TM9-805

WAR DEPARTMENT TECHNICAL MANUAL

1½-TON 4x4 TRUCK (Chevrolet)

RESTRICTED DISSEMINATION OF RESTRICTED MATTER—
No person is entitled solely by virtue of his grade or position to knowledge or possession of classified matter. Such matter is entrusted only to those individuals whose official duties require such knowledge or possession. (See also paragraph 23*b*, AR 380-5, 15 March 1944.)

WAR DEPARTMENT • *30 DECEMBER 1943*

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For supersession of Quartermaster Corps 10—series manuals, see paragraph 1 d

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WAR DEPARTMENT
Washington 25, D. C., 30 December 1943

TM 9-805—1½-ton 4 x 4 Truck (Chevrolet), is published for the information and guidance of all concerned.

[A. G. 300.7 (22 Nov 43)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION: X.

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

1½-TON 4 x 4 TRUCK (Chevrolet)

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1½-TON 4 x 4 TRUCK (Chevrolet)

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PART ONE—VEHICLE OPERATING INSTRUCTIONS

Section I

INTRODUCTION

1. SCOPE.

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

b. In addition to a description of 1½-ton 4 x 4 truck (Chevrolet), this manual contains technical information required for the identification, use, and care of the materiel. This manual is divided into two parts. Part One, section I through section VIII, contains vehicle operating instructions. Part Two, section IX through section XXXV, contains vehicle maintenance instructions for using arm personnel charged with the responsibility of doing maintenance work within their jurisdiction.

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

d. This technical manual supersedes the organizational maintenance instructions in the following Quartermaster Corps publications:

	Date	Name
TM 10-1127	1 March 1942	1½-ton Truck, 4 x 4 (Chevrolet)
TM 10-1203 Changes Nos. 1 through 4	1 March 1942	1½-ton Truck, 4 x 4 (Chevrolet)
TM 10-1431	28 June 1943	1½-ton Truck, 4 x 4 (Chevrolet)
TM 10-1461	1 April 1942	1½-ton Truck, 4 x 4 panel (Chevrolet)
TM 10-1557	15 July 1942	1½-ton Truck, 4 x 4 (Chevrolet)
TM 10-1559	1 August 1942	1½-ton Truck, 4 x 4 (Chevrolet)

*To provide operating instructions with the materiel, this technical manual has been published in advance of complete technical review. Any errors or omissions will be corrected by changes or, if extensive, by an early revision.

1½-TON 4 x 4 TRUCK (Chevrolet)

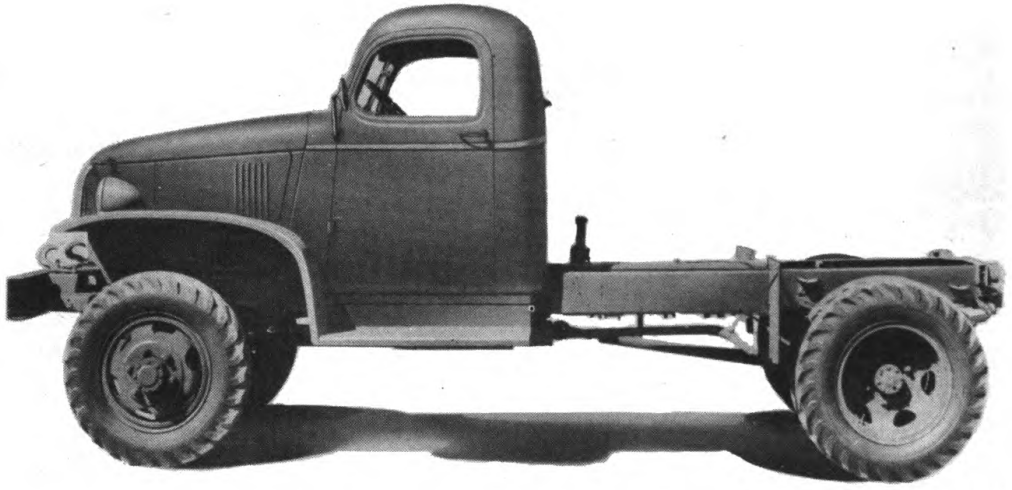

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Figure 1—Chevrolet 1½-Ton, 4 x 4 Truck
Model G-7103—Chassis with Cab
Model G-7113—Cab Tractor

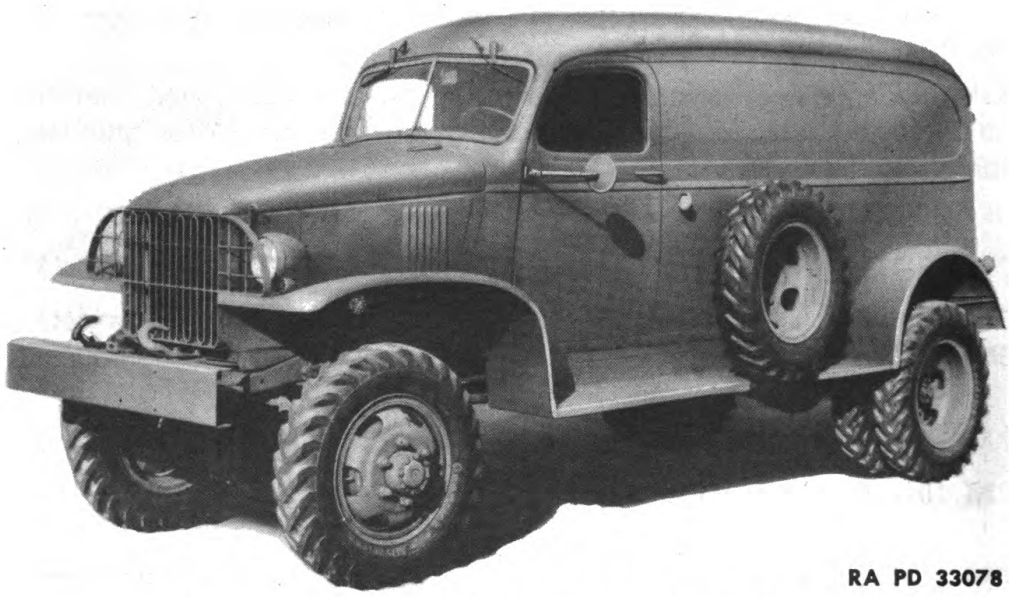

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Figure 2—Chevrolet 1½-Ton, 4 x 4 Truck
Model G-7105—Panel

INTRODUCTION

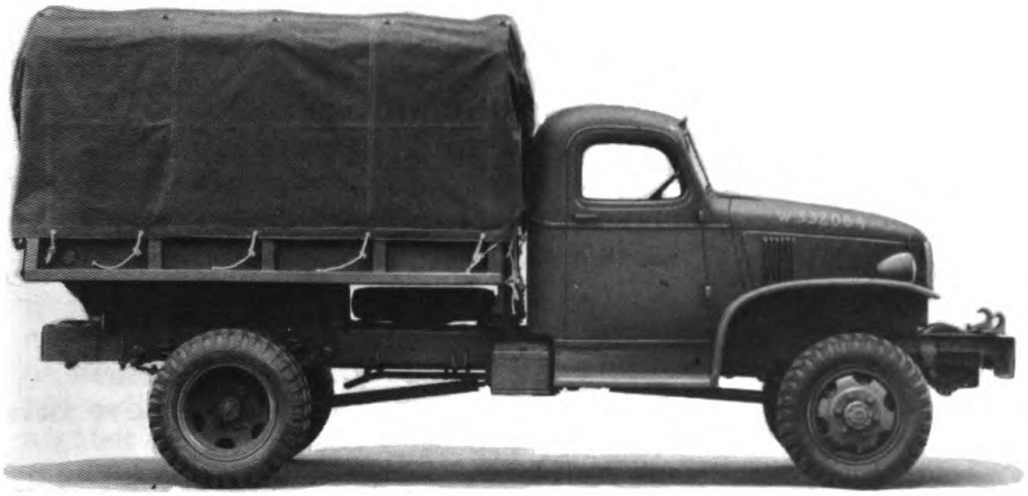

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Figure 3—Chevrolet 1½-Ton, 4 x 4 Truck
Model G-7106—Dump less Winch
Model G-7116—Dump with Winch

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Figure 4—Chevrolet 1½-Ton, 4 x 4 Truck
Model G-7107—Cargo less Winch
Model G-7117—Cargo with Winch

1½-TON 4 x 4 TRUCK (Chevrolet)

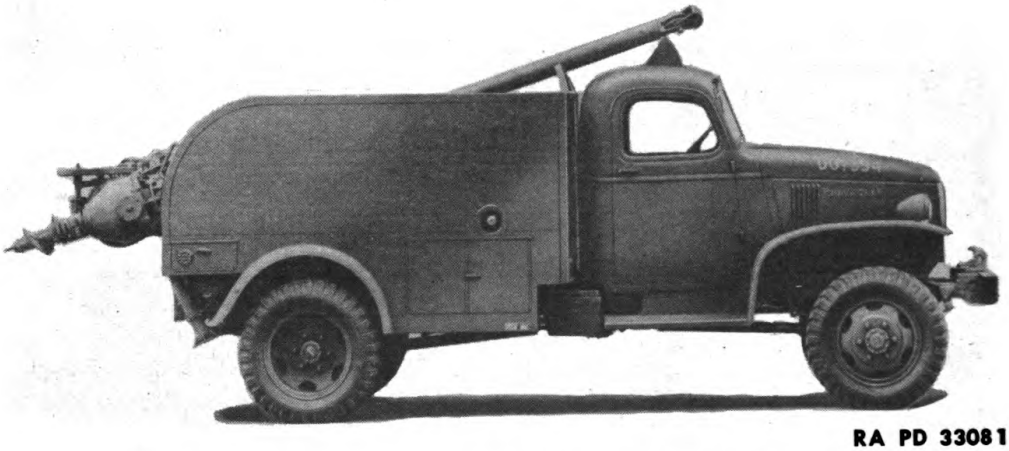

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Figure 5—Chevrolet 1½-Ton, 4 x 4 Truck Model G-7163—Telephone Earth Borer

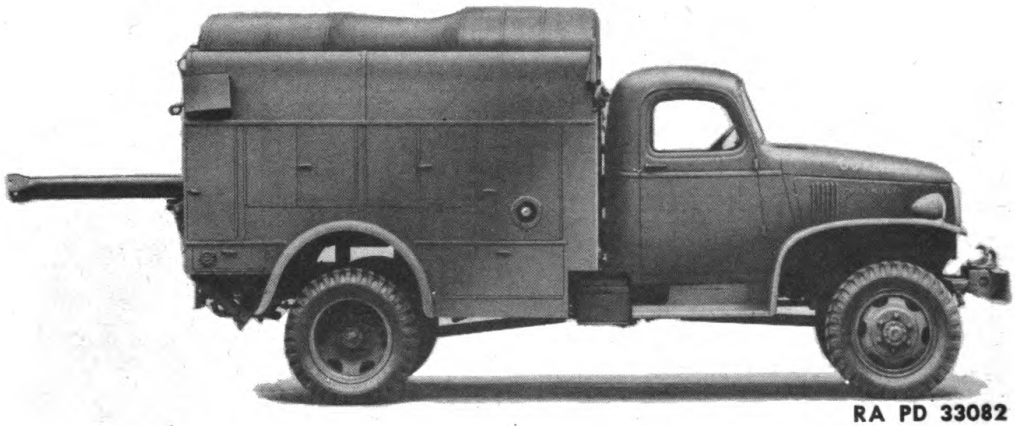

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Figure 6—Chevrolet 1½-Ton, 4 x 4 Truck Model G-7173—Telephone Maintenance

Section II

DESCRIPTION AND TABULATED DATA

2. DESCRIPTION.

a. General. The information in this manual covers several models of the Chevrolet 1½-ton 4 x 4 truck. These models all have 145-inch wheelbase and dual rear wheels. They use the same engine, transmission, transfer case, and front and rear axles, with the exception of the telephone earth borer and telephone maintenance trucks which use a different rear axle and transfer case. Each vehicle has a serial number and load data plate (fig. 7) located on the left side of the windshield header panel. The various models are identified as follows:

Model	Type of Vehicle
G-7103	Chassis with cab
G-7113	Cab tractor
G-7105	Panel
G-7106	Dump less winch
G-7116	Dump with winch
G-7107	Cargo less winch
G-7117	Cargo with winch
G-7163	Telephone earth borer
G-7173	Telephone maintenance

3. DIFFERENCES AMONG MODELS.

a. Model G-7103—Chassis with Cab (fig. 1). This model does not have any body other than the cab mounted on it.

b. Model G-7113—Cab Tractor (fig. 1). This vehicle is the same as model G-7103 except that it has a fifth wheel for hauling semitrailers.

c. Model G-7105—Panel (fig. 2). This model is equipped with a panel body constructed so that the cab is part of the body. There is no partition between the cab and the body, as it is a single unit.

d. Model G-7106—Dump Less Winch (fig. 3). This vehicle is a chassis and cab (G-7103) with a body mounted behind the cab. A hydraulic hoist is installed between the chassis and the body. The rear end of the body is pivoted to the frame so that the front of the body can be raised, and permit the operator to dump the load when desired. The body is provided with stake pockets to permit the installation of side racks, bows, and tarpaulin.

e. Model G-7116—Dump with Winch (fig. 3). This vehicle is the same as model G-7106 but, in addition, it is equipped with a winch at the front of the frame.

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f. Model G-7107—Cargo Less Winch (fig. 4). This model is the same as the dump truck (G-7106), except that it does not have a hoist, and the body is mounted rigidly to the frame with U-bolts.

g. Model G-7117—Cargo with Winch (fig. 4). This vehicle is the same as cargo truck G-7107, except that it is equipped with a winch mounted at the front of the frame.

h. Model G-7163—Telephone Earth Borer (fig. 5). This vehicle has a special body, and is equipped with an earth boring machine for post hole digging and a center-mounted winch.

i. Model G-7173—Telephone Maintenance (fig. 6). This vehicle has a specially designed body that has several compartments built into the side panels. These compartments are accessible through doors in the outside of the side panels. It is equipped with pole-setting equipment used in conjunction with a center-mounted winch.

4. DATA.

a. Vehicle Specifications.

	MODELS								
	7103	7105	7106	7107	7113	7116	7117	7163	7173
Wheelbase (in.)	145	145	145	145	145	145	145	145	145
Length, over-all (in.)	206	221 3/16	223 1/2	224	206	230 1/2	231	212	227 1/2
Width, over-all (in.)	85 3/4	86 11/16	86	86	85 3/4	86	86	90	90
Height, over-all (in.)	87	90 7/8	108	106 1/2	87	108	106 1/2	104	104
Wheel size	20 x 7	20 x 7	20 x 7	20 x 7	20 x 7	20 x 7	20 x 7	20 x 7	20 x 7
Tire size—all 8-ply	750 x 20	750 x 20	750 x 20	750 x 20	750 x 20	750 x 20	750 x 20	750 x 20	750 x 20
Tread, front (in.)	60 1/2	60 1/2	60 1/2	60 1/2	60 1/2	60 1/2	60 1/2	60 1/2	60 1/2
Tread, rear—mean (in.)	67 1/2	67 1/2	67 1/2	67 1/2	67 1/2	67 1/2	67 1/2	67 1/2	67 1/2
Crew	2	2	2	2	2	2	2	2	2
Weight, curb (lb)	5,870	6,760	8,365	7,545	6,065	9,010	8,215	12,180	10,215
Weight, gross (lb)	—	10,080	11,685	10,865	10,885*	12,330	11,535	12,500	11,550
Ground clearance	9 7/8	9 7/8	9 7/8	9 7/8	9 7/8	9 7/8	9 7/8	9 7/8	9 7/8
Pintle height	28 3/4	28 3/4	28 3/4	28 3/4	28 3/4	28 3/4	28 3/4	23	23

b. Performance.

Speeds allowable with transfer case in high range:									
Fourth gear	48	48	48	48	48	48	48	48	48
Third gear	28	28	28	28	28	28	28	28	28
Second gear	14	14	14	14	14	14	14	14	14
First gear	6	6	6	6	6	6	6	6	6
Reverse gear	6	6	6	6	6	6	6	6	6

*With 12,000-pound towed load that imposes 4,500-pound weight (including weight of the lower 5th wheel) on tractor truck.

	MODELS								
	7103	7105	7106	7107	7113	7116	7117	7163	7173
Speeds allowable with transfer case in low range:									
Fourth gear	24	24	24	24	24	24	24	24	24
Third gear	14	14	14	14	14	14	14	14	14
Second gear	7	7	7	7	7	7	7	7	7
First gear	3	3	3	3	3	3	3	3	3
Reverse gear	3	3	3	3	3	3	3	3	3
Approach angle (degrees)	45	45	45	45	45	39	39	45	45
Departure angle (degrees)	30	30	30	30	45	30	30	30	30
Minimum turning radius (ft)	29½	29½	29½	29½	29½	29½	29½	29½	29½
Fording depth (in.)	32	32	32	32	32	32	32	32	32
Towing facilities—front	Towing hooks (two) on all models.								
Towing facilities—rear	Pintle hook on all models.								
Maximum grade ascending ability (percent)	65	65	65	65	65	65	65	65	65
Maximum allowable engine speed	3100	3100	3100	3100	3100	3100	3100	3100	3100
Miles per gallon at 48 mph	9	9	9	9	9	9	9	9	9
Cruising range at 48 mph	270	270	270	270	180**	270	270	315	315
c. Capacities.									
Transmission (pt)	5½	5½	5½	5½	5½	5½	5½	5½	5½
Transfer case (pt)	4	4	4	4	4	4	4	4	4
Front axle (pt)	13½	13½	13½	13½	13½	13½	13½	13½	13½
Rear axle (pt)	14	14	14	14	14	14	14	14	14
Fuel (gal)	30	30	30	30	30	30	30	35	35
Cooling system (qt)	17¼	17¼	17¼	17¼	17¼	17¼	17¼	17¼	17¼
Crankcase (qt)	5	5	5	5	5	5	5	5	5

**With towed load.

Section III

DRIVING CONTROLS AND OPERATION

5. DRIVING CONTROLS.

a. Introduction. The driver of one of these vehicles must be thoroughly familiar with the various controls and their proper use. The instruments and driving controls are illustrated in figure 7, which should be referred to for the key letters shown in the following paragraphs.

b. Carburetor Choke (T). This control is used when starting a cold engine. Pulling out choke control button shuts off the air to the carburetor, providing a rich mixture. The choke button must be pushed in when the engine starts. If the engine is warm, the use of the choke is unnecessary.

c. Ignition Switch (V). This switch is to turn on the ignition when starting the engine. The switch is off when the lever is pointed straight down.

d. Hand Throttle (W). The hand throttle is located on the instrustrument panel to the right of the ignition switch; pulling this button opens the throttle. This control may be used when starting or, if it is desired, to run the engine at a constant speed.

e. Clutch Pedal (AA). The clutch pedal is used to disengage the engine from the transmission when shifting gears. CAUTION: *The clutch must never be engaged quickly when the vehicle is in gear.* Driving with foot on pedal will cause wear of clutch facings and throwout bearing. There must be 1 inch of free travel of the clutch pedal before the clutch starts to disengage.

f. Brake Pedal (AB). Pressing on the brake pedal applies the hydraulic brakes at all four wheels. Avoid driving with foot on brake pedal, as brakes will be partially applied and cause rapid wear of lining.

g. Accelerator (AC). The accelerator is operated by the right foot to control the speed of the engine.

h. Cranking Motor Switch Pedal (AF). Pressing down on pedal with foot engages the cranking motor and flywheel gears, and also closes the cranking motor switch, completing the electrical circuit between battery and cranking motor. Rotation of cranking motor armature through the gears, cranks the engine. When the engine starts, foot must be removed from pedal immediately.

i. Transmission Gearshift Lever (AD). The transmission gearshift lever is used to select various gear ratios provided in the trans-

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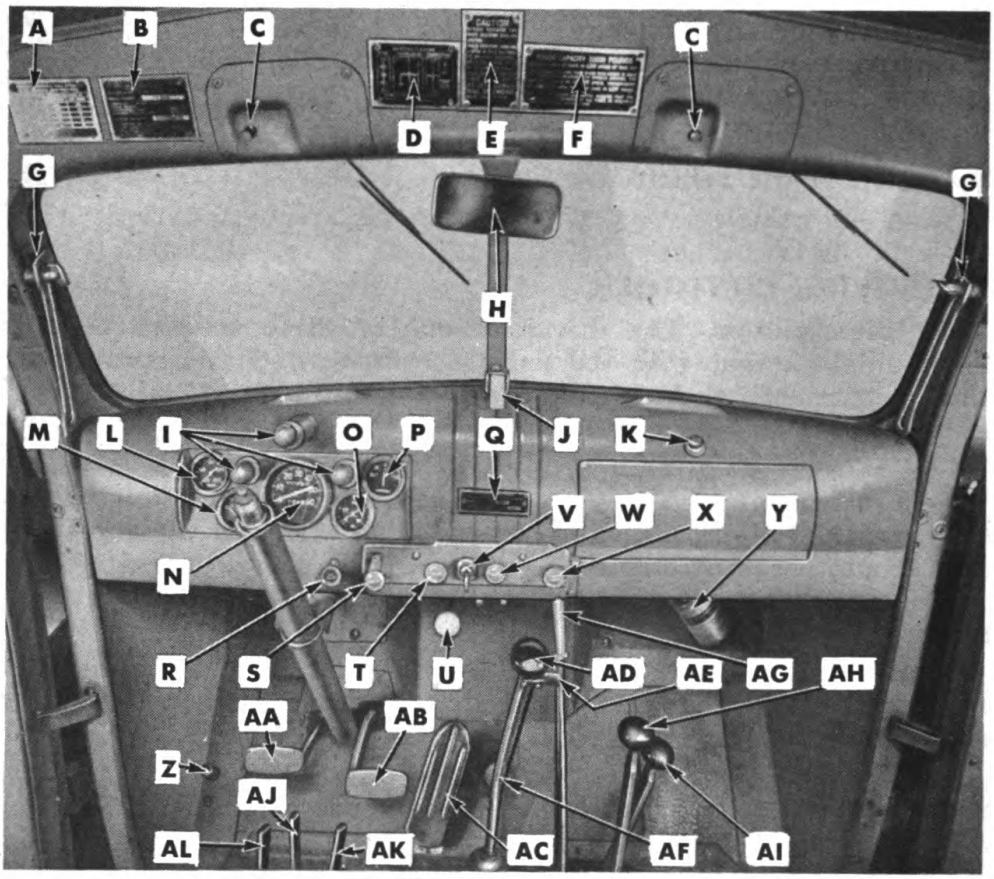

A—ROAD SPEED PLATE
B—SERIAL NUMBER AND LOAD DATA PLATE
C—WINDSHIELD WIPER SWITCH
D—SHIFTING DIAGRAM PLATE
E—COOLING SYSTEM CAUTION PLATE
F—WINCH OPERATION INSTRUCTION PLATE
G—WINDSHIELD QUADRANT ADJUSTING SCREWS
H—REAR VIEW MIRROR
I—INSTRUMENT LIGHTS
J—WINDSHIELD CENTER LOCK
K—GLOVE COMPARTMENT LOCK
L—TEMPERATURE INDICATOR
M—FUEL GAGE
N—SPEEDOMETER
O—OIL PRESSURE GAGE
P—AMMETER
Q—PUBLICATION DATA PLATE
R—BLACKOUT DRIVING LIGHT SWITCH
S—LIGHT SWITCH
T—CARBURETOR CHOKE
U—COWL VENTILATOR CONTROL LEVER
V—IGNITION SWITCH
W—HAND THROTTLE
X—INSTRUMENT LIGHT SWITCH
Y—FIRE EXTINGUISHER
Z—HEADLIGHT DIMMER SWITCH
AA—CLUTCH PEDAL
AB—BRAKE PEDAL
AC—FOOT ACCELERATOR
AD—TRANSMISSION GEARSHIFT LEVER
AE—TRANSMISSION REVERSE GEAR LATCH
AF—STARTING SWITCH PEDAL
AG—HAND BRAKE LEVER
AH—TRANSFER CASE SHIFTING LEVER (HIGH—LOW GEAR)
AI—FRONT AXLE SHIFTING LEVER
AJ—WINCH POWER TAKE-OFF CONTROL LEVER
AK—HOIST VALVE CONTROL LEVER
AL—HOIST POWER TAKE-OFF CONTROL LEVER

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Figure 7—Driving Compartment, Instruments and Controls

mission. There are four forward speeds and one reverse speed. Reverse gear can only be engaged when latch (AE) on gearshift lever is raised. Lever positions for various gears are shown on shifting diagram plate (D).

j. Hand Brake Lever (AG). The hand brake lever is used to control the parking brake at the rear of the transfer case. Pulling the hand brake lever toward the rear applies the parking brake, while pushing it forward releases the brake. Whenever the vehicle is parked, the lever must be pulled toward the rear as far as possible. Before moving the vehicle, lever must be pushed forward to the fully released position.

k. Transfer Case Shifting Lever (AH). The transfer case shifting lever is used to select "HIGH" or "LOW" speed range, or "NEUTRAL" in the transfer case. See shifting diagram plate (D). The shifting lever is linked to the front axle control lever in such a way that it is impossible to shift into the low speed in the transfer case without the drive to the front axle being engaged.

l. Front Axle Shifting Lever (AI). The front axle shifting lever permits engaging or disengaging the front axle drive through the transfer case. When the lever is pushed forward, the front drive is engaged, and when it is pulled toward the rear, it is disengaged. The front axle drive should be disengaged when operating on dry, hard-surfaced roads. However, the front axle should be engaged when operating on soft-surfaced roads such as sand, dirt, gravel, or muddy roads, to prevent putting undue strain on the rear axle. Four-wheel drive should always be used when approaching uneven terrain; do not allow vehicle to stall before going into four-wheel drive.

m. Winch Power Take-off Control Lever (AJ). The winch power take-off control lever is the lever that controls the power winch through the power take-off attached to the transmission. When the winch is not in use, a hinged plate locks the winch control lever in the neutral position. For shifting positions refer to plate on windshield head panel (D).

n. Hoist Valve Control Lever (AK). The hoist valve control lever is used to control the valve in the hydraulic hoist. When the hoist is not being used, the lever is pulled back toward the seat.

o. Hoist Power Take-off Control Lever (AL). The hoist power take-off control lever is used in connection with the hoist valve lever to operate the hydraulic hoist. Instructions covering the operation of the winch and hoist controls are contained in paragraph 163.

6. INSTRUMENTS AND MISCELLANEOUS CONTROLS.

a. Temperature Indicator (L). The temperature indicator indicates the temperature of the liquid in the cooling system at all times. The dial of the instrument indicates temperature in degrees Fahrenheit. The driver must watch this instrument closely for any indication of excessive temperature. Whenever the indicator hand shows over 180 degrees, the driver must immediately investigate the

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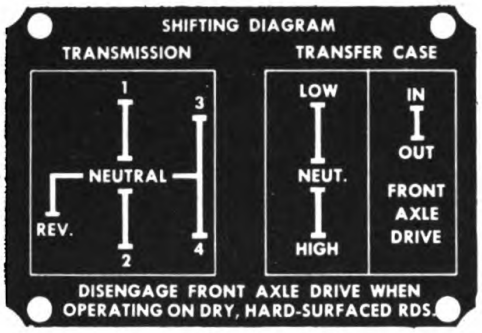
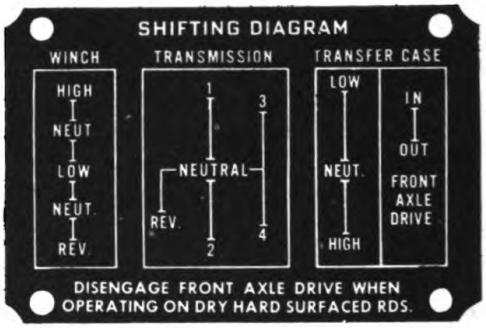
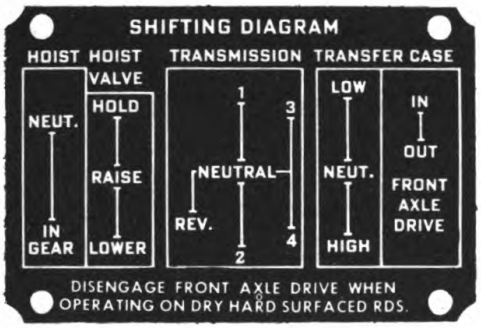


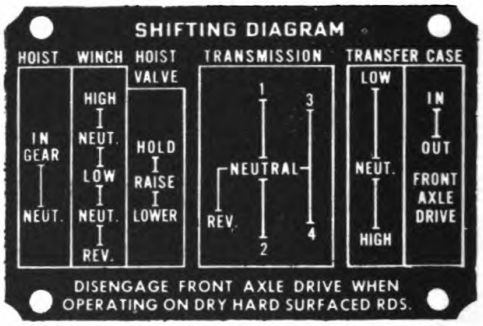
A—FOUR-SPEED TRANSMISSION AND TRANSFER CASE



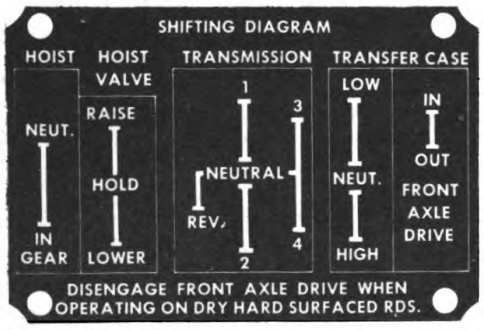
B—FOUR-SPEED TRANSMISSION, TRANSFER CASE AND WINCH



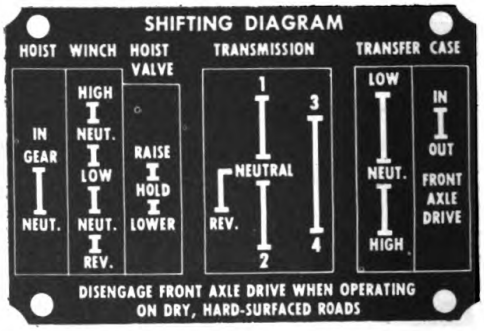
C—FOUR-SPEED TRANSMISSION, TRANSFER CASE AND HOIST



D—FOUR-SPEED TRANSMISSION, WINCH AND HOIST



E—FOUR-SPEED TRANSMISSION, TRANSFER CASE AND PERFECTION HOIST



F—FOUR-SPEED TRANSMISSION, WINCH AND PERFECTION HOIST

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Figure 10—Gearshifting Instruction Plates

turns on the blackout marker lights (fig. 9) and taillight. In addition, this position permits turning on the blackout driving light when the blackout driving light switch is pulled out, and also the blackout stop light when the brakes are applied. To turn on the regular headlights, depress the blackout safety button on top of the switch, and pull the control button out to the second position. In this position, circuits are established to the regular tail and stop lights. When the lighting switch button is pulled out to the third position, it provides a circuit for the service stop light during daylight driving.

b. Blackout Driving Light Switch (R). The blackout driving light switch is used to turn on the blackout driving light located on the left front fender (fig. 9). The blackout driving light can be turned on only when the main light switch is pulled out to first position.

c. Instrument Panel Light Switch (X). This switch is used to turn on the instrument lights (I) when the light switch is in the bright headlight position. These lights will not operate with the light switch in the blackout position.

d. Headlight Dimmer Switch (Z). This is a foot-operated switch used to select the headlight beam (upper or lower) desired after the headlights are turned on, by depressing the switch button with the foot. CAUTION: *Always use the lower beam when passing approaching vehicles. This is an important safety rule.*

8. INSTRUCTION PLATES.

a. Shifting Diagram Plates (D). Shifting diagram plates are furnished with each vehicle to give the driver instructions on the various shifting lever positions. Several different shifting diagram plates are used, depending on the special equipment installed on the vehicle as listed below and illustrated in figures 10 and 11.

(1) Shifting diagram plate used with four-speed transmission and transfer case ("A", fig. 10).

(2) Shifting diagram plate used with four-speed transmission, transfer case, and winch ("B", fig. 10).

(3) Shifting diagram plate used with four-speed transmission, transfer case, and hoist ("C", fig. 10). Used with either Hercules or Heil hoist and Central Fibre Products power take-off.

(4) Shifting diagram plate used with four-speed transmission, transfer case, and hoist ("E", fig. 10). Used with Perfection hoist and Central Fibre Products power take-off.

(5) Shifting diagram plate used with four-speed transmission, transfer case, winch, and hoist ("D", fig. 10). Used with either the Heil or Hercules hoist and the Wood or Spicer power take-off.

(6) Shifting diagram plate used with four-speed transmission, transfer case, winch, and hoist ("F", fig. 10). Used with Perfection hoist and either Wood or Spicer power take-off.

(7) Shifting diagram plate used on models G-7163 Telephone Earth Borer truck, and G-7173 Telephone Maintenance truck (fig. 11).

