locking plates up flat against cap screw heads.

(6) Repeat (4) and (5) above at other end of propeller shaft assembly.

c. Removal (With Flange-Mounted Universal Joints) (fig. 216).

(1) Remove eight self-locking nuts and bolts securing adapter flange at one end of propeller shaft assembly to companion

flange on driven shaft. Remove propeller shaft assembly from companion flange.

(2) Repeat (1) above at other end of propeller shaft assembly, and remove propeller shaft assembly from vehicle.

(3) Remove four cap screws and lockwashers securing two journal bearings to adapter flange, and remove adapter flange from journal and bearing assembly.

(4) Bend down two locking plates, remove four cap screws securing two journal bearings (two cap screws from each bearing) to propeller shaft yoke, and remove journal and bearing assembly from yoke.

(5) Repeat (3) and (4) above at other end of propeller shaft assembly.

d. Installation (With Flange-Mounted Universal Joints) (fig. 216).

(1) Position journal and bearing assembly at propeller shaft yoke, position locking plate on yoke, and install two cap screws in holes in locking plate, yoke, and journal bearing.

(2) Position locking plate over holes in other arm of yoke, and install two cap screws in holes in locking plate, yoke, and journal bearing. Tighten cap screws, and bend locking plates up flat against cap screw heads.

(3) Position adapter flange at journal and bearing assembly, and install four cap screws and lockwashers in holes in flange and two journal bearings.

(4) Repeat (1), (2), and (3) above at other end of propeller shaft assembly.

(5) Position adapted flange on one end of propeller shaft assembly at companion flange on driven shaft, and install eight bolts with self-locking nuts in holes in flanges. Tighten nuts.

Note. Always install propeller shafts so that slip yoke is at power input end of shaft assembly.

(6) Repeat (5) above at other end of propeller shaft assembly.

Section XXIII. FRONT AXLE

212. Description and Data

a. Description. The front axle assembly (fig. 217) is a hypoid, double reduction, single speed type. It is secured to the underside of the front springs by a pair of clamp plates and U-bolts at each end. The differential and carrier assembly on top of the axle housing transmits power from the transfer-to-front-axle propeller shaft (fig. 213) to the left and right drive shafts inside the housing whenever the overrunning clutch on the transfer front output shaft is engaged (par. 206*a*). Universal joints installed at the outer end of each of the drive

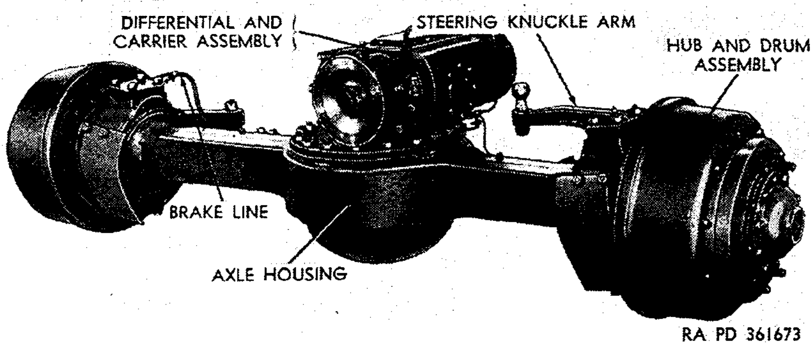


Figure 217. Front axle assembly.

shafts permit delivery of power to the wheels under all conditions or direction of travel, regardless of whether the wheels are set for turning to the right or left or for straightahead motion.

b. Data.

Manufacturer	Timken-Detroit
Model	FM 240 HX1
Gear ratio (all models except M139c)	6.443 : 1.00
Gear ratio (M139c)	10.26 : 1.00
Lubricant capacity	12 pt

213. Front Wheel Alinement

a. General. Front wheel alinement has a major effect on steering from the standpoints of control, ease of steering, and safety. Front wheel misalinement is a major cause of premature and uneven tire wear. The factors involved in front wheel alinement are caster, camber, turning-angle, and toe-in as illustrated in figure 218.

(1) *Caster.* Front axle caster is the inclination of the center line through the upper and lower steering knuckle trunnions toward the rear of the truck. Caster is established by design and can be changed only by the shifting of the front axle on the springs or by distortion of the chassis frame or springs. There is no adjustment for caster.

(2) *Camber.* Front wheel camber is the inclination of the vertical center line through the wheel and tire assembly away from the vertical center line of the truck. There is no adjustment for camber, however, loose wheel bearings, loose knuckle trunnion bearings, bent steering knuckle, or bent axle housing will affect camber.

(3) *Turning angle.* Front wheel turning angle is the maximum angle through which the wheels may be turned from the straightahead position. This angle is limited by nonadjustable turning stops.

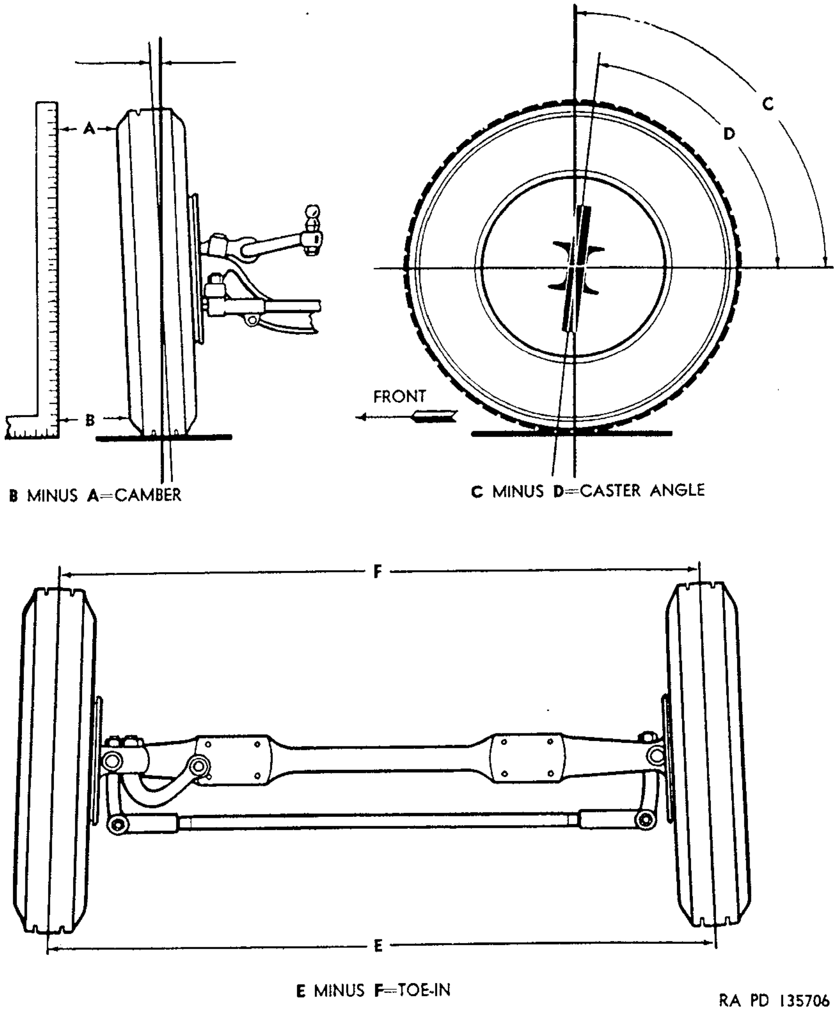


Figure 218. Front wheel alinement.

(4) *Toe-in.* Front wheel toe-in is the amount by which the wheels are closer together at the front than at the rear when the wheels are in the straightahead position. Camber causes both wheels to have a tendency to turn outward from the truck. Toe-in counteracts this tendency and causes the wheels to roll straight ahead with no scuffing action.

b. Toe-in Check. Inflate tires to correct pressure (par. 61*b*), and place truck on a smooth, level surface with the wheels in straight ahead position. Place gage 41–G–510 between the wheels ahead of the axle, with the ends of the gage bearing against the tire side walls and with both pendant chains just touching the ground. Set gage so pointer registers zero. Remove gage and place at same relative position at rear of axle, with the ends of the gage bearing against the tire side walls and with both pendant chains just touching the ground. The pointer will indicate the amount of toe-in or toe-out. Correct toe-in is $\frac{1}{8} \pm \frac{1}{16}$ inch.

c. Tie Rod Replacement. Loose wheel bearings, damaged wheels, bent steering knuckle, bent axle housing, or bent tie rod will affect toe-in. Adjust wheel bearings (par. 242) or replace damaged wheel (par. 241), and again check toe-in before replacing tie rod.

(1) *Removal* (fig. 219). Place truck on a level surface and apply handbrake. Raise front axle enough to take weight of truck off front wheels. Remove cotter pin and nut from stud at each end of tie rod. Remove tie rod end studs from left and right steering knuckle arms, and remove tie rod assembly from truck.

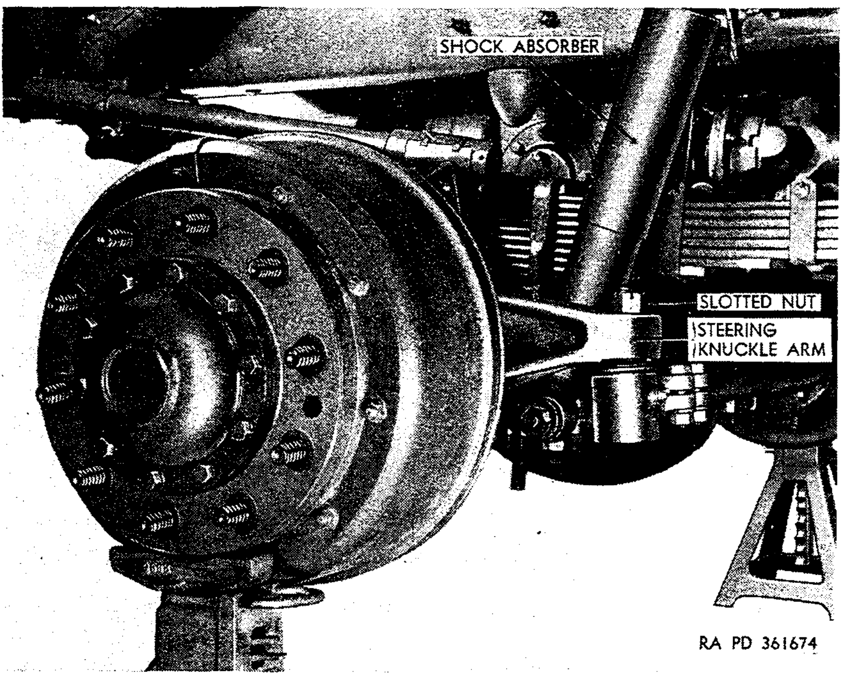


Figure 219. Left end of front axle assembly with wheel and tire removed.

(2) *Installation* (fig. 219). Insert tie rod end studs in holes in steering knuckle arms, and install two slotted nuts, one on each stud, and tighten. Install cotter pin in end of each tie rod end stud. Lower front wheels.

214. Axle Shaft With Universal Joint Assemblies

a. Removal (Short Shaft).

(1) Remove left front hub and drum assembly (par. 242).

(2) Unscrew connector securing brake line (fig. 220) to wheel cylinder at back side of backing plate assembly, and remove line from cylinder.

(3) Remove 10 nuts and lockwashers from studs securing oil slinger (fig. 220) and backing plate assembly to steering knuckle, and remove oil slinger and backing plate assembly.

(4) Remove spindle (fig. 220) from outer steering knuckle flange. Spindle can be loosened from flange by tapping on side of spindle with a brass hammer and driving wedge blocks between the flange and the spindle.

(5) Pull axle shaft and universal joint assembly (fig. 221) from steering knuckle and axle housing.

b. Cleaning and Inspection.

(1) *Cleaning.* Thoroughly wash axle shaft and universal joint assembly in dry-cleaning solvent or volatile mineral spirits to remove all old lubricant. Wash inner and outer flange of steering knuckle (par. 75).

(2) *Inspection.* Inspect universal joint balls and races for a grooved, scratched, or pitted condition. To determine if excessive play or backlash exists in universal joint, place the axle shaft and universal joint assembly in a vertical position in a vise, with the outer shaft up and with the vise jaws gripping the inner shaft just below the universal joint.

Note. To prevent damage to the inner shaft, use soft metal or wood protectors in jaws of vise.

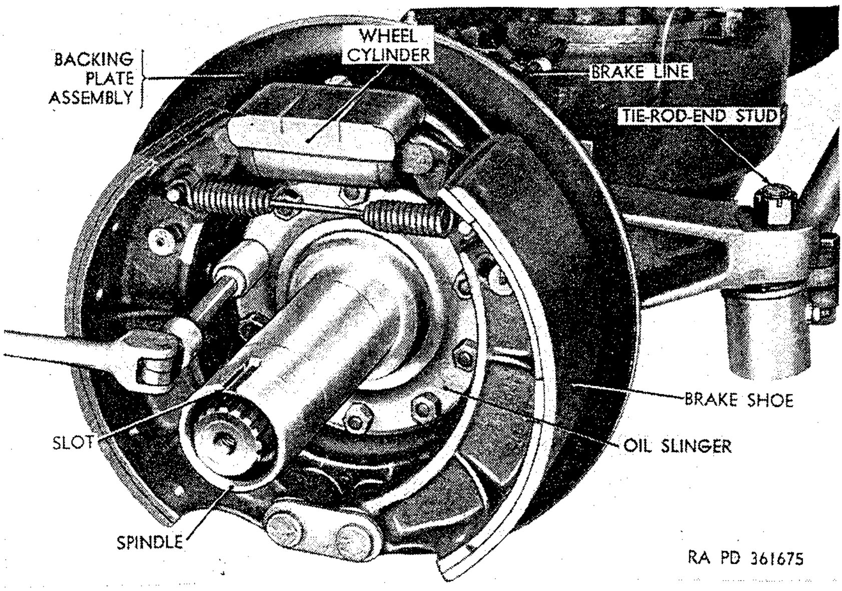


Figure 220. Removing oil slinger and backing plate.

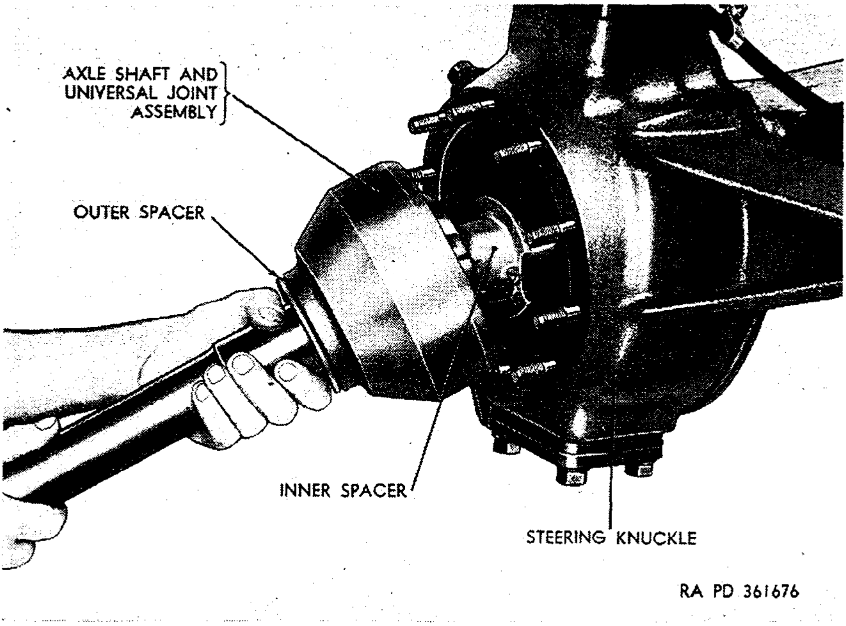


Figure 221. Removing axle shaft and universal joint assembly.

Firmly push down on outer shaft so that it rests on center ball, and at the same time attempt to twist the universal joint in both directions. Inspect axle shaft spacer washers and sleeves in steering knuckle and axle housing for excessive wear or damage. Examine axle shaft splines for nicks, cracks, or other damage. If excessive backlash in universal joint is noted, or if other parts are found to be excessively worn, damaged, or otherwise unserviceable, report the condition to ordnance maintenance personnel.

(3) *Special lubrication.* Spread new lubricant (par. 67) well into universal joint until it fills all space between balls, cage, and race. Also, spread lubricant on surfaces which contact spacer washers and bushing in the spindle.

c. Installation (Short Shaft).

(1) Using care not to damage oil seal in housing outer end, insert axle shaft and universal joint assembly (fig. 221) into steering knuckle and axle housing, guiding splined end of inner shaft into splined differential side gear inside axle housing. Be sure inner and outer spacers (fig. 221) are in position on inner and outer shafts before proceeding to next step.

(2) Place spindle (fig. 220) over outer shaft and position spindle flange on studs on outer steering knuckle flange, making sure that milled slot on threaded end of spindle is at top.

(3) Position backing plate assembly (fig. 220) and oil slinger on studs on outer steering knuckle flange, using nonhardening compound to install oil slinger, and install 10 lockwashers and nuts on studs. Tighten nuts.

(4) Position brake line (fig. 220) at wheel cylinder fitting at back side of backing plate assembly, and tighten connector.

(5) Install left front hub and drum assembly (par. 242).

d. Removal (Long Shaft).

(1) Remove right front hub and drum assembly (par. 242).

(2) Proceed as in *a*(2), (3), (4), and (5) above.

e. Cleaning and Inspection. Refer to *b* above.

f. Installation (Long Shaft).

(1) Proceed as in *c*(1), (2), (3), and (4) above.

(2) Install right front hub and drum assembly (par. 242).

215. Front Axle

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) *Position truck.* Place truck on a level surface and apply handbrake to prevent truck from rolling. Place a floor jack under differential housing and raise front end of truck high enough to permit withdrawing axle assembly.

Warning: Weight of vehicle must remain supported by overhead hoisting equipment, floor jacks, or support stands at all times. Do not attempt to support weight of truck on hydraulic jack (fig. 99).

Adjust two support stands to the desired height, locate them under frame side rails at rear of front spring brackets, and lower truck on stands.

(2) *Remove wheel and tire assemblies.* Remove left and right front wheel and tire assemblies (par. 241). Place a support stand under left and right front hubs (fig. 222), and remove floor jack from under differential housing.

(3) *Remove shock absorbers.* Remove left and right front shock absorbers (par. 252*a*(4)).

(4) *Disconnect drag link.* Disconnect lower drag link from steering arm ball (par. 249*c*).

(5) *Disconnect propeller shaft* (fig. 223). Disconnect adapter flange on front end of transfer-to-front-axle propeller shaft from companion flange at rear of front-axle differential. Refer to paragraph 211.

(6) *Remove* U-*bolt clamp plates* (fig. 224). Remove four nuts and lockwashers from two U-bolts securing axle housing to right front spring, and remove clamp plate from U-bolts. Repeat above operations at left front spring.

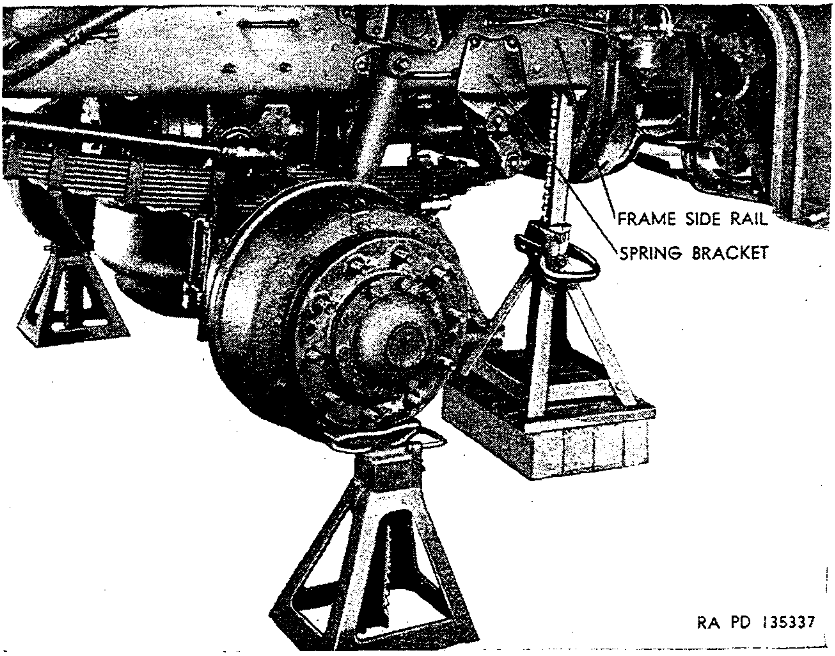


Figure 222. Truck support stands positioned for front axle removal.

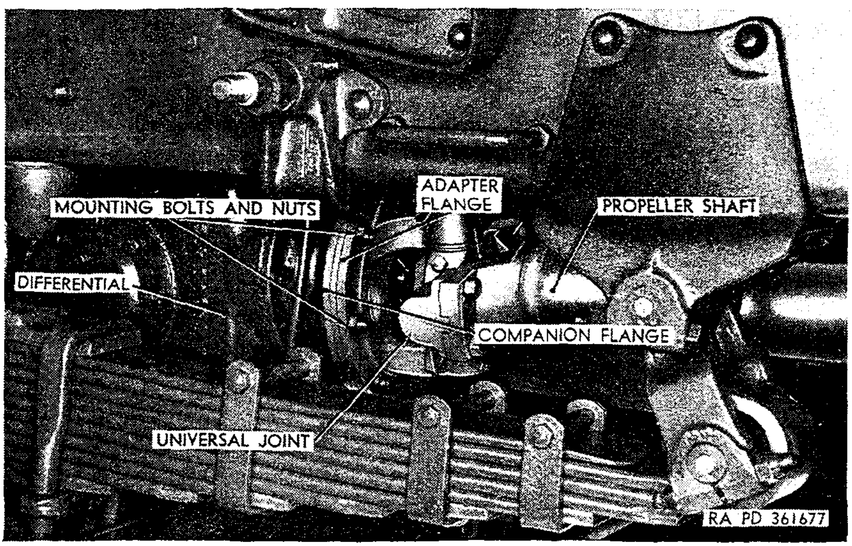


Figure 223. Disconnecting transfer-to-front-axle propeller shaft.

(7) *Position hydraulic jack.* Position hydraulic jack (fig. 99) with axle fixture under the front axle (fig. 225), raise jack sufficiently to release support stands under the wheel hubs, and remove the stands.

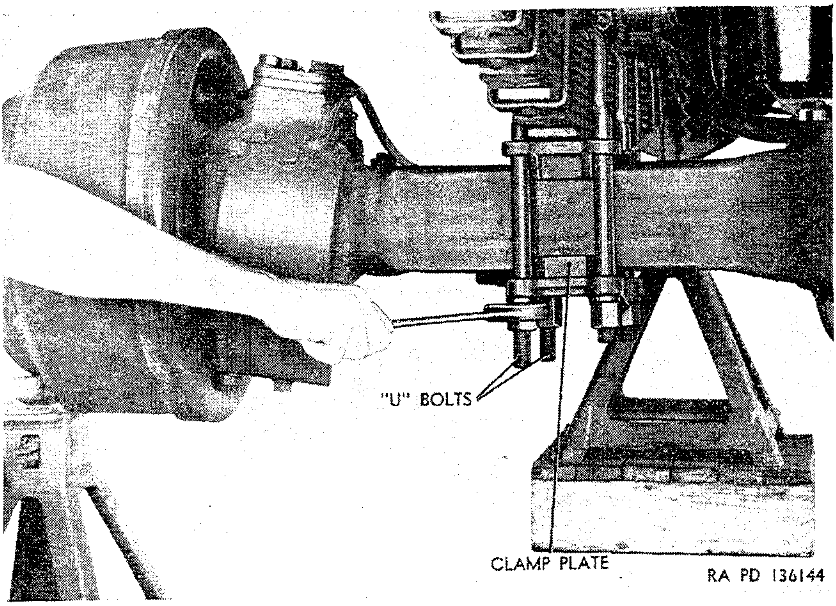


Figure 224. Removing U-bolt clamp plate.

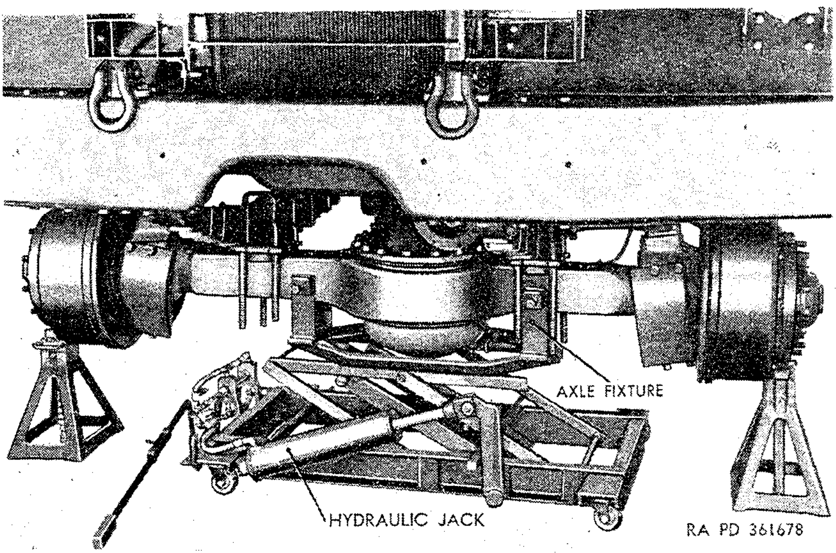


Figure 225. Hydraulic jack positioned for front axle removal.

(8) *Disconnect brake line* (fig. 226). Lower axle, unscrew connector securing rigid brake line to flexible brake line at bracket on top of differential housing, and separate lines. Remove cap screw securing bracket to top of differential housing, and remove flexible brake line and bracket from housing.

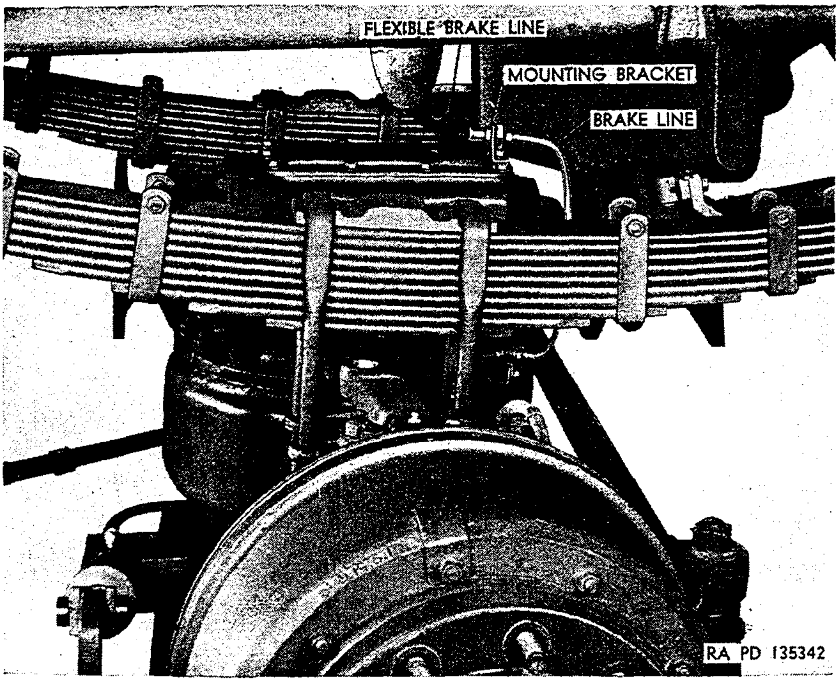


Figure 226. Front axle lowered for disconnecting flexible brake line.

(9) *Remove front axle* (fig. 227). Lift the four U-bolts, two on each front spring, free of the spring seats, and lower hydraulic jack sufficiently to allow removal of axle from under truck. Pull jack with axle assembly forward and out from under front of truck. Remove spring seats from axle assembly.

c. *Installation.*

(1) *Position front axle.* With front axle supported by hydraulic jack (fig. 227) in lowered position, push jack and axle assembly under front of truck. Place left and right spring seats on axle, and making sure that all U-bolts are properly alined and that spring center bolt heads enter alinement holes in spring seats, raise axle sufficiently to permit assembly of brake lines.

(2) *Connect brake line* (fig. 226). Position flexible brake line and bracket on top of differential housing, install cap screw, and tighten. Position rigid brake line at flexible brake line, and tighten connector.

(3) *Connect propeller shaft* (fig. 223). Connect adapter flange on front end of transfer-to-front-axle propeller shaft to companion flange at rear of front axle differential. Refer to paragraph 211.

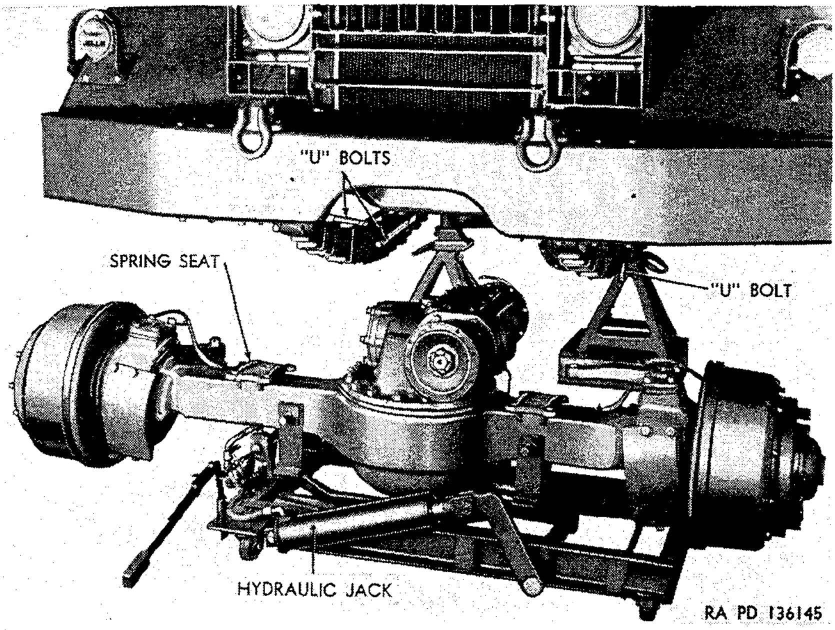


Figure 227. Removing front axle assembly.

(4) *Install* **U**-*bolt clamp plates.* Raise front axle sufficiently to permit placing support stands under front wheel hubs, and place stands in position (fig. 222).

Warning: Weight of vehicle must remain supported by overhead hoisting equipment, floor jacks, or support stands at all times. Do not attempt to support weight of truck on hydraulic jack (fig. 225).

Release hydraulic jack and pull out from under truck. Position clamp plate (fig. 224) on the two **U**-bolts at underside of right end of axle housing, and install two lockwashers and nuts on each **U**-bolt. Repeat above operation at left end of axle housing. Tighten the eight clamp plate retaining nuts (on four **U**-bolts), using a torque wrench, to 300 to 400 pound-feet torque.

(5) *Connect drag link.* Connect lower drag link to steering arm ball (par. 249*d*).

(6) *Install shock absorbers.* Install left and right front shock absorbers (par. 252*b* (3)).

(7) *Install wheel and tire assemblies.* Install left and right front wheel and tire assemblies (par. 241), after removing support stands from under front axle hubs. Place a floor jack under differential housing, raise front axle, and remove support stands from under frame side rails. Lower front axle, and remove floor jack from under truck.

(8) *Bleed brakes.* Bleed front wheel brakes (par. 221).

(9) *Lubricate.* Lubricate front axle assembly and propeller shaft universal joints (par. 67).

(10) *Record of replacement.* Record the replacement on DA Form 478.

Section XXIV. REAR AXLES

216. Description and Data

a. Description. Two identical rear axle assemblies, mounted in tandem, are included in the rear suspension system (fig. 228). The rear axle assembly is a hypoid, double reduction, single-speed type. Three identical torque rod assemblies, two at the right end of the axle and one at the left end of the axle, connect each rear axle assembly to the rear suspension brackets. These torque rods not only maintain the correct relative positions of the rear axle assemblies, but also transmit driving and braking forces from the axles to the frame. A differential and carrier assembly, mounted at the top center of the axle housing, transmits power from the transfer-to-forward-rear-axle and forward-rear-axle-to-rear-rear-axle propeller shafts (fig. 213) to the left and right drive shafts inside the axle housings.

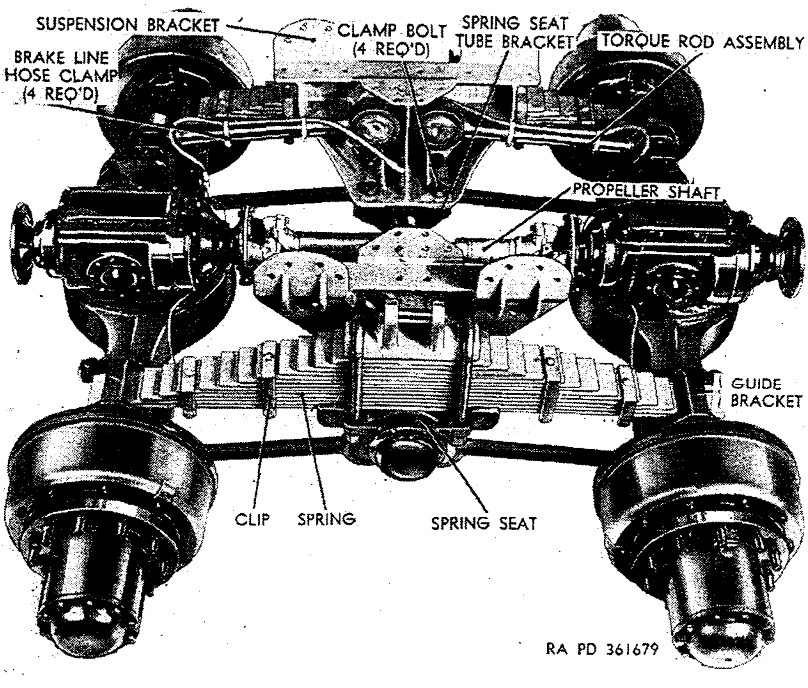


Figure 228. Rear suspension system.

b. Data.

Manufacturer	Timken-Detroit
Model	M240HX4
Gear ratio (all models except M139C)	6.443 : 1.00
Gear ratio (M139C)	10.26 : 1.00
Lubricant capacity	12 qt

217. Axle Shaft

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal. Remove 10 cap screws and lockwashers securing axle drive flange (fig. 229) to hub and drum assembly. Withdraw shaft from hub by pulling on axle drive flange. Remove and discard flange gasket.

c. Installation. Make sure axle shaft is clean. Slide new gasket (fig. 229) over splined end of shaft and hold in place on flange. Insert splined end of shaft in hub, and push axle drive flange inward toward center of truck, carefully guiding splines on end of axle shaft into splined differential side gear. Aline holes in drive flange and hub, and install 10 cap screws and lockwashers. Tighten cap screws to 70 to 80 pound-feet torque.

218. Rear Axle

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal (Forward Rear Axle).

(1) *Position truck.* Place truck on a level surface and block front wheels to prevent truck from rolling. Raise rear end

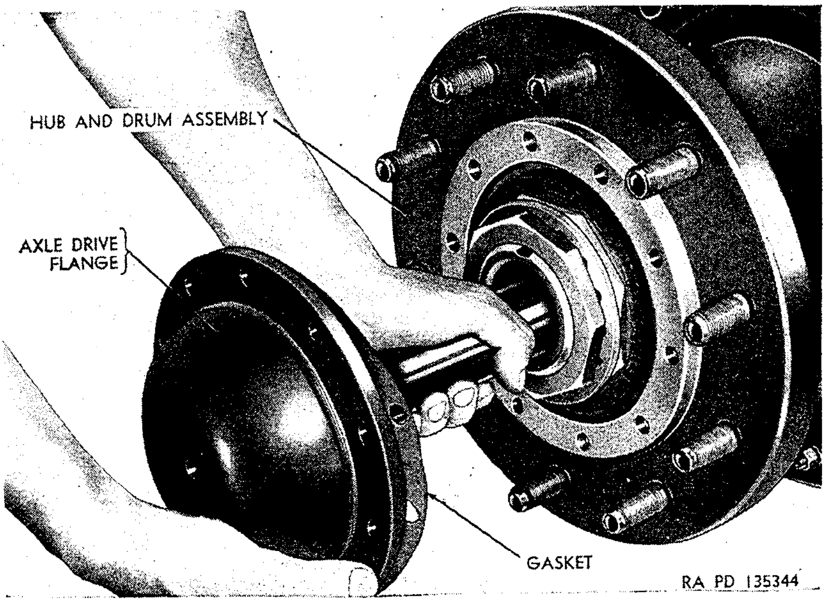


Figure 229. Removing rear axle shaft.

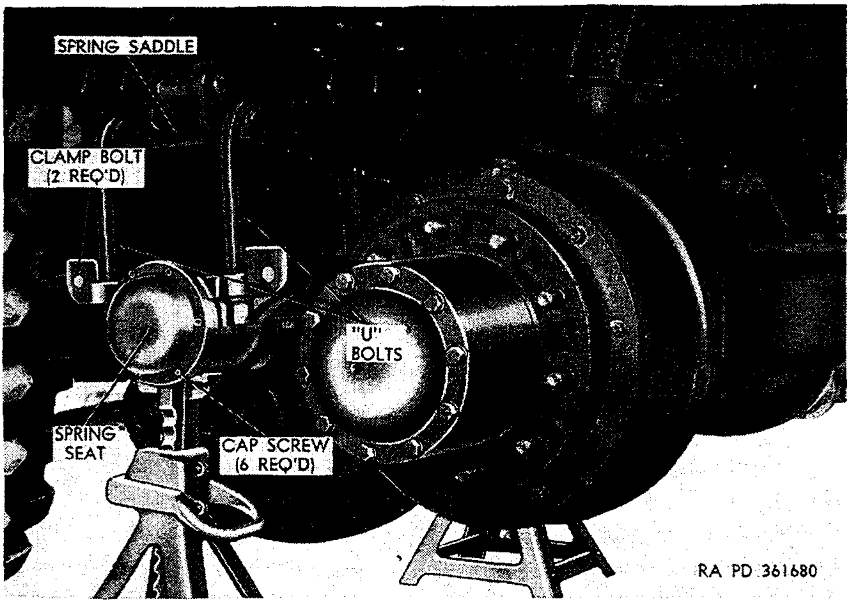


Figure 230. Rear suspension assembly raised for axle removal.

of truck and place a support stand under each spring seat (fig. 230).

(2) *Remove wheel and tire assemblies.* Remove wheel and tire assemblies from both ends of axle assembly to be removed (par. 241).

(3) *Disconnect brake line* (fig. 231). Unscrew connector securing brake line hose to tee connection at frame rear suspension cross member, and remove line from tee. Remove brake-line-hose clamps from upper torque rod, and remove hose from rod.

(4) *Disconnect propeller shafts.* Disconnect adapter flange on rear end of transfer-to-forward-rear-axle propeller shaft from companion flange at front of forward-rear-axle differential (par. 211*c*). Disconnect adapter flange on front end of forward-rear-axle-to-rear-rear-axle propeller shaft from companion flange on rear of forward-rear-axle differential.

(5) *Disconnect upper torque rod* (fig. 232). Remove four nuts and lockwashers from four bolts securing upper torque rod bracket and clamping plate to right end of axle housing. Remove the clamping plate from underside of axle housing, and remove the two front bolts and the right rear bolt from the torque rod bracket.

(6) *Position upper torque rod* (fig. 233). Remove brake line tee from mounting bracket. Raise upper torque rod clear of axle, and support in raised position with a short bar placed

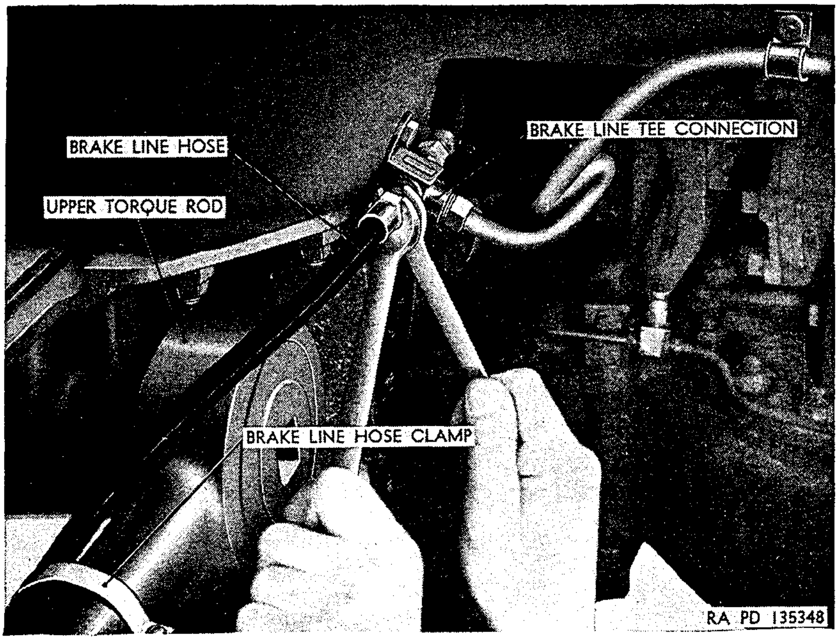


Figure 231. Disconnecting hydraulic brake line hose.

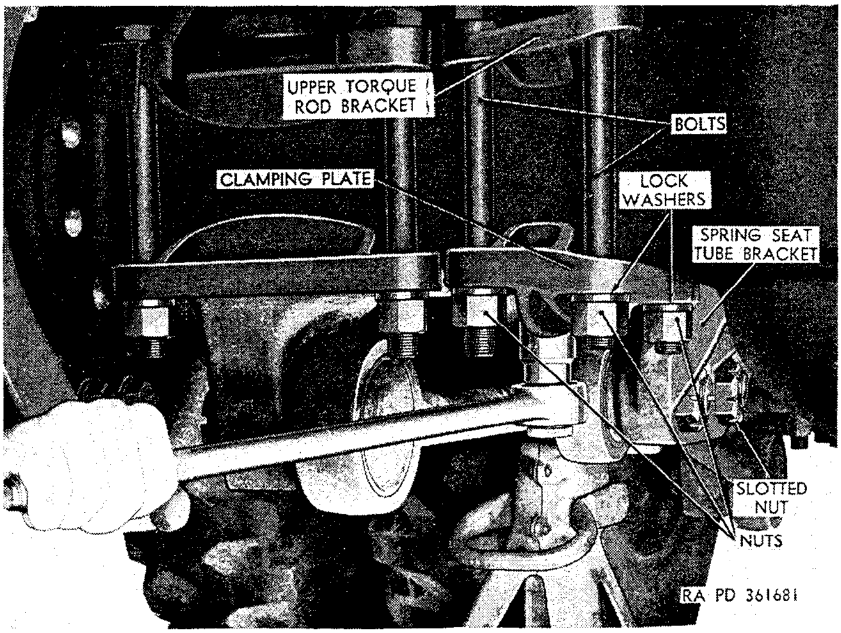


Figure 232. Disconnecting upper torque rod.

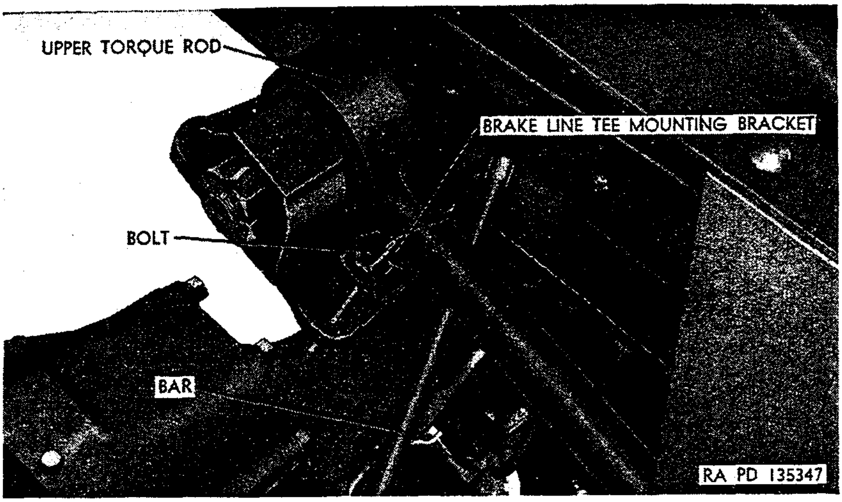


Figure 233. Upper torque rod positioned for forward rear axle removal.

between frame side rails. Wire brake-line-tee mounting bracket and left rear torque-rod-bracket bolt to upper torque rod.

(7) *Disconnect lower torque rods* (fig. 234). Remove cotter pin and slotted nut securing front end of lower torque rod to bracket at underside of right end of axle housing. Rap bracket sharply to loosen tapered stud in torque rod bracket and, using a bar, pry torque rod from bracket. Repeat above operation to remove left torque rod from bracket on underside of left end of axle housing.

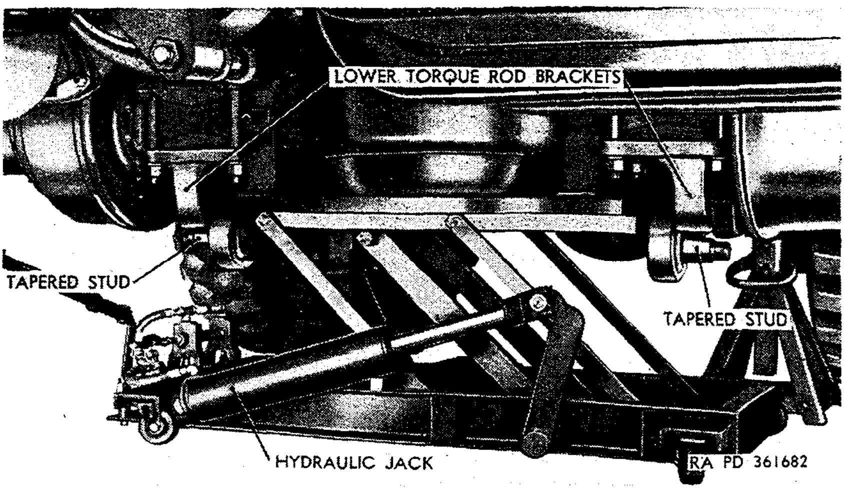


Figure 234. Lower torque rods disconnected.

(8) *Position hydraulic jack.* Position hydraulic jack (fig. 99) with axle fixture under the forward rear axle (fig. 234), raise axle on hydraulic jack enough to release front ends of rear springs (fig. 228) in spring guide brackets, and roll axle on hydraulic jack toward front of truck.

(9) *Remove axle assembly* (fig. 235). Lower hydraulic jack sufficiently to allow removal of axle from under truck. Pull jack with axle assembly sideways and out from under side of truck.

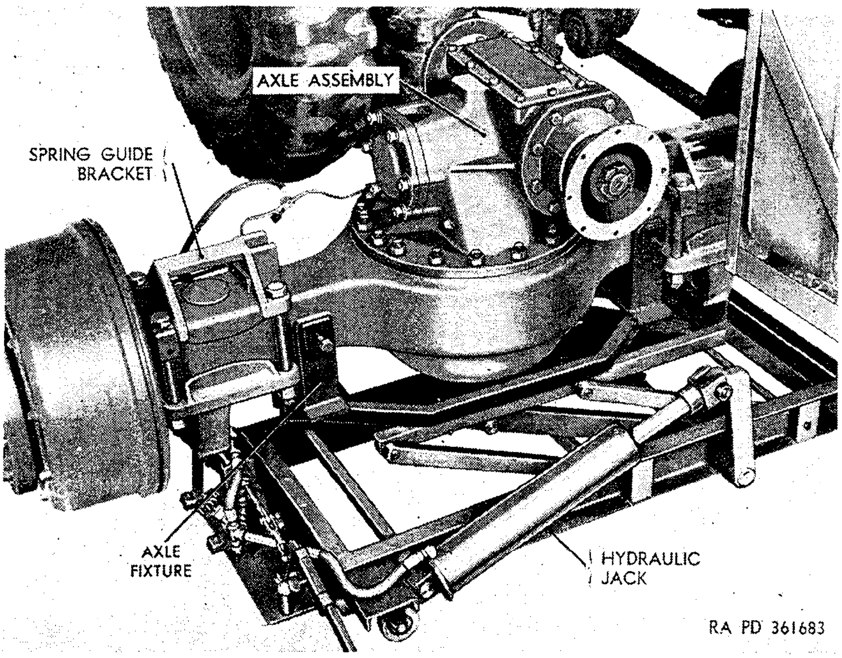


Figure 235. Removing forward rear axle assembly.

c. *Installation (Forward Rear Axle).*

(1) *Position axle assembly.* With forward rear axle supported by hydraulic jack in lowered position (fig. 235), push jack and axle assembly under side of truck. Raise axle on jack until front ends of rear springs (fig. 228) are alined with spring guide brackets on top of axle housing, and push axle toward rear of truck so that spring ends enter guide brackets.

(2) *Connect upper torque rod.* Remove wire securing brake-line-tee mounting bracket (fig. 233) and left-rear-torque-rod-bracket bolt to torque rod. Remove bar securing upper torque rod in raised position, and position torque rod bracket on top of axle housing. This will secure axle in position and permit removal of hydraulic jack. Lower hydraulic jack and remove from under truck. Install the two front bolts

(fig. 232) and the right rear bolt in torque-rod-bracket holes, install clamping plate on bolts from underside of axle housing, and install four lockwashers and nuts of the four bracket mounting bolts. Tighten nuts.

(3) *Install lower torque rods* (fig. 234). Insert tapered stud at front end of lower right torque rod through torque rod bracket on underside of axle housing, install slotted nut on stud, and tighten nut to 350 to 400 pound-feet torque. Install cotter pin in end of stud. Repeat above operations to connect lower left torque rod to bracket on underside of left end of axle housing.

(4) *Connect propeller shafts.* Connect adapter flange on rear end of transfer-to-forward-rear-axle propeller shaft to companion flange at front of forward-rear-axle differential (par. 211*d*). Connect adapter flange of front end of forward-rear-axle-to-rear-rear-axle propeller shaft to companion flange on rear of forward-rear-axle differential.

(5) *Connect brake line* (fig. 231). Position brake line at tee connection on frame rear suspension cross member, and tighten connector. Position brake hose on upper torque rod and install two clamps.

(6) *Bleed brakes.* Bleed rear wheel brakes (par. 221).

(7) *Install wheel and tire assemblies.* Refer to paragraph 241.

(8) *Lubricate.* Lubricate axle assembly and propeller shaft universal joints (par. 67).

(9) *Lower rear suspension assembly.* Raise rear end of truck, remove support stand under each spring seat (fig. 230), and lower rear end of truck.

(10) *Record of replacement.* Record the replacement on DR Form 478.

d. Removal (Rear Rear Axle). The rear rear axle is removed in the same manner as the forward rear axle (*b* above).

e. Installation (Rear Rear Axle). The rear rear axle is installed in the same manner as the forward rear axle (*c* above).

Section XXV. BRAKE SYSTEM

219. Description and Data

a. Description. The brake system of the vehicles covered by this manual consists of the service brakes and the hand brake.

(1) *Service brake system.* The service brake system is an air assisted hydraulic system consisting of the brake pedal linkage, master cylinder, air-hydraulic cylinder, wheel cylinders, connecting lines and hoses for hydraulic fluid, and brake shoes.

(*a*) *Brake pedal linkage* (figs. 236 and 237). The brake pedal linkage is comprised of a pedal secured to a lever, which is pivoted on a bracket bolted to the frame left side rail. The lower end of the pedal lever is pinned to a yoke on the front end of the master-cylinder piston rod. The upper end of the pedal lever is secured to the brake pedal (AA, fig. 65), which extends through the floor board into the cab.

(*b*) *Master cylinder.* The master cylinder (fig. 236), bolted to the rear of the pedal lever bracket, consists of a hydraulic fluid reservoir, hydraulic cylinder with spring-loaded piston, and a check valve mechanism. Movement of the brake pedal linkage causes the piston inside the master cylinder to force fluid from the cylinder outlet through a connecting line into the air-hydraulic cylinder ((*c*) below).

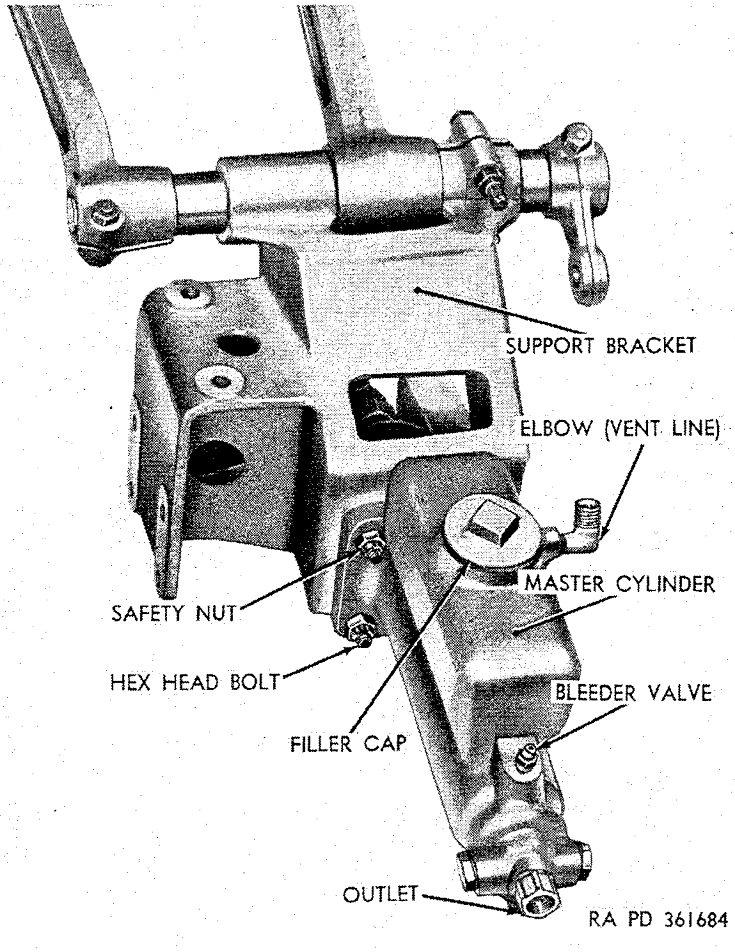


Figure 236. Rear view of brake pedal linkage and master cylinder.

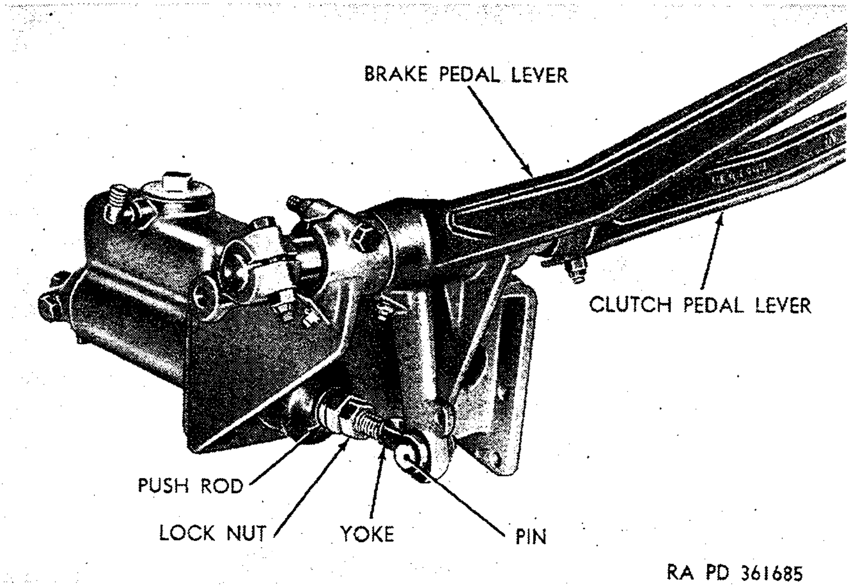


Figure 237. Right front view of brake pedal linkage.

(*c*) *Air-hydraulic cylinder* (*power brake unit*). The air-hydraulic cylinder (fig. 238), mounted directly below the master cylinder, consists of an air valve, air cylinder, hydraulic cylinder, and piston assembly. The piston assembly is comprised of the air-cylinder piston and hydraulic-cylinder piston mounted at opposite ends of a common piston rod. Pressure of the fluid forced from the master cylinder ((*b*) above) causes the air valve to open, thereby admitting air from the compressed air system (par. 231) into the air cylinder. This causes movement of both the air-cylinder piston and the hydraulic-cylinder piston, since they are mounted on the same shaft, which causes the hydraulic-cylinder piston to force fluid from the hydraulic cylinder through connecting lines to the wheel cylinders ((*d*) below).

(*d*) *Wheel cylinders.* The wheel cylinder (fig. 220), mounted on the backing plate assembly at both ends of each axle assembly, consists of two opposed rubber cups and pistons inclosed in a cast housing. A rubber boot installed at each end of the housing prevents dirt or foreign matter from entering the cylinder. The two rubber cups installed between the pistons inside the housing prevent fluid from leaking past the pistons. Push rods extending through the rubber boots provide connection between the wheel cylinder pistons and brake shoes ((*e*) below). The fluid

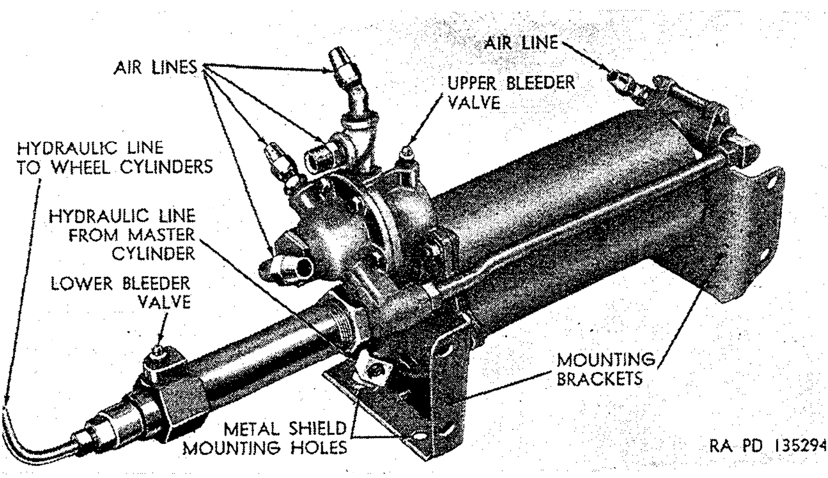


Figure 238. Air-hydraulic cylinder.

forced from the air hydraulic cylinder ((*c*) above) enters the wheel cylinder at a point between the rubber cups and pistons. This causes the cups and pistons to move outward away from the center of the cylinder bore so as to exert pressure through the push rods on the upper ends of the brake shoes ((*e*) below).

(*e*) *Brake shoes.* Two brake shoes (fig. 220) are mounted on the backing plate at both ends of each axle assembly. The lower ends of the shoes are secured to the backing plate by anchor pins and locknuts. The upper ends of the shoes are retained in position by "C" washers installed on guide pins attached to the backing plate. This permits each shoe to pivot on its anchor pin. The outer ends of the wheel-cylinder push rods engage slots in the upper ends of the brake shoes. Therefore, when pressure is exerted on the inner ends of the push rods by the wheel-cylinder pistons ((*d*) above), the push rods force the upper ends of the brake shoes away from the wheel cylinders. This causes the entire brake lining surface of both shoes to contact the braking surface of the brake drum, thereby creating friction between the brake shoes and brake drum to reduce or stop the rotation of the drum (and wheel).

(2) *Hand brake.* The hand brake consists of a brake drum (fig. 239) and a pair of brake shoes mounted at the rear of the transfer and actuated by a cable connected to the hand brake lever (par. 25) in the cab. The drum is bolted to the transfer rear output shaft, and the two brake shoes are pinned together and then bolted to a bracket extending from the transfer rear-output-shaft-bearing cover. Operation of the

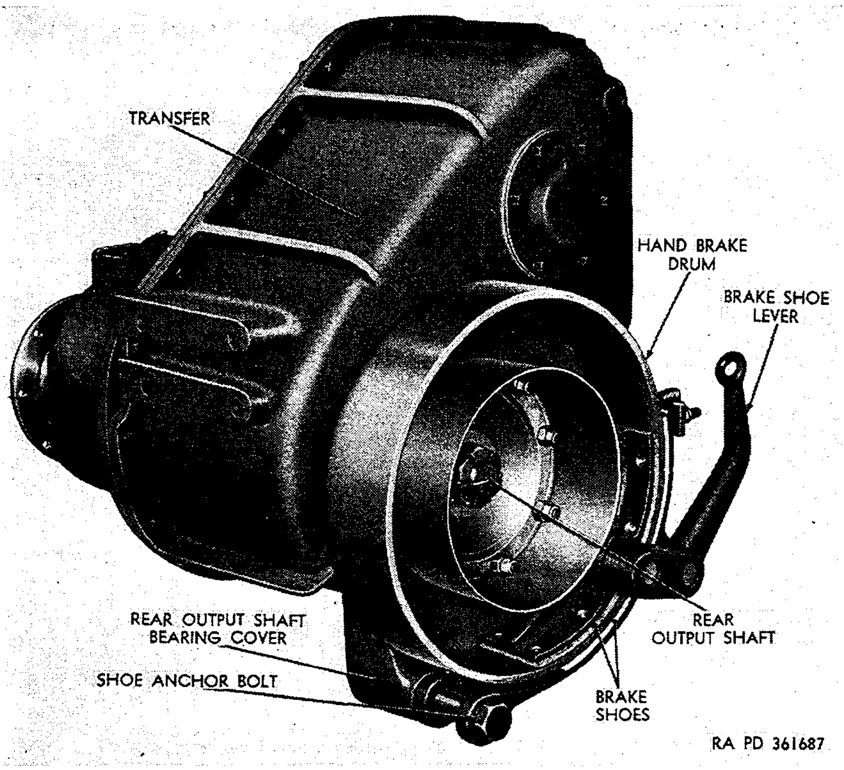


Figure 239. Hand brake mounted on rear of transfer.

hand brake lever causes the cable to pull the upper end of the brake shoe lever toward the center of the brake drum. This causes the entire brake lining surface of both shoes to contact the braking surfaces of the drum with a squeezing action, thereby creating friction between the shoes and drum to reduce or stop the rotation of the drum (and transfer output shaft).

b. Service Brake System Data.