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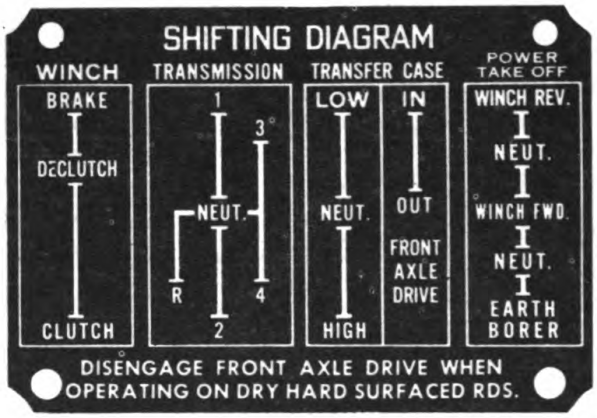

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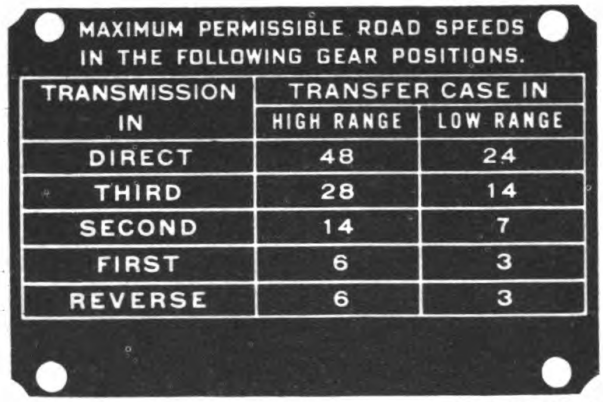
Figure 11—Shifting Diagram, Telephone Maintenance Vehicles

b. Cooling System Draining Caution Plate ("E", fig. 7). This plate gives the driver instructions for draining the cooling system.

c. Power Winch Operation Instruction Plate (F). This plate gives the driver instructions regarding operation of the winch.

d. Maximum Permissible Road Speeds Plate (A). This plate gives the maximum permissible road speeds at which the vehicle shall be driven in the various gear positions with the transfer case in "HIGH" or "LOW" gear. Figure 12 shows a reproduction of this plate.



TRANSMISSION IN	TRANSFER CASE IN	
	HIGH RANGE	LOW RANGE
DIRECT	48	24
THIRD	28	14
SECOND	14	7
FIRST	6	3
REVERSE	6	3

RA PD 33085

Figure 12—Maximum Permissible Road Speeds Plate

e. Serial Number and Load Data Plate (B). This plate shows the model number, serial number, and load data. This information varies with the different models; therefore, attention must be given to the load data plate on the vehicle being operated.

f. Publication Data Plate (Q). This plate shows the numbers for the parts list and maintenance manual that apply to the vehicle.

DRIVING CONTROLS AND OPERATION

9. OPERATION OF THE VEHICLE.

a. Preliminary Instructions. Before attempting to start the engine or operate the vehicle, make the before-operation inspections.

b. Starting the Engine.

(1) Place the transmission gearshift lever and transfer case shift lever in neutral (see shifting diagram plate).

(2) Pull out hand throttle about ⅜ inch. NOTE: *This is not necessary if engine is warm.*

(3) Pull out on choke button to obtain proper fuel and air mixture for starting. If the engine is warm, choking will be unnecessary.

(4) Turn ignition switch to "ON" position.

(5) Step on starter pedal to crank the engine. Release pedal as soon as engine starts.

(6) Push in on choke button and adjust hand throttle to obtain even idling. When engine is cold, it should be run several minutes before attempting to move the vehicle.

c. Starting the Vehicle.

(1) Push clutch pedal downward to disengage the clutch.

(2) Shift transfer case shift lever into either "HIGH" or "LOW" speed position (see shifting diagram plate).

(3) Move transmission gearshift lever to the left, and forward into first gear position.

(4) Release the hand brake lever.

(5) Step down on accelerator pedal to speed up the engine. Engage clutch pedal slowly, and push accelerator pedal down as necessary to pick up the load and prevent stalling the engine as the truck starts to move.

(6) As truck speed increases, release accelerator pedal, depress the clutch pedal, move the gearshift lever to "NEUTRAL", and then to the next higher speed. Step down on accelerator, and engage clutch as explained in previous paragraph. Repeat this operation until transmission is in high gear.

d. Shifting Gears in Transfer Case. The transfer case may be operated in either "HIGH" or "LOW" speed range when the front axle is engaged, but cannot be operated in "LOW" speed range when the front axle is disengaged.

(1) To engage the front axle, shift the transfer case into neutral, and move front axle shift lever forward.

(2) To disengage the front axle, shift the transfer case into neutral, and move front axle shift lever toward the rear.

e. Shifting Gears in Transfer Case from High to Low Speed. This shift must not be attempted except when the vehicle is being operated at low speeds or at a standstill. Front axle must be engaged for this shift.

(1) Depress the clutch pedal, and move transfer case shift lever to neutral position.

(2) Engage clutch pedal, and accelerate engine to approximately twice that of vehicle speed.

(3) Depress clutch pedal again, and move shift lever forward (without applying excessive pressure) into "LOW" speed position. Then release clutch and accelerate engine.

f. Shifting Gears in Transfer Case from "LOW" to "HIGH" Speed. This shift may be accomplished at any time, regardless of vehicle speed.

(1) Release accelerator, depress clutch pedal, and move shift lever to neutral position.

(2) Release clutch pedal, and accelerate engine to synchronize engine speed with that of vehicle.

(3) Depress clutch pedal, and move shift lever toward rear into "HIGH" speed position.

g. Shifting to Lower Speed in Transmission. The transmission should always be shifted to the next lower speed before engine begins to labor, or before vehicle speed is reduced appreciably. Shifting to lower speed is accomplished as follows:

(1) Depress the clutch pedal quickly, maintaining the same pressure on accelerator. Move gearshift lever to "NEUTRAL," and at the same instant engage the clutch.

(2) Again depress the clutch pedal, and move the gearshift lever to the next lower speed. Engage the clutch slowly, and at the same time accelerate the engine speed to synchronize it with that of the vehicle. NOTE: *Use the same transmission gear going downhill as would be required to climb the same hill.*

h. Shifting into Reverse. Before attempting to shift into "REVERSE", the truck must be brought to a complete stop.

(1) Push clutch pedal downward to disengage clutch.

(2) Shift the transmission to "NEUTRAL," raise latch on gearshift lever, and move lever to left as far as possible, then toward the rear (see shifting diagram plate).

(3) Engage clutch and accelerate the engine in the same manner as previously explained.

i. Stopping the Truck.

(1) Remove foot from accelerator pedal, and apply brake by pressing down on foot pedal.

(2) When speed of truck has been reduced to idling speed of engine, disengage the clutch, and move transmission gearshift lever into "NEUTRAL" position.

(3) When truck has come to a complete stop, release clutch pedal and apply hand brake.

10. TOWING THE VEHICLE.

a. Towing to Start Vehicle. Perform the Before-operation Service as instructed in paragraph 23; then place transfer case shifting lever in "HIGH" gear, and the front axle control lever so that it is out of

front axle drive. Place the transmission gearshift lever in either third or high gear, then turn on the ignition switch, and hold the clutch pedal all the way down against the floorboard. Start towing the vehicle, and as soon as both vehicles attain a steady momentum of about 10 to 12 miles per hour, let the clutch out slowly and use the choke, if necessary, in the same manner as if starting the engine with the cranking motor. As soon as the engine starts, push in the clutch and place the transmission lever in "NEUTRAL", then stop both vehicles, and uncouple the tow car.

b. Towing Disabled Vehicle. Place the front axle control lever so that it is out of front axle drive. Then place the transfer case shifting lever and the transmission gearshift lever in "NEUTRAL". Use the brakes on the vehicle being towed to slow up or stop the vehicle when towing it.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section IV

AUXILIARY EQUIPMENT CONTROLS AND OPERATION

11. GENERAL.

a. The auxiliary equipment referred to in this section consists of fire extinguisher, hoists, front-mounted winches, center-mounted winches, and the different types of power take-offs required for operation of this equipment. The operation of power take-offs will not be treated separately, as the power take-off is only used as a part of the operation of the other auxiliary equipment.

12. FIRE EXTINGUISHER OPERATION.

a. Release the spring-type lock, and remove extinguisher from the mounting bracket. Turn handle to the left, and work it in and out like a pump. Direct the stream of liquid at the base of flame unless used on burning liquid. When extinguisher is used on burning liquid, direct the stream against inside of liquid container above surface of liquid. CAUTION: *Refill or exchange extinguisher for one that has been refilled at earliest possible moment after use, as this unit must be kept in operating condition.*

13. HOIST OPERATION.

a. Start the engine (par. 9 **b**). Disengage the clutch and shift the hoist power take-off shift lever to the "IN GEAR" position as shown on the shifting diagram plate located on the windshield header. Engage the clutch, and move the hoist valve control lever to the "RAISE" position as shown on the shifting diagram plate. This starts to raise dump body. Accelerate engine slightly to provide faster action. When the body reaches the desired angle, shift the hoist valve control lever to the "HOLD" position to hold the body in this position, and to the "LOWER" position to lower the body. When the body is firmly seated, shift the hoist valve control lever to the "HOLD" position; disengage the clutch, and shift the hoist power take-off shift lever to "NEUTRAL" position. The hoist may be operated by following the above instructions when the vehicle is in motion.

14. FRONT-MOUNTED WINCH OPERATION.

a. Vehicle Stationary (fig. 13). Disengage the jaw-type clutch on the winch drum shaft by pushing clutch yoke toward center of vehicle until poppet enters hole in support. Unreel sufficient cable from drum

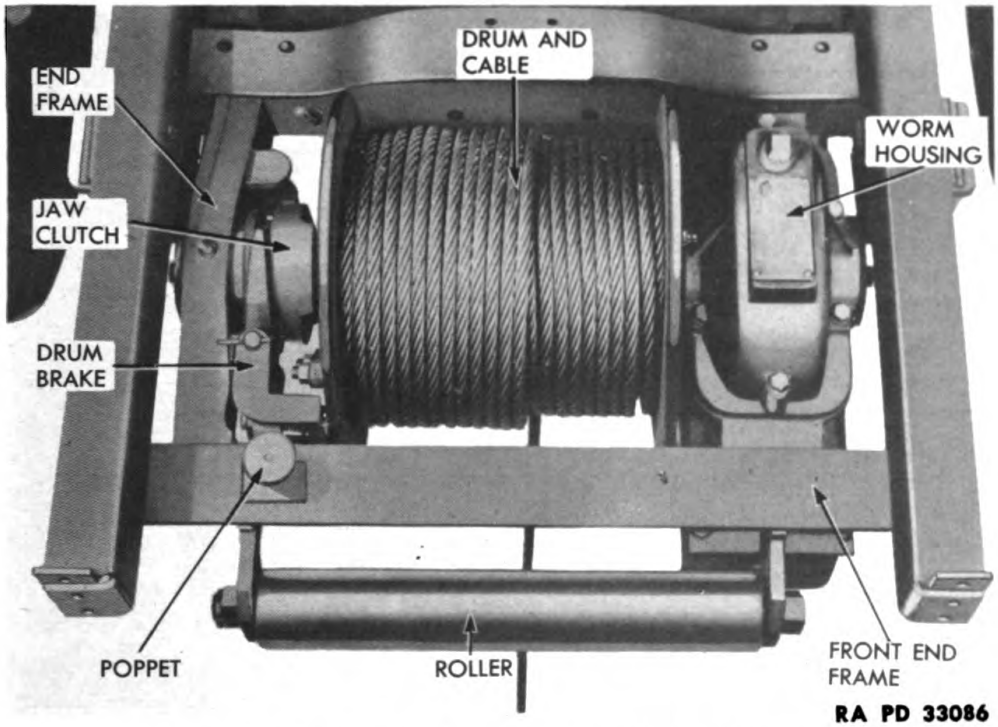


Figure 13—Front-mounted Power Winch

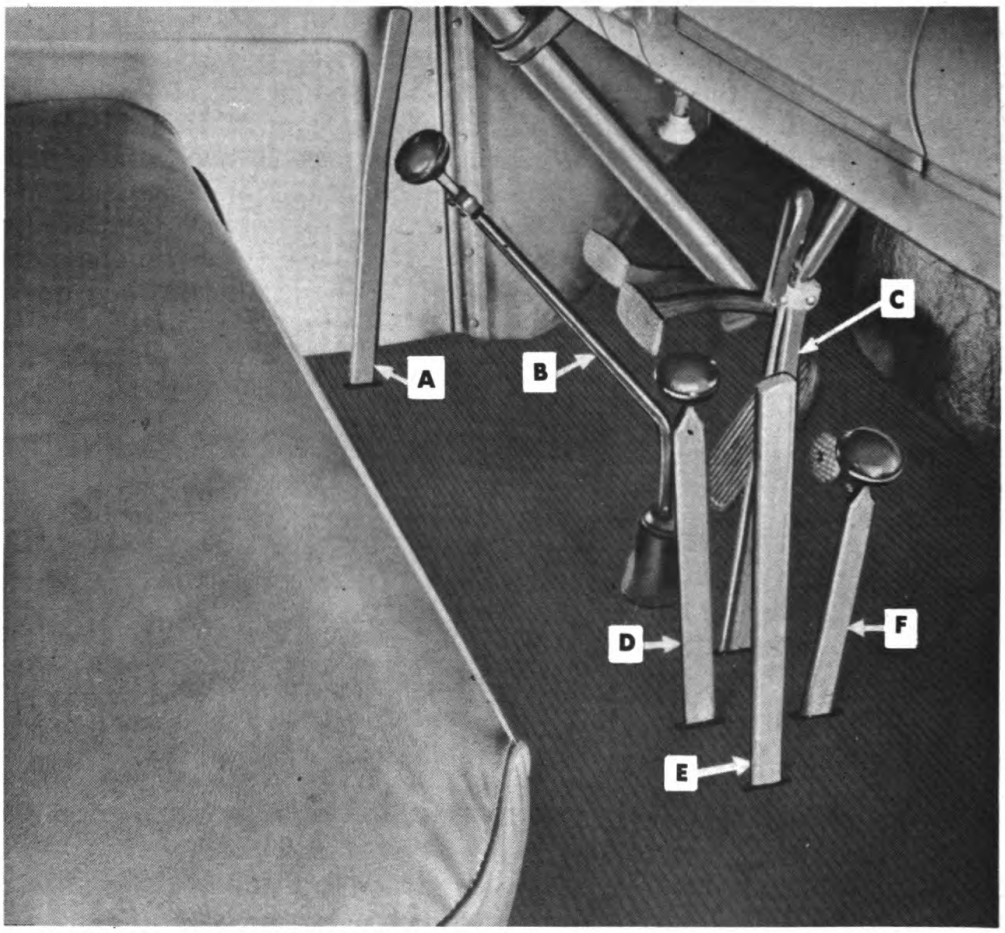
to attach cable to load. Engage jaw clutch by pushing the clutch yoke toward frame side rail until poppet drops in hole in support. Place transmission in neutral; set the hand brake, and start the engine. Disengage the clutch; shift the power take-off "WINCH" shift lever to a forward speed (see shifting diagram plate on windshield header); engage the clutch, and at the same time accelerate engine as necessary to pull or lift load on winch. NOTE: *Use "LOW" or "HIGH" gear depending on load to be handled; when in doubt, use "LOW" gear.* When load is to be stopped, depress clutch pedal; shift power take-off to neutral; release jaw clutch; disconnect cable from load, and carefully wind cable on drum by hand while holding the cable tight. The operation in reverse is the same, except that the engine is used to steadily release the cable from drum.

b. Vehicle in Gear. When the winch is being used to assist the vehicle the instructions in subparagraph **a** above should be followed, except that the transfer case and transmission should be in "LOW" gear, the brakes released, and the power take-off in "LOW".

15. CENTER-MOUNTED WINCH OPERATION (Telephone Service)

a. Controls. The power take-off and winch control levers on the telephone service truck are not in the same positions as on the other 4 x 4 models. For location of these levers refer to figure 14.

1½-TON 4 x 4 TRUCK (Chevrolet)



A—WINCH CLUTCH AND BRAKE CONTROL LEVER
B—TRANSMISSION GEARSHIFT LEVER
C—HAND BRAKE LEVER
D—TRANSFER CASE SHIFT LEVER
E—POWER TAKE-OFF CONTROL LEVER
F—FRONT AXLE SHIFT LEVER

RA PD 33087

Figure 14—Cab Interior of Telephone Service Vehicles

b. Operation. Shift the transfer case to "NEUTRAL"; start the engine; disengage the clutch, and shift the transmission to second gear. Shift the power take-off lever to the forward ("REVERSE") position as shown on the shifting diagram plate on windshield header (fig. 11). During this shift the clutch pedal should be engaged and disengaged slowly to properly mate the power take-off gears. With the clutch pedal depressed, move the winch clutch and brake control lever back into "CLUTCH" position to engage the winch clutch. Engage the vehicle clutch pedal to unreel the cable, and pull it out to attach it to load. The cable can also be unreeled by shifting the winch clutch and brake lever forward to disengage the clutch, and applying sufficient brake to prevent the cable from loosening on the drum while the cable is unreeled by hand. Attach the cable to load; depress the clutch pedal; shift the power take-off to forward gear, and engage the clutch to lift or pull the load. When load is properly

positioned, depress clutch pedal; shift winch clutch and brake control lever to center (DECLUTCH) position; shift transmission to "NEUTRAL," release clutch pedal, and shift power take-off to "NEUTRAL." If the winch is not to be used again, shift transfer case to "HIGH" gear; disconnect cable from load, and tightly wind cable on drum (fig. 126). This winch is also used in connection with the pole derrick for setting poles.

Section V

OPERATION UNDER UNUSUAL CONDITIONS

16. SAND.

a. When operating in sandy or dusty localities, it is necessary to clean the valve cover air cleaner and the carburetor air cleaner more frequently than usual. Under extreme conditions, it may be necessary to clean these air cleaners daily. This can be determined by removing the covers and rubbing a finger through the oil in the air cleaners to see if there is grit, sand, or dirt in the oil chamber. It will also be necessary to clean the hydrovac air cleaner about once a month or more often, depending on the conditions. This can be determined by removing the air cleaner cover and examining the wire gauze, and if dirty, remove, clean, and oil it.

17. MUD AND WATER.

a. Mud. When driving through mud it may be necessary to shift the front axle control lever to engage the front axle drive. Under extreme conditions it may also be necessary to use a lower transmission speed. Very often when driving through soft mud, the mud will work its way into the brake drums, and get on the brake linings and shoes. This condition causes excessive wear on the brake linings and drums, and the mud should be removed as soon as conditions permit. It will be necessary to remove the brake drums so that the dirt can be washed out with water.

b. Water. When driving through water, it is necessary to reduce the speed of the vehicle to as slow as 2 to 3 miles per hour under extreme conditions. If the depth of the water is above the lowest point of the flywheel housing underpan, the transmission should be shifted to the low or first speed, and the clutch should not be released until the vehicle is in shallower water, as water on the clutch facings will cause the clutch to slip. After the vehicle has passed through the water, the brakes should be tested by applying the brakes. If the brakes do not take hold properly, it will be necessary to "ride" the brake pedal a short distance to dry out the brake linings.

18. ROUGH TERRAIN.

a. When operating over rough terrain, the speed of the vehicle should be governed by the condition of the terrain. Do not attempt

to drive the vehicle so fast that it jumps over the rough spots. In extreme cases it will be necessary to shift the transmission to a lower speed so that the vehicle can follow the terrain without excessive jarring.

19. SNOW AND ICE.

a. Snow. Driving through snow is similar to driving through sand with two exceptions, one of which is the possibility of skidding, and the other is the fact that snow will not cause excessive brake lining wear. When stopping the vehicle in snow, do not apply the brakes suddenly, as this is liable to lock the wheels and cause the vehicle to skid. It will not be necessary to remove the drums to clean out any snow that might get into the brake mechanism unless the brakes get full of slush, which freezes and causes the brake shoes to become inoperative.

b. Ice. Driving over ice is always hazardous, as too much power or sudden brake application will cause the vehicle to skid. Never drive the vehicle over ice at a speed that does not permit full control of the vehicle at all times. When applying the brakes, depress the brake pedal gradually, and do not release the clutch until the vehicle is practically stopped.

20. HOT WEATHER.

a. Introduction. Operation of these vehicles in high temperatures requires additional precautions, more frequent inspections, and closer observance of the instruments and gages.

b. Cooling System. The formation of scale and rust occurs more readily in high temperatures; therefore, the water should be drained and the radiator and cooling system flushed, whenever the water becomes rusty. If a rust preventive is available, it should be added to the water. Check the fan belt frequently to see that it is adjusted properly. Check the water pump frequently to see that it is operating properly and not leaking. Check the hose connections to see that they do not leak, and that they do not show signs of deterioration; if so, they should be replaced. Check the thermostat to see that it is opening properly. Check the radiator core to see that the air passages in the core are not congested with bugs, leaves, etc. If these passages are congested, they should be cleaned out.

c. Battery. When the vehicle is being operated in extremely hot climates the distilled water in the battery electrolyte evaporates very rapidly. For this reason the battery should be checked daily, and distilled water added to bring the electrolyte ¼ inch above the top of plates. Battery electrolyte is much more active at high temperature than at low temperature. This highly active electrolyte causes rapid deterioration of the plates and separators, and more rapid "self-discharge" of idle batteries. CAUTION: *Idle batteries must be stored in a cool place.* Batteries can safely be used in hot climates with a weaker electrolyte solution, which will prolong battery life. When unusually short battery life is experienced in tropical climates,

the batteries should be forwarded to a higher echelon for adjustment of electrolyte as recommended for use in hot climates.

21. COLD WEATHER.

a. Introduction. The operation and maintenance of these vehicles at low temperatures requires additional precautions and preparations that are not necessary in temperate climates. Low temperature ranges can generally be divided into three ranges, each requiring definite preparations and precautions: +32°F to 0°F; 0°F to −20°F; below −20°F.

b. +32°F to 0°F. The cooling system must be protected with a sufficiently strong antifreeze solution to protect it against freezing at the lowest probable temperature. The battery must be kept in a fully charged condition. The fuel system must be kept free from dirt or water, and the engine should be kept properly tuned. SAE 10 oil should be used in the engine.

c. 0°F to −20°F. The cooling system must be filled with a permanent type antifreeze solution strong enough to protect the cooling system against freezing in temperatures as low as −20°F. A 166°F thermostat must be installed. The lower part of the radiator core, and the hood and fender skirt louvers must be covered. When parking the vehicle for any length of time, the front must be covered with a tarpaulin. The vehicle should be stored inside when facilities are available. CAUTION: *SAE 10 engine oil must be used. The battery must be kept fully charged, and the ignition system in good condition.* To start the engine, the throttle should be from ⅓ to ½ open, the choke valve fully closed, and the clutch pedal fully depressed. When the engine starts, adjust the choke and throttle to obtain a smooth, fast idle. Run the engine at this speed until it is thoroughly warmed up, and the oil pressure drops to normal, before attempting to drive the vehicle.

d. Below −20°F. Special winterizing equipment must be installed for satisfactory operation in these temperatures. The operating instructions in the winterizing equipment manual must be adhered to for satisfactory operation of the equipment and the vehicle.

Section VI

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

22. PURPOSE.

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

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

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

d. The general inspection of each item applies also to any supporting member or connection, and generally includes a check to see if the item is in good condition, correctly assembled, secure, or excessively worn.

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

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

(3) The inspection of a unit to determine if it is "secure" is usually an external visual examination, wrench, hand-feel, or a pry-

bar check for looseness. Such an inspection should include brackets, lock washers, lock nuts, locking wires, or cotter pins used in assembly.

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

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

23. BEFORE-OPERATION SERVICE.

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

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

(1) ITEM 1, TAMPERING AND DAMAGE. Look for injury to vehicle in general, its accessories or equipment, caused by tampering or sabotage, collision, falling debris, or shell fire.

(2) ITEM 2, FIRE EXTINGUISHER. Inspect fire extinguisher for corrosion, full charge, clean nozzle, and secure mounting.

(3) ITEM 3, FUEL, ENGINE OIL, AND WATER. Check amount of fuel, oil, and coolant. Add as needed. NOTE: *Any appreciable drop in levels since After-operation Service should be investigated, and cause corrected or reported.* When antifreeze solution is in use, if any appreciable addition of water is needed, have antifreeze value tested. Be sure spare fuel and water cans are full and securely mounted.

(4) ITEM 4, ACCESSORIES AND DRIVES. Examine carburetor, generator, regulator, cranking motor, fuel pump, fuel filter, air cleaner, and water pump for loose or damaged connections and loose mountings. Be sure fan and generator drive belt is in good condition and adjusted to have ¾-inch finger pressure deflection.

(5) ITEM 6, LEAKS, GENERAL. Look under vehicle and in engine compartment for fuel, coolant, and lubricant leaks; particularly at carburetor, fuel pump, fuel filter, radiator, and water pump.

(6) ITEM 7, ENGINE WARM-UP. Start engine and observe if cranking motor has adequate cranking speed and engages and disengages properly without unusual noise. Note any tendency toward difficult starting. If oil pressure gage does not register within 10 seconds, stop engine, and correct trouble or report to designated authority. Set hand throttle to fast idle speed, and during the warm-up period proceed

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

with the following Before-operation Services (items 8 through 22). Listen for unusual noises; watch instrument indications, and note any unsatisfactory engine performance such as misfiring and rapid temperature rise.

(7) ITEM 8, CHOKE. While starting engine, observe choke for satisfactory operation. As engine warms up, reset choke as required for smooth engine operation, and to prevent crankcase oil dilution.

(8) ITEM 9, INSTRUMENTS.

(a) Oil Pressure Gage. Oil pressure gage should show normal reading of 5 pounds at idle, or 12 to 17 pounds at running speeds.

(b) Ammeter. After engine starts and is running at fast idle, ammeter should show a high positive (+) charge rate for a short period until generator restores to battery the current used in starting. After this period ammeter should register a zero or slight positive (+) charge with lights and accessories turned off.

(c) Fuel Gage. Fuel gage should register approximate amount of fuel in tank.

(d) Temperature Gage. Engine temperature should increase gradually during warm-up period. Temperature gage should register 140°F to 170°F. CAUTION: *Do not move vehicle until engine temperature reaches 135°F.*

(9) ITEM 10, HORN AND WINDSHIELD WIPERS. Test horn (tactical situation permitting) for proper operation and tone. Inspect wipers, arms, and blades for good condition. See if blades contact glass evenly throughout full stroke.

(10) ITEM 11, GLASS AND REAR VIEW MIRRORS. Look for loose or damaged frames, brackets, or regulators. Clean windshield and door glass, and inspect for damage or discoloration. Clean mirror and aim properly.

(11) ITEM 12, LAMPS (LIGHTS) AND REFLECTORS. Operate all switches (tactical situation permitting) and see if all lights respond properly. Be sure all lights and reflectors are secure, and lenses are clean and undamaged.

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

(13) ITEM 14, TIRES. Inspect all tires for damage or low pressure. Inflate to 55 pounds pressure (tires cool), if time is available. Remove imbedded objects from treads and from between duals. Make sure spare is secure in carrier.

(14) ITEM 15, SPRINGS AND SUSPENSION. Examine springs for abnormal sag, broken or shifted leaves, and loose or missing rebound clips. See that eyebolts, U-bolts, shackles, and shock absorbers are in good condition and tight. Examine shocks for leaks.

(15) ITEM 16, STEERING LINKAGE. Examine steering gear, Pitman arm, rods, rod ends, and steering arms for looseness or damage and excessive lubricant leaks.

(16) ITEM 17, FENDERS AND BUMPERS. Inspect fenders and bumpers for looseness and damage.

(17) ITEM 18, TOWING CONNECTIONS. Inspect tow hooks and pintle hook for looseness or damage, and see that pintle hook locking device is operating satisfactorily.

(18) ITEM 19, BODY, LOAD, AND TARPAULINS. Inspect cab and top tarpaulin for damage. See that doors and latches operate properly. Inspect cab and body for looseness and damage. Inspect load for damage and see that it is properly distributed. On cargo bodies be sure tail gate is secure and tarpaulin (if used) is properly lashed to body hooks or loops. On **dump bodies** be sure body is fully lowered and alined on frame sill, and that tail gate is closed, and lever is in locked position. On **panel bodies** be sure rear doors are secure. **On telephone maintenance or earth borer** equipped vehicles, be sure materials are properly stowed, and stowage compartment doors are closed and secure.

(19) ITEM 20, DECONTAMINATOR. Examine decontaminator for secure mounting, full charge, and closed valve.

(20) ITEM 21, TOOLS AND EQUIPMENT. See that tools and equipment are present, serviceable, and properly mounted and stowed.

(21) ITEM 22, ENGINE OPERATION. Engine may be assumed to be operating normally when it idles with choke button fully depressed and oil pressure is indicated on oil pressure gage (5 pounds at idle, 12 to 17 pounds at running speeds). Accelerate engine several times after it has reached normal operating temperature, and listen for any unusual noises, unsatisfactory operating characteristics, or excessive exhaust smoke.

(22) ITEM 23, DRIVER'S PERMIT AND FORM NO. 26. Make sure Driver's Permit, vehicle manual, Lubrication Guide, and Standard Accident Form No. 26 are present, legible, and safely stowed.

(23) ITEM 25, DURING-OPERATION SERVICE. The During-operation Service should start as soon as vehicle is put in motion.

24. DURING-OPERATION SERVICE.

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

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

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(1) ITEM 27, FOOT AND HAND BRAKES. The foot brake should have 1½-inch free pedal travel, and should operate smoothly and effectively without pulling vehicle to one side, leaving ⅓ reserve pedal travel available. If trailer is connected, note if electric brake controller action is satisfactory to operate trailer brakes effectively. When vehicle is stopped on a reasonable incline, hand brake should hold vehicle with ⅓ reserve lever travel available.

(2) ITEM 28, CLUTCH. Inspect clutch pedal to see that it has 1-inch to 1¼-inch free travel before it starts to disengage. Clutch should not chatter, squeal, or grab on engagement, or slip when fully engaged under load.

(3) ITEM 29, TRANSMISSION. As transmission (and power take-off, if used) is operated, see that gears shift smoothly, operate quietly, and do not creep or jump out of mesh.

(4) ITEM 30, TRANSFER. As transfer and declutching shift mechanism (and power take-off, if used) are operated, see that gears shift smoothly, operate quietly, and do not creep or jump out of mesh.

(5) ITEM 31, ENGINE AND CONTROLS. Be on the alert for deficiencies in engine performance such as lack of usual power, misfiring, unusual noise, stalling, indications of overheating, or unusual exhaust smoke. Note if engine responds to controls satisfactorily, and if controls appear to be in proper adjustment, and are not excessively loose or binding.

(6) ITEM 32, INSTRUMENTS. Observe readings of all instruments frequently during operation to be sure units to which they pertain are functioning satisfactorily.

(a) Temperature Gage. Temperature gage should read 140°F to 170°F after warm-up. Investigate and report excessive engine heat over 190°F.

(b) Oil Pressure Gage. Oil pressure gage should read 5 pounds at idle, and 12 to 17 pounds at running speeds. If there is unusual drop in pressure, or oil pressure is not registering, engine should be stopped immediately.

(c) Ammeter. During operation, after battery has recovered from discharge caused by starting, ammeter should indicate a zero or slight positive (+) reading with needle steady.

(d) Fuel Gage. Fuel gage should continue to indicate approximate amount of fuel in tank.

(e) Speedometer and Odometer. Speedometer should indicate vehicle speed. Odometer should record accumulating mileage.

(7) ITEM 33, STEERING GEAR. Note any indication of looseness or binding, excessive pull to either side, shimmy, wheel tramp, or unusual noise.

(8) ITEM 34, RUNNING GEAR. Listen for any unusual noises, such as knocking, clicking, or bumping sounds from wheels, axles, or suspension parts.

(9) ITEM 35, BODY. Note any noise or abnormal condition that might indicate shifting, loose top tarpaulin or curtains, loose or dam-

aged doors, hardware, floor or inspection plates, or mounted body attachments.

25. AT-HALT SERVICE.

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

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

(1) ITEM 38, FUEL, OIL, AND WATER. Check amount of fuel, oil, and coolant. Add as necessary. CAUTION: *Do not turn radiator filler cap beyond safety stop until hissing has ceased.*

(2) ITEM 39, TEMPERATURES: HUBS, BRAKE DRUMS, TRANSFER, TRANSMISSION, AND AXLES. Place hand cautiously on each brake drum and wheel hub to determine if abnormally hot. Inspect transmission, transfer, and driving axles for overheating or excessive oil leaks.

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

(4) ITEM 41, PROPELLER SHAFTS. Inspect all propeller shafts and universal joints for looseness, damage, or oil leaks. Remove any foreign material wound around shaft or joints.

(5) ITEM 42, SPRINGS AND SUSPENSION. Examine springs for broken or shifted leaves, damaged or loose clips, U-bolts, eyebolts, and shackles. See if shock absorbers and linkage are securely connected and mounted.

(6) ITEM 43, STEERING LINKAGE. Examine steering control mechanism, arms, and linkage frictional joints for damage or looseness, and investigate any irregularities noted during operation.

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

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

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

(10) ITEM 47, ACCESSORIES AND BOLTS. Inspect fan and water pump pulley, and generator pulley for looseness. Examine fan belt for excessive wear or fraying and deflection of ¾ inch midway between fan and generator pulleys.

(11) ITEM 48, AIR CLEANERS. When operating under extremely dusty or sandy conditions, see that air cleaners and breather caps are in condition to deliver clean air. Service as required.