(1) *Master cylinder.*

Manufacturer	Wagner Electric Corp.
Manufacturer's number	LO-FF-14130B
Ordnance number	7411070
Type	combination

(2) *Air-hydraulic cylinder.*

Manufacturer	Bendix Products Div.
Manufacturer's number	BX-375844
Ordnance number	7376689

(3) *Wheel cylinder.*

Manufacturer	Wagner Electric Corp.
Manufacturer's number	LO-FC-1012
Ordnance number	A214970

(4) *Wheel cylinder flexible lines.*

Manufacturer	Wagner Electric Corp.
Manufacturer's number:	
Front	LO–FC–14617B
Rear	
Ordnance number:	
Front	7409330
Rear	7409331

220. Service Brake Adjustments

Adjustment of components of the service brake system consists of adjusting the brake pedal linkage to obtain proper brake pedal free travel, and of adjusting the brake shoes at each wheel. Adjustment of the brake shoes to compensate for normal lining wear only is termed minor adjustment. Adjustment of the brake shoes following removal and installation of the shoes, which requires adjustment of the brake-shoe anchor pins, is termed major adjustment.

a. Brake Pedal Free Travel Adjustment. Brake pedal free travel, which is the distance the brake pedal is depressed before the master cylinder push rod pinned to the lower end of the pedal lever (fig. 237) moves before contacting the piston inside the master cylinder, must be between one-fourth and one-half inch. Excessive free travel reduces the usable stroke of the master cylinder piston, and insufficient free travel will cause the brakes to drag after several applications. Check brake pedal free travel and adjust, if necessary (1) through (6) below.

(1) Remove pin (fig. 237) securing push rod yoke to pedal lever.

(2) Hold push rod to prevent it from turning, and loosen locknut on yoke.

(3) Holding push rod, turn yoke until desired brake pedal free travel is obtained.

Note. To increase free travel, turn yoke clockwise. To decrease free travel, turn yoke counterclockwise.

(4) Position push rod yoke on pedal lever and install yoke pin.

(5) Check brake pedal free travel. If necessary, repeat (1), (3), and (4) above until correct free travel is obtained.

(6) Tighten locknut on push rod yoke, holding push rod to prevent it from turning.

b. Minor Adjustment.

(1) Adjust wheel bearings (par. 242) at one wheel.

(2) Turn rear adjusting shoe cam (fig. 240) on back side of backing plate counterclockwise until brake drags slightly when wheel is turned by hand. Then turn adjusting cam clockwise just enough to allow wheel to rotate freely.

(3) Turn forward adjusting shoe cam (fig. 240) clockwise until brake drags slightly when wheel is turned by hand. Then turn adjusting cam counterclockwise just enough to allow

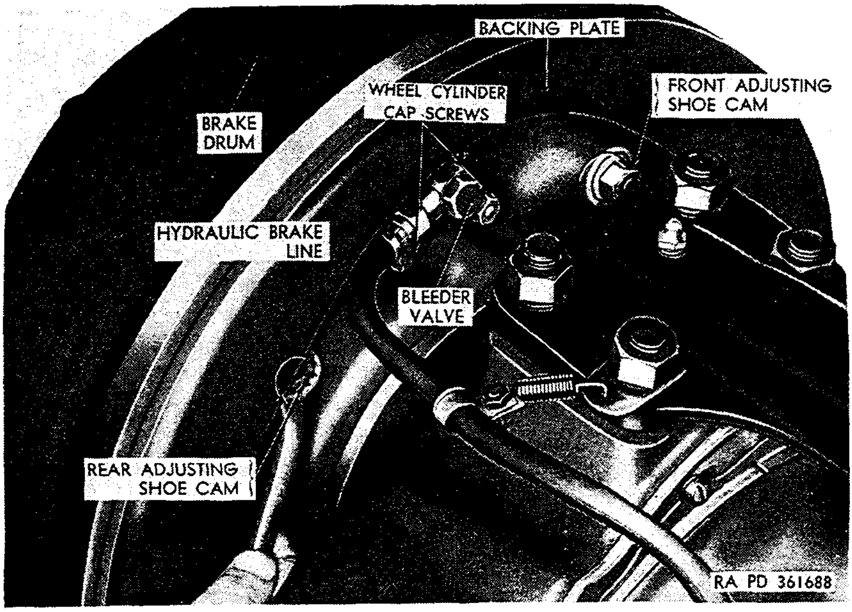


Figure 240. Turning adjusting shoe cam.

wheel to rotate freely. Make adjustment of both cams as uniform as possible.

(4) Lower wheel, and repeat above procedures at each remaining wheel.

c. Major Adjustment.

(1) With wheel and tire assembly removed, remove nut and lock-washer from stud securing inspection cover (fig. 241) to brake drum, and remove cover.

(2) Rotate brake drum until inspection hole is 1½ inches above lower end of rear brake shoe. Insert feeler gage in inspection hole (fig. 242) to determine clearance between brake shoe and drum. Clearance should be 0.010 inch at this point.

(3) If clearance between shoe and drum is incorrect, adjust clearance ((*a*) and (*b*) below).

(*a*) Loosen rear anchor pin locknut (fig. 243) at back side of backing plate.

(*b*) Holding locknut, turn anchor pin until 0.010 inch clearance between shoe and drum is obtained. To reduce clearance, turn anchor pin clockwise. To increase clearance, turn anchor pin counterclockwise.

(4) Rotate brake drum until inspection hole is 1½ inches below upper end of rear brake shoe. Insert feeler gage in inspection hole to determine clearance between brake shoe and drum. Clearance should be 0.020 inch at this point.

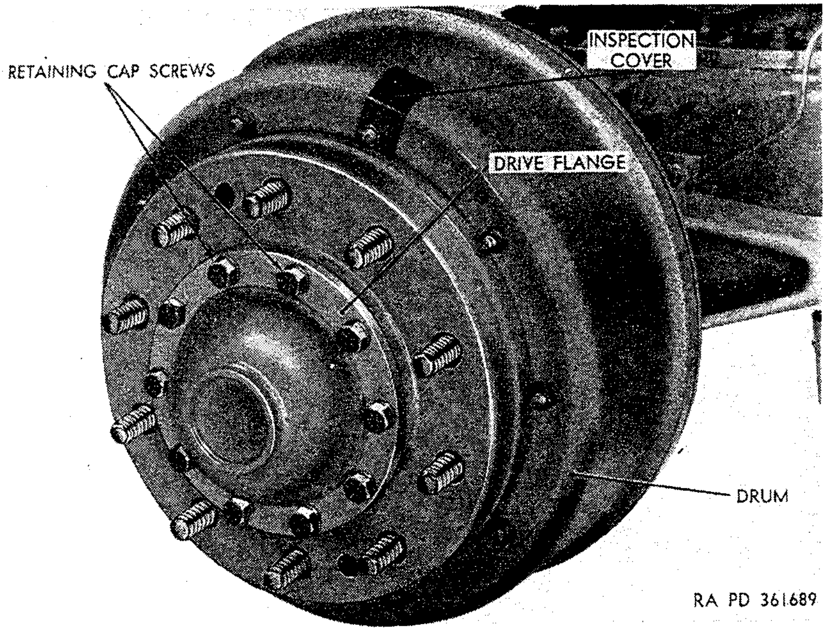


Figure 241. Hub and drum assembly with wheel and tire assembly removed.

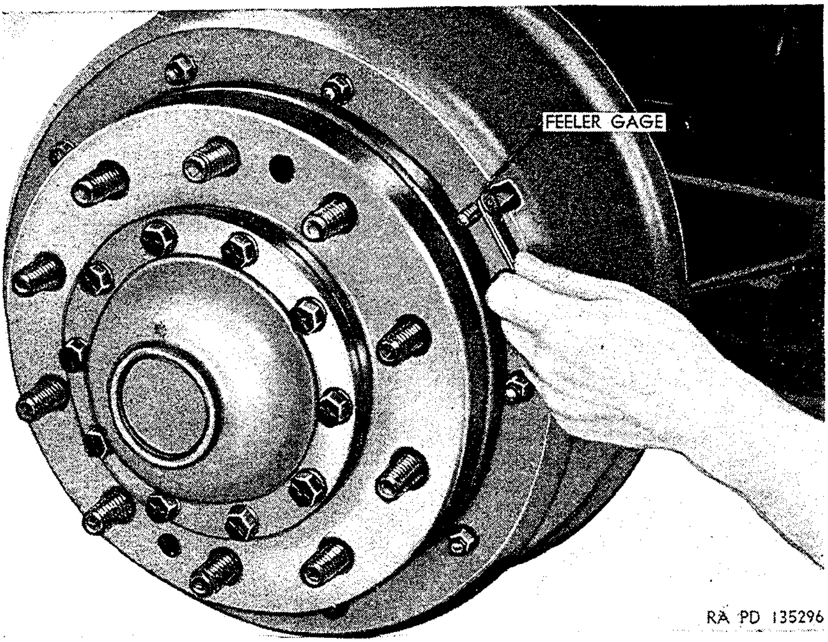


Figure 242. Checking clearance between brake shoe and drum.

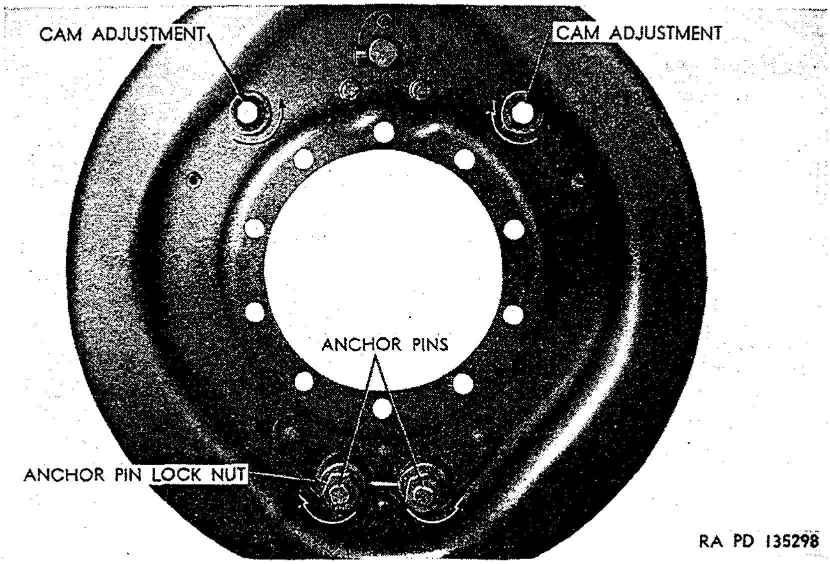


Figure 243. View of back side of backing plate assembly removed from axle.

(5) If clearance between shoe and drum is incorrect, adjust clearance ((*a*) and (*b*) below).

(*a*) Turn rear adjusting shoe cam (fig. 240) until clearance between shoe and drum, measured by feeler gage, is 0.020 inch. To reduce clearance, turn cam counterclockwise. To increase clearance, turn cam clockwise.

(*b*) Recheck to be sure that 0.010-inch clearance is maintained at lower end of rear shoe.

(6) Adjust clearance between lower and upper ends of front brake shoe and drum ((2), (3), (4), and (5) above).

Note. Clearance between lower end of front shoe and drum is decreased by turning front anchor pin counterclockwise, and increased by turning pin clockwise. Clearance between upper end of front shoe is increased by turning front shoe adjusting cam counterclockwise and decreased by turning cam clockwise.

(7) Holding anchor pins (fig. 243), to prevent them from turning, tighten both anchor pin locknuts and check brake shoe clearances again.

(8) Position inspection cover (fig. 241), on brake drum stud, install lock washer and nut on stud and tighten nut.

221. Bleeding Service Brake System

a. General. Since operation of the service brake system is dependent upon the incompressibility of hydraulic brake fluid, it is important that the lines and cylinders of the system be filled solidly with fluid that is free of air, which can be compressed sufficiently to impair operation of the service brakes. Therefore, whenever air is permitted to enter the system, due to failure to maintain correct fluid level in master cylinder, loose connections or faulty seals, or replacement of any component of the system, bleeding is necessary. Bleeding is the systematic removal of air or contaminated fluid from the brake hydraulic system by forcing brake fluid from bleeder valves mounted on the master cylinder, air-hydraulic cylinder and wheel cylinders in that order. The need for bleeding the system is generally indicated by a springy, spongy brake pedal action. Two men are required to bleed the system, one to maintain a constant supply of brake fluid in the master cylinder and to pump the brake pedal, and the other to open and close the bleeder valves and to observe the condition of the brake fluid as it is forced from the system.

b. Bleeding Master Cylinder (fig. 236).

(1) Clean the bleeder tube over end of valve. Allow other end of tube to hang into a clean container, such as a pint glass jar.

(2) Unscrew bleeder valve three-fourths of a turn and depress brake pedal slowly, checking the fluid flowing from the end of the bleeder tube for air bubbles. Hold pedals in depressed position.

(3) Tighten bleeder valve, and slowly release brake pedal.

Note. Make sure that master cylinder is kept filled with brake fluid during bleeding operation. Do not use fluid removed during bleeding operation to fill master cylinder.

(4) Repeat (2) and (3) above until all air bubbles cease to appear or when fluid flows from bleeder tube in a solid stream.

(5) Remove bleeder tube from bleeder valve, and check valve again to be sure that it is closed tightly. Perform bleeding operation at air-hydraulic cylinder (*c* below).

c. Bleeding Air-Hydraulic Cylinder (fig. 238). Perform bleeding operations at air-hydraulic cylinder (*b* above), bleeding upper bleeder valve first and lower bleeder valve last.

d. Bleeding Wheel Cylinders (fig. 240). Perform bleeding operations at each wheel cylinder (*b* above).

e. Partial Bleeding of Service Brake System. When a brake line has been disconnected at only one wheel, only the wheel cylinder at that wheel must be bled. Perform bleeding operations at that wheel only (*b* above).

222. Brake Pedal Linkage

a. Removal.

(1) Remove safety nut and cap screw from upper end of clutch pedal lever (fig. 244), and remove clutch pedal stem from

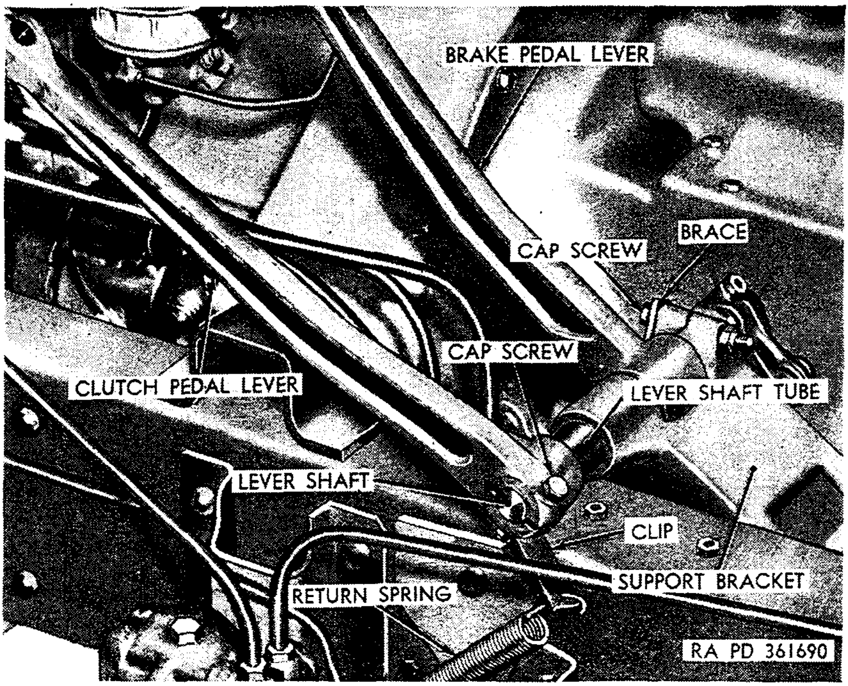


Figure 244. Brake and clutch pedal mounting.

lever. Remove rubber bumper from stem, and remove clutch pedal from top side of floor board.

(2) Unhook upper end of clutch pedal return spring (fig. 244) from clip bolted to lower end of clutch pedal lever.

(3) Remove safety nut and cap screw (fig. 244) from lower end of clutch pedal lever, and remove lever clip, and key from lever shaft.

(4) Remove cotter pin from end of yoke pin, remove yoke pin, and remove control rod (fig. 143) from control rod lever.

(5) Remove safety nut and cap screw from upper end of brake pedal lever (fig. 244), and remove brake pedal stem from lever. Remove rubber bumper from stem, and remove brake pedal from top side of floor board.

(6) Remove safety nut (fig. 143) and cap screw from control rod lever and remove lever and key from lever shaft.

(7) Remove cotter pin from end of yoke pin (fig. 237), remove yoke pin, and remove push rod yoke from lower end of brake pedal lever.

(8) Unhook upper end of brake pedal return spring (fig. 142) from lower end of brake pedal lever.

(9) Remove safety nut and cap screw (fig. 244) from upper right side of support bracket, and remove lever shaft tube with shaft and bushings from brake pedal lever and support bracket.

b. Installation.

(1) Position brake pedal lever (fig. 244) at support bracket, and install lever shaft tube with shaft and bushings in bore of bracket and lever, making sure that groove in lever shaft tube is alined with cap screw hole in upper right side of support bracket to permit insertion of cap screw.

(2) Aline hole in upper end of support bracket brace (fig. 244) with cap screw hole in upper right side of support bracket, and install cap screw in holes in brace and bracket. Install safety nut on cap screw, and tighten.

(3) Install clutch control rod lever (fig. 143) and key on shaft, and secure with cap screw and safety nut.

(4) Position control rod (fig. 143) on lower end of control rod lever, install yoke pin, and install cotter pin in end of yoke pin.

(5) Install clutch pedal lever (fig. 244) and key on shaft. Position return spring bracket clip at lower end of lever, install cap screw in holes in lever and clip, and install safety nut on cap screw. Tighten nut on cap screw.

(6) Hook upper end of clutch pedal return spring to clip at lower end of clutch pedal lever.

(7) Hook upper end of brake pedal return spring (fig. 142) to lower end of brake pedal lever.

(8) Position yoke (fig. 237) on front of master-cylinder push rod at lower end of brake pedal lever, install yoke pin, and install cotter pin in end of yoke pin.

(9) Insert brake pedal stem in hole in top side of floor board, install rubber bumper on stem, and insert stem in hole at upper end of brake pedal lever. Install cap screw and safety nut at upper end of pedal lever, and tighten.

(10) Insert clutch pedal stem in hole in top side of floor board, install rubber bumper on stem, and install stem in hole at upper end of clutch pedal lever. Install cap screw and safety nut at upper end of pedal lever, and tighten.

(11) Lubricate brake pedal lever and lever shaft (par. 67).

(12) Check brake pedal free travel and adjust, if necessary (par. 220*a*).

(13) Check clutch pedal free travel and adjust, if necessary (par. 202).

223. Brake Master Cylinder

(figs. 236 and 237)

a. Filling. Remove filler cap, and fill reservoir with new brake fluid (par. 67) until fluid level is one-half inch below filler cap opening.

Caution: Use care during filling to prevent dirt or other foreign matter from entering the reservoir.

Check filler cap gasket to be sure that it will seal properly. Install filler cap and tighten.

b. Removal.

(1) Remove cotter pin from end of yoke pin, remove yoke pin, and remove master-cylinder push rod yoke from lower end of brake pedal lever.

(2) Unscrew connector securing vent line to elbow at upper right side of master cylinder, and remove line from elbow.

(3) Unscrew connector securing hydraulic fluid line to outlet fitting at rear of master cylinder, and remove line from fitting.

(4) Remove four nuts and bolts from mounting flange on front of master cylinder, and remove master cylinder from support bracket.

c. Installation.

(1) Position master cylinder at rear of support bracket, install four bolts in holes in master-cylinder mounting flange and bracket, and install four safety nuts on bolts. Tighten nuts and bolts.

(2) Position hydraulic line at outlet fitting on rear of master cylinder, and tighten connector.

(3) Position vent line at elbow on upper right side of master cylinder, and tighten connector.

(4) Position yoke at front end of master-cylinder push rod on lower end of brake pedal lever, install yoke pin, and install cotter pin in end of yoke pin.

(5) Fill master cylinder (*a* above).

(6) Bleed brakes (par. 221).

224. Air Hydraulic Cylinder

a. Removal.

(1) Remove four nuts from bolts securing metal shield to underside of air-hydraulic cylinder, and remove bolts and shield from cylinder. Figure 238 illustrates metal shield mounting holes.

(2) Unscrew connector securing hydraulic line (fig. 156) to front of air-hydraulic cylinder, and remove line from cylinder.

(3) Unscrew connectors securing four air lines to top of air-hydraulic cylinder (fig. 238), unscrew connector securing one air line to rear of cylinder, and remove the five lines from the cylinder.

Note. Place identification tags on all lines to facilitate installation of air-hydraulic cylinder.

(4) Unscrew connector securing hydraulic line from master cylinder to bottom center of air-hydraulic cylinder (fig. 238), and remove line from cylinder.

(5) Support air-hydraulic cylinder, remove two mounting bolts each from front and rear mounting brackets (fig. 238) on cylinder, and remove cylinder from truck.

b. Installation.

(1) Position air-hydraulic cylinder (fig. 156) under frame left side rail, and install two mounting bolts at front and rear mounting brackets (fig. 238) on cylinder.

(2) Position hydraulic line from master cylinder at fitting at bottom center of air-hydraulic cylinder (fig. 238), and tighten connector.

(3) Position four air lines at fittings at top of air-hydraulic cylinder (fig. 238), and tighten connectors. Position air line at fitting at rear of cylinder, and tighten connector.

(4) Position hydraulic line (fig. 156) at outlet at front end of air-hydraulic cylinder, and tighten connector.

(5) Position metal shield at bottom of air-hydraulic cylinder mounting brackets (fig. 238), install four bolts and nuts, and tighten nuts.

(6) Bleed air-hydraulic cylinder and wheel cylinders (par. 221).

225. Wheel Cylinders

a. Removal.

(1) Remove wheel and tire assembly (par. 241).

(2) Remove hub and drum assembly (par. 242).

(3) Unscrew connector securing hydraulic brake line (fig. 240) to wheel cylinder at back side of backing plate assembly, and remove line from cylinder.

(4) Unhook return spring (fig. 245) from one of brake shoes.

(5) Remove two wheel cylinder cap screws (fig. 240) and lockwashers from back side of backing plate assembly, and remove wheel cylinder (fig. 245) with cover from front side of backing plate.

b. Installation.

(1) Position wheel cylinder (fig. 245) with cover on front side of backing plate assembly, install two wheel cylinder cap screws (fig. 240) with lockwashers in holes at back side of backing plate, and tighten cap screws.

(2) Install return spring (fig. 245) between brake shoes.

(3) Position hydraulic brake line (fig. 240) at wheel cylinder inlet rear of backing plate assembly, and tighten connector.

(4) Install hub and drum assembly (par. 242).

(5) Install wheel and tire assembly (par. 241).

(6) Bleed wheel cylinder (par. 221).

(7) Adjust brakes, using minor adjustment procedures (par. 220).

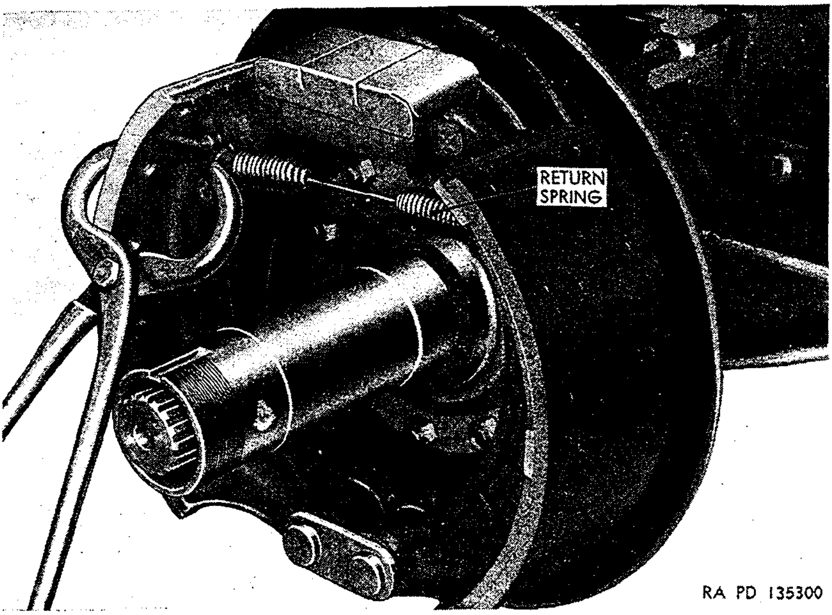


Figure 245. Removing brake shoe return spring.

226. Brake Shoes

a. Removal.

(1) Remove wheel and tire assembly (par. 241).

(2) Remove hub and drum assembly (par. 242).

(3) Install clamp over ends of wheel cylinder (fig. 245) to hold wheel-cylinder pistons in position.

(4) Unhook return spring (fig. 245) from both brake shoes.

(5) Remove "C" washer securing front brake shoe to guide pin (fig. 246) attached to backing plate assembly, using pliers. Repeat this operation at rear shoe.

(6) Remove anchor pin locknuts (fig. 243) at back side of backing plate assembly, and pull brake shoes (fig. 246) and anchor pins from front side of backing plate.

(7) Pull anchor pins from bore at lower end of brake shoes.

b. Installation.

(1) Install anchor pins (fig. 246) with anchor pin plate in bore at lower end of brake shoes. Turn anchor pins so that punch marks, which indicate high side of anchor pin cams, are toward each other.

(2) Making sure that flat washers (fig. 246) are in place on both guide pins, position brake shoes on guide pins with anchor pins inserted in holes at bottom of backing plate. Make sure that wheel-cylinder push rods engage slots in upper ends of brake shoes, and install "C" washers on guide pins.

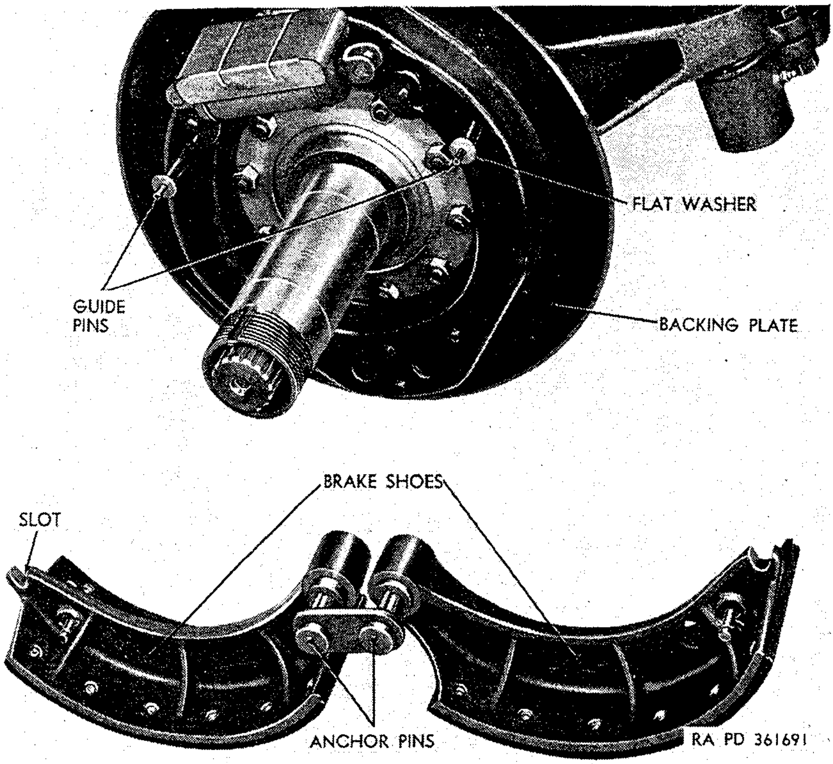


Figure 246. Brake shoes and anchor pins removed from backing plate.

(3) Install anchor pin locknuts (fig. 243) at back side of backing plate assembly.
(4) Install return spring (fig. 245) between brake shoes, and remove clamp from ends of wheel cylinder.
(5) Install hub and drum assembly (par. 242).
(6) Bleed wheel cylinder (par. 221).
(7) Adjust brakes, using major adjustment procedures (par. 220).
(8) Install wheel and tire assembly (par. 241).

227. Hydraulic Lines and Hoses

a. General. The hydraulic lines between the master cylinder, air-hydraulic cylinder, and axles are rigid-type lines of seamless metal tubing. Flexible-type lines are used to connect axle lines to wheel cylinders.

b. Removal. To remove hydraulic line, disconnect both ends of line, remove retaining clips from line, and remove line from truck.

c. Installation. To install hydraulic line, position line between hydraulic system components to be connected, secure line with retaining clips, and connect line at both ends. Tighten all connections, and bleed the brake hydraulic system (par. 221).

228. Hand Brake Adjustment

a. General. Hand brake controls consist of a hand brake lever (par. 25) connected by a cable to the brake shoe lever (fig. 202) at the rear of the transfer. The hand brake is properly adjusted when it will hold the truck on an incline with at least one-third of the hand-brake-lever travel in reserve, or if application of the brake at a speed of 10 mph stops the truck within a reasonable distance.

b. Adjustment. To increase braking action of hand brake, turn the adjusting cap at the end of the hand brake lever clockwise. To decrease braking action (to prevent dragging of brake shoes), turn the adjusting cap counterclockwise. If braking action cannot be increased sufficiently by turning adjusting cap clockwise, turn adjusting cap counterclockwise, adjust cable tension at brake shoe lever, and then turn adjusting cap clockwise until correct brake adjustment is obtained. To adjust cable at brake shoe lever, hold adjusting nut (fig. 202) on transfer end of cable, loosen locknut, turn adjusting nut clockwise on cable, and tighten locknut.

229. Hand Brake Lever and Cable

a. Coordination with Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Remove cotter pin from clevis pin securing cable clevis to lower end of hand brake lever (fig. 67), remove clevis pin, and remove cable assembly from hand brake lever.

(2) Remove two safety nuts securing hand brake lever assembly to left end of driver's seat.

(3) Remove five safety nuts and cap screws securing hand brake lever assembly to top side and cable clamp bracket to underside of cab floor, and remove brake lever assembly and cable clamp bracket from cab floor.

(4) Remove safety nut and cap screw securing closed clip (fig. 192) and hand brake cable to clip extension at left end of rear cab cross member, and remove clip from cable.

(5) Remove locknut (fig. 202) and adjusting nut from end of hand brake cable at brake shoe lever, and remove cable from lever.

(6) Remove two cap screws and safety nuts securing cable anchor clamp (fig. 212) and cable to cable clamp bracket bolted to rear of transfer case, and remove clamp and cable from bracket.

(7) Remove cable assembly from truck.

c. Installation.

(1) Position hand brake lever assembly on top and cable clamp bracket (with cable clamped in place) on underside of cab

floor, install five cap screws and safety nuts through lever assembly, cab floor, and clamp bracket, and tighten.

(2) Install two safety nuts on studs at left end of driver's seat to secure hand brake lever assembly to seat, and tighten nuts.

(3) Position cable clevis on lower end of hand brake lever link, insert clevis pin in holes in clevis and link, and install cotter pin in clevis pin.

(4) Insert free end of cable (fig. 202) in hole at upper end of brake shoe lever, and install adjusting nut and locknut on end of cable.

(5) Position cable on cable clamp bracket (fig. 212) at rear of transfer, making sure that cable clamp spacer is in place on bracket under cable. Position cable anchor clamp over cable, insert two cap screws and tighten.

(6) Place closed clip (fig. 192) on cable, and position clip and cable on clip extension at left end of rear cab cross member. Insert cap screw in holes in clip and extension, install safety nut on cap screw, and tighten.

(7) Adjust hand brake (par. 228).

230. Hand Brake Shoes

a. Removal.

(1) Block wheels to prevent truck from moving.

(2) Unhook brake shoe retracting spring (fig. 202) from outer end of shoe stop screw. Unhook brake shoe lever retracting spring from upper end of brake shoe lever.

(3) Remove locknut (fig. 202) and adjusting nut from end of cable at brake shoe lever, and remove cable from lever.

(4) Remove locknut from front end of shoe anchor bolt (fig. 239), and unscrew bolt from bracket integral with transfer-rear-output-shaft-bearing cover. Remove shoe anchor bolt from bore at lower end of outer shoe.

(5) Spread inner and outer shoes (fig. 247), and remove shoe and lever assembly from brake drum.

(6) Remove "C" washer from front end of two brake-shoe-lever pins (fig. 247), and remove inner and outer shoes from pins.

b. Installation.

(1) Position inner and outer brake shoes (fig. 247) on brake-shoe-lever pins, and install **C** washer at front end of both pins.

(2) Position shoe and lever assembly on brake drum (fig. 239).

(3) Insert shoe anchor bolt (fig. 239) in bore at lower end of outer shoe, screw bolt through bracket integral with transfer-rear-output-shaft-bearing cover, and loosely install locknut on anchor bolt. Screw anchor bolt into bracket until

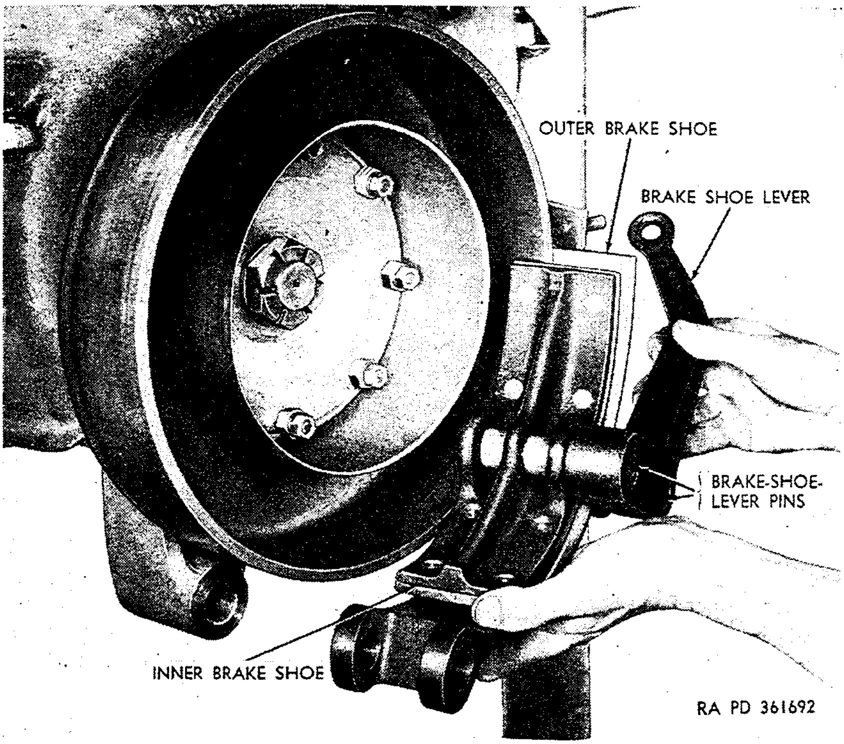


Figure 247. Removing hand brake shoe and lever assembly.

slight bind is felt when operating brake shoe lever, then back off bolt one-half turn, and tighten locknut.

(4) Insert end of hand brake cable (fig. 202) in hole in upper end of brake shoe lever, and install adjusting nut and locknut on end of cable.

(5) Hook end of brake shoe retracting spring (fig. 202) over outer end of shoe stop screw. Hook end of brake shoe lever retracting spring in eye at upper end of brake shoe lever.

(6) Adjust hand brake (par. 228).

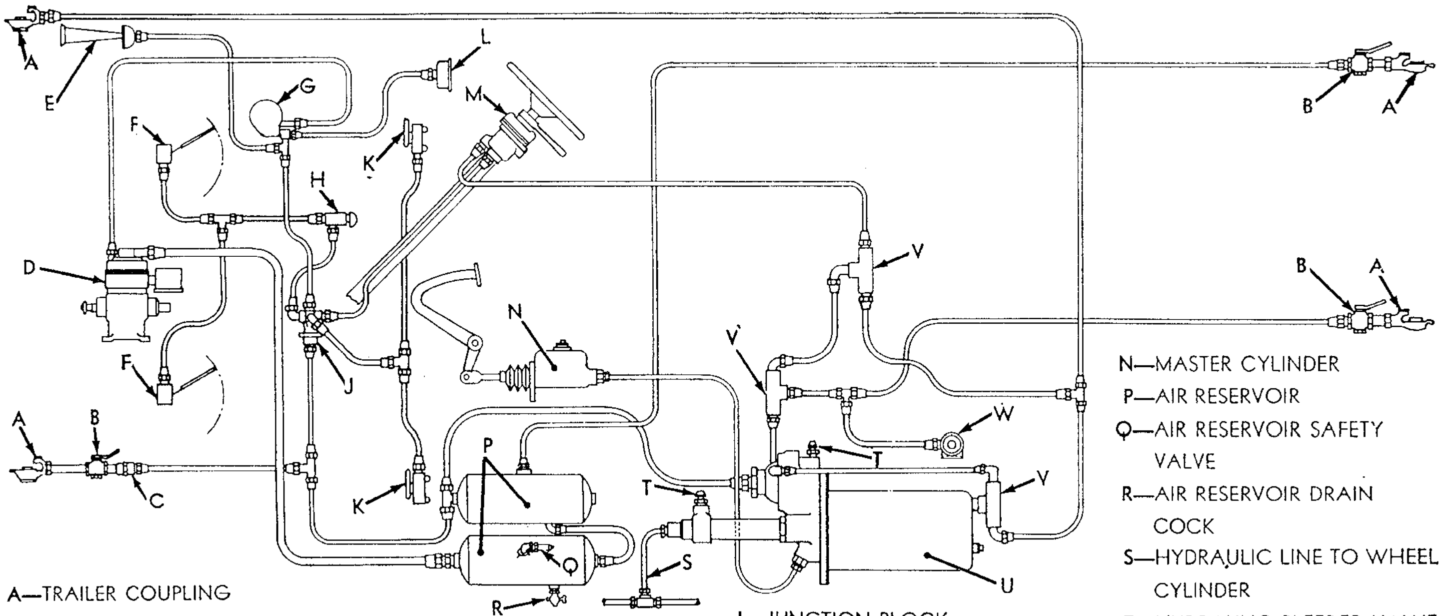
(7) Remove wheel blocks.

Section XXVI. COMPRESSED AIR SYSTEM

231. Description and Data

a. Description. The compressed air system (fig. 248) consists of the air compressor, air governor, air reservoirs, hand control valve, trailer brake couplings, air supply valves, and air lines and fittings.

(1) *Air compressor.* The air compressor (fig. 131) is a two-cylinder, single acting, piston-type. It is mounted on a bracket bolted to the lower right side of the engine crankcase, and driven by a belt from the crankshaft pulley. The



A—TRAILER COUPLING
B—TRAILER COUPLING CUT-OUT COCK
C—SINGLE CHECK VALVE
D—AIR COMPRESSOR
E—HORN
F—WINDSHIELD WIPER
G—AIR GOVERNOR
H—WINDSHIELD WIPER CONTROL VALVE
J—JUNCTION BLOCK
K—AIR SUPPLY VALVE
L—AIR PRESSURE GAGE SENDING UNIT
M—HAND CONTROL VALVE
N—MASTER CYLINDER
P—AIR RESERVOIR
Q—AIR RESERVOIR SAFETY VALVE
R—AIR RESERVOIR DRAIN COCK
S—HYDRAULIC LINE TO WHEEL CYLINDER
T—HYDRAULIC BLEEDER VALVE
U—AIR HYDRAULIC BRAKE CYLINDER
V—DOUBLE CHECK VALVE
W—STOP LIGHT SWITCH

RA PD 361693

Figure 248. Compressed air system piping diagram.

347797°—55——24

compressor cylinder head is water cooled, coolant being circulated through it directly from the water pump. An unloading mechanism mounted on top of the cylinder-head body and connected to the air governor ((2) below) unloads the compression stroke whenever the pressure in the system reaches a predetermined maximum.

(2) *Air governor.* The air governor (A, fig. 122) is mounted on the right front side of the cab cowl. A line from the upper air reservoir (P, fig. 248) delivers compressed air to the governor (G, fig. 248). When the pressure in this line reaches 120 psi, a valve inside the governor opens. This allows compressed air to be delivered from the governor through a line to the unloader valve on top of the compressor (D, fig. 248), which opens and prevents further compression of air by the compressor. When the pressure in the line from the upper air reservoir to the air governor drops below 105 psi, the valve inside the governor closes, causing the unloader valve at the compressor to close also, which allows the compressor to resume the compression of air.

(3) *Air reservoirs.* Two air reservoirs (fig. 156), which are cylindrical steel tanks, are mounted, one above the other, on the outside of the frame left side rail. The purpose of the reservoirs is to maintain an adequate supply of compressed air in the system whenever the truck is in operation. A safety valve (Q, fig. 248) is installed on the lower reservoir to protect the system against excessive air pressures. When the pressure in the reservoir reaches 150 psi, the safety valve opens and reduces the pressure in the system. The lower reservoir is also equipped with a drain cock (R, fig. 248) for the purpose of draining the condensation which normally collects in the reservoirs, and to provide a safe means of manually exhausting the compressed air from the system.

(4) *Hand control valve.* The hand control valve (Z, fig. 65 and M, fig. 248), located on the steering column, is used to control the brakes on the towed vehicle.

(5) *Trailer brake couplings.* Air brake hose coupling assemblies are provided on the front (fig. 152) and rear (fig. 76) of the vehicle to enable the compressed air system to be connected to the compressed air system of another vehicle, or to a trailer air-brake system. Identification tags bearing the words "SERVICE" and "EMERGENCY" are attached to the appropriate couplings on the vehicle to identify the air lines. Dummy couplings are provided for blocking off the hose couplings when not in use to prevent the entrance of dirt or other foreign matter into the air lines.

(6) *Air supply valves.* Two air supply valves (fig. 67 and K, fig. 248) are mounted under the instrument panel, one at each end, in the cab. These valves are connected in the line between the air governor and the upper air reservoir.

(7) *Air lines and fittings.* Air lines between the components of the compressed air system, air-hydraulic cylinder (par. 219), horn (par. 166), windshield wipers (par. 319), and stop-light switch (par. 166) are copper tubes with threaded fittings at both ends. Manually operated cut-out cocks (B, fig. 248) are installed in the lines to the trailer brake couplings to provide a means of closing off these couplings when not in use. One single check valve (C, fig. 248) and three double check valves (V, fig. 248) are installed in the lines to control the flow of air through the system.

b. Data.

(1) *Air compressor.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE–224618
Ordnance No	7539349
Type	2–UE–7¼ V.W.

(2) *Air governor.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE–224053
Ordnance No	7539351
Type	0–1 (waterproof)

(3) *Air reservoirs.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE–224627
Ordnance No	7539241
Size	7-inch diameter

(4) *Safety valve.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE–205105
Ordnance No	45–V–18130–900

(5) *Air reservoir drain cock.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE–215310
Ordnance No	7205007

(6) *Hand control valve.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE–224649
Type	HP

(7) *Air supply valve.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE–221351
Ordnance No	7533853

(8) *Single check valve.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE-220306

(9) *Double check valve.*

Make	Bendix-Westinghouse
Manufacturer's No	BWE-217698
Ordnance No	A340153

232. Air Leakage Tests

Excessive leakage at components or at connections in the compressed air system can be detected by the soap-sud method. With the compressed air system fully charged, coat outside of components and connections with soap suds to check for leakage. A 3-inch bubble formed in 3 seconds is maximum leakage permissible. If excessive leakage is found, tighten connection or replace component.

233. Air Compressor

a. Adjustment.

(1) *Unloader valve clearance adjustment.*

(*a*) Remove unloader-valve cover (fig. 140) from compressor cylinder head. Remove cover gasket from cylinder head and discard.

(*b*) Using feeler gage (fig. 249), check clearance of unloader valves. Clearance should be 0.010 to 0.015 inch. If clearance is not within these limits, adjust valves ((*c*) below). If clearance is correct, proceed as in (*d*) below.

(*c*) Loosen locknut (fig. 249) on both adjusting screws, turn screws until 0.12-inch clearance is obtained, and tighten locknuts.

(*d*) Position new gasket on compressor cylinder head, and install unloader-valve cover.

(2) *Drive belt tension adjustment.*

(*a*) Check compressor drive belt tension by applying pressure to the belt (fig. 154) at a point midway between the compressor pulley and the crankshaft pulley. Belt deflection at this point should be one-half inch. If deflection is found to be more or less than one-half inch, adjust belt tension ((*b*) below).

(*b*) Loosen two cap screws (L, fig. 148) on front flange of compressor drive pulley. Using a wrench (fig. 250), turn flange in or out on threaded hub until correct belt tension ((*a*) above) is obtained. Tighten the two cap screws on front flange.

b. Servicing. Servicing of the air compressor consists of cleaning and oiling the curled hair pad inside the air strainer.

(1) Remove air strainer from air compressor (*c* below).

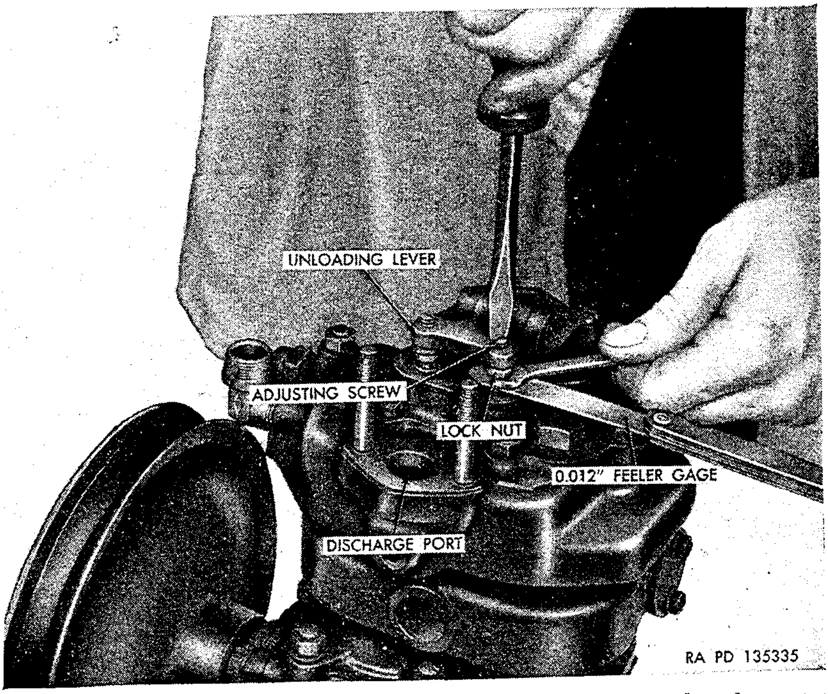


Figure 249. Checking and adjusting air-compressor unloader valve clearances.

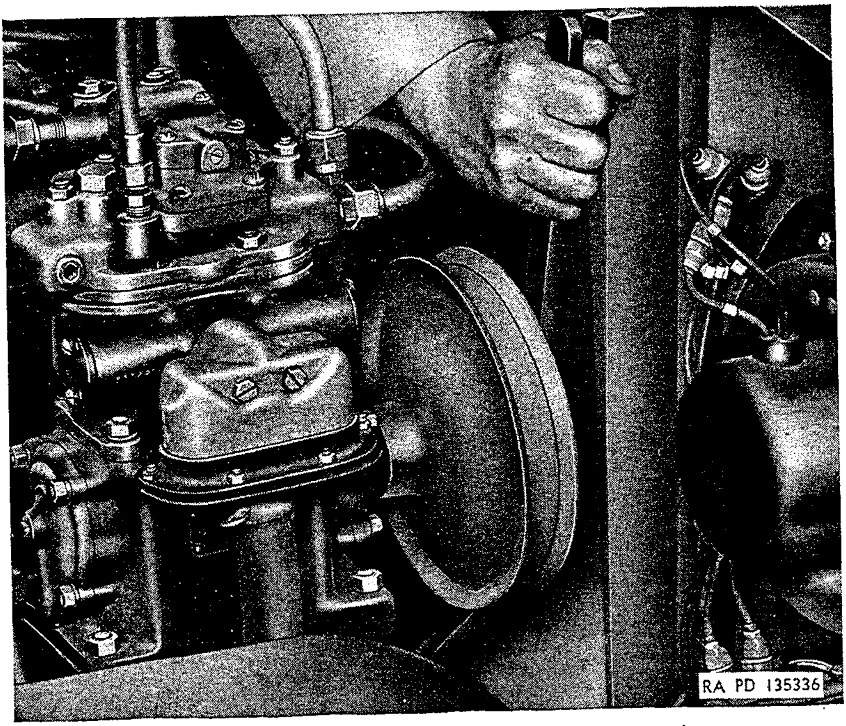


Figure 250. Adjusting air-compressor drive belt tension.

(2) Remove four screws (fig. 251) and lockwashers securing cover to air strainer body, and remove cover from body. Remove and discard cover gasket.

(3) Remove strainer baffle (fig. 251) and curled hair from air strainer body. Wash curled hair thoroughly in dry-cleaning solvent or volatile mineral spirits (par. 75).

(4) Saturate curled hair with engine oil, squeeze out excess oil, and place hair in strainer body.

(5) Install strainer baffle in strainer body with screen side of baffle next to hair.

(6) Position new cover gasket and cover on bottom of air strainer body, and install four screws and lockwashers in holes in cover and body. Tighten screws.

(7) Install air strainer on air compressor (*d* below).

c. Air Strainer Removal.

(1) On vehicles equipped with air-cleaner-to-air-compressor-intake line (X, fig. 119 and fig. 140), loosen clamp screw at underside of air strainer, and remove hose from strainer intake.

(2) Remove two cap screws and washers securing strainer (fig. 140) to right side of air compressor, and remove strainer from compressor. Remove and discard air inlet gasket (fig. 251).

d. Air Strainer Installation.

(1) Position air strainer (fig. 140) with new air inlet gasket (fig. 251) on right side of air compressor, and install two cap

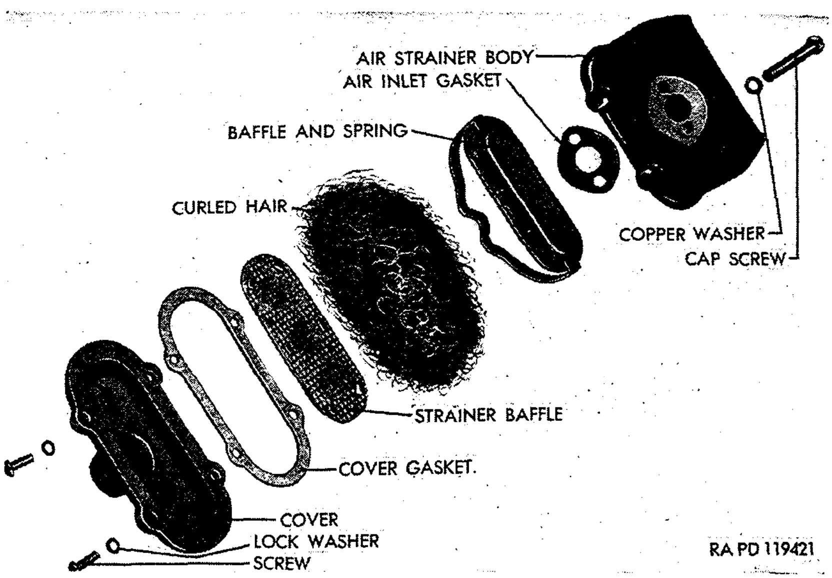


Figure 251. Air-compressor air strainer—exploded view.

screws with washers and gaskets in holes in air strainer body and air compressor block. Tighten cap screws.

(2) On vehicles equipped with air-cleaner-to-air-compressor-intake line (X, fig. 119), slide line on intake sleeve at underside of air strainer (fig. 140), and tighten clamp screw.

e. Air Compressor Removal and Installation.

(1) *Coordination with ordnance maintenance unit.* Refer to paragraph 2 for information on coordination with an ordnance maintenance unit.

(2) *Removal.*

(*a*) On vehicles equipped with air-cleaner-to-air-compressor-intake line (X, fig. 119 and fig. 140), loosen clamp screw at underside of air strainer, and remove line from strainer intake.

(*b*) Unscrew connectors securing water inlet and outlet lines (fig. 140) to fittings at front of air-compressor cylinder head, and remove lines from fittings.

(*c*) Unscrew connector securing air-compressor-to-air-reservoir line (fig. 140) to top rear of air compressor cylinder head, and remove line from head.

(*d*) Unscrew connector securing air-compressor-to-governor line (fig. 140) to top rear of air compressor cylinder head, and remove line from head.

(*e*) Remove four hex nuts (fig. 154) and lockwashers from studs securing air compressor to compressor mounting bracket at lower right side of engine crankcase, and remove compressor drive belt from pulley. Lift compressor from mounting bracket. Remove and discard compressor-to-mounting-bracket gasket.

(3) *Installation.*

(*a*) Clean gasket surfaces on compressor mounting bracket (fig. 154) and air-compressor crankcase, and install new gasket on mounting bracket.

(*b*) Position air compressor on mounting bracket, and loosely install four lockwashers and nuts (fig. 154) on mounting bracket studs. Place compressor drive belt on pulley. Tighten mounting nuts on studs.

(*c*) Position air-compressor-to-governor line (T, fig. 122) at inlet at top rear of air-compressor cylinder head (fig. 140), and tighten connection.

(*d*) Position air-compressor-to-air-reservoir line (fig. 140) at outlet at top rear of air-compressor cylinder head, and tighten connector.

(*e*) Position water inlet and outlet lines (fig. 140) at fittings on front of air-compressor cylinder head, and tighten connectors.

(*f*) On vehicles equipped with air-cleaner-to-air-compressor intake line (X, fig. 119) slide line (fig. 140) on intake sleeve at underside of air strainer, and tighten clamp screw.

234. Air Governor

a. Servicing. Servicing of the air governor (A, fig. 122) consists of cleaning and oiling the lamb's wool pad inside the governor air strainer.

(1) Remove cap nut (fig. 252) from governor strainer body, and pull cup strainer, cylinder strainer, and lamb's wool from strainer body.

(2) Wash cup strainer, cylinder strainer, and lamb's wool in dry-cleaning solvent or volatile mineral spirits (par. 75).

(3) Saturate lamb's wool with engine oil, squeeze out excess oil, and place lamb's wool in cylinder strainer.

(4) Insert cylinder strainer and cup strainer in strainer body, and install cap nut.

b. Air Governor Removal and Installation.

(1) *Coordination with ordnance maintenance unit.* Refer to paragraph 2.

(2) *Removal.*

(*a*) Unscrew connector securing air-reservoir-to-governor line (fig. 159) and governor-to-horn line to lower fitting at left side of air governor, and remove lines from fitting.

(*b*) Unscrew connector securing air-compressor-to-governor line (T, fig. 122) to upper fitting at left side of air governor, and remove line from fitting.

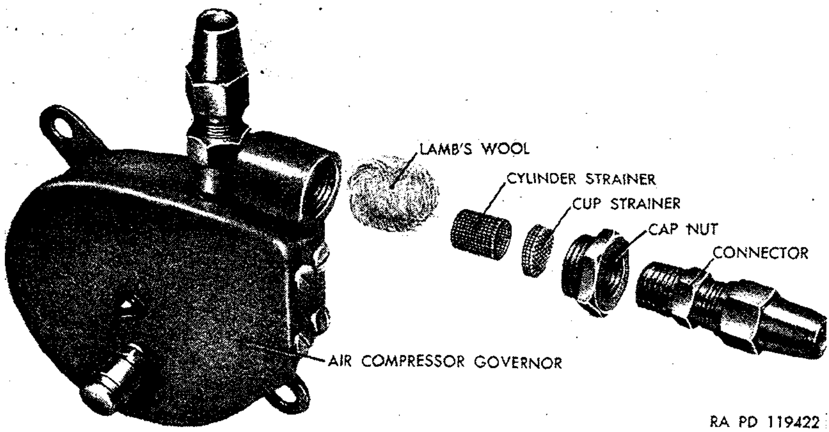


Figure 252. Air-compressor air governor with air strainer disassembled.

(*c*) Remove two cap screws securing governor (A, fig. 122) to right front side of cab cowl, and remove governor from cowl.

(3) *Installation.*

(*a*) Position air governor (A, fig. 122) at right front side of cab cowl, install two cap screws, and tighten.

(*b*) Position air-compressor-to-governor line (T, fig. 122) at upper fitting on left side of governor, and tighten connector.

(*c*) Position air-reservoir-to-governor line (fig. 159) and governor-to-horn line at lower fitting on left side of governor, and tighten connectors.

235. Air Reservoirs

a. Draining. To drain air reservoirs (fig. 253), open drain cock on underside of lower air reservoir. When all water has drained from reservoir, close drain cock.

b. Air Reservoir Removal and Installation.

(1) *Coordination with ordnance maintenance unit.* Refer to paragraph 2.

(2) *Removal.*

(*a*) Open drain cock on underside of lower air reservoir (fig. 253) to relieve pressure in compressed air system.

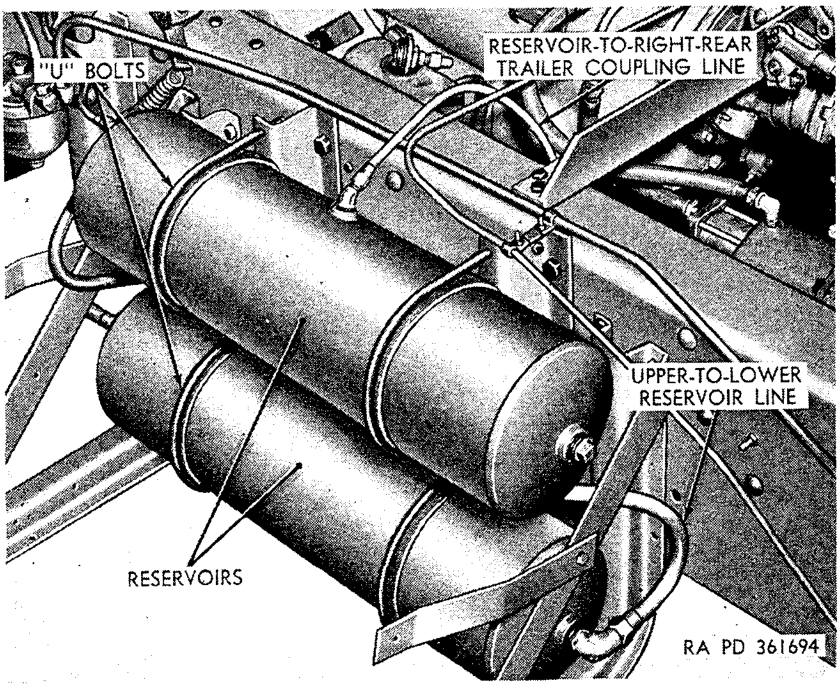


Figure 253. Air reservoirs installed on outside of frame left side rail.

(b) After compressed air has been exhausted from system, unscrew connector securing air-compressor-to-air-reservoir line (fig. 156) to front end of lower reservoir, and remove line from reservoir.

(c) Unscrew connector securing air-line tee (fig. 156) to front end of upper reservoir, and remove tee from reservoir.

(d) Unscrew connector securing upper-to-lower-reservoir line (fig. 253) to rear end of lower reservoir, and remove line from reservoir.

(e) Unscrew connector securing upper-to-lower-reservoir line to underside of upper reservoir, and remove line from reservoir.

(f) Unscrew connector securing reservoir-to-right-rear-trailer-coupling line (fig. 253) to top of upper reservoir, and remove line from reservoir.

(g) Support lower reservoir, remove two nuts from front and rear "U" bolts (fig. 253), remove "U" bolts from reservoir-mounting brackets, and remove lower reservoir from vehicle.

(h) Support upper reservoir, remove two nuts from front and rear U bolts (fig. 253), remove "U" bolts from reservoir-mounting brackets, and remove upper reservoir from vehicle.

(3) *Installation.*

(a) Position upper reservoir (fig. 253) at mounting bracket bolted to outside of frame left side rail, install front and rear "U" bolts over reservoir with ends inserted in holes in bracket, and install two nuts on each U bolt. Tighten nuts.

(b) Install lower reservoir (fig. 253), using same procedures as in (a) above.

(c) Position reservoir-to-right-to-rear-trailer-coupling line (fig. 253) at outlet on top of upper reservoir, and tighten connector.

(d) Position upper-to-lower-reservoir line (fig. 253) at inlet on underside of upper reservoir, and tighten connector.

(e) Position upper-to-lower-reservoir line at outlet on rear end of lower reservoir, and tighten connector.

(f) Position air-line tee (fig. 156) at outlet on front end of upper reservoir, and tighten connector.

(g) Position air-compressor-to-air-reservoir line (fig. 156) at inlet on front end of lower reservoir, and tighten connector.

(h) Close drain cock on underside of lower air reservoir.

236. Hand Control Valve

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Open drain cock on underside of lower air reservoir (fig. 253) to relieve pressure in compressed air system.

(2) Unscrew connector securing air supply line (fig. 248) to hand control valve (fig. 67), and remove line from valve.

(3) Unscrew connector securing trailer coupling line (fig. 248) to hand control valve, and remove line from valve.

(4) Remove two nuts, lockwashers, and clamp (fig. 67) from cap screws securing hand control valve to steering gear jacket, and remove valve from jacket.

(5) Remove two cap screws from hand-control-valve mounting flange.

c. Installation.

(1) Insert two cap screws in holes in hand-control-valve mounting flange.

(2) Position hand control valve (fig. 67) on right side of steering gear jacket and install clamp, two lockwashers, and nuts on cap screws in hand-control-valve mounting flange. Tighten cap screw and nuts.

(3) Position trailer coupling line (fig. 248) at outlet on underside of hand control valve and tighten connector.

(4) Position air supply line (fig. 248) at inlet on underside of hand control valve, and tighten connector securely.

(5) Close drain cock on underside of lower air reservoir.