(12) ITEM 49, FENDERS AND BUMPERS. Inspect fenders or splash guards, and bumpers for looseness or damage.

(13) ITEM 50, TOWING CONNECTIONS. See that tow hooks and pintle hook and fifth wheel (if used) are in good condition and securely mounted. See that pintle hook or fifth wheel is properly latched. If towing load, make sure trailer electrical connections are securely fastened.

(14) ITEM 51, BODY, LOAD, AND TARPAULIN. Examine cab, body, equipment, or load for shifting. Be sure tarpaulin (if used) is properly secured and in good condition.

(15) ITEM 52, GLASS. Clean windshield, door and window glass, rear view mirror, and light lenses; inspect for damage.

26. AFTER-OPERATION AND WEEKLY SERVICE.

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

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

(1) ITEM 55, ENGINE OPERATION. See that engine idles satisfactorily. Accelerate and decelerate engine and note any missing, backfiring, unusual noises, vibration, or exhaust smoke. Investigate any unusual condition noticed during operation.

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

(3) ITEM 54, FUEL, OIL, AND WATER. Check fuel, oil, and coolant levels; replenish as required. Leave sufficient space for expansion. Fill spare cans. When antifreeze is used and an appreciable amount of water is added to coolant, have value of antifreeze tested. CAUTION: *Observe safety precautions for grounding static electricity when handling gasoline. Do not add coolant when engine is too hot.*

1½-TON 4 x 4 TRUCK (Chevrolet)

(4) ITEM 57, HORN AND WINDSHIELD WIPERS. Inspect horn for secure mounting and tight connections. See if wiper arms and blades are in good condition; inspect wiper blades for even contact with glass throughout full stroke.

(5) ITEM 58, GLASS AND REAR VIEW MIRROR. Clean rear view mirror, windshield, and other glass. Be sure glass and mountings are secure and undamaged.

(6) ITEM 59, LAMPS (LIGHTS) AND REFLECTORS. Operate switches and see that lamps respond. During blackout, inspect lamps with switch in blackout position only. Be sure all lamps are off after completing inspection. Depress brake pedal and see that stop lights burn. Clean all lenses and warning reflectors, and inspect for damage.

(7) ITEM 60, FIRE EXTINGUISHER. Inspect fire extinguisher for presence, full charge, proper mounting, and clear nozzle. Examine for corrosion or damage. If extinguisher has been used, report it for refill or replacement.

(8) ITEM 61, DECONTAMINATOR. Inspect decontaminator for good condition, full charge, and secure mounting. If used, report for refill or replacement.

(9) ITEM 62, *BATTERIES.

(a) Inspect batteries to see that they are clean, secure, and not leaking or damaged. See that cell caps are finger-tight.

(b) Weekly. Clean dirt from top of battery. If terminal connections or posts are corroded, clean them thoroughly and apply fresh, thin coating of grease. Tighten terminal bolts if loose. Remove vent caps and check level of electrolyte. Add water if required, taking precautions so that battery will not be damaged during freezing temperatures. Battery should be secure, not bulging or cracked or leaking electrolyte; battery carrier should be secure, clean, free of rust, and well painted. If mountings are loose, tighten them cautiously so as not to damage the battery case. Report any defects.

(10) ITEM 63, *ACCESSORIES AND BELTS.

(a) Inspect all accessories such as carburetor, generator and regulator, cranking motor, and water pump for loose connections and loose mountings. Inspect carburetor, water pump and fuel filter for leaks. Inspect fan belt for good condition and deflection of ¾ inch midway between pulleys. Investigate and correct or report any deficiencies of accessory units noticed during operation.

(b) Weekly. Tighten any loose connections, linkage, or mountings.

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

(12) ITEM 65, *AIR CLEANERS AND BREATHER CAPS.

(a) Inspect for looseness or damage. Examine oil in reservoirs

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

for correct level and excessive dirt. When operating in sandy or dusty conditions, clean and service air cleaners and breather caps as often as necessary.

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

(13) ITEM 66, *FUEL FILTERS.

(a) Examine fuel filters for leakage, damage, and loose mounting.

(b) Weekly. Remove drain plug; drain water and sediment from bowl. If fuel pump sediment bowl shows excessive dirt, remove bowl and clean element.

(14) ITEM 67, ENGINE CONTROLS. Inspect engine controls for wear, damage, or disconnected linkage, and for adequate lubrication.

(15) ITEM 68, *TIRES.

(a) Examine all tires, including spares for damage and excessive wear. Remove all imbedded foreign matter, such as nails, glass, or stones, from treads and carcasses and from between duals. Check for low pressures and proper position of valve stem and presence of valve caps. Inflate to correct pressure, as needed (55 lb maximum, cool).

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

(16) ITEM 69, SPRINGS AND SUSPENSION. Inspect springs for abnormal sag, broken or shifted leaves, and loose or missing rebound clips. See that eyebolts, U-bolts, and shackles are tight, and that shock absorbers are secure and not leaking. Investigate any unusual noise or condition noticed during operation.

(17) ITEM 70, STEERING LINKAGE. Inspect steering linkage for bent, loose, or inadequately lubricated parts. Investigate any unusual condition noticed during operation.

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

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

(a) See that all axle housing and transfer vents are present, in good condition, secure, and not clogged.

(b) Weekly. Remove and clean axle and transfer vents, and reinstall securely.

(20) ITEM 73, LEAKS, GENERAL. Inspect around engine compartment and beneath vehicle for indications of fuel, oil, coolant, or brake fluid leaks.

(21) ITEM 74, GEAR OIL LEVELS. After units have cooled, check lubricant level of differentials, transmission, and transfer; report if low. NOTE: *Proper level with units cool is ½ inch below filler plug hole.*

1½-TON 4 x 4 TRUCK (Chevrolet)

(22) ITEM 74, FENDERS AND BUMPERS. Examine for looseness or damage.

(23) ITEM 77, *TOWING CONNECTIONS.

(a) Inspect tow hooks (fifth wheel, if used) and pintle hool for looseness or damage. Inspect towed load (if any) electrical connections for good condition and secure attachment.

(b) Weekly. Lower the trailer landing gear, observing whether or not it operates properly, is adequately lubricated, not damaged, and secure. Unhitch the trailer. Clean the contacting surfaces of the fifth wheel, upper plate, and kingpin thoroughly. Inspect them for wear and damage, and apply a fresh coating of clean grease. Tighten all mounting bolts; rehitch the trailer, noticing if the hand lever works easily, and if the latching mechanism closes completely and latches securely. Tighten mounting bolts of tow hooks, pintle hook, or fifth wheel (if used), as required.

(24) ITEM 78, BODY, LOAD, AND TARPAULIN, (HOIST, IF USED), Inspect cab and body carefully for damaged, loose, or missing parts. Make sure load is evenly distributed, and that load or equipment is secure. See that tarpaulin and curtains (if used) are in good condition, and that grommets and ropes are present and undamaged. All ropes should be lashed securely to hooks or rings. Examine hoist cylinder (where used) at pump and pump valve for leaks.

(25) ITEM 79, *WINCH.

(a) Examine winch assembly for looseness or damage, and excessive oil leaks at worm gear housing. See that winch drive shaft shear pin is in good condition and secure. Be sure sliding clutch operates freely and locks securely.

(b) Weekly. If vehicle has been operated in deep water, sample lubricant for contamination. If water is present, report condition. If winch cable was used recently, or is dry or wound unevenly, unwind entire length and clean. Rewind evenly on winch drum, applying a thin coat of engine oil while winding, and secure cable chain and hook securely to front tow hooks. NOTE: *Clean, used oil is satisfactory.* If winch is center-mounted, check drive chain adjustment. Idler should be set so that chain is tight.

(26) ITEM 82, *TIGHTEN.

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

(b) Weekly. Tighten wheel mounting and axle flange nuts and cap screws, spring U-bolts, eyebolts, shackles and rebound clips, torque rods, shock links, U-joint companion flanges, body mountings, engine mountings, accessories or special equipment mountings, transfer case mountings, steering arms, towing connections, or any other mountings or external assembly nuts or screws, where inspection or experience indicates the necessity, on a weekly or mileage basis.

(27) ITEM 83, *LUBRICATE AS NEEDED.

(a) Lubricate all items such as shackles, hinges, latches, control

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

linkage frictional joints, or any point where inspection has indicated oilcan or hand greasing is needed.

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

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

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

(b) Weekly. Wash vehicle when possible. If not possible, wipe off thoroughly. Inspect paint or camouflage pattern for rust, or for bright spots which might cause light reflections. See that vehicle markings are legible, unless covered for tactical reasons. CAUTION: *If vehicle is driven into water for washing, care must be taken to see that water or dirt does not get into wheel bearings, gear cases, or brakes, or on electrical units or wiring.*

(29) ITEM 85, *TOOLS AND EQUIPMENT.

(a) Check vehicle stowage and tool lists to see that all items are present. Inspect items to see that they are in good condition, and properly mounted or stowed.

(b) Weekly. Clean all tools and equipment of rust or dirt, and apply preservative where necessary, when possible. See that tools with cutting edge are sharp and properly protected, and that all items are securely mounted or stowed. NOTE: *When services are completed, be sure all inspection plates are replaced securely.*

1½-TON 4 x 4 TRUCK (Chevrolet)

Section VII

LUBRICATION

27. INTRODUCTION.

a. Lubrication is an essential part of preventive maintenance, determining to a great extent the serviceability of parts and assemblies.

28. LUBRICATION GUIDE.

a. General. Lubrication instructions for these vehicles are consolidated in a Lubrication Guide (figs. 15 and 16). These specify the points to be lubricated, the periods of lubrication, and the lubricant to be used. In addition to the items on the Lubrication Guide, other small moving parts, such as hinges and latches, must be lubricated at frequent intervals.

b. Supplies. In the field it may not be possible to supply a complete assortment of lubricants called for by the Lubrication Guide to meet the recommendations. It will be necessary to make the best use of those available, subject to inspection by the officer concerned, in consultation with responsible ordnance personnel.

c. Lubrication Notes. The following instructions supplement and repeat for clarity those notes on the Lubrication Guide which pertain to lubrication and service of individual units and parts. All note references in the guide itself are to the subparagraphs below having the corresponding number.

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

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

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

(4) AIR CLEANERS. Daily, check engine air cleaner level and refill oil reservoir to bead level with used crankcase oil or OIL, engine, SAE 30 above +32°F; SAE 10 for +30°F to 0°F. From 0°F to −40°F, use FLUID, shock-absorber, light. Every 1,000 miles (daily under extreme dust conditions) remove and wash all parts. Below −40°F, remove oil and operate dry. Every 1,000 miles or more frequently if required, remove hydrovac cylinder air cleaner, located at rear of cylinder, wash all parts and reoil curled hair with used crankcase oil or OIL, engine, SAE 30 above +32°F; SAE 10 for +32°F to 0°F. From 0°F to −40°F, use FLUID, shock-absorber,

light. Below −40°F, wash and replace dry. Every 1,000 miles, or more frequently if required, clean and oil crankcase breather on late models. Breather is located on top of valve cover. Every 3,000 miles, or more frequently if required, remove, clean, and reoil governor cleaner with used crankcase oil or OIL, engine, SAE 30 above +32°F; SAE 10 for +32°F to 0°F. From 0°F to −40°F, use FLUID, shock-absorber, light. Below −40°F, wash and replace dry.

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

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

(7) GEAR CASES. Weekly, check level with truck on level ground and, if necessary, add lubricant to within ½ inch of plug level when cold or to plug level when hot. Drain, and refill at inervals indicated on guide. Drain only after operation. Fill differentials to level of lower plug hole. Clean magnetic drain plug on transfer case before replacing. Keep all gear case breathers clean.

(8) UNIVERSAL JOINTS AND SLIP JOINTS.

(a) Winch and Dump Body Hoist. Apply GREASE, general purpose, No. 1, above +32°F and No. 0 below +32°F, to joint until lubricant appears at cross, and to slip joint until lubricant is forced from end of slip joint.

(b) Truck. Apply GREASE, general purpose, No. 1, above +32°F and No. 0 below +32°F, to joint until it overflows at relief valve and to slip joint until lubricant is forced from vent at universal joint end of spline.

(9) WINCH PROPELLER SHAFT SHEAR PIN. Every 6,000 miles, disconnect front universal joint, remove shear pin and universal joint from shaft, clean and coat end of shaft and inside of universal joint collar with GREASE, general purpose, No. 1 above +32°F, and No. 0 below +32°F, to prevent rusting.

(10) FRONT WHEEL UNIVERSAL JOINTS. With vehicle on level ground, remove inspection plug on top of steering knuckle housing and add lubricant through fitting at bottom of steering knuckle housing until it comes out inspection hole. Replace plug. Every 6,000 miles, disassemble, clean, reassemble, and refill.

(11) HYDROVAC CYLINDER. Every 6,000 miles, remove pipe plug from the cylinder at the relay valve end of the unit of single- and double-piston types. Also remove pipe plug at the center plate of double-piston type. Lubricate both types with about ½ ounce of FLUID, shock-absorber, light, through each opening. Replace plugs.

(12) DISTRIBUTOR. Every 6,000 miles, wipe distributor breaker cam lightly with GREASE, general purpose, No. 1 above +32°F, and No. 0 below +32°F, and lubricate breaker arm pivot and wick under

No. 503

WAR DEPARTMENT LUBRICATION GUIDE

ORDNANCE DEPARTMENT

TRUCK, 1½-TON, 4x4

(CHEVROLET CONVENTIONAL)

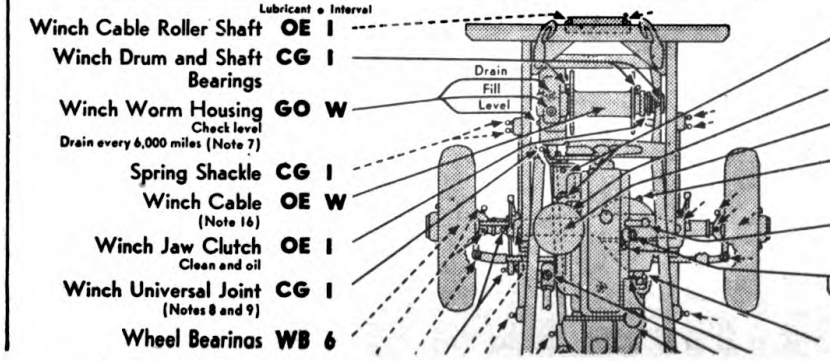
MANUFACTURER'S SERIAL NUMBER located on plate in cab over windshield, left side. SNL G-506.

TABLE OF CAPACITIES AND LUBRICANTS TO BE USED

UNIT	CAPACITY (Approx.)	LOWEST EXPECTED AIR TEMPERATURE		
		+32° F. and above	+32° F. to 0° F.	Below 0° F.
Crankcase	5 qt.	OE SAE 30	OE SAE 10	Refer to OFSB 6-11
Transmission	2¾ qt.	GO SAE 90	GO SAE 80	GO Grade 75
Trans. with Single P.T.O.—Dump body	3¼ qt.			
Trans. with Single P.T.O.—Winch	5 qt.			
Trans. with Double P.T.O.—Winch and Dump Body	5¼ qt.			
Transfer Case	2 qt.			
Differential (Front)	6¾ qt.			
Differential (Rear)	7 qt.			
Winch Worm Housing	1¾ qt.			

CAUTION Lubricate Dotted Arrow Points on BOTH SIDES. Points on OPPOSITE SIDE are indicated by Dotted Short-Shaft Arrows.

NOTE—See Reverse Side for lubrication of DUMP BODY HOISTS



Lubricant ○ Interval

- Winch Cable Roller Shaft — OE I
- Winch Drum and Shaft Bearings — CG I
- Winch Worm Housing — GO W
  Check level
  Drain every 6,000 miles (Note 7)
- Spring Shackle — CG I
- Winch Cable — OE W
  (Note 16)
- Winch Jaw Clutch — OE I
  Clean and oil
- Winch Universal Joint — CG I
  (Notes 8 and 9)
- Wheel Bearings — WB 6
  Remove, clean and repack

Serviced From Under Hood

Interval ○ Lubricant

- I OE — Generator 6 to 8 drops
  Fill rear bearing to plug level
  (Late models, no lubrication)
- D OE — Air Cleaner
  Check level (Note 4)
- 6 OE — Accelerating Pump Shaft
  (Carter carburetor only) (Note 13)
- W GO — Front Axle Differential
  Check level
  Drain every 6,000 miles (Note 7)
  (Reached from under truck)
- D OE — Crankcase (See Table)
  Check level
  Drain every 1,000 miles (Note 5)
- 6 OE — Distributor (Note 12)
- I CG — Distributor Shaft
  Turn cup down 1 full turn, refill as required

RA PD 318310

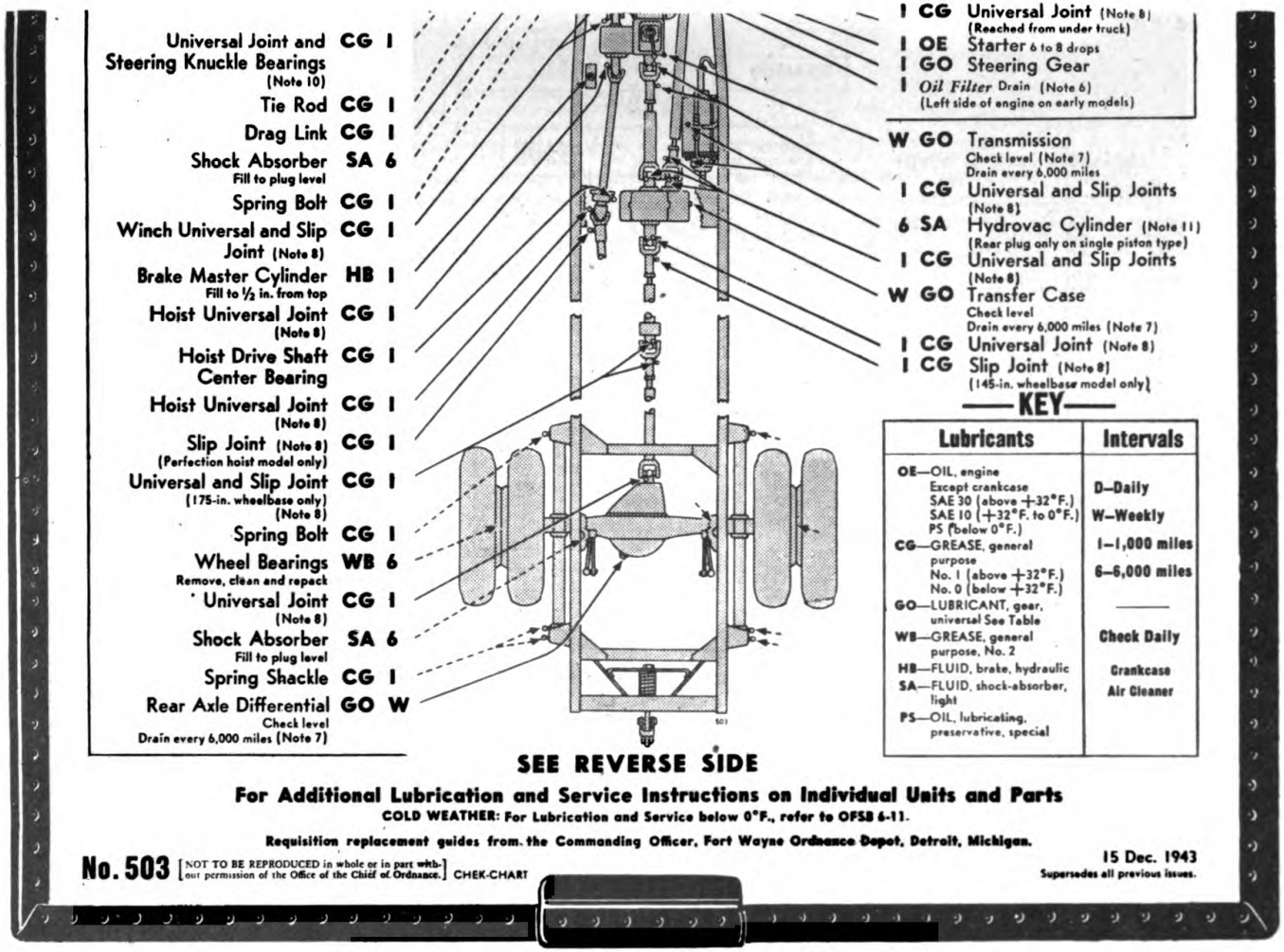


Figure 15—Lubrication Guide (Chassis)

RA PD 318310B

No. 503

WAR DEPARTMENT LUBRICATION GUIDE

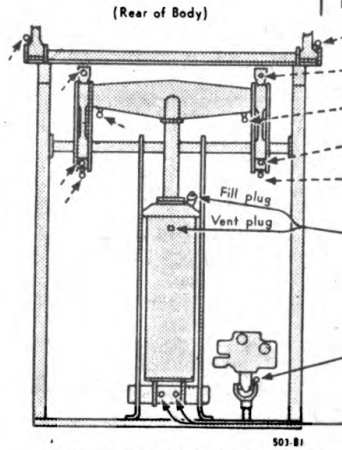
ORDNANCE DEPARTMENT

TRUCK, 1½-TON, 4x4

(CHEVROLET CONVENTIONAL)

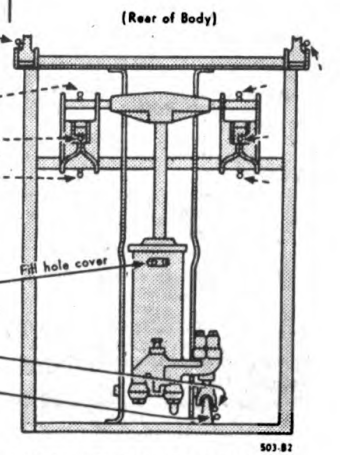
TRUCK MANUFACTURER'S SERIAL NUMBER located on plate in cab over windshield, left side. SNL G-506.

CAUTION Lubricate Dotted Arrow Points on BOTH SIDES. Points on OPPOSITE SIDE are indicated by Dotted Short-Shaft Arrows.



PERFECTION DUMP BODY HOIST

Interval • Lubricant		Lubricant • Interval
1 CG	Body Pivot Hinge or Shaft	CG 1
1 CG	Lift Link (upper)	
1 CG	—Cross Head Bearing—	CG 1
1 CG	——Lift Link (lower)——	CG 1
1 CG	Lift Arm Assembly Shaft Bearing	CG 1
1 OE	Hydraulic Hoist Cylinder (Capacity 9 qt.) (Note 14)	
	Hydraulic Hoist Cylinder (SAE 10) (Capacity 7 qt.) (Note 14)	OE 1
1 CG	—Universal Joint (Note 8)—	CG 1
	Slip Joint (Note 8)	CG 1
1 CG	Cylinder Pivot Mounting	



HERCULES DUMP BODY HOIST

NOTE— See Reverse Side for lubrication of TRUCK and WINCH

—KEY—

Lubricants	Intervals
OE—OIL, engine	

RA PD 318311

Except crankcase SAE 30 (above +32°F.) SAE 10 (+32°F. to 0°F.) PS (below 0°F.)	1 – 1,000 miles
CG—GREASE, general purpose No. 1 (above +32°F.) No. 0 (below +32°F.)	
HB—FLUID, brake, hydraulic	
SA—FLUID, shock-absorber, light	
PS—Oil, lubricating, preservative, special	

NOTES Additional Lubrication and Service Instructions on Individual Units and Parts NOTES

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

1. FITTINGS—Clean before applying lubricant. Lubricate until new lubricant is forced from the bearing, unless otherwise specified. CAUTION: Lubricate chassis points after washing truck.
2. INTERVALS indicated are for normal service. For extreme conditions of speed, heat, water, sand, mud, snow, rough roads, dust, etc., reduce interval by 1/3 or 1/2, or more if conditions warrant.
3. CLEANING—SOLVENT, dry-cleaning, or OIL, fuel, Diesel, will be used to clean or wash all parts. Use of gasoline for this purpose is prohibited. All parts will be thoroughly dry before lubricating.
4. AIR CLEANERS—Daily, check engine air cleaner level and refill oil reservoir to bead level with used crankcase oil or OE. From 0°F. to —40°F., use SA. Every 1,000 miles, daily under extreme dust conditions, remove and wash all parts. Below —40°F., remove oil and operate dry. Every 1,000 miles, or more frequently if required, remove Hydrovac cylinder air cleaner, located at rear of cylinder, wash all parts and recoil curled hair with used crankcase oil or OE. From 0°F. to —40°F., use SA. Below —40°F., wash and replace dry. Every 1,000 miles, or more frequently if required, clean and oil crankcase breather on late models. Breather located on top of valve cover. Every 3,000 miles, or more frequently if required, remove, clean and recoil governor cleaner with used crankcase oil or OE. From 0°F. to —40°F., use SA. Below —40°F., wash and replace dry.
5. CRANKCASE—Drain only when engine is hot. Refill to FULL mark on gage. Run engine a few minutes and recheck oil level. CAUTION: Be sure pressure gage indicates oil is circulating.
6. OIL FILTER—Every 1,000 miles, drain sediment. Every 6,000 miles or more often if filter becomes clogged, drain filter, clean inside and renew element. Run engine a few minutes, check crankcase level, add OE to FULL mark on gage.
7. GEAR CASES—Weekly, check level with truck on level ground and, if necessary, add lubricant to within 1/2 in. of plug level when cold or to plug level when hot. Drain and refill at intervals indicated on guide. Drain only after operation. Fill differentials to level of lower plug hole. Clean magnetic drain plug on transfer case before replacing. Keep all gear case breathers clean.
8. UNIVERSAL JOINTS AND SLIP JOINTS—(Winch and Dump Body Hoist) Apply CG to joint until lubricant appears at cross and to slip joint until lubricant is forced from end of slip joint. (Truck) Apply CG to joint until it overflows at relief valve and to slip joint until lubricant is forced from vent at universal joint end of spline.
9. WINCH PROPELLER SHAFT SHEAR PIN — Every 6,000 miles, disconnect front universal joint, remove shear pin and universal joint from shaft, clean and coat end of shaft and inside of universal joint collar with CG to prevent rusting.
10. UNIVERSAL JOINTS (Front wheels)—With vehicle on level ground, remove inspection plug on top of steering knuckle housing and add lubricant through fitting at bottom of steering knuckle housing until it comes out inspection hole. Replace plug. Every 6,000 miles, disassemble, clean, reassemble and refill.
11. HYDROVAC CYLINDER—Every 6,000 miles, remove pipe plug from the cylinder at the relay valve end of the unit of single and double piston types. Also remove pipe plug at the center plate of double piston type. Lubricate both types with about 1/2 oz. of SA, through each opening. Replace plugs.
12. DISTRIBUTOR—Every 6,000 miles, wipe distributor breaker cam lightly with CG and lubricate breaker arm pivot and wick under rotor with 1 to 2 drops of OE.
13. ACCELERATING PUMP SHAFT—Remove air cleaner and carburetor accelerating pump dust cover. Saturate felt ring on carburetor pump lever shaft with OE.
14. HYDRAULIC HOIST CYLINDERS—(Hercules) Raise body to maximum lift, fill cylinder and before replacing cover, lower body to bleed air and surplus oil. Again raise body and replace fill hole cover and gasket. (Perfection) Raise body to maximum lift, fill cylinder, replace and tighten fill plug. Loosen, but do not remove, vent plug and lower body completely to bleed air and surplus oil. Raise body and tighten vent plug. (Both Models) Every 6 months, disconnect oil line from pump, drain and refill. Use OE, SAE 10.
15. FIFTH WHEEL *(Tractor models)*—Every 1,000 miles, clean and lubricate lower plate coupler pin, locking jaws and guide with OE.
16. WINCH CABLE—After each use, clean and oil with used crankcase oil or OE. Weekly, if cable has not been used, coat outer coils. Monthly, unwind entire cable, clean and oil.
17. CLUTCH PILOT BEARING — Whenever clutch is removed for inspection or repair, after cleaning parts, coat the shift fork ball seat, pack recess inside clutch release bearing collar, pack pilot bearing and fill cavity in crankshaft behind bearing, coat shaft splines lightly and coat ball seat in shift fork with WB. CAUTION: Do not wash clutch release bearing.
18. OIL CAN POINTS—Every 1,000 miles, lubricate pintle hook pins and connections, control rod bushings, clevises and linkage etc., with OE.
19. RUBBER BUSHINGS—Every 1,000 miles, apply HB to shock absorber link rubber bushings. CAUTION: Do not oil.
20. POINTS REQUIRING NO LUBRICATION SERVICE — Fan, Water Pump, Clutch Release Bearing, Generator (late models), Springs, Propeller Shaft Center Bearing (175 in. wheelbase model), Power Take-Off, Clutch and Brake Pedals, Front Axle Declutch, Dump Hoist Hydraulic Pump, Governor.
21. DETAILED INSTRUCTIONS — Refer to Technical Manual.

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

15 Dec. 1943

Supersedes all previous issues.

Figure 16—Lubrication Guide (Hoist)

RA PD 318311B

rotor with one to two drops of OIL, engine, SAE 30 above +32°F; SAE 10 for +32°F to 0°F; OIL, lubricating, preservative, special, below 0°F.

(13) ACCELERATING PUMP SHAFT. Remove air cleaner and carburetor accelerating pump dust cover. Saturate felt ring on carburetor pump lever shaft with OIL, engine, SAE 30 above +32°F; SAE 10 for +32°F to 0°F; OIL, lubricating preservative, special, below 0°F.

(14) HYDRAULIC HOIST CYLINDERS.

(a) Hercules. Raise body to maximum lift, fill cylinder and before replacing cover, lower body to bleed air and surplus oil. Again raise body and replace fill hole cover and gasket.

(b) Perfection. Raise body to maximum lift, fill cylinder, replace and tighten fill plug. Loosen, but do not remove, vent plug and lower body completely to bleed air and surplus oil. Raise body and tighten vent plug.

(c) Both Models. Every 6 months, disconnect oil line from pump, drain and refill. Use OIL, engine, SAE 10, for all temperatures.

(15) TRACTOR MODEL FIFTH WHEELS. Every 1,000 miles, clean and lubricate lower plate coupler pin, locking jaws and guide with OIL, engine, SAE 30 above +32°F; SAE 10 for +32°F to 0°F; and OIL, lubricating, preservative, special, below 0°F.

(16) WINCH CABLE. Coat winch cable with used crankcase oil or OIL, engine, SAE 30 above +32°F; SAE 10 for +32°F to 0°F; and OIL, lubricating, preservative, special, below 0°F after each period of use. When not in use, coat outer coils weekly.

(17) CLUTCH PILOT BEARING. Whenever clutch is removed for inspection or repair, and after cleaning parts, coat the shift fork ball seat, pack recess inside clutch release bearing collar, pack pilot bearing and fill cavity in crankshaft behind bearing, coat shaft splines lightly and coat ball seat in shift fork with GREASE, general purpose, No. 2. CAUTION: *Do not wash clutch release bearing.*

(18) OILCAN POINTS. Every 1,000 miles, lubricate pintle hook pins and connections, control rod bushings, clevises, linkage, etc., with OIL, engine, SAE 30 above +32°F; SAE 10 for +32°F to 0°F; OIL, lubricating, preservative, special, below 0°F.

(19) RUBBER BUSHINGS. Every 1,000 miles, apply FLUID, brake, hydraulic, to shock-absorber link rubber bushings. CAUTION: *Do not oil.*

(20) POINTS REQUIRING NO LUBRICATION SERVICE. These points are the fan, water pump, clutch release bearing, generator (late models), springs, propeller shaft center bearing (175-in. wheelbase model), power take-off, clutch and brake pedals, front axle declutch, dump hoist hydraulic pump, and governor.

(21) WHEEL BEARINGS. Remove bearing cone assemblies from hub and wash spindle and inside of hub. Inspect bearing races and replace if necessary. Wet the spindle and inside of hub and hub cap

with GREASE, general purpose, No. 2, to a miximum thickness of 1/16-inch to retard rust. Wash bearing cones and grease seals and dry. Inspect and replace if necessary. Lubricate bearings with GREASE, general purpose, No. 2, with a packer or by hand, kneading lubricant into all spaces in the bearing. Use extreme care to protect bearings from dirt and immediately reassemble and replace wheel. The lubricant in the bearings is sufficient to provide lubrication until the next service period. Do not fill hub or hub cap. Any excess might result in leakage into the brake drum.

29. REPORTS AND RECORDS.

a. Reports. If lubrication instructions are closely followed, proper lubricants used, and satisfactory results are not obtained, make a report to the ordnance officer responsible for the maintenance of the materiel.

b. Records. A complete record of lubrication may be kept for every vehicle in the Duty Roster (W.D. AGO Form 6).

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Section VIII

TOOLS AND EQUIPMENT STOWAGE ON VEHICLE

30. VEHICLE TOOLS.

a. General. Each vehicle is equipped with the tools listed in subparagraph c below so that minor repairs can be performed by the driving personnel. The larger tools, and a tool bag containing small tools, are located on the several models as follows:

Model	Tool Location
G-7103—Chassis with cab	Under driver's seat
G-7105—Panel	In back of driver's seat back
G-7113—Cab tractor	Tool box on right running board
G-7106—Dump less winch G-7116—Dump with winch	Under driver's seat
G-7107—Cargo less winch G-7117—Cargo with winch	In compartment under body tail gate
G-7163—Telephone earth borer G-7173—Telephone maintenance	Under driver's seat

b. Special Tools. A list of special tools for second echelon use will be found in section XI.

c. Vehicular Tool List.

	Federal Stock No.
Crank, engine starting	
Hammer, machinist's, ball peen, 16-oz.	41-H-523
Handle, wheel bearing nut	
Handle, wheel wrench	
Pliers, combination slip joint, 6-in.	41-P-1650
Screwdriver, clutch head, 5/32-in.	41-S-1117-4
Screwdriver, clutch head, 1/4-in.	41-S-1117-6
Screwdriver, clutch head, 5/16-in.	41-S-1117-8
Screwdriver, common, 6-in. blade	41-S-1104
Wrench, adjustable, automobile type, 11-in.	41-W-448
Wrench, adjustable, crescent type, 8-in.	41-W-486
Wrench, engineer's, open-end, 3/8- x 7/16-in.	41-W-991
Wrench, engineer's, open-end, 1/2- x 19/32-in.	41-W-1003
Wrench, engineer's, open-end, 9/16- x 11/16-in.	41-W-1005-5
Wrench, engineers, open-end, 5/8- x 25/32-in.	41-W-1008-10
Wrench, engineer's, open-end, 3/4- x 7/8-in.	41-W-1012-5
Wrench, spark plug	
Wrench, special hex socket (winch trucks only)	
Wrench, wheel	
Wrench, wheel bearing nut	
Wrench, clutch feed shaft coupling (earth borer only)	
Wrench, clutch shaft bearing nut lock (earth borer only)	

Wrench, idler gear adjusting nut (earth borer only)
Wrench, leveling ratchet (earth borer only)
Wrench, leveling worm shaft bushing (earth borer only)

31. VEHICLE EQUIPMENT.

a. The following items of equipment are included with each vehicle, and are located on the various models as outlined in paragraph 30 **a.**

Chains, tire, 7.50 x 20 single, 7.50 x 20 dual
Chain, utility tow (1)
Extension, lubricating gun
*Extinguisher, fire
Gage, tire pressure
Gun, lubrication
Handle, jack
Iron, tire changing
Jack, auto assembly
Oiler
Pump, tire

32. VEHICLE SPARE PARTS.

a. General. A number of vehicle spare parts are contained in a kit attached to the dash above the fire extinguisher on the assistant driver's side. Whenever spare parts are removed from the kit and put into service, an equal quantity should be replaced in the kit at the first opportunity so they will be available when needed.

b. Spare Parts Kit. The following parts are contained in the vehicle spare parts kit:

Belt, fan and generator
Cap, tire valve (unit)
Lamp, incandescent, No. 63 type, 3-cp
Lamp-unit, taillight blackout tail
Lamp-unit, taillight blackout stop
Lamp-unit, taillight service tail and stop (2 units)
Pin, cotter (unit)
Pin, winch drive shaft shear
Plug, spark (unit)
Tape, friction (¾-in. wide 8-oz roll)
Valve, tire (unit)
Wire, stove pipe

*The fire extinguisher is installed on all models at the back of the dash on the assistant driver's side.

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PART TWO—VEHICLE MAINTENANCE INSTRUCTIONS

Section IX

RECORD OF MODIFICATIONS

33. FSMWO AND MAJOR UNIT ASSEMBLY REPLACEMENT RECORD.

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

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

c. Early Modifications. Upon receipt by a third or fourth echelon repair facility of a vehicle for modification or repair, maintenance personnel will record the FSMWO numbers of modifications applied prior to the date of AGO Form No. 478.

Section X

SECOND ECHELON PREVENTIVE MAINTENANCE

34. SECOND ECHELON PREVENTIVE MAINTENANCE SERVICES.

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

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

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

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

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

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

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

(c) The general inspection of each item applies also to any supporting member or connection, and usually includes a check to see

whether or not the item is in good condition, correctly assembled, secure, or excessively worn. The mechanic must be thoroughly trained in the following explanations of these terms:

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

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

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

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

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

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

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

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

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

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

SECOND ECHELON PREVENTIVE MAINTENANCE

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

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

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

MAINTENANCE	
6,000 Mile (six month)	1,000 Mile (monthly)
1	1
3	3

ROAD TEST

NOTE: *When the tactical situation does not permit a full road test, perform those items which require little, or no, movement of the vehicle. When a road test is possible, it should be for 5 miles preferably, and not over 10 miles.*

Before-operation Service. Perform the Before-operation Service described in paragraph 23.

Dash Instruments and Gages.

OIL PRESSURE GAGE. Normal oil pressure with engine at idle is 5 pounds, at running speeds, 12 to 17 pounds (engine warm). CAUTION: *When gage indicates zero or excessively low pressure, stop engine immediately and investigate.*

AMMETER. Ammeter should show high charge for short time after starting, and then return to zero or slightly above zero with all lights and accessories switched off. When battery is low, or electrical load heavy, high reading will continue for a longer time. Ammeter hand should be steady.

SPEEDOMETER AND ODOMETER. Speedometer should indicate road speed correctly, and operate without excessive fluctuation and noise. Odometer should register total accumulating mileage.

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MAINTENANCE		
6,000 Mile (six month)	1,000 Mile (monthly)	
		TEMPERATURE GAGE. Under normal conditions the temperature gage should show 140° to 170°F after warm-up. Maximum safe operating temperature 190°F.
		FUEL GAGE. Fuel gage should register approximate amount of fuel in tank at all times.
4	4	**Horn, Mirror, and Windshield Wipers.** Test horn for proper operation and tone (tactical situation permitting). Observe wiper for full contact with glass throughout complete stroke.
5	5	**Brakes (Service and Parking, Braking Effect, Feel, Side Pull, Noise, Chatter, and Pedal Travel).** Operate brakes at various speeds during road test.
		SERVICE BRAKES. Apply foot pedal sufficiently to stop vehicle within minimum distance and observe their effectiveness, any pull of vehicle to one side, unusual noise, or chatter. Pedal should depress with little effort, and should return to off position when released.
		PARKING BRAKE. Stop vehicle on reasonable incline; apply parking brake, and observe if it holds vehicle effectively; make sure that lever has at least ⅓ travel in reserve, and that ratchet and pawl latch the applied brake securely.
6	6	**Clutch.** Clutch pedal must have free travel of 1 inch to 1¼ inches. Clutch must operate smoothly without squealing, chattering, or grabbing on engagement, or slipping when fully engaged under load.
7	7	**Transmission and Transfer (Lever Action, Declutching, Vibration, and Noise).** Levers should move into each gear range position easily and quietly. Test declutching lever to see that front axle engages properly. Note any vibration that may indicate loose mountings or noise that may indicate damaged, execessively worn, or inadequately lubricated parts.
8	8	**Steering (Free Play, Bind, Wander, Shimmy, Side Pull, Column, and Wheel).** With vehicle in motion move steering wheel fully in both directions, and observe whether or not there is any indication of looseness or binding. Note any tendency of vehicle to wander, shimmy, or pull to one side. See that steering column and wheel are in good condition and secure.
9	9	**Engine (Idle, Acceleration, Power, Noise, and Governed Speed).** Observe engine operating characteristics as follows:
		UNUSUAL NOISES. Listen for knocks and rattles as the engine is accelerated and decelerated, under both light and heavy loads.
		ACCELERATION AND POWER. Operate the engine at various speeds in all gear ratios, noting if the vehicle

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile (six month)	1,000 Mile (monthly)
		has normal pulling power and acceleration. Note any tendency to stall while shifting. NOTE: *A slight ping during fast acceleration is normal.* GOVERNED SPEED. With the vehicle in a low gear, slowly depress the accelerator to the toeboard, and by observing the speedometer reading, see if the vehicle reaches, but does not exceed, the governed speed specified on the caution plate.
10	10	**Unusual Noises (Attachments, Cab, and Wheels).** Be on the alert during road test for any noise that may indicate loose or damaged attachments mounted on vehicle, loose cab or body mountings, floor plates, doors, windshield, or hardware. Listen particularly for indications of loose wheel mountings.
11	11	**Brake Booster Operation, Hydrovac.** Whenever brakes are applied, observe if the hydrovac unit appears to assist in the application satisfactorily. After stopping vehicle operate pedal and listen at hydrovac air cleaner unit for air movement, indicating unit is operating.
13	13	**Temperatures (Brake Drums, Hubs, Axles, Transmission, and Transfer).** Place hand cautiously on all brake drums and wheel hubs to see if they are abnormally hot. Inspect axle housing, transmission, and transfer case for indications of overheating.
14	14	**Leaks.** Look for engine oil, coolant, and fuel leaks within engine section and underneath the vehicle. Trace any leaks found to their source and correct or report them to designated authority.

MAINTENANCE OPERATIONS

Raise Vehicle—Block Safely

CAUTION: *Use necessary precautions to block vehicle so it may be operated safely in gear at reasonable speeds.*

16	16	**Gear Oil Level and Leaks (Axles, Transmission, and Transfer).** Remove filler plugs in front and rear axles, transmission, and transfer case, and check lubricant levels. Proper level is from lower edge of filler hole when hot, to ½ inch below when cold. Allow sufficient time for foaming to subside before checking levels. Note condition of lubricant. If an oil change is due in any of these units, or condition of lubricant indicates an oil change is necessary, drain and refill with specified oil. Note any indications of excessive lubricant leaks at oil seals or gaskets.
17	17	**Unusual Noises (Engine, Belts, Accessories, Transmission, Transfer, Shafts and Joints, Axles, and Wheel Bearings).** With engine running observe as follows:

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MAINTENANCE		
6,000 Mile (six month)	1,000 Mile (monthly)	
		ENGINE, BELT AND ACCESSORIES. Accelerate and decelerate the engine momentarily, and listen for any unusual noise in these units that might indicate damaged, loose, or excessively worn engine parts, drive belt, or accessories. Locate and correct or report any unusual engine noise heard during the road test.
		TRANSMISSION, TRANSFER, PROPELLER SHAFTS AND JOINTS, AXLES, AND WHEEL BEARINGS. With the transmission in an intermediate gear, and front driving axles engaged, operate these units at a constant, moderate speed by use of the hand throttle, and listen for any unusual noise that might indicate damaged, loose, or excessively worn unit parts. Observe all propeller shafts and wheels for vibrations and runout. Locate, correct, or report any noise noted during road test.
22	22	**Battery.** Inspect battery case for cracks and leaks. Clean top of battery. Inspect cables, terminals, bolts, posts, straps, and hold-downs for good condition. Test specific gravity and voltage, and record on W.D. AGO Form No. 461. Specific gravity readings below 1.225 indicate battery should be recharged or replaced. Electrolyte level should be above top of plates, and may extend ¼ inch above plates. Replenish by adding distilled or clean water.
22		CONDITION TEST. Perform high-rate discharge test according to instructions for "condition" test which accompany test instrument, and record voltage on W.D. AGO Form No. 461. Cell variation should not be more than 30 percent. NOTE: *Specific gravity must be above 1.225 to make this test.* Clean entire battery and carrier, repaint carrier if corroded. Clean battery cable terminals, terminal bolts and nuts, and battery posts; and grease lightly. Inspect bolts for serviceability. Tighten terminals and hold-down bolts carefully to avoid damage to battery.
18	18	**Cylinder Head and Gasket.** Examine cylinder head for cracks, and cylinder head and gaskets for indications of oil, coolant, or compression leaks. If head bolts are loose, or leaks are evident, tighten to 75 to 80 foot-pounds torque and in proper sequence, according to figure 24.
	19	**Valve Mechanism.** Look for broken valve springs and proper oil delivery, and see that valve mechanism parts are correctly assembled, and not excessively worn. Adjust valves only if noisy.
19		ADJUST. Adjust valve clearance to specifications. Normal operation: intake valve, 0.006 to 0.008 inch; exhaust valve, 0.013 to 0.015 inch. Heavy duty oper-

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE		
6,000 Mile (six month)	1,000 Mile (monthly)	
		ation: intake valve, 0.010 inch; exhaust valve, 0.020 inch. CAUTION: *Before adjusting valves, engine should run idle for at least 30 minutes until thoroughly warmed up.*
20	20	**Spark Plugs.** Inspect around insulators or gaskets for leaks. When operating conditions require, plugs may be removed for service.
20		SERVE. Remove plugs, clean deposits from electrodes and insulators; inspect for cracks. Adjust gaps to 0.040 inch by bending grounded electrodes only. Use torque-indicating wrench (15 ft-lb maximum) for installing plugs. NOTE: *Replace plugs after completing item 21.*
21		**Compression.** Perform compression test on all cylinders with spark plugs removed and throttle wide open. Minimum compression is 110 pounds, with 5 to 10 pounds variation allowed between cylinders. Record results on W.D. AGO Form No. 461.
23	23	**Crankcase.** With engine idling, look for oil leaks around crankcase, at timing-gear cover, valve cover, and clutch housing. With engine stopped, check oil level. If an oil change is due or condition of oil warrants a change, drain crankcase and refill to correct level with specified oil. Do not start engine again until item 24 is completed.
24	24	**Oil Filter and Lines.** See if oil filter, and all exterior oil lines and connections are in good condition, secure, and not leaking. Remove filter drain plug and drain water and dirt.
24		SERVE. When cartridge replacement is due, or when filter is clogged, remove cover and oil filter cartridge. Clean filter case and install new cartridge, using new gaskets.
25	25	**Radiator (Core, Shell, Mountings, Hose, Cap and Gasket, Antifreeze Record, and Steam Relief Tube).** Inspect all applicable items to see that they are in good condition, secure, and not leaking. Examine condition of coolant to see if it is so contaminated that cooling system should be cleaned. Clean all insects, dirt, or grease deposits from core air passages and inspect for bent cooling fins. CAUTION: *Use only a suitably shaped piece of wood or blunt instrument to straighten fins.* If antifreeze is in use, test its protective value, and record in space provided on back of work sheet Form No. 461.
25		TIGHTEN. Carefully tighten all loose radiator mountings, water connections, and hose clamps.
26	26	**Water Pump, Fan, and Shroud.** Inspect pump for shaft end play and loose or worn bearings. Inspect fan

MAINTENANCE		
6,000 Mile (six month)	1,000 Mile (monthly)	
		blades for cracks and looseness at hub; and shroud for security and alinement with fan. Correct or report if water leaks continuously at drain hole.
		Generator, Cranking Motor, and Switch. Inspect for good condition, secure mounting, and clean, secure wiring connections; see that cranking motor linkage and retracting spring are correctly assembled, in good condition, and not excessively worn.
27		SERVE. Remove generator and cranking motor inspection covers; see that commutators and brushes are not excessively worn, that brushes are free in holders, have sufficient spring tension to hold them in contact with commutator, and that brush connecting wires are secure and not chafing. Clean commutator end of generator and cranking motor with compressed air. If commutator is dirty, clean with flint paper 2/0 and blow out dust with compressed air. Tighten generator and cranking motor mounting bolts securely.
29	29	**Drive Belt and Pulleys.** Inspect drive belt for evidence of excessive wear, cracks, or deterioration. Inspect all drive pulleys and hubs for good condition, alinement, and secure mountings. Adjust fan and generator drive belt to ¾-inch finger-pressure deflection.
31	31	**Distributor.** Inspect distributor assembly externally for secure mounting, cleanliness, condition of attachments, and tight connections. Examine cap and rotor for cracks or signs of electrical leakage; cap terminals and rotor conductor strap for corroded or burned condition. See that cap vent hole is open. Inspect breaker points for alinement, burning, or pitting, and proper gap adjustment (0.018 in.); check condenser lead for chafing, and breaker arm block for security. NOTE: *If breaker points are badly pitted, install new set of points and condenser.* Check shaft for side-play looseness, to determine amount of bushing wear. Test centrifugal-advance mechanism for normal range of movement by finger force against rotor. When finger is removed, shaft should return to original position without binding or sticking.
		SPECIAL LUBRICATION. Apply a small amount of grease to cam surfaces and movable breaker arm pin. CAUTION: *Keep lubricant away from breaker points. Wipe cam clean before applying lubricant.*
31		ADJUST. Adjust breaker point gap (0.018 in.).
32	32	**Coil and Wiring.** See that coil mounting is tight, and coil is clean and not damaged. Inspect high and low

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE		
6,000 Mile (six month)	1,000 Mile (monthly)	
		tension wiring in engine compartment for indications of chafing, cracking, swelling, or loose support mounting. If necessary, tighten connections.
33	33	**Manifolds and Heat Control.** Inspect intake and exhaust manifolds for cracks, mounting nuts for presence and security, and gaskets for good condition and indications of leaks. Tighten all manifold-assembly, mounting, exhaust pipe, and carburetor flange nuts evenly and securely. Inspect bimetal heat valve control spring for correct assembly to heat control valve shaft, and shaft for freedom to operate. CAUTION: *Bimetal spring should be wound only ½ turn at 70°F.*
34	34	**Air Cleaner.** Inspect carburetor air cleaner to see that it is in good condition, securely mounted and connected, and not leaking. Remove reservoir and element, clean in dry-cleaning solvent, fill reservoir to proper level with clean engine oil, and reassemble. Be sure gaskets are in place and all joints and air horn connections are tight.
36	36	**Carburetor (Choke, Throttle, Linkage, and Governor).** See that these items are in good condition, correctly assembled, and securely installed; that the carburetor does not leak; that the control linkage, including the choke and throttle shaft, is not excessively worn; that the choke valve opens fully when the control is in its released position; that the throttle valve opens fully when the accelerator is fully depressed; and that the governor is secure and properly sealed.
37	37	**Fuel Filter and Lines.** Inspect fuel filter and lines for leakage, looseness, and damage.
	37	CLEAN. Close fuel shut-off valve, drain sediment from filter bowl, and flush out bowl by opening shut-off valve briefly. Replace drain plug. Clean fuel pump filter bowl and screen, and open shut-off valve.
37		CLEAN. Remove fuel filter bowl and element. Wash parts in dry-cleaning solvent. Reassemble filter, making sure gaskets are in good condition. NOTE: *If element is damaged, replace.*
38	38	**Fuel Pump (Pressure).** Inspect pump to see that it is in good condition, securely mounted, and not leaking. Remove sediment bowl, and wash bowl and screen in dry-cleaning solvent. NOTE: *Be sure gasket is in place and serviceable when bowl is reinstalled.*
38		Attach a test gage to pressure side of fuel pump and after starting engine (item 39) see that pressure is between 2 pounds minimum and 3¾ pounds maximum, at idle speed.
39	39	**Cranking Motor (Action, Noise, and Speed).** Start the engine, observing whether or not cranking motor en-

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MAINTENANCE	
6,000 Mile (six month)	1,000 Mile (monthly)
		gages and operates properly without excessive noise, and has adequate speed; and if the engine starts readily. As soon as the engine starts, note if the oil pressure gage and ammeter indications are satisfactory.
40	40	**Leaks (Engine Oil, Fuel, and Water).** With engine running recheck all points of oil, fuel, and cooling system for leaks. Trace any found to source and correct or report them to proper authority.
41	41	**Ignition Timing.** With octane selector set at zero, neon light connected, start engine and run at slow idle speed. Check ignition timing. Observe whether automatic control advances timing as engine is gradually accelerated.
41		ADJUST. Adjust ignition timing (par. 86).
42	42	**Engine Idle and Vacuum Test.** Inspect as follows:
		ADJUST. Connect a vacuum gage to the intake manifold at wiper connection, adjust the engine idle speed and idle mixture until the vacuum gage indicates a steady maximum reading.
43	43	**Regulator Unit (Connections, Voltage, Current, and Cut-out).** Inspect regulator unit to see that it is in good condition, securely mounted and connected, and clean.
43		TEST. Connect the low-voltage circuit tester and observe if the voltage regulator, current regulator, and cut-out, control the generator output properly. Replace if test shows faulty operation. CAUTION: *This test should be made only after the regulator unit has reached normal operating temperatures.*
47	47	**Tires and Rims (Valve Stems and Caps, Condition, Direction, Matching, Spare Carrier).** Inspect and service as follows:
		VALVE STEMS AND CAPS. Observe if all valve stems are in good condition and in correct position, and make sure that all valve caps are present and finger-tight.
		CONDITION. Examine all tires for cuts, bruises, breaks, and blisters. Remove imbedded glass, nails, and stones. Look for irregular tread wear, watching for any sign of flat spots, cupping, feather edges, and one-sided wear. Correct mechanical deficiencies causing such conditions. Remove tires worn thin at center of tread (or other unserviceable tires) and exchange for new or retreaded tires. Front tires, worn irregularly, should be moved to rear-wheel positions.
		DIRECTION. Directional tires and non-directional tires should not be installed on the same vehicle. Directional tires on rear wheels should be mounted so that the "V" of the chevron will point down when viewed from the front. Directional tires on front wheels will ordinarily

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MAINTENANCE	
6,000 Mile (six month)	1,000 Mile (monthly)
	47
47	

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

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

SPARE-TIRE CARRIERS. See if spare-tire carriers are in good condition and secure.

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

TIGHTEN. Tighten all wheel nuts securely.

SERVE. With the tires properly inflated, measure the over-all circumference of all tires, including spares. Select the tires to be mounted on duals or on driving axles, so that they will not have differences in over-all circumference exceeding 3/4 inch. Mount all dual tires with the larger tire outside. The valve stem on the inner wheel should point out and the valve stem on the outer wheel should point in, and should be opposite each other. NOTE: *The spares must be matched properly and mounted for use on one of the road wheels at intervals not exceeding 90 days. A convenient time to do this is during these maintenance services.* CAUTION: *After performing the tire-matching service, do not reinstall the wheels until the wheel-bearing services are completed.*

48	
	49
49	

Rear Brakes (Drums, Supports, Cylinders). Remove rear wheels, and inspect and service as follows: On 6,000-mile maintenance several wheel bearing and brake items up to 52 are group services and overlap. Perform in best order for economy of time and orderly reassembly.

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

WHEEL CYLINDERS. Observe if wheel cylinders are in good condition and securely mounted. Examine for fluid leaks. If leaks are evident, replace wheel cylinder.

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

Rear Brake Shoes (Linings, Anchors, Springs). If vehicle has been operated in deep water, mud, or loose sand, remove right rear wheel and brake drum, and examine lining for damage. If this lining must be replaced, remove all wheels, check their brakes, and service as necessary.

INSPECTION. Remove rear wheels and check linings to see if they are in good condition, tightly secured to

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MAINTENANCE	
6,000 Mile (six month)	1,000 Mile (monthly)

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

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

49	49

ADJUST. Perform rear brake shoe adjustment. Adjust to slight drag, back off adjusting pinion ⅔ turn or four sides of hex head of adjusting pinion. Adjust at each end of cylinder.

52	52

Rear Wheels (Bearings, Seals, Drive Flanges, and Nuts). Inspect and service as follows:

WHEELS. Inspect wheels to see that they are in good condition and secure.

BEARINGS AND SEALS. Check for looseness of wheel bearing adjustment. Revolve wheels and listen for evidence of dry or damaged bearings. Inspect around flanges and brake supports for lubricant leaks.

DRIVE FLANGES AND NUTS. Note if these are in good condition, and if nuts are tightened securely.

52	

CLEAN. Disassemble rear wheel bearings and oil seals. Clean thoroughly in dry-cleaning solvent, and examine bearing cups and cones to see that they are in good condition; determine if machined surfaces they contact are in good condition, and that there is no excessive wear.

SPECIAL LUBRICATION. When all of the related items are to the point where the wheel bearings are to be reinstalled, lubricate the bearings according to Lubrication Guide (par. 28).

52	

ADJUST. After lubricating the wheel bearings, reassemble the hub and drum assemblies into place, and adjust the wheel bearings (par. 133).

	53

Front Brakes (Hose, Drums, Supports, and Cylinders). Inspect front brake hose and drums to see that they are in good condition, that hose is properly supported, securely connected, and not chafing or leaking.

53	

Remove front wheels and inspect and service as follows:

DRUMS AND SUPPORTS. Clean and inspect in same manner as in item 48.

CYLINDERS. Inspect in same manner as in item 48.

	54

Front Brake Shoes (Linings, Anchors, and Springs). Inspect in same manner as in item 49.

54	

INSPECTION. Remove front wheels and brake drums

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MAINTENANCE		
6,000 Mile (six month)	1,000 Mile (monthly)	
54	54	ADJUST. Perform front brake shoe adjustment as described in paragraph 122 after subsequent related items to 60 inclusive, are completed.
55	55	**Steering Knuckles (Joints, Bearings, and Seals).** Inspect to see that knuckle housings are in good condition. Look particularly for cracks around steering arms. See that outside knuckle felt seals and seal flanges are in good condition and secure. Remove lubrication plug and examine sample of lubricant to see if it appears to be contaminated.
55		CLEAN. Remove constant velocity universal joint assembly. Wash thoroughly in dry-cleaning solvent and, without disassembly, inspect parts to see that they are in good condition and not excessively worn. Pay particular attention to universal joint washers, balls and races, axle splines, flanges, and pivot bearings, or bushings.
55		SPECIAL LUBRICATION. Pack new lubricant well into constant velocity universal joint until it fills all space between balls, cages, and races. Reassemble steering knuckle, taking care to replace any unserviceable lubricant retainer seals or gaskets.
56	56	**Front Springs (Clips, Leaves, U-bolts, Hangers, and Shackles).** See that they are in good condition, correctly assembled, and secure. Spring clips and bolts should be in place; spring leaves should not be shifted out of their correct position. NOTE: *This may be an indication of a sheared center bolt.* Note if the deflection of both springs is normal and approximately the same. Test the hangers and bolts for excessive wear by means of a pry bar.
		TIGHTEN. Tighten all spring U-bolts securely and uniformly.
57	57	**Steering (Arms, Tie Rods, Drag Link, Seals and Boots, Pitman Arm, Gear, Column, and Wheel).** See that these items are in good condition, correctly and securely assembled and mounted, whether or not the steering gear case is leaking lubricant, and that the lubricant is at the proper level. Pay particular attention to the Pitman arm to see that it is securely mounted and not bent out of its normal shape. Also observe if the steering system is in good adjustment.
57		TIGHTEN. Tighten the Pitman arm shaft nut securely. Also tighten the steering gear case assembly and mount-

MAINTENANCE		
6,000 Mile (six month)	1,000 Mile (monthly)	
		ing nuts or screws, taking care not to disturb the adjusting screws and lock nuts. CAUTION: *Loosen the steering column bracket when tightening the steering case mounting nuts, so as not to distort the column.*
58	58	**Front Shock Absorbers and Links.** See that shock absorber bodies are securely mounted to frame. Examine links and bushings for wear or loose connections. Look for fluid leaks.
58		SERVE. Disconnect link from axle. Fill body with fluid. Work arm several times, allowing any excess fluid to run out. NOTE: *If arm comes down easily part way, then comes to a stop and moves down slowly rest of way, not enough fluid has been added. Too much resistance or no resistance may indicate broken or inoperative units.*
60	60	**Front Wheels (Bearings, Seals, Flanges, Axle End Play, and Nuts).** Inspect front wheels, bearings, seals, drive flanges, and nuts in same manner as in item 52 for similar rear wheel items.
60		CLEAN. Disassemble, clean, and inspect the front wheel bearings and oil seals in the same manner as described in item 52.
60		SPECIAL LUBRICATION. Apply in same manner as described in item 52.
60		ADJUST. Adjust wheel bearings in same manner as described in item 52, and adjust brake shoes as described in paragraph 122.
61	61	**Front Axle (Pinion End Play, Seal, Vent, and Alinement).** Examine housing for cracks, leaks, and bent or sprung condition. Make sure that differential carrier cap screws are tight. Test pinion shaft for end play, and see that seal is not leaking. Inspect front axle alinement by comparing measurements from front spring eyebolt to center of axle spring pad, on each side.
		CLEAN. Remove and clean axle vent.
62	62	**Front Propeller Shafts (Joints, Alinement, Seals, and Yokes).** Examine lock rings and U-bolts for presence, security, and good condition. See that yoke is securely mounted and is not excessively worn at sleeve yoke. Look for indication of leaks at trunnion bearing seals and at sleeve yoke cap and gasket.
62		TIGHTEN. Tighten all U-bolts and yoke nuts securely.
63	63	**Engine (Mountings, Ground Strap, and Side Pans).** Examine engine mountings for looseness, deterioration,

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		or damage. Examine side pans and ground strap for good condition and secure mounting. See if engine brace rod is in good condition and secure.
64	64	**Hand Brake (Ratchet and Pawl, Linkage, Drum, and Lining).** Inspect hand brake for worn ratchet, pawl, or linkage; scored or oily drum; thin or oily shoe lining. See that all parts are securely mounted.
64		ADJUST. Adjust hand brake lining clearance to 0.010 to 0.012 inch between lining and drum at anchor; 0.010 inch between upper and lower ends of lining and drum.
65	65	**Clutch Pedal (Free Travel, Linkage, and Return Spring).** Inspect shaft mounting and operating linkage for wear and free operation; see that adjustment locking devices are secure. Make sure pedal return spring brings pedal to correct released position.
65		ADJUST. Adjust clutch pedal free travel to 1 to 1¼ inches.
66	66	**Brake Pedal (Free Travel, Linkage, and Return Spring).** Check toeboard and brake pedal arm clearance; normal clearance is ¼ inch between brake pedal arm and underside of toeboard. Examine pedal operating linkage for wear and secure connections. See that pedal retracting spring returns pedal against its stop.
67	67	**Brake Master Cylinder (Vent, Fluid Level, Leaks, and Switch).** See that filler plug vent is open, that boot is properly installed, and that unit is securely mounted. Look for indications of leaks, and see that stop light switch is securely installed and terminals secure. Fill master cylinder reservoir to within ¼ inch of top. Clean vent hole and replace gasket when needed.
68	68	**Brake, Hydrovac Unit (Air Cleaner and Hose, Cylinder).** Look for fluid leaks. Test unit for secure mounting, and see that cylinder clamps, plugs, vents, hose, and connections are secure. Remove, disassemble, clean, and reoil air cleaner.
68		SPECIAL LUBRICATION. Lubricate according to Lubrication Guide.
71	71	**Transmission (Mountings, Linkage, Seals, and Power Take-off).** Examine transmission and power take-off unit (when so equipped), its controls and drives, for secure mounting, for indications of cracks, and leaks at seals or gaskets.
71		TIGHTEN. Tighten securely all transmission and power take-off mounting and external assembly bolts and cap screws.
72	72	**Transfer (Mountings, Linkage, Seals, Vent, and Power Take-off).** Examine transfer and power take-off,

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72	

if so equipped, for indications of cracks, leaks at seals and gaskets, misalinement, and insecure mounting. Clean vent and inspect for good condition. See that vent is securely mounted. Inspect linkage for wear and secure connections. Tighten all mounting bolts.

TIGHTEN. Tighten all external case assembly cap screws and lock screws.

73	73

Rear Propeller Shaft (Joints, Alinement, Seals, and Yokes). Examine lock rings and U-joint bolts for presence, security, and good condition. See that yoke is securely mounted, and is not excessively worn at sleeve yoke. Look for indication of leaks at trunnion bearing seals, and at sleeve yoke cap and gasket.

73	

TIGHTEN. Tighten all U-joint bolts, and yoke nuts securely.

75	75

Rear Axle (Pinion End Play, Seals, Vent, and Alinement). Examine rear axle housing for cracks, leaks, and bent or sprung condition. Test pinion shaft for end play, and check to see that seal is not leaking. Make sure differential carrier mounting cap screws are tight. Observe whether or not rear axle appears to be in alinement. Clean housing vent.

77	77

Rear Springs (Clips, Leaves, U-bolts, Hangers, and Shackles). See that spring clips and bolts are in place, and spring leaves not shifted out of position. See that deflection of both springs is normal and approximately the same. Using a pry bar, test hangers, shackles, and bolts for excessive wear and looseness. Tighten all spring U-bolts uniformly and securely.

78	78

Rear Shock Absorbers and Links. See that shock absorber bodies are securely mounted to frame. Examine links and bushings for wear or loose connections. Look for fluid leaks.

78	

SERVE. Disconnect link from axle. Fill body with fluid. Work arm several times, allowing any excess fluid to run out. NOTE: *If arm comes down easily part way, then comes to a stop and moves down slowly rest of way, not enough fluid has been added. Too much resistance or no resistance may indicate broken or inoperative units.*

79	79

Cab and Body Mountings. Examine cab three-point mountings. Inspect cab right and left front mountings for deteriorated, loose, or missing fabric rubber cushions; lock nuts for security on mounting bolts; cab rear mounting for cracked, broken, or loose U-springs; center bolt and mounting for good condition and secure assembly. See that body U-bolts or mounting bolts and filler blocks are in good condition. Tighten body U-

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6,000 Mile (six month)	1,000 Mile (monthly)
		bolts and cab mounting bolts securely, and adjust cab rear center mounting bolt. CAUTION: *Loosen steering column bracket before alining cab, or tightening cab bolts; otherwise, column may become distorted.*
80	80	**Frame (Rails and Cross Members).** Examine side rails, cross members, and brackets for evidence of bent, cracked, or damaged condition. Look for loose rivets and apparent misalinement.
81	81	**Wiring, Conduits, and Grommets.** Examine wiring and conduits under vehicle for loose supports, chafed or worn-through insulation, pinched or damaged wiring harness, or loose connections. Check grommets for presence and good condition. Inspect trailer connection socket and connections for good condition.
82	82	**Fuel Tank, Fittings, and Lines.** Examine fuel tank for secure mounting, and indications of leaks; see that filler neck is secure and not leaking, and that cap seals properly. Inspect fuel lines for loose connections, loose mountings, and for leaks.
83		SERVE. Remove plug from bottom of fuel tank to drain water and sediment. Drain only until fuel starts to run clear. Use necessary precautions against fire.
83	83	**Brake Lines (Fittings and Hose).** Examine brake lines, fittings, and hose under the vehicle and at axle housings for leaks, secure mounting, and good condition.
84	84	**Exhaust Pipe and Muffler.** Inspect exhaust pipe for secure attachment to exhaust manifold and muffler. Look for exhaust leaks; see that muffler clamps are secure, muffler body is not cracked, dented, or leaking; and that tail pipe is unobstructed.
85	85	VEHICLE LUBRICATION. If due, lubricate in accordance with Lubrication Guide, section VII, and current lubrication directives, using only clean lubricant and omitting items that have had special lubrication during this service. Replace damaged or missing fittings, vents, flexible lines, or plugs.