237. Trailer Brake Couplings

a. Removal. To remove the trailer brake couplings (fig. 254), close the cutout cock, if necessary, at the coupling to be removed.

Note. The cutout cock is open when the handle is at a 90° angle with the body of the cock. Stops are provided to prevent the handle from being turned beyond its normal open and closed positions.

Remove dummy coupling from trailer brake coupling, and unscrew trailer brake coupling from cutout cock or elbok (right front coupling only).

b. Installation. To install trailer brake couplings, turn coupling onto threaded end of cutout cock or elbow (right front coupling only). Connect dummy coupling to trailer brake coupling to prevent dirt or foreign matter from entering air lines.

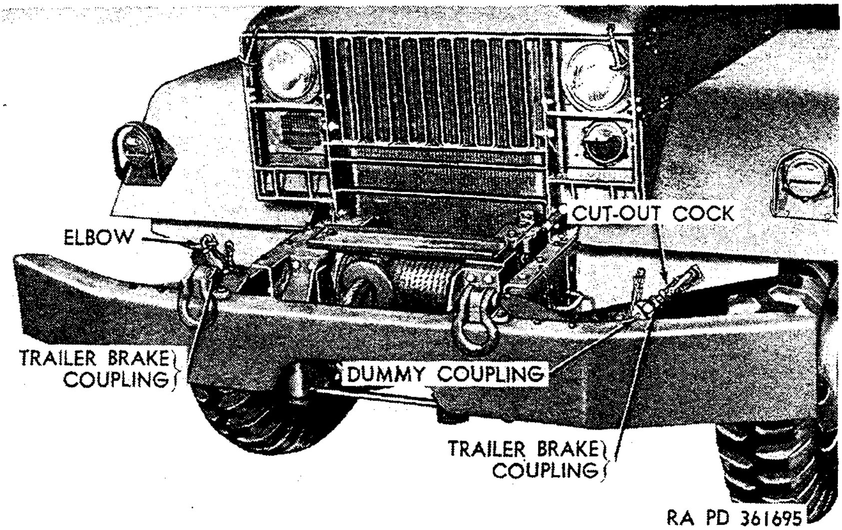


Figure 254. Trailer brake couplings installed at front of vehicle.

238. Air Supply Valves

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Open drain cock on underside of lower air reservoir (fig. 253) to relieve pressure in compressed air system.

(2) Unscrew connector securing air supply line to air supply valve (K, fig. 248).

(3) Unscrew cap from air supply valve (fig. 67).

(4) Remove two safety nuts and cap screws securing air supply valve to cab cowl, and remove valve.

c. Installation.

(1) Position air supply valve (fig. 67) on cab cowl, and secure with two cap screws and safety nuts.

(2) Position air supply line at inlet part of air supply valve (K, fig. 248), and tighten connector.

(3) Screw cap on air supply valve outlet.

(4) Close drain cock on underside of lower air reservoir (fig. 253).

239. Air Lines and Fittings

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal. To remove air lines or fittings (fig. 248), open drain cock on underside of lower air reservoir to relieve pressure in compressed air system. Unscrew connectors at both ends of line, remove safety nut and cap screw securing air-line closed clip to vehicle, where used, and remove line from vehicle. Unscrew connectors securing air lines to inlet and outlet on fittings (tees, check valves, junction block, et cetera), and remove fittings from vehicle.

c. Installation. Place air line (fig. 248) in position and secure closed clip, where used, to vehicle with cap screw and safety nut. Position ends of line at inlet and outlet of fittings, and tighten connectors.

Section XXVII. WHEELS, HUBS, AND DRUMS

240. Description

a. Wheels. The wheels (figs. 255 and 256) used on these vehicles are of the offset-disk-type, and are interchangeable between front and rear axles and on opposite sides of the vehicle. Two types of tire mountings are used. Some of the wheels are equipped with bolted-on-type side rings, and some are equipped with snap-on-type side ring. Wheels are secured by cap nuts installed on mounting studs at hub flanges. These cap nuts are interchangeable between hubs on the same side but not between hubs on opposite sides of the vehicle.

b. Hubs. All hugs (fig. 257) are mounted on opposed tapered roller bearings. Each hub is secured to its axle with an inner bearing adjusting nut, bearing nut washer, and outer bearing adjusting nut.

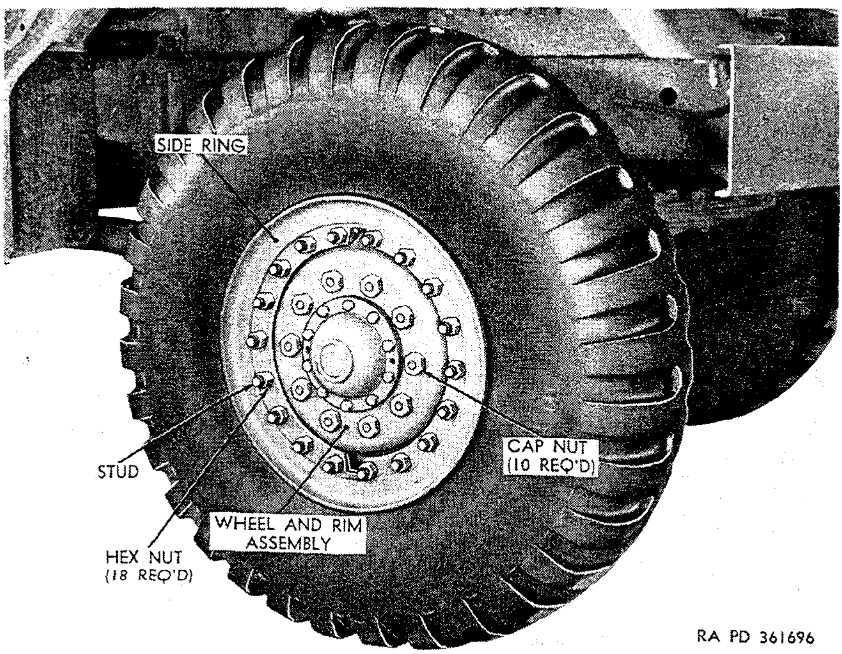


Figure 255. Wheel and tire assembly with bolted-on-type side ring (14:00 X 20 tires)

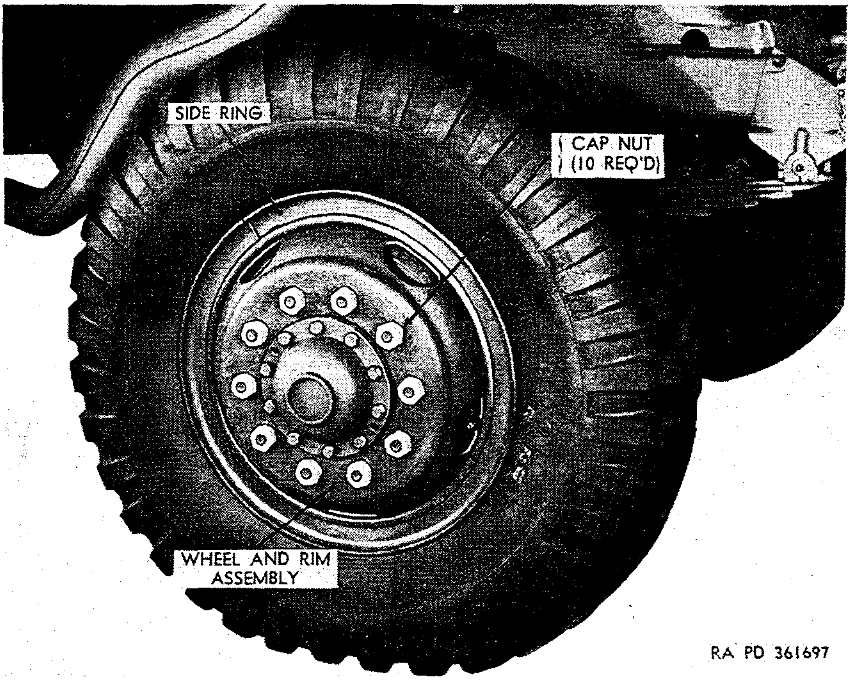


Figure 256. Wheel and tire assembly with snap-on-type side ring (11:00 X 20 tires)

All hubs are equipped with inner oil seals, but only the rear hubs have outer oil seals.

c. Drums. All drums (fig. 241) are secured to hubs by retaining nuts and lockwashers installed on mounting studs at hub flanges. All drums are interchangeable between front and rear axles and opposite sides of the vehicle.

241. Wheel and Tire Assembly

a. Tire Inflation. For correct tire inflation pressures for highway driving, cross-country driving, and driving in mud, sand, and snow, refer to paragraph 61. This same information is also included on the servicing and publication data plate (fig. 15). Pressure in all tires must be equal. When checking tire inflation pressure, do not reduce pressure if tires are hot.

b. Matching Tires. Replacement tires should be of the same design and tread as other tires on the vehicle. Differences in design and tread in some instances result in unequal rolling radii. If tires do not have the same outside diameter within one-half inch, excessive tread scuffing will result. When selecting a replacement tire, select one having an outside diameter that matches within one-half inch the outside diameter of other tires on the vehicle, particularly on the same axle.

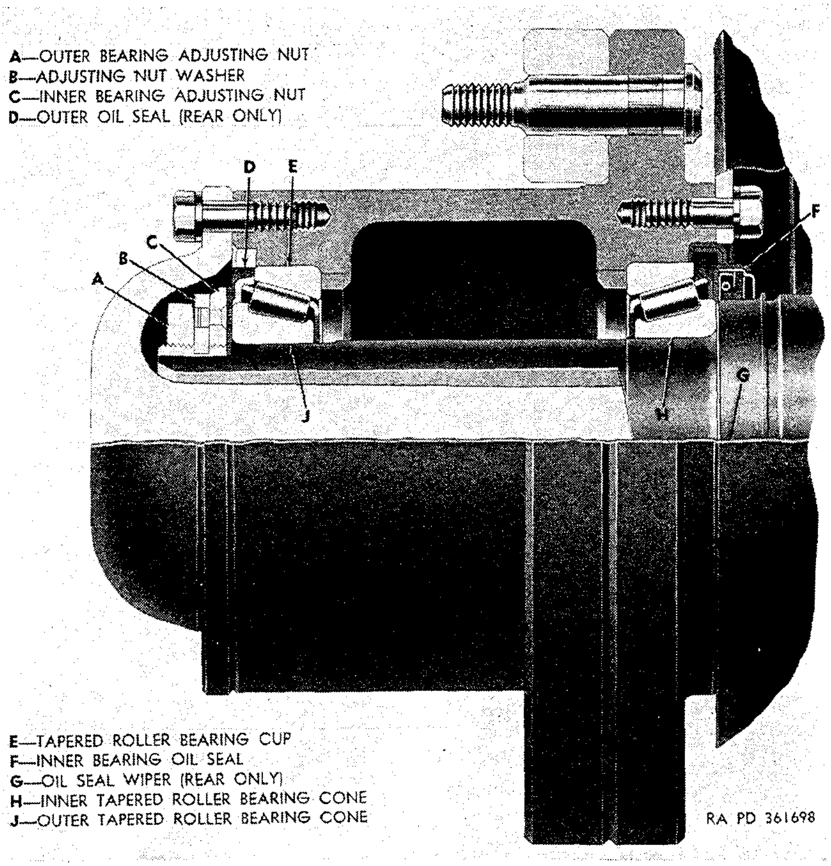


Figure 257. Cutaway view of hub assembly—rear illustrated

Measure outside diameter of tires with a conventional tire measuring gage.

c. Tire Removal (Bolted-on-Type Side Ring).

(1) Remove wheel and tire assembly (A below).

(2) Remove valve core from inner tube stem and allow tube to become completely deflated.

Caution: Do not attempt to remove side ring until inner tube is completely deflated.

(3) Remove 18 side ring retaining nuts (fig. 255), and remove side ring from wheel.

(4) Using tire irons to dislodge bead of tire from rim, remove tire, tube, and bead lock from rim.

(5) Install valve core in inner tube stem, and inflate tube sufficiently to spread tire beads.

(6) Pry up on bead lock at a point about 8 inches from hinges. Collapse bead lock and turn 90° to remove from tire.

(7) Deflate inner tube and remove from tire.

d. Tire Installation (Bolted-on-Type Side Ring).

(1) Install tube in tire and inflate sufficiently to hold in place.

(2) With bead lock collapsed, insert inner tube valve stem through hole in bead lock. Install bead lock inside of casing, press part way through tire, and inflate tube sufficiently to spread tire beads.

(3) Turn bead lock and work into position between tire beads. Deflate inner tube completely.

(4) Holding one end of bead lock with foot, pull other end of bead lock up with both hands until hinge snaps into place. Center bead lock so edges are below beads of tire at all points.

(5) Install tire and bead lock assembly on wheel rim with valve stem pointing outward. Be sure lug on bead lock engages valve stem slot in wheel rim.

(6) Install side ring (fig. 255), and secure with the 18 side ring retaining nuts. Tighten nuts alternately.

Caution: These nuts must be tightened before inflating tire.

(7) Inflate tire (*a* above).

(8) Install wheel and tire assembly (*h* below).

e. Tire Removal (Snap-on-Type Side Ring).

(1) Remove wheel and tire assembly (*g* below).

(2) Remove valve core from inner tube stem and allow tube to become completely deflated.

(3) With wheel and tire assembly laying flat with side ring (fig. 256) facing upward, insert a tire iron into notch in side ring.

(4) Working a tire iron between side ring and disk, pry side ring off wheel.

(5) Turn wheel and tire over and dislodge tire from taper on wheel rim.

(6) Remove wheel from tire.

f. Tire Installation (Snap-on-Type Side Ring).

(1) Place inner tube inside tire, install tire flap, and inflate inner tube sufficiently to prevent tube from being pinched during tire mounting.

(2) Place wheel flat on ground, and place tire over wheel. Insert valve stem through hole in wheel rim so the stem points toward the wheel disk.

(3) Position side ring (fig. 256) on wheel with inner flange down, and start the inner flange of ring under wheel flange opposite the notch in the side ring. Using a wood block and hammer, force the side ring into position on the wheel rim.

(4) Make certain the side ring is seated properly against rim of wheel through its entire circumference; then inflate tire (*a* above).

Warning: When inflating tire, turn the side ring away from any person nearby to prevent injury if the ring should fly off.

(5) Install wheel and tire assembly (*h* below).

g. Wheel and Tire Assembly Removal. Loosen 10 wheel retaining nuts (fig. 256) securing wheel to hub. Raise wheel to be removed until tire is clear of ground. Remove the 10 wheel retaining nuts, and remove wheel and tire assembly.

Caution: On wheels with bolted-on-type side rings (fig. 255), do not loosen side ring retaining nuts.

h. Wheel and Tire Assembly Installation. Position wheel and tire assembly on wheel studs at hub flange, and install 10 wheel retaining nuts (fig. 256) on studs. Alternately tighten wheel retaining nuts, using wrench furnished with truck. Lower wheel and check tightness of retaining nuts.

242. Hub and Drum Assembly

a. Wheel Bearings.

(1) *Adjustment.*

(*a*) *Check adjustment.* Raise wheel installed on hub to be checked until tire is clear of ground. Grasp top of tire and alternately push and pull on tire, observing the amount of wheel wobble or bearing play. When bearings are correctly adjusted, movement of the brake drum (fig. 240) in relation to the top edge of the backing plate is just perceptible, with wheels turning freely. If movement appears to be excessive, proceed as in (*b*) below; otherwise, lower wheel and remove jack.

(*b*) *Adjust wheel bearings.*

1. With wheel raised, remove 10 drive flange retaining cap screws (fig. 241), and remove flange from hub.

Note. Rear axle shaft is also removed when removing drive flange from rear hub (par. 214).

2. Using wheel nut wrench (fig. 100), remove outer bearing adjusting nut (fig. 258) and bearing nut washer.

3. While turning wheel, tighten inner bearing adjusting nut (fig. 258), using large end of wrench, until wheel binds; then back off nut approximately one-eighth turn. Recheck wheel bearing adjustment ((*a*) above).

4. Using wheel nut wrench, install bearing nut washer (fig. 258) and outer bearing adjusting nut. Tighten outer nut.

347797° 55——25

5. Check adjustment. Position drive flange (fig. 241) on hub, and install 10 retaining cap screws. Tighten cap screws.

Note. When installing drive flange at rear hubs, rear axle shaft must be installed also (par. 214).

6. Lower wheel and remove jack.

(2) *Wheel bearing removal.*

(*a*) Remove hub and drum assembly (*c*(1) below).

(*b*) Remove inner-bearing oil seal (F, fig. 257) and inner tapered-roller-bearing cone (H, fig. 257) from hub.

(3) *Cleaning and inspection.* Clean both inner and outer tapered-roller-bearing cones (par. 68*d*(3)). Inspect cones for excessive wear or other defects which would prevent smooth operation, and replace, if necessary. Inspect bearing cups (E, fig. 257) in hub bores for wear, scoring, or distortion, and replace, if necessary (*b* below).

(4) *Wheel bearing installation.*

(*a*) Lubricate inner and outer tapered-roller-bearing cones (par. 68*d*(3)).

(*b*) Install inner-bearing oil seal (F, fig. 257) and inner tapered-roller-bearing cone (H, fig. 257) on spindle.

(*c*) Install hub and drum assembly (*c*(2) below).

b. Bearing Cups.

(1) *Removal.*

(*a*) Remove hub and drum assembly (*c*(1) below), but do not remove brake drum from hub.

(*b*) Using a puller, remove outer bearing cup (E, fig. 257) from hub.

(*c*) Turn hub and drum assembly over and remove inner bearing cup from hub.

(2) *Installation.*

(*a*) Lay hub and drum assembly flat with outer end facing up, position outer tapered roller bearing cup (E, fig. 257) in hub bore, and press cup into place against shoulder in bore.

(*b*) Turn hub and drum assembly over, position inner bearing cup in hub bore, and press cup into place against shoulder in bore.

(*c*) Install hub and drum assembly (*c*(2) below).

c. Hub and Drum.

(1) *Removal.*

(*a*) Raise wheel at hub to be removed until tire is clear of ground.

(*b*) Remove drive flange (*a*(1) (*b*)*1* above).

(*c*) Using wheel nut wrench (fig. 100), remove outer bearing adjusting nut (fig. 258), bearing nut washer, and inner bearing adjusting nut from spindle.

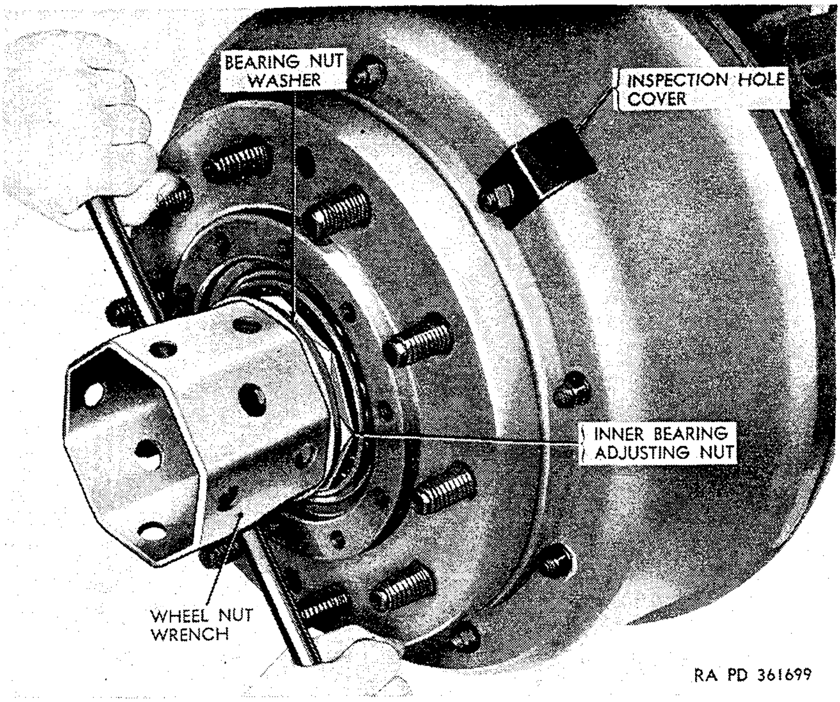


Figure 258. Removing outer bearing adjusting nut.

(*d*) Remove outer-bearing oil seal (D, fig. 257) from hub outer bore (rear axles only).

(*e*) Remove outer tapered-roller-bearing cone (J, fig. 257).

(*f*) Remove hub and drum assembly (fig. 259) from axle spindle.

(*g*) Remove 10 nuts (fig. 259) and lockwashers securing brake drum to hub, pry drum loose, and remove drum from hub.

(2) *Installation.*

(*a*) Position brake drum on studs at hub outer flange, and install 10 lockwashers (fig. 259) and nuts on studs. Tighten nuts.

(*b*) Install hub and drum assembly (fig. 259) on axle spindle so that inner tapered-roller-bearing cone (H, fig. 257) and inner-bearing oil seal (F, fig. 257) enter hub inner bore.

(*c*) Install outer tapered-roller-bearing cone (J, fig. 257) in hub outer bore against outer tapered roller bearing cup (E, fig. 257).

(*d*) Install outer-bearing oil seal (D, fig. 257) on spindle against cone (rear axles only).

(*e*) Using wheel nut wrench (fig. 258), install inner bearing adjusting nut on spindle.

(*f*) Install wheel and tire assembly (par. 241*h*).

(*g*) Adjust wheel bearings (*a* above).

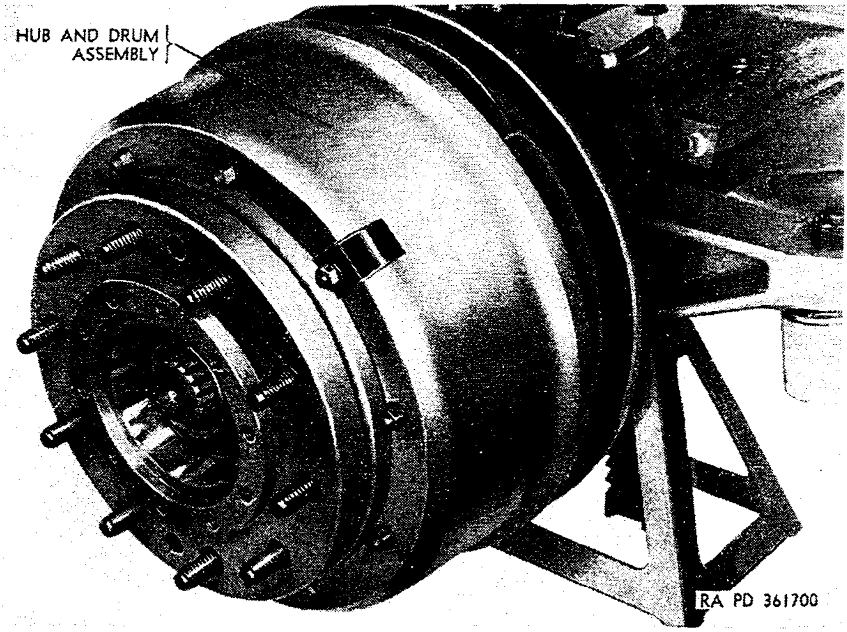


Figure 259. Removing hub and drum assembly.

Section XXVIII. STEERING SYSTEM

243. Description and Data

a. Description.

(1) *General.* The steering system is comprised of the steering wheel (P, fig. 65), hydraulically-assisted steering gear (fig. 260), hydraulic oil reservoir (F, fig. 148), hydraulic pump (fig. 130), relief valve, and steering linkage.

(2) *Steering wheel.* The three-spoke steering wheel (P, fig. 65) is mounted on the upper end of the steering shaft (fig. 260) and secured by a hex nut. The horn button assembly (W, fig. 65) is mounted in the center of the steering wheel.

(3) *Steering gear* (fig. 260). The steering gear is a cam-and-lever-type unit equipped with a hydraulic power cylinder. A lever inside the steering gear housing is actuated by rotation of a cam at the lower end of the steering shaft, which turns with the steering wheel. This causes the upper end of the pitman-arm (fig. 261), which is secured to the opposite end of the lever shaft, to move either forward or backward, according to the direction of rotation of the steering wheel. The movement of the pitman-arm is transmitted through the steering linkage (fig. 261) to the steering knuckles and wheels, steering the vehicle. Rotation of the steering shaft also

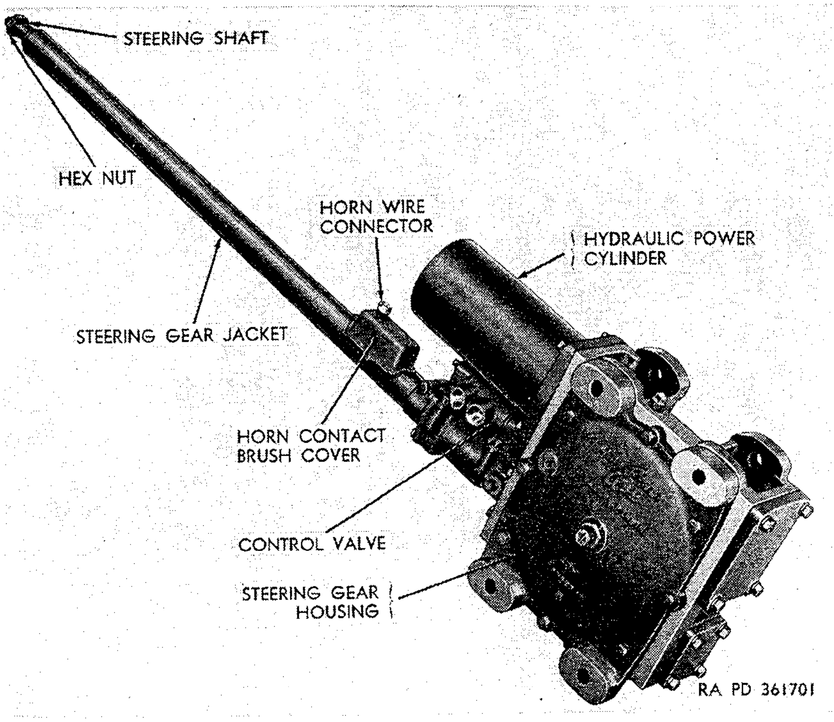


Figure 260. Right side view of steering gear removed from vehicle.

changes, by means of a cam actuated lever, the relationship of the inlet and outlet valves inside the control valve assembly mounted on the steering gear jacket. This permits hydraulic oil to be pumped into the appropriate side of the power cylinder piston, which is connected to the lever inside the steering gear housing, to assist in moving the pitman-arm.

(4) *Hydraulic oil reservoir.* The hydraulic oil reservoir (F, fig. 148) is mounted to the rear of the left headlight support bracket. A mounting bracket attached to the bottom of the reservoir is bolted to the top of the frame left side rail, and mounting brackets attached to the front and rear ends of the reservoir are bolted to the left front fender splash shield (fig. 262). A drain plug is provided in the bottom of the reservoir for draining. A filler screen is installed in the filler opening to prevent dirt or other foreign matter from entering the hydraulic system.

(5) *Hydraulic pump.* The gear-type hydraulic pump (fig. 130) is bolted to the rear of the front crankcase plate. The pump is driven by the engine camshaft gear, and is in operation whenever the engine is running.

(6) *Relief valve.* The relief valve (fig. 263), mounted on a bracket bolted to the steering gear housing, prevents excessive

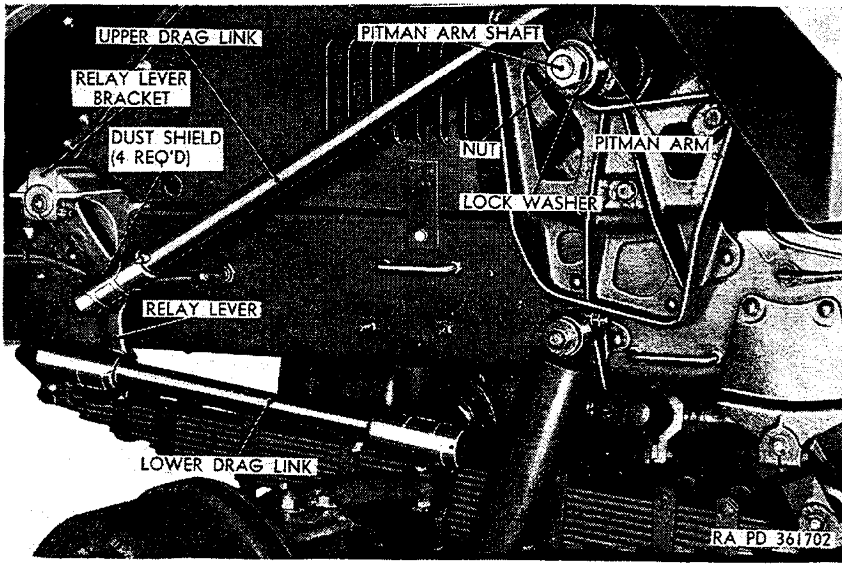


Figure 261. Steering linkage installed on vehicle under left front fender.

pressures in the steering hydraulic system. The relief valve is set for a maximum pressure of 750 psi.

(7) *Steering linkage.* The steering linkage (fig. 261) consists of the upper drag link, relay lever, and lower drag link. Adjustable spring-loaded ball seats at both ends of each drag link (fig. 261) engage ball studs attached to the pitman-arm, relay lever, and steering arm. The relay lever (fig. 261) consists of a lever with two ball studs to which the forward ends of the upper and lower drag links are secured.

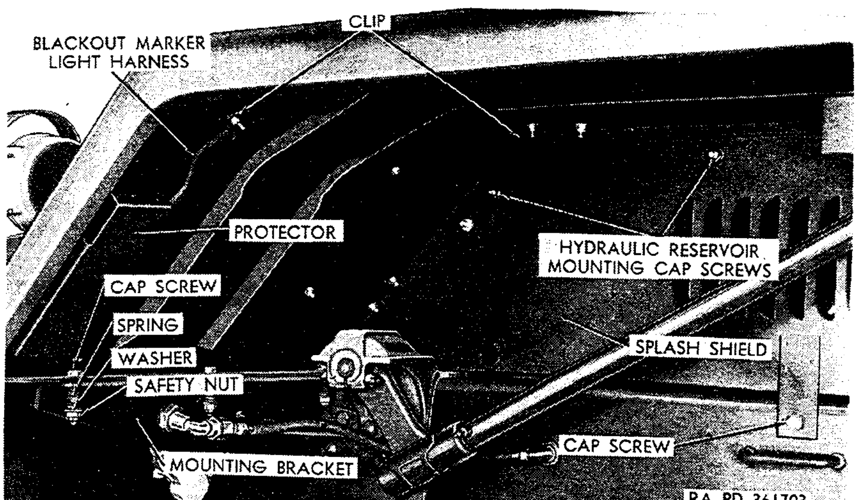


Figure 262. View of underside of left front fender.

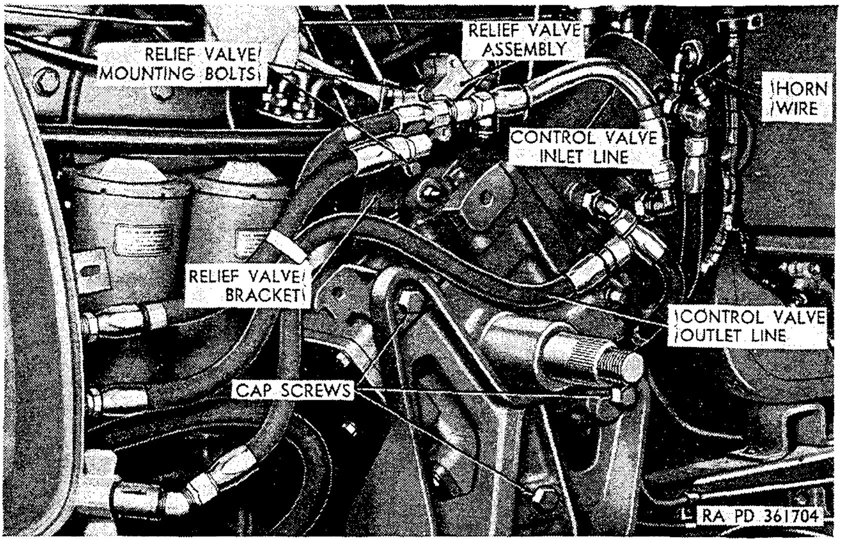


Figure 263. View of steering gear installed with left front fender removed.

b. Data.

(1) *Steering gear.*

Make	Ross Gear and Tool Co.
Model	HP–70
Type	hydraulic
Ratios:	
Extreme left	19 : 1
Center	22 : 1
Extreme left	19 : 1

(2) *Hydraulic oil reservoir.*

Make	International Harvester Co.
Model	IHC–101012R11
Ordnance number	7409290
Capacity	8½ qt

(3) *Relief valve.*

Make	Pesco
Model	PS–05–2223–020–01
Ordnance number	7409294

(4) *Hydraulic pump.*

Make	Pesco
Model	PS–052057–50–01
Ordnance number	7369967
Type	gear

244. Steering Wheel

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Remove horn button assembly (par. 180).

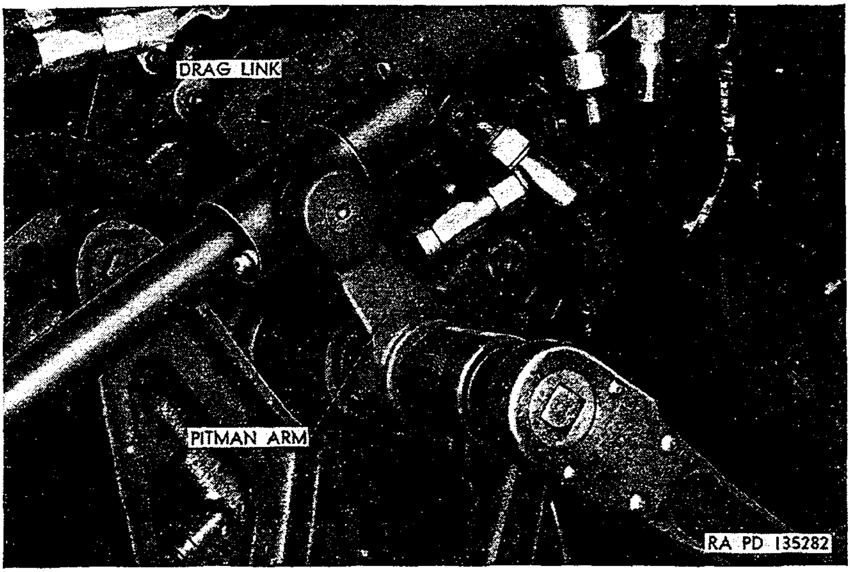


Figure 264. Removing steering wheel.

(2) Remove hex nut (fig. 260) securing steering wheel to upper end of steering shaft.

(3) Using a puller (fig. 264), remove steering wheel from steering shaft.

c. *Installation.*

(1) Position steering wheel (P, fig. 65) on upper end of steering shaft (fig. 260) with splines on end of shaft engaging splines in bore of steering wheel hub.

Note. Steering wheel should be installed so that spokes form a Y when viewed from driver's seat with front wheels in straightahead position.

(2) Install hex nut (fig. 260) on steering shaft and tighten.

(3) Install horn button assembly (par. 180).

245. Steering Gear

a. *Coordination With Ordnance Maintenance Unit.* Refer to paragraph 2.

b. *Adjustment.*

(1) *Pitman-arm shaft adjustment.*

(*a*) Disconnect upper drag link at pitman-arm (par. 249).

(*b*) Loosen three cap screws and safety nuts (fig. 72) securing steering-gear-jacket mounting bracket to dash panel.

(*c*) Loosen locknut (fig. 265) at right side of steering gear housing.

(*d*) Turn the steering wheel from one extreme to the other, counting the number of revolutions between the two extremes. Turn steering wheel clockwise as far as it will go;

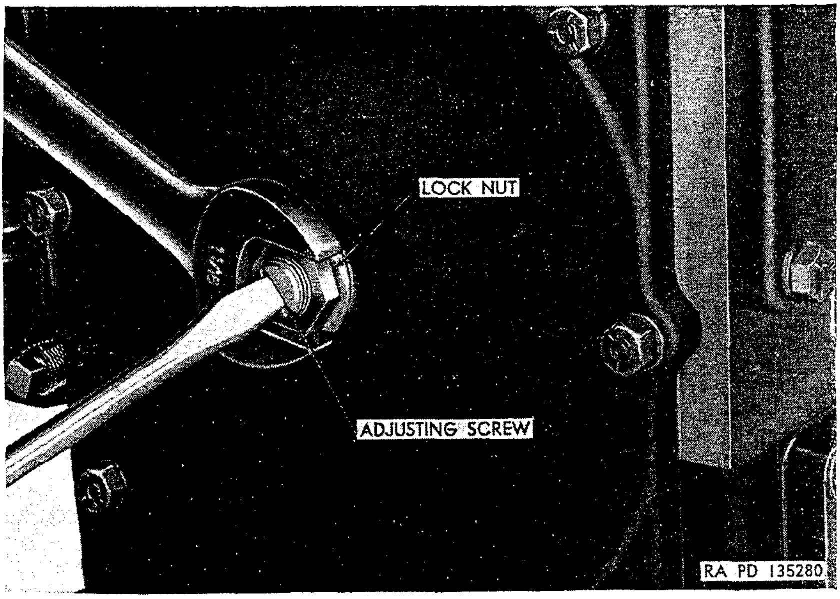


Figure 265. Adjusting pitman-arm shaft.

then turn steering wheel counterclockwise one-half the number of revolutions counted between the extreme right and left positions. This places the steering wheel in the middle of its range of travel, which is the correct position of the steering wheel for straightahead steering.

Caution: Do not adjust pitman arm shaft with steering wheel in any other position.

(*e*) Tighten adjusting screw (fig. 265) until a very slight drag is felt when turning the steering wheel with a light grip of the thumb and forefinger. Wheel should turn freely with just a perceptible drag.

(*f*) Holding the adjusting screw to prevent further turning, tighten the locknut (fig. 265).

(*g*) Adjust steering gear jacket ((2) below).

(*h*) Connect rear end of upper drag link to pitman-arm (par. 249).

(2) *Steering gear jacket adjustment.*

(*a*) Loosen three cap screws and safety nuts (fig. 72) securing steering-gear-jacket mounting clamp to dash panel, and note whether jacket moves to a different position.

(*b*) Tighten three safety nuts on cap screws securing steering-gear-jacket mounting bracket to dash panel in position as alined by the jacket.

Note. The column must not be sprung in any direction from its free position. Binding of the steering shaft inside the jacket may prevent proper operation of the steering gear hydraulic system.

If the jacket has been permanently bent as the result of severe misalinement, notify ordnance maintenance personnel.

c. Pitman-Arm Removal (fig. 261).

(1) Remove nut and lockwasher (fig. 261) securing pitman arm to left end of pitman-arm shaft.

(2) Pull pitman arm from shaft.

(3) Disconnect rear end of upper drag link (fig. 261) from pitman-arm ball stud (par. 249).

d. Pitman-Arm Installation (fig. 261).

(1) Connect rear end of upper drag link to pitman-arm ball stud (par. 249).

(2) Set front wheels in straightahead position, and set steering wheel in the midposition (*b* (1) (*d*) above).

(3) Position pitman arm on splined shaft with arm pointing upward.

(4) Push pitman arm onto shaft until nut can be installed on threaded end of shaft. Install lockwasher and nut on shaft and tighten.

e. Steering Gear Removal.

(1) Remove steering wheel (par. 244*b*).

(2) Remove hand control valve (par. 236*b*).

(3) Remove three safety nuts (fig. 72) and cap screws securing steering-gear-jacket mounting bracket to instrument panel. Remove four screws and lockwashers securing steering jacket pad and remove pad.

(4) Remove left front fender assembly (par. 321).

(5) Remove pitman arm (*c* above).

(6) Remove relief valve (par. 248*b*).

(7) Disconnect inlet and outlet lines (fig. 263) at left side of control valve.

(8) Disconnect horn wire (fig. 263) at terminal on top of horn-contact-brush cover (fig. 260).

(9) Remove three safety nuts and cap screws (fig. 263) securing steering gear to steering gear bracket, and remove steering gear from vehicle (fig. 266).

Note. The driver's seat in the cab must be raised to provide clearance for the steering gear jacket.

(10) Remove split-lockwasher screw, spacer, cap screw, washer, and safety nut securing relief-valve mounting bracket (fig. 263) to steering gear housing, and remove bracket from housing.

(11) Disconnect both ends of two control-valve-to-power-cylinder lines (fig. 266), and remove lines from steering gear.

(12) Remove six elbows from control valve and power cylinder inlet and outlet ports.

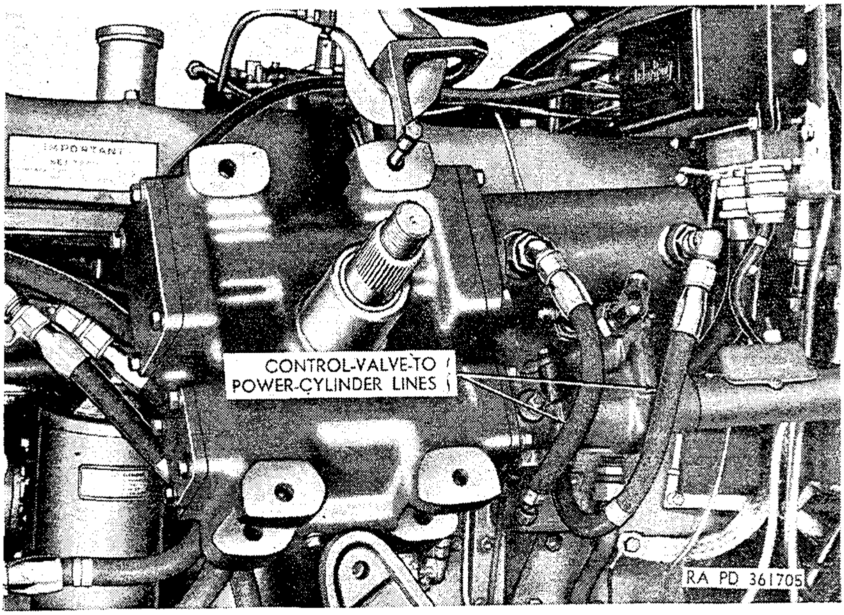


Figure 266. Removing steering gear.

f. Steering Gear Installation.

(1) Install six elbows in inlet and outlet ports of control valve (fig. 260) and power cylinder.

(2) Position two control-valve-to-power-cylinder lines (fig. 266) at inlet-and-outlet-port elbows on control valve and power cylinder, and tighten connectors.

(3) Position relief-valve mounting bracket (fig. 263) on right side of steering gear housing, install split-lockwasher screw, spacer, cap screw, washer, and safety nut, and tighten.

(4) Position steering gear in vehicle at right side of steering gear bracket, install three cap screws (fig. 263) and safety nuts, and tighten.

(5) Connect horn wire (fig. 263) to terminal at top of horn-contact-brush cover (fig. 260).

(6) Position inlet and outlet lines (fig. 263) at elbows on left side of control valve, and tighten connectors.

(7) Install relief valve (par. 248*c*).

(8) Install left front fender assembly (par. 321).

(9) Install steering wheel (par. 244*c*).

(10) Install steering jacket pad with four pad screws and lockwashers. Loosely install three cap screws and safety nuts (fig. 72) in holes in instrument panel and steering-gear-jacket mounting bracket, and adjust steering gear jacket (*b* (2) (*b*) above).

(11) Install pitman arm (*d* above).

(12) Adjust pitman arm shaft (*b* (1) above).

(13) Fill hydraulic oil reservoir (par. 67), and check all lines and connections for leaks.

(14) Record the replacement on DA Form 478.

246. Hydraulic Oil Reservoir

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Remove drain plug from bottom of reservoir (F, fig. 148) and drain oil from reservoir.

(2) Unscrew connector securing vent line (fig. 162) to top of reservoir, and remove line from reservoir.

(3) Disconnect two inlet lines at rear end of reservoir (par. 250).

(4) Disconnect outlet line at right side of reservoir (par. 250).

(5) Remove cap screw, washer, two mounting cushions, spacer, and safety nut securing mounting bracket on bottom of reservoir to top of frame left side rail.

(6) Support reservoir and remove two cap screws (fig. 262), four washers, and two safety nuts securing mounting brackets on front and rear ends of reservoir to left front-fender splash shield. Remove reservoir from vehicle.

c. Installation.

(1) Position steering gear hydraulic oil reservoir (F, fig. 148) on top of frame left side rail immediately to the rear of the left headlight support bracket. Secure mounting brackets on front and rear ends of reservoir to left front-fender splash shield with two cap screws (fig. 262), four washers, and two safety nuts. Tighten nuts.

(2) Secure mounting bracket on bottom of reservoir to top of frame left side rail with cap screw, washer, two mounting cushions, spacer, and safety nut. Tighten nut.

(3) Connect outlet line to fitting at right side of reservoir (par. 250).

(4) Connect two inlet lines to fittings at rear end of reservoir (par. 250).

(5) Position vent line (fig. 162) at fitting on top of reservoir, and tighten connector.

(6) Fill reservoir (par. 67), and check connections for leaks.

247. Hydraulic Pump

Note. The key letters noted in parentheses are in figure 148, except where otherwise indicated.

a. Removal.

(1) Disconnect two self-sealing couplings (G) and remove lines from inlet and outlet at left side of hydraulic pump (fig. 130).

Note. Place identification tags on lines to facilitate installation of pump.

(2) Remove lower pump mounting cap screw (C) and front ground strap (K) from front of timing gear cover.
(3) Support pump, remove upper pump mounting cap screw (C), and pull pump from rear of front crankcase plate.
(4) Remove nut and lockwasher from pump drive shaft, and remove drive gear and woodruff key from shaft.
(5) Remove coupling, elbow (E), and bushing (D) from upper port at left side of pump, and remove coupling, elbow (E), and bushing (D) from lower port at left side of pump.
(6) Remove and discard pump-to-front-crankcase-plate gasket.

b. Installation.

(1) Clean gasket surfaces of pump (fig. 130) and front crankcase plate.
(2) Install coupling, elbow (E), and bushing (D) at upper port on left side of pump, and install coupling, elbow (E), and bushing (D) at lower port on left side of pump.
(3) Position woodruff key and drive gear on end of pump drive shaft, install lockwasher and nut on shaft, and tighten nut.
(4) Position pump with new gasket at rear of front crankcase plate, install upper pump mounting cap screw (C) from front side of timing gear cover, and tighten.
(5) Insert lower pump mounting cap screw (C) in rear terminal of engine front ground strap (K), install cap screw from front of timing gear cover, and tighten.
(6) Connect self-sealing couplings (G) to inlet and outlet couplings at left side of hydraulic pump.

248. Relief Valve

(fig. 267)

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Unscrew coupling securing outlet line to relief valve, and remove line from valve outlet elbow.
(2) Remove relief valve from bracket bolted to steering gear housing.

Note. On some vehicles, the relief valve is secured to the bracket by two safety nuts installed on studs screwed into the valve body. On other vehicles, the relief valve is secured to the bracket by a cap screw and a safety nut installed on a stud screwed into the valve housing.

(3) Unscrew relief valve from tee, and remove valve from vehicle.
(4) Remove elbow from relief valve outlet.

c. Installation.

(1) Install elbow in relief valve outlet.
(2) Position relief valve inlet port at tee, and screw valve onto tee.

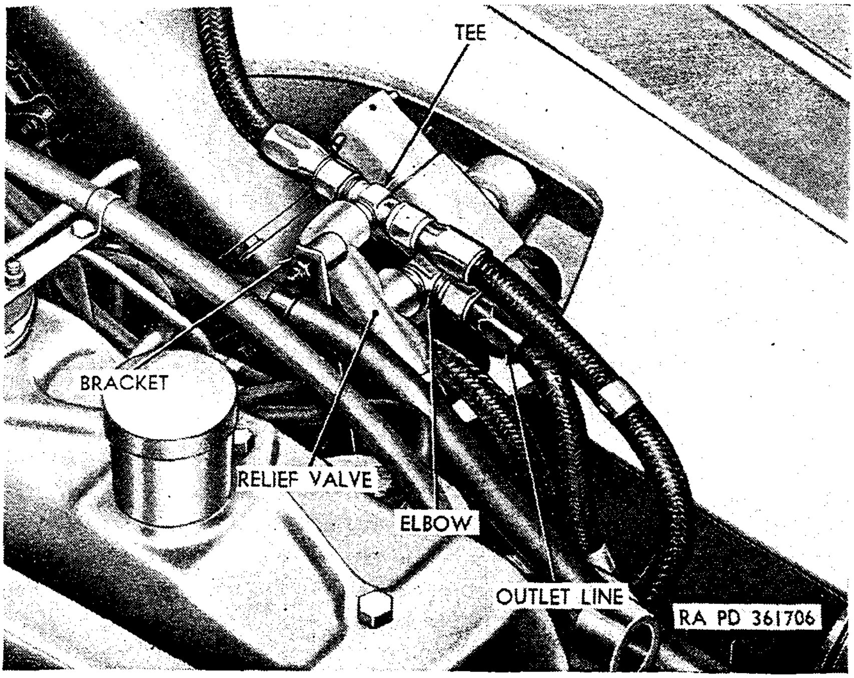


Figure 267. Top right view of relief valve installed.

(3) Secure relief valve to bracket bolted to steering gear housing. Refer to note in *b* (2) above.

(4) Position outlet line at valve outlet elbow, and tighten connector.

249. Steering Linkage

a. Upper Drag Link Removal.

(1) Remove dust shield (fig. 261) from pitman-arm end of upper drag link.

(2) Remove cotter pin (fig. 268) from drag link.

(3) Unscrew adjusting plug (fig. 268) as far as possible without removing it from end of drag link.

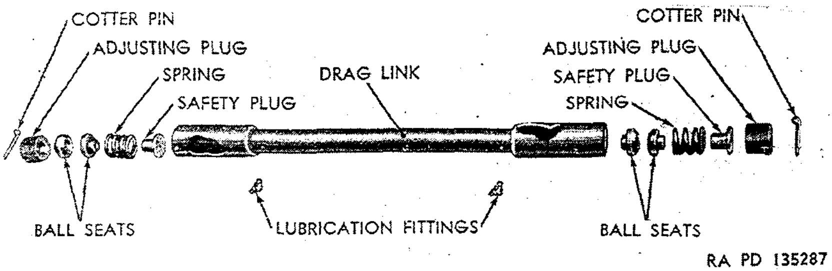


Figure 268. Drag link assembly—exploded view.

(4) Repeat (1), (2), and (3) above at relay-lever end of drag link.

(5) Turn steering wheel in both directions to loosen drag link ends, pull front end of drag link from ball stud at relay lever, and pull rear end of drag link from ball stud at pitman-arm, and remove drag link from vehicle.

b. Upper Drag Link Installation.

(1) Place rear end of upper drag link (fig. 261) on pitman-arm ball stud, and screw adjusting plug (fig. 268) into end of drag link but do not tighten.

Note. Distance between ball stud opening and drag link end is greater at one end of drag link assembly than at the other (fig. 268). Install upper drag link so that end with greater distance between ball stud opening and drag link end is at pitman-arm.

(2) Place front end of upper drag link on upper ball stud on relay lever (fig. 261), and screw adjusting plug into end of drag link but do not tighten.

(3) Install dust shield (fig. 261) at both ends of drag link, and lubricate drag link (par. 67).

(4) Turn adjusting plug into rear end of drag link until ball seats (fig. 268) clamp pitman-arm ball stud firmly; then back out adjusting plug until slot in plug is alined with first cotter pin hole. Install new cotter pin.

(5) Repeat in (4) above at front end of upper drag link.

c. Lower Drag Link Removal. Remove lower drag link (fig. 261) from ball studs at relay lever and steering arm (*a* above).

d. Lower Drag Link Installation. Install lower drag link (*b* above).

Note. Install lower drag link so that end with greater distance between ball stud opening and drag link end is at relay lever.

e. Relay Lever Removal (fig. 261).

(1) Remove front end of upper drag link from upper ball stud at relay lever (*a* above).

(2) Remove front end of lower drag link from lower ball stud at relay lever (*c* above).

(3) Remove safety nut and cap screw at left side of relay-lever bracket.

(4) Remove lubrication fitting from outer end of relay-lever pin, and install cap screw in lubrication fitting hole. Pulling on cap screw, pull relay lever pin from bracket, and remove lever from bracket.

f. Relay Lever Installation (fig. 261).

(1) Position relay lever in bracket on frame left side rail, and install relay-lever pin in bore of bracket and lever.

Note. Groove in pin must be at bottom of bracket bore.

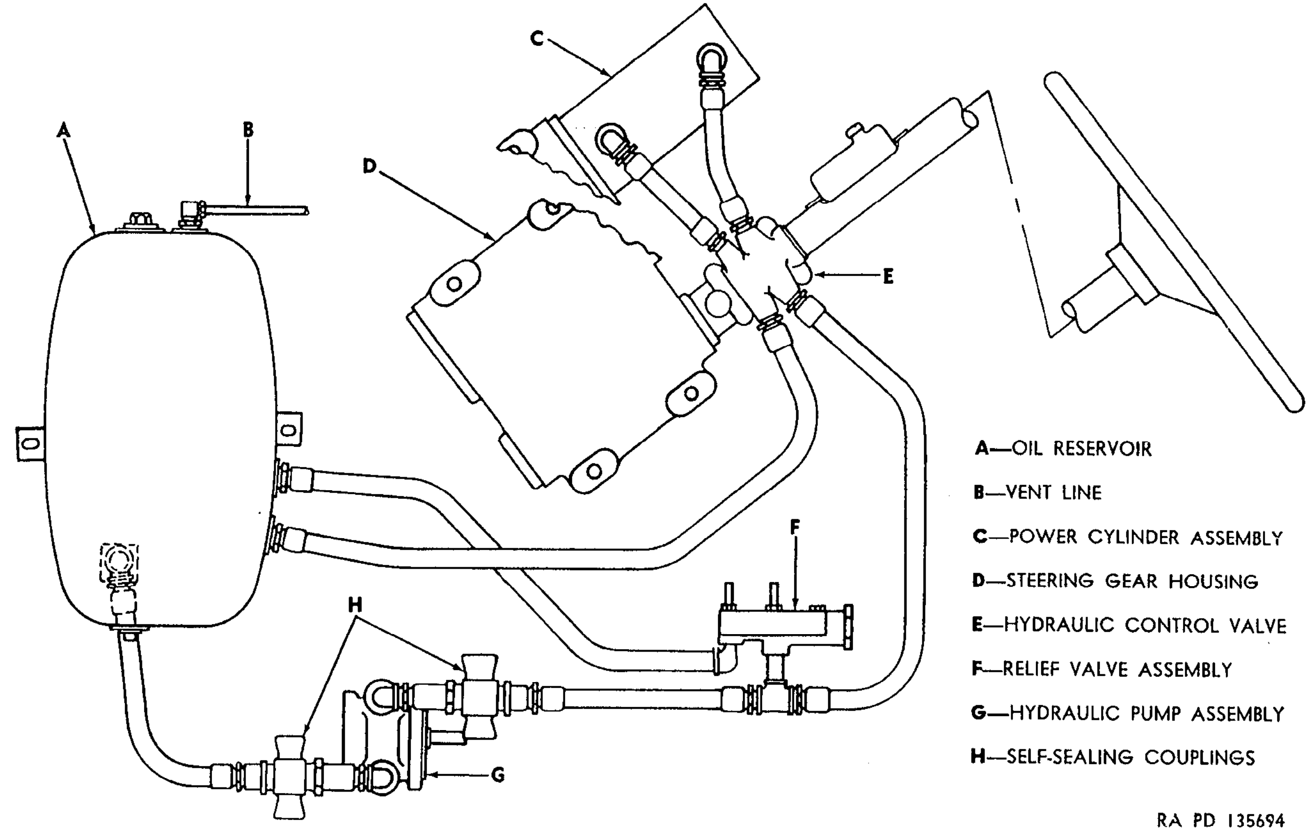


Figure 269. Steering hydraulic system piping diagram.

(2) Install cap screw and safety nut in left side of bracket to clamp pin in bracket. Tighten screw and nut.
(3) Install front end of lower drag link on lower ball stud at relay lever (*d* above).
(4) Install front end of upper drag link on upper ball stud at relay lever (*b* above).
(5) Remove cap screw from outer end of relay-lever pin, and install lubrication fitting in hole in end of pin. Lubricate relay lever (par. 67).

250. Hydraulic Lines and Couplings

The components of the steering hydraulic system (fig. 269) are connected by flexible lines equipped at both ends with threaded connectors. To facilitate service and maintenance of the steering system, the couplings are self-sealing, which makes it possible to separate the fluid carrying lines without loss of fluid.

Section XXIX. SPRINGS AND SHOCK ABSORBERS

251. Description and Data

a. Description.

(1) *Front springs.* Two semielliptic-type springs, one on each side, are mounted with the arch down at the front of the vehicle (fig. 270). An eye at the rear end of each spring is pinned to a shackle which is pivoted on a hanger attached to the frame side rail. This permits the rear end of the spring to move within the limits of the arc of travel of the shackle. An eye at the front end of each spring is pinned to a hanger attached to the frame side rail. The spring leaves are held together as an assembly by a bolt through the center of each leaf, and the leaves are held in alinement by six clips. The front axle is secured to each of the front springs by a pair of U bolts and clamp plates.
(2) *Rear springs.* Two semielliptic-type springs (fig. 228), one on each side, are mounted with the arch up at the rear of the vehicle. The center section of each spring is secured to a spring seat by two U-bolts. Both ends of each spring are free to slide in guide brackets bolted to the forward rear and rear rear axles. The spring leaves are held together as an assembly by a bolt through the center of each leaf, and the leaves are held in alinement by four clips.
(3) *Shock absorbers.* Two nonadjustable, double-acting shock absorbers (fig. 270), one on each side, are mounted at the front of the vehicle. The upper end of each shock absorber is secured by a safety nut and washer to a stud, which is

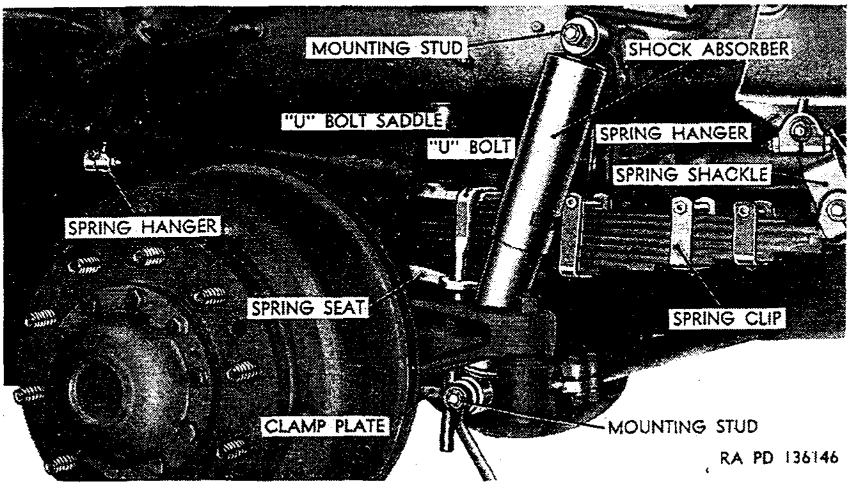


Figure 270. Left front spring and shock absorber—installed.

clamped to a bracket attached to the frame side rail. The lower end of each shock absorber is secured by a safety nut and washer to a stud, which is clamped to the spring clamp plate bolted to the underside of the front axle. Two rubber bushings are installed in both the upper and lower shock-absorber mounting eyes.

(4) *Torque rods.* Four torque rods (fig. 228) installed between the two rear axles and the left and right spring seats, and two torque rods installed between the two rear axles and the right rear-suspension-support bracket transmit driving and braking forces from the rear axles to the chassis. The six torque rod assemblies used on each rear suspension are identical, and the tapered stud at both ends of each torque rod is secured to its mounting bracket by a slotted nut locked in place with a cotter pin.

b. Data.

(1) *Front springs.*

Make	Standard Steel Spring Co.
Manufacturer's number	SSS–9112A
Ordnance number	7409345
Number of leaves	10
Length (under load)	50 in.
Width of leaves	3 in.

(2) *Rear springs.*

Make	Standard Steel Spring Co.
Manufacturer's number	SSS–9113
Ordnance number	7409613
Number of leaves	13
Length	59¼ in.
Width of leaves	4 in.

(3) *Shock absorbers.*

Make	Delco Products Div.
Model	750–T
Manufacturer's number	DP–5516454
Ordnance number	7409617

252. Front Springs
(fig. 270)

a. Removal.

(1) Raise frame to remove load from spring to be removed.

(2) Loosen safety nut on cap screw at bottom of front spring hanger, drive pin from hanger and front spring eye, and remove spring from front hanger.

(3) Loosen safety nut on cap screw at bottom of spring shackle, drive pin from shackle and rear spring eye, and remove spring from shackle.

(4) Remove safety nut securing lower shock-absorber mounting eye to stud at clamp plate. Remove washer, two rubber bushings, and mounting eye from stud.

(5) Remove four nuts and lockwashers from two U-bolts at underside of clamp plate, and remove clamp plate, two U-bolts, and U-bolt saddle.

(6) Lift spring off spring seat and remove from vehicle. Remove spring seat from axle.

b. Installation.

(1) Place spring seat on top of front axle, and position front spring on top of seat so that lower end of spring center-bolt enters hole in center of seat.

(2) Position U-bolt saddle on top of spring, and place two U-bolts over saddle with ends through holes in spring seat. Position clamp plate on underside of axle with U-bolts extending through holes in clamp plate, and install four lockwashers and nuts on the two U-bolts.

Note. Be sure that clamp plate is installed so that shock-absorber mounting stud is at rear of axle.

Tighten nuts on U-bolts.

(3) Install lower shock-absorber mounting eye, with rubber bushing inserted in each end of eye, on mounting stud at rear left side of clamp. Install washer and safety nut on stud and tighten.

(4) Position rear spring-eye at spring shackle, install pin through shackle and spring-eye, and tighten safety nut on cap screw at bottom of shackle to clamp pin in place.

(5) Position front spring-eye at spring hanger, install pin through hanger and spring-eye, and tighten safety nut on cap screw at bottom of hanger to clamp pin in place.

(6) Lower frame to place load on spring, and lubricate spring shackle and hanger pins (par. 67).

253. Rear Springs

(fig. 228)

a. Removal.

(1) Remove rear wheels (par. 241*g*).

(2) Raise frame to remove load from spring to be removed.

(3) Place jack under spring seat, and support seat to prevent seat and torque rod assembly from dropping when **U**-bolts are removed.

(4) Remove clamp bolts and nuts securing front and rear ends of spring seat tube bracket to underside of suspension bracket.

(5) Remove four nuts and lockwashers from two **U**-bolts. Lower spring seat on jack until ends of **U**-bolt are free of seat, remove **U**-bolts from spring saddle, and remove saddle from spring. On the wrecker truck M62 and tractor wrecker truck M246, remove **U**-bolts and the stabilizer beam from rear spring.

(6) Slide one end of spring through guide bracket on either axle until opposite end of spring is free of its guide bracket; then slide other end of spring from its guide bracket, and remove spring from vehicle.

b. Installation.

(1) Slide one end of spring through guide bracket on either axle; then slide other end of spring into its guide bracket, and position spring so that lower end of spring center-bolt is directly over hole in center of spring seat.

(2) Position spring saddle on top of spring, and place the two **U**-bolts over the saddle and spring. On the M62 and M246, place stabilizer beam over spring and secure with **U**-bolts.

(3) Raise spring seat and insert ends of **U**-bolts in holes in seat; then raise seat against spring, being sure that lower end of spring center-bolt enters hole in center of seat.

(4) Install four lockwashers and nuts on **U**-bolts, and tighten nuts.

(5) Install clamp bolts through front and rear ends of spring seat tube bracket and suspension bracket, and remove jack from under seat.

(6) Lower frame to place load on spring.

254. Spring Seats

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Bearing Adjustment.

(1) Remove wheels from both rear axles (par. 241) to provide access to spring seat to be adjusted.

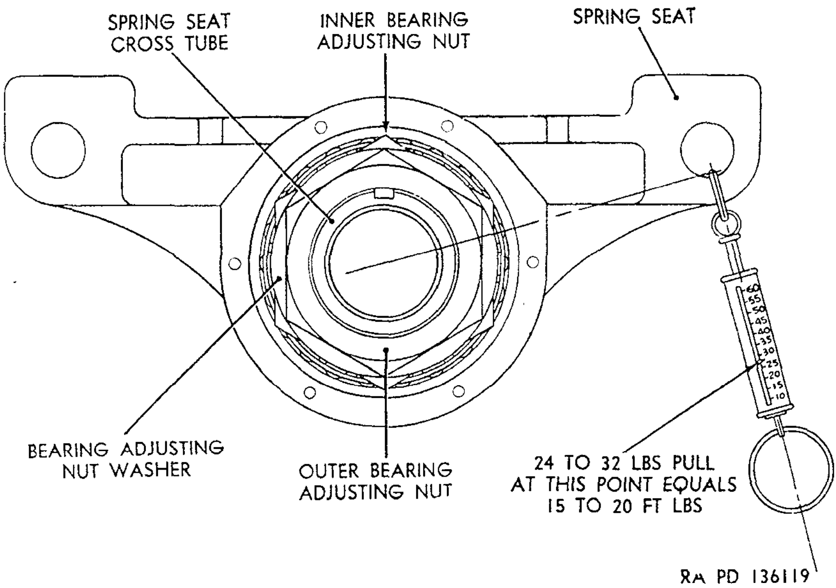


Figure 271. Spring seat bearing adjustment.

(2) Place jack under cross tube connecting left and right spring seats (fig. 230) and raise jack sufficiently to hold it in position.

(3) Remove four nuts and lockwashers from two **U**-bolts (fig. 230), and remove **U**-bolts from spring seat and spring saddle.

(4) Remove clamp bolts (fig. 230) from front and rear ends of spring seat.

(5) Place two jacks under spring, one on each side of spring seat, and raise spring clear of seat sufficiently to permit some rotation of spring seat around end of cross tube (fig. 271).

(6) Hook end of a tester scale in clamp bolt hole (fig. 271) and pull downward on scale, noting pull required to rotate spring seat on cross tube. When bearings are correctly adjusted, pull on scale required to rotate spring seat is 24 to 32 pounds, which is equal to 15 to 20 foot-pounds preload on bearings. If spring-seat bearing adjustment is required, proceed as in (7) through (11) below. Otherwise, proceed as in (12) through (17) below.

(7) Remove six cap screws (fig. 230) and lockwashers from spring seat cap, and remove cap from spring seat assembly. Remove and discard cap gasket.

(8) Remove outer bearing adjusting nut (fig. 271) and bearing adjusting nut washer from cross tube.

(9) Turn inner bearing adjusting nut (fig. 271) until a pull of 24 to 32 pounds on scale is required to rotate the spring seat.

(10) Install bearing adjusting nut washer and outer bearing-adjusting nut on cross tube, and tighten nut. Check bearing adjustment ((6) above).

(11) Position new cap gasket and spring seat cap on spring seat (fig. 230), install six cap screws and lockwashers, and tighten cap screws.

(12) Lower spring on spring seat, and remove jacks from under spring.

(13) With spring saddle (fig. 230) in position on top of spring, place two U-bolts over the saddle and spring, inserting the ends of the U-bolts in holes in spring seat.

(14) Install four lockwashers and nuts on the two U-bolts, and tighten nuts.

(15) Install clamp bolts (fig. 230) in front and rear ends of spring seat, and tighten bolts.

(16) Remove jack from under cross tube connecting left and right spring seats.

(17) Install wheels on both rear axles (par. 241).

c. Removal.

(1) Disconnect spring seat from spring (*b*(1) through (5) above).

(2) Remove six cap screws (fig. 230) and lockwashers from spring seat cap, and remove cap from spring seat assembly. Remove and discard cap gasket.

(3) Remove outer bearing adjusting nut (fig. 271), bearing adjusting nut washer, and inner bearing adjusting nut from cross tube.

(4) Pull spring seat with outer tapered roller bearing cone from cross tube, and remove cone from spring seat.

d. Installation.

(1) With inner tapered roller bearing cone in position on cross tube (fig. 271), install spring seat assembly on cross tube so that cone enters bearing cup in inner bore of seat.

(2) Install outer tapered roller bearing cone on cross tube, inserting cone in bearing cup in outer bore of seat.

(3) Install inner bearing adjusting nut on end of cross tube, and adjust bearings (*b*(6) above).

255. Torque Rods

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Lower Torque Rod Removal.

(1) Remove cotter pin and slotted nut from tapered stud (fig. 234) securing front end of lower left front torque rod to lower bracket at underside of left end of forward rear axle.

(2) Rap bracket sharply to loosen tapered stud in bracket bore and, using a pry bar, pry torque rod from bracket.

(3) Remove cotter pin and slotted nut (fig. 232) from tapered stud, securing rear end of torque rod to spring seat tube bracket.

(4) Using a drift and heavy hammer, drive tapered stud on end of torque rod from spring seat tube bracket, and remove torque rod from under vehicle.

c. *Lower Torque Rod Installation.*

(1) Insert tapered stud on rear end of lower left front torque rod through spring seat tube bracket (fig. 232), install slotted nut on stud, and tighten nut to 350 to 400 pound-feet torque. Install cotter pin in end of stud.

(2) Insert tapered stud (fig. 234) on front end of torque rod through lower bracket at underside of left end of forward rear axle, install slotted nut on stud, and tighten nut to 350 to 400 pound-feet torque. Install cotter pin in end of stud.

d. *Upper Torque Rod Removal.*

(1) Remove cotter pin and slotted nut from tapered stud, securing front end of upper right front torque rod to upper bracket (fig. 232) on top of right end of forward rear axle.

(2) Rap bracket sharply to loosen tapered stud in bracket bore and, using a pry bar, pry torque rod from bracket.

(3) Remove two brake line clips (fig. 228) from upper torque rod, and remove brake line from rod.

(4) Remove cotter pin and slotted nut from tapered stud securing rear end of torque rod to suspension bracket (fig. 228).

(5) Using a drift and heavy hammer, drive tapered stud on end of torque rod from bracket, and remove torque rod from under vehicle.

e. *Upper Torque Rod Installation.*

(1) Insert tapered stud on rear end of upper right front torque rod through suspension bracket (fig. 228), install slotted nut on stud, and tighten nut to 350 to 400 pound-feet torque. Install cotter pin in end of stud.

(2) Insert tapered stud on front end of torque rod through upper bracket (fig. 232), install slotted nut on stud, and tighten nut to 350 to 400 pound-feet torque. Install cotter pin in end of stud.

(3) Position brake line on upper torque rod and secure with two clamp clips (fig. 228).

Section XXX. FRONT WINCH ASSEMBLY

256. Description and Data

a. Description.

(1) *Front winch.* The front winch assembly (fig. 71) is mounted between the radiator and front bumper on extensions bolted to the left and right frame side rails. The front winch is a worm-gear, jaw clutch, horizontal drum-type with an internal automatic brake and a drum drag brake. The automatic brake, which is attached to the front end of the drive (worm gear) shaft, sustains the winch load whenever the delivery of power to the drive shaft is interrupted, as by shifting the control lever to neutral. The internally-mounted drag brake is in constant contact with the left end of the winch drum. It prevents the drum from spinning when free spooling (unwinding) cable. Some winches are equipped with a level winding device ((2) below) and a manually-operated cable tensioner which is mounted on the front of the winch.

(2) *Winch drive.* Power for operating the winch is supplied by the truck engine through a power-take-off (par. 208*a*(2) or (3)) which is connected to the winch by a propeller shaft (fig. 272). The propeller shaft is secured to the winch drive shaft by a shear pin which prevents damage to the winch resulting from overloading.

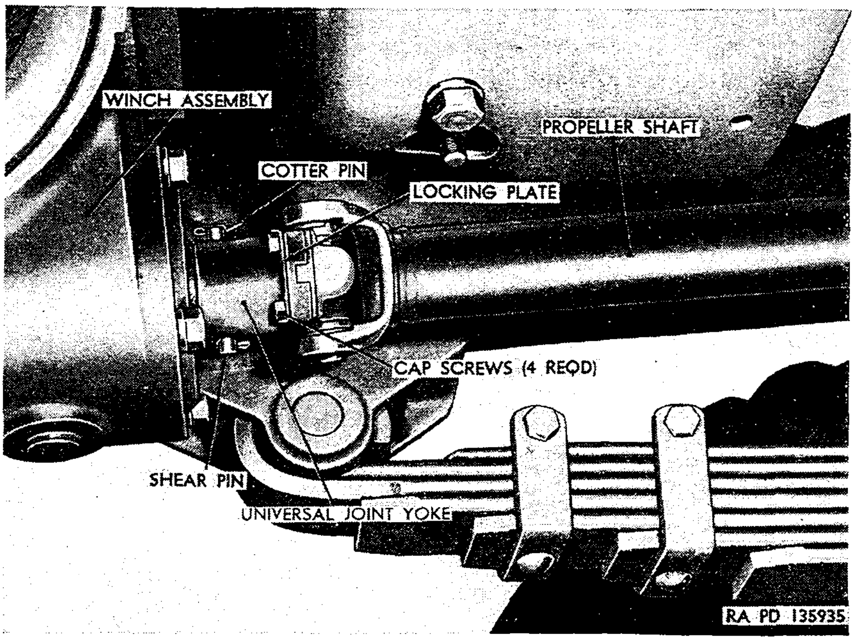


Figure 272. Bottom view of front winch and propeller shaft.

(3) *Level wind.* The front winch level wind (F, fig. 71) is bolted to the top of the end frame (left end of winch) and gear case (right end of winch). When winding cable, tension of the cable on the swivel sheave (P, fig. 132) causes the swivel sheave frame (K, fig. 132) to travel (on its four wheels) from side to side on the trolley track (L, fig. 132). This causes the cable to be wound on the drum in tight, even coils and layers, preventing loose layers or crossed coils which might crush or foul the cable.

b. Data.

Make	Gar Wood
Model	GW–DA615
Ordnance number	7727328
Capacity	20,000 lb.
Cable diameter	⅝ in.
Cable length:	
All models except M62 and M246	200 ft.
M62 and M246	280 ft.

257. Adjustment

a. Adjustment Tests.

(1) *Drag brake test.* To check drag brake adjustment, disengage winch drum clutch (par. 51*b*(2)) and pull on winch cable. Stop pulling cable and observe whether winch drum stops turning as soon as pulling is stopped. If winch drum continues to turn without pull on cable, adjust drag brake (*b* below).

(2) *Automatic brake test.* To check automatic brake adjustment, park truck at top of a steep grade with truck facing downhill. Attach winch cable to another truck at bottom of hill and, using front winch only (par. 51*c*), start pulling other truck up hill. When truck being pulled is part way up incline, shift front winch control lever into neutral (par. 51*b*(1)). If truck being pulled rolls backward, adjust automatic brake (*c* below).

b. Drag Brake Adjustment. To increase braking action of drag brake, turn adjusting screw (fig. 273) clockwise. Test adjustment as in *a*(1) above.

c. Automatic Brake Adjustment. To increase braking action of automatic brake, turn adjusting bolt (N, fig. 71) clockwise one-half turn, and test brake adjustment (*a*(2) above).

Note. Do not tighten more than one-half turn before testing.

Caution: If, after adjustment and testing for several minutes, the hand cannot be held on the brake cover (Q, fig. 71) because of heat, loosen the adjusting bolt one-half turn and again test the adjustment. When correctly adjusted, the brake will become warm but should not be too hot to allow the hand to be held on the brake cover.

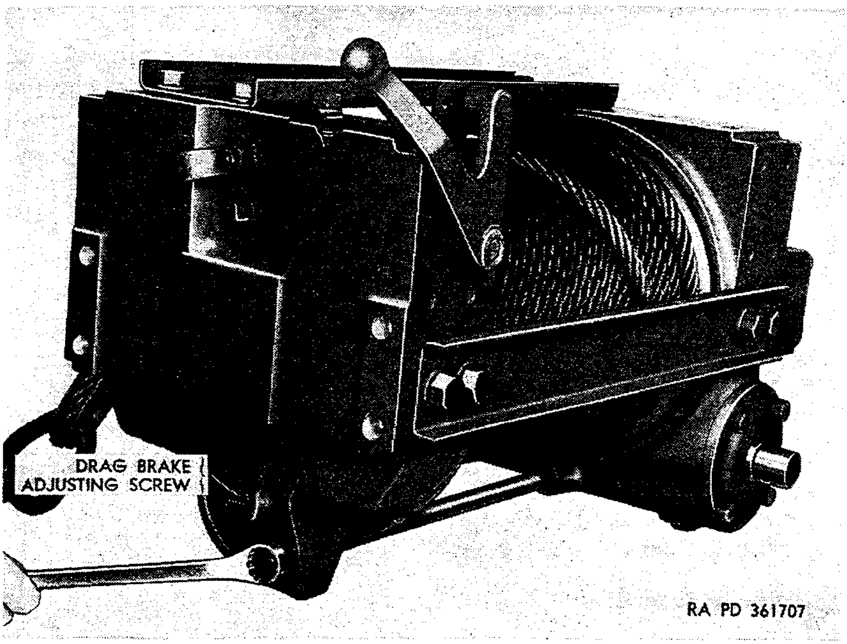


Figure 273. Left rear view of front winch removed from vehicle.

258. Front Winch

a. Removal.

(1) Attach hoisting equipment to winch and hoist until slack is just removed from chain or cable.

(2) Separate propeller-shaft front universal joint from yoke (fig. 272) on winch drive shaft (par. 211*a*(1)).

(3) Remove three hex-head bolts (fig. 152), safety nuts, and lockwashers from mounting bracket at each end of winch.

(4) Remove three cap screws (fig. 152) and lockwashers from support bracket at each end of winch.

(5) Hoist winch high enough to clear front bumper and remove winch from vehicle.

b. Installation.

(1) Attach hoisting equipment to winch (fig. 273) and hoist winch high enough to clear front bumper. Lower winch between frame side rail extensions and aline winch mounting holes.

(2) Install three cap screws (fig. 152) and lockwashers in holes in support bracket and side rail extension at each end of winch, and tighten cap screws.

(3) Install three hex-head bolts (fig. 152), lockwashers, and safety nuts in mounting bracket holes at each end of winch (fig. 152).

(4) Connect propeller-shaft front universal joint to yoke (fig. 272) on winch drive shaft (par. 211*b*(1) and (2)).

(5) Remove hoisting equipment from winch.

259. Propeller Shaft

a. Removal. Refer to paragraph 211*a*.

b. Installation. Refer to paragraph 211*b*.

c. Shear Pin Replacement (fig. 272). Turn universal joint yoke on winch drive shaft and aline shear pin holes in yoke with hole though shaft. Drive broken part of shear pin from drive shaft. Insert new aluminum alloy shear pin in holes in yoke and drive shaft, and install cotter pin in each end of shear pin.

Caution: Never substitute rivets, pins, or bolts for the regular shear pin.

260. Level Wind

a. Removal.

Note. The key letters noted in parentheses are in figure 132, except where otherwise indicated.

(1) Remove four cap screws (J) and lockwashers securing level wind cable guard (N) to swivel sheave frame (K). Remove cable guard.

(2) Remove winch cable (M) from swivel sheave (P), and place cable around one end of trolley track (L). Install cable guard, and four lockwashers and cap screws to prevent loss.

(3) Remove two cap screws (fig. 152) and washers securing right end of level wind to gear case. Remove two cap screws and washers securing left end of level wind to end frame.

(4) Lift level wind off winch and remove from vehicle.

b. Installation.

(1) Position level wind (fig. 152) on top of winch, and aline level wind mounting holes.

(2) Install two cap screws and washers in holes in right end of level wind and gear case, and tighten cap screws. Install two cap screws and washers in holes in left end of level wind and end frame, and tighten cap screws.

(3) Remove four cap screws (J) and lockwashers securing level wind cable guard (N) to swivel sheave frame (K). Remove cable guard.

(4) Place winch cable (M) in swivel sheave groove, position cable guard on swivel sheave frame, and install four cap screws with lockwashers in holes in guard and frame. Tighten cap screws.

261. Winch Cable

a. Removal. Completely unwind cable (M, fig. 132) from winch drum (par. 51*c*(2)). Remove hex-socket setscrew from winch drum, and pull end of cable from hole in drum. Pull cable from level wind swivel sheave (P, fig. 132) and tensioner sheaves.

b. Installation. Thread winch cable (M, fig. 132) between tensioner sheaves and over level wind swivel sheave (P, fig. 132). Insert end of cable in hole in drum, and tighten hex-socket setscrew to secure cable to drum. Wind cable on drum (par. 51*c*(7)).

Section XXXI. REAR WINCH ASSEMBLY

262. Description and Data

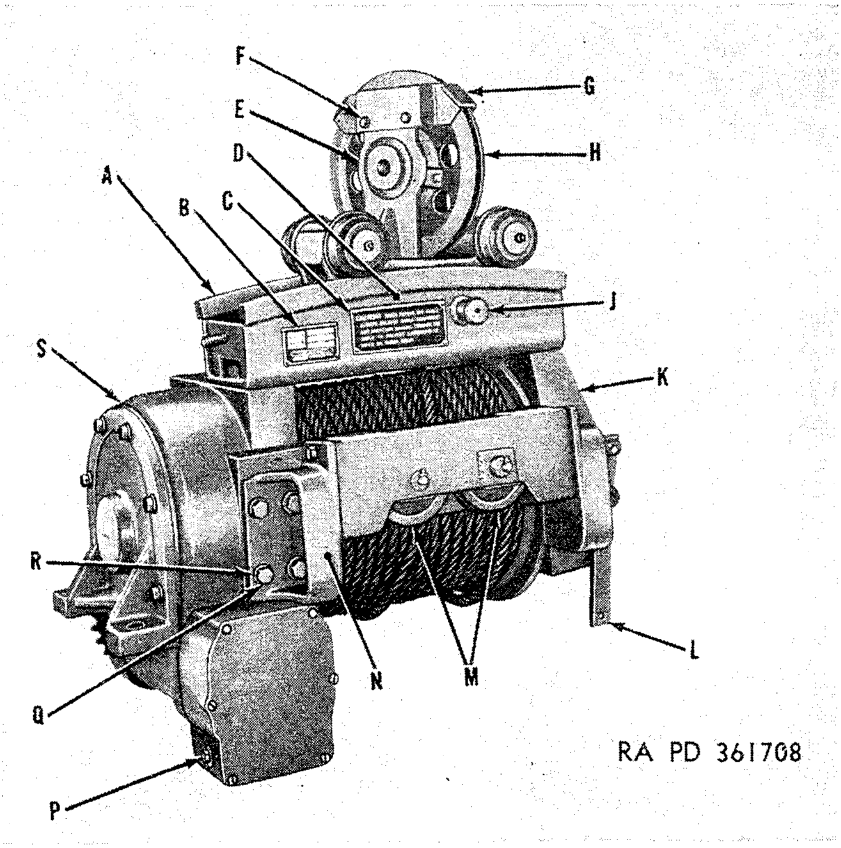
a. Description.

(1) *Rear winch.* The rear winch (fig. 274) is a worm-geared, horizontal drum-type with an internal automatic brake. It is used on the medium wrecker truck M62 only, and is mounted on the wrecker body to the rear of the crane (fig. 74). The automatic brake, which is attached to the rear end of the drive (worm gear) shaft, sustains the winch load whenever the delivery of power to the drive shaft is interrupted, as by shifting the winch shift lever to neutral. All rear winches are equipped with a level wind and a manually-controlled pneumatically-operated cable tensioner, which is mounted on the rear of the winch.

Note. The information in paragraph 4*a* regarding wrecker crane locational nomenclature does not apply to the rear winch on the medium wrecker truck M62.

(2) *Winch-drive.* Power for operating the winch is supplied by the truck engine through a power-take-off (par. 208*a*(4)), which is connected by a propeller shaft to the power divider (par. 268*a*(4)). A forward propeller shaft (fig. 275) and a rear propeller shaft (fig. 276), connected by a universal joint which is supported by a pillow block (M, fig. 277), extend from the power divider to the bearing assembly (fig. 276) bolted to the rear of the wrecker body. A drive sprocket secured to the rear end of the bearing assembly shaft is connected by a drive chain to the driven sprocket secured to the front end of the winch drive shaft. The driven sprocket is secured to the drive shaft by a shear pin which prevents damage to the winch resulting from overloading.

(3) *Level wind.* The rear winch level wind (D, fig. 274) is bolted to the top of the end frame (right end of winch) and gear case (left end of winch). When winding cable, tension of the cable on the swivel sheave (H, fig. 274) causes the swivel sheaves frame (E, fig. 274) to travel (on its four wheels) from side to side on the trolley track (A, fig. 274). This causes the cable to be wound on the drum in tight, even coils



A—Trolley track
B—Nameplate
C—Cable tension caution plate
D—Level wind
E—Swivel sheave frame
F—Cap screw
G—Cable guard
H—Swivel sheave
J—Level wind lock knob
K—End frame
L—Tension sheave adjusting frame lever
M—Tension sheave
N—Frame bracket
P—Automatic brake adjusting bolt
Q—Cap screw
R—Lockwasher
S—Gear case

Figure 274. Left rear view of rear winch removed from vehicle M62.

and layers, preventing loose layers or crossed coils which might crush or foul the cable.

(4) *Control linkage.* The rear winch control linkage is comprised of the winch shift lever (fig. 276), rear control rod (fig. 278), relay levers (fig. 275), and front control rod. The rear end of the rear control rod is connected to the lower end of the winch shift lever by a yoke and pin. The front end of the rear control rod is connected to the left relay lever (fig. 275) by a yoke and pin. The rear end of the front control rod is connected to the right relay lever (P, fig. 277) by a yoke and pin. The front end of the front control rod

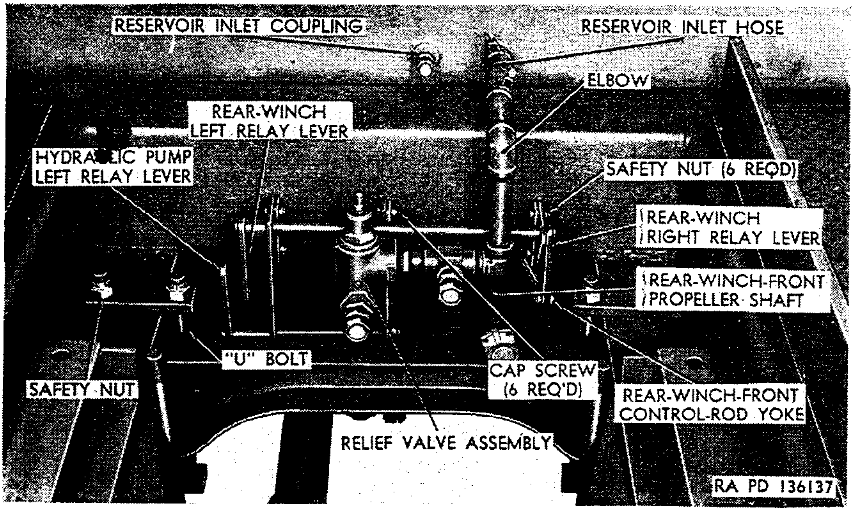


Figure 275. Rear view of forward end of wrecker body with crane removed M62.

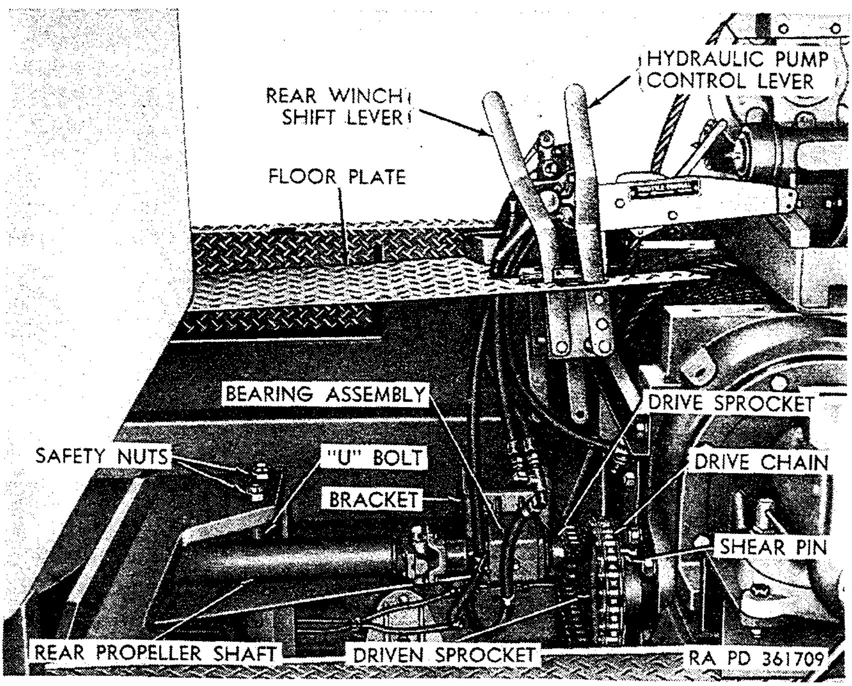
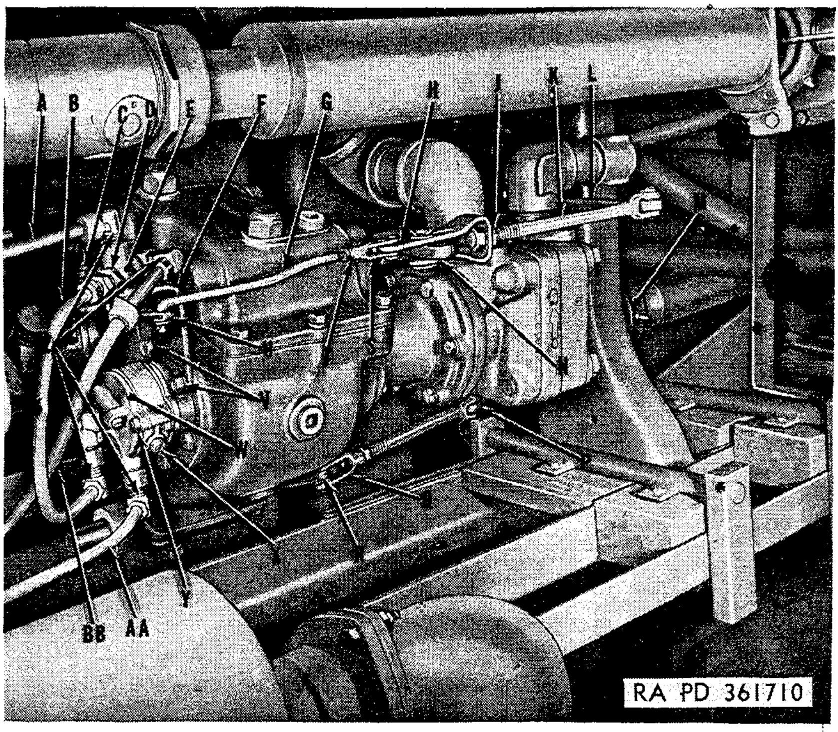


Figure 276. Left side view of rear end of wrecker body with floor plate raised M26.



A—Control-valve-to-governor line
B—Governor-valve-to-control-valve lin
C—Safety nut
D—Adapter
E—Governor-valve control valve
F—Control valve mounting bracket
G—Control-valve control rod
H—Slotted clevis
J—Nut
K—Hydraulic-pump front control rod
L—Hydraulic-pump right relay lever
M—Pillow block
N—Hydraulic - pump - output-shifter-shaft arm
P—Rear-winch right relay lever
Q—Rear - winch - front - control - rod adjustable yoke
R—Winch-output shifter shaft arm
S—Yoke
T—Nut
U—Control valve lever
V—Cap screws
W—Governor valve
X—Adjusting hole plug
Y—Nut
Z—Elbows
AA—Carburetor - to - governor - valve line
BB—Governor - valve - to - control-valve line

Figure 277. Bottom view of power divider installed on underside of hydraulic raised M62.

is connected to the winch-output-shifter-shaft arm (R, fig. 277) by a yoke and pin. The yoke at the rear end of both the front and rear control rod is threaded onto the rod to permit adjustment of the winch control linkage.

b. Data.

Make	Gar Wood
Model	GW–ESA716K
Ordnance number	7409980
Capacity	45,000 lb.
Cable diameter	¾ in.

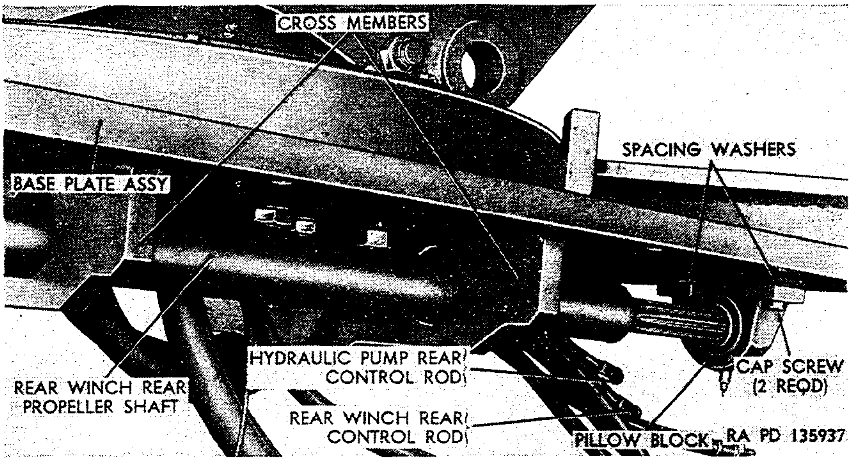


Figure 278. Right side view of underside of crane base plate removed from vehicle M62.

263. Adjustment

a. Automatic Brake Adjustment. The automatic brake used on the rear winch is the same as the one used on the front winch. For procedures to be followed in adjusting this brake, refer to paragraph 257*c*.

b. Cable Tensioner Adjustment.

(1) *Preliminary procedures and test.*

(*a*) Remove chain and hook assembly from winch cable and pull cable from between tension sheaves (M, fig. 274).

(*b*) Start engine to build up normal operating pressure (105 to 120 psi) in compressed air system.

(*c*) Move cable tensioner control valve lever to "ON" position (fig. 43).

(*d*) Check opening between sheaves with a 5/8-inch diameter rod. If rod cannot be inserted between sheaves, or if rod fits loosely between sheaves, adjust cable tensioner ((2) below). If opening between sheaves is correct (sheaves just closed on rod), proceed as in (2) (*g*), (*h*), and (*i*) below.

(2) *Adjustment.*

(*a*) Remove cotter pin (fig. 279) and yoke pin securing air-chamber push rod yoke to lower end of tension-sheave-adjusting-frame lever, and remove yoke from lever.

(*b*) Loosen locknut on air-chamber push rod, and turn yoke on push rod as necessary to obtain correct gap between sheaves.

Note. Turning yoke clockwise on push rod increases the distance between the sheaves (when cable tensioner control valve lever is in the "ON" position). Turning yoke counterclockwise on push rod decreases distance between sheaves.

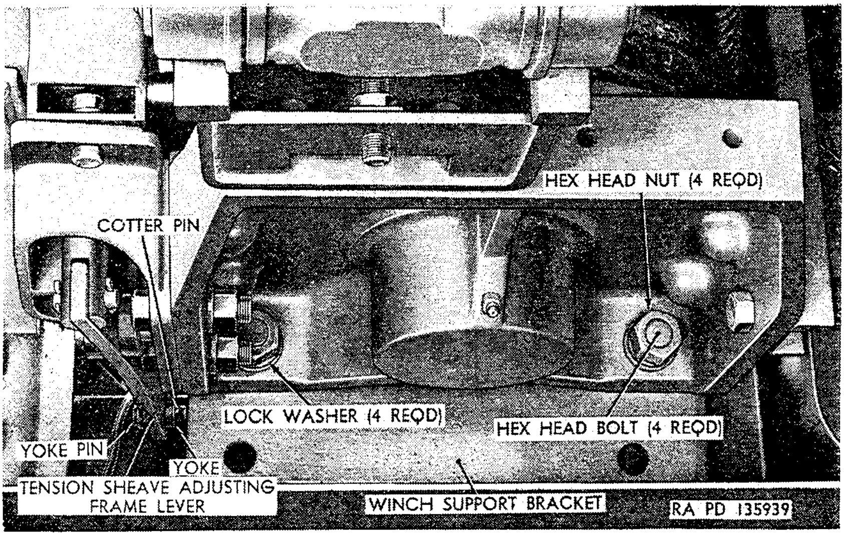


Figure 279. Top view of right end of rear winch—installed.

(*c*) Tighten locknut on air-chamber push rod.

(*d*) Position push rod yoke on lower end of tension-sheave-adjusting-frame lever, and install yoke pin through yoke and lever. Install cotter pin in end of yoke pin.

(*e*) Insert the ⅝-inch diameter rod between the sheaves, and move the control valve lever to the ON position. Sheaves should just close on rod. If necessary, repeat (*a*) through (*e*) above until correct adjustment is obtained.

(*f*) Move control valve lever to OFF position, and measure opening between sheaves (maximum distance between grooves). Opening should be at least $^{13}/_{16}$ inch to permit ¾-inch cable to pass freely between sheaves when unwinding cable.

(*g*) Stop engine.

(*h*) Pass cable between tension sheaves (M, fig. 274) and between upper and lower guide rollers (fig. 74).

(*i*) Install chain and hook assembly on winch cable.

c. Control Linkage Adjustment.

(1) Move rear winch shift lever (fig. 75) to NEUTRAL position. Lock lever in this position by means of the lock hinge attached to the floor plate.

(2) Remove cotter pin and yoke pin securing front control rod yoke (Q, fig. 277) to winch-output-shifter-shaft arm (R, fig. 277), and remove control rod yoke from arm.

(3) Pushing on shifter shaft arm, push shifter shaft into power divider as far as it will go; then pull shifter shaft out of power divider to the NEUTRAL position. This can be felt

due to a poppet ball inside the power divider falling into the first groove (of two) on the shifter shaft. This movement of the shifter shaft from the UNWIND to the NEUTRAL position is approximately 1⅜ inches.

(4) Loosen locknut on forward control rod and turn yoke on control rod as necessary until yoke can be connected to shifter shaft arm without movement of shifter shaft.

Note. If linkage is so far out of adjustment that correct adjustment cannot be obtained by following the procedures in (1) through (4) above, make additional adjustment at yoke connecting rear control rod to lower end of winch shift lever.

(5) Tighten locknut on forward control rod.

(6) Position control rod yoke over shifter shaft arm, install yoke pin through yoke and arm, and install cotter pin in end of yoke pin.

Note. When proper adjustments have been made, movement of the rear winch shift lever from neutral to unwind is three-quarters of an inch. Movement of the lever from neutral to wind is 1⅜ inches.

d. Rotochamber Adjustment. Refer to paragraph 270*a*.

264. Rear Winch

a. Removal.

(1) Remove cotter pin (fig. 279) and yoke pin securing air-chamber push rod yoke to lower end of tension-sheave-adjusting-frame lever, and remove yoke from lever.

(2) Remove two cap screws and safety nuts securing floor plate (fig. 276) to support bracket bolted to rear of winch.

(3) Remove drive chain (par. 265*i*).

(4) Remove four hex-head bolts (fig. 279), nuts, and lockwashers securing winch to left and right support brackets.

(5) Remove chain and hook assembly from winch cable.

(6) Using wrecker crane (fig. 280) or other overhead hoisting equipment, remove rear winch from vehicle.

b. Installation.

(1) Lift rear winch into position on rear of wrecker body, and aline winch mounting holes with holes in left and right support brackets.

(2) Secure winch to support brackets with four hex-head bolts (fig. 279), lockwashers, and nuts.

(3) Pass cable between tension sheaves (M, fig. 274) and between upper and lower guide rollers (fig. 74), and install chain and hook assembly on cable.

(4) Install drive chain (par. 265*j*).

(5) Install two cap screws in holes in floor plate (fig. 276) and support bracket bolted to rear of winch. Install safety nuts on screws and tighten.

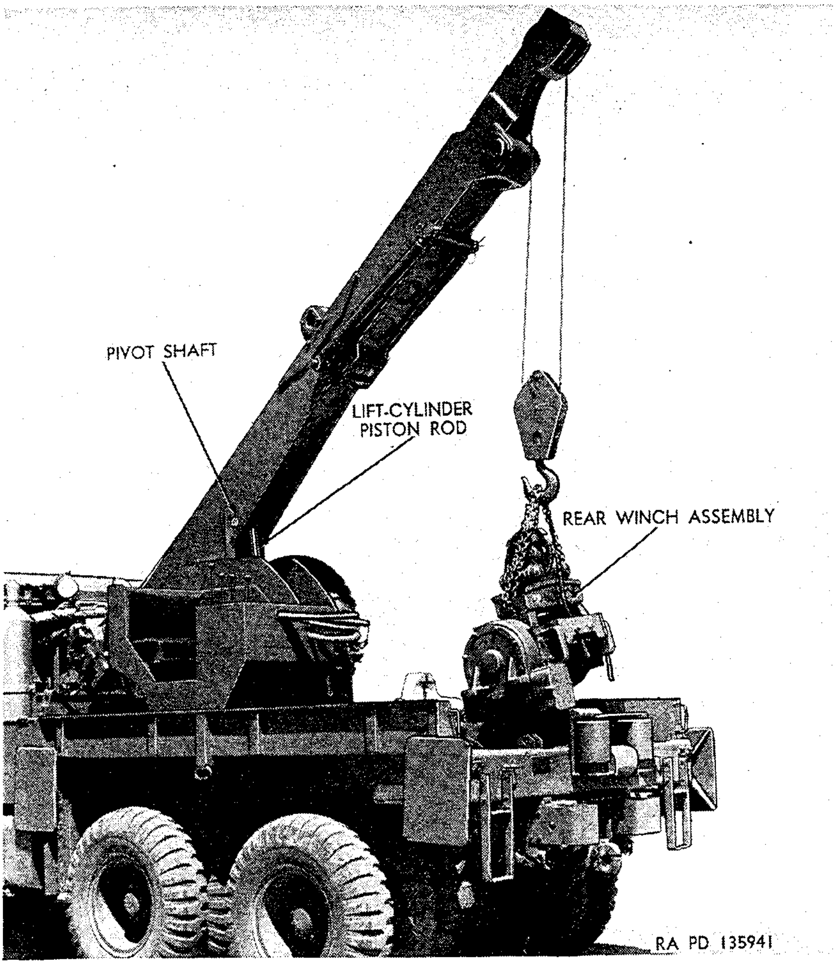


Figure 280. Removing rear winch assembly using wrecker crane.

(6) Position air-chamber push rod yoke on lower end of tension-sheave-adjusting-frame lever (fig. 279), and secure with yoke pin and cotter pin.

c. Cable Tensioner Removal.

(1) Remove rear winch (*a* above).

(2) Remove four cap screws (Q, fig. 274) and lockwashers securing cable tensioner to gear case (S, fig. 274).

(3) Remove four cap screws, four lockwashers, and two hex nuts securing cable tensioner to end frame (K, fig. 274), and remove tensioner from winch.

d. Cable Tensioner Installation.

(1) Position cable tensioner on rear of winch, and aline holes in right tension-sheave-frame bracket and end frame (K, fig. 274).

(2) Install four cap screws, four lockwashers, and two hex nuts in holes in bracket and end frame. Tighten screws and nuts.
(3) Install four cap screws (Q, fig. 274) and lockwashers in holes in left tension-sheave-frame bracket (N, fig. 274) and gear case (S, fig. 274), and tighten screws.
(4) Install winch (*b* above).

265. Winch Drive

a. Front Propeller Shaft Removal.

(1) Disconnect front propeller-shaft front universal joint from yoke on power-divider winch output shaft (par. 211*a*(1)).
(2) Pull propeller shaft toward front of vehicle, removing rear universal joint with slip yoke assembly from front (splined) end of rear propeller shaft (fig. 278).
(3) Disconnect front propeller-shaft rear universal joint from rear propeller shaft slip yoke (par. 211*a*(1)).
(4) Remove universal joint at each end of front propeller shaft (par. 211*a*(3)).

b. Front Propeller Shaft Installation.

(1) Install universal joint at each end of front propeller shaft (par. 211*b*(1), (2), and (3)).
(2) Attach rear propeller shaft slip yoke to front propeller-shaft rear universal joint (par. 211*b*(4) and (5)).
(3) Slide rear propeller shaft slip yoke, with front propeller shaft attached, on front (splined) end of rear propeller shaft (fig. 278).
(4) Connect front propeller-shaft front universal joint to yoke on power-divider winch output shaft (par. 211*b*(4) and (5)).

c. Rear Propeller Shaft Removal. Wrecker crane base plate must be removed from vehicle to remove winch-drive rear propeller shaft. Refer to paragraph 274*a*.

d. Rear Propeller Shaft Installation. Refer to paragraph 274*b*.

e. Pillow Block Removal.

(1) Disconnect front propeller-shaft rear universal joint from slip yoke on front (splined) end of rear propeller shaft (par. 211*a*(1)).
(2) Slide slip yoke from front end of rear propeller shaft (fig. 278).
(3) Remove two cap screws (fig. 278) securing pillow block to underside of base plate, and remove spaicng washers from between base plate and pillow block.
(4) Loosen setscrew securing pillow-block-bearing inner race to rear propeller shaft, and slide pillow block forward and remove from shaft.

f. Pillow Block Installation.

(1) Slide pillow block (fig. 278) on front (splined) end of rear propeller shaft, and aline mounting holes with holes in underside of base plate.

(2) Place spacing washers between pillow block and base plate, and secure pillow block to underside of base plate with two cap screws.

(3) Tighten setscrew in pillow-block-bearing inner race to secure race to shaft.

(4) Slide slip yoke on front end of rear propeller shaft, and connect front propeller-shaft rear universal joint to slip yoke (par. 211*b*(4) and (5)).

g. Bearing Assembly Removal (fig. 276).

(1) Disconnect rear propeller-shaft rear universal joint from yoke on front (splined) end of drive sprocket shaft.

(2) Remove two safety nuts from studs securing bottom of bearing assembly to mounting bracket.

(3) Remove two hex-head bolts, lockwashers, and nuts securing top of bearing assembly to mounting bracket, and remove bearing assembly and spacing shims from bracket. Remove drive chain from drive sprocket.

Note. Keep spacing shims intact in order to obtain proper drive chain tension following bearing assembly installation.

(4) Slide yoke from front (splined) end of drive sprocket shaft.

h. Bearing Assembly Installation (fig. 276).

(1) Insert two hex-head bolts in bearing assembly mounting holes, and place spacing shims on bolts and studs on left side of bearing assembly.

(2) Inserting hex-head bolts and studs in mounting bracket holes, position bearing assembly with spacing shims on mounting bracket. Loosely install two lockwashers and nuts on bolts, and install two safety nuts on studs.

(3) Place drive chain on drive sprocket, and tighten nuts on bearing mounting studs and bolts to 50 to 60 pound-feet torque. Check drive chain for proper tension (½-inch deflection at mid-point between drive sprocket and driven sprocket). If necessary, remove bearing assembly and add or remove spacing shims until proper chain tension is obtained.

(4) Slide slip yoke on front (splined) end of drive sprocket shaft.

(5) Connect rear propeller-shaft rear universal joint to slip yoke on drive sprocket shaft (par. 211*b*(4) and (5)).

i. Drive Chain Removal.

(1) Remove two nuts, lockwashers, and cap screws securing chain guard (fig. 75) to floor plate.

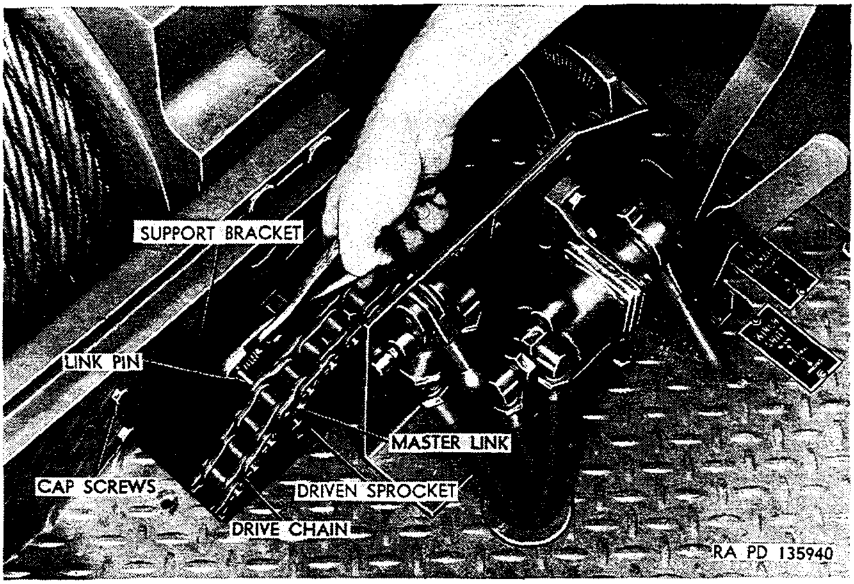


Figure 281. Separating rear winch drive chain M62.

(2) Operate winch (par. 52*c*), turning drum in small increments, until master link (fig. 281) in chain is visible.

(3) Remove cotter pin and link pin (fig. 281) from master link, and separate ends of chain. Remove chain from sprockets.

j. Drive Chain Installation.

(1) Loosen nuts securing bearing assembly (fig. 276) to mounting bracket.

(2) Place drive chain (fig. 276) around sprockets, pull ends of chain together, and install link pin (fig. 281). Install cotter pin in end of link pin.

(3) Tighten nuts on bearing assembly mounting studs and bolts to 50 to 60 pound-feet torque. Check drive chain for proper tension (½-inch deflection at midpoint between drive sprocket and driven sprocket). If necessary, remove bearing assembly and add or remove spacing shims until proper chain tension is obtained.

(4) Position chain guard (fig. 75) on floor plate, and secure with two cap screws, lockwashers, and nuts.

k. Shear Pin Replacement. Turn driven sprocket (fig. 276) on winch drive shaft and aline shear pin holes in sprocket hub and shaft. Drive broken part of shear pin from drive shaft. Insert new shear pin in holes in sprocket hub and drive shaft, and install cotter pin in end of shear pin.

Caution: Never substitute rivets, pins, or bolts for the regular shear pin.

266. Level Wind

Note. The key letters noted in parentheses are in figure 274, except where otherwise indicated.

a. Removal.

(1) Remove four cap screws (F) and lockwashers (two from each side) securing cable guard (G) to swivel sheave frame (E).

(2) Remove winch cable from swivel sheave (H), and place cable around one end of trolley track (A). Replace cable guard, four lockwashers, and four cap screws to prevent loss.

(3) Remove two cap screws and lockwashers securing left end of level wind to end frame (K). Remove two cap screws and lockwashers securing right end of level wind to gear case (S).

(4) Lift level wind (D) off winch and remove from vehicle.

b. Installation.

(1) Position level wind (D) on top of winch, and aline level wind mounting holes.

(2) Install two cap screws and lockwashers in holes in right end of level wind and gear case (S). Install two cap screws and lockwashers in holes in left end of level wind and end frame (K). Tighten cap screws to 80 to 100 pound-feet torque.

(3) Remove four cap screws (F) and lockwashers securing cable guard (G) to swivel sheave frames (E), and remove cable guard.

(4) Place winch cable in swivel sheave groove, position cable guard on swivel sheave frame, and install four cap screws and lockwashers in holes in guard and frame. Tighten cap screws to 20 to 25 pound-feet torque.

267. Winch Cable

a. Removal.

(1) Completely unwind cable from winch drum (par. 52*c*).

(2) Remove hex-socket setscrew from winch drum, and pull end of cable from hole in drum.

(3) Remove cable from level wind sheave (H, fig. 274) and guide rollers (fig. 74).

b. Installation.

(1) Pass cable between upper and lower guide rollers (fig. 74) and over level wind swivel sheave (H, fig. 274).

(2) Insert end of cable in hole in winch drum. Install hex-socket setscrew in hole in drum, and tighten setscrew to secure cable to drum.

(3) Wind cable on drum (par. 52*c*).

Section XXXII. WRECKER CRANE (M62)

268. Description and Data

a. Description.

(1) *General.* The hydraulically-operated crane mounted on the rear of the chassis of the medium wrecker truck M62 consists primarily of the assemblies described in (2) through (17) below. The complete crane can be replaced as a single unit providing hoisting equipment having a capacity of approximately 8,000 pounds is available. However, the illustrations and replacement instructions contained in this section refer to replacement of the individual units and assemblies comprising the crane.

Note. The information in paragraph 4*a* regarding wrecker crane locational nomenclature does not apply to the power divider, power divider controls, and rear winch.

(2) *Clutch control valve.* The clutch control valve (fig. 75) is a two-way air valve connected in the compressed air system (fig. 282) between the air supply line and the roto chamber ((3) below). The valve is bolted to a bracket attached to the front of the wrecker body floor plate. When the valve lever is in the DISENGAGE position, compressed air is permitted to pass through the valve and control-valve-to-roto-chamber air line into the rear end of the rotochamber.

(3) *Roto chamber* (fig. 146). The roto chamber is a single-acting air cylinder having a spring-loaded piston, which causes the piston to move to and remain at the rear end of the cylinder whenever the clutch control valve lever is in the ENGAGE position. The front end of the roto chamber push rod is connected by an adjustable yoke and pin to the clutch release outer lever. Compressed air admitted into the rear end of the roto chamber through the clutch control valve ((2) above) causes the piston inside the roto chamber to move forward. This causes the push rod and outer lever to contact and push the clutch release inner lever forward, thereby disengaging the clutch.

(4) *Power divider assembly.* The power divider assembly (figs. 283 and 284) is a single-speed gear box with one input (drive) shaft and two output shafts. It is mounted by a bracket to the bottom of the hydraulic reservoir (fig. 285). The drive shaft yoke (fig. 284) is connected by a propeller shaft and universal joint to the power-take-off (fig. 207) mounted on the rear of the transfer. The winch output shaft yoke (fig. 283) is connected by a universal joint to the front end of the rear-winch front propeller shaft (fig. 275). The hydraulic

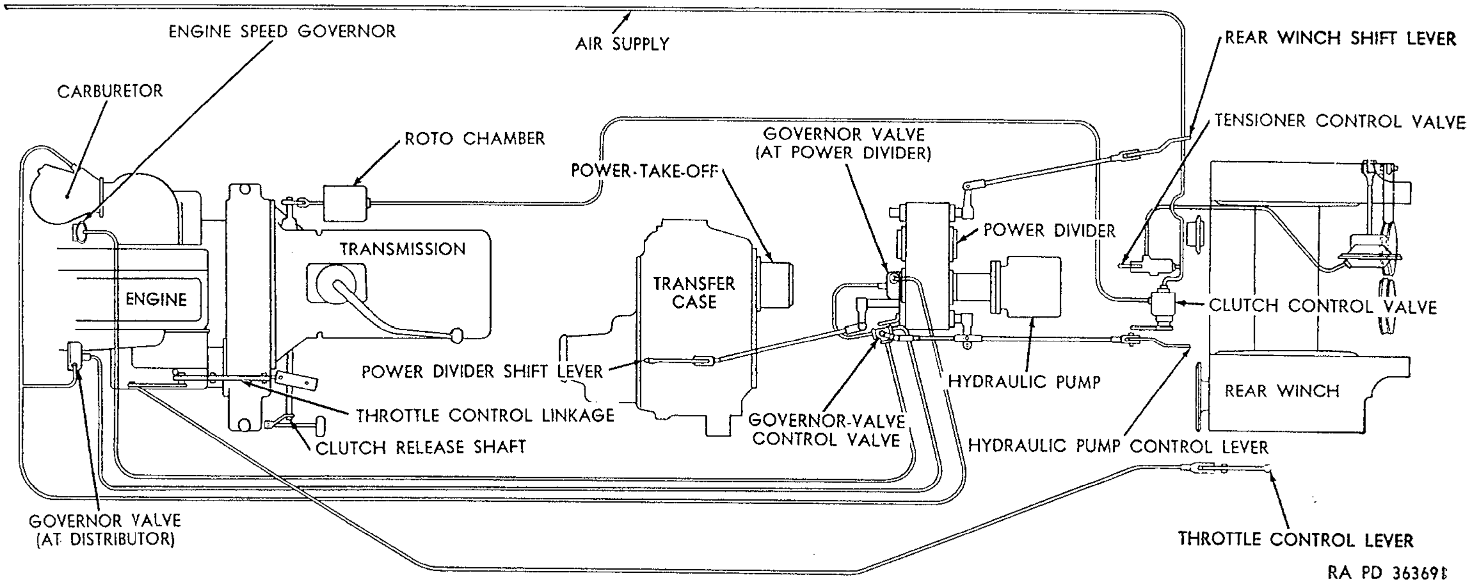


Figure 282. Wrecker crane (M62) air lines.

pump output shaft is connected by a coupling (fig. 283) to the hydraulic pump input shaft. When the hydraulic pump control lever is in the DISENGAGE position, the air passages inside the governor-valve control valve (E, fig. 277 and fig. 282) are arranged so that the engine speed governor (fig. 282) is controlled by the governor valve (M, fig. 135) mounted on the rear of the distributor drive housing. This valve is adjusted to govern the engine speed at 2,950 rpm (maximum no-load speed) for truck operation (par. 126*b*). When the hydraulic pump control lever is in the ENGAGE position, the air passages inside the governor-valve control valve are arranged so that the engine speed governor is controlled by the governor valve (W, fig. 277) mounted on the front of the power divider. This valve is adjusted to govern the engine speed at 1,600 rpm (no-load) for crane operation. The power divider, hydraulic pump, and relief valve ((6) below) are removed from the vehicle as a single unit.

(5) *Power divider controls.* The power divider controls consist of the rear winch control linkage (par. 262*a*(4)) and hydraulic pump control linkage. The hydraulic pump control linkage is comprised of the hydraulic pump control lever (fig. 75), rear control rod (fig. 278), relay lever (fig. 275), front

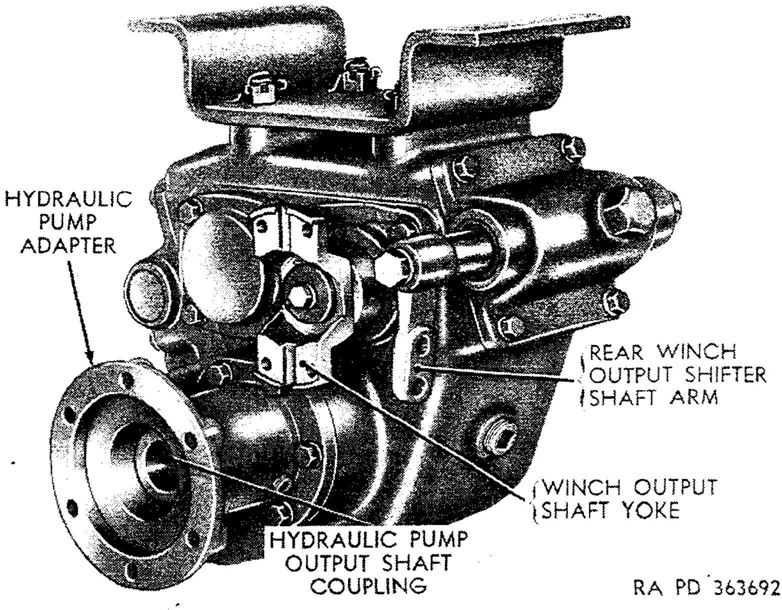


Figure 283. Rear view of power divider removed from vehicle M62.

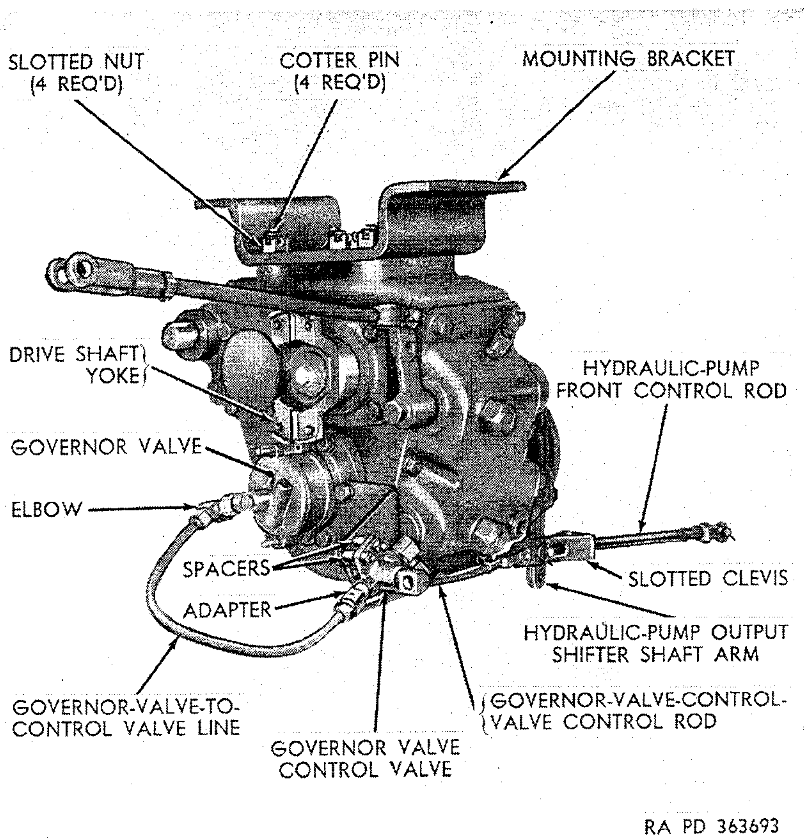


Figure 284. Front view of power divider removed from vehicle M62.

control rod (K, fig. 277), and governor-valve-control-valve control rod (G, fig. 277). The rear end of the rear control rod is connected to the lower end of the control lever (fig. 276) by a yoke and pin. The front end of the rear control rod is connected to the left lever of the relay lever assembly by a yoke and pin. The rear end of the front control rod is connected to the right lever of the relay lever assembly by a yoke and pin. The front end of the front control rod (fig. 284) is connected to the pump-output-shifter-shaft arm and to the rear end of the governor-valve-control-valve control rod. The front end of the governor-valve-control-valve control rod is connected to the valve lever (U, fig. 277).

(6) *Hydraulic pump and relief valve.* The flange-mounted vane-type hydraulic pump (fig. 285) is bolted to the hydraulic pump adapter (fig. 283) mounted on the rear of the power divider. The hydraulic pump output shaft coupling (fig. 283) is keyed to the power-divider output shaft and to the

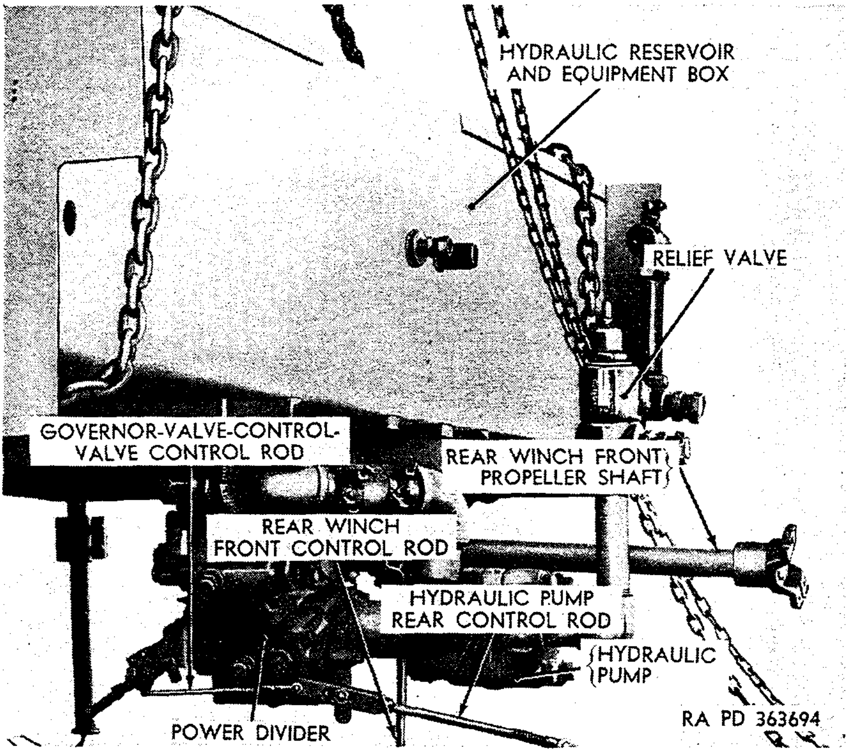


Figure 285. Hydraulic reservoir with power divider, pump, and relief valve removed from vehicle (M62).

hydraulic-pump shaft. The adjustable relief valve assembly (fig. 285) is connected to the hydraulic-pump outlet port. The purpose of this valve is to protect the crane hydraulic system from excessive (above 1,200 psi) pump pressures.