LOWER VEHICLE TO GROUND

86	86	**Toe-in and Turning Stops.** Use the toe-in gage to determine if toe-in is $\frac{1}{16}$ inch. See that wheel turning stops are present and secure. Turn front wheels fully in both directions, and see if turn is limited by stops and tires clear all parts of vehicle.
87	87	**Winch (Front- and Center-mounted).** Test clutch for free movement to both engaged and disengaged positions, and for secure latching. Test worm brake for adjustment to hold load when power take-off is in neutral. Test drum brake adjustment to prevent drum

MAINTENANCE	
6,000 Mile (six month)	1,000 Mile (monthly)
	cable from unreeling. Inspect worm gear case for secure mounting; assembly bolts, cap screws, and plugs for tightness. Inspect for leaks. Replace any improvised shear pins. Inspect cable for frayed ends, sharp kinks, or other damage, and see that it is evenly wound. Check guide roller for freedom to roll, cleanliness, and secure shaft. Lubricate sliding jaw clutch, shaft, and operating arm with engine oil.
	87 SERVE. Check winch worm gear case oil level, and add or drain lubricant as necessary to bring to correct level.
87	ADJUST. Adjust center-mounted winch drive chain idler until any perceptible slack is eliminated.
87	SERVE. Check winch worm gear case oil level and add as necessary to bring to correct level. If an oil change is due, or condition of lubricant warrants, drain and refill winch worm gear case with specified oil.
87	CLEAN. Unwind winch cable and clean entire length. As cable is rewound evenly and tightly, apply a coating of engine oil.
88	88 **Fifth Wheel (On Vehicles So Equipped).** Inspect fifth-wheel rocker plate and bed plate for good condition, proper assembly, and secure mounting. Inspect kingpin lock to see that it operates properly and locks securely. Inspect kingpin for excessive wear. Tighten all assembly and mounting bolts. Clean fifth-wheel plate and lubricate with chassis lubricant. Lubricate grease fittings and hand-pack lubricant into latching mechanism.
89	89 **Tractor-to-Trailer Brake Wiring and Connections (On Vehicles So Equipped).** Inspect wiring for good condition and secure fastening so it will not chafe or interfere with working parts. Inspect connecting fittings to see that they are in good condition, securely mounted, and are not excessively worn.
90	90 **Hoist (Mounting, Drive, Controls, Pump, Lines, and Cylinder) (On Vehicles So Equipped).** Raise body and inspect sills, subsills, hoist, pump, lines, drive shafts, and universal joints to see that they are in good condition, correctly assembled, and securely mounted. Inspect drive shaft joints, controls, and linkage for excessive wear. Look for oil leaks at cylinder, pump, and lines. Observe for cylinder piston leaks by noting whether or not body tends to drop. Fill cylinder with prescribed lubricant in manner indicated for specific make of hoist in section XXXIII. Lubricate grease fittings, and apply few drops of oil to pin joints of lifting and pump control mechanism.
90	TIGHTEN. Tighten all hoist mounting and assembly

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6,000 Mile (six month)	1,000 Mile (monthly)
91	91	**Lamps (Lights) (Head, Tail, Body, Stop, and Blackout).** Inspect the head, tail, body, stop, and blackout lights for broken lenses and secure mounting. Tactical situation permitting, operate switches, and see that lights respond. Test foot switch high and low beam control. Test blackout lights to make sure they do not illuminate any part of the vehicle. See that stop light burns when brake pedal is depressed.
91		ADJUST. Aim headlight beams. Adjust blackout lamp-units so that their light does not shine on any part of vehicle.
92	92	**Safety Reflectors.** Inspect for proper position, cleanliness, good condition, and secure mounting.
93	93	**Front Bumper, Tow Hooks, Brush Guards, and Grilles.** Inspect for presence, good condition, and secure mounting.
94	94	**Hood, Hinges and Fasteners.** See that hood is alined and secure when fastened, and is not bent or kinked. Make sure fasteners are present, secure, in good condition, and properly lubricated.
95	95	**Front Fenders and Running Boards.** Inspect for loose mounting, cracks, and dents.
96	96	**Cab (Doors, Hardware, Glass, Seat and Trim, Floorboards, Ventilator, and Map Compartment).** Inspect these items to see that they are in good condition and secure; that ventilator door and windshield hardware operates properly; that doors are alined in their openings; engage the bumpers and strikers, and latch properly in closed position.
98	98	**Circuit Breaker.** Examine thermal circuit breaker (30 amp) located on main light switch to see that connections are tight. Inspect the horn circuit breaker located between ignition switch and horn; gas gage circuit breaker located between ignition and gas gage instrument for any damage and for tight connections.
99	99	**Rear Fenders and Splash Guards.** Inspect for secure mounting and good condition.
100	100	**Body (Panels, Rear Doors, Tail Gate and Chains, Floor, Skid Strips, Stakes, Sockets, Bows, Tops, Tarpaulins, End Curtains, Troop Seats, and Stowage**

nuts securely. Tighten piston rod packing nut and any pump or control valve gland nuts, taking care not to overtighten them as this may score shafts and cause leaks.

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Compartments). Inspect all applicable above items on vehicle to see if they are in good condition, correctly assembled, and secure.

CARGO BODIES. On cargo bodies be sure that tail gate closes and latches properly, that chains are intact, that top bows are secure and not damaged, and that tarpaulins and end curtains are properly installed and lashed to body hooks or rings.

PANEL BODIES. On panel bodies be sure that doors fit openings, that they close and latch properly; that locks and strikers are adequately lubricated, and not excessively worn.

TELEPHONE MAINTENANCE AND EARTH BORER VEHICLES. On telephone maintenance and earth borer vehicles see that all panels and stowage bins are secure and not damaged; that compartment doors fit, close, and latch properly; and that any special equipment and mounting brackets are in good condition and securely mounted.

DUMP BODIES. On dump bodies see that tail gate closes and latches properly, that locking lever operates satisfactorily, and that body is properly alined on sills.

101	101	**Rear Bumper and Pintle Hook.** Inspect these units for good condition and security. Examine pintle and latch for proper operation and adequate lubrication. See that spring is not broken, and that draw bar is not excessively worn.
103	103	**Paint and Markings.** Examine the paint of entire vehicle to see that it is in good condition, paying particular attention to any bright spots in finish that might cause glare or reflection. Inspect vehicle markings and identification for legibility. Include identification plates and their mountings, if furnished.
104	104	**Radio Bonding.** Examine suppressors, filters, condensers, shielding, and bonding for proper position, good condition, security, and cleanliness. NOTE: *Report any irregularities, except cleaning and tightening, to signal corps personnel.*

TOOLS AND EQUIPMENT

131	131	**Tools (Vehicle and Pioneer).** Inspect all the standard vehicle and Pioneer tools to see that they are all present (pars. 30 and 31), in good condition, clean, and properly stowed or securely mounted. Also examine the tools which have cutting edges to see that they are sharp.

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MAINTENANCE	
6,000 Mile (six month)	1,000 Mile (monthly)
		Any tools mounted on the outside of the vehicle which have bright or polished surfaces, should be painted or otherwise treated to prevent rust, glare, or reflection.
132	132	**Fire Extinguisher.** See that they are in good condition, securely mounted, and fully charged. Also be sure the nozzles are free from corrosion.
133	133	**Decontaminator.** See that decontaminator is in good condition, and securely mounted. Make the check for full charge by removing the filler plug.
134	134	**First Aid Kit (if Specified).** See that it is in good condition, and that all of its items are present and properly packed. Report any deficiencies immediately.
135	135	**Publications and Form No. 26.** The vehicle and equipment manuals, Lubrication Guide, and Standard Form No. 26 (Accident Report Form), should be present, legible, and properly stowed.
136	136	**Traction Devices (Chains).** Examine tire chains to be sure they are in good condition, clean (if not in use), not excessively worn, protected against rust, and properly mounted or stowed.
137	137	**Tow (Chains, Cables, Rope, and Snatch Blocks).** See that the provided towing devices are in good condition, clean, and properly stowed. Tow chains or cables should be properly protected against rust when not in use. If snatch blocks are furnished, check to see that they operate freely.
139	139	**Fuel and Water Cans and Brackets.** Observe whether or not fuel, water cans, and brackets are in good condition and secure; see that caps fit tightly and are secured to can with a chain; and determine if the cans are leaking.
141	141	**Modifications (FSMWO's) Completed.** Inspect the vehicle to determine whether or not all Field Service Modification Work Orders have been completed.
142	142	**Final Road Test.** Recheck items 2 to 15 inclusive. Confine this test to minimum distance necessary to make satisfactory observations. Recheck transmission, transfer, and front and rear axles for lubricant level and for leaks. NOTE: *Correct, or report all deficiencies found during final road test, to the proper authority.*

Section XI

ORGANIZATION TOOLS AND EQUIPMENT

35. STANDARD TOOL SETS.

a. The tool sets available to individuals (specialists) and organizations, dependent upon the allocation in the tables of equipment are listed in SNL N-19. The components of these tool sets are also listed and illustrated.

36. SPECIAL TOOL SET.

a. The following special tools are allocated one each to a regimental or battalion maintenance platoon.

	Manufacturer's Number	Federal Stock No.
Flaring tool, brake tube	KM-J-1280	14-T-3076-35
Wrench, socket, cylinder head bolt (wide sweep) ¾ in. hex, ½ in. square drive	KM-KMO-187-10	41-W-2965

Section XII

TROUBLE SHOOTING

37. GENERAL.

a. The trouble shooting information given in this section will aid in determining the cause of troubles that may develop in the units or systems of the vehicle. A separate paragraph is used for trouble shooting on each vehicle unit or system. Each trouble symptom carries a subparagraph heading followed by itemized possible causes of the trouble and the tests or correction procedures. If it is not practical to give the diagnosis or correction procedure under the specific symptom, a paragraph reference where complete information can be found, will be shown.

38. ENGINE.

a. Engine Will Not Turn.

(1) ENGINE SEIZURE. Place transmission gearshift lever in neutral and attempt to turn the engine with the hand crank. If the engine cannot be turned with the hand crank, seizure is indicated. Notify higher authority.

(2) STARTING SYSTEM INOPERATIVE. See paragraph 42 **b**.

(3) INCORRECT OIL VISCOSITY. Drain and fill with proper grade (par. 28 **c** (4)).

b. Engine Turns but Will Not Start.

(1) FUEL NOT REACHING COMBUSTION CHAMBERS. Disconnect fuel line from carburetor bowl, turn ignition switch off, and work fuel pump priming lever up and down several strokes. If fuel does not flow from fuel line, check for fuel supply in main tank, and see that valve at fuel filter is open. Refer to paragraph 40 for further checks.

(2) INOPERATIVE IGNITION SYSTEM. Make sure ignition switch is turned on. Crank engine and watch ammeter hand; if ammeter hand does not move, there is trouble in the ignition system. See paragraph 42 **a**. If ammeter hand moves, make further check by removing spark plug wire from one spark plug, holding wire terminal ¼ inch from engine, and cranking engine. If spark does not jump gap, spark is probably inadequate. See paragraph 42 **a** (3) for further checks.

(3) SLOW CRANKING SPEED. See paragraph 42 **b** (1).

c. Engine Does Not Develop Full Power.

(1) FAULTY IGNITION SYSTEM. See paragraph 42 **a**.

(2) IMPROPER FUEL MIXTURE. See paragraph 40.

(3) INCORRECT VALVE ADJUSTMENT. Adjust valves (par. 61).

(4) LEAKING CYLINDER HEAD GASKET. Replace gasket (par. 60).

(5) EXHAUST SYSTEM PARTLY RESTRICTED. Replace or clean restricted parts (par. 78).

(6) AIR LEAKS AT CARBURETOR OR MANIFOLD GASKETS. With engine running, apply a small amount of oil to gaskets and note any change in engine speed, or any indication of the oil being drawn into manifold. Tighten attaching bolts, or replace leaking gaskets (par. 62).

(7) ENGINE OVERHEATING. Note temperature indicator for operating temperature. Check cooling cystem (par. 41). Check for correct grade of oil and fuel.

(8) PREIGNITION. Check for correct grade of fuel. Check ignition timing (par. 57 **k**). Check cooling system (par. 57 **n**). Check spark plugs (par. 42 **a** (3)). If the above items are found satisfactory, it may be necessary to clean carbon (par. 59) and exchange the cylinder head, to assure satisfactory valve operation (par. 58).

(9) INCORRECT GOVERNOR OPERATION. Remove carburetor air cleaner, and open carburetor throttle valve. Look down through the carburetor to check the position of the governor throttle valve, which should be 10 degrees from vertical. If in any other position, replace the governor (par. 76).

(10) TRANSFER CASE IN FOUR-WHEEL DRIVE ON HARD SURFACE ROADS. Shift transfer case to two-wheel drive (par. 5 **k**).

(11) POOR ENGINE COMPRESSION OR IMPROPER VALVE TIMING. Test compression (par. 57 **b**). If poor compression is caused by cylinder head gasket leak, replace the gasket. Report valve trouble to higher authority, or replace cylinder head with one having conditioned valves. Report other compression troubles, or improper valve timing, to higher authority.

d. Engine Misfires.

(1) FAULTY IGNITION SYSTEM. See paragraph 42 **a**.

(2) LOW ENGINE COMPRESSION. See subparagraph **c** (11) above.

(3) INCORRECT FUEL MIXTURE. Check for air leaks. See subparagraph **f** (3) below. Adjust carburetor idling (par. 72 **b**). Carburetor not functioning properly. Notify higher authority.

(4) LEAKING CYLINDER HEAD GASKET. Replace head gasket (par. 60).

e. Popping, Spitting, or Spark Knock.

(1) OVERHEATED INTAKE MANIFOLD. Make sure manifold heat control valve shaft is free in manifold. Disconnect control valve thermostatic spring and check its tension. Spring must be wound up only ½ turn to hook over anchor pin at 70°F. Replace thermostatic spring or manifold if spring is damaged or valve shaft frozen in manifold.

(2) FAULTY INGITION SYSTEM. See paragraph 42 **a**.

(3) POOR CARBURETION. See paragraph 40.

(4) VALVES NOT SEATING PROPERLY. Adjust valves (par. 61). Test engine compression (par 57 **b**).

(5) ENGINE OVERHEATING. Thoroughly flush cooling system. Adjust fan belt. Tune engine (par. 57).

(6) FAULTY SPARK PLUGS. Remove, inspect, clean, and adjust spark plugs (par. 42 **a** (3)).

(7) LOW OCTANE FUEL. Low octane fuel will cause spark knock. It is normal to get a slight knock on acceleration. If higher octane fuel is not available, excessive spark knock may be decreased by setting the distributor octane selector back a few degrees.

(8) EXCESSIVE CARBON IN COMBUSTION CHAMBERS. Remove cylinder head. Clean carbon (par. 59), and inspect valve condition.

f. Rough Engine Idling.

(1) IMPROPER IDLING ADJUSTMENT. Adjust carburetor idling (par. 72 **b**).

(2) CARBURETOR NEEDLE VALVE NOT SEATING. This condition usually causes fuel to leak out on body of carburetor. Notify higher authority, or replace carburetor.

(3) AIR LEAKING INTO MANIFOLD. Disconnect hydrovac and windshield wiper vacuum lines, and plug manifold fittings. If engine idle is improved, a leak in one of these systems is indicated. Disconnect line from crankcase ventilator metering valve, and plug end of valve. Improvement in engine idling indicates leak in crankcase ventilator line, or a sticking metering valve. Check carburetor and manifold gaskets for leak (subpar. **c** (6) above).

(4) VALVES NOT SEATING PROPERLY. Adjust valves (par. 61). Check compression (par. 57 **b**).

(5) CYLINDER HEAD GASKET LEAK. Test compression (par. 57 **b**). If necessary, replace gasket (par. 58).

g. Excessive Oil Consumption.

(1) EXTERNAL OIL LEAKS. Check oil pan drain plug for leaks. If necessary drain oil, replace plug gasket, and refill crankcase. Check for leaks along oil pan. Tighten oil pan bolts (par. 63) and replace gaskets if necessary. Check for leaks at timing gear cover. If leaks are detected, notify higher authority. Check for leaks at fuel pump gasket; tighten bolts, or replace gasket. Check for leaks at rocker arm cover and push rod cover. Replace gaskets if necessary. Check for leaks at oil lines or oil filter, and make necessary repairs. Check for oil leak at rear main bearing, which is indicated by engine oil running out of clutch housing. Notify higher authority.

(2) BURNING OIL. Check by running engine at about ½ throttle opening and watch for excessive blue smoke in exhaust. Report to higher authority.

h. Abnormal Oil Pressure.

(1) LOW OIL PRESSURE. Light oil at high operating temperatures will produce a rather low pressure. If pressure is too low, check for sufficient oil of good quality in crankcase, and check for oil leaks. If trouble cannot be located, notify higher authority.

(2) NO OIL PRESSURE. Stop engine and check for oil in crankcase. Disconnect oil line to oil gage, start engine, and check for oil being forced out of fitting on engine. If oil is not forced out of fitting, oil pump failure is indicated. Do not run engine. Notify higher authority.

(3) HIGH OIL PRESSURE. Heavy or cold oil produces high oil pressure. Make sure correct grade of oil is being used. Run engine just above idling speed until oil is warmed up. If pressure still is abnormally high, oil lines are probably restricted. Notify higher authority.

i. Engine Noises. It is often very difficult to determine the exact cause of engine noises. If unusual noises develop which the driver is unable to definitely locate and correct, the vehicle should not be driven until the engine has been inspected by higher authority, and instructions given regarding its use and repair. When unusual engine noises develop, check for low or no oil pressure, and abnormally high temperature reading. Check for sufficient oil in the crankcase and sufficient solution in the cooling system.

j. Engine Tune-up. Many of the troubles referred to under trouble shooting can be corrected with a good engine tune-up. See paragraph 57.

39. CLUTCH.

a. Clutch Drag. With vehicle parked and engine idling, push clutch pedal clear down, hesitate slightly, and shift transmission into gear. If the gears clash, a "draggy" clutch is indicated. Adjust clutch pedal to obtain 1¼ inches of free pedal travel (par. 69). If this does not correct trouble, the clutch will have to be removed and inspected (par. 70). Replace damaged parts.

b. Clutch Slipping. This can be detected by placing the vehicle on a hard pull in high gear. Adjust clutch pedal to 1¼ inches free travel. If clutch pedal adjustment does not correct trouble, clutch must be disassembled (par. 70) to check for worn, oil-soaked, or loose facings. Also check for weak clutch spring, damaged clutch pressure plate, or pressure plate lugs binding in cover. Replace damaged parts.

c. Clutch Grabbing. It will be necessary to disassemble clutch (par. 70) and inspect the clutch facings for excessive wear, also for glazed or oil-soaked condition. Replace damaged parts.

d. Clutch Chatter. Clutch chatter on engagement may be caused by loose engine mountings. Check engine mounting bolts. Disassemble clutch (par. 70), and inspect the disk facings for being glazed, worn, or oil-soaked. Check pressure plate lug fit in cover. Replace all damaged parts.

e. Clutch Rattle.

(1) WEAK RETRACTOR SPRINGS. Remove flywheel underpan, and replace the three retractor springs.

(2) THROWOUT FORK LOOSE ON BALL, CLUTCH DISK CUSHION SPRINGS BROKEN, OR PRESSURE PLATE LUGS LOOSE IN CLUTCH COVER. Disassemble clutch and make necessary replacements (par. 70).

40. FUEL SYSTEM.

a. Fuel Does Not Reach Carburetor. Disconnect fuel line from fitting on carburetor bowl, and crank engine or pump lever on fuel pump. If fuel is not forced out of fuel line, fuel is not being delivered to carburetor.

(1) LACK OF FUEL. Check fuel supply in main tank.

(2) VALVE TURNED OFF. Turn on fuel line valve at fuel filter on right side of frame.

(3) GAS TANK CAP VENT PLUGGED. Clean vent or replace cap.

(4) FUEL FILTER PLUGGED. Remove and clean filter (par. 74).

(5) PLUGGED FUEL LINE. Remove fuel line and blow out with compressed air.

(6) FUEL PUMP INOPERATIVE. Remove sediment bowl, clean thoroughly, and install bowl, using a new gasket. Work the fuel pump priming lever several strokes, which should fill the fuel pump. If fuel pump fails to operate, replace pump (par. 73), or notify higher authority.

b. Excessive Fuel in Carburetor. This is caused by leaking needle valve in carburetor. Replace carburetor or notify higher authority.

c. Fast Idling.

(1) CARBURETOR CONTROLS STICKING. Check to see that throttle valve closes until stop screw rests on stop. Lubricate and free-up controls if necessary.

(2) IMPROPER IDLING ADJUSTMENT. Adjust carburetor idling (par. 72 **b**).

d. Will Not Idle.

(1) IMPROPER IDLING ADJUSTMENT. Adjust carburetor idling (par. 72 **b**).

(2) LOW SPEED JET PLUGGED. Notify higher authority, or replace carburetor (par. 72).

e. Rough Idling. See paragraph 38 **f**.

f. Engine Misses or Cuts Out on Acceleration. Remove carburetor air cleaner, look down into carburetor air horn, and open and close throttle valve. If accelerating pump is working, a small stream of fuel will be injected into carburetor from accelerating pump jet. If pump is not working, replace carburetor or notify higher authority.

g. Hard Starting.

(1) CHOKE VALVE NOT CLOSING. Remove air cleaner, and pull choke button on dash all the way out. If valve does not close, adjust by pushing choke button in, loosening choke lever to control screw, opening choke valve, and tightening screw. Recheck in choke position.

(2) CHOKE VALVE SPRING BROKEN. Pull choke button all the way out, and check opening and closing of choke valve by pushing down on free side of choke valve. Replace carburetor, or notify higher authority, if the choke valve spring is broken.

41. COOLING SYSTEM.

a. Overheating. This condition is indicated by high temperature indicator reading, excessive spark knock, loss of power, or boiling of coolant.

(1) LACK OF COOLANT. Fill cooling system (par. 80 **e**).

(2) LOOSEN FAN BELT. Adjust fan belt (par. 82).

(3) FAN BELT DAMAGED. Replace fan belt (par. 82).

(4) THERMOSTAT NOT OPENING. Replace thermostat (par. 83).

(5) COOLING SYSTEM CLOGGED. Thoroughly flush cooling system following instructions furnished with the flushing solution.

(6) FAULTY IGNITION. See paragraph 42 **a**.

(7) FAULTY WATER PUMP. Replace water pump (par. 81).

b. Overcooling. Indicated by low temperature indicator reading and time required for engine to warm up.

(1) THERMOSTAT FAILURE. Replace thermostat (par. 83).

(2) WATER BYPASS SHUT-OFF COCK OPEN. Close shut-off cock on left side of cylinder head. See instructions on metal tag attached to shut-off cock (par. 6 **m**).

c. Loss of Coolant.

(1) LEAKING RADIATOR. Replace radiator (par. 80) or notify higher authority.

(2) LOOSE OR DAMAGED HOSE CONNECTIONS. Tighten or replace hose connections.

(3) LEAKY WATER PUMP. Replace pump (par. 81).

(4) PRESSURE RADIATOR CAP NOT SEALING PROPERLY. Replace cap gasket.

(5) LEAKS AT CYLINDER HEAD GASKET. Replace gasket (par. 58).

(6) LEAKY CYLINDER EXPANSION PLUGS OR CRACKED CYLINDER BLOCK. Notify higher authority.

(7) CRACKED CYLINDER HEAD. Replace cylinder head (par. 60).

(8) OVERHEATING. See subparagraph **a** above.

42. ELECTRICAL SYSTEM.

a. Ignition System.

(1) HARD STARTING.

(a) Distributor Points Faulty. Remove distributor cap, clean points, replacing if badly pitted, and adjust gap to 0.018 inch (par. 87 **c**).

(b) Spark Plugs Faulty. Remove, clean, inspect, and adjust spark plugs (par. 42 **a** (3)).

(c) High Tension Wires Faulty. Inspect high tension wires for poor insulation, shorting, and corroded terminals. Replace if necessary.

(d) Loose Terminals in Primary Circuit. Clean and tighten all terminals in the primary ignition circuit between battery and distributor.

(e) Low Capacity Condenser. Test by trying a condenser that is known to be of standard capacity.

(f) Battery Not Fully Charged or Faulty. This can usually be detected by slow cranking speed. Install fully charged battery (par. 94).

(g) Low Capacity Coil. Test by installing a coil that is known to be up to specifications.

(h) Carburetor or Fuel System Faulty. See paragraph 40.

(2) ENGINE FAILS TO START.

(a) Starting System Trouble. Trouble in the starting system is usually detected by slow cranking speed (subpar. **b** below).

(b) Fuel System Trouble. See paragraph 40.

(c) Loose Connections in Primary Circuit. Clean and tighten all connections in the primary circuit between battery and distributor.

(d) High Tension Wires Shorting. Check high tension wiring for damaged insulation. Replace damaged wires.

(e) Distributor Faulty. Clean and adjust distributor points and time engine (par. 86). Check distributor cap and rotor for cracks or damage. Replace damaged parts.

(f) Coil or Condenser Faulty. If facilities for testing are not available, replace these units (one at a time) with units known to be satisfactory (par. 87 **d** and 88 **a**).

(g) Ignition System Shorted. Check for wet high-tension wires, spark plugs, and distributor; if wet, dry them thoroughly. With ignition switch turned on, note the ammeter reading. If it is high, a short in the primary circuit is indicated. Check primary circuit wiring carefully to locate short circuit.

(3) ENGINE MISFIRES. See paragraph 38 d.

(a) Spark Plugs Faulty. Test by shorting spark plugs one by one to determine the cylinder that is misfiring. Remove spark plugs and check for cracked porcelains, badly burned electrodes, excessive deposits, or being fouled. Replace plugs if found in bad condition. Clean, adjust, and install spark plugs (par. 88 c).

(b) High Tension Wires Faulty. Check condition of high tension wires. Replace all wires that have poor insulation.

(c) Distributor Cap Faulty. Check distributor cap for cracks and damaged terminals. Replace distributor cap if damage is found.

b. Battery and Starting System.

(1) SLOW CRANKING SPEED.

(a) Partially Discharged Battery. Check with hydrometer. If reading is below 1.250, charge or exchange battery (par. 94).

(b) Low Capacity Battery. Test each cell with a high-discharge cell-testing voltmeter. If low capacity or shorted cell is found, replace battery (par. 94).

(c) Loose or Corroded Terminals in Starting Circuit (fig. 48). Thoroughly clean and tighten all connections and terminals in the starting system.

(d) Burned Cranking Motor Switch Contacts. Remove cranking motor switch and examine contacts; if they are burned, replace switch (par. 90).

(e) Heavy Oil in Engine. Change to proper grade (par. 28 c (4)).

(f) Cranking Motor Faulty. If the above checks did not reveal the trouble, the cranking motor is evidently at fault. Notify higher authority, or replace cranking motor (par. 90).

(2) CRANKING MOTOR WILL NOT OPERATE.

(a) Discharged Battery. Test with hydrometer; if below 1.250, replace or charge battery.

(b) Battery Cables or Terminals Faulty. Inspect, clean, and tighten terminals. Replace damaged cables.

(c) Faulty or Damaged Cranking Motor or Cranking Motor Drive. Notify higher authority, or replace cranking motor (par. 90).

(3) STARTING SYSTEM TESTS OK BUT ENGINE DOES NOT TURN.

(a) Transmission in Gear. Shift transmission to neutral.

(b) Engine Seized. Attempt to turn engine with starting crank; if it will not turn, try turning water pump by fan blades. If pump will not turn, replace pump (par. 81). Remove pistons, and again try to turn engine with starting crank. If engine cannot be turned with spark plugs removed, notify higher authority.

(4) BATTERY DISCHARGED. Test with battery hydrometer. The following items may cause a discharged battery.

(a) Discharged Through Equipment. Check to see that the ignition, light, heater, or other accessory switches have not been left turned on. Install a fully charged battery. After connecting the positive cable, touch ground strap to negative terminal of battery, and note carefully for any spark that would indicate a short or complete circuit in the system. Connect ground strap and watch ammeter for any signs of discharge. If any discharge is noted, a thorough check of the circuits must be made.

(b) Low or No Charging Rate. See subparagraph c (4) below.

(c) Generator-regulator Cutout Relay Points Sticking. This can be detected by a high rate discharge with engine idling or turned off. Replace regulator (par. 89 c).

c. Generator and Regulator.

(1) GENERAL. As the charging rate of the generator is governed by the state of charge of the battery, it is important that the battery be tested and the terminals checked (par. 94), before condemning the generator or the regulator. The following paragraphs outline several tests that will assist in determining whether the trouble is in the generator, the regulator, or the wiring.

(2) FULLY CHARGED BATTERY AND A LOW CHARGING RATE. This indicates normal voltage regulator operation. To check the current regulator, remove the battery wire from the battery ("BAT") terminal of the regulator. Connect the positive lead of an ammeter to the battery terminal of the regulator, and the negative lead to the battery wire. With the ignition switch in the "OFF" position, step on the starting switch, and crank the engine for about 15 seconds. Then start the engine and, with it running at medium speed, turn on lights, radio, and other electrical accessories; note quickly the generator output, which should be approximately 40 amperes. Now turn off the lights, radio, and other accessories, and allow the engine to continue running. As soon as the generator has replaced in the battery the current used in cranking, the voltage regulator, if operating properly, will taper the output down to a few amperes.

(3) FULLY CHARGED BATTERY AND A HIGH CHARGING RATE. Disconnect the field wire from the field ("F") terminal of the regulator. This opens the generator field circuit, and the output should immediately drop off. If it does not, the generator and field wires are shorted together in the wiring harness. If the output drops off to "ZERO" with the field lead disconnected, the trouble has been isolated in the regulator. Notify higher authority, or replace the regulator (par. 89 c).

(4) LOW BATTERY AND A LOW OR NO CHARGING RATE. Check the circuit for loose connections, corroded battery terminals, loose or corroded ground strap, and frayed or damaged wires. The high resistance resulting from these conditions will prevent normal charge from reaching the battery. If the entire charging circuit is in good

condition, then either the regulator or generator is at fault. With a jumper wire connect the field and armature terminals together. Increase the generator speed, and check the output. If the output increases, the regulator requires attention and must be replaced (par. 89 **c**). If the output does not increase, the generator is not functioning properly. Check the fan belt for proper adjustment. Remove the cover band, and inspect the commutator for dirt, which can be cleaned with No. 00 flint paper, and the dirt blown out. If the output still does not increase, flash the armature terminal to ground with a screwdriver, with the generator operating at medium speed. If a spark does not occur, the trouble is in the generator. Notify higher authority, or replace generator (par. 89 **b**).

d. Temperature Indicator.

(1) INDICATOR HAND STAYS IN "HOT" RANGE. This indicates damaged indicator caused by overheating. Replace indicator (par. 91 **b**).

(2) INDICATOR HAND STAYS IN "COLD" RANGE. If hand stays in "COLD" position it may indicate a damaged thermostat; remove thermostat and see if it is holding open (par. 83). If hand does not move on gage, check for a leak in the indicator line. Replace indicator (par. 91 **b**).

e. Fuel Gage. The ignition switch must be turned on to provide a circuit for the fuel gage. The gage consists of a tank unit, dash unit, and the wiring. These three items must be taken into consideration when trouble shooting the fuel gage.

(1) GAGE SHOWS EMPTY AT ALL TIMES. Check for loose connections at ignition switch and dash unit. Disconnect tank unit wire from dash unit; if gage shows full, dash unit is OK. If gage continues to show empty, replace dash unit (par. 91 **c** (2)). Connect wire to dash unit, and disconnect wire from tank unit; if gage shows full, the tank unit is shorted and must be replaced (par. 91 **c** (3)). If gage does not show full, the wire is shorted.

(2) GAGE SHOWS FULL AT ALL TIMES. Check for loose connections or high resistance at the tank terminal of dash unit, at the tank unit terminal, and tank unit ground wire. If gage continues to show full, disconnect wire from tank unit, and ground end of wire to frame. If gage still shows full, there is an open circuit in the wiring. Repair or replace dash unit to tank wire. If gage shows empty with end of wire grounded, there is an open circuit in the tank unit and it must be replaced (par. 91 **c** (3)).

f. Speedometer.