(7) *Base plate and pivot post assembly.* The base plate and pivot post assembly as referred to in this paragraph consists of the crane base plate (fig. 286), pivot post (fig. 286), shipper support (fig. 287), swivel valve assembly (fig. 288), and operator's compartment and control valve bank assembly (fig. 288). The combined weight of these units is approximately 3,500 pounds. The base plate is bolted to the crane body, which is bolted to the left and right frame side rails. The pivot post, which is hollow, is internally supported at the top and bottom by tapered roller bearings, which are installed on a tubular support member attached to the base plate. The pivot post support cap (fig. 289) bolted to the top of the pivot post support, anchors the pivot post to the support while permitting the pivot post to rotate freely on its vertical axis. The shipper support, on which the boom and shipper assembly ((10) below) are pivoted, is bolted to mounting

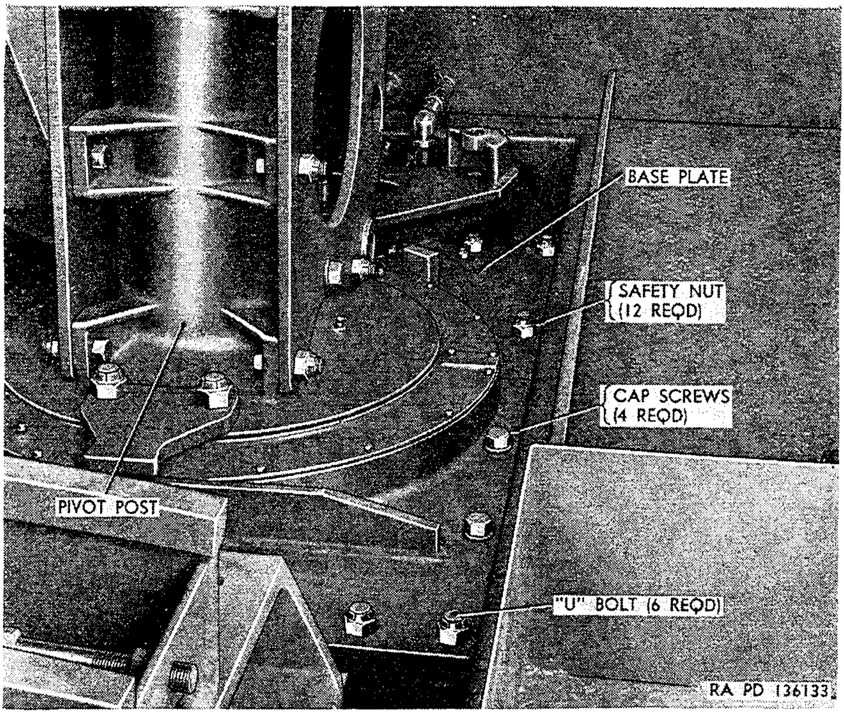


Figure 286. View of lower end of pivot post and base plate M62.

bosses cast on the sides of the pivot post. For description of the swivel valve, refer to (9) below. For description of the control valve bank, refer to (14) below.

(8) *Swing motor* (fig. 79). The swing motor mounted on the rear of the base plate consists of a pair of double-acting hydraulic cylinders. The front end of both piston rods is connected to the pivot-post drive pinion crank. The drive pinion at the lower end of the crank drives the ring gear at the bottom of the pivot post through an idler gear. The rear end of both cylinders is anchored by a pin to a bracket welded to the base plate. A spring-loaded valve spool inside the cylinder bodies, which is actuated by a lever operating against a roller attached to the base plate, controls the flow of hydraulic oil through the cylinder.

(9) *Swivel valve* (figs. 288 and 289). The swivel valve assembly (fig. 288) is installed on top of the pivot post support cap (fig. 289) with its lower end extending into the pivot post support. A locking plate secures the valve assembly to the support cap. The swivel valve assembly permits 360° rotation of the crane without twisting or breaking the hydraulic lines from the pump to the driving motor, hoist hydraulic oil motor ((13) below), boom lift cylinder ((11)

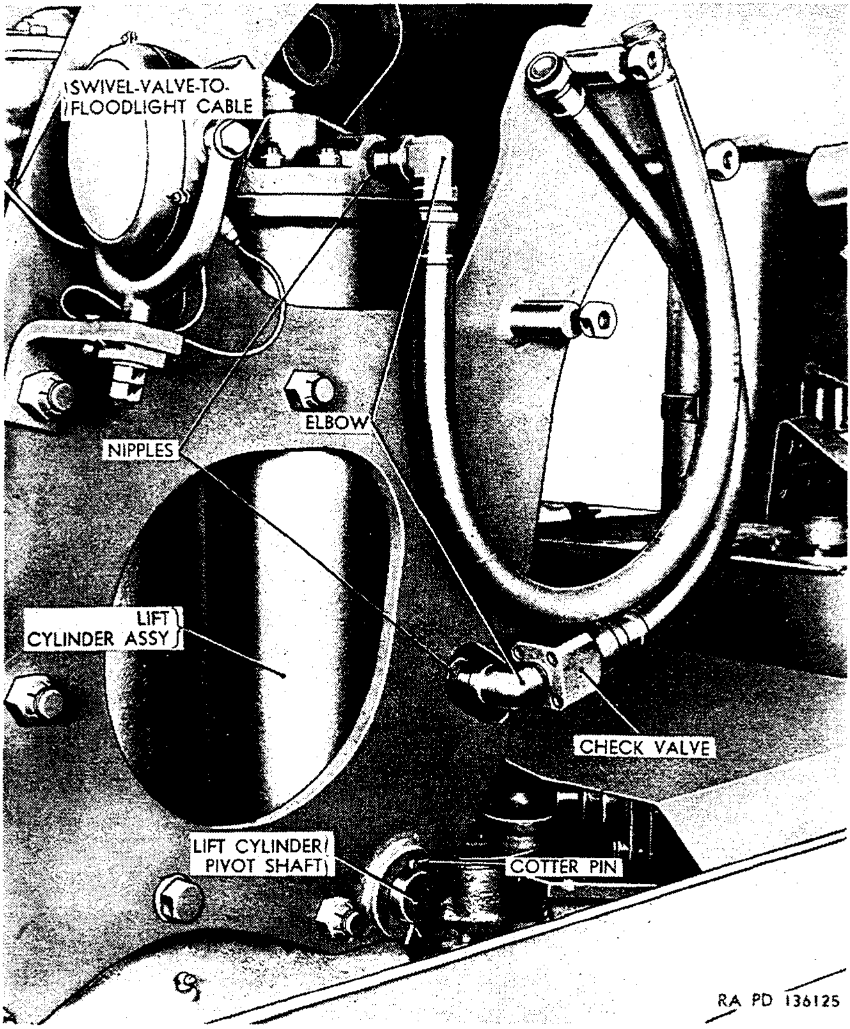


Figure 287. View of left side of pivot post shipper support, and boom lift cylinder.

below), boom crowd cylinder ((12) below), and control valve bank assembly ((14) below).

(10) *Boom and shipper assembly.* The boom and shipper assembly consists of the boom (fig. 81) and shipper, which are telescoping tubular steel members having a rectangular-shaped cross section, held together by the boom crowd cylinder ((12) below). The rear end of the shipper is pivoted on a pin (fig. 290) installed at the top rear of the shipper support, which permits raising and lowering the front end of the boom. Weight of the shipper and boom assembly is approximately 2,150 pounds. Although the boom and shipper assem-

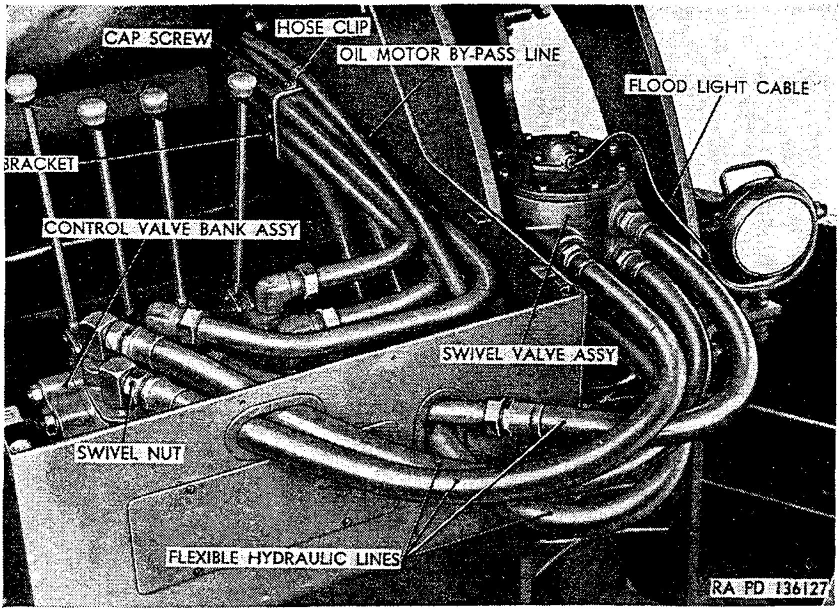


Figure 288. Front view of operator's compartment and control valve bank assembly.

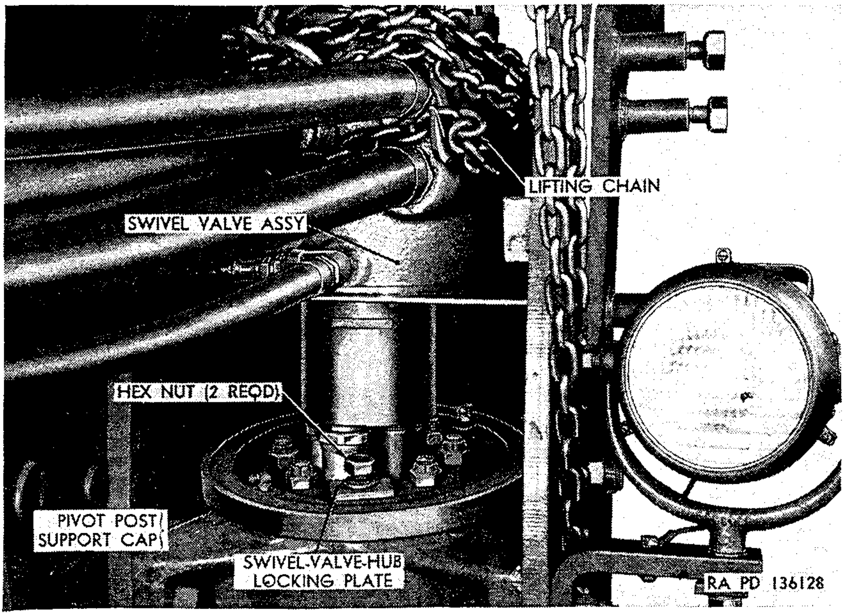


Figure 289. Front view of upper end of pivot post with swivel valve in raised position.

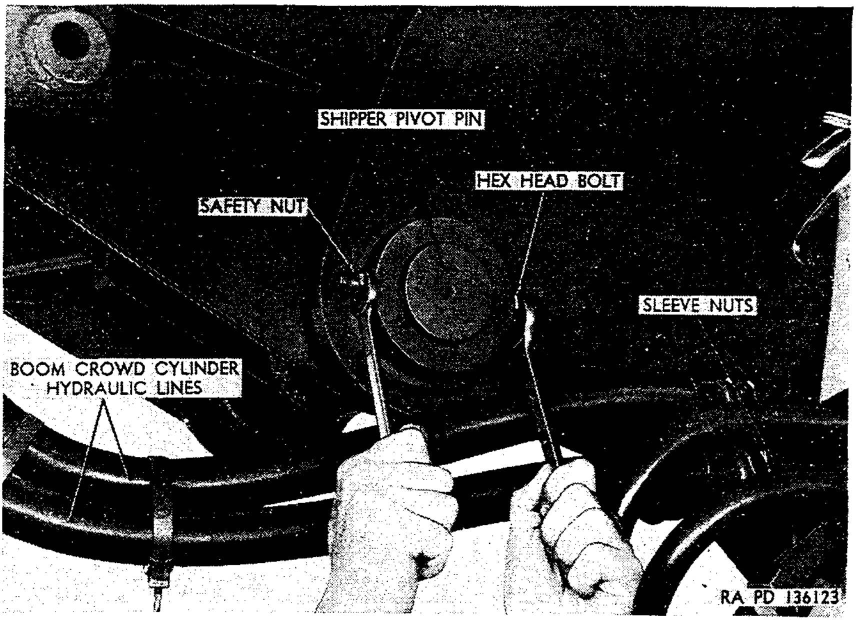


Figure 290. View of right end of shipper pivot pin installed in shipper support.

bly removal procedures (par. 277) in this section require removal of the boom hoist hydraulic oil motor and cable drum ((13) below) before removal of the boom and shipper assembly, both assemblies can be removed as a single unit.

(11) *Boom lift cylinder.* The boom lift cylinder (fig. 287) is vertically mounted to the rear of the pivot post. The lower end of the cylinder is pivoted on a shaft installed between the sides of the shipper support. The upper end of the lift-cylinder piston rod (fig. 280) is pivoted on a shaft installed between the sides of the shipper. Weight of the boom lift cylinder is approximately 265 pounds. By using overhead hoisting equipment to raise the front end of the boom to its position of maximum elevation, the boom lift cylinder can be removed without removal of the boom and shipper assembly. However, the boom lift cylinder removal procedures (par. 278) in this section require removal of the shipper and boom assembly.

(12) *Boom crowd cylinder.* The boom crowd cylinder (fig. 291) is mounted horizontally inside the boom and shipper assembly. The rear end of the crowd-cylinder piston rod is secured to the anchor (welded to the rear end of the shipper) by two nuts and a locking plate. A collar welded to the crowd cylinder at a point midway between the ends is secured to the boom by two pins inserted through the sides of the boom and the collar.

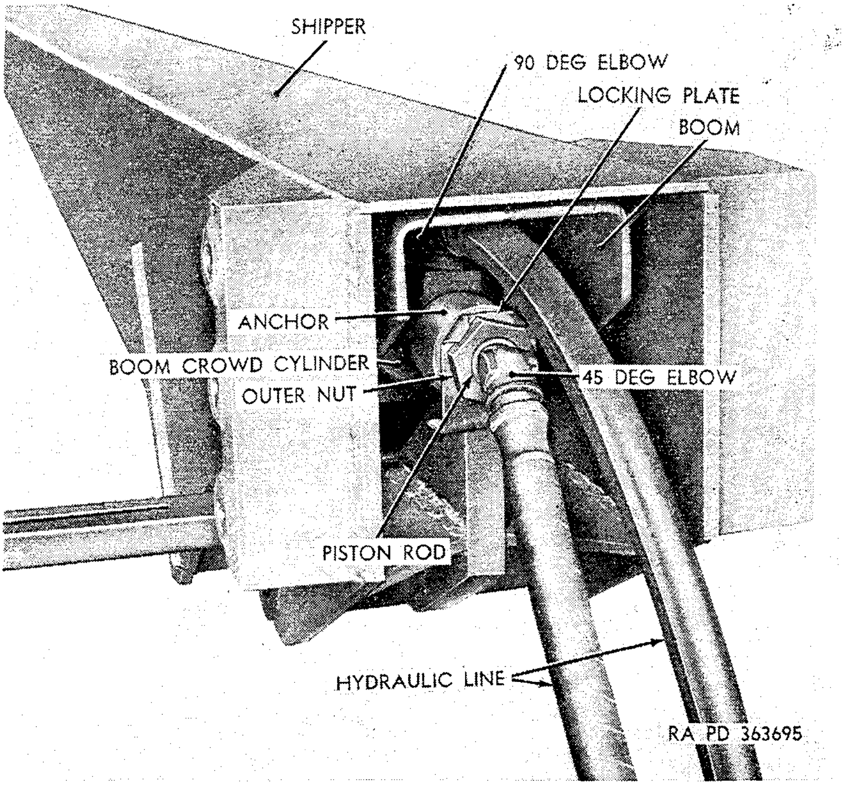


Figure 291. Rear view of boom and shipper assembly with cable drum removed M62.

(13) *Boom hoist hydraulic oil motor and cable drum assembly.* The boom hoist hydraulic oil motor and cable drum assembly (fig. 81) is bolted to the rear of the shipper. Either the oil motor or the cable drum can be removed separately. However, the removal procedures (par. 280) in the section cover removal of both assemblies as a single unit. Weight of the boom hoist hydraulic oil motor and cable drum assembly is approximately 730 pounds.

(14) *Control valve bank assembly.* The control valve bank assembly (fig. 292) is bolted to a shelf at the front of the operator's compartment. Wrecker crane operating instruction and caution plates are mounted on the control valve bank cover (fig. 80).

(15) *Hydraulic lines and fittings.* The tubing used in the crane hydraulic lines is of butt-welded steel construction, and the fittings are Ermeto flareless. Flexible lines are high-pressure-type rubber hose with swedged-on couplings.

347797°—55——28

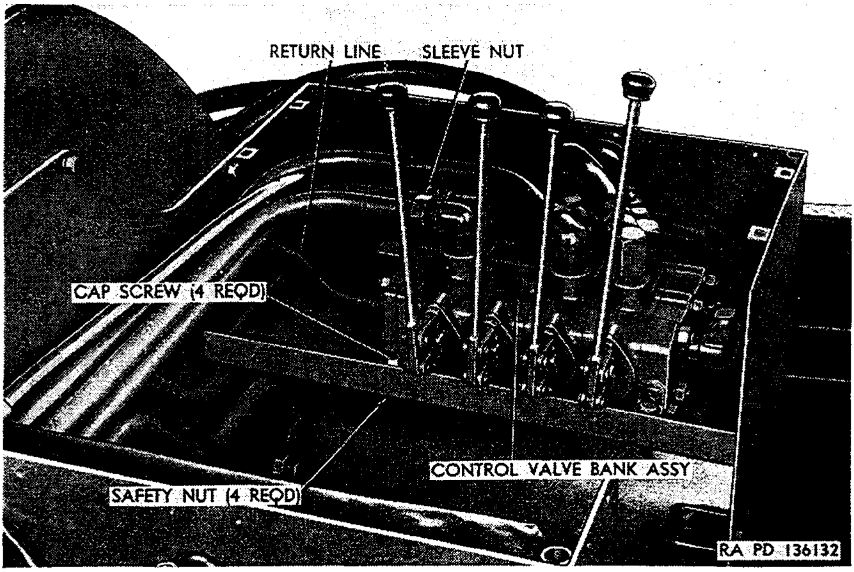


Figure 292. Rear view of operator's compartment and control valve bank assembly with cover removed M62.

(16) *Hydraulic reservoir and equipment box* (fig. 81). The hydraulic reservoir and equipment box assembly is bolted to brackets attached to the frame side rails. Although the reservoir and equipment box removal procedures (par. 283) require removal of the power divider, hydraulic pump, and relief valve before removal of the reservoir and equipment box, these assemblies can be removed with the reservoir as a single unit.

(17) *Crane body* (fig. 81). The crane body is bolted at the rear to the left and right frame side rails by two U-bolts, one at each side. The front of the crane body is bolted to two brackets, one on each side, attached to the left and right frame side rails. The approximate weight of the crane body, including the outriggers, is 2,100 pounds. The base plate and pivot assembly must be removed before the crane body can be removed. However, the crane body can be removed without first removing the rear winch assembly, in which case the approximate weight of the body and winch assembly is 3,700 pounds.

(18) *Hydraulic system.* The wrecker crane hydraulic system (fig. 293) is completely sealed except for the breather-type reservoir filler cap. A bayonet-type oil level gage attached to a square-head pipe plug is installed in the top of the reservoir. Refer to paragraph 67 for information on maintenance of crane hydraulic system.

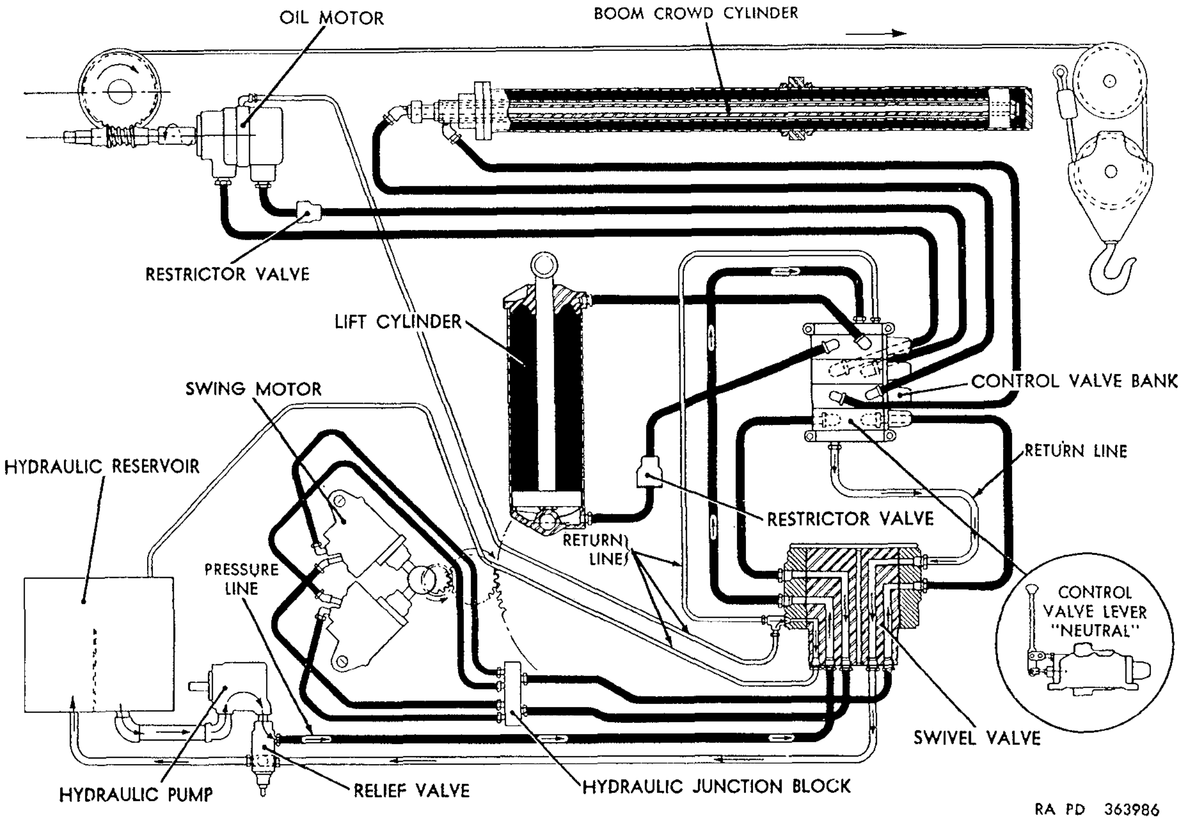


Figure 293. Crane hydraulic system M62.

b. Data.

(1) *Wrecker crane.*

Make	Austin-Western
Type	hydraulic
Manufacturer's number	AWR-HCF-1830
Capacity rating	5 ton

(2) *Clutch control valve.*

Make	Bendix-Westinghouse
Manufacturer's number	BWE-225004

(3) *Roto chamber.*

Make	Bendix-Westinghouse
Ordnance number	7413932
Manufacturer's number	BWE-224875

(4) *Hydraulic pump.*

Make	Vickers
Type	vane
Manufacturer's number	VKR-U-430-36-1C-11
Ordnance number	7409847

(5) *Relief valve.*

Make	Hydreco
Ordnance number	7409655
Manufacturer's number	HDE-VR15-C

(6) *Swivel valve.*

Make	Austin-Western
Ordnance number	7409923
Manufacturer's number	AWR-HCU-242

(7) *Swing motor.*

Make	Austin-Western
Ordnance number	7409871
Manufacturer's number	AWR-HCU-244

(8) *Boom hoist hydraulic motor.*

Make	Vickers
Type	vane
Ordnance number	7409635
Manufacturer's number	VKR-M2-540-150-6FC-11

(9) *Control valve bank assembly.*

Make	Austin-Western
Ordnance number	8330173
Manufacturer's number	AWR-HCU-310

269. Clutch Control Valve

(fig. 75)

a. Removal.

(1) Remove two air lines from elbows at left end of clutch control valve.

Note. Place identification tags on both lines to facilitate installation of valve.

(2) Remove two cap screws and safety nuts securing valve to mounting bracket, and remove valve from bracket.

b. Installation.

(1) Position clutch control valve on rear of mounting bracket, and secure with two cap screws and safety nuts.

(2) Connect the two air lines to elbows at left end of valve.

270. Roto Chamber

(fig. 146)

a. Adjustment.

(1) Check clutch pedal free travel (par. 202) and adjust, if necessary.

(2) Loosen locknut on adjusting screw installed in clutch release outer lever.

(3) Turn adjusting screw until clearance between adjusting-screw head and upper end of inner lever is between three thirty-second and one-fourth inch. Figure 294 illustrates point of measurement between adjusting-screw head and inner lever.

(4) Hold adjusting screw to prevent it from turning, and tighten locknut.

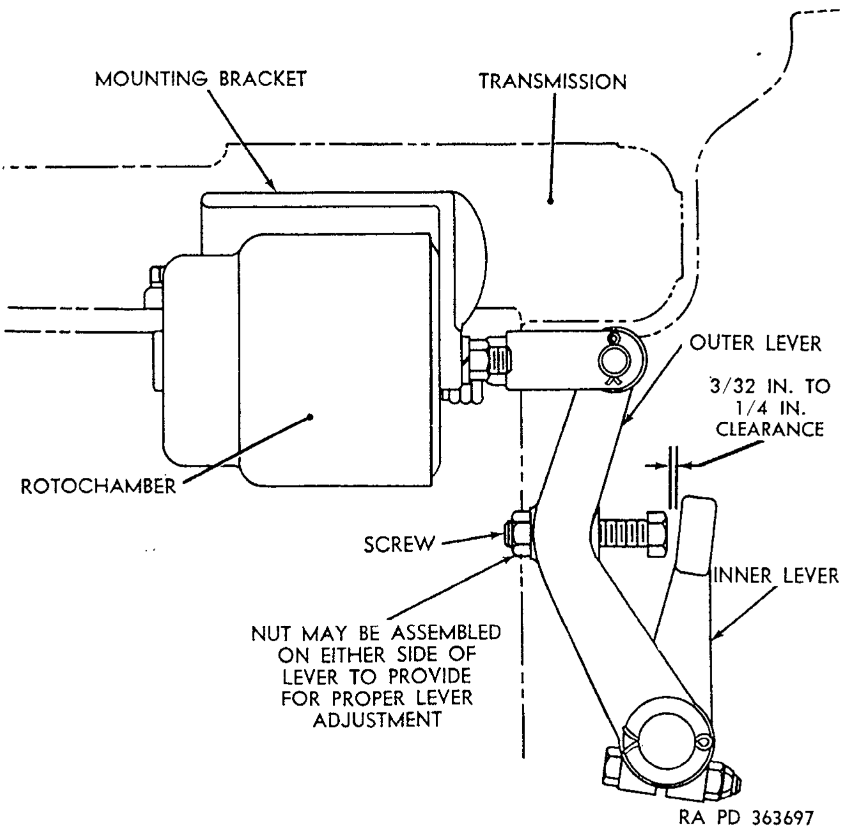


Figure 294. Roto chamber adjustment diagram.

b. Removal.

(1) Remove cotter pin and yoke pin securing push rod yoke on front end to clutch release outer lever, and remove yoke from lever.

(2) Unscrew nut securing air line to rear of roto chamber, and remove line from roto chamber.

(3) Remove two cap screws and lockwashers securing roto chamber mounting bracket to upper right side of transmission, and remove roto chamber and bracket assembly from transmission.

(4) Remove two nuts and lockwashers at front of mounting bracket, and remove roto chamber from bracket.

c. Installation.

(1) Insert the two studs on front end of roto chamber in mounting holes in front end of mounting bracket, and install two nuts and lockwashers on studs. Tighten nuts.

(2) Position roto chamber and mounting bracket assembly at upper right side of transmission, and secure with two cap screws and lockwashers.

(3) Position air line at rear of roto chamber, and tighten connector nut.

(4) Position roto chamber push rod yoke on upper end of outer lever, and secure with yoke pin and cotter pin.

(5) Check roto chamber adjustment (*a* above), and adjust roto chamber, if necessary.

271. Power Divider Assembly

Note. The key letters noted in parentheses are in figure 277, except where otherwise indicated.

a. Governor Valve.

(1) *Coordination with ordnance maintenance unit.* Refer to paragraph 2.

(2) *Adjustment.*

(*a*) Start engine (par. 45).

(*b*) After engine coolant temperature reaches normal operating range (par. 31), engage power divider (par. 53*b*(2)).

(*c*) Pull throttle control (fig. 72) all the way out and leave in LOCKED OUT position. Observe engine speed (rpm) indicated by tachometer (K, fig. 65), which is the engine speed at which the governor valve (W) mounted on the power divider controls the engine speed governor (par. 119*a*(3)).

(*d*) Stop engine (par. 47).

(*e*) If engine governed speed (no-load) indicated by (*c*) above is not within range of satisfactory governor operation (1,550 to 1,650 rpm when governor is controlled by governor valve at power divider), adjust governor valve at power divider *1* through *6* below.

1. Remove adjusting hole plug seal, and remove plug (X) from side of governor valve housing.

2. Place the transmission gearshift lever in "5" gear position, place the transfer shift lever in neutral position, and place the power divider control lever in "ENGAGE" position. With the ignition switch off, crank engine by small increments (by momentarily depressing starter button) until adjusting screw inside governor is alined with adjusting hole.

3. Insert a screwdriver in the adjusting hole and turn the adjusting screw clockwise to increase engine governed speed or counterclockwise to decrease engine governed speed. One full turn of the adjusting screw in either direction will result in a change in the engine governed speed of approximately 150 rpm.

4. Install plug (X) in adjusting hole, and check governor valve adjustment by repeating (*a*) through (*d*) above.

5. If necessary, repeat *1* through *4* above until governor valve adjustment is satisfactory.

6. Attach a new locking wire and lead seal to the adjusting hole plug and the fin on the control valve housing adjacent to the adjusting hole.

(3) *Removal.*

(*a*) Unscrew two nuts securing governor-valve-to-control-valve line (B) and carburetor-to-governor-valve line (AA) to governor valve (W) inlet and outlet port elbows, and remove lines from elbows.

Note. Place identification tags on lines to facilitate governor valve installation.

(*b*) Unscrew two nuts (Y) and remove two lockwashers from studs securing governor valve (W) to front of power divider. Remove valve from studs.

(4) *Installation.*

(*a*) Turn shaft inside governor valve so that slot in end of shaft will be alined with key on front end of hydraulic pump output shaft when governor valve is installed on power divider.

(*b*) Slide governor valve (W) on mounting studs on front of power divider, and secure with two lockwashers and nuts (Y).

(*c*) Position carburetor-to-governor-valve line (AA) and governor-valve-to-control-valve line (B) at governor valve inlet and outlet port elbows, and tighten connector nuts.

(*d*) Adjust governor valve ((2) above).

b. Governor Valve Control Valve.

(1) *Adjustment.* Refer to paragraph 272*a*.

(2) *Removal.*

(*a*) Unscrew three nuts securing control-valve-to-governor line (A), governor-valve-to-control-valve line (B), and governor-valve-to-control-valve line (BB) to control valve (E) inlet and outlet port elbows (Z) and adapter (D), and remove lines from elbows and adapter.

(*b*) Remove cotter pin from end of control-valve control rod (G), and remove control rod from control valve lever (U).

(*c*) Remove two cap screws (V) and lockwashers securing mounting bracket (F) to front of power divider, and remove bracket and control valve assembly from power divider.

(*d*) Remove two safety nuts (C) from cap screws securing control valve (E) to mounting bracket, and remove two cap screws, control valve, and two spacers (fig. 284) from bracket.

(3) *Installation.*

(*a*) Insert two cap screws through hole in mounting bracket control valve (F), install two spacers (fig. 284) and governor valve control valve (E) on cap screws, and secure with two safety nuts (C).

(*b*) Position bracket and control valve assembly on front of power divider, and install two cap screws (V) with lockwashers in holes in bracket and power divider.

(*c*) Insert front end of control-valve control rod (G) in hole in lower end of control valve lever (U), and install cotter pin in end of rod.

(*d*) Position control-valve-to-governor line (A) at control-valve outlet port elbow (Z), position governor-valve-to-control-valve line (B) at control-valve inlet port adapter (D), and position governor-valve-to-control-valve line (BB) at control-valve inlet port elbow (Z). Tighten the three connector nuts.

c. Power Divider.

(1) *Coordination with ordnance maintenance unit.* Refer to paragraph 2.

(2) *Removal.*

(*a*) Loosen hose clamp securing reservoir inlet hose (fig. 275) to inlet pipe at rear of reservoir, and remove hose from pipe. Turn elbow 45° to allow clearance for removal between relay lever assemblies.

(*b*) Remove cotter pin and yoke pin securing rear-winch-front-control-rod yoke (fig. 275) to rear-winch right relay lever, and remove yoke from lever.

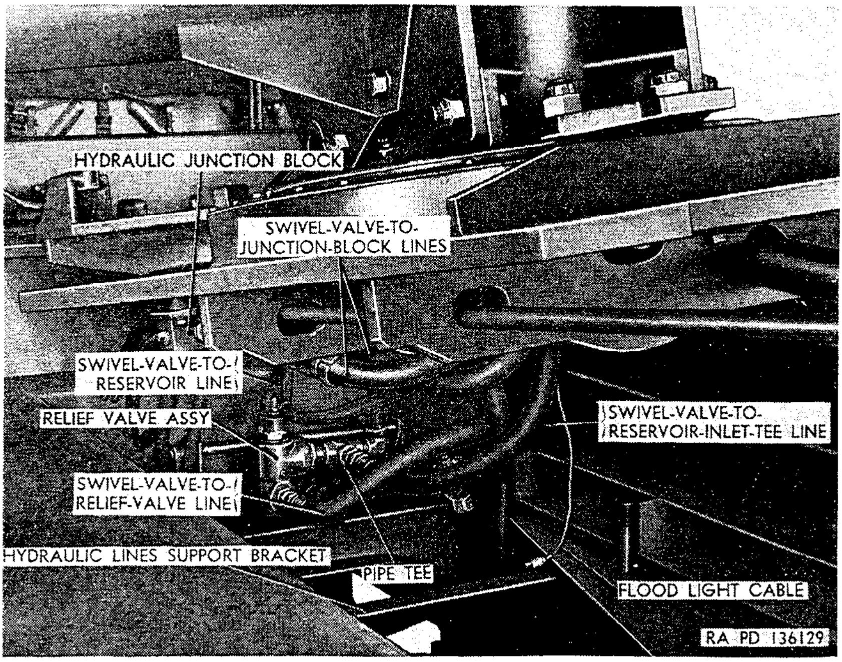


Figure 295. Left front view of base plate and pivot post assembly partially removed M62.

(*c*) Disconnect swivel-valve-to-relief-valve line (fig. 295) from relief valve outlet, and disconnect swivel-valve-to-reservoir-inlet-tee line from pipe tee at relief valve.

(*d*) Remove clamp securing swivel-valve-to-reservoir line (fig. 295) to top of relief valve and remove line from valve.

(*e*) Close oil supply valve (fig. 296) at underside of hydraulic reservoir.

(*f*) Loosen two hose clamps securing pump inlet hose (fig. 296) to reservoir outlet.

(*g*) Remove cotter pin and yoke pin (fig. 296) securing hydraulic-pump-front-control-rod yoke to hydraulic-pump right relay lever, and remove yoke from lever.

(*h*) Disconnect power-take-off-to-power-divider propeller shaft from drive shaft yoke (fig. 284) at front of power divider (par. 211).

(*i*) Disconnect rear-winch front propeller shaft (fig. 275) from winch output shaft yoke (fig. 283) at rear of power divider (par. 211).

(*j*) Remove cotter pin and yoke pin (fig. 296) securing power-divider-rear-control-rod yoke to input shifter shaft arm, and remove yoke from arm.

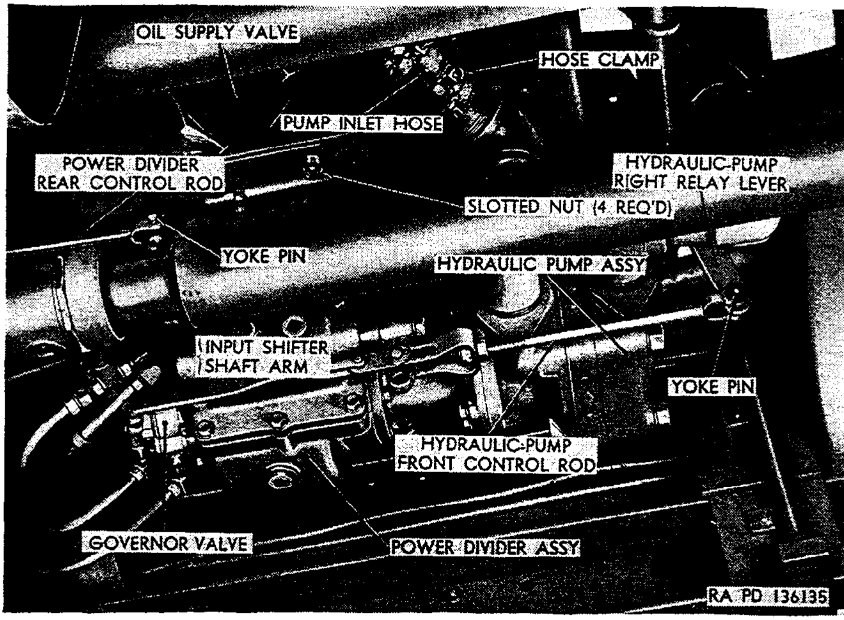


Figure 296. Bottom view of right side of power divider installed M62.

(*k*) Unscrew nut securing carburetor-to-governor-valve line (AA) to governor-valve (W) inlet port elbow, and remove line from elbow.

(*l*) Unscrew nut securing governor-valve-to-control-valve line (BB) to control-valve inlet port elbow (Z) and remove line from elbow.

(*m*) Unscrew nut securing control-valve-to-governor line (A) to control-valve outlet port elbow (Z) and remove line from elbow.

(*n*) Support power divider, pump, and relief valve assembly, and remove four cotter pins and slotted nuts (fig. 296) securing power divider mounting bracket (fig. 284) to studs on bottom of reservoir. Remove power divider, pump, and relief valve assembly from under vehicle.

(*o*) Remove hydraulic pump from pump adapter at rear of power divider (par. 273*c*).

(*p*) Remove governor valve from front of power divider (*a*(3) (*b*) above).

(*q*) Remove governor-valve control valve from front of power divider (*b* (2) above).

(*r*) Remove four cotter pins (fig. 284) and slotted nuts from studs securing mounting bracket to power divider, and remove bracket from studs.

(*s*) Remove cotter pin, clevis pin, and washer securing hydraulic-pump-front-control-rod slotted clevis (fig. 284) to hydraulic-pump-output shifter shaft arm, and remove clevis, with control-valve control rod attached, from arm.

(*t*) Remove cotter pin and yoke pin securing rear-winch-front-control-rod yoke (Q) to rear-winch output shifter shaft arm (R) and remove yoke from arm.

(3) *Installation.*

(*a*) Position rear-winch-front-control-rod adjustable yoke (Q) on rear-winch output shifter shaft arm (R) and secure with yoke pin and cotter pin.

(*b*) Position hydraulic-pump-front-control-rod slotted clevis (fig. 284), with governor-valve-control-valve control rod attached, on left side of hydraulic-pump output shifter shaft arm, and secure with clevis pin and cotter pin.

(*c*) Position mounting bracket (fig. 284) on studs on top of power divider, and secure with four slotted nuts and cotter pins.

(*d*) Install governor-valve control valve on front of power divider (*b* (3) (*a*) through (*c*) above).

(*e*) Install governor valve on front of power divider (*a*(4) (*a*) and (*b*) above).

(*f*) Position governor-valve-to-control-valve line (fig. 284) at governor-valve outlet port elbow and at control-valve inlet port adapter, and tighten connector nuts.

(*g*) Install hydraulic pump on pump adapter at rear of power divider (par. 273*d*).

(*h*) Position power divider, pump, and relief valve assembly under vehicle, and secure power-divider mounting bracket to studs on underside of hydraulic reservoir with four slotted nuts (fig. 296) and cotter pins.

(*i*) Position control-valve-to-governor line (A) at control-valve outlet port elbow (Z) and tighten connector nut.

(*j*) Position governor-valve-to-control-valve line (BB) at control-valve inlet port elbow (Z), and tighten connector nut.

(*k*) Position carburetor-to-governor-valve line (AA) at governor-valve inlet port elbow (Z), and tighten connector nut.

(*l*) Position power-divider-rear-control-rod yoke on input shifter shaft arm (fig. 296), and secure with yoke pin and cotter pin.

(*m*) Connect rear-winch front propeller shaft (fig. 275) to winch output shaft yoke (fig. 283) at rear of power divider (par. 211).

(*n*) Connect power-take-off-to-power-divider propeller shaft to drive shaft yoke (fig. 284) at front of power divider (par. 211).

(*o*) Position hydraulic-pump-front-control-rod yoke on hydraulic-pump right relay lever (fig. 296), and secure with yoke pin and cotter pin.

(*p*) Install pump inlet hose (fig. 296) on reservoir outlet, and tighten two hose clamps.

(*q*) Position swivel-valve-to-reservoir line (fig. 295) at top of relief valve and secure with clamp.

(*r*) Connect swivel-valve-to-relief-valve line (fig. 295) to relief valve outlet, and connect swivel-valve-to-reservoir-inlet-tee line to pipe tee at relief valve.

(*s*) Position rear-winch-front-control-rod yoke (fig. 275) on rear-winch right relay lever, and secure with yoke pin cotter pin.

(*t*) Turn elbow (fig. 275) 45° to aline reservoir inlet hose with inlet sleeve on front of reservoir, install hose on sleeve, and tighten hose clamp securely.

(*u*) Open oil supply valve (fig. 296) at underside of hydraulic reservoir.

(*v*) Adjust hydraulic pump control linkage (par. 272*a*).

(*w*) Adjust rear winch control linkage (par. 272*b*).

(*x*) Check governor valve adjustment, and adjust valve, if necessary (*a*(2) above).

272. Power Divider Controls

Note. The key letters noted in parentheses are in figure 277, except where otherwise indicated.

a. Hydraulic Pump Control Linkage.

(1) *Adjustment.*

(*a*) Remove cotter pin and yoke pin securing hydraulic-pump front control rod (K) to hydraulic-pump right relay lever (L), and remove rod from lever.

(*b*) Place hydraulic pump control lever (fig. 75) in disengage position, and secure lever with locking hinge attached to wrecker body floor plate.

(*c*) Remove cotter pin securing control-valve control rod (G) to control-valve lever (U), and remove rod from lever.

(*d*) Loosen nut (J) on front control rod (K).

(*e*) Using front control rod, pull output shifter shaft arm (N) as far as possible toward rear of vehicle (to DISENGAGE position).

Note. Total travel of arm from engaged to disengage position is five-eighths of an inch.

(*f*) With clevis (H) moved as far as possible toward rear of vehicle so that pin securing clevis to output shifter shaft arm is against front end of clevis slot, turn front control rod (K) in clevis until front control rod yoke can be connected to hydraulic-pump right relay lever.

Note. If linkage is so far out of adjustment that this cannot be done, adjust hydraulic-pump rear control rod (fig. 278), using adjustable yoke securing rear control rod to lower end of hydraulic pump control lever (fig. 276).

(*g*) Position front control rod yoke on relay lever, and secure with yoke pin and cotter pin.

(*h*) Holding control rod, tighten nut (J) against clevis (H).

(*i*) Move control valve lever (U) as far as possible toward rear of vehicle.

(*j*) Loosen nut (T) on control-valve control rod (G), and turn control rod in yoke (S) until front end of rod can be inserted in hole in lower end of lever.

(*k*) Insert control rod end through hole in control valve lever, and install cotter pin in end of rod.

(*l*) Holding control rod, tighten nut (T) against yoke (S).

(2) *Removal.*

(*a*) *Hydraulic pump front control rod.*

1. Remove cotter pin and yoke pin securing front control rod (K) to hydraulic-pump right relay lever (L) and remove rod from lever.

2. Loosen nut (J), and turn control rod from clevis (H).

(*b*) *Relay levers.* Refer to paragraph 284*a*.

(*c*) *Hydraulic pump rear control rod.*

1. Remove base plate and pivot post assembly (par. 274*b*).

2. Pull hydraulic-pump rear control rod (fig. 278) from underside of base plate.

(3) *Installation.*

(*a*) *Hydraulic pump rear control rod.*

1. Insert hydraulic-pump rear control rod (fig. 278) through holes in cross members welded to underside of base plate.

2. Install base plate and pivot post assembly (par. 274*c*).

(*b*) *Relay levers.* Refer to paragraph 284*b*.

(*c*) *Hydraulic pump front control rod.*

1. Install threaded end of hydraulic-pump front control rod (K) in clevis (H).

2. Adjust hydraulic pump control linkage (*a* (1) *e* through *l* above).

b. Rear Winch Control Linkage.

(1) *Adjustment.* Refer to paragraph 263*c*.

(2) *Removal.*

(*a*) *Rear winch front control rod.*

1. Remove cotter pin and yoke pin securing rear-winch-front-control-rod adjustable yoke (Q) to winch output shifter shaft arm (R), and remove yoke from arm.

2. Remove cotter pin and yoke pin securing rear-winch front control rod to rear-winch right relay lever (P), and remove rod from lever.

(*b*) *Relay levers.* Refer to paragraph 284*a*.

(*c*) *Rear winch rear control rod.*

1. Remove base platea nd pivot post assembly (par. 274*b*).

2. Pull rear-winch rear control rod (fig. 278) from underside of base plate.

(3) *Installation.*

(*a*) *Rear winch rear control rod.*

1. Insert rear-winch rear control rod (fig. 278) through holes in cross members welded to underside of base plate.

2. Install base plate and pivot post assembly (par 274*c*).

(*b*) *Relay levers.* Refer to paragraph 284*b*.

(*c*) *Rear winch front control rod.*

1. Position rear-winch-front-control-rod yoke on rear-winch right relay lever (P), and secure yoke pin and cotter pin.

2. Adjust rear winch control linkage (par. 263*c*).

273. Hydraulic Pump and Relief Valve Assembly

a. *Relief Valve Test.*

(1) Remove pipe plug (fig. 297) from elbow at boom hoist hydraulic oil motor, and install hydraulic pressure gage in hole in elbow.

Note. Install gage so that it can be read from crane operator's compartment.

(2) Lower hoist cable hook (par. 53*b*) to ground to prevent fouling of hoist cable block with boom sheaves while testing relief valve.

(3) With the boom fully retracted, move the crowd control lever (G, fig. 80) to the RETRACT position (fig. 49), and move the hoist control lever (J, fig. 80) to the UP position.

(4) Holding the crowd and hoist control levers in positions described above, observe pressure indicated on hydraulic pressure gage. The pressure indicated on the gage is the pressure at which the relief valve is opening. If gage indicates incorrect relief valve setting (more or less than 1,200 psi), adjust relief valve (*b* below).

Caution: Do not adjust relief valve so that opening pressure exceeds 1,200 psi as too high a relief valve setting will materially shorten the life of the crane hydraulic system components.

b. *Relief Valve Adjustment.*

(1) Remove clamp securing swivel-valve-to-reservoir line (fig. 295) to top of relief valve, and remove line from valve.

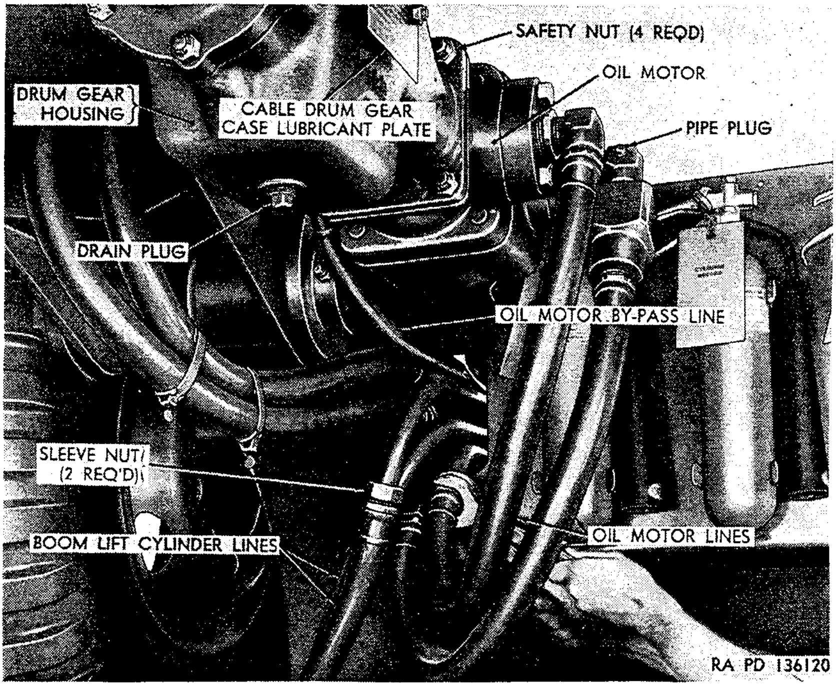


Figure 297. Disconnecting boom hoist hydraulic oil motor lines M62.

(2) Remove blind nut (fig. 298) from relief-valve adjusting setscrew, and loosen jam nut on setscrew.

(3) Using a screwdriver, turn setscrew as necessary to obtain the correct relief valve setting of 1,200 psi.

Note. Turning the setscrew clockwise increases the pressure required to open the relief valve. Turning the setscrew counterclockwise decreases the relief valve opening pressure.

(4) After correct relief valve setting is obtained, hold setscrew and tighten jam nut. Install blind nut (fig. 298) on setscrew.

Note. Be sure that jam nut and blind nut are tight on setscrew so that parts will not loosen during operation.

(5) Position swivel-valve-to-reservoir line (fig. 295) at top of relief valve, and secure with clamp (fig. 295).

c. Removal (fig. 298).

(1) Remove power divider assembly (par. 271*c*(2)(*a*) through (*n*)).

(2) Remove six cap screws and lockwashers securing hydraulic pump and relief valve assembly to pump adapter at rear of power divider.

(3) Remove pump-to-relief-valve hydraulic piping, with hydraulic pump assembly attached, from relief valve.

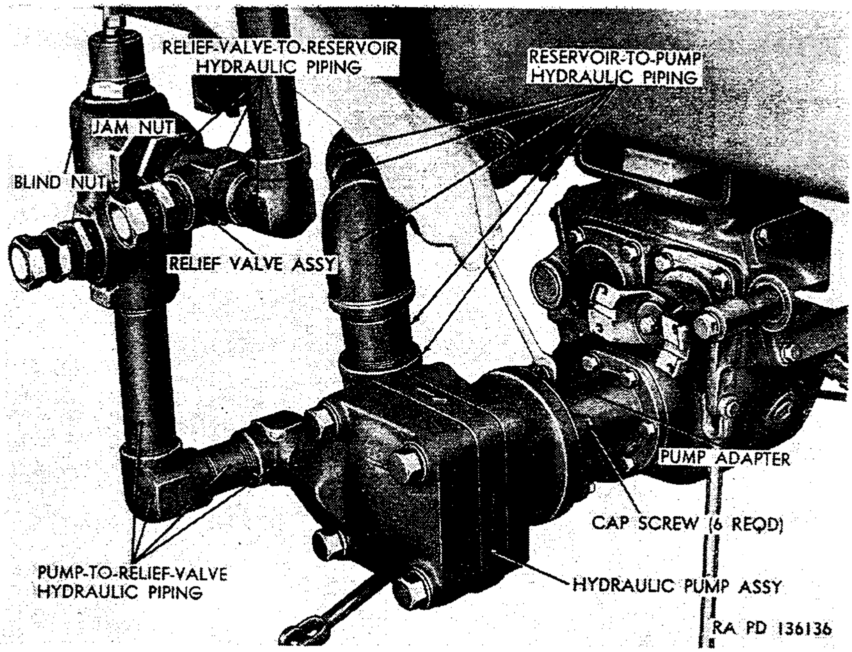


Figure 298. Removing hydraulic pump and relief valve assembly from power divider M62.

(4) Remove relief-valve-to-reservoir hydraulic piping from relief valve.

(5) Remove reservoir-to-pump hydraulic piping from pump.

(6) Remove pump-to-relief-valve hydraulic piping from pump.

d. Installation (fig. 298).

(1) Install pump-to-relief-valve hydraulic piping in pump outlet port.

(2) Install reservoir-to-pump hydraulic piping in pump inlet port.

(3) Install relief-valve-to-reservoir hydraulic piping in relief valve output port.

(4) Install relief valve, with relief-valve-to-reservoir hydraulic piping attached, on pump-to-relief-valve hydraulic piping.

(5) Position new gasket on pump flange, aline key on pump shaft with keyway in hydraulic pump output shaft coupling, and position pump on adapter at rear of power divider. Install six cap screws with lockwashers in holes in adapter and pump flanges, and tighten screws.

(6) Install power divider assembly (par. 271*c*(3)(*h*) through (*x*)).

274. Base Plate and Pivot Post Assembly

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Remove boom and shipper assembly (par. 277).

(2) Remove boom lift cylinder (par. 278).

(3) Remove swing motor (par. 275).

(4) Remove eight cap screws (fig. 75) and lockwashers securing floor plate to crane body. Remove two cap screws (fig. 281) and safety nuts securing floor plate to support bracket. Remove two cap screws (fig. 75) and safety nuts securing mounting bracket to crane body.

(5) Remove cotter pin and yoke pin securing rear-winch rear control rod (fig. 278) to lower end of rear winch shift lever (fig. 276), and remove rod from lever.

(6) Remove cotter pin and yoke pin securing hydraulic-pump rear control rod (fig. 278) to lower end of hydraulic pump control lever (fig. 276), and remove rod from lever.

(7) Remove cotter pin and yoke pin securing rear-winch rear control rod (fig. 278) to rear-winch left relay lever (fig. 275), and remove rod from lever.

(8) Remove cotter pin and yoke pin securing hydraulic-pump rear control rod (fig. 278) to hydraulic-pump left relay lever (fig. 275), and remove rod from lever.

(9) Raise floor plate (fig. 276) to permit access to base plate rear U-bolts, and prop plate in raised position.

(10) Remove 12 safety nuts (fig. 286) from 6 U-bolts, and remove 2 cap screws and lockwashers securing base plate to crane body.

(11) Disconnect rear-winch front propeller shaft (fig. 275) from rear-winch rear propeller shaft (fig. 278). Refer to paragraph 211.

(12) Disconnect rear propeller shaft from bearing assembly (fig. 276). Refer to paragraph 211.

(13) Disconnect swivel-valve-to-relief-valve line (fig. 295) from relief valve outlet, and disconnect swivel-valve-to-reservoir-inlet-tee line from pipe tee at relief valve.

(14) Disconnect swivel-valve-to-reservoir line (fig. 295) from reservoir inlet coupling (fig. 275), remove clamp securing line to top of relief valve, and remove line from valve.

(15) Disconnect floodlight cable (fig. 295) from wiring harness (par. 164).

(16) Remove hex nut from cap screw (fig. 299) securing base plate to hydraulic lines support bracket (fig. 295).

347797°—55——29

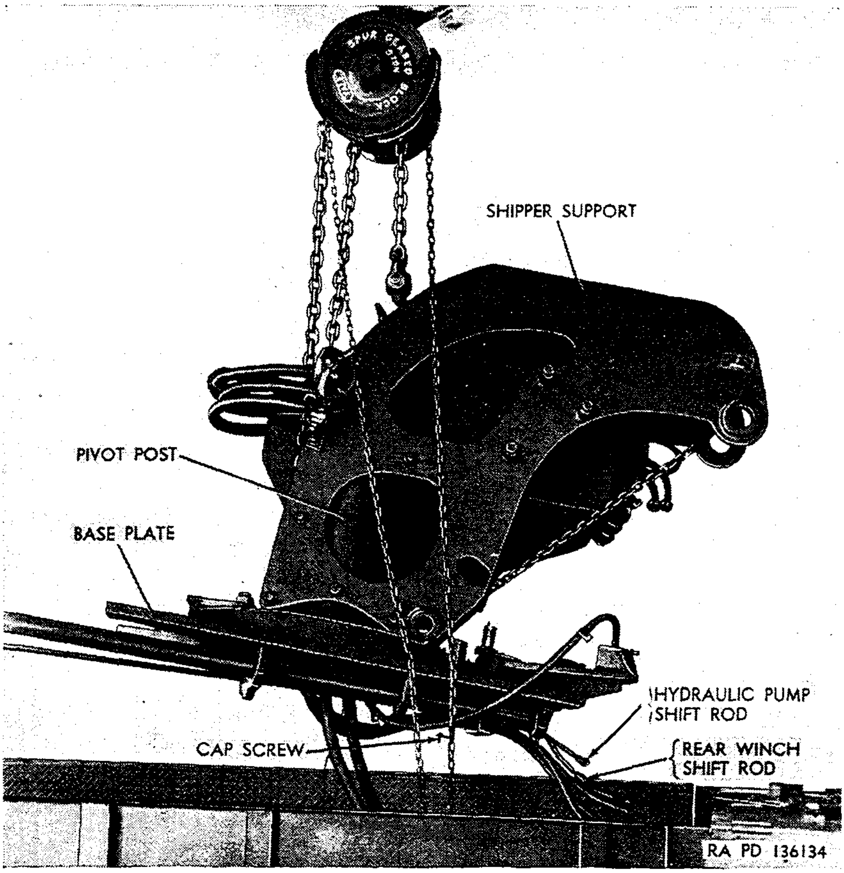


Figure 299. Removing base plate and pivot post assembly from crane body M62.

(17) Place a chain under the operator's compartment and between the shipper support (fig. 299), and using overhead hoisting equipment, remove base plate and pivot post assembly from crane body.

(18) Remove slip yoke from splined end of rear-winch rear propeller shaft (fig. 278), and remove shaft from pillow block and cross members welded to underside of base plate.

(19) Remove rear-winch rear control rod and hydraulic-pump rear control rod from cross members welded to underside of base plate (fig. 278).

c. Installation.

(1) Insert rear-winch rear control rod (fig. 278) and hydraulic-pump rear control rod through holes in right end of cross members, and position rods on underside of base plate.

(2) Insert rear-winch rear propeller shaft (fig. 278) through holes in left end of cross members, and position shaft on

underside of base plate with splined end of shaft extending through pillow block.

(3) Using overhead hoisting equipment, lift base plate and pivot post assembly into position on crane body and guide base plate mounting **U** bolts (fig. 286) through holes in base plate.

(4) Install 12 safety nuts (fig. 286) on the 6 **U** bolts, and install 4 cap screws with lockwashers in holes in base plate and crane body. Tighten nuts and screws.

(5) Place hydraulic lines over support bracket (fig. 295), and secure bracket to base plate with cap screw (fig. 299) and hex nut.

(6) Connect floodlight cable (fig. 295) to wiring harness (par. 164).

(7) Connect swivel-valve-to-reservoir line (fig. 295) to reservoir inlet coupling (fig. 275), position line at top of relief valve valve (fig. 295) and secure with clamp.

(8) Connect swivel-valve-to-relief-valve line (fig. 295) to relief valve outlet, and connect swivel-valve-to-reservoir-inlet-tee line to pipe tee at relief valve.

(9) Connect rear-winch rear propeller shaft (fig. 276) to yoke at bearing assembly (par. 211).

(10) Slide slip yoke on splined end of rear propeller shaft (fig. 278), and connect yoke to rear-winch front propeller shaft (fig. 275). Refer to paragraph 211.

(11) Remove prop supporting floor plate (fig. 276) in raised position, and position floor plate on crane body. Secure with eight cap screws (fig. 75) and lockwashers.

(12) Secure floor plate to support bracket (fig. 281) with two cap screws and safety nuts, and secure mounting bracket (fig. 75) to crane body with two cap screws and safety nuts.

(13) Position hydraulic-pump rear control rod (fig. 278) on hydraulic-pump left relay lever (fig. 275), and secure with yoke pin and cotter pin.

(14) Position hydraulic-pump rear control rod on lower end of hydraulic pump control lever (fig. 276), and secure with yoke pin and cotter pin.

(15) Position rear-winch rear control rod (fig. 278) on rear-winch left relay lever (fig. 275), and secure with yoke pin and cotter pin.

(16) Position rear-winch rear control rod on lower end of rear winch shift lever (fig. 276), and secure with yoke pin and cotter pin.

(17) Install swing motor (par. 275).

(18) Install boom lift cylinder (par. 278).

(19) Install boom and shipper assembly (par. 277).

(20) Lubricate hydraulic crane and rear winch drive (par. 67).

275. Swing Motor

Note. The key letters noted in parentheses are in figure 300, except where otherwise indicated.

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Timing

(1) Remove swing motor cover (*c* below).

(2) Rotate pivot post and boom assembly (par. 53*b*) until right swing-hydraulic-motor cylinder assembly (fig. 79) is in the dead center position (piston rod fully retracted). When cylinder is correctly positioned, the centering hole (H) in the rim of the drive pinion crank (fig. 79) is alined with the centering hole in the base plate (under the crank).

(3) Install a pin in centering holes in crank and base plate to prevent movement of piston (K), and stop engine (par. 47).

(4) Place identification tags on the two hydraulic lines connected to the elbows (fig. 79) installed in valve chamber ports (A and C). Unscrew two nuts (fig. 79), and remove the lines from the elbows.