(1) DOES NOT REGISTER SPEED OR MILEAGE. Disconnect cable from speedometer head, and drive vehicle or jack up rear wheels; start engine, and place controls in position for two-wheel drive. Check to see if end of speedometer cable is turning. If cable turns, speedometer head must be replaced (par. 91 **f**). If cable does not turn, disconnect cable from transfer case. If end of speedometer driven gear shaft in transfer case turns, cable is broken and should

be replaced. If speedometer gear shaft in transfer case does not turn, the speedometer drive and driven gear must be replaced. Notify higher authority.

(2) DOES NOT REGISTER SPEED. Replace speedometer (par. 91 f).

(3) DOES NOT REGISTER MILEAGE. Replace speedometer (par. 91 f).

(4) REGISTERS MILEAGE ACCURATELY BUT SPEED NOT ACCURATE. Replace speedometer, or notify higher authority.

(5) SPEEDOMETER NOISE. Disconnect cable from speedometer head; if noise stops, replace speedometer head. If noise does not stop, disconnect cable from fitting on transfer case; if noise stops, replace or lubricate cable. If noise does not stop, notify higher authority.

g. Oil Pressure Gage.

(1) GAGE SHOWS PRESSURE WITH ENGINE NOT RUNNING. Disconnect line from back of gage; if gage does not return to zero, replace gage (par. 91 g). If gage returns to zero, the line is restricted. Clean out line, or notify higher authority.

(2) GAGE WILL NOT SHOW PRESSURE. This is an indication of engine trouble. **Do not run engine.** Check oil level in crankcase. Disconnect pressure gage line from fitting on left side of engine; crank engine several revolutions. If oil is not forced out of fitting, notify higher authority. If oil is forced out of fitting, replace gage (par. 91 g).

h. Ammeter. If the ammeter is thought to be faulty, the simplest method of checking is to install an ammeter that is known to be satisfactory, and compare the reading under the same operating conditions.

i. Lighting.

(1) ALL LIGHTS BURN DIM.

(a) Discharged Battery. Test battery with hydrometer, and if necessary test with voltmeter (par. 94 b). Replace or recharge low battery.

(b) Loose or Corroded Connections. Check, tighten, and clean all connections between battery and lighting switch.

(2) INDIVIDUAL LIGHT OR LIGHTS BURN DIM. Check the individual light circuit for loose or corroded connections. Check the light for poor ground connections. Make necessary corrections.

(3) ALL LIGHTS DO NOT BURN. Check for discharged battery and poor connections between battery and lighting switch. With lighting switch turned on, check for open-circuited lighting switch circuit breaker by connecting the two terminals on circuit breaker with a jumper wire. If the lamps light with the jumper in place, the lighting switch assembly should be replaced. Check individual circuits for short circuit.

(4) INDIVIDUAL LIGHTS DO NOT BURN. Check for burned out lamp or lamps, loose connections in the individual circuit, and poor ground at the individual light.

(5) CIRCUIT BREAKER CLICKS ON AND OFF. This indicates a short circuit in the lighting system. Check the light switch in each position to isolate the short in an individual circuit. If necessary, disconnect the wires one-by-one from the switch until the short is traced to an individual circuit. Trace the wire, and insulate or replace the damaged wire or unit.

j. Radio Suppression.

(1) The radio suppression equipment is installed to control the radiation of radio interference by the electrical equipment of the truck. It is very important that the equipment have tight, clean connections. Periodically tighten all bond straps, filter, and condenser connections. Tighten the plated bolts in front end sheet metal assembly.

(2) RADIO INTERFERENCE.

(a) Poor Bond Strap Connections. Tighten all bond strap attaching bolts or remove bolts; clean surfaces and reinstall bolts, using plated toothed lock washers.

(b) Poor Bonds at Sheet Metal. Tighten all sheet metal attaching bolts, making sure that the toothed lock washers are used on all plated bolts.

(c) Test for Continued Interference. Start the engine, and run at a fast idle to see if the above repairs corrected the trouble. If trouble still exists, speed up engine and turn off ignition switch. If noise continues, it is in generator and regulator system; however, if noise stops as soon as ignition is turned off, the noise is in the ignition system.

(d) Noise in Generator-regulator System. Check the mounting and connections of the three filters at regulator, and the filter and condenser at the generator. Remove the generator band; inspect and clean the commutator. If commutator is badly burned or worn, replace the generator. Test the circuit as instructed in subparagraph *(c)* above. If noise still exists, change the filters and condenser one-by-one, testing after each installation until the faulty unit is located.

(e) Noise in Ignition System. If the test in subparagraph *(c)* above indicated that the trouble was in the ignition system, check all electrical connections in the primary and secondary circuits to see that they are tight and clean. Check, clean, and adjust or replace distributor points (par. 87). Check, clean, and adjust or replace spark plugs (par. 88). Check for oil-soaked or damaged high tension wires. Check for cracked or damaged distributor cap. Replace damaged parts. Check distributor and ignition coil filters for good connections and tight mounting. Start engine and test for radio interference. If interference exists, replace the two filters and seven suppressors one-by-one, testing between replacements until interference is eliminated.

43. TRANSMISSION (sec. XX).

a. Slips Out of High Gear.

(1) TRANSMISSION MOUNTING BOLTS LOOSE. Tighten the four bolts attaching the transmission to clutch housing.

(2) SHIFT LOCK SPRING WEAK OR BROKEN. Disengage clutch and move shifting lever slowly between high gear, neutral, and third gear to check for lock ball dropping in shaft groove. If a pronounced locking action is not detected, the spring is weak or broken. Notify higher authority or replace transmission (pars. 97 and 98).

(3) DAMAGED MAIN SHAFT PILOT BEARING. This can usually be detected by idling engine with clutch engaged, or driving in third gear and listening for bearing noise. Notify higher authority, or replace transmission.

b. Slips Out of Low Gear.

(1) SHIFT LOCK SPRING WEAK OR BROKEN. Test by shifting slowly between low gear, neutral, and second gear. If a pronounced locking action is not noted in the three positions, the spring is evidently weak or broken. Notify higher authority or replace transmission (pars. 97 and 98).

(2) WORN LOW SPEED GEARS. Usually results in gear noise as well as jumping out of gear. Notify higher authority, or replace transmission (pars. 97 and 98).

c. Noisy Gears. Notify higher authority, or replace transmission (pars. 97 and 98).

d. Difficulty in Shifting into Low Gear. When shifting into low or second gear, pull the lever to left as far as it will go, and attempt to shift into low and second; if shifts cannot be made, move lever slightly to right and try again; if shift can be made, the reverse latch on lower end of shift lever or interlock guide plate is worn. Notify higher authority, or replace transmission (pars. 97 and 98).

e. Lubricant Leaks into Clutch Housing.

(1) TRANSMISSION LUBRICANT LEVEL HIGH. Drain down to correct level.

(2) CLUTCH GEAR BEARING RETAINER LOOSE. Remove transmission, tighten retainer screws, and install transmission (par. 98).

f. Lubricant Leaks at Rear of Transmission.

(1) BEARING RETAINER LOOSE. Tighten bearing retainer screws.

(2) BEARING RETAINER GASKET DAMAGED. Notify higher authority, or replace transmission (pars. 97 and 98).

(3) IDLER GEAR SHAFT LOOSE. Notify higher authority, or replace transmission (pars. 97 and 98).

44. TRANSFER CASE (sec. XXI).

a. Lubricant Leaks.

(1) BEARING RETAINERS LOOSE. Tighten bearing retainer cap screws.

(2) BEARING RETAINER GASKETS DAMAGED. Replace gaskets or notify higher authority.

(3) OIL SEALS DAMAGED. Notify higher authority, or replace transfer case (pars. 101 and 102).

(4) CASE CRACKED. Notify higher authority, or replace transfer case (pars. 101 and 102).

b. Slips Out of Gear.

(1) SHIFT LOCK SPRING WEAK OR BROKEN. Notify higher authority, or replace transfer case (pars. 101 and 102).

(2) MISALINEMENT OF MAIN SHAFT EXTENSION. Notify higher authority, or replace transfer case (pars. 101 and 102).

(3) IMPROPER ADJUSTMENT OF SHIFTER SHAFT CONTROL RODS. Adjust control rods (par. 100).

45. PROPELLER SHAFTS (sec. XXII).

a. Vibration.

(1) BENT PROPELLER SHAFT. Replace shaft (pars. 104 and 105).

(2) SHAFT IMPROPERLY ASSEMBLED. Check to see that the slip joint is installed on the shaft with the sleeve yoke in the same plane as the yoke welded to the opposite end of shaft.

(3) UNIVERSAL JOINTS BADLY WORN. Replace worn joint or propeller shaft (pars. 104 and 105).

b. Excessive Backlash.

(1) WORN UNIVERSAL JOINTS. Replace propeller shaft (pars. 104 and 105).

(2) UNIVERSAL JOINT U-CLAMPS LOOSE. Tighten U-clamps.

c. Noisy Universal Joints.

(1) LACK OF LUBRICANT. Lubricate joints.

(2) WORN UNIVERSAL JOINT. Replace joint or propeller shaft (pars. 104 and 105).

46. FRONT AXLE.

a. Hard Steering.

(1) STEERING GEAR TROUBLE. See paragraph 51.

(2) LACK OF LUBRICANT. Lubricate tie rod ends and steering connecting rod.

(3) LOW TIRE PRESSURE. Inflate front tires to 55 pounds.

(4) TIE ROD BOLTS TIGHT. Adjust tie rod bolts by removing cotter pins, tightening nuts just wrench-tight, and backing them off ½ turn. Install cotter pins.

(5) STEERING KNUCKLE BEARINGS DRY OR TOO TIGHT. Notify higher authority.

(6) IMPROPER TOE-IN. Adjust toe-in (par. 108).

b. Lubricant Leaks.

(1) LEAKS AT STEERING KNUCKLE SUPPORT. Replace seal and gasket (par. 110).

(2) LEAKS AT AXLE HOUSING COVER GASKET. Tighten attaching screws; or, drain lubricant, remove cover, and replace gasket.

(3) LEAKS AT DIFFERENTIAL CARRIER GASKET. Tighten carrier attaching bolts or replace gasket. See third member replacement (par. 112).

c. Shimmy.

(1) STEERING GEAR TROUBLE. See paragraph 51.

(2) TIE ROD BUSHINGS WORN. Notify higher authority.

(3) IMPROPER TIRE INFLATION. Inflate front tires to 55 pounds.

(4) LOOSE FRONT WHEEL BEARINGS. Adjust front wheel bearings (par. 133).

(5) STEERING KNUCKLE BEARINGS LOOSE. Notify higher authority.

(6) IMPROPER CASTER. Notify higher authority.

(7) WHEELS LOOSE ON HUBS. Tighten wheel attaching nuts.

d. Wandering.

(1) FRONT WHEEL BEARINGS OUT OF ADJUSTMENT. Adjust front wheel bearings (par. 133).

(2) SPRING CENTER BOLT SHEARED AND AXLE SHIFTED. Replace center bolt and tighten U-bolts securely.

(3) IMPROPER TOE-IN. Adjust toe-in (par. 108).

e. Noisy Differential.

(1) LACK OF LUBRICANT. Fill differential to correct level.

(2) FAULTY GEARS OR BEARINGS. Report to higher authority.

47. REAR AXLE.

a. Lubricant Leaks.

(1) LEAKS AT AXLE HOUSING COVER. Tighten cover retaining bolts; or, drain lubricant, remove cover, install new gasket, and install cover.

(2) LEAKS AT DIFFERENTIAL CARRIER GASKET. Tighten carrier attaching bolts, or replace gasket. See third member assembly replacement (par. 116).

(3) LEAKS AT AXLE FLANGE. Install new gaskets and tighten bolts securely.

b. Noisy Differential.

(1) LACK OF LUBRICANT. Fill differential to correct level.

(2) FAULTY GEARS OR BEARINGS. Report to higher authority.

c. Excessive Backlash.

(1) AXLE SHAFT FLANGES LOOSE. Install new terne plate gasket and tighten bolts securely.

(2) WORN DIFFERENTIAL AND SIDE GEAR SPACERS. Notify higher authority.

(3) WORN UNIVERSAL JOINTS. Replace propeller shaft. (par. 104).

1½-TON 4 x 4 TRUCK (Chevrolet)

48. BRAKE SYSTEM.

a. Brake Pedal "Spongy." "Spongy" brake pedal action indicates air in hydraulic system. Bleed brakes (par. 123).

b. All Brakes Drag.

(1) IMPROPER PEDAL TOEBOARD CLEARANCE. Adjust pedal toeboard clearance (par. 122 **b**).

(2) DIRT IN MASTER CYLINDER COMPENSATING PORT. Replace master cylinder (par. 124).

(3) MINERAL OIL IN SYSTEM. Replace master and wheel cylinders, flush system, and refill with correct fluid (pars. 124 and 125).

c. One Brake Drags.

(1) LOOSE WHEEL BEARINGS. Adjust wheel bearings (par. 133).

(2) WEAK OR BROKEN RETRACTOR SPRING. Replace retractor spring (par. 126).

(3) IMPROPER BRAKE SHOE ADJUSTMENT. Readjust brake shoes.

d. Excessive Pedal Travel.

(1) NORMAL LINING WEAR. Adjust brake (par. 122).

(2) FLUID LOW IN MASTER CYLINDER. Fill master cylinder and bleed all brakes (par. 123).

e. Brake Pedal Applies Brakes but Pedal Gradually Goes to Floor.

(1) EXTERNAL LEAKS. Apply brakes, force pedal on down to floor two or three times, and check for external leaks at master cylinder, wheel cylinders, and all lines. Make necessary repairs or replacements.

(2) MASTER CYLINDER LEAK PAST PRIMARY CUP. If external leaks were not found in the above test, it is evident that the master cylinder primary cup is leaking. Replace master cylinder (par. 124).

f. Brakes Uneven.

(1) OIL ON LININGS. Thoroughly clean brake mechanism and install new linings (par. 126). Correct cause of oil leaking on brake lining.

(2) TIRES IMPROPERLY INFLATED. Inflate tires according to specifications (par. 131).

(3) SPRING CENTER BOLT SHEARED AND SPRING SHIFTED ON AXLE. Replace center bolt and tighten U-bolts securely.

g. Excessive Pedal Pressure Required, Poor Brakes.

(1) GREASE, MUD OR WATER ON LININGS. Remove drums and clean linings.

(2) FULL AREA OF LININGS NOT CONTACTING DRUMS. Free-up shoe linkage, sand lining, or replace shoes or drums if damaged.

(3) SCORED BRAKE DRUMS. Replace drums (par. 126).

(4) HYDROVAC SYSTEM NOT OPERATING PROPERLY. See subparagraph **h** below.

h. Hydrovac System Fails to Operate.

(1) RESTRICTED HYDROVAC AIR CLEANER. Clean and lubricate air cleaner (par. 28 c (3)).

(2) VACUUM LINE LEAKS. This generally produces a rough idling engine as well as hydrovac trouble. Correct air leaks.

(3) HYDROVAC LINE CHECK VALVE STICKING. Remove valve, disassemble, and clean thoroughly.

(4) LACK OF LUBRICANT IN HYDROVAC CYLINDER. Lubricate cylinder (par. 28 c (11)).

(5) WORN OR DAMAGED PARTS IN HYDROVAC. Replace hydrovac (par. 128).

49. WHEELS, WHEEL BEARINGS, HUBS, AND TIRES.

a. Hard Steering.

(1) TIRES UNDERINFLATED. Inflate tires to recommended pressure (par. 131 b (4)).

(2) STEERING GEAR OR FRONT AXLE TROUBLES (pars. 46 and 51).

b. Tires Leak Air.

(1) VALVE CORE LEAKS. Tighten or replace valve core.

(2) TUBE LEAKS. Remove tire and check tube for leaks (par. 132). Patch or vulcanize tube.

c. Uneven or Excessive Tire Wear.

(1) IMPROPER TOE-IN. Adjust toe-in (par. 108).

(2) IMPROPER TIRE PRESSURE. Maintain correct tire pressure.

(3) IMPROPER CASTER OR CAMBER. If the caster or camber are thought to be incorrect, notify higher authority.

(4) EXCESSIVE USE OF FOUR-WHEEL DRIVE. Use four-wheel drive only where additional traction is required.

(5) SPRUNG WHEELS. Check wheels by jacking up vehicle and turning wheels. Replace wheels having excessive run-out.

(6) AXLE SHIFTED ON SPRING SEAT. Replace spring center bolt if necessary, and tighten U-bolts.

d. Wheels Loose on Hub Bolts. Improperly tightened or elongated holes in hub, due to running with loose wheel nuts. Tighten nuts, and if holes are elongated, replace wheel.

e. Wheel Bearings Loose.

(1) IMPROPERLY ADJUSTED. Adjust according to instructions in paragraph 133.

(2) BEARINGS WORN OR DAMAGED. Replace bearings (par. 134).

50. SPRINGS AND SHOCK ABSORBERS.

a. Hard Riding.

(1) INSUFFICIENT LUBRICATION. Lubricate chassis (par. 28).

(2) BROKEN SPRING HANGER, SHACKLE PIN, OR SPRING EYE. Replace broken part or notify higher authority.

(3) NO SHOCK ABSORBER ACTION. Disconnect shock absorber link and move arm up and down. If movement is not controlled, fill shock absorber (par. 138 **b**), and recheck. If condition is not corrected, replace shock absorber (par. 138 **a**). If shock absorber arm catches or binds, replace shock absorber.

b. Excessive Flexibility.

(1) BROKEN SPRING LEAVES. Replace spring (par. 137).

(2) SHOCK ABSORBER FLUID LOW. Fill shock absorber (par. 138 **b**).

(3) BROKEN SHOCK ABSORBER. Disconnect shock absorber link, and check absorber action. If shock absorber arm binds or moves without shock control, replace assembly (par. 138 **a**).

c. Excessive Noise.

(1) WORN SHACKLE PINS AND BUSHINGS. Replace worn parts (par. 136), or notify higher authority.

(2) DRY SPRING LEAVES. Lubricate spring, or notify higher authority.

(3) LOOSE SPRING CLIPS. Tighten spring clips.

(4) LOOSE SPRING SHACKLES. Notify higher authority.

(5) BROKEN SHOCK ABSORBER. Disconnect shock absorber link and work arm up and down; if there is free movement for a short distance, and the arm then comes to a definite stop, replace shock absorber.

51. STEERING ARM.

a. Hard Steering.

(1) LACK OF LUBRICATION. Lubricate steering gear, tie rod ends, and steering connecting rod.

(2) TIE ROD ADJUSTED TOO TIGHT. Remove tie rod bolt cotter pin, tighten nut wrench-tight, and back off ½ turn. Install cotter pin.

(3) UNDERINFLATED TIRES. Inflate front tires to 55 pounds.

(4) IMPROPER STEERING GEAR ADJUSTMENT. Adjust steering gear (par. 143).

(5) TIGHT, DRY OR DAMAGED STEERING KNUCKLE BEARINGS. Notify higher authority.

(6) IMPROPER FRONT AXLE ALINEMENT. See paragraph 106 **b**.

b. Loose Steering.

(1) IMPROPER STEERING GEAR ADJUSTMENT. Adjust steering gear (par. 143).

(2) LOOSE STEERING CONNECTING ROD JOINTS. Adjust steering connecting rod ends (par. 141), or replace worn parts.

(3) WORN TIE ROD BOLT BUSHINGS. Notify higher authority.

c. Vehicle Pulls to One Side.

(1) UNEQUAL TIRE PRESSURE. Inflate front tires to 55 pounds.

(2) DRAGGING BRAKES. Adjust brakes (par. 122).

(3) TIGHT OR DAMAGED WHEEL BEARINGS. Adjust or replace wheel bearings (par. 133).

(4) IMPROPER CASTER OR CAMBER. Notify higher authority.

d. Wander or Weaving.

(1) TIGHT STEERING GEAR. Adjust steering gear (par. 143).

(2) LOOSE STEERING GEAR. Adjust steering gear (par. 143).

(3) TIGHT, DRY, OR DAMAGED STEERING KNUCKLE BEARINGS. Notify higher authority.

(4) IMPROPER FRONT END ALINEMENT. Notify higher authority.

e. Road Shocks Transferred to Steering Wheel.

(1) STEERING CONNECTING ROD ASSEMBLED WRONG OR IMPROPERLY ADJUSTED. See paragraph 141.

(2) STEERING GEAR IMPROPERLY ADJUSTED. Adjust steering gear (par. 143).

52. CAB, BODY, AND FRAME.

a. Windshield Leaks.

(1) TEST FOR LEAKS. Force the windshield adjusting arms all the way down to close windshield, and lock the center of windshield with clamp lock. Sit in cab and watch for leaks while an assistant sprays water on windshield and front of cab. Leaks may occur between weatherstrip and cab windshield frame, between windshield glass and windshield frame or at windshield center channel.

(2) LEAKS AT WINDSHIELD DIVISION CHANNEL. Remove the center division channel attachings screws and inner channel. Seal with a suitable waterproof sealing compound.

(3) LEAKS BETWEEN WINDSHIELD WEATHERSTRIP AND CAB OPENING. Adjust hinge mounting to center windshield in opening. Replace rubber weatherstrip if it is damaged (par. 146 c). When the weatherstrip is in good condition, and the windshield has been adjusted to the opening, a slight leak at one or two points can be corrected by opening the windshield, pushing the lip of weatherstrip toward windshield opening, and working a strip of friction tape folded to four thicknesses in between the outer edge of weatherstrip and outer flange of windshield frame. In some cases it may be necessary to shim between the hinges and windshield frame to increase the weatherstrip tension at the top.

b. Doors Close Hard.

(1) LACK OF LUBRICATION. Lubricate door hinges, door check strap, door lock bolt, door lock striker plate, door dovetail plate, and door dovetail.

(2) DOOR HINGES SPRUNG. Replace door hinges.

c. Door Windows Will Not Raise. Check for damaged run channels, or obstructions in window opening. Notify higher authority.

d. Windshield Wipers Will Not Operate.

(1) LEAK OR OBSTRUCTION IN VACUUM LINE. Disconnect vacuum line from wiper, and check for normal vacuum. Make necessary repairs.

(2) WIPER WILL NOT OPERATE. Notify higher authority, or replace wiper (par. 146 d).

e. Frame Bent or Sagged. Notify higher authority.

f. Frame Rivets Loose. Notify higher authority.

53. POWER TAKE-OFF.

a. Leaks Lubricant.

(1) LEAKS AT MOUNTING. Tighten mounting bolts, or replace gasket between power take-off and transmission (par. 155 c).

(2) LEAKS AT POWER TAKE-OFF COVER GASKET. Tighten cover bolts, or replace gasket.

(3) LEAKS AT CAPS OR SEALS. Tighten cap retaining screws, replace gaskets, or notify higher authority.

b. Will Not Stay in Gear. Disconnect shift pull rod, shift gear into position until lock ball drops into groove, and adjust pull rod to correct length with lever in position. If this does not correct trouble, notify higher authority, or replace power take-off.

c. Gears Noisy. Check lubricant level in power take-off. Notify higher authority.

54. WINCH.

a. Winch Drum Brake Will Not Hold. If the winch cable loosens up on drum when poppet is in position in hole in cross member, the brake should be adjusted (par. 161 c (1)).

b. Winch Will Not Drive.

(1) SHEAR PIN IN DRIVE SHAFT JOINT BROKEN. Replace shear pin (par. 161 c (3)).

(2) JAW CLUTCH NOT ENGAGED. Engage jaw clutch.

(3) POWER TAKE-OFF NOT OPERATING. Check to see that power take-off is shifted into gear. If power take-off output shaft does not turn, notify higher authority or replace power take-off.

c. Worm Brake Will Not Hold. If the winch will not hold a normal load with the power cut off, the worm brake should be adjusted (par. 161 c (2)).

55. HYDRAULIC HOIST.

a. Leaks Oil. Check for oil leaks at all flange, plate, cover, and fitting gaskets. Tighten attaching screws, bolts, or nuts. Check for leaks at packing glands; tighten if necessary. Check for leaks at pipe fittings or manifold studs; tighten if necessary. If the above checks or corrections fail to stop the leaks, notify higher authority, replace gaskets or packings if advisable, or replace hoist assembly.

TROUBLE SHOOTING

b. Will Not Raise Body Clear Up. Check for lack of oil in system and fill system (pars. 164 **b**, 165 **b**, or 166 **b**).

c. Will Not Hold in Desired Position.

(1) CONTROL VALVE LINKAGE NOT ADJUSTED PROPERLY. Adjust control valve control rod length, and recheck until correct operation is obtained.

(2) OIL LEAK PAST PISTON. Notify higher authority, or replace hoist assembly.

d. Will Not Raise Body.

(1) LACK OF OIL. Fill system (pars. 164 **b**, 165 **b**, or 166 **b**).

(2) PUMP GEARS NOT TURNING. Check for disconnected drive line or loose drive yoke on pump drive shaft. Make necessary repairs or replacement.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XIII

ENGINE—DESCRIPTION, DATA, MAINTENANCE, AND ADJUSTMENT IN VEHICLE

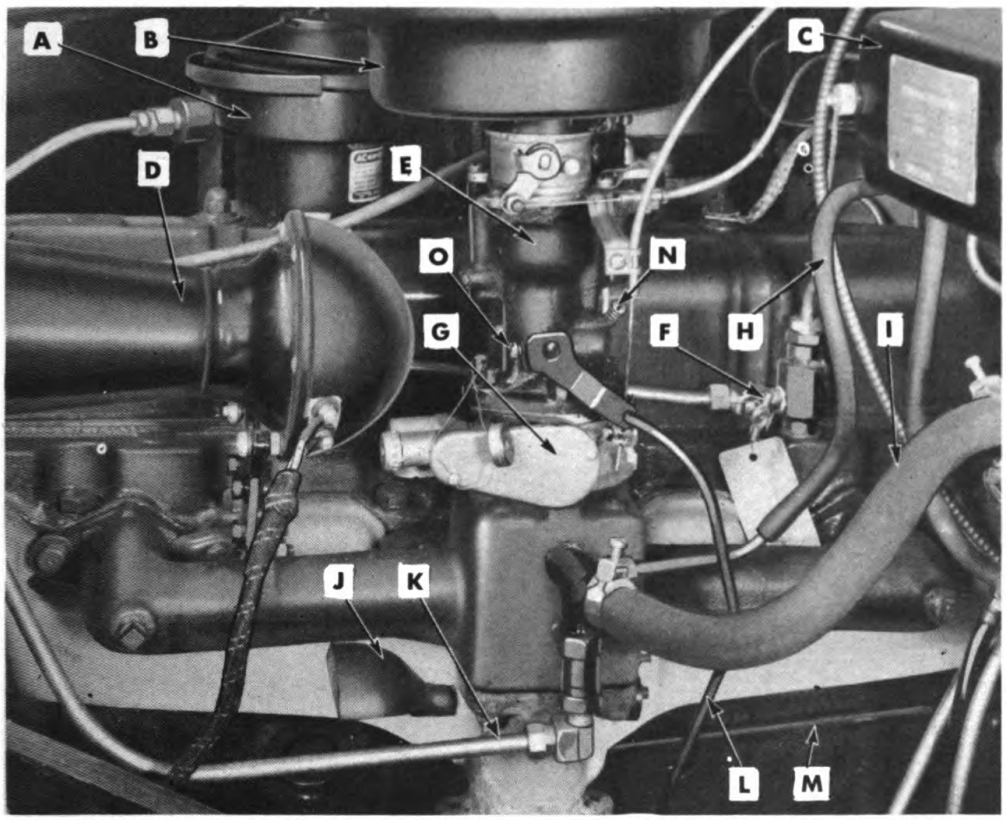
56. DESCRIPTION AND TABULATED DATA.

a. Description. The engine is a 4-cycle, gasoline, 6-cylinder, in-line, valve-in-head type. The engine number is stamped on a machined surface in the right side of the block just back of the distributor. The cylinders are numbered consecutively from the fan, or front end of the engine. The engine runs in a clockwise direction, as viewed from the front.

b. Data.

Model	Chevrolet BV 1001 up
Number of cylinders	6
Firing order	1-5-3-6-2-4
Bore and stroke	$3\frac{9}{16}$ in. x $3\frac{15}{16}$ in.
Piston displacement	235.5 cu in.
Compression ratio	6.62 to 1
Maximum brake horsepower—at 3,100 rpm	93
Rated horsepower (SAE)	30.4
Weight of engine and clutch	574 lb
Torque, ft-lb	182
Oil capacity	5 qt
Oil filler location	Right side
Oil gage rod	Right side, back of distributor
Oil drain location	Bottom, rear of pan

ENGINE—DESCRIPTION, DATA, MAINTENANCE, AND ADJUSTMENT IN VEHICLE



A—ROCKER ARM COVER AIR CLEANER
B—CARBURETOR AIR CLEANER
C—GENERATOR REGULATOR UNIT
D—HORN
E—CARBURETOR
F—WATER BY-PASS SHUT-OFF COCK
G—ENGINE GOVERNOR
H—WINDSHIELD WIPER VACUUM LINE
I—HYDROVAC VACUUM CHECK VALVE LINE
J—MANIFOLD HEAT CONTROL VALVE
K—CRANKCASE VENTILATION VACUUM LINE
L—ACCELERATOR LEVER (BELL CRANK TO CARBURETOR)
M—ACCELERATOR LEVER (BELL CRANK TO ACCELERATOR PEDAL)
N—IDLE ADJUSTMENT SCREW
O—THROTTLE STOP SCREW
RA PD 33073

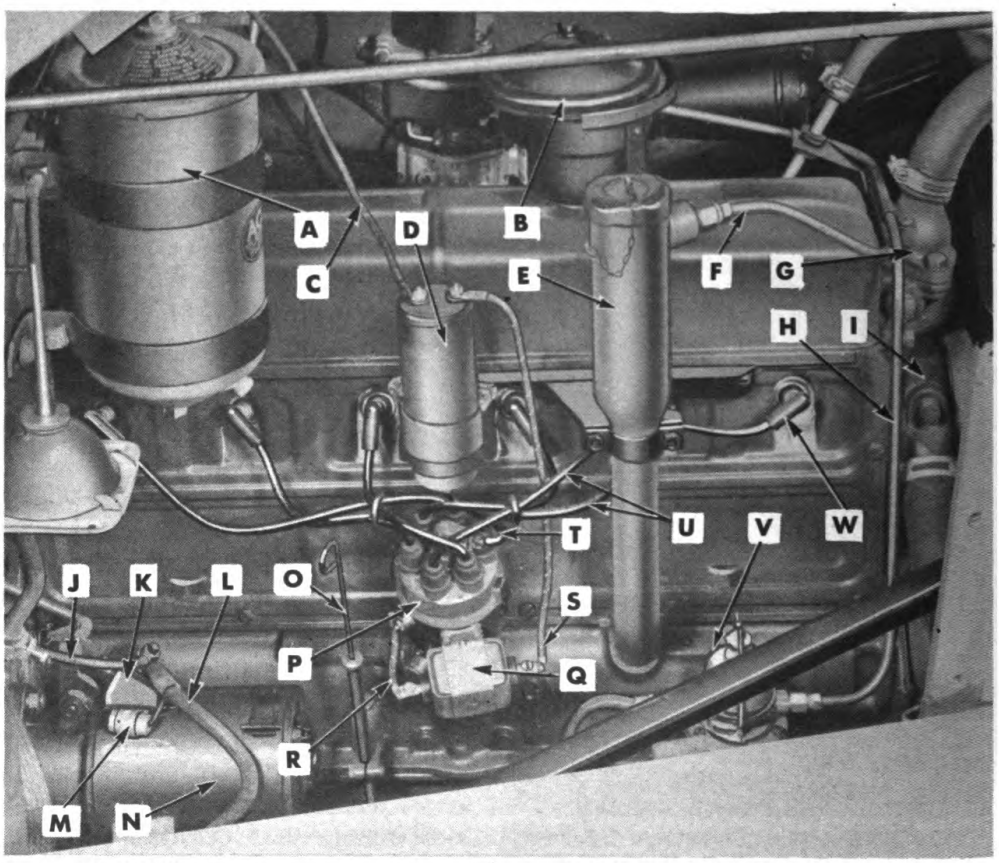
Figure 17—Engine in Chassis, Left Side

57. TUNE-UP.

a. General. One of the most important operations in the maintenance of the engine is proper engine tune-up. This operation, more than any other, will determine whether or not the engine delivers the maximum in performance and economy.

b. Compression Test (fig. 19).

(1) Before making any checks on an engine, run it for several minutes to warm it up and lubricate the valve mechanism. The compression of the engine must be checked first when tuning an engine, because an engine with uneven compression cannot be tuned successfully.