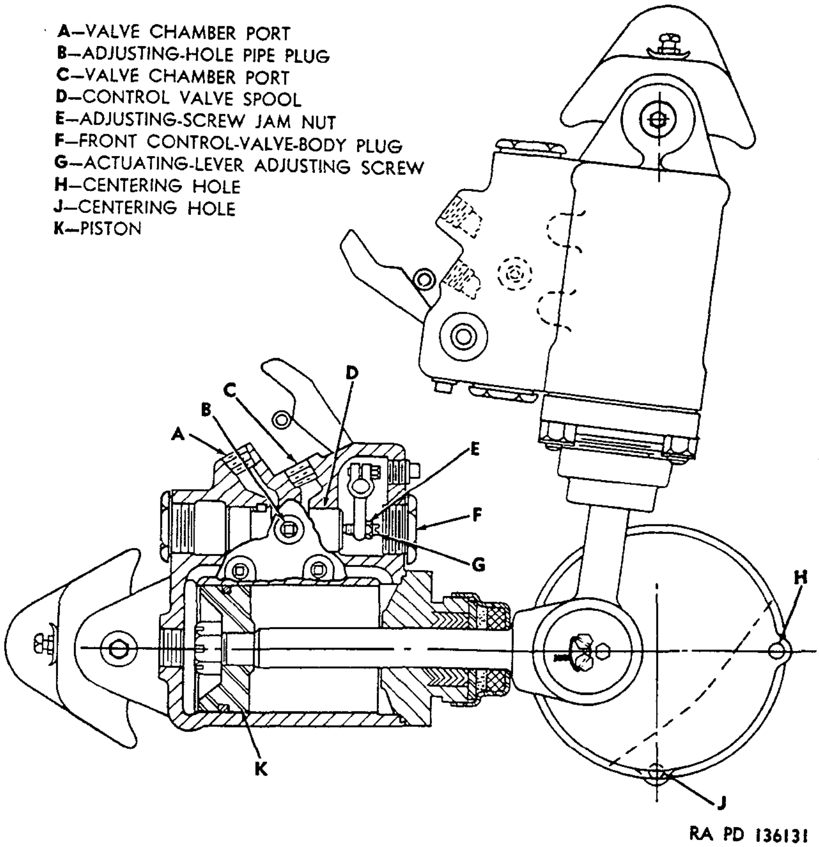


Figure 300. Swing motor timing diagram M62.

(5) Remove the adjusting-hole pipe plug (fig. 79) from the top of the control valve body.

(6) Remove the front control-valve-body plug (F) from the control valve body.

(7) Loosen adjusting-screw jam nut (E) on actuating-lever adjusting screw (G).

(8) Attach a compressed air hose to control valve body at adjusting hole pipe plug (B), and adjust air pressure as low as possible.

(9) Using a screw driver, turn adjusting screw (G) until the amount of air blown from the two valve chamber ports (A and C) is equal. This indicates that the control valve spool (D) is in the NEUTRAL position (center of its range of travel) when the piston (K) is on dead center.

(10) Hold adjusting screw to prevent it from turning, and tighten jam nut on screw.

(11) Remove compressed air hose from control valve body, and install adjusting-hole pipe plug (fig. 79) in body.

(12) Install front control-valve-body plug (F) in control valve body.

(13) Position the two hydraulic lines at elbows (fig. 79) installed in valve chamber ports, and tighten connector nuts.

(14) Remove pin from centering hole (H) in rim of drive pinion crank and from base plate.

(15) Rotate pivot post and boom assembly (par. 53*b*) until left swing-hydraulic-motor cylinder assembly (fig. 79) is in the dead center position. When cylinder is correctly positioned, the centering hole (J) in rim of drive pinion crank is alined with centering hole in base plate (under crank).

(16) Install a pin in centering holes in crank and base plate to prevent movement of piston (K), and stop engine (par. 47).

(17) Adjust left swing-hydraulic-motor cylinder assembly par. ((4) through (14) above).

Note. Adjusting-hole pipe plug for left cylinder assembly is installed on underside of control valve body.

Caution: Be sure to remove pin from centering holes in drive pinion crank and base plate after completing timing procedures.

c. Removal.

(1) Rotate pivot post and boom assembly (par. 53*b*) 90° to the left so that boom is extended over right side of truck.

(2) Remove eight cap screws (fig. 78) and lockwashers securing swing motor cover to crane body, and lift cover from body.

(3) Cut locking wire, remove two cap screws securing piston rod retaining plate (fig. 301) to drive pinion crank, and remove plate from crank.

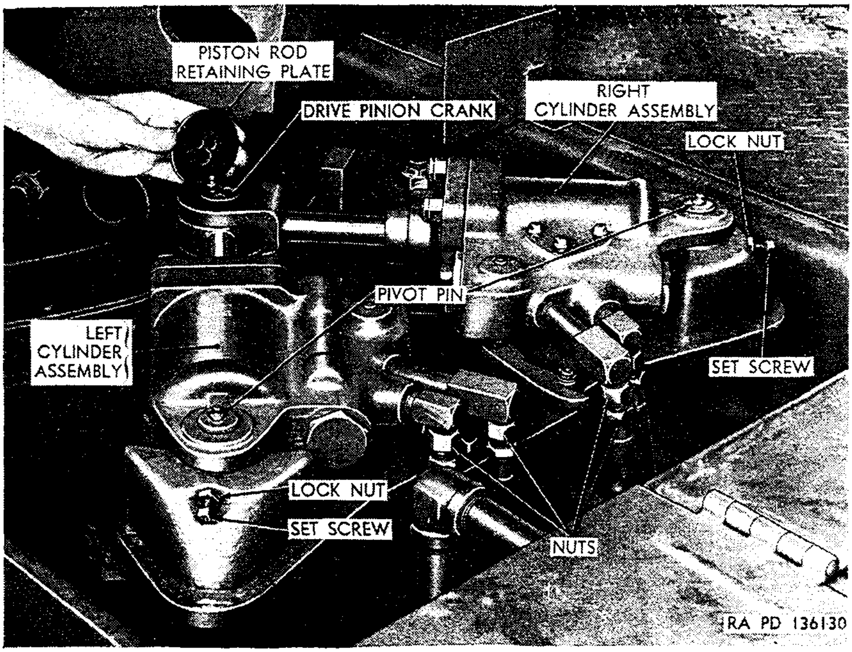


Figure 301. Removing piston rod retaining plate from drive pinion crank M62.

(4) Unscrew four nuts (fig. 301) securing hydraulic lines to elbows installed in swing-hydraulic-motor cylinder assemblies, and remove lines from elbows.

Note. Place identification tags on lines and elbows to facilitate swing motor installation.

(5) Loosen two locknuts (fig. 301) and setscrews securing pivot pins in mounting brackets welded to base plate, and drive pins from cylinder bodies and brackets, and remove from underside of base plate.

(6) Pivot each of the cylinder assemblies on the drive pinion crank to free the cylinder bodies from the mounting brackets. Lift the two cylinder assemblies together from the drive pinion crank. Pull the piston rods apart to separate the cylinder assemblies.

d. Installation.

(1) Position right cylinder piston rod over left cylinder piston rod, and install piston rods on drive pinion crank (fig. 301).

(2) Position piston rod retaining plate (fig. 301) on crank, secure with two cap screws, and install new locking wire.

(3) Pivot both cylinder assemblies on the drive pinion crank, and aline pivot pin bores in cylinder bodies with holes in mounting brackets. Install pivot pins (fig. 301) in holes in cylinder bodies and mounting brackets, and secure with setscrews. Tighten the two setscrew locknuts.

(4) Position four hydraulic lines at elbows installed in left and right cylinder assemblies, and tighten connector nuts (fig. 301).
(5) Time swing motor (*b* above).
(6) Position swing motor cover (fig. 78) on crane body, and secure with eight cap screws and lockwashers.

276. Swivel Valve

a. Removal.

(1) Disconnect floodlight cable (fig. 288) from connector at rear of floodlight (par. 164).
(2) Disconnect oil motor bypass line (fig. 297) at hoist oil motor. Loosen cap screw (fig. 288) securing hose clip to bracket, and remove oil motor bypass line from clip and bracket.
(3) Using overhead hoisting equipment, raise the shipper and boom assembly to the extreme upward position.

Note. When raising boom, hold boom control lever (K, fig. 80) in UP position (fig. 49) to permit the oil in the lift cylinder to bypass.

(4) Disconnect four flexible hydraulic lines (fig. 288) and one return line (fig. 292) at control valve bank assembly.

Note. Place identification tags on hydraulic lines and control valve bank elbows to facilitate swivel valve installation.

(5) Loosen two hex nuts (fig. 289), and slide swivel-valve-hub locking plates out of groove in swivel valve.

Note. One locking plate is installed at front and rear of swivel valve assembly.

(6) Disconnect floodlight cable (fig. 295) from wiring harness (par. 164).
(7) Disconnect two swivel-valve-to-junction-block lines (fig. 295) at junction block.
(8) Disconnect swivel-valve-to-relief-valve line (fig. 295) and swivel-valve-to-reservoir-inlet-tee line at relief valve.
(9) Disconnect swivel-valve-to-reservoir line (fig. 295) from reservoir inlet coupling (fig. 275), remove clamp securing line to top of relief valve (fig. 295), and remove line from valve.
(10) Using overhead hoisting equipment, lift swivel valve assembly (fig. 289), together with hydraulic lines, from pivot post, and remove from vehicle.

b. Installation.

(1) Using overhead hoisting equipment, support swivel valve assembly (fig. 289) over pivot post and feed floodlight cable and hydraulic lines attached to bottom of swivel valve through center of pivot post.
(2) Lower swivel valve assembly into position on top of pivot post support cap (fig. 289), and engage the two locking plates in groove in swivel valve. Tighten locking plate retaining nuts.

(3) Connect four flexible hydraulic lines (fig. 288) and one return line (fig. 292) at control valve bank assembly.
(4) Position oil motor bypass line (fig. 288) on bracket on left side panel in operator's compartment, and secure with clip. Tighten clip retaining cap screw.
(5) Connect oil motor bypass line (fig. 297) to hoist oil motor.
(6) Connect floodlight cable (fig. 288) to connector at rear of floodlight (par. 164).
(7) Connect swivel-valve-to-reservoir line (fig. 295) to reservoir inlet coupling (fig. 275), position line at top of relief valve (fig. 295), and secure with clamp.
(8) Connect swivel-valve-to-relief-valve line (fig. 295) to relief-valve outlet, and connect swivel-valve-to-reservoir-inlet-tee line to pipe tee at relief valve.
(9) Connect two swivel-valve-to-junction-block lines (fig. 295) at junction block.
(10) Connect floodlight cable (fig. 295) to wiring harness (par. 164).
(11) Remove overhead hoisting equipment from boom and shipper assembly, and lower boom (par. 53*b*).

277. Boom and Shipper Assembly

a. Removal.

(1) Secure boom to shipper with a chain (fig. 302) to prevent boom from rolling out of shipper during removal of assembly.

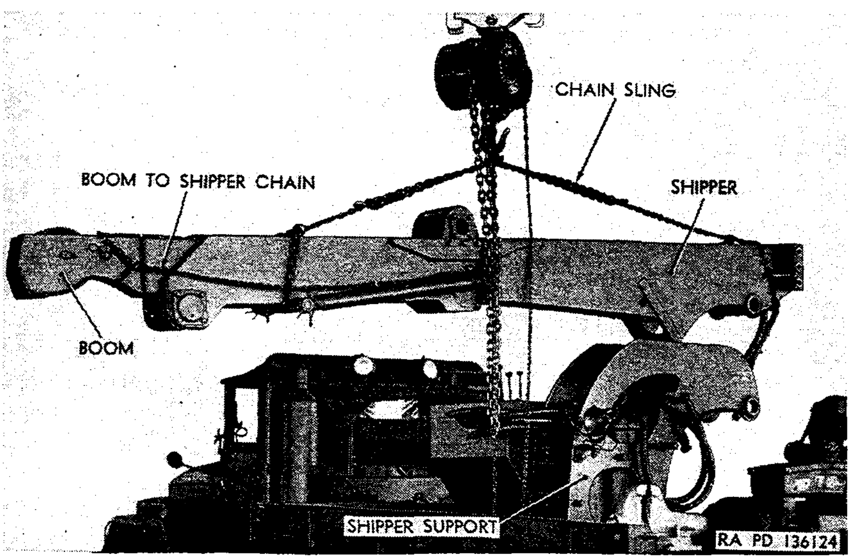


Figure 302. Removing boom and shipper assembly M62.

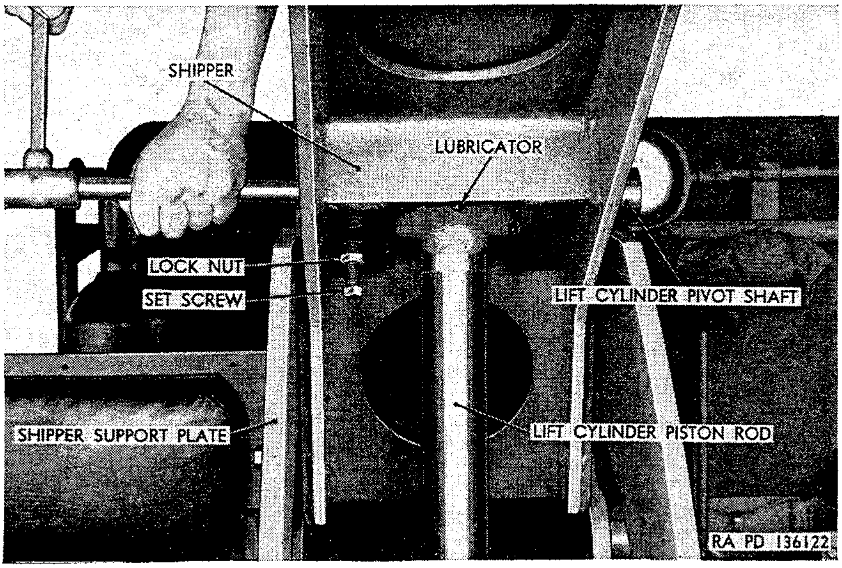


Figure 303. Removing lift cylinder pivot shaft M62.

(2) Remove boom hoist hydraulic oil motor and cable drum (par. 280).

(3) Using overhead hoisting equipment, raise the shipper and boom assembly to expose the lift cylinder pivot shaft (fig. 280).

Note. When raising boom, hold boom control lever (K, fig. 80) in "UP" position (fig. 49) to permit the oil in the lift cylinder to bypass.

(4) Loosen locknut (fig. 303) and set screw and drive out lift cylinder pivot shaft.

(5) Lower boom and shipper assembly to the horizontal position, and remove overhead hoisting equipment.

Note. When lowering boom, hold boom control lever in "DOWN" position (fig. 49) to permit the oil in the lift cylinder to bypass.

(6) Attach a chain sling to boom and shipper assembly (fig. 302) and, using overhead hoisting equipment, raise hoist chain or cable just enough to support weight of boom and shipper assembly.

(7) Position a container to catch oil drainage from boom crowd cylinder, and disconnect two boom crowd cylinder hydraulic lines (fig. 290) at sleeve nuts. Insert corks or plugs in lines to prevent oil leakage.

(8) Remove safety nut (fig. 290) and hex-head bolt securing shipper pivot pin to shipper support, and drive pin from shipper support and from shipper.

(9) Lift boom and shipper assembly from shipper support (fig. 302), and remove from vehicle.

b. Installation.

(1) Using overhead hoisting equipment and chain sling (fig. 302), lift boom and shipper assembly into position between sides of shipper support.

(2) Aline pivot pin holes in shipper with holes in shipper support, and insert shipper pivot pin (fig. 290) in holes. Aline hole through right end of pin with holes in shipper support, insert hex-head bolt (fig. 290) through holes, and install safety nut on bolt.

Note. A nut is welded to left end of pivot pin to facilitate alining holes for hex-head bolt.

(3) Remove overhead hoisting equipment and chain sling from boom and shipper assembly, attach hoist to front end of boom, and raise boom to expose lift cylinder pivot shaft holes.

(4) Aline pivot shaft bore in upper end of lift cylinder piston rod (fig. 280) with pivot shaft holes in shipper, and install lift cylinder pivot shaft (fig. 303). Tighten locknut and setscrew on underside of shipper.

(5) Remove plugs from the two boom crowd cylinder hydraulic lines (fig. 290), and connect lines at sleeve nuts.

(6) Lower boom and shipper assembly to the horizontal position, and remove hoist.

Note. When lowering boom, hold boom control lever in "DOWN" position (fig. 49) to permit the oil in the lift cylinder to bypass.

(7) Remove chain securing boom to shipper.

(8) Install boom hoist hydraulic oil motor and cable drum (par. 280).

(9) Lubricate hydraulic crane (par. 67).

278. Boom Lift Cylinder

a. Removal.

(1) Disconnect two boom lift cylinder lines (fig. 297) at sleeve nuts directly below boom hoist hydraulic oil motor.

(2) Using overhead hoisting equipment, raise the boom and shipper assembly to the extreme upward position.

(3) Loosen locknut (fig. 303) and setscrew, and drive out lift cylinder pivot shaft.

(4) Remove the two lift cylinder lines with nipples (fig. 287) and elbows attached from lift cylinder ports.

(5) Remove cotter pin (fig. 287), and drive lift cylinder pivot shaft from shipper support and lower end of cylinder.

(6) Using a chain hoist (fig. 304), lift the boom lift cylinder from shipper support, and remove from vehicle.

b. Installation.

(1) Using a chain hoist (fig. 304), lift the boom lift cylinder into position between the sides of the shipper support.

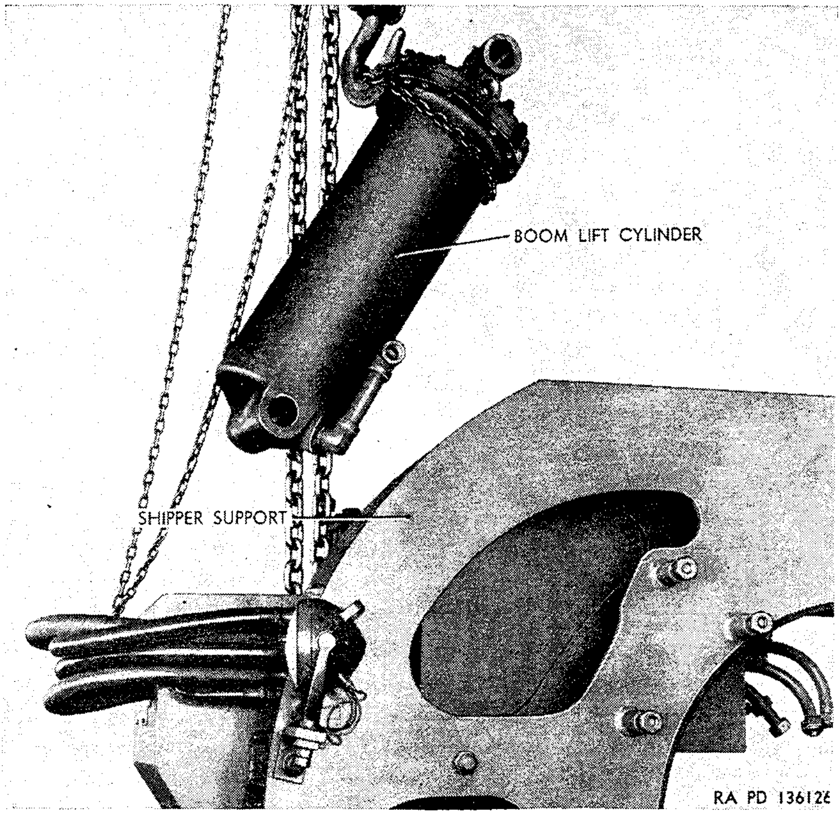


Figure 304. Removing boom lift cylinder.

(2) Aline pivot shaft bore in lower end of cylinder (fig. 287) with holes in sides of shipper support, and install lift cylinder pivot shaft. Install cotter pin in end of shaft.

(3) Install lift cylinder lines with nipples (fig. 287) and elbows in lift cylinder ports.

Caution: The check valve installed in line connected to lower cylinder port restricts dropping speed of the load. Be sure that the lines are installed as shown in figure 287.

(4) Aline pivot shaft bore in upper end of lift cylinder piston rod (fig. 303) with pivot shaft holes in shipper, and install lift cylinder pivot shaft. Tighten locknut and setscrew on underside of shipper.

(5) Lower boom and shipper assembly to the horizontal position, and remove overhead hoisting equipment.

(6) Connect the two boom lift cylinder lines (fig. 297) at sleeve nuts directly below boom hoist hydraulic oil motor.

(7) Lubricate upper lift cylinder pivot shaft (par. 67).

279. Boom Crowd Cylinder

a. Removal.

(1) Remove boom and shipper assembly (par. 277*a*), and place on suitable supports.

(2) Remove overhead hoisting equipment, chain sling (fig. 302), and boom to shipper chain.

(3) Remove 45° elbow (fig. 291) with hydraulic line attached from piston rod.

(4) Bend lip on locking plate (fig. 291) away from outer nut, and remove outer nut, locking plate, and inner nut (located between locking plate and cylinder anchor) from piston rod.

(5) Pull boom (fig. 305) from shipper only far enough to attach a chain sling, attach sling, and support with overhead hoisting equipment.

Caution: When pulling boom from shipper to attach sling, support front (sheave) end of boom to prevent tilting which could cause serious injury to personnel.

(6) Pull boom from shipper, place boom on suitable supports, and remove hoist and chain sling.

(7) Remove cotter pins (fig. 306) and crowd-cylinder-to-boom pins securing crowd-cylinder collar to boom, and pull cylinder from boom far enough to permit attaching a chain sling.

(8) Attach chain sling (fig. 306) and overhead hoisting equipment to crowd cylinder, and remove cylinder from boom.

(9) Remove 90° elbow (fig. 306) with hydraulic line attached from crowd cylinder.

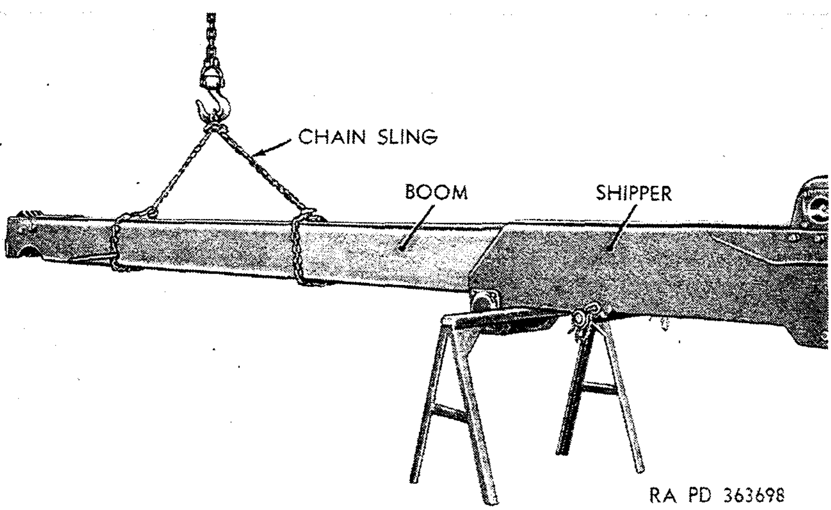


Figure 305. Removing boom from shipper M62.

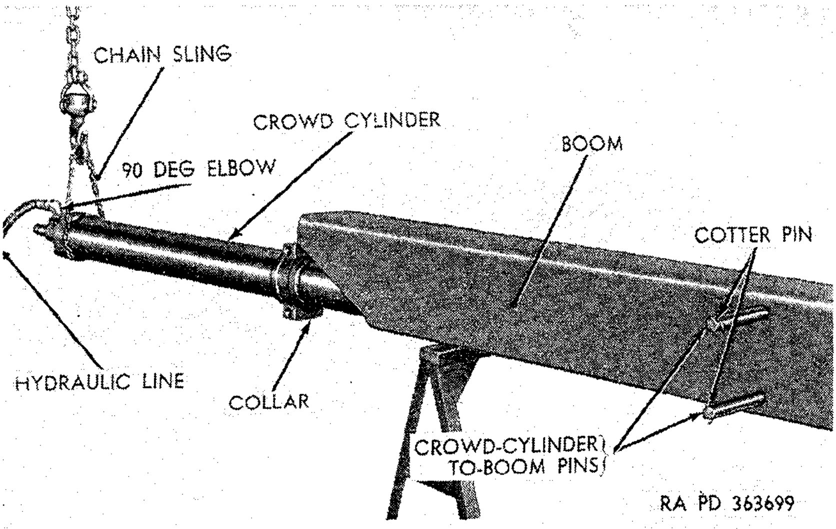


Figure 306. Removing boom crowd cylinder from boom M62 and M246.

b. Installation.

(1) Install 90° elbow (fig. 306) with hydraulic line attached in port on top of crowd-cylinder head.

Note. Elbow and line cannot be installed after cylinder is anchored in boom.

(2) Supporting crowd cylinder with chain sling (fig. 306) and overhead hoisting equipment, slide cylinder into position inside boom. Remove hoist and chain sling.

(3) Aline holes in crowd-cylinder collar (fig. 306) with holes in sides of boom, and install the two crowd-cylinder-to-boom pins. Secure pins with two cotter pins.

(4) Attach chain sling (fig. 305) to boom and support boom with overhead hoisting equipment. Insert end of boom in shipper, and slide boom inside shipper as far as it will go, guiding piston rod through hole in anchor (fig. 291) at rear of shipper.

(5) Install inner nut on piston rod (fig. 291) and tighten. Install locking plate and outer nut on piston rod. Tighten outer nut, and bend lip on locking plate against nut.

(6) Install 45° elbow (fig. 291) with hydraulic line attached in end of piston rod.

(7) Secure boom (fig. 302) to shipper with a chain to prevent boom from rolling out of shipper during installation of assembly, and attach a chain sling to shipper. Attach overhead hoisting equipment to sling, and support boom and shipper assembly.

(8) Install boom and shipper assembly (par. 277*b*).

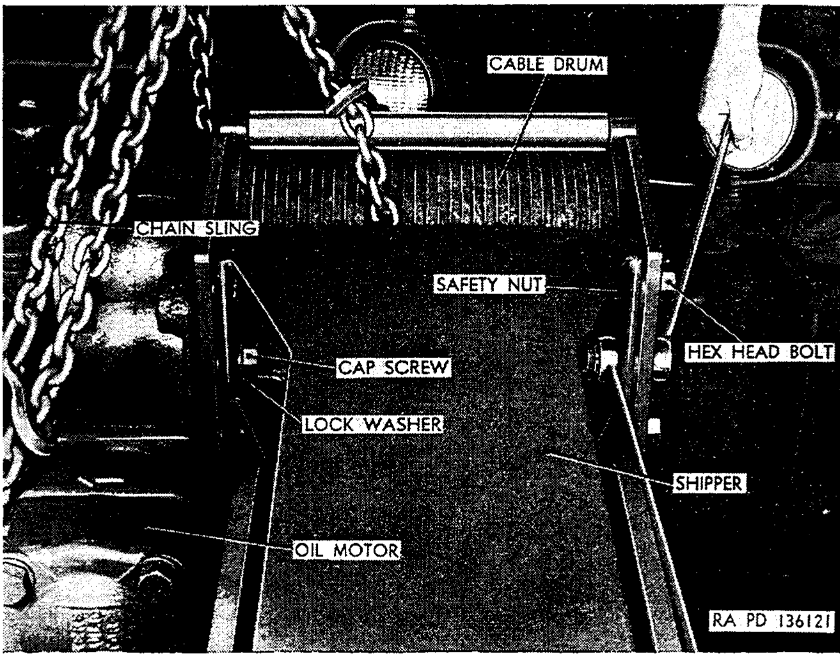


Figure 307. Removing boom hoist hydraulic oil motor and cable drum M62 and M246.

280. Boom Hoist Hydraulic Oil Motor and Cable Drum

a. Removal.

(1) Remove hoist cable from drum (*c* below).

(2) Attach a chain sling (fig. 307) to oil motor and cable drum assembly, attach overhead hoisting equipment to sling, and just support weight of assembly with hoist.

(3) Disconnect two oil motor lines (fig. 297) at sleeve nuts, and disconnect oil motor bypass line at oil motor.

Note. Place identification tags on oil lines to facilitate oil motor and cable drum installation.

(4) Remove three cap screws (fig. 307) and lockwashers securing right end of cable drums to shipper.

(5) Remove three safety nuts (fig. 307) and hex-head bolts securing left end of cable drum to shipper, lift oil motor and drum assembly from shipper, and remove from vehicle.

b. Installation.

(1) Using overhead hoisting equipment, lift boom hoist hydraulic oil motor and cable drum (fig. 307) into position at rear of shipper.

(2) Aline mounting holes in left end of cable drum with holes in shipper (fig. 307), and insert three hex-head bolts through holes. Install three safety nuts on bolts and tighten.

(3) Install three cap screws (fig. 307) with lockwashers in holes in shipper and right end of cable drum, and tighten screws.

(4) Remove overhead hoisting equipment and chain sling from oil motor and cable drum.

(5) Connect two oil motor lines (fig. 297) at sleeve nuts, and connect oil motor bypass line to oil motor.

c. Hoist Cable Removal.

(1) Unwind hoist cable from drum (par. 53*b*).

(2) Drive cable wedge from drum, and remove cable from hole in drum. Remove cable from boom and boom sheaves.

d. Hoist Cable Installation.

(1) Thread hoist cable around boom sheaves, position on top of boom and shipper assembly, and insert end of cable in hole in drum. Secure cable to drum with cable wedge.

(2) Wind hoist cable on drum (par. 53*b*).

281. Control Valve Bank

a. Removal.

(1) Remove four cap screws and lockwashers securing control valve bank cover (fig. 80) to operator's cab, and remove cover from cab.

(2) Disconnect all hydraulic lines from control valve bank (fig. 292) at sleeve nuts.

Note. Place identification tags on all hydraulic lines and connections to facilitate control valve bank installation.

(3) Remove four cap screws (fig. 292) and safety nuts securing control valve bank to cab, and lift bank from cab.

Note. The control valve bank is mounted in the cab on two mounting straps.

b. Installation.

(1) Position control valve bank (fig. 292) on mounting straps in crane operator's cab, and secure with four cap screws and safety nuts.

(2) Connect all hydraulic lines at sleeve nuts (fig. 292). Refer to paragraph 282*b*.

(3) Position control valve bank cover (fig. 80) in cab over control valve bank, and secure with four cap screws and lockwashers.

282. Hydraulic Lines and Fittings

a. Removal. Unscrew sleeve nut at both ends of flexible line or tube, remove clamps or brackets securing line or tube to crane, where used, and remove line or tube from vehicle.

Caution: Before disconnecting any hydraulic line, place identification tag on line and its corresponding port to prevent incorrect installation of hydraulic lines and crane components.

b. Installation. Position flexible line or tube on crane, secure with clamps or brackets where provided, and connect both ends of line or tube ((1) or (2) below).

(1) Using wrench, tighten all flexible-line sleeve nuts.

(2) Pull tube-fitting sleeve nuts up fingertight; then give nut a one-eighth turn only with a wrench.

Note. When installing new tubes and fittings, never tighten over two turns after sleeve has shouldered in body of fitting. Otherwise, the sleeve and tubing will be distorted, which will prevent a leak-proof seal.

283. Hydraulic Reservoir and Equipment Box

a. Removal.

(1) Remove power divider assembly (par. 271*c*).

(2) Disconnect swivel-valve-to-reservoir line (fig. 295) from reservoir inlet coupling (fig. 275).

(3) Remove four safety nuts (fig. 308), two on each side, securing hydraulic reservoir and equipment box to mounting brackets attached to left and right frame side rails.

(4) Attach a chain sling (fig. 309) and overhead hoisting equipment to reservoir, and lift reservoir from mounting brackets and remove from vehicle.

Note. Be careful not to lose spacers (fig. 309).

(5) Remove four cap screws (fig. 309), two from each end, from reservoir.

b. Installation.

(1) Insert four cap screws (fig. 309), two at each end, in holes in reservoir and equipment box.

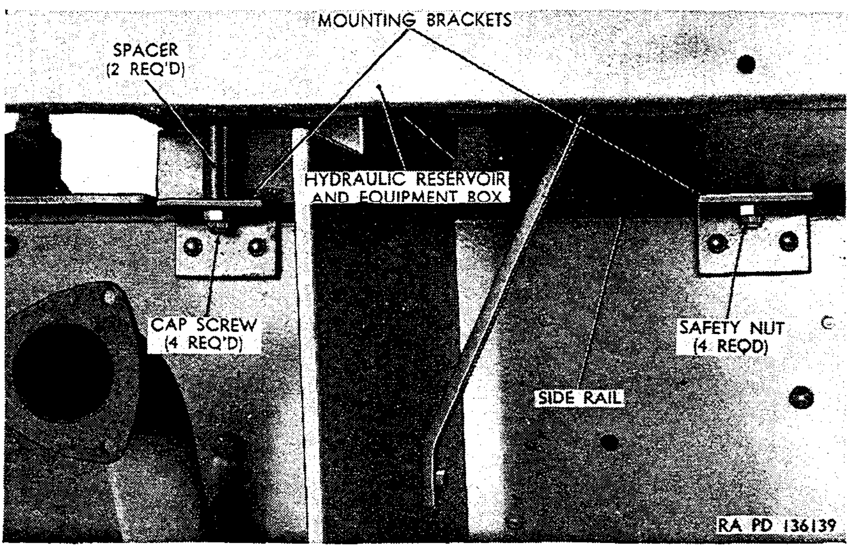


Figure 308. Hydraulic reservoir and equipment box mounting at right side rail.

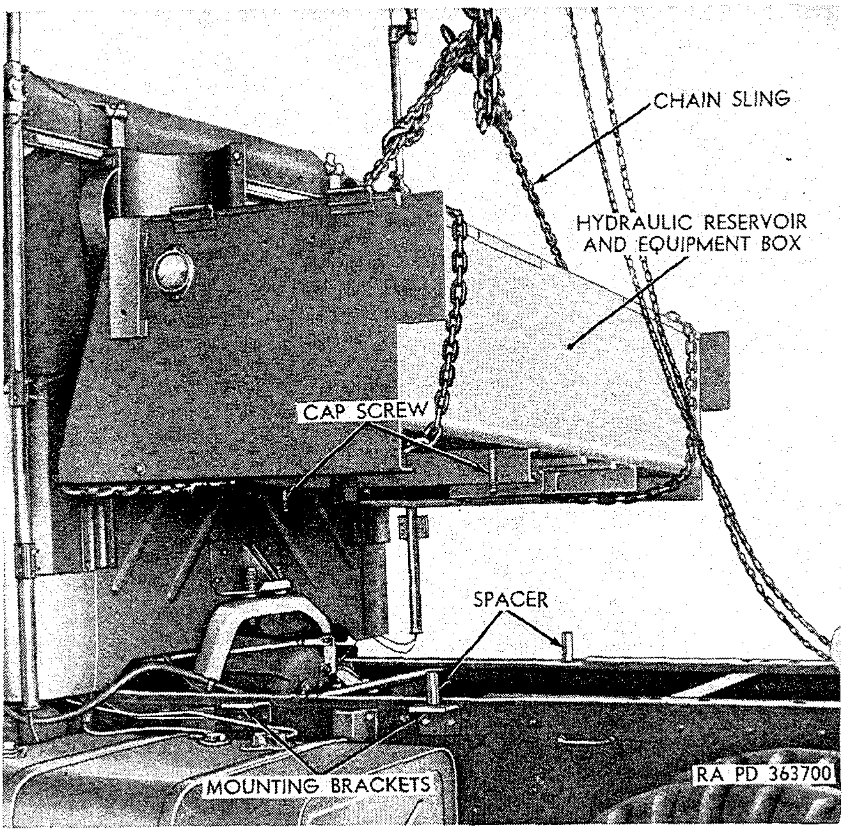


Figure 309. Removing hydraulic reservoir and equipment box M62.

(2) Make sure that spacers (fig. 309) are in position on mounting brackets, and using chain sling and hoist, position hydraulic reservoir and equipment box on brackets.

(3) Install four safety nuts (fig. 308), two on each side, on cap screws. Tighten nuts.

(4) Connect swivel-valve-to-reservoir line (fig. 295) to reservoir inlet coupling (fig. 275).

(5) Install power divider assembly (par. 271*c*).

284. Crane Body

a. Removal.

(1) Remove base plate and pivot post assembly (par. 274*b*).

(2) Remove six safety nuts (fig. 275) and cap screws securing hydraulic pump and rear winch relay levers and bracket to crane body, and remove levers and bracket from body.

(3) Loosen hose clamp securing reservoir inlet hose (fig. 275) to inlet pipe at rear of reservoir, and remove hose from pipe. Turn elbow 45° to allow clearance for removal of crane body.

(4) Remove four safety nuts (fig. 275) from two "U" bolts securing rear of crane body to left and right frame side rails.

(5) Remove 10 safety nuts (fig. 310), 5 from each side, securing front of crane body to mounting brackets bolted to rear of left and right frame side rails.

(6) Disconnect five bayonet-type taillight cable connectors (fig. 310), three at left rear corner of vehicle and two at right rear corner. Remove two clamps securing taillight cables to each side of crane body, and pull cables and connectors through body.

(7) Attach a chain sling (fig. 311) and overhead hoisting equipment to crane body, and lift body from vehicle.

b. Installation.

(1) Using chain sling (fig. 311) and hoist, lift crane body into position on truck chassis.

Note. Before lowering body, make sure that body spacers (fig. 310) are in position on frame side rails, and aline U-bolts (fig. 275) with holes in body.

(2) Install 10 safety nuts (fig. 310), 5 on each side, on hex head bolts extending through body and brackets bolted to left and right frame side rails.

(3) Pull taillight cables through crane body, and secure with two clamps to each side of body. Connect five bayonet-type taillight cable connectors (fig. 310), three at left rear corner of vehicle and two at right rear corner.

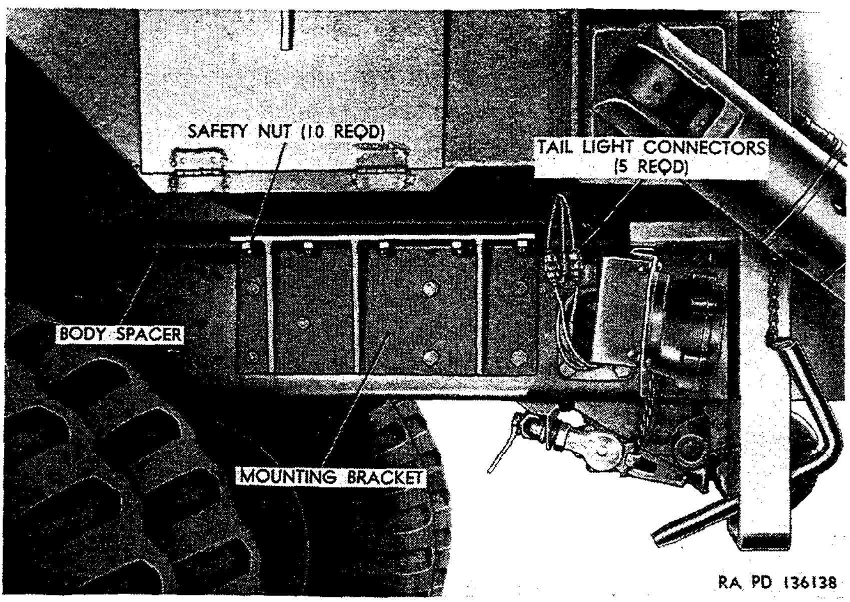


Figure 310. Crane body mounting at rear of left frame side rail M62.

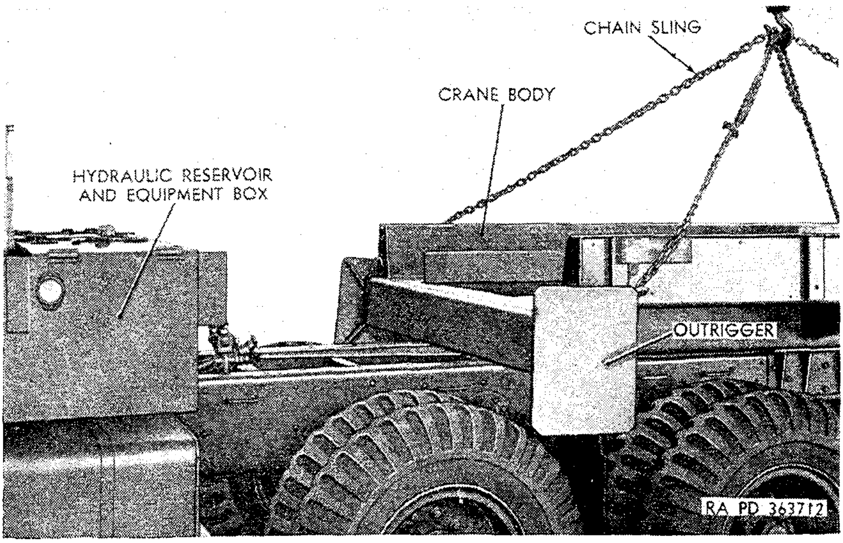


Figure 311. Removing crane body M62.

(4) Install four safety nuts (fig. 275) on the two U-bolts at rear of crane body, and tighten nuts to 100 to 150 pound-feet torque.

(5) Position hydraulic pump and rear winch relay levers (fig. 275) and bracket on rear of crane body, and secure with six safety nuts and cap screws.

(6) Turn elbow (fig. 275) 45° to aline reservoir inlet hose with inlet sleeve on front of reservoir, install hose on sleeve, and tighten hose clamp.

(7) Install base plate and pivot post assembly (par. 274*c*).

285. Floodlights, Cables, and Switches

a. Floodlights.

(1) *Lamp-unit replacement* (fig. 312).

(*a*) Remove three screws securing door to floodlight body, and pull door and lamp-unit assembly from body.

(*b*) Loosen two terminal screws on back of lamp-unit, remove two cables from terminals, and remove door and lamp-unit assembly from floodlight.

(*c*) Remove four springs securing lamp-unit to door, and remove lamp-unit from door. Discard lamp-unit.

(*d*) Insert new lamp-unit in door, and secure with four retaining springs.

(*e*) Position door and lamp-unit assembly in front of floodlight body, and insert cable terminals under lamp-unit terminal-screw heads. Tighten terminal screws.

(*f*) Insert lamp-unit in floodlight body, aline door-mounting screw holes, and secure door to body with three screws.

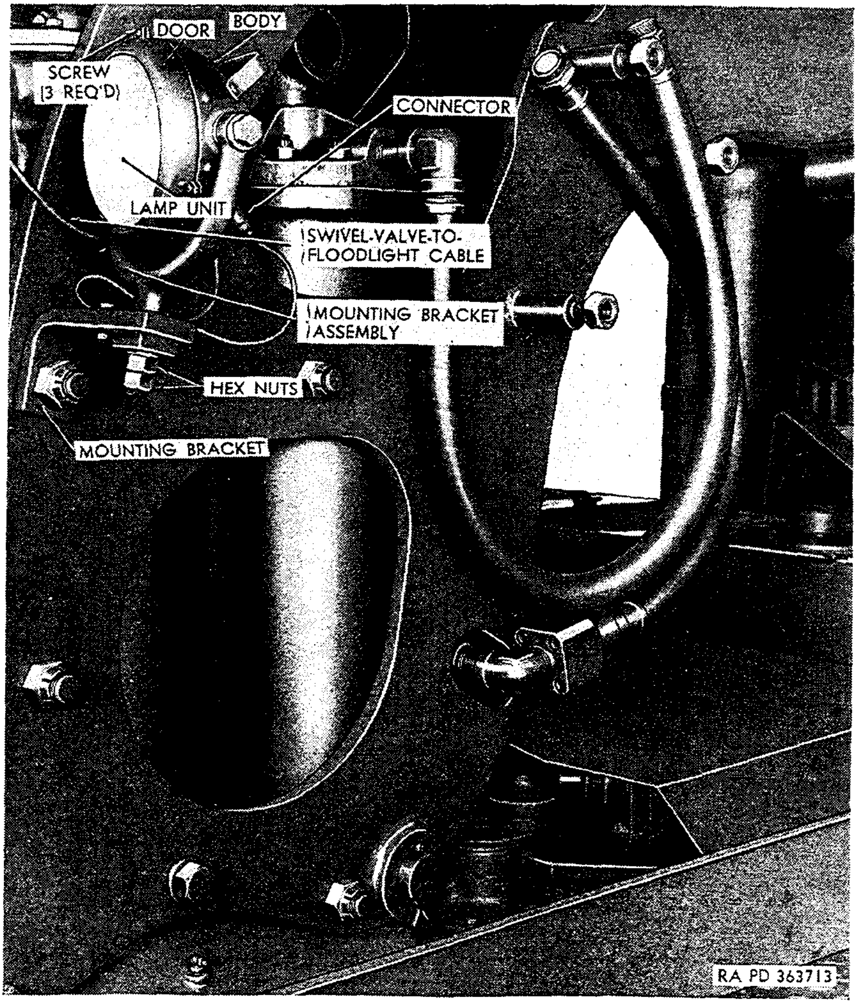


Figure 312. Floodlight mounted on left side of shipper support M62.

(2) *Floodlight switch removal.*

(*a*) Remove floodlight lamp-unit ((1)(*a*) and (*b*) above).

(*b*) Disconnect two bayonet-type connectors (fig. 312) securing floodlight cables to rear of floodlight.

(*c*) Remove two screws securing contact bracket and switch assembly to inside of floodlight body (fig. 312). Remove bracket and switch assembly (with cables) from body.

(*d*) Pull switch cable plug-type terminal from contact bracket socket.

(*e*) Disconnect switch cable bayonet-type connector from lamp-unit cable connector.

(*f*) Remove two screws and lockwashers securing switch assembly to contact bracket, and remove switch assembly from bracket.

(3) *Floodlight switch installation.*

(*a*) Position floodlight switch assembly on contact bracket, and secure with two screws and lockwashers.

(*b*) Insert switch cable plug-type terminal in contact bracket socket.

(*c*) Connect switch cable bayonet-type connector to lamp-unit cable connector.

(*d*) Position contact bracket and switch assembly in floodlight body (fig. 312), and secure bracket to body with two screws.

(*e*) Connect two floodlight cable bayonet-type connectors (fig. 312) to connectors at rear of floodlight.

(*f*) Install floodlight lamp-unit ((1) (*e*) and (*f*) above).

(4) *Floodlight removal (floodlight mounted at shipper support illustrated)* (fig. 312).

(*a*) Disconnect two bayonet-type connectors securing floodlight cables to rear of floodlight.

(*b*) Remove two hex nuts and plain washer securing floodlight mounting bracket assembly to mounting bracket bolted to shipper support. Remove floodlight assembly from mounting bracket.

(5) *Floodlight installation (floodlight mounted at shipper support illustrated)* (fig. 312).

(*a*) Insert floodlight mounting bracket stud through hole in mounting bracket bolted to shipper support, and install plain washer and two hex nuts on stud.

(*b*) Connect two floodlight cable bayonet-type connectors to connectors at rear of floodlight.

b. Floodlight cables.

(1) *Removal.* Refer to paragraph 164*a*.

(2) *Installation.* Refer to paragraph 164*b*.

c. Floodlight Switch (at Instrument Panel).

(1) *Removal.* Refer to paragraph 185*a*.

(2) *Installation.* Refer to paragraph 185*b*.

286. Hydraulic System

a. Draining. Whenever the oil in the hydraulic system is to be removed, it will be necessary to drain all hydraulic lines and cylinders as well as the hydraulic reservoir. To completely drain the system, remove the drain plug (BK, fig. 113) from the bottom of the hydraulic reservoir. Disconnect hydraulic lines (par. 282) at each cylinder (fig. 293); then, using overhead hoisting equipment or chain blocks, extend and retract each cylinder individually, allowing the oil to pour out the cylinder ports. Disconnect all hydraulic lines at their lowest point, and allow lines to drain completely. After all oil has been drained from the system, connect all hydraulic lines to prevent circulation of air through the system.

b. Filling. Refer to paragraph 67.

Section XXXIII. WRECKER CRANE (M246)

287. Description and Data

a. Description.

(1) *General.* The hydraulically-operated crane mounted on the rear of the chassis of the tractor wrecker truck M246 consists primarily of the assemblies described in (2) through (13) below. The complete crane can be replaced as a single unit providing hoisting equipment having a capacity of approximately 8,000 pounds is available. However, the illustrations and replacement instructions contained in this section refer to replacement of the individual units and assemblies comprising the crane.

Note. The information in paragraph 4*a* regarding wrecker crane locational nomenclature does not apply to the hydraulic pump and relief valve assembly.

(2) *Hydraulic pump and relief valve assembly.* The flange-mounted vane-type hydraulic pump (fig. 313) is bolted to a bracket attached to the underside of the rear outrigger frame tube. The pump is driven by a propeller shaft (fig. 313) extending from the power-take-off (fig. 209) on the rear of the transfer to the pump input shaft. The adjustable relief valve (fig. 313) is connected to the hydraulic pump outlet port. The purpose of this valve is to protect the crane hydraulic system from excessive (above 1,200 psi) pump pressures.

(3) *Base plate and pivot post assembly.* The base plate and pivot post assembly as referred to in this paragraph consists of the crane base plate (fig. 84), pivot post, shipper support, swivel valve (fig. 288), and operator's cab and control valve bank assembly (fig. 88). The combined weight of these units is approximately 3,920 pounds. The base plate is bolted to both the crane body and to the truck frame. The pivot post, which is hollow, is internally supported at the top and bottom by tapered roller bearings, which are installed on a tubular support member attached to the base plate. The pivot post support cap (fig. 289), bolted to the top of the pivot post support, anchors the pivot post to the support while permitting the pivot post to rotate freely on its vertical axis. The shipper support, on which the boom and shipper assembly ((6) below) are pivoted, is bolted to mounting bosses cast on the sides of the pivot post. For description of the swivel

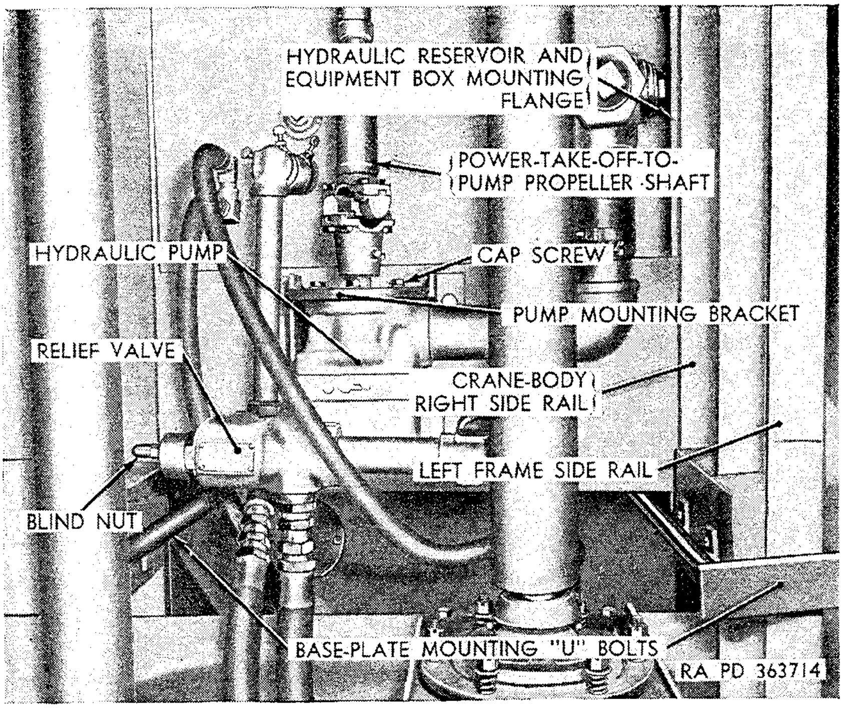


Figure 313. Bottom view of hydraulic pump and relief valve assembly installed M246.

valve, refer to paragraph 268*a*(9). For description of the control valve bank, refer to paragraph 268*a*(14).

(4) *Swing motor and drive gear case* The flange-mounted vane-type hydraulic swing motor (fig. 85) is secured to the drive gear case by six safety nuts installed on studs screwed into the motor housing. The drive gear case is secured to the crane base plate by three safety nuts installed on studs screwed into the gear case. The swing motor drive shaft is connected to the drive worm inside the gear case by a keyed coupling. Although the procedures (par. 290) in this section cover removal of the swing motor and drive gear case as a unit, the swing motor can be removed without removing the drive gear case.

(5) *Swivel valve.* Refer to paragraph 268*a*(9).

(6) *Boom and shipper assembly.* The boom and shipper assembly consists of the boom (fig. 89), boom extension, and shipper, which are telescoping tubular steel members having a rectangular shaped cross section, held together by two boom-extension retaining pins (fig. 86) and the boom crowd cylinder ((8) below). The rear end of the shipper is pivoted on a pin (fig. 290) installed at the top rear of the shipper sup-

port, which permits raising and lowering the front end of the boom. Weight of the shipper and boom assembly is approximately 2,620 pounds. Although the boom and shipper removal procedures (par. 292) require removal of the boom hoist hydraulic oil motor and cable drum before removal of the boom and shipper assembly, both assemblies can be removed as a single unit.

(7) *Boom lift cylinder.* Refer to paragraph 268*a*(11).

(8) *Boom crowd cylinder.* Refer to paragraph 268*a*(12).

(9) *Boom hoist hydraulic oil motor and cable drum assembly.* Refer to paragraph 268*a*(13).

(10) *Control valve bank.* Refer to paragraph 268*a*(14).

(11) *Hydraulic lines and fittings.* Refer to paragraph 268*a*(15).

(12) *Hydraulic reservoir and equipment box.* The hydraulic reservoir and equipment box (fig. 85) is secured to the crane body by four cap screws installed through holes in the top flange of the crane-body side rails (fig. 313) into tapped blocks welded to the top side of the hydraulic-reservoir-and-equipment-box mounting flanges. Weight of the reservoir and equipment box is 185 pounds.

(13) *Crane body.* The crane body (fig. 314) is bolted to the truck frame (after removal of the base plate and pivot post assembly) by four cap screws and safety nuts, installed two on each side through brackets bolted to the truck frame. In addition, the fifth wheel approach plates at the front of the crane body are bolted to the top flange of the truck frame side rails by six cap screws and safety nuts, three on each side. The approximate weight of the crane body, including the outriggers, is 2,200 pounds.

(14) *Hydraulic system.* The wrecker crane hydraulic system (fig. 315) is completely sealed except for the breather-type

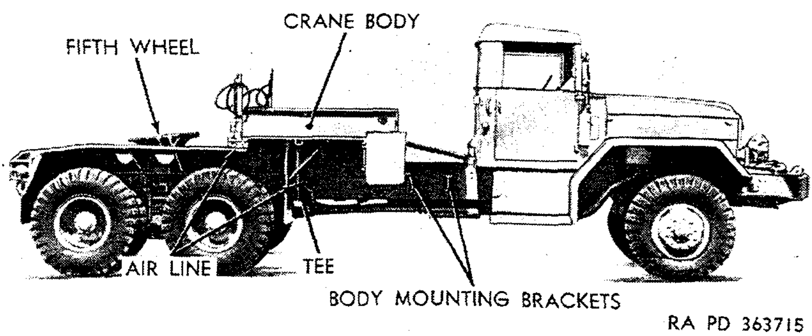


Figure 314. Right side view of tractor wrecker truck M246 with hydraulic crane and reservoir removed.

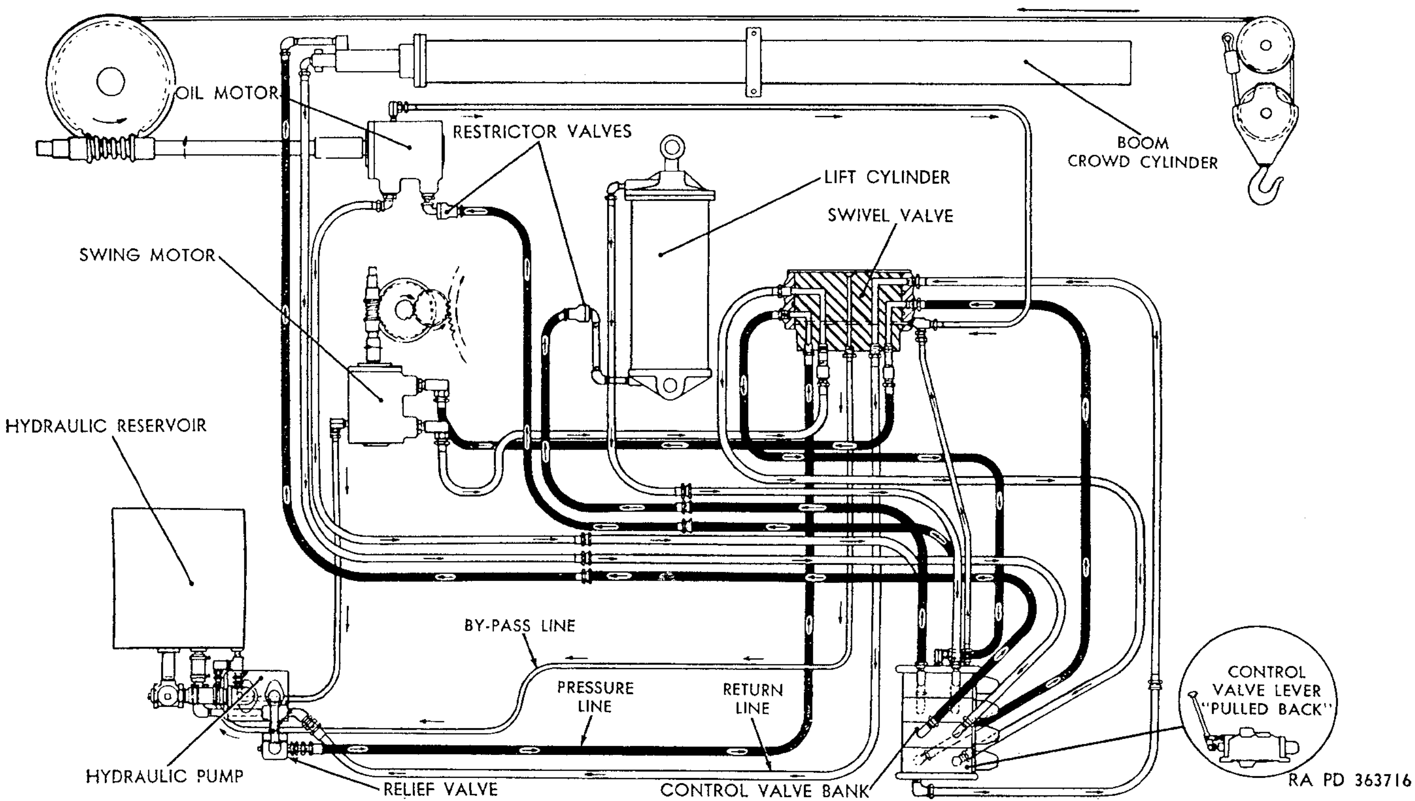


Figure 315. Crane hydraulic system M246.

reservoir filler cap. A bayonet-type oil level gage attached to a square-head pipe plug is installed in the top of the reservoir. Refer to paragraph 67 for information on maintenance of crane hydraulic system.

b. Data.

(1) *Wrecker crane.*

Make	Austin-Western
Type	hydraulic
Capacity rating	5 ton

(2) *Hydraulic pump.*

Make	Vickers
Type	vane

(3) *Relief valve.*

Make	Hydreco

(4) *Swivel valve.*

Make	Austin-Western

(5) *Swing hydraulic oil motor.*

Make	Vickers

(6) *Boom hoist hydraulic oil motor.*

Make	Vickers
Type	vane

(7) *Control valve bank assembly.*

Make	Austin-Western

288. Hydraulic Pump and Relief Valve Assembly

a. Relief Valve Test and Adjustment.

(1) *Testing.* Refer to paragraph 273*a*.

(2) *Adjustment.* Refer to paragraph 273*b*.

b. Hydraulic Pump and Relief Valve Removal.

(1) Disconnect swivel-valve-to-relief-valve line (fig. 316) from relief valve outlet port.

(2) Disconnect swivel-valve-to-reservoir-inlet-tee line (fig. 316) from tee at relief valve.

(3) Loosen two hose clamps securing reservoir inlet hose (fig. 316) to sleeve on bottom of reservoir, and remove hose from sleeve.

(4) Loosen two hose clamps securing pump inlet hose (fig. 316) to oil supply valve outlet port.

(5) Remove power-take-off-to-pump propeller shaft (fig. 313) from pump propeller shaft (par. 211).

(6) Remove six cap screws (fig. 313) and lockwashers securing pump to pump mounting bracket, pull pump from bracket, sliding pump inlet hose (fig. 316) from oil supply valve outlet port, and remove hydraulic pump and relief valve assembly from vehicle.

(7) Remove reservoir-to-pump piping from pump inlet port.

(8) Remove pump-to-relief-valve piping from pump outlet port.

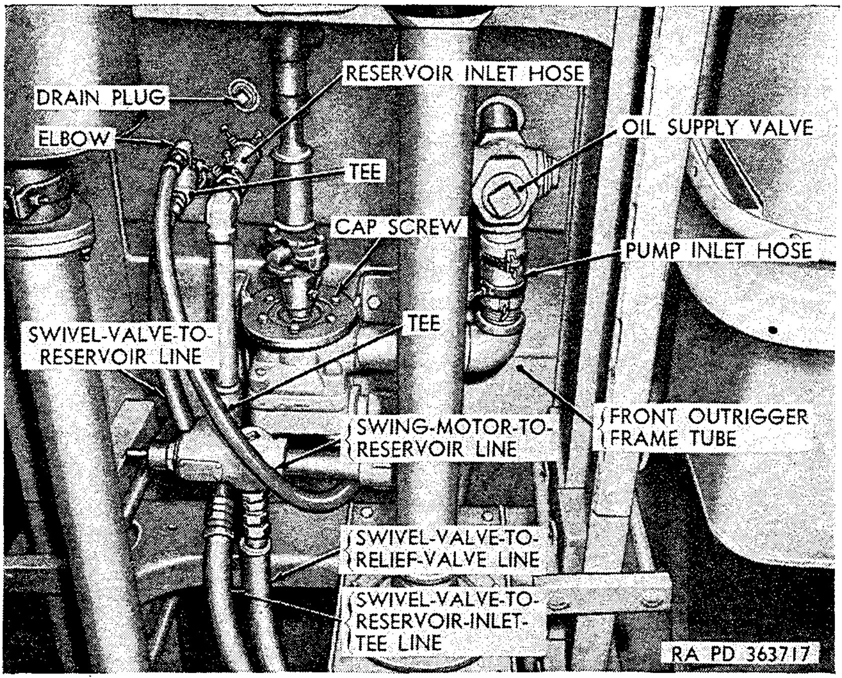


Figure 316. Front bottom view of hydraulic pump and relief valve assembly installed M246.

(9) Remove pump-to-relief-valve piping from relief valve inlet port.

(10) Remove relief-valve-to-reservoir piping from relief valve outlet port.

c. Hydraulic Pump and Relief Valve Installation.

(1) Install relief-valve-to-reservoir piping in relief valve outlet port.

(2) Install pump-to-relief-valve piping in relief valve inlet port.

(3) Install pump-to-relief-valve piping in pump outlet port.

(4) Install reservoir-to-pump piping in pump inlet port.

(5) Position pump and relief valve assembly under front outrigger frame tube, and secure pump (fig. 316) to pump mounting brack with six cap screws and lockwashers. Tighten cap screws.

(6) Install power-take-off-to-pump propeller shaft (fig. 313) on pump drive shaft (par. 211).

(7) Connect swivel-valve-to-reservoir-inlet-tee line (fig. 316) to tee at relief valve.

(8) Connect swivel-valve-to-relief-valve line (fig. 316) to relief valve outlet port.

(9) Install reservoir inlet hose (fig. 316) on sleeve at bottom of reservoir, and tighten the two hose clamps.

(10) Install pump inlet hose (fig. 316) on oil supply valve outlet port, and tighten the two hose clamps. Open oil supply valve.

289. Base Plate and Pivot Post Assembly

a. Coordination With Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Remove boom and shipper assembly (par. 292).
(2) Remove boom lift cylinder (par. 293).
(3) Remove swing motor and drive gear case (par. 290), and drop swing-motor-to-reservoir line (fig. 85) through hole in crane base plate.
(4) Remove 16 safety nuts (fig. 84) from 8 **U** bolts securing base plate to crane body side rails and truck frame side rails.
(5) Remove four cap screws (fig. 84) and lockwashers securing base plate to crane body.
(6) Disconnect floodlight cable at bayonet-type connector clipped to top of frame cross member under crane base plate.
(7) Disconnect swivel-valve-to-relief-valve line (fig. 316) from relief valve outlet port.
(8) Disconnect swivel-valve-to-reservoir-inlet-tee line (fig. 316) from tee at relief valve.
(9) Disconnect swivel-valve-to-reservoir line (fig. 316) from tee on bottom of reservoir.
(10) Place a chain under the operator's cab and between the shipper support (fig. 299), and using overhead hoisting equipment, lift base plate and pivot post assembly from crane body.

c. Installation.

(1) Using overhead hoisting equipment, lift base plate and pivot post assembly into position on crane body, guiding base plate mounting **U**-bolts (fig. 313) through holes in base plate. Remove hoisting equipment.
(2) Connect swivel-valve-to-reservoir line (fig. 316) to tee on bottom of reservoir.
(3) Connect swivel-valve-to-reservoir-inlet-tee line (fig. 316) to tee at relief valve.
(4) Connect swivel-valve-to-relief-valve line (fig. 316) to relief valve outlet port.
(5) Connect floodlight cable to bayonet-type connector clipped to top of frame cross member under crane base plate.
(6) Install 16 safety nuts (fig. 84) on 8 **U**-bolts, and tighten.
(7) Install four cap screws (fig. 84) and lockwashers in holes in base plate and crane body side rails.
(8) Insert swing-motor-to-reservoir line (fig. 316) through hole

in crane base plate, and install swing motor and drive gear case (par. 290).
(9) Install boom lift cylinder (par. 293).
(10) Install boom and shipper assembly (par. 292).
(11) Lubricate hydraulic crane (par. 67).

290. Swing Motor and Drive Gear Case

a. Coordination With an Ordnance Maintenance Unit. Refer to paragraph 2.

b. Removal.

(1) Disconnect swing-motor-to-reservoir line (fig. 85) from elbow on rear of swing motor.
(2) Disconnect two swivel-valve-to-swing-motor lines (fig. 85) from elbows on front of swing motor.
(3) Remove three safety nuts (one at left side and two at right side) from studs securing drive gear case to crane base plate, and remove swing motor and drive gear case from vehicle.
(4) Remove six safety nuts (fig. 85) securing swing motor to drive gear case, and remove motor from gear case.

c. Installation.

(1) Aline key on swing-motor drive shaft with keyway in coupling on drive worm, position swing motor (fig. 85) on drive gear case, and secure with six safety nuts. Tighten nuts (on motor mounting studs).
(2) Position drive gear case on crane base plate, with studs on bottom of case entering holes in base plate, and secure with three safety nuts.
(3) Connect two swivel-valve-to-swing-motor lines (fig. 85) at elbows on front of swing motor.
(4) Connect swing-motor-to-reservoir line (fig. 85) at elbow on rear of swing motor.

291. Swivel Valve

a. Removal.

(1) Perform procedures outlined in paragraph 276*a*(1) through (5).
(2) Disconnect floodlight cable at bayonet-type connector clipped to top of frame cross member under crane base plate.
(3) Disconnect two swivel-valve-to-swing-motor lines (fig. 85) from elbows on front of swing motor.
(4) Disconnect swivel-valve-to-relief-valve line (fig. 316) from relief valve outlet.
(5) Disconnect swivel-valve-to-reservoir-inlet-tee line (fig. 316) from tee at relief valve.
(6) Disconnect swivel-valve-to-reservoir line (fig. 316) from tee at bottom of reservoir.

(7) Using overhead hoisting equipment, lift swivel valve assembly (fig. 289), together with hydraulic lines and floodlight cable, from pivot post, and remove from vehicle.

b. Installation.

(1) Perform procedures outlined in paragraph 276*b*(1) through (6).

(2) Connect two swivel-valve-to-swing-motor lines (fig. 85) at elbows on front of swing motor.

(3) Connect floodlight cable to bayonet-type connector clipped to top of frame cross member under crane base plate.

(4) Connect swivel-valve-to-reservoir line (fig. 316) at tee on bottom of reservoir.

(5) Connect swivel-valve-to-reservoir-inlet-tee line (fig. 316) at tee at relief valve.

(6) Connect swivel-valve-to-relief-valve line (fig. 316) to relief valve outlet port.

(7) Remove overhead hoisting equipment from boom and shipper assembly, and lower boom.

292. Boom and Shipper Assembly

a. Removal. Refer to paragraph 277*a*.

b. Installation. Refer to paragraph 277*b*.

293. Boom Lift Cylinder

a. Removal. Refer to paragraph 278*a*.

b. Installation. Refer to paragraph 278*b*.

294. Boom Crowd Cylinder

a. Removal. Refer to paragraph 279*a*.

b. Installation. Refer to paragraph 279*b*.

295. Boom Hoist Hydraulic Oil Motor and Cable Drum

a. Removal. Refer to paragraph 280*a*.

b. Installation. Refer to paragraph 280*b*.

296. Control Valve Bank

a. Removal. Refer to paragraph 281*a*.

b. Installation. Refer to paragraph 281*b*.

297. Hydraulic Lines and Fittings

a. Removal. Refer to paragraph 282*a*.

b. Installation. Refer to paragraph 282*b*.

298. Hydraulic Reservoir and Equipment Box

a. Removal.

(1) Disconnect swivel-valve-to-reservoir line (fig. 316) at tee on bottom of reservoir.

(2) Disconnect swing-motor-to-reservoir line (fig. 316) at elbow on bottom of reservoir.

(3) Loosen two hose clamps securing reservoir inlet hose (fig. 316) to sleeve on bottom of reservoir, and remove hose from sleeve.

(4) Loosen two hose clamps securing pump inlet hose (fig. 316) to oil supply valve outlet port, and remove hose from valve.

(5) Remove four cap screws and lockwashers (from inside of crane body side rails) securing reservoir mounting flanges (fig. 313) to crane body side rails.

(6) Attach a chain sling and overhead hoisting equipment to reservoir, and lift reservoir from crane body and remove from vehicle.

b. Installation.

(1) Using chain sling and hoist, position hydraulic reservoir and equipment box on crane body, and aline holes in crane body side rails (fig. 313) with holes in reservoir mounting flanges. Install four cap screws with lockwashers in mounting holes, and tighten.

(2) Slide pump inlet hose (fig. 316) on oil supply valve outlet port, and tighten the two hose clamps.

(3) Slide reservoir inlet hose (fig. 316) on sleeve at bottom of reservoir, and tighten the two hose clamps.

(4) Connect swivel-valve-to-reservoir line (fig. 316) at tee on bottom of reservoir.

(5) Connect swing-motor-to-reservoir line (fig. 316) at elbow on bottom of reservoir.

299. Crane Body

a. Removal.

(1) Remove base plate and pivot post assembly (par. 289).

(2) Remove fifth wheel (par. 303).

(3) Remove hydraulic pump and relief valve assembly (par. 288).

(4) Drain air reservoirs (par. 235).

(5) Disconnect both ends of air line (fig. 314) connecting elbow (fig. 317) at base of trailer hose and cable supports to tee (fig. 314) at truck-frame side rails. Remove clips securing air lines to crane body, and remove lines.

(6) Remove trailer coupling receptacle (fig. 318) from bracket attached to front outrigger frame tube (par. 161).

(7) Remove trailer coupling receptacle (fig. 93) at base of right trailer hose and cable support (par. 161).

(8) Disconnect five bayonet-type taillight cable connectors, three at left rear corner of vehicle and two at right rear corner.

(9) Remove four cap screws and safety nuts securing rear of crane body (fig. 314) to brackets, two on each side of vehicle, bolted to frame side rails.

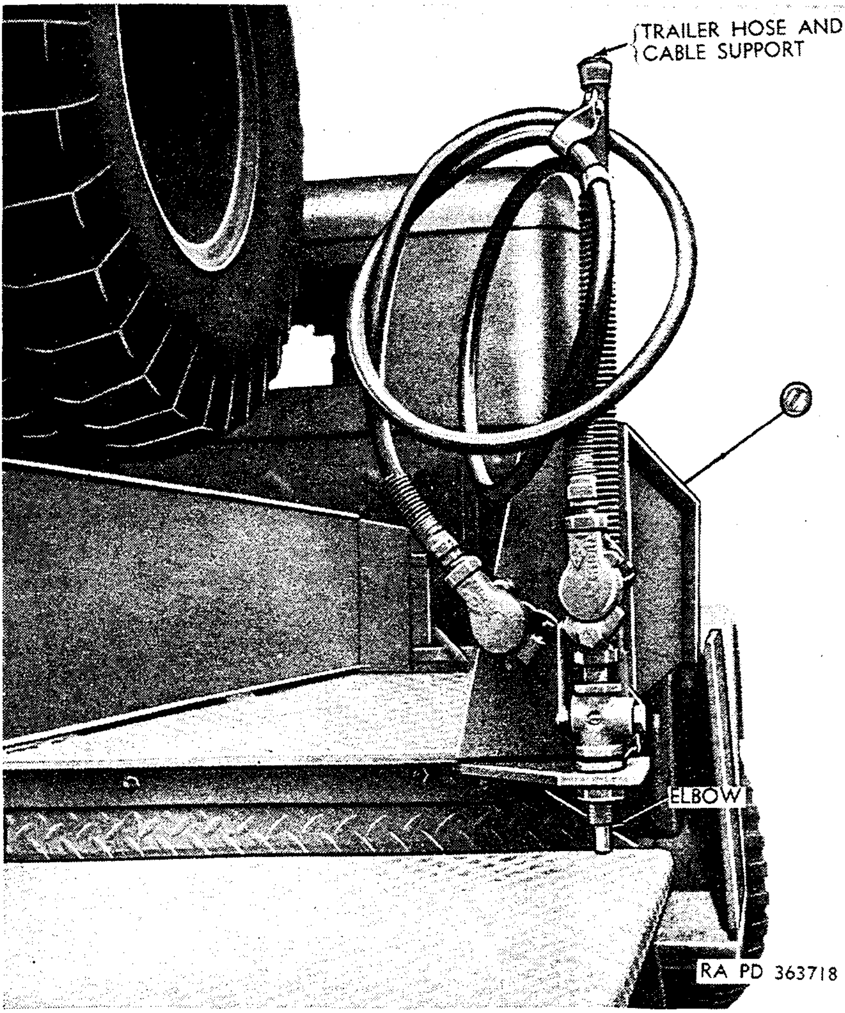


Figure 317. Front view of left trailer hose and cable support M246.

(10) Remove six cap screws and lockwashers, located under fifth wheel approach plates (fig. 318), three on each side, securing front of crane body to truck-frame side rails.

(11) Attach a chain sling and overhead hoisting equipment to crane body, and remove body from vehicle.

b. Installation.

(1) Using a chain sling and overhead hoisting equipment, lift crane body into position on truck-frame side rails, and aline mounting holes.

(2) Install six cap screws and lockwashers under fifth wheel approach plates (fig. 318) in holes in crane-body side rails and truck-frame side rails. Tighten cap screws.

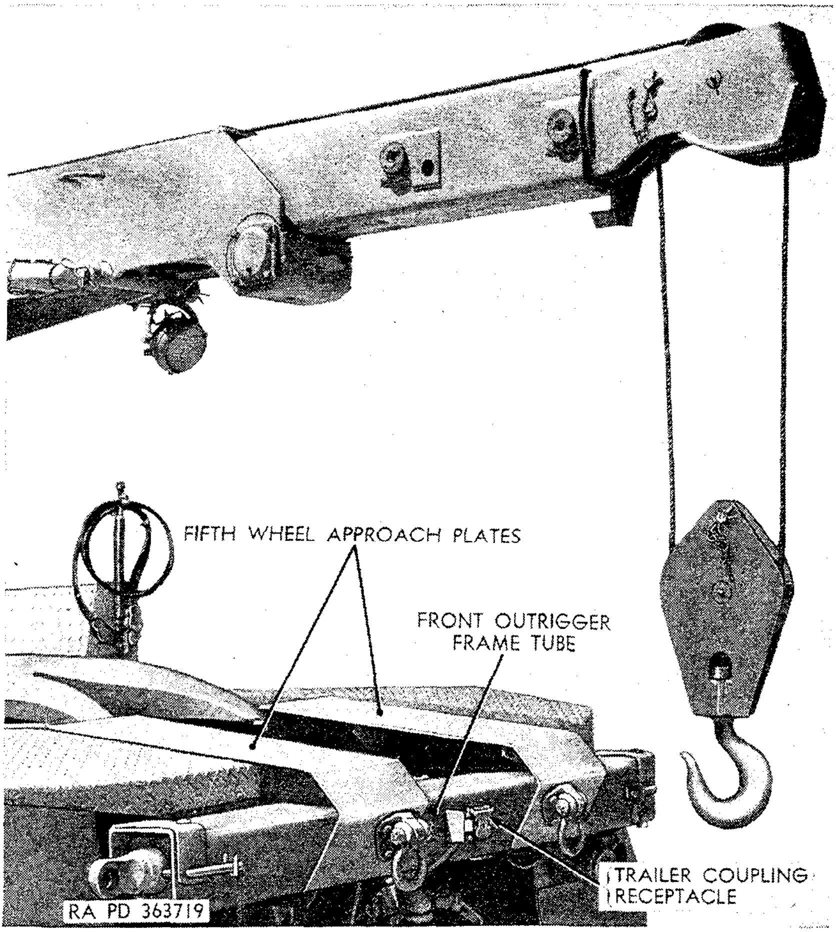


Figure 318. Front view of right front corner of crane body M246.

(3) Install four cap screws and safety nuts through holes in rear of crane body (fig. 314) and brackets bolted to truck-frame side rails. Tighten cap screws and nuts.

(4) Connect five bayonet-type taillight cable connectors, three at left rear corner of vehicle and two at right rear corner.

(5) Install trailer coupling receptacle (fig. 93) at base of right trailer hose and cable support (par. 161).

(6) Install trailer coupling receptacle (fig. 318) at bracket attached to front outrigger frame tube (par. 161).

(7) Position air lines (fig. 314) on left and right sides of crane body, and secure to body with clips. Connect both lines to elbow (fig. 317) at base of trailer hose and cable supports and to tee (fig. 314) at truck-frame side rails.

(8) Install hydraulic pump and relief valve assembly (par. 288).

347797°—55——31

(9) Install fifth wheel (par. 303).
(10) Install base plate and pivot post assembly (par. 289).

300. Floodlights, Cables, and Switches

a. Floodlights.
(1) *Lamp-unit replacement.* Refer to paragraph 285*a*(1).
(2) *Floodlight switch removal.* Refer to paragraph 285*a*(2).
(3) *Floodlight switch installation.* Refer to paragraph 285*a*(3).
(4) *Floodlight removal.* Refer to paragraph 285*a*(4).
(5) *Floodlight installation.* Refer to paragraph 285*a*(5).

b. Floodlight Cables.
(1) *Removal.* Refer to paragraph 164*a*.
(2) *Installation.* Refer to paragraph 164*b*.

c. Floodlight Switch (at Instrument Panel).
(1) *Removal.* Refer to paragraph 185*a*.
(2) *Installation.* Refer to paragraph 185*b*.

301. Hydraulic System

a. Draining. Refer to paragraph 286*a*.
b. Filling. Refer to paragraph 67.

Section XXXIV. FIFTH WHEEL ASSEMBLY

302. Description and Data

a. Description. The fifth wheel assembly, which is mounted on the rear of the chassis of the tractor truck M52 and on the front of the crane body of the tractor wrecker truck M246, consists of the fifth wheel (figs. 86 and 319), approach plates (figs. 318 and 320), and cen-

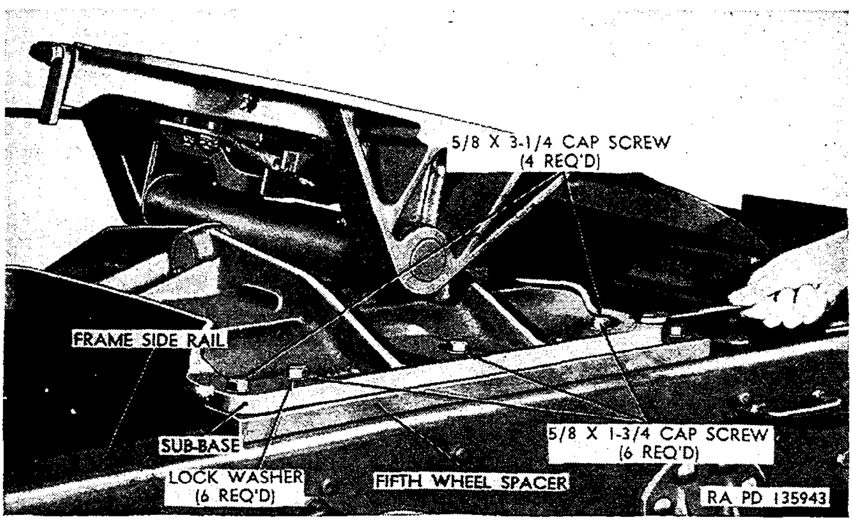


Figure 319. Left front view of fifth wheel M52.

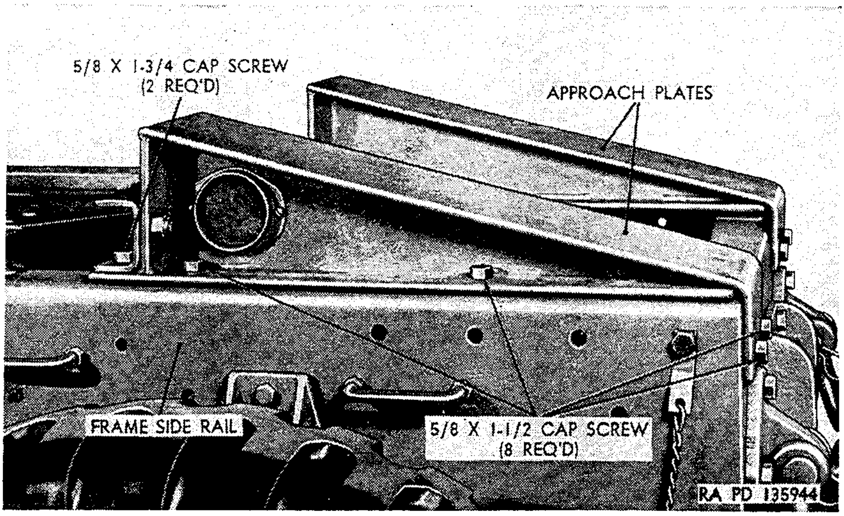


Figure 320. Left rear view of approach plate assembly M52.

ter deck plate (fig. 321) (M52 only). On the tractor truck M52, the approach plate and center deck plate are bolted directly to the frame left and right side rails. The fifth wheel is bolted to the side rails and fifth wheel spacers (fig. 319), which are bolted to the side rails. On the tractor wrecker truck M246, the approach plates are a part of the crane body, and the fifth wheel is bolted to both the crane-body side rails and the truck-frame side rails.

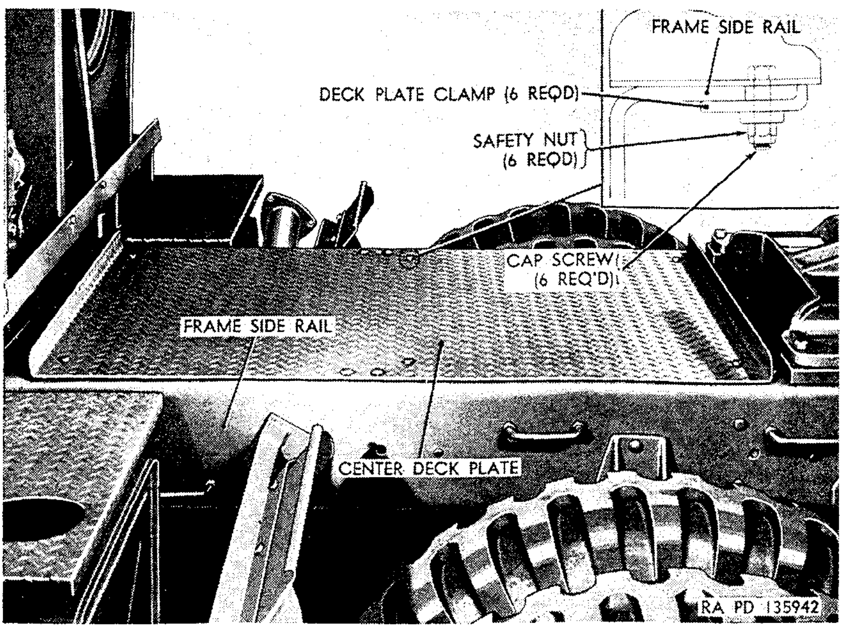


Figure 321. Top left view of center deck plate M52.

b. Fifth Wheel Data.

Make	Dayton Steel Foundry
Ordnance number	7367608
Manufacturer's number	DSF–FWU33QB
Type	automatic coupling
Size	33 in.

c. Fifth Wheel Adjustment. The fifth wheel is equipped with two adjusting wedges that control its lateral movement. The adjusting wedges are used in the full-locked position when vehicle is engaged in highway operations. For off-highway use, wedges should be in the fully-withdrawn position. No other adjustment is required.

303. Fifth Wheel

a. Removal (M52).

(1) Remove six cap screws (fig. 319) and lockwashers and four cap screws and safety nuts (located on inside of frame side rails) securing fifth wheel subbase to fifth wheel spacers and frame side rails.

(2) Using overhead hoisting equipment, remove fifth wheel from vehicle.

b. Installation (M52).

(1) Using overhead hoisting equipment, lift fifth wheel into position on spacers (fig. 319) bolted to frame side rails, and aline mounting screw holes in subbase and spacers.

(2) Install six 5/8 x 1 3/4 cap screws (fig. 319) with lockwashers in holes in subbase and spacers, and tighten. Insert four 5/8 x 3 1/4 cap screws through holes in subbase and spacer, install four safety nuts on cap screws, and tighten.

c. Removal (M246).

(1) Remove safety nuts (located on inside of truck-frame side rails) from eight cap screws, four on each side of fifth wheel subbase, securing fifth wheel (fig. 86) to crane-body side rails and truck-frame side rails. Remove cap screws.

(2) Remove two cap screws and lockwashers, one on each side of subbase, securing fifth wheel to crane-body side rails.

(3) Using overhead hoisting equipment, remove fifth wheel from vehicle.

d. Installation (M246).

(1) Using overhead hoisting equipment, lift fifth wheel (fig. 86) into position on crane-body side rails, and aline mounting screw hole in subbase and side rails.

(2) Install cap screw with lockwasher in center hole on each side of subbase (into tapped hole in side rail), and tighten.

(3) Insert eight cap screws in holes in subbase, crane-body side rails, and truck-frame side rails. Install eight safety nuts on cap screws, and tighten.

304. Approach Plate Assembly

a. Removal (M52 Only).

(1) Remove eight cap screws (fig. 320) and safety nuts and two cap screws and safety nuts securing approach plate assembly to frame side rails.

(2) Lift approach plate assembly from vehicle.

b. Installation (M52 Only).

(1) Lift approach plate assembly into position on frame side rails (fig. 320), and aline mounting screw holes in approach plates and side rails.

(2) Install two 5/8 x 1¾ cap screws (fig. 320) and eight 5/8 x 1½ cap screws in holes in approach plates and side rails. Install 10 safety nuts on cap screws, and tighten.

305. Center Deck Plate

a. Removal (M52 Only).

(1) Remove six cap screws (fig. 321), safety nuts, and deck plate clamps securing center deck plate to frame side rails.

(2) Lift center deck plate from vehicle.

b. Installation (M52 Only).

(1) Lift center deck plate (fig. 321) into position on frame side rails, and aline mounting screw holes in plate and side rails.

(2) Insert six cap screws (fig. 321) in holes in plate and side rails, and install six safety nuts and deck plate clamps on cap screws. Tighten cap screws and nuts.

Section XXXV. DUMP BODY AND HOIST ASSEMBLY

306. Coordination With Ordnance Maintenance Unit

Refer to paragraph 2.

307. Description and Data

a. Description.

(1) *General.* The dump body and hoist assembly (fig. 94) mounted on the rear of the chassis of the dump truck M51 is comprised of the dump body, subframe, hydraulic pump, control valve assembly, control linkage, and hydraulic hoist assembly.

(2) *Dump body* (fig. 94). The dump body is of all-steel welded construction. The body is pivoted to the rear of the subframe ((3) below) by a pair of removable hinge brackets, which are bolted to the underside of the body. Safety braces attached to the underside of the dump body are provided for supporting the body when in the raised position.

(3) *Subframe* (fig. 94). The subframe is bolted directly to the frame left and right side rails. The subframe includes the

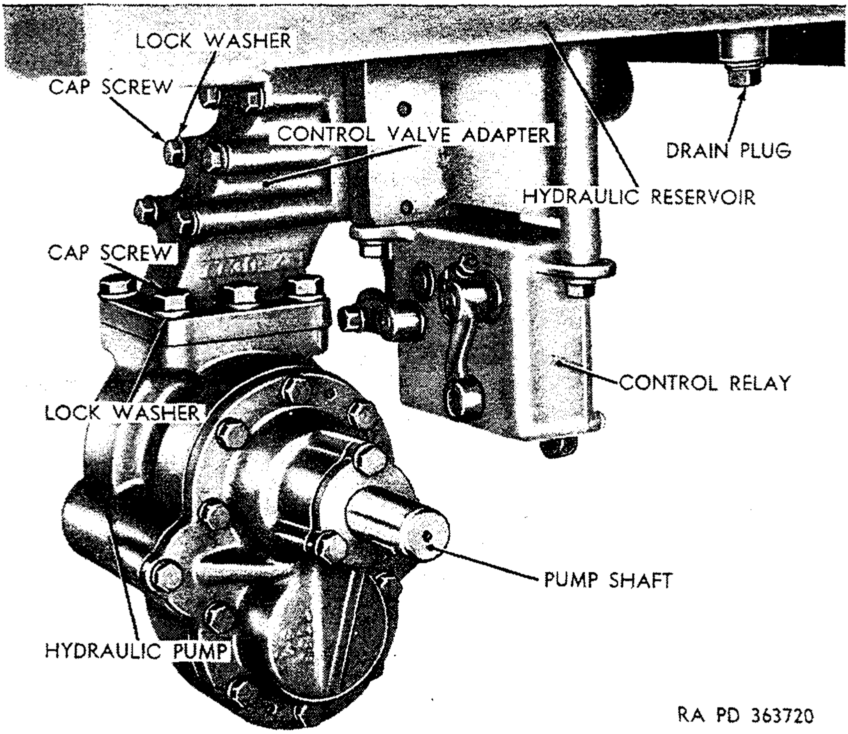


Figure 322. Right front view of hydraulic hoist pump mounting M51.

hydraulic reservoir and cross member for supporting the base of the hydraulic hoist cylinders ((7) below).

(4) *Hydraulic pump.* The gear-type hydraulic pump (fig. 322), which is connected by a propeller shaft to the transmission-mounted power-take-off (par. 208), is bolted to the control valve assembly ((5) below) by an adapter.

(5) *Control valve assembly.* The control valve assembly (fig. 323) consists of a spool-type hydraulic valve with a pair of hydraulic manifolds installed in the outlet ports. The control valve is bolted to a mounting base welded to the rear of the hydraulic reservoir.

(6) *Control linkage.* The control linkage (fig. 324) is comprised of four control rods, each having an adjustable yoke, connected by relay levers and cross shafts so as to provide control of the power-take-off (par. 208*a*(3)) and the control valve by a single control lever (fig. 67).

(7) *Hydraulic hoist assembly.* The hydraulic hoist assembly consists of two hydraulic hoist cylinders (fig. 94), mounted side by side with the base of each cylinder pivoted on a shaft clamped to the subframe. The upper end of each hoist cyl-

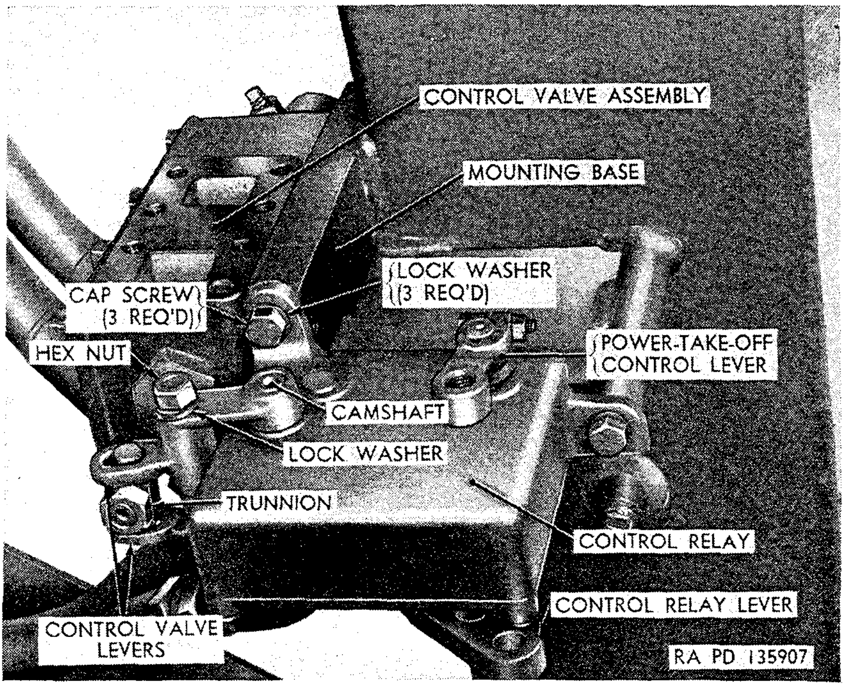


Figure 323. Bottom view of right side of control valve assembly with pump and adapter removed M51.

inder piston rod (fig. 325) is clamped to a crosshead, each end of which is pivoted to a lifting arm assembly which is pinned to the underside of the dump body. High-pressure-type hoses connect the hoist cylinders to the hydraulic manifolds (fig. 332) installed in the control valve outlet ports.

b. Data.

Manufacturer	St Paul Hoist
Ordnance number	7409208
Capacity	5 cu. yd
Inside length	125 in.
Inside width	82 in.
Height of sides and ends	23 in.
Maximum dumping angle	70°

308. Dump Body

a. Removal.

(1) Raise dump body to maximum elevated position (par. 55), position safety braces (fig. 94), and lower body until supported by braces.

(2) Remove two hex nuts (fig. 325), lockwashers, and cap screws securing left and right thrust plate lifting pins to thrust plates on underside of dump body.

A—POWER-TAKE-OFF
B—POWER-TAKE-OFF CROSS SHAFT ROD
C—DRIVE SHAFT ASSY
D—POWER-TAKE-OFF CROSS SHAFT LEFT LEVER
E—POWER-TAKE-OFF CROSS SHAFT RIGHT LEVER
F—POWER-TAKE-OFF CROSS SHAFT
G—POWER-TAKE-OFF RELAY LEVER ROD
H—HYDRAULIC PUMP
J—VALVE ADAPTER BODY
K—VALVE ASSY
L—POWER-TAKE-OFF RELAY LEVER
M—RELAY
N—RELAY LEVER
P—RELAY CROSS SHAFT ROD
Q—RELAY CROSS SHAFT LEFT LEVER
R—HAND LEVER LOCK
S—RELAY CROSS SHAFT RIGHT LEVER
T—RELAY CROSS SHAFT
U—HAND LEVER
V—HAND LEVER CROSS SHAFT
W—HAND LEVER CROSS SHAFT ROD
X—HAND LEVER CROSS SHAFT LEVER

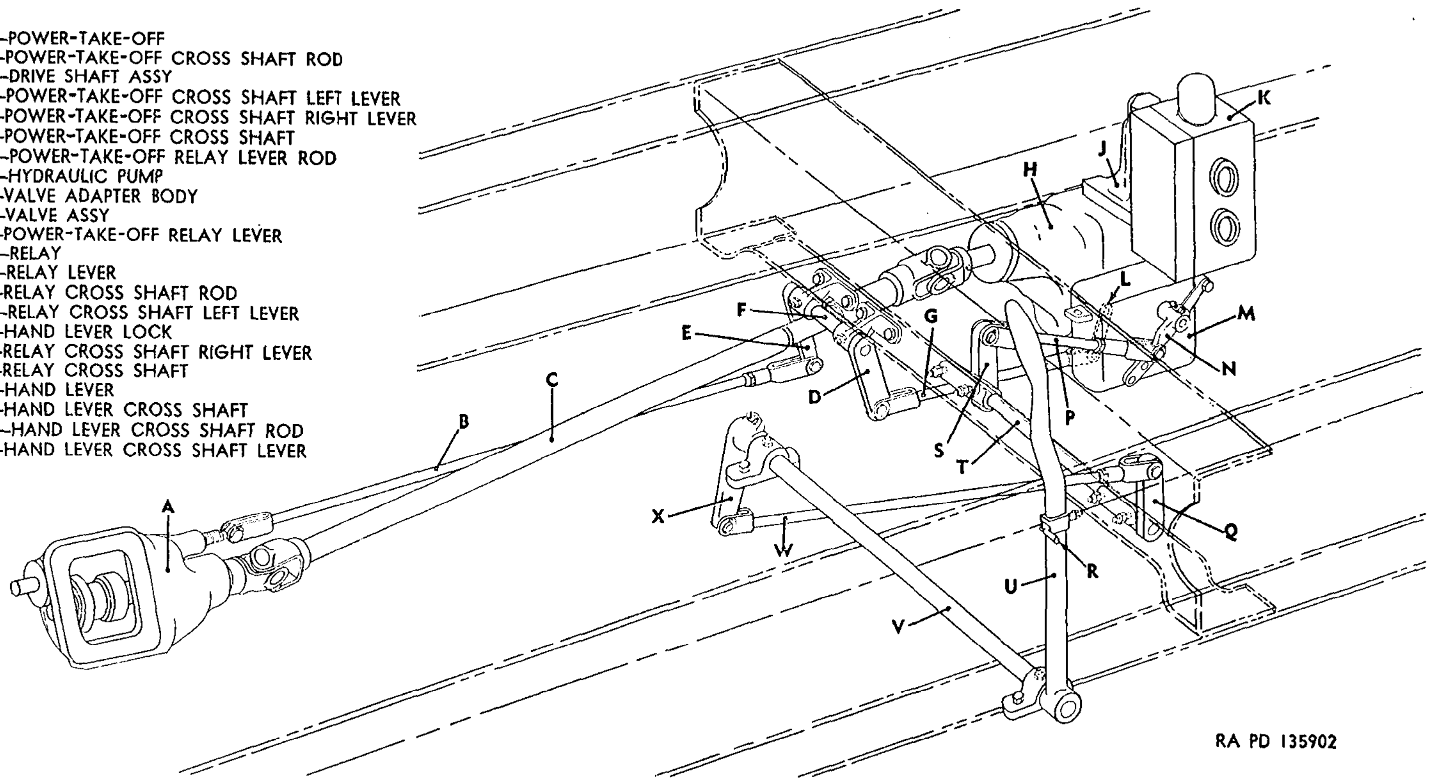


Figure 324. Dump body control linkage M51.

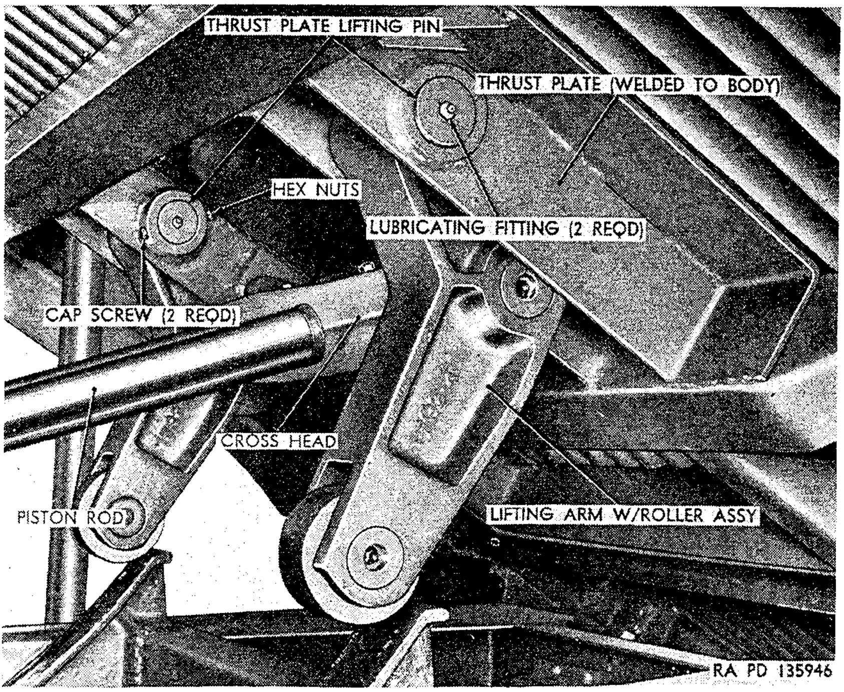


Figure 325. Left side of hoist assembly with dump body in raised position M51.

(3) Raise body, remove safety braces, and lower body to extreme lowered position.

(4) Remove lubrication fittings (fig. 325) from both thrust plate lifting pins, and drive pins from thrust plates and lifting arms.

(5) Remove 10 cap screws (fig. 326), lockwashers, and hex nuts securing 2 hinge brackets to rear corners of dump body.

(6) Attach chain sling and overhead hoisting equipment to dump body, and lift body from subframe.

b. Installation.

(1) Using chain sling and overhead hoisting equipment, position dump body (fig. 326) on subframe.

(2) Aline holes in thrust plates (fig. 32) with holes in lifting arms, and install thrust plate lifting pins.

Note. Aline holes in lifting pins with holes in thrust plate for installation of pin retaining cap screws.

(3) Aline holes in hinge brackets (fig. 326) with holes in rear corners of dump body, and secure hinge brackets to body with 10 cap screws, lockwashers, and hex nuts. Tighten cap screws and nuts.

(4) Raise dump body, and secure in raised position with safety braces (fig. 94).

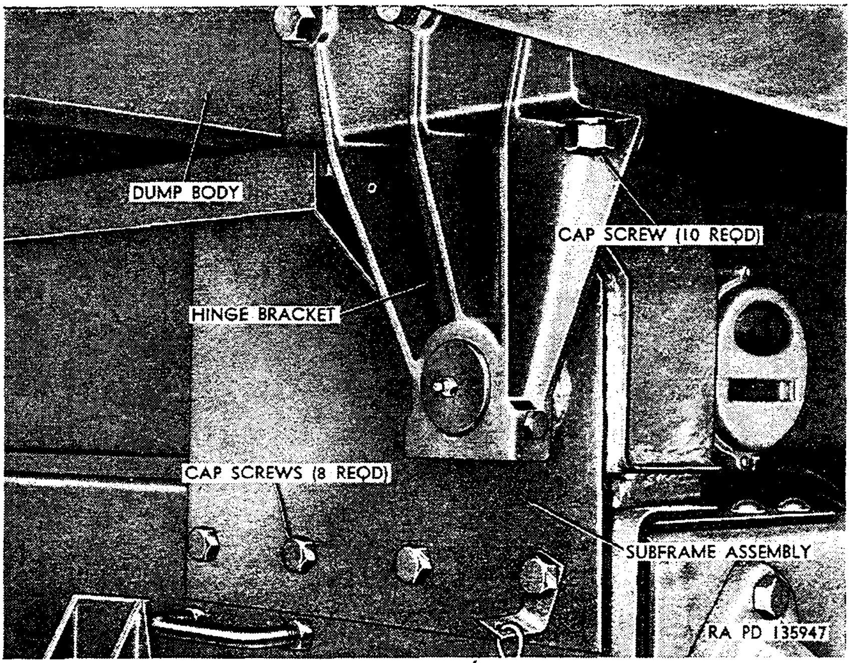


Figure 326. Left rear corner of dump body M51.

(5) Install cap screw (fig. 325) in holes in thrust plate and lifting pin at each thrust plate, install lockwasher and hex nut on screw, and tighten.
(6) Install lubrication fitting (fig. 325) in end of each thrust plate lifting pin.
(7) Raise body, remove safety braces, and lower body to extreme lowered position.

309. Hydraulic Hoist Assembly

a. Hoist Cylinder Removal.

(1) Remove dump body (par. 308).
(2) Remove four cap screws (fig. 327) and lockwashers securing four crosshead retainers and hoist cylinder piston rods to crosshead. Remove retainers from crosshead, and remove crosshead from piston rods.
(3) Disconnect two hydraulic flexible lines (fig. 328) from ports at base of cylinder to be removed.
(4) Remove four cap screws (fig. 329) and lockwashers securing two bearing caps to subframe cross member, remove bearing caps, and remove cylinder with trunnion shaft from cross member.
(5) Loosen two square-head setscrews (fig. 329) securing trunnion shaft to cylinder base, and remove shaft from cylinder.

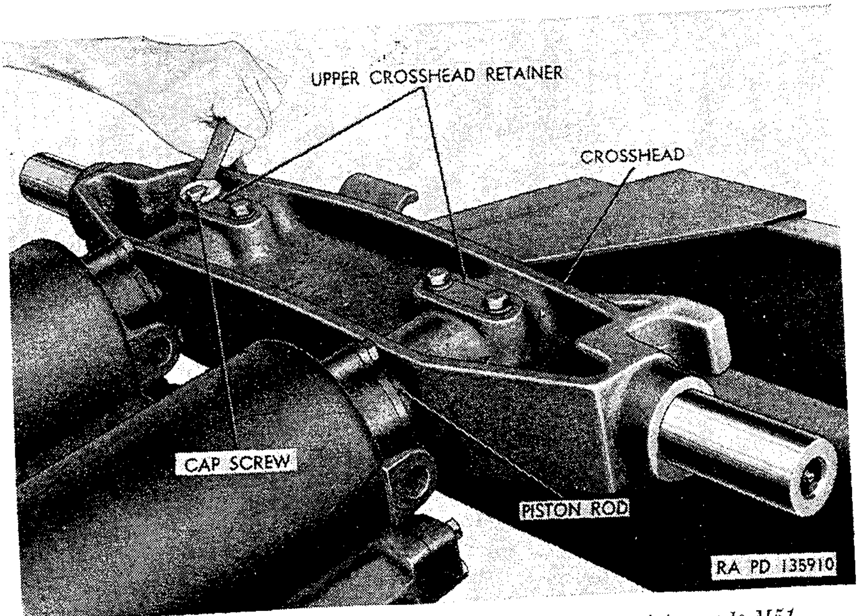


Figure 327. Removing crosshead from hoist cylinder piston rods M51.

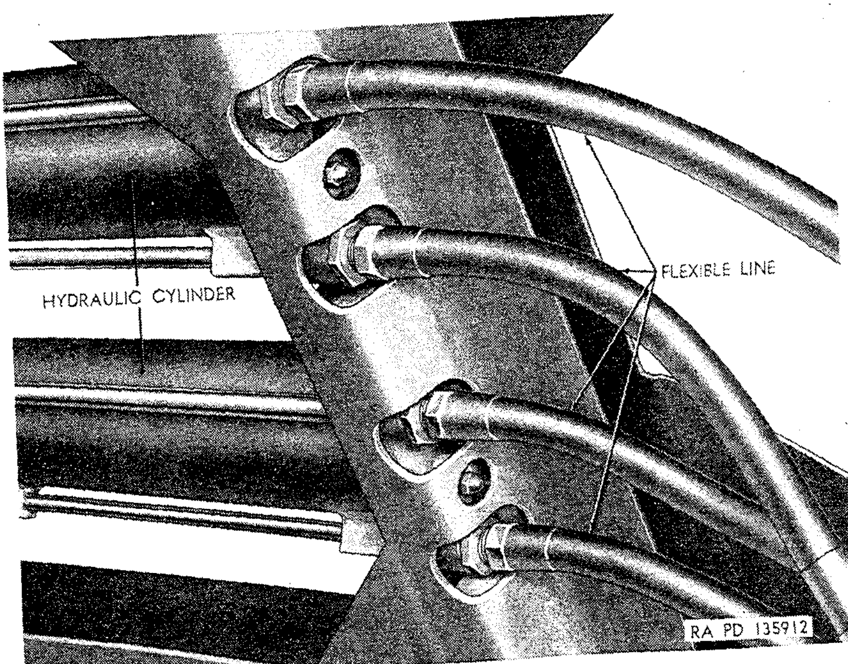


Figure 328. Front bottom view of hoist cylinders and flexible lines M51.

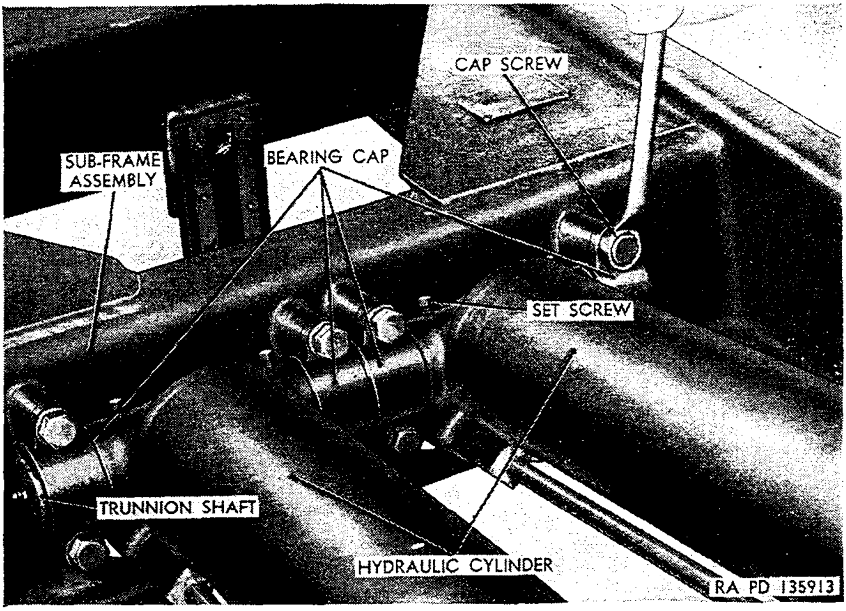


Figure 329. Top rear view of hoist cylinder base mounting.

b. Hoist Cylinder Installation.

(1) Insert trunnion shaft (fig. 329) in bore at base of hoist cylinder, and tighten two square-head setscrews to lock shaft in bore.

(2) Position trunnion shaft with cylinder on rear face of subframe cross member (fig. 329), position two bearing caps on shaft ends and secure caps to cross member with four cap screws and lockwashers.

(3) Connect two hydraulic flexible lines (fig. 328) to ports at base of cylinder. Refer to figure 330 when connecting lines.

(4) Position crosshead (fig. 327) on hoist cylinder piston rods, insert four crosshead retainers in crosshead, two at each piston rod, and install two cap screws with lockwashers through each upper retainer into lower retainer. Tighten cap screws.

(5) Install dump body (par. 308).

c. Removal.

(1) Remove dump body (par. 308).

(2) Remove both hoist cylinders (*a* above).

(3) Remove hydraulic pump (par. 310).

(4) Remove control relay (par. 311).

(5) Remove control valve (par. 312).

(6) Remove eight cap screws (fig. 326) and safety nuts securing brackets at rear end of subframe to frame side rails.

(7) Remove two cotter pins (fig. 331), slotted nuts, plain washers, tension springs, hex-head bolts, and four spring keepers

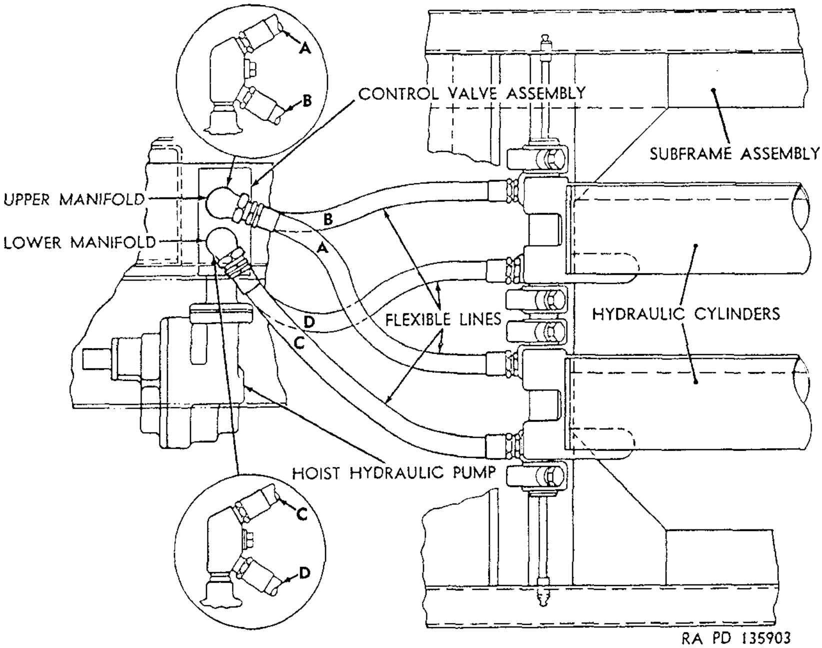


Figure 330. Hoist assembly flexible lines.

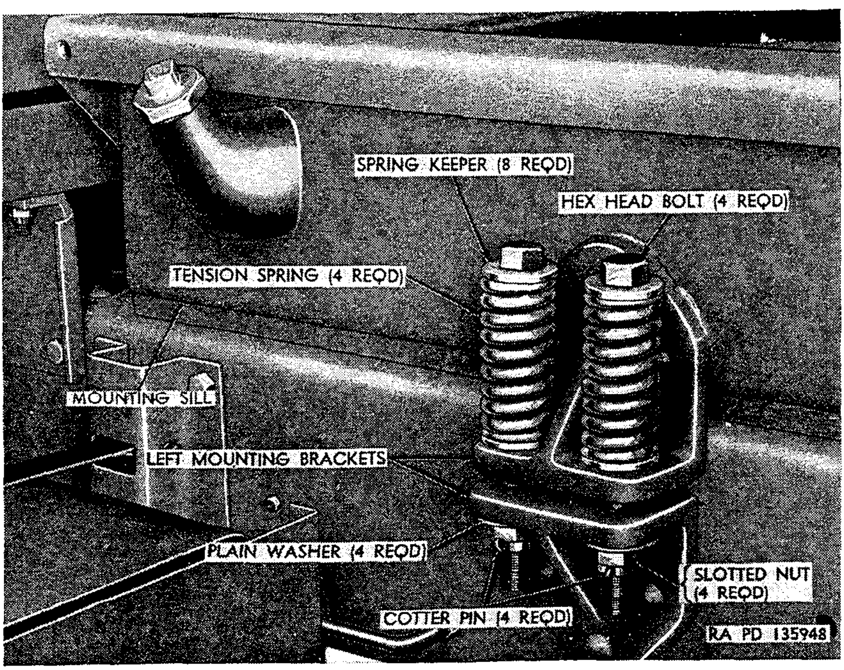


Figure 331. Subframe left front mounting M51.

securing subframe left and right front mounting brackets to brackets bolted to left and right frame side rails.

(8) Attach chain sling and overhead hoisting equipment to subframe (fig. 94), and lift subframe from vehicle.

d. Installation.

(1) Using chain sling and overhead hoisting equipment, lift subframe (fig. 94) into position on left and right side rails.

Note. Before lowering subframe, be sure that mounting sills (fig. 331) are in position on top of left and right side rails.

(2) Aline holes in subframe left and right front mounting brackets (fig. 331) with holes in brackets bolted to left and right frame side rails, and secure with four spring keepers, two hex-head bolts, tension springs, plain washers, slotted nuts, and cotter pins.

(3) Secure brackets at rear corners of subframe (fig. 326) to frame left and right side rails with eight cap screws and safety nuts. Tighten screws and nuts.

(4) Install control valve (par. 312).

(5) Install control relay (par. 311).

(6) Install hydraulic pump (par. 310).

(7) Install two hoist cylinders (*b* above).

(8) Install dump body (par. 308).

310. Hydraulic Pump

a. Removal.

(1) Remove drain plug (fig. 322) and drain reservoir and hydraulic system.

Note. In order to completely drain the hydraulic system, the hoist cylinder pistons must be completely extended or in raised position.

(2) Remove power-take-off-to-pump propeller shaft from pump shaft (par. 211).

(3) Remove six cap screws and lockwashers (fig. 322) securing pump to bottom flange of control valve adapter, and remove pump from adapter.

b. Installation.

(1) Position hydraulic pump (fig. 322) on bottom flange of control valve adapter, and secure pump to flange with six cap screws and lockwashers. Tighten cap screws.

(2) Install power-take-off-to-pump propeller shaft on pump shaft (par. 211).

(3) Fill hydraulic system (par. 67).

311. Control Relay

a. Removal.

(1) Remove cotter pin and yoke pin securing relay cross shaft rod (P, fig. 324) to control relay lever (fig. 323 and N, fig. 324), and remove rod yoke from lever.

(2) Remove cotter pin and yoke pin securing relay lever rod (G, fig. 324) to power-take-off relay lever (fig. 323 and L, fig. 324), and remove rod yoke from lever.

(3) Remove hex nut (fig. 323) and lockwasher from cap screw securing control valve levers to trunnion, and remove levers from trunnion and camshaft.

(4) Remove three cap screws (fig. 323) and lockwashers securing control relay to underside of reservoir, and remove relay.

b. Installation.

(1) Position control relay (fig. 323) at bottom of mounting base welded to rear of reservoir, and secure with three cap screws and lockwashers.

(2) Install left and right control valve levers (fig. 323) on trunnion and camshaft, and clamp levers together with cap screw, lockwasher, and hex nut.

(3) Position yoke at rear end of relay lever rod (G, fig. 324) on power-take-off relay lever (fig. 323 and L, fig. 324), and secure yoke to lever with yoke pin and cotter pin.

(4) Position yoke at rear end of relay cross shaft rod (P, fig. 324) on control relay lever (fig. 323 and N, fig. 324), and secure yoke to lever with yoke pin and cotter pin.

312. Control Valve Assembly

a. Removal.

(1) Remove hydraulic pump (par. 310).

(2) Remove six cap screws (fig. 322) and lockwashers securing control valve adapter to control valve, and remove adapter from valve.

(3) Remove control valve levers (fig. 323) from trunnion (par. 311*a*(3)).

(4) Disconnect four hydraulic flexible lines from manifolds (fig. 332) installed in control valve outlet ports.

(5) Remove eight cap screws (fig. 332) and lockwashers securing control valve assembly to mounting base at rear of reservoir, and remove valve from base.

b. Installation.

(1) Position control valve assembly (fig. 332) on mounting base at rear of reservoir, and secure with eight cap screws and lockwashers.

(2) Connect four hydraulic flexible lines to manifolds (fig. 332) installed in control valve ports. Refer to figure 330 when connecting lines.

(3) Install control valve levers (fig. 323) on trunnion (par. 311*b*(2)).

(4) Position control valve adapter (fig. 322) on right side of

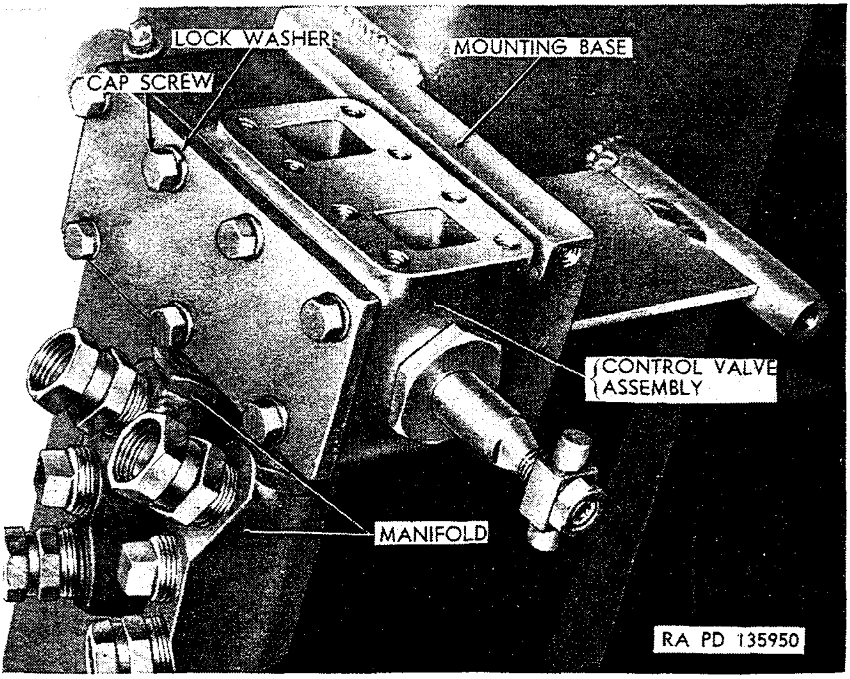


Figure 332. Removing control valve assembly M51.

control valve assembly, and secure with six cap screws and lockwashers.

(5) Install hydraulic pump (par. 310).

313. Control Linkage

Note. The key letters noted in parentheses are in figure 324, except where otherwise indicated.

a. Adjustment.

(1) Remove cotter pin and yoke pin securing relay cross shaft rod (P) to control relay lever (N), and remove rod yoke from lever.

(2) Remove cotter pin and yoke pin securing relay lever rod (G) to power-take-off relay lever (L), and remove rod yoke from lever.

(3) Release control lever lock (R), and move dump body control lever (U) forward and down as far as it will go (to POWER UP position (fig. 64)).

(4) Pull trunnion (fig. 323) downward as far as it will go (to place control valve spool in POWER UP position (fig. 64)).

(5) Push relay lever rod (G) forward as far as it will go to place power-take-off shifter shaft in engaged position.

(6) Turn adjustable yokes on rods (G and P) until holes in yokes can be alined with holes in levers (L and N) without

moving rods or levers forward or backward. If necessary, make additional adjustment at adjustable yokes on cross shaft rods (B and W).

(7) Position rear yoke on relay lever rod (G) on power-take-off relay lever (L), and secure with yoke pin and cotter pin.

(8) Position rear yoke relay cross shaft rod (P) on control relay lever (N), and secure with yoke pin and cotter pin.

(9) Move dump body control lever (U) up and back as far as it will go (to NEUTRAL position (fig. 64)), and engage control lever lock (R).

b. Removal. Complete removal of the control linkage is not recommended. However, individual parts may be replaced if worn or damaged sufficiently to prevent proper adjustment of the linkage (*a* above). To remove cross shaft and relay lever rods, remove cotter pins and yoke pins securing rod yokes to levers, and remove rods. To install cross shaft and relay lever rods, position end with welded-on yoke on lever, and secure with cotter pin and yoke pin; then turn adjustable yoke at other end of rod until hole in yoke can be alined with hole in lever without moving either rod or lever. Position yoke on lever, and secure with yoke pin and cotter pin. To remove lever and shaft assemblies, disconnect cross shaft and relay lever rods from levers, and remove cap screw, lockwashers, and hex nuts securing shaft brackets to frame cross member. Remove lever and shaft assembly from vehicle.

c. Installation. To install lever and shaft assemblies, position shaft brackets on frame cross member and secure with cap screws, lockwashers, and hex nuts. Connect cross shaft and relay lever rods to levers, and secure with yoke pins and cotter pins.

Section XXXVI. FRAME AND BRACKETS

314. Description

The frame is comprised of two pressed steel channel sections (side rails) which are connected and reinforced by riveted cross member and gussets. The pintle hook mounting bracket, lifting shackle bracket, and safety-chain shackle bracket are bolted to the frame or to the bumper (which is bolted to the frame).

315. Pintle Hook Assembly

a. Hook Removal. Remove cotter pin, slotted nut, and plain washer (located at front side of rear cross member) securing pintle hook (fig. 333) to mounting bracket, and pull hook from bracket.

b. Hook Installation. Insert threaded end of hook in hole in mounting bracket (fig. 333), and secure hook to bracket with plain washer, slotted nut, and cotter pin.