A—OIL FILTER
B—ROCKER ARM COVER AIR CLEANER
C—PRIMARY LEAD—IGNITION SWITCH TO COIL
D—IGNITION COIL
E—OIL FILLER TUBE
F—CRANKCASE VENTILATOR VACUUM LINE
G—THERMOSTAT HOUSING
H—FUEL PUMP TO CARBURETOR LINE
I—WATER PUMP
J—AMMETER TO CRANKING MOTOR SWITCH WIRE
K—CRANKING MOTOR SWITCH
L—BATTERY POSITIVE CABLE
M—CRANKING MOTOR CONDENSER
N—CRANKING MOTOR
O—OIL LEVEL GAGE ROD
P—DISTRIBUTOR
Q—DISTRIBUTOR FILTER
R—PRIMARY LEAD—FILTER TO IGNITION POINTS
S—PRIMARY LEAD—COIL TO DISTRIBUTOR FILTER
T—SECONDARY LEAD—COIL TO DISTRIBUTOR
U—SPARK PLUG WIRES
V—FUEL PUMP
W—SPARK PLUG SUPPRESSORS

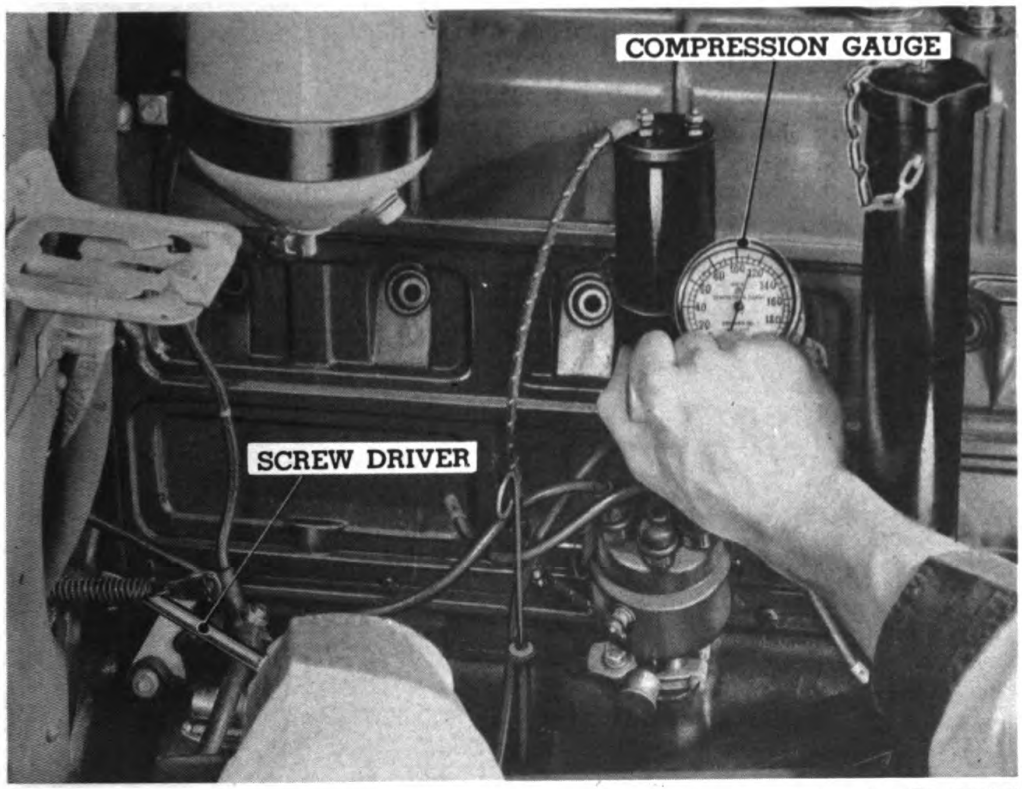
RA PD 33074

Figure 18—Engine in Chassis, Right Side

(2) Remove all spark plugs. Be sure the ignition is turned off, and the throttle valve is in the open position.

(3) Insert the compression gage (41-G-124) in a spark plug hole, and hold it tightly. Crank the engine with the cranking motor until the gage reaches its highest reading. This requires only a few turns of the engine. Repeat the same test on all cylinders, and make a note of the compression on each cylinder.

ENGINE—DESCRIPTION, DATA, MAINTENANCE, AND ADJUSTMENT IN VEHICLE



RA PD 32290

Figure 19—Checking Engine Compression, Using Gage (41-G-124)

(4) The compression on all cylinders should be 110 pounds or better, and all cylinders should read alike, within 5 to 10 pounds, for satisfactory engine performance.

(5) Should there be a low compression reading on two adjacent cylinders, it indicates a possible intercylinder leak, usually caused by a leak at a cylinder head gasket.

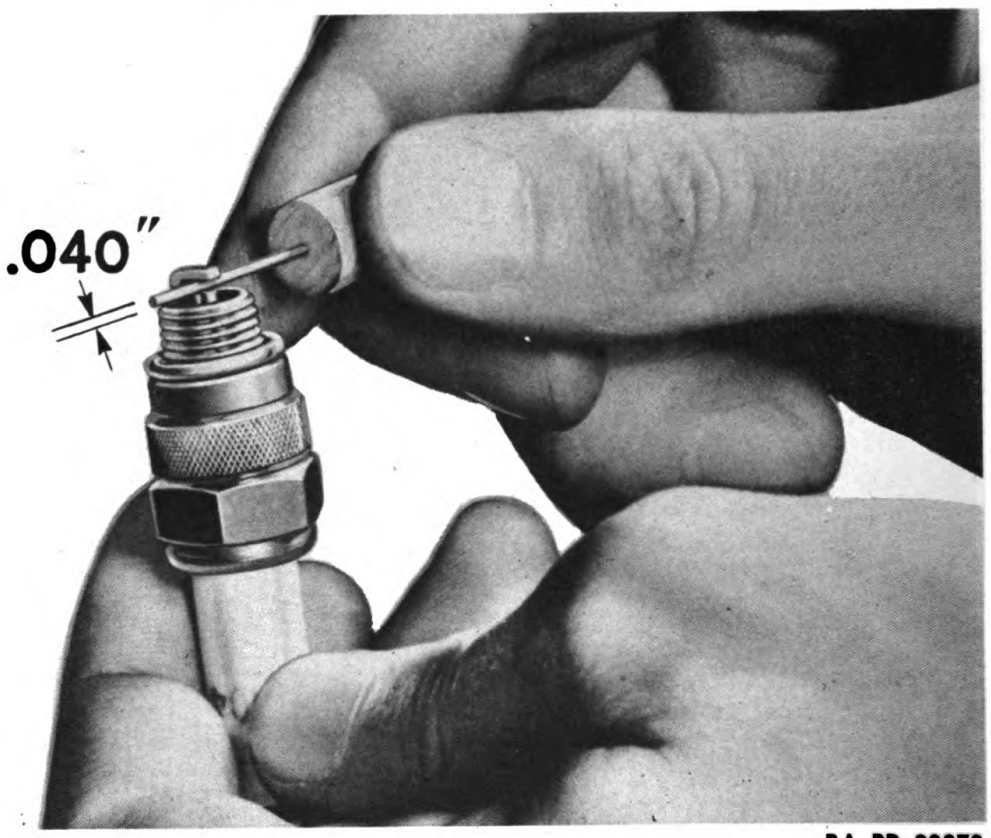
(6) If the compression readings are low or vary widely, the cause of the trouble may be determined by injecting a liberal supply of engine oil on top of the pistons of the low-reading cylinders.

(7) Crank the engine over several times, and then take a second compression test. If there is practically no difference in the readings when compared with the first test, it indicates sticky or poorly seating valves. However, if the compression reading on the low-reading cylinders is about uniform with the other cylinders, it indicates compression loss past the pistons and rings.

(8) The cause of low or uneven compression must be corrected before proceeding with an engine tune-up job.

c. Spark Plugs (fig. 20).

(1) Clean the spark plugs thoroughly, using an abrasive-type cleaner. If the porcelains are badly glazed or blistered, the spark



RA PD 32272

Figure 20—Setting Spark Plug Gap

plugs should be replaced. All spark plugs must be of the same make and heat range.

(2) Adjust the spark plug gaps to 0.040 inch, using a round feeler gage. CAUTION: *Do not bend the center electrode.*

(3) Care must be used when installing the 10-millimeter spark plugs, or the gap setting may be changed. If a torque wrench is used when installing the plugs, the proper torque is 15 foot-pounds.

d. Battery Test. Connect the negative terminal of a voltmeter to the starting switch terminal, and the positive terminal of the voltmeter to a good ground. Close the cranking motor switch, and crank the engine for 15 seconds. If the cranking motor turns the engine over at a good rate of speed with the voltmeter reading 5 volts or better, it indicates a satisfactory starting circuit. This includes the condition of the battery, terminals, and cables. However, if the cranking speed is slow, or the voltmeter reading is under 5 volts, the cranking motor, battery, and battery cable terminals should be checked individually to locate the source of the trouble (par. 42 **b**).

e. Distributor (fig. 18).

(1) Remove the spark plug wires from the distributor cap, and examine the terminals for corrosion. The wires must also be checked for damaged insulation, and for being oil-soaked.

(2) Remove the distributor cap, and check the cap and distributor rotor for cracks or burned contacts.

(3) Check the automatic advance mechanism by turning the distributor cam in a clockwise direction as far as possible; then release the cam, and see if the springs return it to its retarded position. If the cam does not return readily, the distributor must be replaced.

(4) Examine the distributor points. Dirty points should be cleaned, and pitted or worn points should be replaced. Check the points for alinement, and aline them if necessary.

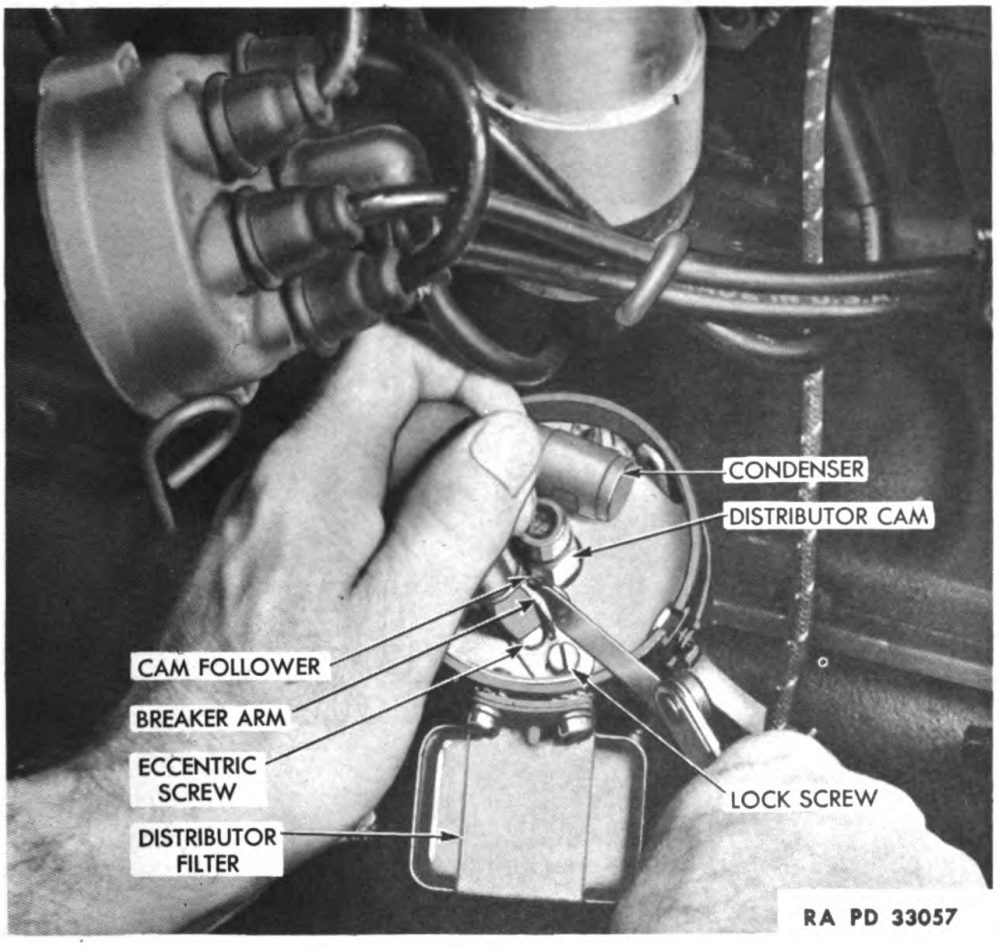


Figure 21—Distributor Point Adjustment

(5) Hand-crank the engine until the cam follower rests on the peak of the cam. Adjust the point gap to 0.018 inch, using a feeler gage (fig. 21). This operation must be performed very accurately, as it affects point-dwell, or length of time points stay together. Hand-crank the engine until the cam follower is located between the cam peaks. Hook the end of a point scale over the movable

point, and pull steadily on the spring scale until the points just start to open. At this point the reading on the scale should be between 17 and 21 ounces.

(6) Set the octane selector at "0" on the scale. Reassemble distributor cap and spark plug wires. Make sure that the terminals of the primary wire from the ignition coil to the distributor are clean and tight.

f. Coil and Condenser (figs. 18 and 21). Check ignition coil and condenser (pars. 87 d and 88 a).

g. Fuel Pump (fig. 17). Remove the filter bowl and screen, and wash them thoroughly in dry-cleaning solvent. When reassembling, make sure that the cork gasket is in good condition and properly seated. Tighten all fuel pump connections.

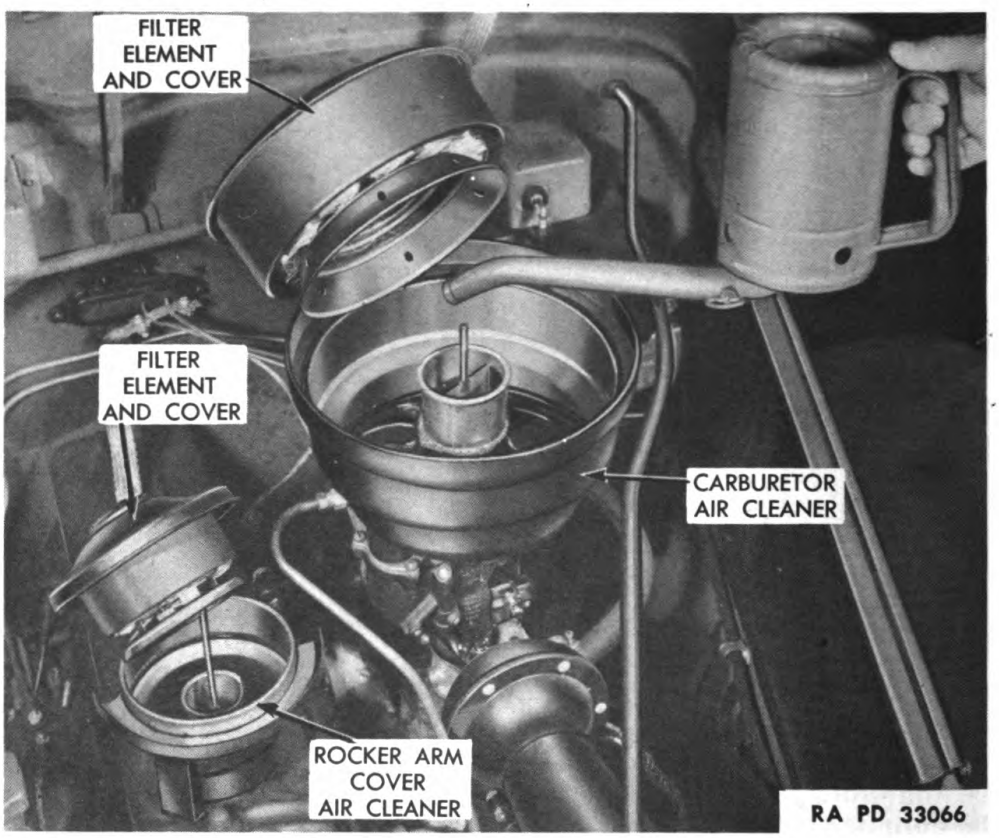


Figure 22—Filling Oil Bath Air Cleaners

h. Carburetor and Rocker Arm Cover Air Cleaners (fig. 17).

(1) Remove the air cleaners from the carburetor and rocker arm cover. Remove the wing nut from the top, and remove the cover. Remove the filter element assembly. CAUTION: *Do not pry the element loose if it sticks.* The element must be removed by hand to avoid damaging the filter element flange, which must lie flat against

the body to insure a tight seat, and prevent air leaks when the cover is assembled.

(2) Empty the oil out of the cleaner, and clean out all oil and accumulated dirt. Wash body with dry-cleaning solvent and wipe dry. Wash filter element by slushing up and down in dry-cleaning solvent. Dry thoroughly, either with an air hose, or by letting it stand until dry. Fill the body of the cleaner with engine oil, crankcase grade (fig. 22).

(3) It is not necessary to reoil the filter element, as this is done automatically when the vehicle is driven.

(4) Reassemble the filter element in the body of the cleaner, being sure that the flange sits flat against the top flange of the body.

(5) Reassemble the cover, making sure that the gasket is clean and in good condition over its entire surface, so that a tight seal is obtained at this point. Install wing nut.

(6) Reassemble the cleaners to the carburetor and rocker arm cover. The carburetor cleaner must be put on so that it rests against the carburetor to assure a good seat at this point; then tighten clamp.

i. Carburetor (fig. 17). The only adjustments that should be attempted by the using arms are the throttle stop screw and idling adjusting screw (par. 72 **b**).

j. Manifold Heat Control Valve (fig. 17). Unhook the thermostatic spring from its anchor pin, and check for correct installation. When properly installed it requires only ½ turn of the spring to slip it over its anchor pin. Should the thermostatic spring be distorted in any way it should be replaced.

k. Ignition Timing. With the octane selector set at "0" attach one wire of the neon timing light to No. 1 spark plug, and the other wire to the No. 1 spark plug wire. Mark the steel ball imbedded in the flywheel with a piece of chalk. Start the engine and run it at idling speed. Loosen distributor clamp, and rotate distributor body clockwise or counterclockwise until the steel ball in the flywheel lines up with the pointer on the flywheel housing (fig. 49). Tighten the distributor clamp screw.

l. Valve Adjustment.

(1) Start the engine and while it is warming up, tighten the cylinder head bolts, rocker arm shaft support bolts and nuts, and the manifold bolts and nuts. Where torque wrenches are available, the cylinder head bolts should be tightened to 75 or 80 foot-pounds, and the rocker arm shaft support bolts to 25 to 30 foot-pounds.

(2) Normalize the engine and adjust the valves (par. 61).

(3) Install the rocker arm cover, using a new gasket, and check for oil leaks.

m. Idling Adjustment (fig. 17). Adjust the carburetor idle and throttle stop screws in combinations with each other to secure the best idling performance. Idling speed should be set at 500 to 550 revolutions per minute.

n. Cooling System. Tighten all hose connections, and examine for any indications of water leaks. Check the fan belt for cracks, being oil-soaked, and for proper tension; and adjust it if necessary (par. 82).

o. Road Test. After the completion of the above operations, the vehicle should be road-tested for performance. During this time the octane selector should be adjusted for the grade of fuel being used. For best performance and maximum gasoline economy, the octane selector should be set to produce a slight ping when accelerating at wide-open throttle.

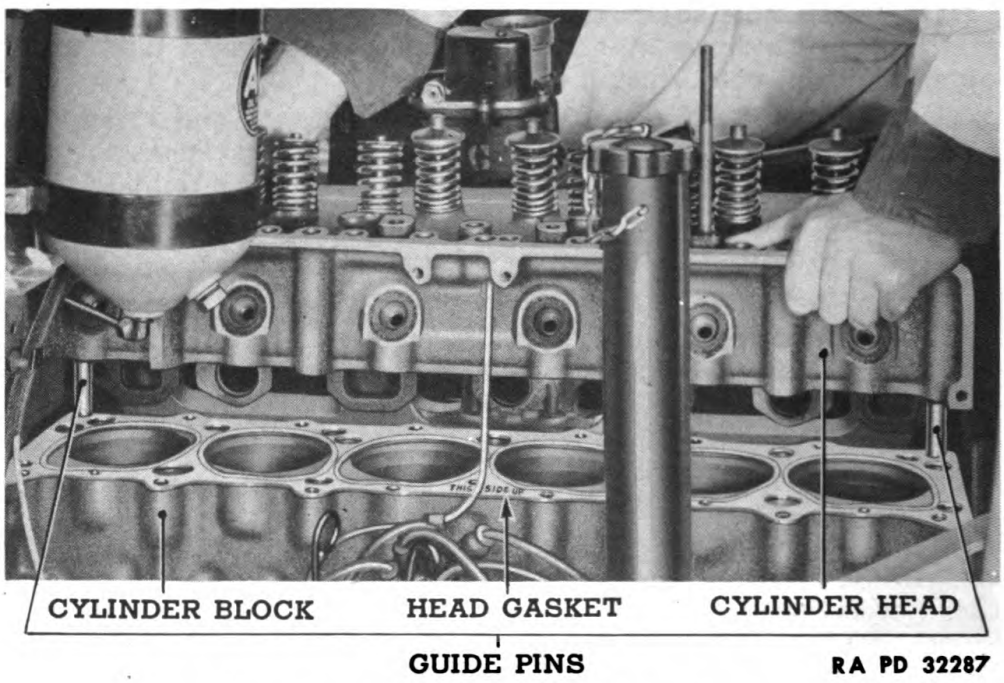


Figure 23—Cylinder Head Installation

58. CYLINDER HEAD AND GASKET REMOVAL.

a. Disconnect Manifolds. Remove the carburetor air cleaner. Disconnect lower end of throttle rod. Disconnect the manifold from the engine. Pull the manifold and carburetor assembly to the left until it clears the cylinder head, and wire it to the radiator brace rod or block it up to support its weight. Remove fuel pump to carburetor line and the crankcase ventilator to manifold line.

b. Remove Push Rod Cover. Drain cooling system. Remove rocker arm cover. Remove spark plugs. Remove push rod cover.

c. Remove Rocker Arms. Disconnect steam relief tube hose and remove tube. Remove thermostat housing. Disconnect temperature indicator and oil line to rocker arm. Remove the two rocker arm assemblies by removing the four bolts and two nuts.

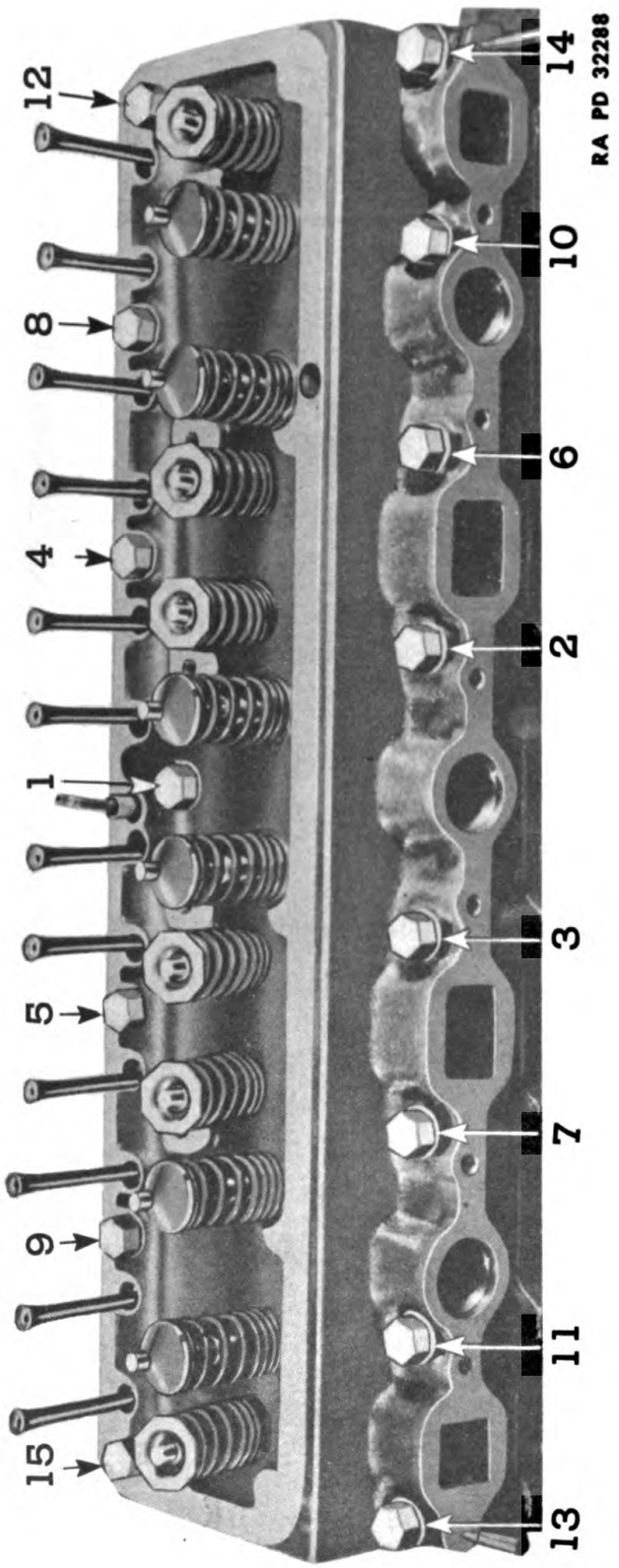
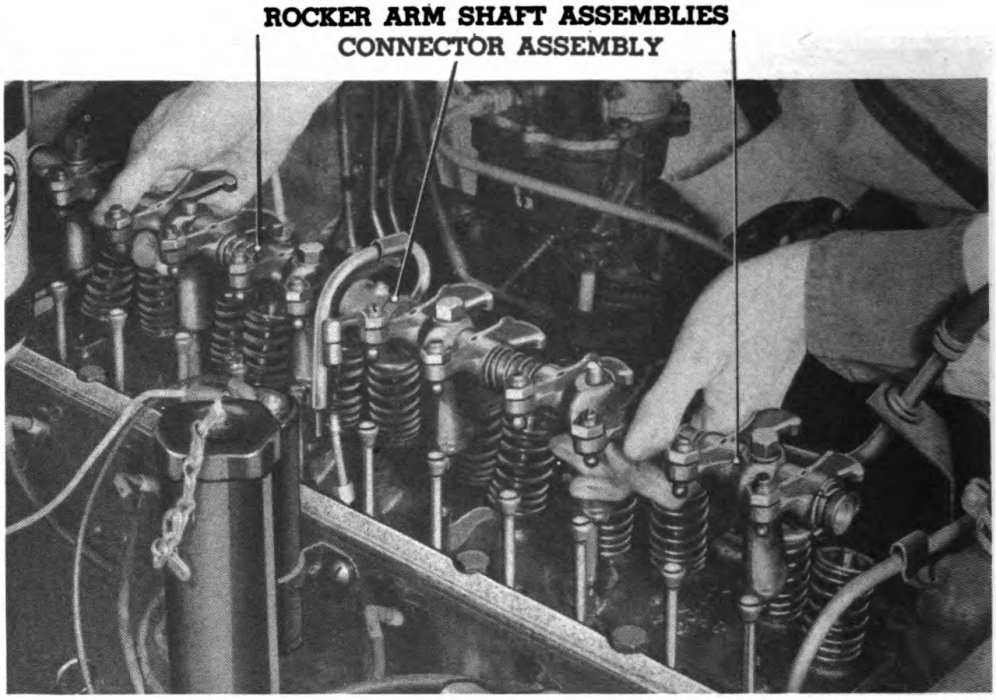


Figure 24—Bolt Tightening Diagram

d. Remove Cylinder Head and Gasket. Lift out the push rods, and remove the cylinder head bolts. Lift off the cylinder head and remove gasket. Remove temperature indicator fitting.

59. CARBON REMOVAL.

a. With an electric drill and carbon brush, remove all carbon from the combustion chambers and valve ports every time the head is removed. Scrape the carbon from the heads of the pistons and the top of the cylinder wall. Remove any sludge and gum formations from the rocker arms and shafts. Clean all oil holes and passages in the rocker arms and shafts.



RA PD 32289

Figure 25—Installing Rocker Arms and Shafts

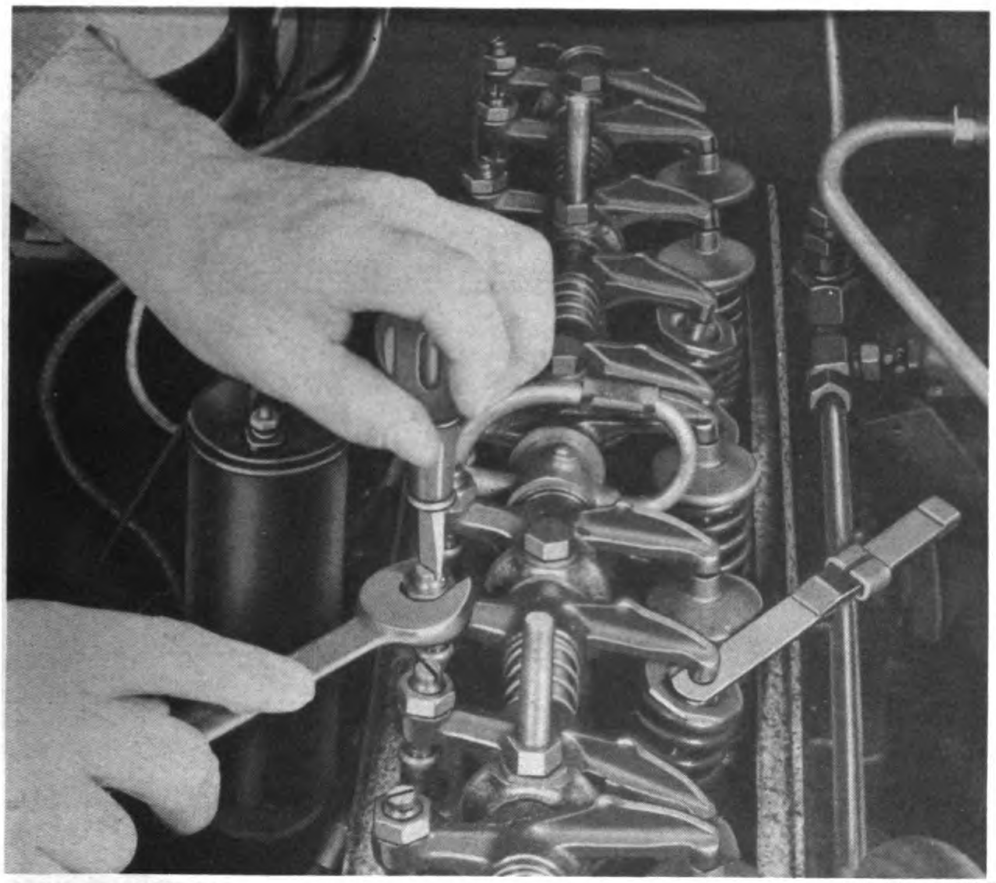
60. CYLINDER HEAD AND GASKET INSTALLATION.

a. Install Cylinder Head (fig. 23). Place the head gasket on the block with the markings "THIS SIDE UP," up and on the camshaft side of the engine. Install two cylinder head guide pins in the block, one in the front, and the other in the rear holes on the manifold side, to maintain alinement of the gasket while the head is being set in place. Install the cylinder head and tighten the 15 head bolts finger-tight. Then use a torque wrench and tighten all head bolts to between 75 and 80 foot-pounds, following the sequence shown in figure 24. It is important to follow this sequence when tightening head bolts to prevent water leaks into the cylinders, or compression leaks between cylinders, or into the water jacket.

b. Install Push Rod Cover. Install rocker arm shafts with connector assembly between them (fig. 25), and tighten retaining bolts

and nuts. Attach and tighten rocker arm oil line to connector assembly. Install temperature indicator fitting. Install steam relief tube. Connect temperature indicator. Install thermostat housing. Install push rod cover.

c. Connect Manifolds. Install spark plugs. Install rocker arm cover. Fill cooling systems. Connect manifold assembly and tighten securely. Install fuel pump to carburetor line and crankcase ventilator to manifold line.



RA PD 32257

Figure 26—Valve Adjustment

61. VALVE TAPPET ADJUSTMENT.

a. Normalize Engine. To normalize the expansion of all parts and stabilize oil temperature, run the engine at a fast idle (approximately 600 rpm) and check the oil temperature with a thermometer at the overflow pipe on the valve rocker shaft connector. When a constant oil temperature is reached for a period of 5 minutes, the engine is normalized and ready for valve adjustment. If a thermometer is not available for checking the oil temperature, the engine should be run at a fast idle for 30 minutes before making the adjustment.

b. Adjustment (fig. 26). Lubricate valve stems to insure free movement of the valves in their guides. Adjust the clearance between the rocker arms and the valve stems as follows:

	Normal Operation	Heavy-Duty Operation
Intake	0.006 to 0.008 in.	0.010 in.
Exhaust	0.013 to 0.015 in.	0.020 in.