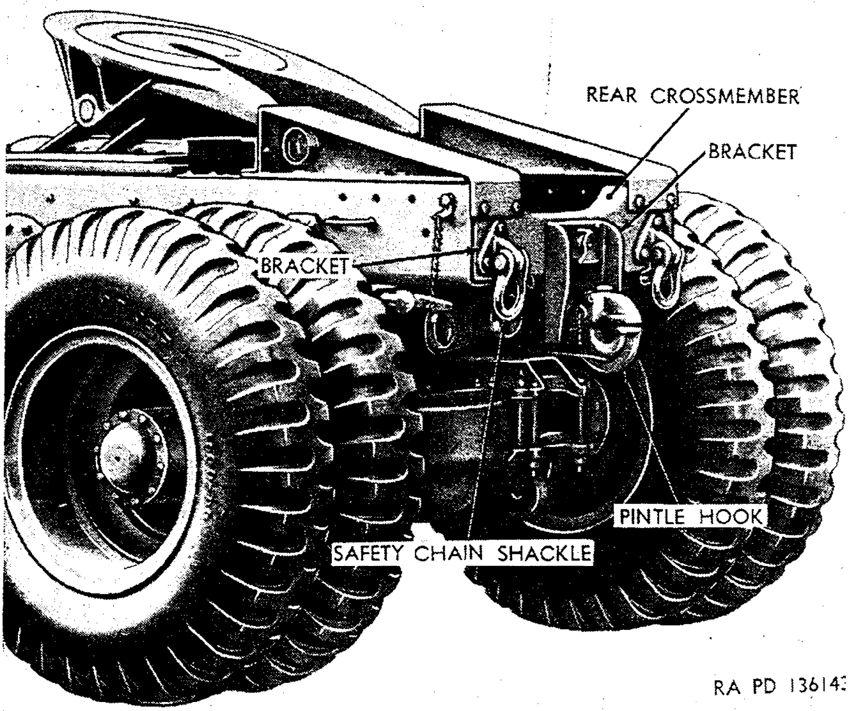


Figure 333. Pintle hook and safety chain shackle mounted on rear of tractor truck M52.

c. Bracket Removal.

(1) Remove pintle hook (*a* above).

(2) Remove eight cap screws and safety nuts securing bracket (fig. 333) to rear cross member, and remove bracket.

d. Bracket Installation.

(1) Position pintle-hook mounting bracket (fig. 333) on frame rear cross member, and secure with eight cap screws and safety nuts.

(2) Install pintle hook (*b* above).

316. Lifting Shackle Assembly

Note. The key letters noted in parenthese are in figure 71.

a. Shackle Removal. Remove clip (B) securing clevis pin (A) to lifting shackle (R) and bracket (C), remove pin, and remove shackle from bracket.

b. Shackle Installation. Position lifting shackle (R) on bracket (C), and insert clevis pin (A) through holes in shackle and bracket. Install clip (B) in end of clevis pin.

c. Bracket Removal.

(1) Remove lifting shackle (*a* above).

(2) Remove two cap screws and safety nuts securing front end of bracket (C) to top of front bumper.

(3) Remove safety nut, short spacer, cap screw, and long spacer securing rear end of bracket to top of front bumper, and remove bracket from bumper.

d. Bracket Installation.

(1) Position lifting shackle bracket (C) on top of front bumper, and secure front end of shackle to bumper with two cap screws and safety nuts.

(2) Position long spacer between bumper flanges under bracket rear mounting hole, and insert cap screw through hole and spacer. Install short spacer and safety nut on cap screw at underside of bottom bumper flange, and tighten.

(3) Install lifting shackle (*b* above).

317. Safety Chain Shackle Assembly
(fig. 333)

a. Shackle Removal. Procedure for removing safety chain shackle is same as for lifting shackle. Refer to paragraph 316*a*.

b. Shackle Installation. Procedure for installing safety chain shackle is same as for lifting shackle. Refer to paragraph 316*b*.

c. Bracket Removal.

(1) Remove safety chain shackle (*a* above).

(2) Remove three cap screws and safety nuts securing bracket to rear cross member, and remove bracket.

d. Bracket Installation.

(1) Position safety chain shackle bracket on frame rear cross member, and secure with three cap screws and safety nuts.

(2) Install safety chain shackle (*b* above).

Section XXXVII. CAB, HOOD, AND FENDERS

318. Description

a. Cab. The cab (fig. 334) consists of the cowl, instrument panel, side panels, doors, rear panels, seats, and floor. Weather protection is provided by the windshield, door glass windows, and top paulin. Two windshield wipers are mounted at the top of the windshield frame, and a rear view mirror is mounted on the windshield center post.

b. Hood. The hood consists of a one-piece, reinforced top panel (B, fig. 132), and a left and right side panel (G, fig. 132). The rear of the top panel is hinged to the cab cowl. The front end of the top panel is secured in the closed position by two hold-down catches (A, fig. 132), one on each side of the brush guard. The side panels are hinged at the front and rear to the front fenders, and are secured in the closed position by two lever-type latches (F, fig. 132), one at each end.

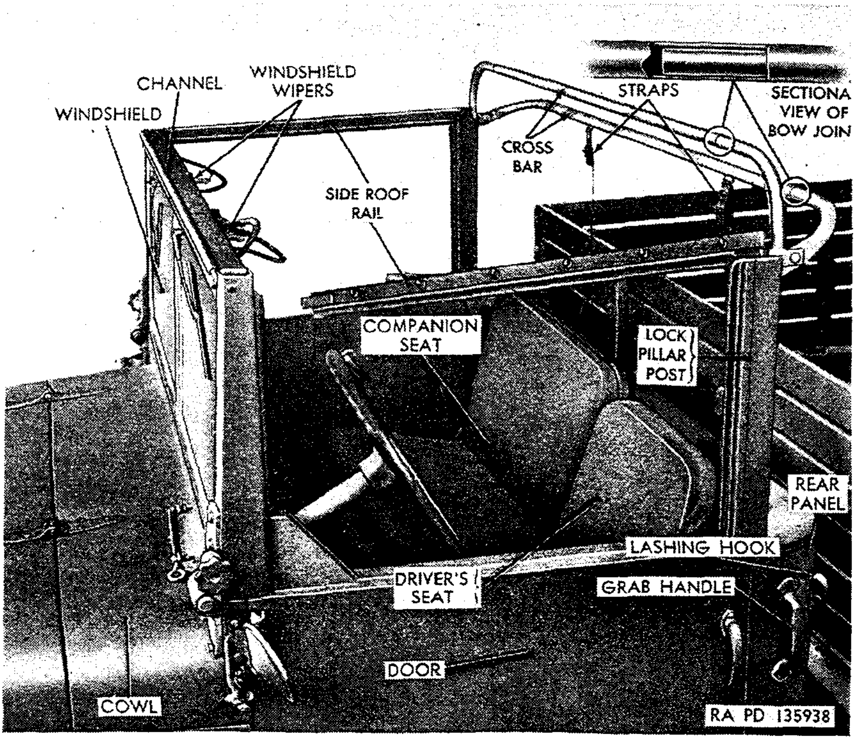


Figure 334. Top left view of cab with top paulin removed.

c. Fenders. The left and right front fenders are bolted at the front end to brackets attached to the frame. The rear end of the front fenders is bolted to the cab cowl.

319. Cab
(fig. 334)

a. Top Paulin Removal. Remove lashing rope from grab handles and lashing hooks attached to rear panel. Release six fasteners securing paulin to left and right roof side rails. Lift paulin from channels in lock pillar posts. Release fasteners at upper corners of windshield frame, one on each side, and pull paulin over windshield. Slide paulin to either side to remove from channel at top of windshield frame.

b. Top Paulin Stowage. Fold top paulin, and stow behind seats in cab.

Note. Do not fold paulin while it is wet.

c. Top Paulin Installation. Slide front end of paulin from either side into channel at top of windshield frame. Draw paulin over bows at top rear of cab, and slide sides of paulin into channels in lock pillar posts. Fasten paulin at upper corners of windshield frame, and secure with six fasteners on each side to side roof rails. Lash rear of paulin to lashing hooks on rear panel, and tie ends of rope to grab handles.

d. Cab Top Frame Removal. Remove top paulin (*a* above). Disengage both side roof rails from windshield frame. Turn rails in and fold down on hinge at lock pillar post. Loosen thumb screw at cab lock pillar on each side, and lift lock pillar posts and bow assembly from sockets. Remove cross bars from bows.

e. Cab Top Frame Stowage. Strap cross bars together with straps on rear cross bar, and stow cross bars with lock pillar posts behind seats in cab.

f. Cab Top Frame Installation. Insert cross bars in bows so that cross bar with straps is at rear. Install lock pillar posts in sockets in cab lock pillars, and tighten thumb screw on each side. Raise side roof rails, and engage front ends of rails in slots at upper corners of windshield frame.

g. Rear View Mirror Removal. Remove two screws securing rear view mirror mounting bracket to windshield center post, and remove mirror and bracket assembly from post.

h. Rear View Mirror Installation. Position rear view mirror with mounting bracket on windshield center post, and secure with two screws.

i. Windshield Wiper Removal. Remove nut securing windshield wiper arm and blade assembly to front end of wiper motor shaft, and remove arm from shaft. Pull air hose from wiper-motor intake connection. Remove four screws and lockwashers securing wiper motor to top of windshield frame, and remove motor from frame.

j. Windshield Wiper Installation. Position windshield wiper motor at top rear of windshield frame, and secure with four screws and lockwashers. Install air hose on wiper-motor intake connection. Position wiper arm and blade assembly on front end of wiper motor shaft, and secure with blind nut.

320. Hood

a. Top Panel Removal. Pull upward and outward on holddown catches (A, fig. 132) on upper left and right sides of brush guard to release front end of hood top panel (B, fig. 132). Remove pins from both top panel hinges (C, fig. 132), and lift top panel from vehicle.

b. Top Panel Installation. Position hood top panel (B, fig. 132) on top of brush guard and side panels (G, fig. 132), with rear end of top panel against cab cowl so that hinge halves on top panel engage hinge halves on cowl. Install two hinge pins through top panel and cowl hinge halves. Pull upward on holddown catches (A, fig. 132), engage catches with brackets on front of top panel, and release catches to lock hood in closed position.

c. Side Panel Removal. Refer to paragraph 114*b*(2).

d. Side Panel Installation. Refer to paragraph 115*i*.

321. Front Fenders

a. Removal.

(1) Remove left side panel (par. 320*c*).

(2) Remove ground strap screws for left headlight and blackout driving light from splash shield (fig. 262).

(3) Remove harness clips, and disconnect harness at connectors behind left headlight support bracket.

(4) Remove clips securing blackout marker light harness (fig. 262) to underside of fender, disconnect cable connectors behind protector, and pull harness through hole in splash shield into engine compartment.

(5) Remove radiator upper shield (par. 135*a*(6)).

(6) Loosen nut and bolt at left and right frame brackets (fig. 134) and at left and right brush guard braces, and tilt upper end of brush guard forward.

(7) Remove cap screw (fig. 262), nut, and washers securing splash shield to frame side rail.

(8) Remove two cap screws (fig. 262), four washers, and two safety nuts securing hydraulic reservoir to splash shield.

(9) Remove three safety nuts (fig. 262), washers, springs, and cap screws securing front of fender to mounting bracket.

(10) Remove two cap screws (fig. 335), rubber spacers, springs, washers, and nuts securing rear end of fender to running board.

(11) Remove cap screw (fig. 335) securing splash shield to cab cowl.

(12) Support rear end of fender, and remove three external-teeth lockwasher screws (fig. 335) securing fender to cab. Lift fender from mounting support, and remove from vehicle.

Note. When removing right front fender, the horn must be removed (par. 194*e*) before removing fender.

b. Installation.

(1) Place fender in position with front end resting on fender mounting bracket (fig. 262). Aline mounting holes in rear end of fender with holes in running board, and secure fender to running board with two cap screws (fig. 335), rubber spacers (one between fender and running board), springs, washers, and nuts. Do not tighten nuts.

(2) Install radiator upper shield (par. 135*b*(6)) but do not tighten bolts.

(3) Aline mounting holes in front of fender and mounting bracket (fig. 262), and secure fender to bracket with three cap screws, springs, washers, and safety nuts.

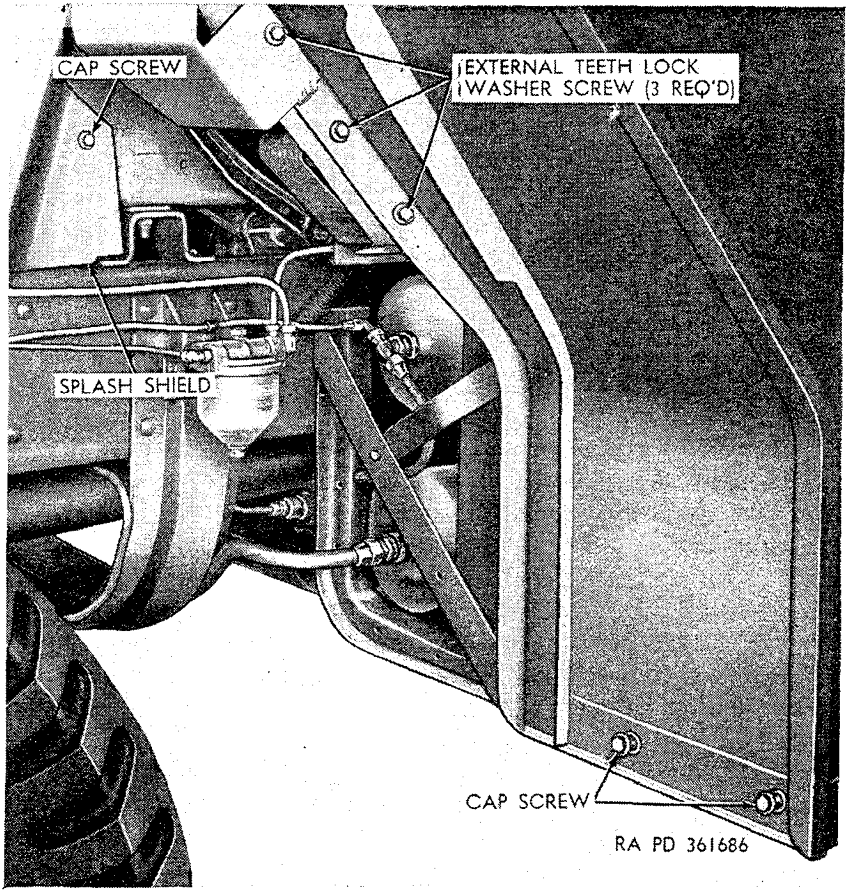


Figure 335. Front view of left front fender rear mounting.

(4) Make sure that cowl panel to fender well is in correct position, and install three external-teeth lockwasher screws (fig. 335).

(5) Secure rear of splash shield (fig. 335) to cab cowl with cap screw.

(6) Secure mounting brackets on front and rear ends of hydraulic reservoir to splash shield (fig. 262) with two cap screws, four washers, and two safety nuts.

(7) Install cap screw (fig. 262), washer, and nut attaching splash shield to frame side rail.

(8) Push top of brush guard (fig. 134) toward rear of truck, and engage slots in left and right braces with bolts in brush guard. Tighten guard-to-frame-bracket nuts and bolts, and guard-to-brace nuts and bolts.

(9) Tighten two nuts on cap screws (fig. 335) securing fender to running board, and tighten bolts securing radiator upper shield to headlight support brackets.

(10) Pull blackout marker light harness (fig. 262) through hole in splash shield, and secure to underside of fender with clips.
(11) Connect blackout-marker light harness connectors to marker light connectors behind protector (fig. 262).
(12) Connect wiring harness connectors to headlight and blackout driving light connectors at rear of left headlight support bracket.
(13) Install wiring harness clips, and install ground strap screws for left headlight and blackout driving light at fender splash shield.
(14) Install hood (par. 115*j*).

Section XXXVIII. CARGO BODY (M41)

322. Description

The cargo body is an open-top metal unit, which is mounted on the frame behind the cab. Weather protection is provided by a paulin and end curtains supported by top bows. Removable front and side cargo racks include sockets for the six top bows. The removable bows are made of wood with metal reinforcements. Troop seats, incorporated in the side cargo racks, can be lowered and, when lowered, are supported on hinged legs. The spare tire is mounted on a bracket inside the body at the forward end.

323. Troop Seats

a. Removal. Troop seats are removed with side cargo racks, or they can be removed separately. To remove side cargo racks, lift straight up to free ends of stakes from sockets at side of body. To remove troop seats only, remove cotter pins and hinge pins from six hinges attaching each seat to rack stakes. Release seat latches, disengage hinges, and remove troop seats.

b. Installation. If troop seats were removed with side cargo racks, engage stakes in sockets and push down on rack. To install troop seats only, position troop seats on side-rack-hinge brackets and aline hinge holes. Install hinge pin and cotter pin in six hinges of each troop seat. Fold seat up against rack and fasten in place with seat latches.

324. Paulin

a. Removal. Untie all paulin lashing ropes from lashing hooks. (Front and rear curtains may or may not be removed at this time.) Make first fold of top paulin on each side lengthwise until lower edge of paulin is even with top buckles. Make second fold lengthwise on both sides until both folds meet. Bring one folded side over the other fold. At each end, make an equal fold toward the center. Make another equal end fold until folded paulin is supported only by center bow.

b. Stowage. Do not fold or stow paulin when wet.

c. Installation. Install front and rear curtains (par. 325). Place folded paulin across center bow. Locate end marked FRONT and position paulin so this end will be at front of body. Unfold paulin and pull tight with front and rear draw ropes. Secure paulin with end and side lashing ropes.

d. Raising for Ventilation. Untie all paulin lashing ropes. Fold paulin under, three folds on each side. Fasten paulin in place, using straps on bows and buckles on paulin. Tie front and rear draw ropes to lashing hooks at each end of body.

325. Curtains

a. Removal. If top paulin is not removed, loosen paulin front and rear draw ropes. Untie front and rear curtain lashing ropes. Unwind curtain lashing ropes from front and rear bows, and remove curtains. Tie front and rear paulin draw ropes.

b. Stowage. Do not fold or stow curtains when wet.

c. Installation. Place curtains in position on front and rear bows. Make certain center of lashing rope is in center eyelet of curtain. Wind lashing rope around bow and through eyelets in curtain, and tie ends of rope to lashing hooks. Tie front and rear paulin draw ropes.

d. Ventilation. Both front and rear curtains are equipped with openings for ventilation. The flaps covering these openings may be opened.

Section XXXIX. MAINTENANCE UNDER UNUSUAL CONDITIONS

326. Extreme Cold Weather Maintenance Problems

a. The importance of maintenance must be impressed on all concerned, with special emphasis on organizational (preventive) maintenance. Maintenance of mechanical equipment in extreme cold is exceptionally difficult in the field. Even shop maintenance cannot be completed with normal speed because the equipment must be allowed to thaw out and warm up before the mechanic can make satisfactory repairs. In the field, maintenance must be undertaken under the most difficult of conditions. Bare hands stick to cold metal. Fuel in contact with the hands results in super cooling due to evaporation, and the hands can be painfully frozen in a matter of minutes. Engine oils, except subzero grade, are unpourable at temperatures below −40° F. Ordinary greases become as solid as cold butter.

b. These difficulties increase the time required to perform maintenance. At temperatures below −40° F., maintenance requires up to five times the normal amount of time. The time required to warm up a vehicle so that it is operable at temperatures as low as −50° F. may approach 2 hours. Vehicles in poor mechanical condition probably will not start at all, or only after many hours of laborious maintenance and heating. Complete winterization, diligent maintenance, and well trained crews are the key to efficient arctic winter operations.

c. Refer to TM 9–2855 and TB ORD 193 for general information on extreme cold weather maintenance procedures.

d. Refer to pertinent technical bulletin for information on winterization kit if utilized for this vehicle.

327. Extreme Cold Weather Maintenance

Refer to TM 9–2855 for a general discussion of maintenance problems, the application of antifreeze compounds and arctic-type lubrication, handling of storage batteries in extreme cold, and dewinterization procedure.

328. Extreme Cold Weather Maintenance—Air Brake Lines and Reservoirs

a. Drainage. To insure effective brake operation, drain the air reservoir frequently during extreme cold weather to prevent water from freezing in the air brake lines. Open the drain cock on the bottom of the air reservoir at halts and before and after operation.

Table V. Antifreeze Compound Requirements

Ambient temperature (degrees F.)	Amount to be included in each gallon of coolant. (See note below.)				Arctic winter antifreeze
	Alcohol		Ethylene glycol antifreeze compound		
	U. S. pints	Imperial pints	U. S. pints	Imperial pints	
30	1	4/5	1	4/5	This compound is issued ready-mixed for 0° to −65° F. temperatures for both initial installation and replenishment of losses.
20	2 1/8	1 4/5	2	1 2/3	
10	3 1/4	2 4/5	3	2 1/2	
0	4 1/4	3 3/4	3 3/4	3 1/8	
−10	5	4 1/8	4 1/2	3 3/4	
−20	5 1/2	4 1/2	4 3/4	4	
−30	6 3/4	5 2/3	5 1/2	4 1/2	
−40	7 1/4	6	6	5	

Note. To be included in, not added to, each gallon of coolant. There are 8 pints in a gallon.

b. Power Plant Heater. The power plant heater kit provides an alcohol evaporator for this vehicle. When the power plant heater is in operation, a small amount of alcohol vapor is introduced into the air reservoir. This alcohol vapor condenses in the reservoir and forms an effective antifreeze solution when it mixes with any water that may be in the reservoir. Make sure there is enough alcohol in the evaporator before the power plant heater is turned on.

Table VI. Antifreeze Compound Requirements

ETHYLENE GLYCOL ANTIFREEZE COMPOUND REQUIREMENTS—AND SPECIFIC GRAVITIES

Ethylene glycol antifreeze compound to be included in each gallon of coolant—US pints	Protection to (degrees F.)	Specific gravity (solution at room temperature)
0	32	1. 000
2	20	1. 024
3	10	1. 038
3¾	0	1. 049
4½	−10	1. 055
4¾	−20	1. 063
5½	−30	1. 070
6	−40	1. 078

Note. Use only an antifreeze testing hydrometer float. Amounts are to be included in, not added to each gallon of coolant.

329. Extreme Hot Weather Maintenance Problems

In areas of operation where high temperatures are anticipated, extreme care must be exercised in checking the vehicle's cooling system and electrolyte level due to the rapid rate of evaporation. Where the climate is damp, the problem of corrosion of all parts of the vehicle presents itself and is usually indicated by rust, paint blisters, and fungus growth. The deterioration of the insulation on electrical cables and wires also presents a problem because of the existing danger of short circuits.

330. Extreme Hot Weather Maintenance

a. Cooling System. Thoroughly clean and flush the cooling system (par. 134) at frequent intervals and keep system filled to coolant level cock (fig. 162), with clean water when operating in extremely high temperatures. Formation of scale and rust in the cooling system occurs more rapidly during operation in extremely high temperatures; therefore, corrosion inhibitor compound should always be added to the cooling liquid. Avoid the use of water that contains alkali or other substances which may cause scale and rust formations. Use soft water whenever possible.

b. Batteries.

(1) *Electrolyte level.* In torrid zones, check level of electrolyte in cells daily and replenish, if necessary, with pure distilled water. If this is not available, rain or drinking water may be used. However, continuous use of water with high mineral content will eventually cause damage to batteries and should be avoided.

(2) *Specific gravity.* Batteries operating in torrid climates should have a weaker electrolyte than for temperate climates. Instead of 1.280 specific gravity as issued, the electrolyte (sulphuric acid, specific gravity 1.280) should be diluted to 1.200 to 1.240 specific gravity (TM 9–2857). This is the correct reading for a fully charged battery. This procedure will prolong the life of the negative plates and separators. Under this condition, a discharged battery should be recharged at about 1.160 specific gravity.

(3) *Self-discharge.* A battery will self-discharge at a greater rate at high temperatures if standing for long periods. This must be considered when operating in torrid zones. If necessary to park for several days, remove batteries and store in a cool place.

Note. Do not store acid-type storage batteries near stacks of tires, as the acid fumes have a harmful effect on rubber.

c. Chassis and Body.

(1) In hot, dry climates, a careful watch must be kept for evidence of the presence of moths and termites.

(2) In hot, damp climates, corrosive action will occur on all parts of the vehicle and will be accelerated during the rainy season. Evidence will appear in the form of rust and paint blisters on metal surfaces and mildew, mold, or fungus growth on fabrics, leather, and glass.

(3) Protect exterior surfaces from corrosion by touch-up painting and keep a film of engine lubricating oil (OE–10) on unfinished exposed metal surfaces. Cables and terminals should be protected by ignition insulation compound.

(4) Make frequent inspections of idle, inactive vehicles. Remove corrosion from exterior metal surfaces with abrasive paper or cloth and apply a protective coating of paint, oil, or suitable rust preventive.

331. Maintenance After Fording

a. General. Although the vehicle unit housings are sealed to prevent the free flow of water into the housings, it must be realized that, due to the necessary design of these assemblies, some water may enter, especially during submersion. The following services should be accomplished on all vehicles which have been exposed to some depth of water or completely submerged, especially in salt water. Precautions should be taken as soon as practicable to halt deterioration and avoid damage before the vehicle is driven extensively in regular service.

b. Body and Chassis. Drain and clean out body, engine and tool compartment. Clean all exposed surfaces and touch up paint where necessary. Coat unpainted metal parts with engine lubricating oil

Table VII. Freezing Temperatures of Batteries at Various Specific Gravities

STATE OF CHARGE	SPECIFIC GRAVITY OF ELECTROLYTE (READING CORRECTED TO 80° F.)	FREEZING POINT (DEGREES F.)
Fully charged	1.275 to 1.300	−85 to −95.
75 percent charged	1.250	−62.
50 percent charged	1.220	−31.
25 percent charged	1.160	1.
Discharged	1.130	10.
Fully discharged	1.000 (water)	32.

Table VIII. Temperature Correction Chart

Safe operating temperature (degrees F.)	Actual hydrometer specific gravity reading fully charged battery)	Calculated specific gravity reading corrected to 80° F.
80	1. 280	1. 280
0	1. 312	1. 280
−10	1. 316	1. 280
−20	1. 320	1. 280
−40	1. 328	1. 280
−65	1. 338	1. 280

(OE–10). Lubricate the chassis thoroughly as directed in the lubrication order. Do more than the usual lubrication job, making sure the lubricant is forced into each lubrication point to force out any water present.

c. Engine, Transmission, Transfer Case, and Axles. Check the lubricant in the engine, transmission, and final drives. Should there be evidence that water has entered, drain, flush, and refill with the correct lubricant. Remove and clean engine and transmission oil filter.

d. Wheels and Brakes. Remove the front wheels and flush out the knuckle housings with a half-and-half mixture of engine lubricating oil (OE–10) and dry-cleaning solvent or volatile mineral spirits. Refill to filler plug level with correct lubricant. Remove rear wheels. Wash all wheel bearings thoroughly with dry-cleaning solvent or volatile mineral spirit after which repack, assemble, and adjust. While the wheels are removed, dry out brake linings and clean rust and scum from brake drum face. Check brake system for presence of water.

e. Batteries. Check the batteries for quantity and specific gravity of electrolyte to be sure no water entered through the vent caps. This is of special importance should the vehicle have been submerged in salt water.

f. Steering Gear. Remove and disassemble steering gear. If the lubricant is contaminated, clean the housing thoroughly with a half-and-half mixture of engine lubricating oil (OE–10) and dry-cleaning solvent or volatile mineral spirits. Assemble, refill with correct grade of lubricant, and adjust (par. 245) steering gear.

g. Electrical Connections. Check all electrical connections for corrosion, particularly the bayonet-type connectors.

h. Fuel System. Drain fuel tanks of any accumulated water, clean fuel filter and lines as necessary. If water is found in the air cleaner, clean and refill with oil.

i. Distributor. Remove the distributor cap, and check to see if any water has entered the distributor. If water is present, drain, clean, and lubricate the distributor as required.

j. Condensation. Although most units are sealed, the sudden cooling of the warm interior air upon submersion may cause condensation of moisture within the cases or instruments. A period of exposure to warm air after fording should eliminate this condition. Cases which can be opened may be uncovered and dried.

k. Aluminum or Magnesium Parts. If vehicle remains in salt water for any appreciable length of time, aluminum or magnesium parts which are exposed to the water will probably be unfit for further use and must be replaced.

l. Deep-Water Fording. Refer to TM 9–2853 for deep-water fording kit information.

332. Maintenance After Operation in Mud

Thorough cleaning and lubrication of all parts affected must be accomplished as soon as possible after operation in mud, particularly when a sea of liquid mud has been traversed. Clean radiator fins and interior of engine compartment. Repack wheel bearings if necessary, clean, oil, and stow the chains in vehicle.

333. Maintenance After Operation in Sand or Dust

Clean engine and engine compartment. Touch up all painted surfaces damaged by sandblasting. Lubricate completely to force out lubricants contaminated by sand or dust. Air cleaners, fuel strainer, and oil filters must be cleaned at least daily. Radiator fins should be cleaned daily with compressed air when operating in dusty terrain. Engine grilles and other exposed vents should be covered with cloth at all times.

CHAPTER 4

SHIPMENT AND LIMITED STORAGE AND DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

334. Domestic Shipping Instructions

a. Preparation for Shipment in Continental United States. When furnishing the 5-ton 6 x 6 trucks interstate or within continental United States, the officer in charge of preparing shipments *will be responsible* for furnishing vehicles to carriers for transport in a *serviceable* condition, properly cleaned, preserved, painted, and lubricated as prescribed in SB 9–4.

Note. For instructions on loading and blocking these vehicles on flatcars, refer to paragraphs 336 and 337. On-vehicle-materiel (OVM) will prepared, packed, and stowed as prescribed in paragraph 336*b*.

b. Preparation for Shipment to Ports (see AR 747–30).

(1) *Inspection.* All used vehicles destined for oversea use will be inspected, prior to shipment, in accordance with the TB ORD 385.

(2) *Processing for shipment to ports.* All vehicles destined to ports of embarkation for oversea shipment will be further processed in accordance with SB 9–4.

Note. Ports of embarkation will perform any necessary supplementary or previously omitted processing upon receipt of vehicles, in accordance with AR 747–30.

(3) *Marking of arctic-lubricated materiel.* It will be the responsibility of the officer in charge of the organization performing arctic-lubrication to insure that the equipment is marked as prescribed in SR 746–30–10. It will be the responsibility of the officer in charge of the installation shipping arctic-lubricated equipment to insure that each item is so marked. Unit commanders of using organizations will insure that such markings are not obliterated while the equipment is arctic-lubricated. When the equipment is deprocessed of this special lubrication, such markings will be immediately and thoroughly obliterated.

c. Removal of Preservatives Before Shipment. Personnel withdrawing vehicles from limited storage for domestic shipment must not remove preservatives other than to insure that the vehicles are complete and serviceable. If it has been determined that preservatives have been removed, they must be restored prior to domestic shipment. Removal of preservatives is the responsibility of depots, ports, and field installations (posts, camps, and stations) receiving shipments.

d. Army Shipping Documents. Prepare all Army shipping documents accompanying freight in accordance with TM 38–705.

e. Deep-Water Fording. If deep-water fording is anticipated during shipment, process vehicles in accordance with TM 9–2853.

335. Limited-Storage Instructions

a. General.

(1) Vehicles received for storage and already processed for domestic shipment, as indicated on DA Form 9–3, Processing Record for Shipment and Storage of Vehicles and Other Engines, must not be reprocessed, unless inspection performed on receipt of vehicles reveals corrosion, deterioration, et cetera.

(2) Process vehicles upon receipt directly from manufacturing facilities or if processing data recorded on tag indicates that preservatives have been rendered ineffective by operation or freight-shipping damage.

(3) Vehicles to be prepared for limited storage must be given a limited technical inspection and processed as prescribed in SB 9–4. Results and classification will be entered on DA For 461–5, Limited Technical Inspection.

b. Receiving Inspection.

(1) Report of vehicles received for storage in a damaged condition or improperly prepared for shipment will be made on DD Form 6, Report of Damaged or Improper Shipment in accordance with SR 745–45–5. Report of vehicles received in an unsatisfactory condition (chronic failure or malfunction) will be made on DA Form 468, in accordance with SR 700–45–5.

(2) When vehicles are inactivated, they will be processed in accordance with type I as prescribed in SB 9–4. Standby storage will normally be handled by ordnance maintenance personnel only.

(3) Immediately upon receipt of vehicles for storage, they must be inspected and serviced (pars. 8 through 11. Perform a systematic inspection and replace or repair all missing or broken parts. If repairs are beyond the scope of the unit, and vehicles will be inactivated for an appreciable length of time, store them in a limited-storage status and attach tags specify-

ing repairs needed. Report of these conditions will be submitted by the unit commander for action by an ordnance maintenance unit.

c. Inspection During Storage. Perform a visual inspection periodically to determine general condition. If corrosion is found on any part, remove rust and clean, paint, and treat with the prescribed preservatives.

Note. Touch-up painting will be in accordance with TM 9–2851.

d. Removal from Limited Storage.

(1) If vehicles are not shipped or issued upon expiration of the limited-storage period, they will be further treated for standby storage by ordnance maintenance personnel.

(2) If vehicles to be shipped will reach their destination within the limited-storage period, they need not be reprocessed upon removal from storage, unless inspection reveals it to be necessary according to anticipated in-transit weather-conditions.

Note. All vehicles being reissued through the depot supply system to troops within the continental limits of the United States must meet the requirements of TB ORD 385. This is *NOT* required for so-called reissues, exchanges, or redistribution among troop units, where the depot supply system is not involved.

(3) Vehicles will be deprocessed, when it has been ascertained that they are to be placed into immediate service. Remove all rust-preventive compounds and thoroughly lubricate (pars. 67 through 73). Inspect and service vehicles (pars. 74 through 77).

(4) Repair and/or replace all items tagged (*b*(3) above).

e. Storage Site. The preferred-type of storage for vehicles is under cover in open sheds or warehouses, whenever possible. When it is found necessary to store vehicles outdoors, the storage site must be selected in accordance with AR 700–105, and vehicles protected against the elements as prescribed in TB ORD 379.

336. Loading the 5-Ton 6 x 6 Trucks for Rail Shipment

a. Preparation.

(1) When vehicles are shipped by rail, every precaution must be taken to see that they are properly loaded and securely fastened and blocked to floor of flatcar (par. 337).

(2) Prepare vehicle for rail shipment as prescribed in SB 9–4. On-vehicle materiel (OVM) will be thoroughly cleaned, preserved, packed (boxed or crated), and securely stowed in or on the vehicle (*b* below).

(3) Load vehicle on flatcar so as not to make an unbalanced load. Apply parking brakes and place transmission in neutral position, after vehicle has been finally spotted on flatcar.

347797°—55——33

(4) Increase tire pressure slightly higher than normal, except where shipment is to be exposed to extremely hot-weather conditions.

(5) If vehicle is equipped with steel tool boxes, remove all padlocks and keys from vehicle in order to prevent pilferage while in transit. Secure lids of steel tool boxes by wiring hasp to prevent damage during shipment. Preserve padlocks and keys with preservative engine oil (grade 1) and wrap in greaseproof barrier-material for domestic shipment or in a waterproof-grease-proof wrapping or bag for oversea shipment. Locate all wrapped padlocks and keys in shipping container with accessories.

b. On-Vehicle Material (OVM) Requirements.

(1) *General.* Preserve and package all on-vehicle materiel (OVM) individually, except items used as sets or in quantities greater than one.

(2) *Batteries and Electrolyte.*

(*a*) If vehicle is to be shipped within the continental United States, *except* directly to ports of embarkation, disconnect the battery cables from battery, clean ((*b*) below), if necessary, and coat cable terminals and battery posts with automotive and artillery grease (GAA); wrap with nonhygroscopic adhesive tape and secure terminals *away* from batteries.

(*b*) If vehicles are to be shipped directly to ports of embarkation except when vehicles are to be combat-loaded, remove batteries, plug vents, and clean outside of batteries with a solution consisting of one-half pound commercial-grade baking soda (sodium bicarbonate) to one gallon of water. Rinse with *cool* water and remove plugs. Scrape or wire-brush and clean cable terminals and battery box (holder) with the above cleaning solution. Rinse with *cool* water. Coat cable terminals with automotive and artillery grease (GAA). Paint battery boxes, if required, with black acid-resisting paint. Batteries and electrolyte will be packed in accordance with TM 9–2857 and TM 9–2854 and secured in vehicle separate from other OVM.

(3) *Publications.* Package publications in accordance with Method IC–3, "Waterproof bag, sealed," using heavy duty, type I, heat sealable, grade A, waterproof class b bags. Pack in the OVM container. Where publications are provided by separate technical services, these will be packed in the same exterior OVM containers with the items to which they are applicable.

(4) *Unit packages.* If unit packages are not water-resistant and it is impractical to make intermediate packages, they will be

overwrapped in flexible waterproof barrier-material and sealed with waterproof water-resistant adhesive.

(5) *Intermediate packages.* Unit packages of related items will be grouped together, wherever possible, into intermediate packages in fiberboard cartons. Container closure will be made by sealing all seams with water-resistant gummed paper tape. When the gross weight exceeds 20 pounds, the containers will be sealed with water-resistant adhesive (for sealing fiberboard boxes), in addition to sealing with tape.

(6) *Exterior containers.*

(*a*) Keep the number of exterior containers to a minimum. The size will be governed by the cubic displacement of the packaged OVM. Dimensions will be such that, when assembled in sets as required and stowed on vehicles, the overall cubage of the vehicle will not be increased and lifting devices will not be obstructed.

(*b*) Place heavy materiel or equipment in the bottom of exterior containers and block and brace, as necessary, so that they will not damage other contents. Pack fragile materiel and canvas items above other OVM items at the top of the container; in addition, pack canvas covers for OVM items in the same exterior containers with the items for which they are intended.

(*c*) Pack unit and intermediate packages in style 2, unlined, snug-fitting, nailed wood boxes, for a type III load, modified (*1* through *7* below).

1. Exterior containers over 200 pounds gross weight will have nominal 2 x 4 end cleats and also beveled end skids of nominal 2 x 4 lumber, placed flat, parallel to the ends of the containers, and spaced approximately 6 inches from each end, with span between skids not to exceed 36 inches.

2. The skids will be fastened to the bottom with nails driven through the floor into the skid member. Nails will be of sufficient length and size to achieve maximum holding power.

3. Additional battens, when required, will be fastened to the inside faces of the top and side panels and to the inside face of the bottom panel, when skids are not required.

4. Construct the container top of matched lumber and nail to the side and end panels. The container will be weatherproofed, strapped, and marked in accordance with TM 9–2854.

Note. Weatherproofing of container tops will not be necessary, if containers are to be stowed within the vehicle.

5. Cover exterior surfaces of all OVM exterior containers (except tops) with one coat of olive drab enamel.

Note. OVM containers stowed within the vehicle will not require painting.

6. Stow all OVM containers inside the body or other suitable location, as applicable, without increasing the cubic displacement of the vehicle. Strap, block, or brace all OVM containers to prevent free movement.

Note. OVM containers must receive maximum protection against corrosion, deterioration, and mechanical damage during shipment and prolonged periods of storage.

7. OVM containers without skids, which are to be stowed in exposed locations in contact with platforms, floors, or other boxes, will be placed on nominal 1 x 4 wood cleats to minimize surface contact. Secure cleats in a manner that will prevent shifting or damage to the contact surfaces.

c. Method of Loading the 5-Ton 6 x 6 Trucks on Flatcars. For method of loading and general loading rules pertaining to rail shipment or ordnance vehicles, see TB 9-OSSC-G.

Warning: The height and width of vehicles, when prepared for rail transportation, must not exceed the limitations indicated in the loading table in AR 700-105 (section II). Whenever possible, local transportation officers must be consulted about the limitations of the particular railroad lines to be used for the movement in order to avoid delays, dangerous conditions, or damage to equipment.

337. Blocking the 5-Ton 6 x 6 Trucks on Railroad Flatcars

a. General. All blocking instructions specified herein are minimum and are in accordance with "Pamphlet No. MD-7, Rules Governing the Loading of Department of Defense Materiel on Open Top Cars" of the Association of American Railroads. Additional blocking may be added, as required, at the discretion of the officer in charge. Double-headed nails may be used, except in the lower piece of two-piece cleats. All item reference letters given in *b* through *f* below, refer to the details and locations shown in figure 337.

Note. Any other loading instructions, regardless of source, which appear to be in conflict with this publication or existing loading rules of the carriers, must be submitted for approval to the Chief of Ordnance, Washington 25, D. C.

b. Brake Wheel Clearance "A." Load vehicles on flatcars, with a minimum clearance of at least 4 inches below and 6 inches above, behind, and to each side of the brake wheel. Any increase in clearance must be consistent with proper location of load.

c. Chock Blocks "B" (6 x 8 x 24, Eight Required). Locate the 45° surface of blocks against the front and rear of each front wheel,

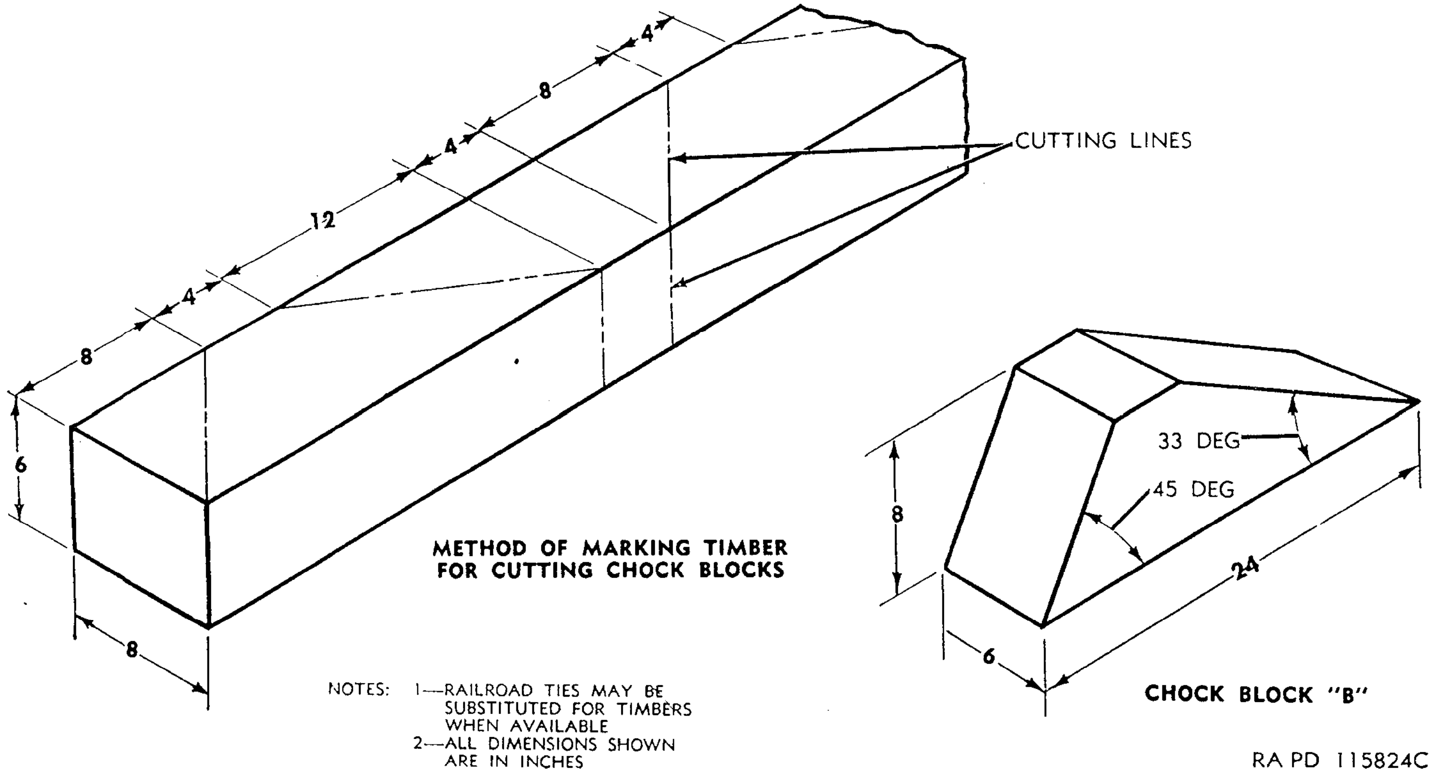
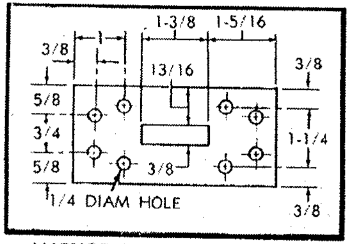
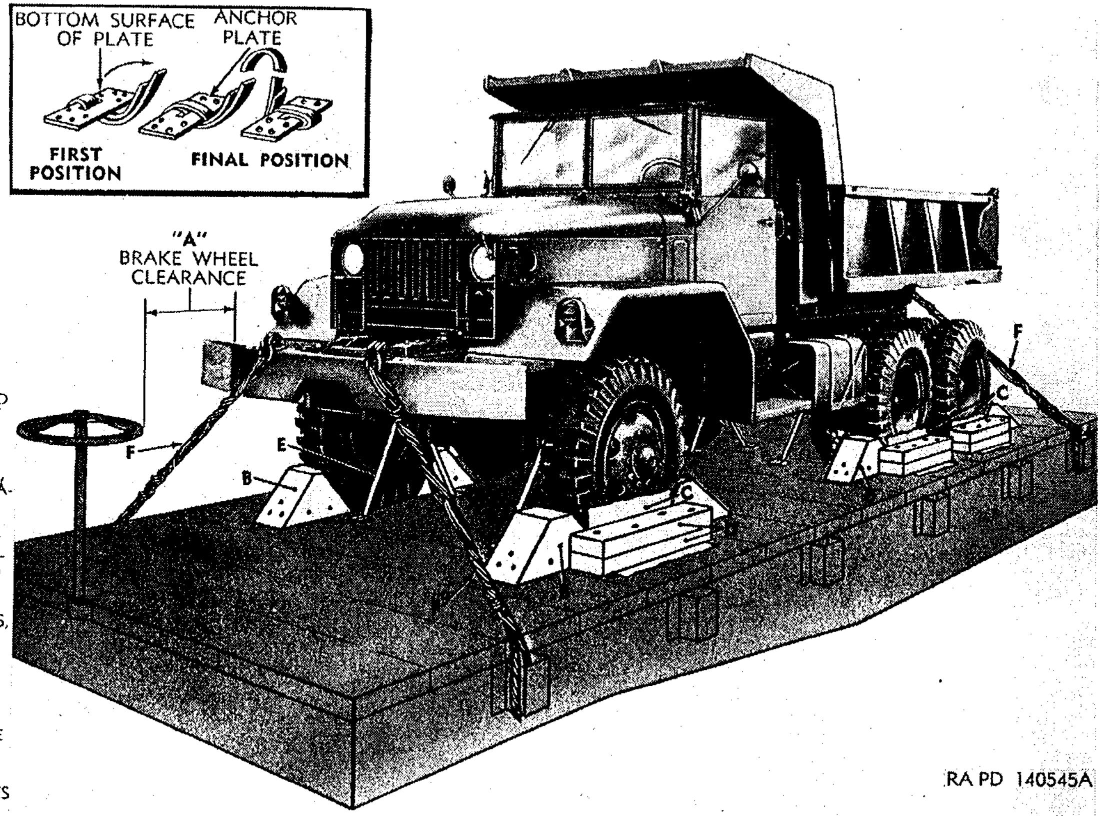


Figure 336. Cutting chock blocks from timbers.



ANCHOR PLATE (2 X 4 X 1/8)



NOTES:

1—THE 5-TON 6X6 DUMP TRUCK M52 ILLUSTRATED HAS NOT BEEN PROCESSED FOR DOMESTIC FREIGHT SHIPMENT BUT SIMPLY ILLUSTRATES METHOD OF BLOCKING

2—THE HEIGHT AND WIDTH OF MATERIEL, WHEN PREPARED FOR RAIL TRANSPORTATION, MUST NOT EXCEED THE LIMITATIONS INDICATED BY THE LOADING TABLE IN AR 700-105 (SECTION II). WHENEVER POSSIBLE, LOCAL TRANSPORTATION OFFICERS MUST BE CONSULTED ABOUT THE LIMITATIONS OF THE PARTICULAR RAILROAD LINES TO BE USED FOR THE MOVEMENT TO AVOID DELAYS, DANGEROUS CONDITIONS, OR DAMAGE TO EQUIPMENT

3—ITEM REFERENCE LETTERS REFER TO DESCRIPTIONS IN TEXT

4—BLOCKING INSTRUCTIONS FOR THE 5-TON 6X6 CARGO TRUCK M41 WILL BE THE SAME AS FOR THE 5-TON 6X6 DUMP TRUCK M52

5—ALL DIMENSIONS SHOWN ARE IN INCHES

Figure 337. Method of blocking the 5-ton 6 x 6 trucks on flatcars.

against the front of each outside intermediate wheel, and against the rear of each outside rear wheel. Nail heel of blocks to car floor with three fortypenny nails and toenail sides of blocks to car floor with two fortypenny nails each.

Note. Chock blocks may be cut from timber (or railroad ties, when available), as shown in figure 336.

d. Wheel Side Cleats "D" (2 x 4 x 36, 12 Required) and Cushioning Material "C." Locate one cleat "D" on car floor, against the outside of each tire, and place suitable cushioning material "C" such as waterproof paper or burlap, between tire and cleat "D." The cushioning material should protrude 2 inches beyond cleat "D" on floor, and 4 inches above cleat at side of tire. Secure cleat to the floor with four thirtypenny nails. Place another cleat on top of each lower cleat and secure to the lower cleat with four thirtypenny nails.

e. Axle Strapping "E" (Six 1-Inch No. 14 BW Gage Hot-Rolled Steel Band, Length to Suit and 12 Steel Anchor Plates). Pass two steel bands over each axle, one near each wheel, and pass each end through an anchor plate (fig. 337). Secure the anchor plates to the floor of the car with eight twentypenny cement-coated nails.

Note. Four strands of No. 8 gage, black annealed wire, twisted to form a cable, may be substituted for each band, if desired. Secure each cable to car floor with a 2 x 4 x 18 wood cleat, nailed lengthwise to car floor with four thirtypenny nails.

f. Vehicle Strapping "F" (Four Strands, No. 8 Gage, Black Annealed Wire or Wires of Equivalent Strength, Length to Suit). Twist-tie these wires together to form cables. Pass one end of each cable through a stake pocket on opposite sides of the vehicle and form a six-inch loop in end, winding each of the four wires tightly around the cable. Extend the loop of the cable around and up to a point above the stake pocket. Pass the other end of the cable through the lifting eye of the vehicle and down through the loop at the other end of cable. Tighten the four strands of wire around the cable, forming a "loop around a loop." Place a cleat or tightening tool between the cables and twist-tie cables to remove slack; remove cleat or tool.

Section II. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

338. General

a. Destruction of the 5-ton 6 x 6 cargo truck M41, M54, and M55, cargo van truck M64, chassis truck M40, M61, M63, and M139, dump truck M51, medium wrecker truck M62 and tractor truck M52, when subject to capture or abandonment in the combat zone, will be undertaken by the using arm *only* when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander.

b. The information which follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items for the vehicle. The issue of these and related materials, and the conditions under which destruction will be effected, are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are—

Mechanical—Requires axe, pick mattock, sledge, crowbar, or similar implement.

Burning —Requires gasoline, oil, incendiary grenades, or other flammables.

Demolition—Requires suitable explosives or ammunition.

Gunfire —Includes artillery, machineguns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances hand grenades may be used.

In general, destruction of essential parts, followed by burning will usually be sufficient to render the trucks useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the trucks must be so badly damaged that they cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the trucks, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction is directed, due consideration should be given to—

(1) Selection of a point of desctruction that will cause greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments or ricocheting projectiles which may occur incidental to the destruction.

(2) Observance of appropriate safety precautions.

339. Destruction of the 5-Ton 6 x 6 Trucks

These 5-ton 6 x 6 trucks are essentially the same, differing mainly in the type of bodies mounted thereon. Therefore, the means described for destruction in paragraphs 340, 341, and 342 is applicable to all the models listed herein. Additional instructions are furnished, where required, to provide for complete destruction of a specific vehicle.

340. Method No. 1—Destruction by Burning

a. Remove and empty portable fire extinguishers.

b. Using an axe, pick mattock, sledge, or other heavy implement, smash all vital elements such as distributor, carburetor, generator, ignition coil, fuel pump, spark plugs, air cleaner, lights, instruments, and controls. If time permits, and a sufficiently heavy implement is available, smash the engine cylinder block and head, crankcase, and transmission.

c. Slash tires. If tires are inflated, exercise care to prevent injury should the tire blow out while being slashed. Whenever practicable, it is usually preferable to deflate tires before slashing.

d. Remove the drain plug or puncture fuel tanks as near the bottom as possible, collecting gasoline for use as outlined in *f* below.

e. Explosive ammunition, if available nearby, should be removed from packing or other protective material. Place ammunition in and about the vehicle so that it will be fully exposed to the fire and in such locations that the greatest damage will result from its detonation. Remove any safety devices from the ammunition.

f. With the doors and hood open to admit air for combustion, pour gasoline and oil in and over the entire vehicle. Ignite by means of an incendiary grenade fired from a safe distance, by a burst from a flame thrower, a combustible train of suitable length, or other appropriate means. Take cover immediately.

Caution: Cover must be taken without delay since an early explosion of the explosive ammunition, if present, may be caused by the fire. Due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns.

If explosive ammunition is present on the vehicle, the danger zone is approximately 250 yards. Elapsed time: about 6 minutes.

341. Method No. 2—Destruction by Demolition

a. Remove and empty portable fire extinguishers.

b. Prepare the required number of 2-pound charges of EXPLOSIVE, TNT (using two 1-pound blocks or equivalent together with the necessary detonating cord to make up each charge) for destruction of the particular model of vehicle as indicated on page 252.

c. Connect the charges for simultaneous detonation with detonating cord.

d. Provide for dual priming to minimize the possibility of a misfire. For priming, either a nonelectric blasting cap crimped to at least 5 feet of safety fuse (safety fuse burns at the rate of 1 ft. in approx. 40 sec.; test before using) or an electric blasting cap and firing wire may be used. Safety fuse, which contains black powder, and nonelectric blast-

Vehicle	No. of charges	Location of charges
Cargo Truck Cargo Van Truck Chassis Truck Tractor Truck	2	Set the *first* charge on top of the clutch housing; set the *second* charge as low on the *right* side of the engine as possible.
Dump Truck	3	Set the *first* charge on top of the clutch housing; set the *second* charge as low on the *right* side of the engine as possible; set the *third* charge on the hoist trunnion member adjacent to the hoist cylinder.
Medium Wrecker Truck	4	Set the *first* charge on top of the clutch housing; set the *second* charge as low on the *right* side of the engine as possible; set the *third* charge on the wrecker transmission assembly; set the *fourth* charge on the air compressor.

ing caps must be protected from moisture at all times. The safety fuse may be ignited by a fuse lighter or a match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

Caution: Keep the blasting caps, detonating cord, and safety fuse separated from the charges until required for use.

Note. For the successful execution of methods of destruction involving the use of demolition materials, all personnel concerned will be thoroughly familiar with the provisions of FM 5–25. Training and careful planning are essential.

e. Destroy the tires by placing an incendiary grenade under each tire. The detonation of the explosive charges should be delayed until the incendiary fires are well started. This will prevent the tires from being extinguished by the blast when the charges are detonated.

f. Detonate the charges. If primed with nonelectric blasting cap and safety fuse, ignite and take cover. If primed with electric blasting cap, take cover before firing. The danger zone is approximately 250 yards. Elapsed time: about 6 minutes.

342. Method No. 3—Destruction by Gunfire

a. Remove and empty portable fire extinguishers.

b. Ordinarily destruction of the tires is effected incidental to and in conjunction with the destruction of the vehicle by gunfire. However, if such destruction is not practicable, destroy the tires (par. 340*c* or 341*e*).

c. Drain or puncture the fuel tanks, unless incendiary grenades are to be used tod estroy the tires.

d. Destroy the vehicle by gunfire using artillery, machineguns, rifles, using rifle grenades, or launchers, using antitank rockets. Fire on the vehicle aiming at the engine, axles, wheels, and body. Although one well placed direct hit may destroy the vehicle, several hits are usually required for complete destruction unless an intense fire is started, in which case the vehicle may be considered destroyed.

Caution: Firing artillery at ranges of 500 yards or less should be from cover. Firing rifle grenades or antitank rockets should be from cover. Elapsed time: about 6 minutes.

APPENDIX

REFERENCES

1. Publication Indexes

Special regulations in the 310–20-series, DA pamphlets of the 310-series, DA Pam 108–1, and FM 21–8 should be consulted frequently for latest changes or revisions of references in this appendix and for new publications relating to materiel covered in this manual.

2. Supply Manuals

a. Ammunition.

Land Mines and Components; Demolition Explosives and Related Items; and ORD 3 SNL R–7 Ammunition for Simulated Artillery, Booby Trap, Hand Grenade, and Land Mine Fire.

b. Maintenance and Repair.

Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials.	ORD 3 SNK K–1
List of Current Issue Items of Soldering, Metallizing, Brazing, and Welding Materials; Gases and Related Items.	ORD 3 SNL K–2
Lubricating Equipment, Accessories, and Related Dispensers.	ORD (*) SNL K–3
Tool-Sets (Common), Specialists' and Organizational.	ORD 6 SNL G–27, Sec. 2

c. Vehicle.

Truck, 5–Ton, 6 x 6, Cargo, M41; Cargo, M54; Cargo, M55; Chassis, M40; Chassis, M61; Chassis, M63; Chassis, M139; Dump, M51; Medium Wrecker, M62; and Tractor, M52 (International).	ORD (*) SNL GH744

d. General.

Introduction------------------------ ORD 1

*See DA Pam 310–29 for published types of supply manuals.

3. Forms

Standard Form 91, Operator's Report of Motor Vehicle Accident.
Standard Form 93, Report of Investigating Officer.
Standard Form 94, Statement of Witness.
DA Form 9–3, Processing Record for Shipment and Storage of Vehicles and Boxed Engines.
DA Form 9–4, Vehicular Storage and Servicing Record.
DA Form 9–68, Spotcheck Inspection Report for Wheeled and Half-Track Vehicles.
DA Form 9–75, Daily Dispatching Record of Motor Vehicles.
DA Form 285, Accident.
DA Form 348, Driver Qualification Record.
DA Form 460, Preventive Maintenance Roster.
DA Form 1089, Claim for Personal Property.
DD Form 313, U. S. Government Operator's Report.
DA Form 461, Preventive Maintenance Service and Inspection for Wheeled and Half-Track Vehicles.
DA Form 461–5, Limited Technical Inspection.
DA Form 468, Unsatisfactory Equipment Report.
DA Form 478, Organizational Equipment File.
DA Form 811, Work Request and Job Order.
DA Form 811–1, Work Request and Hand Receipt.
DD Form 6, Report of Damaged or Improper Shipment.
DD Form 110, Vehicle and Equipment Operational Record.
DD Form 317, Preventive Maintenance Service.

4. Other Publications

a. Ammunition.

Explosives and Demolitions	FM 5–25
Regulations for Firing Ammunition for Training, Target Practice, and Combat.	SR 385–310–1

b. Camouflage.

Camouflage, Basic Principles	FM 5–20
Camouflage of Vehicles	FM 5–20B

c. Decontamination.

Decontamination	TM 3–220
Defense Against CBR Attack	FM 21–40

d. General.

Military Symbols	FM 21–30
Cooling Systems: Vehicles and Powered Ground Equipment	TM 9–2858
Driver Selection and Training	TM 21–300
Driver's Manual	TM 21–305
Instruction Guide: Operation and Maintenance of Ordnance Materiel in Extreme Cold (0° to −65° F.).	TM 9–2855.

Motor Transportation, operations	FM 25–10.
Mountain Operations	FM 70–10.
Basic Arctic Manual	FM 31–70.
Operations in the Arctic	FM 31–71.
Precautions in Handling Gasoline	AR 850–20.
Preparation of Ordnance Materiel for Deep-Water Fording.	TM 9–2853.
Principles of Automotive Vehicles	TM 9–2700.
Accident Reporting	SR 385–10–40.
Spark Plugs	TB ORD 313.
Storage Batteries Lead-Acid-Type	TM 9–2857.
Unsatisfactory Equipment Report	SR 700–45–5.
Motor Vehicles	AR 700–105

e. Maintenance and Repair.

Abrasives, Cleaning, Preserving, Sealing, Adhesive, and Related Materials Issued for Ordnance Materiel.	TM 9–850.
Lubrication	TM 9–2835.
Maintenance and Care of Hand Tools	TM 9–867.
Maintenance and Care of Pneumatic Tires and Rubber Treads.	TM 31–200.
Maintenance Responsibilities and Shop Operation.	AR 750–5.
Painting Instructions for Field Use	TM 9–2851.
Preparation of Ordnance Materiel for Deep-Water Fording.	TM 9–2853.
Tactical Motor Vehicle Inspections and Preventive Maintenance Services.	TM 9–2810.

f. Shipment and Limited Storage.

Army Shipping Document	TM 38–705.
Instruction Guide, Ordnance Preservation, Packaging, Packing, Storage, and Shipping.	TM 9–1005.
Marking of Oversea Supply	SR 746–30–5.
Operation List of Packaging Specifications and Instructions (General Supply).	(**)
Ordnance Storage and Shipment Chart—Group G Major Items and Major Combinations of Group G.	TB 9–OSSC–G.
Processing of Motor Vehicles and Related Unboxed Materiel for Shipment and Storage.	SB 9–4.
Processing of Unboxed and Uncrated Equipment for Oversea Shipment.	AR 747–30.
Preservation, Packaging, and Packing of Military Supplies and Equipment.	TM 38–230.

**Copies may be obtained from the Ordnance Packaging Office, Rossford Ordnance Depot, Toledo 1, Ohio.

Protection of Ordnance General Supplies in Open Storage.	TB ORD 379.
Report of Damaged or Improper Shipment______	SR 745–45–5.
Standards for Oversea Shipment and Domestic Issue of Ordnance Materiel Other Than Ammunition and Army Aircraft.	TB ORD 385.

INDEX

347797°—55——34

[AG 451.2 (17 May 55)]