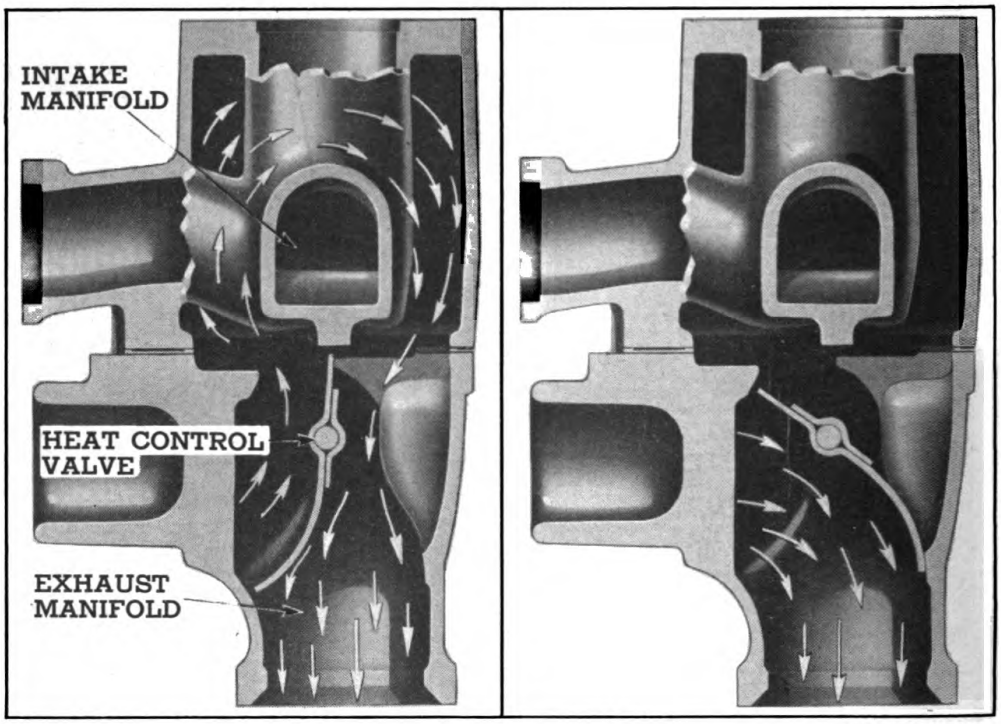


Figure 27—Manifold Heat Control Valve

62. INTAKE AND EXHAUST MANIFOLDS AND GASKETS.

a. General. The intake and exhaust manifolds are bolted together with a gasket between them, and should not be disassembled unless one of the manifolds or the gasket requires replacement. The thermostatically controlled valve located in the exhaust manifold (fig. 27) controls the amount of hot exhaust gases to be directed into the intake heat chamber. This valve aids in "warming up" the engine, yet prevents overheating of the fuel mixture. The tension of the thermostatic spring is very important for proper engine operation. The spring should be wound up just enough for the end to slip over the pin in the manifold. This is approximately ½ turn of the spring at 70°F.

b. Manifold Removal (fig. 28). Remove the two nuts attaching the exhaust pipe to the manifold. Remove air cleaner, carburetor, governor, and gaskets. Disconnect wires, and remove horn with bracket. Disconnect hydrovac vacuum line, windshield wiper line,

ENGINE—DESCRIPTION, DATA, MAINTENANCE, AND ADJUSTMENT IN VEHICLE

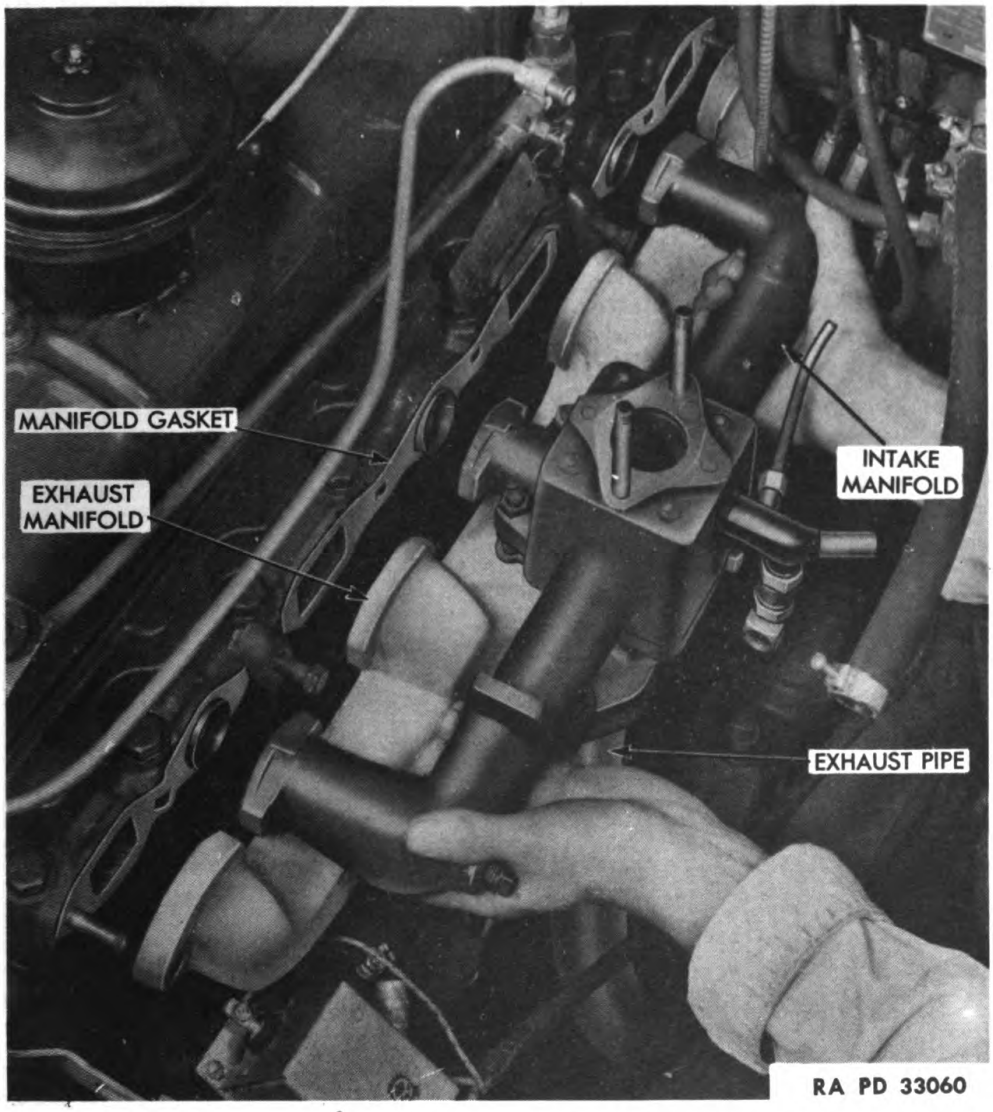


Figure 28—Manifold Replacement

and crankcase ventilator line from four-way fitting on manifold. Remove crankcase ventilator line. Remove the two nuts and six cap screws attaching the manifolds to the cylinder head. Remove the manifolds and gaskets. Remove four-way fitting and metering valve from manifold.

c. Manifold Installation. Place new gaskets in position, and install the manifolds. Tighten all nuts and cap screws evenly and securely to avoid possible gasket leaks. Install the governor and carburetor, using new gaskets. Install air cleaner. Fit exhaust pipe to manifold, using new packing if necessary. Install and tighten retaining nuts. Install four-way fitting and metering valve in manifold. Connect ventilator pipe, windshield wiper line, and hydrovac vacuum line. Install horn and connect wires.

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63. OIL PAN.

a. General. The oil troughs in the oil pan are adjusted to the proper height so that the connecting rod dippers will dip into the oil, and supply lubrication at low engine speeds. As the engine speed is increased and the oil pressure builds up, the oil streams from the nozzles rise and are intercepted by the dippers, forcing the oil into the connecting rod bearings under high pressure. CAUTION: *Care should be taken not to bend the oil nozzles so that the oil stream is directed into the connecting rod dippers.*

b. Removal. Drain oil from pan. Remove oil gage rod and guide tube. Remove oil pan cap screws. Bump the oil pan to loosen it from the gaskets and lower it to the floor, being careful not to damage the oil screen or oil troughs in the pan.

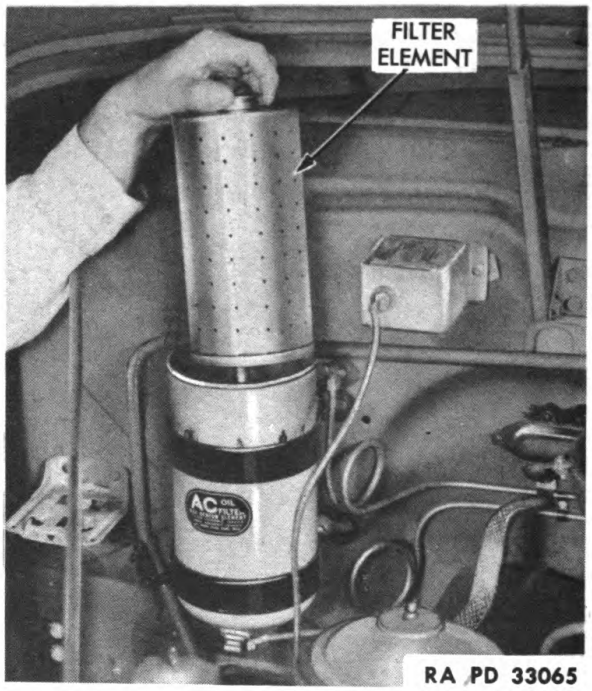

Figure 29—Oil Filter Element Replacement

c. Installation. Tie or shellac new gaskets to the block. Install the new end seals. Work the oil pan up into position, being careful not to damage the suction screen. Install and tighten retaining cap screws. Install the oil gage tube and oil gage rod. Install the drain plug, and refill oil pan with seasonal grade engine oil.

64. OIL FILTER.

a. General. A replaceable-element type oil filter is used to remove foreign matter from the oil. The element should be inspected and replaced periodically, depending on how frequently the oil is changed, type and quality oil used, severity of service, climatic conditions, etc.

b. Element Replacement (fig. 29). Remove drain plug and drain oil. Remove cover and gasket. Lift out the element. Clean the oil filter body and cover with a clean rag. Install drain plug. Place new element into position in the body, and install gasket and cover.

c. Filter Replacement. Disconnect oil lines. Remove upper and lower clamp to bracket bolts on one side of clamps, and loosen clamps sufficiently to permit withdrawal of filter. To install oil filter, slide it into position between the clamps and tighten the clamps. Reconnect oil lines.

65. CRANKCASE VENTILATOR.

a. Description. The crankcase and rocker arm cover are ventilated by a positive suction through the crankcase, provided by connecting a pipe from the oil filler tube to the intake manifold. Fresh air is drawn through an oil bath air cleaner mounted on the valve rocker cover, around the top of the engine, and down past the valve push rods into the crankcase. Air and any fumes in the crankcase are then drawn by suction up the oil filler tube through the connecting pipe and metering valve into the intake manifold.

b. Maintenance.

(1) The crankcase breather air cleaner on the valve rocker arm cover should be serviced periodically at the same time as the carburetor air cleaner (par. 77 **b**). Both air cleaners use the same type oil as used in the engine.

(2) Remove the crankcase breather air cleaner from the valve rocker arm cover, empty out the old oil, and clean out any accumulated dirt. Wash the cleaner body with dry-cleaning solvent and wipe dry.

(3) Wash the cleaner filter element in dry-cleaning solvent and wipe dry.

(4) Fill the body of the crankcase breather air cleaner with engine oil of the viscosity used in the engine to the level indicated on the side of the cleaner body (fig. 22). The capacity of the crankcase breather air cleaner is ½ pint.

(5) Approximately every 5,000 miles, remove the crankcase ventilator to metering valve pipe assembly, and the metering valve assembly. Disassemble the metering valve, and clean all parts thoroughly in dry-cleaning solvent. Wipe all parts dry, and reassemble the valve assembly. Blow out the crankcase ventilator to metering valve pipe assembly with compressed air, or clean out with dry-cleaning solvent. Dry thoroughly.

(6) Reinstall the crankcase ventilator to metering valve pipe assembly and the metering valve on engine, being sure that all pipe connections are tight. Any air leak in the passage from the oil filler

tube to the inlet manifold will reduce the efficiency of the ventilating system.

(7) Under extreme conditions of operation such as unusual amount of dust and dirt in the air, or where there are other types than heavy-duty oils being used, it may be necessary to clean the metering valve and pipe assembly more often.

Section XIV

ENGINE—REMOVAL AND INSTALLATION

66. REMOVAL.

a. Remove Sheet Metal. Drain both the radiator and the cylinder block. Remove hood and side panels. Remove the radiator, front end sheet metal, and fenders as a unit (par. 150).

b. Disconnect Wires and Lines. Remove battery cable and ammeter wire from cranking motor switch terminal. Tape end of battery cable wire, or disconnect the negative cable, to prevent shorts. Remove ignition wire from top of coil. Drain the oil filter, and disconnect the two oil filter lines at connectors. Turn off valve at fuel filter and disconnect the fuel feed line at the fuel pump. Remove right engine side pan. Disconnect the radio suppression ground straps from the rocker arm cover and side of clutch housing. Disconnect wiring from horn and remove horn. Disconnect carburetor end of choke and throttle cables. Remove carburetor air cleaner. Disconnect oil pressure, temperature indicator, windshield wiper, and hydrovac booster lines from engine assembly.

c. Disconnect and Remove Brace Rods and Levers. Disconnect exhaust pipe from the manifolds. Remove left engine side pan and disconnect the two radio suppression ground straps from the left side of the engine. Remove floor and toeboards. Split the universal joint back of the transmission. Remove transfer case control levers and emergency brake lever attaching bolts on right side of transmission. Disconnect power plant brace rod to transmission bracket from transmission and pull back spring at left rear corner of transmission. Disconnect propeller shaft (or shafts) and shift linkage from transmission power take-off, if vehicle is so equipped.

d. Remove Transmission Cover. Disconnect accelerator rod from the bell crank on left side of engine. Remove the three cap screws attaching clutch and brake pedal shaft assembly to clutch housing and disconnect clutch pull-back spring. Disconnect clutch pedal from clutch adjusting eye and brake pull rod link from lever. Remove pedal and shaft assembly. Remove cranking motor cross shaft and disconnect the link and spring from cranking motor gearshift lever. Remove the transmission cover and cover top of transmission with a rag.

e. Remove Engine (fig. 32). Disconnect the front and rear engine mountings. If vehicle is equipped with transmission power take-off, remove left engine mounting. Remove steam relief tube and temperature indicator fitting. Remove the third cylinder head bolt from the rear on the left side, and install the engine lifting eyebolt. Connect a chain fall to the eyebolt and raise the engine, clutch, and transmission from the chassis as a unit. If this engine is to be

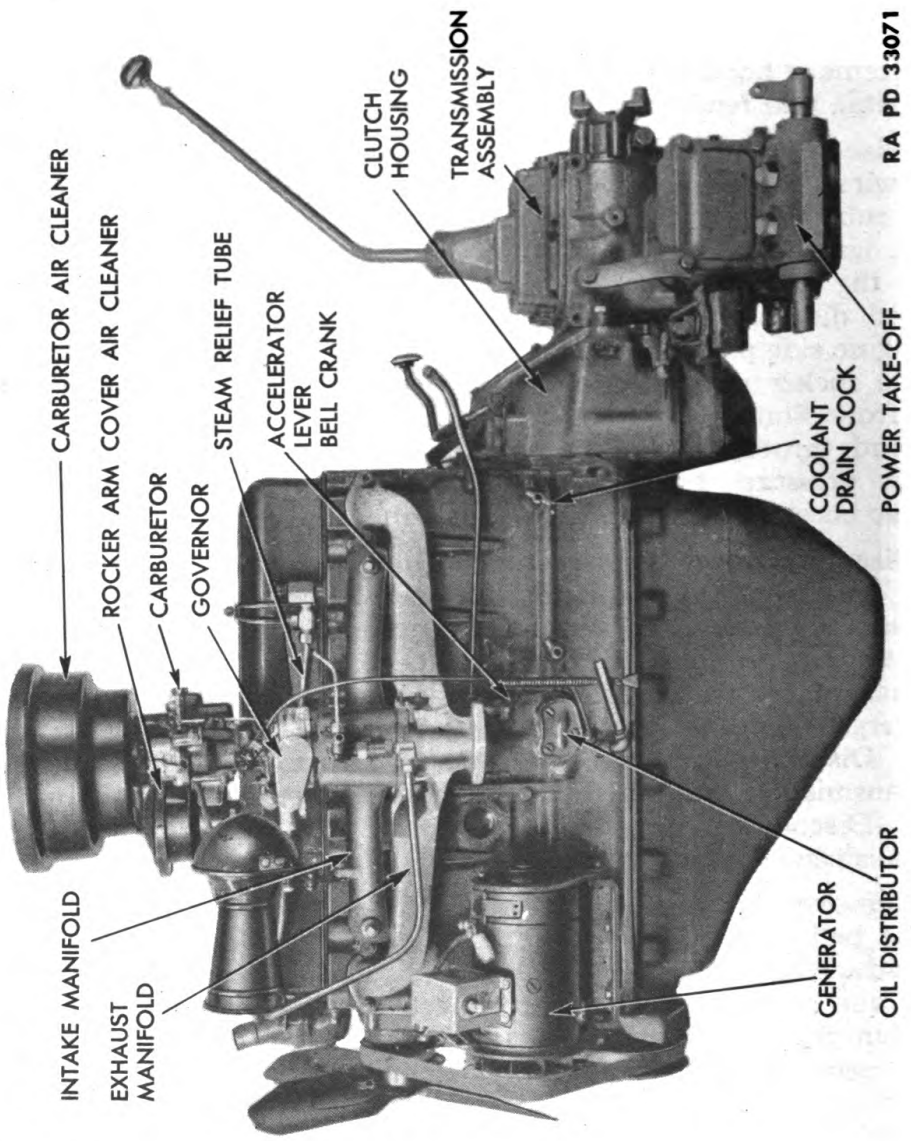

Figure 30—Engine Assembly, Left Side

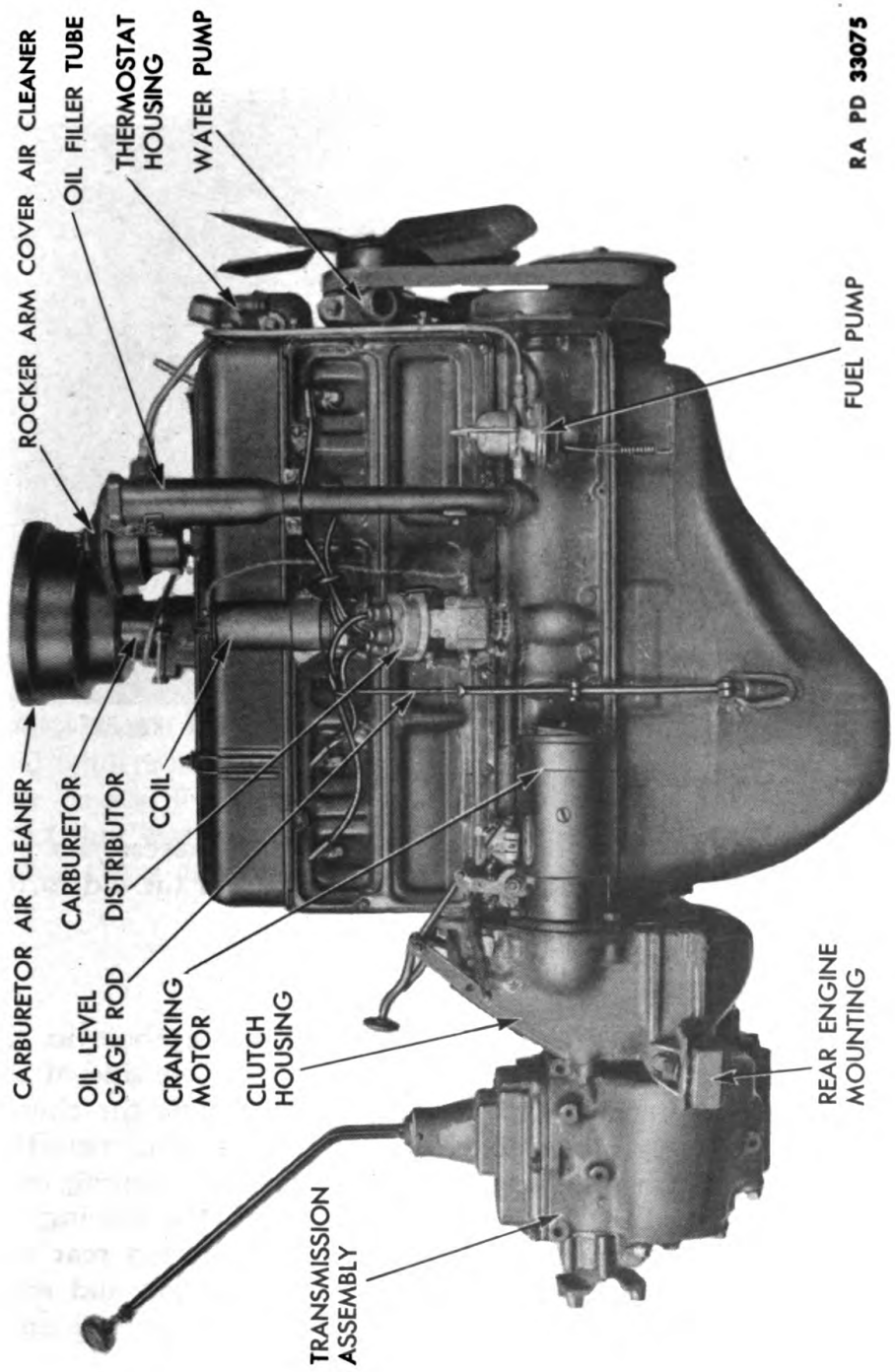

Figure 31—Engine Assembly, Right Side

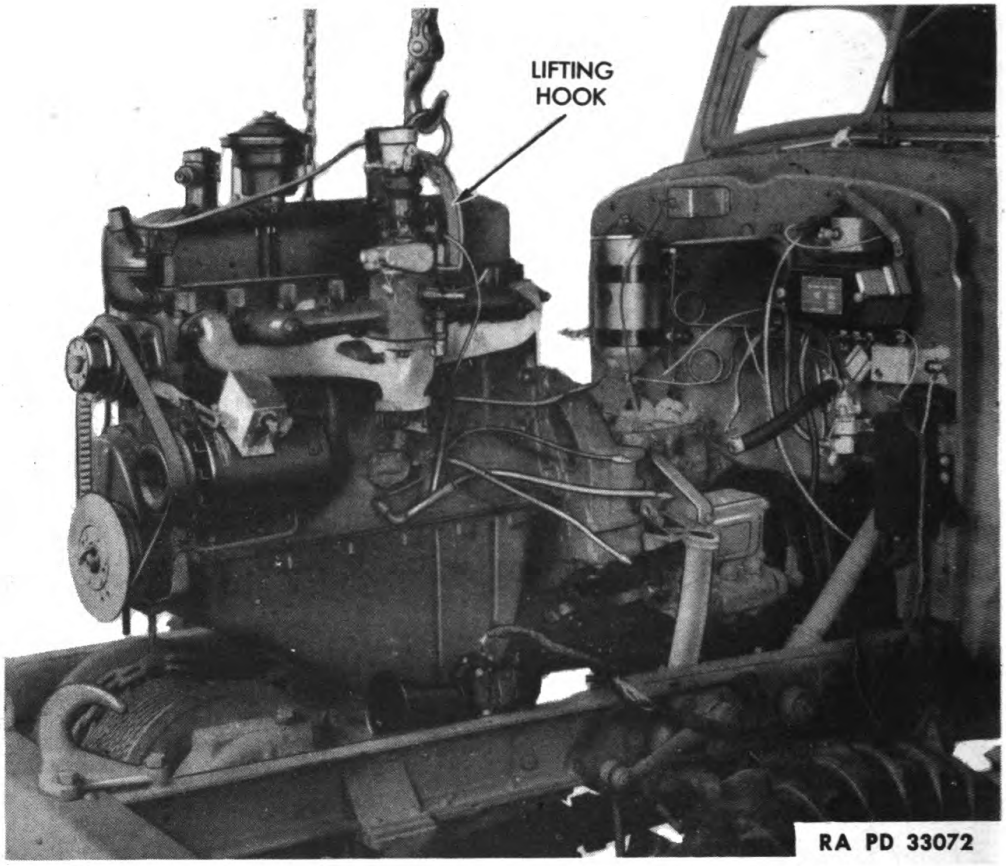

Figure 32—Engine Assembly Removal

replaced with a new or rebuilt engine, transfer all accessories, fittings, and equipment (which are not furnished) from the old to the new engine.

67. INSTALLATION.

a. Install Engine in Vehicle. Install a lifting eyebolt in the third cylinder head bolt hole from the rear on the left side of the engine, and raise the engine with a hoist. Swing it over the chassis and guide the assembly into place. Install left rear engine mounting if it was removed for engine removal. Install engine mounting bolts and nuts; tighten, and lock. Install transmission cover, placing the power plant brace rod bracket in position under the left rear two cover bolts. If these bolts will not drop through bracket and enter holes in cover, adjust length of brace rod so that they will enter without shifting the power plant. Install the two bolts that attach transfer case control levers and emergency brake lever mounting bracket to right side of transmission. Remove lifting eyebolt. Install cylinder head bolt temperature indicator fitting, temperature indicator, and steam relief tube.

b. Connect Shafts and Rods. Install cranking motor cross shaft and bolt the brackets securely. Hook up the cranking motor gearshift link. Place the clutch and brake pedal shaft with pedals in position, install the three retaining bolts, connect clutch pedal to adjusting eye, hook up clutch pull-back spring and brake pull rod. Hook the brake pedal pull-back spring to clip at left rear transmission cover bolt. Install the accelerator rod and attach it to bell crank on left side of engine.

c. Connect Propeller Shaft. Place the universal joint in position and install the U-clamps, lock washers, and nuts. Connect drive shaft (or shafts) and shift linkage to transmission power take-off, if vehicle is so equipped. Install the floor and toeboards. Install left engine side pan, and attach the two radio suppression ground straps to left side of engine. Connect the exhaust pipe to exhaust manifold. Connect the hydrovac booster vacuum line and windshield wiper line.

d. Connect Gages and Lines. Connect oil pressure gage and oil filter lines to connector on left side of engine. Connect choke and throttle cables. Install horn and attach horn wires. Connect the radio suppression ground straps to rocker arm cover stud and clutch housing. Install right engine side pan and tighten screws. Attach gasoline supply line to fuel pump, and turn on valve at fuel filter. Attach the ignition wire to top of coil. Attach the battery cable and ammeter wire to cranking motor terminal.

e. Install Sheet Metal. Install the radiator front end sheet metal and fenders as a unit (par. 151). Install air cleaner. Install hood and side panels. Fill crankcase and transmission. Lubricate the universal joint that was disassembled. Tune engine; test lights, horn, and generator charging rate. Recheck oil level.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XV

CLUTCH

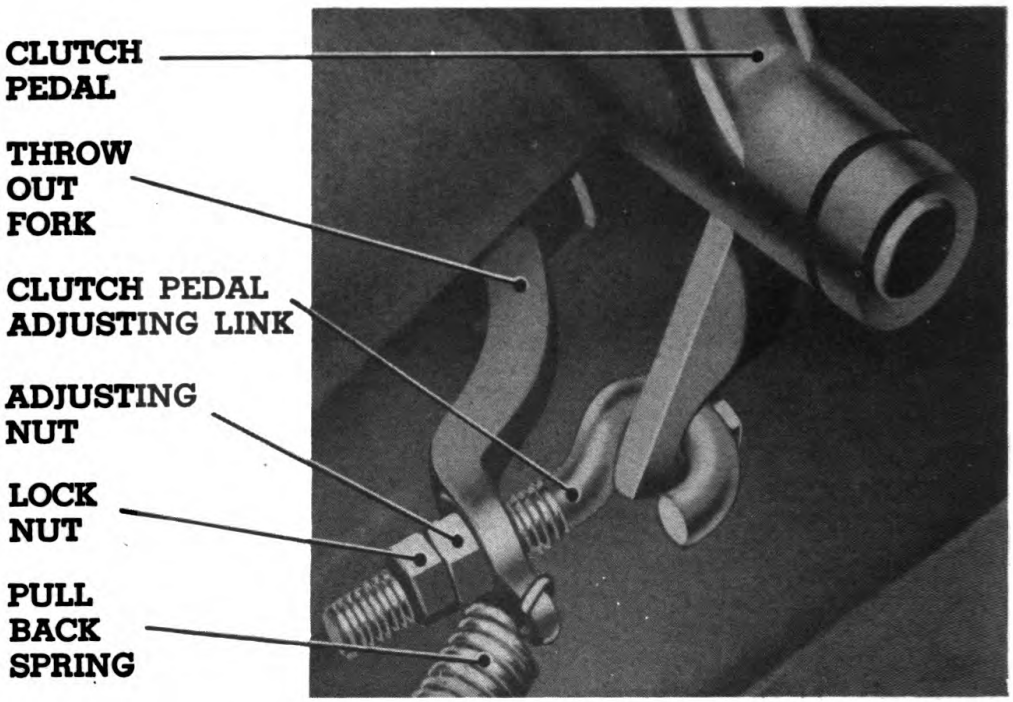

Figure 33—Clutch Free Pedal Travel Adjustment

68. DESCRIPTION AND TABULATED DATA.

a. Description. The clutch is a single-plate, dry-disk type, incorporating a spring-mounted hub. The engagement pressure is supplied by a single diaphragm spring. The clutch is controlled by the clutch pedal, connecting link, throwout fork, and throwout bearing.

b. Data.

Type	Single dry plate
Facings:	
Outside diameter	10¾ in.
Thickness	0.137 in. to 0.143 in.

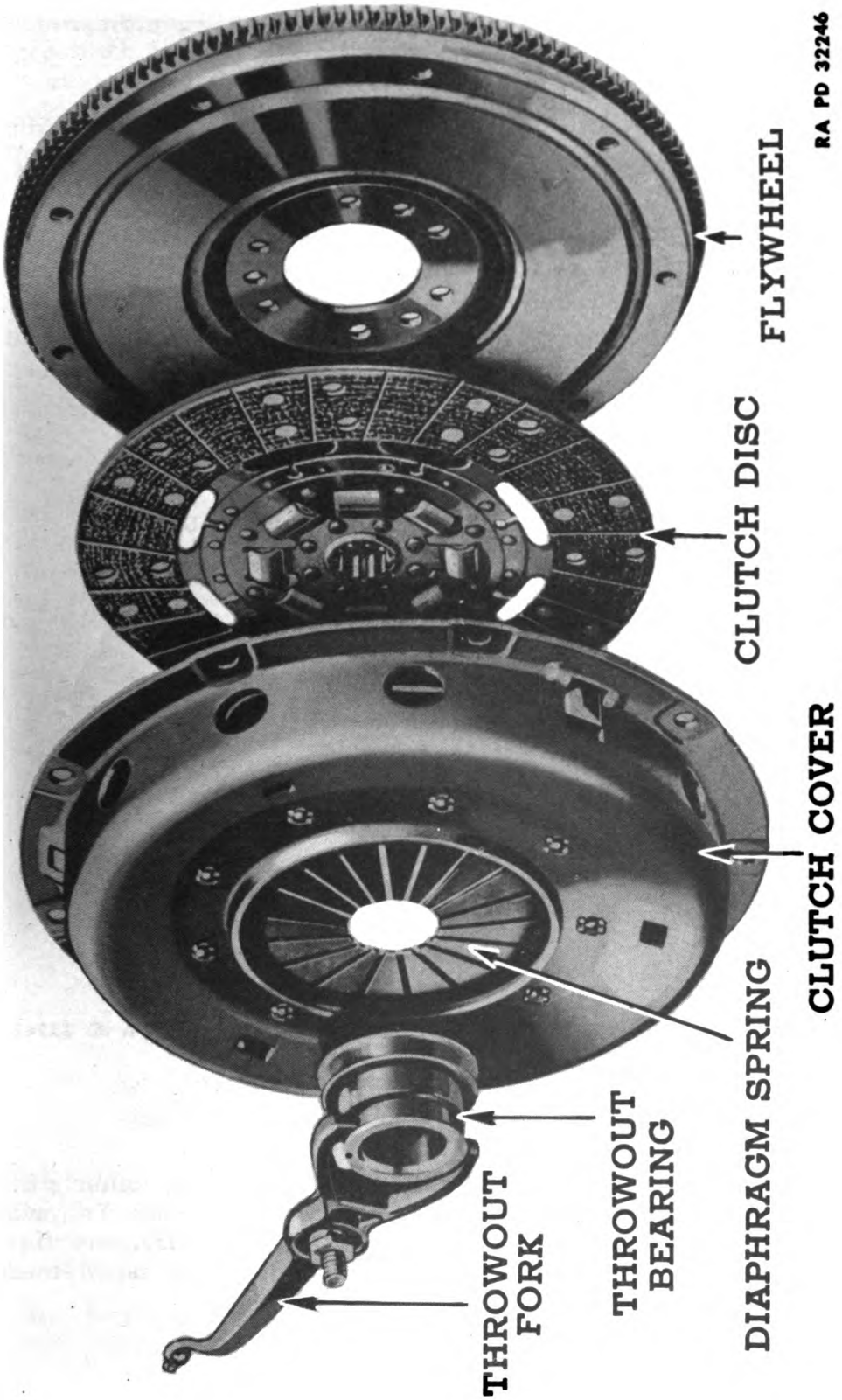

Figure 34—Layout of Clutch Parts

1½-TON 4 x 4 TRUCK (Chevrolet)

Spring:
- Type ..... Single diaphragm
- Diameter ..... 9 in.

Throwout Bearing:
- Type ..... Sealed ball bearing
- Manufacturer's number ..... New Departure CT-22

Service Data:
- Clutch pedal adjustment ..... 1 in. to 1¼ in.
- Clearance between:
  - Driving lugs and cover ..... 0.002 in. to 0.006 in.
  - Splined hub and shaft ..... 0.005 in to 0.0055 in.

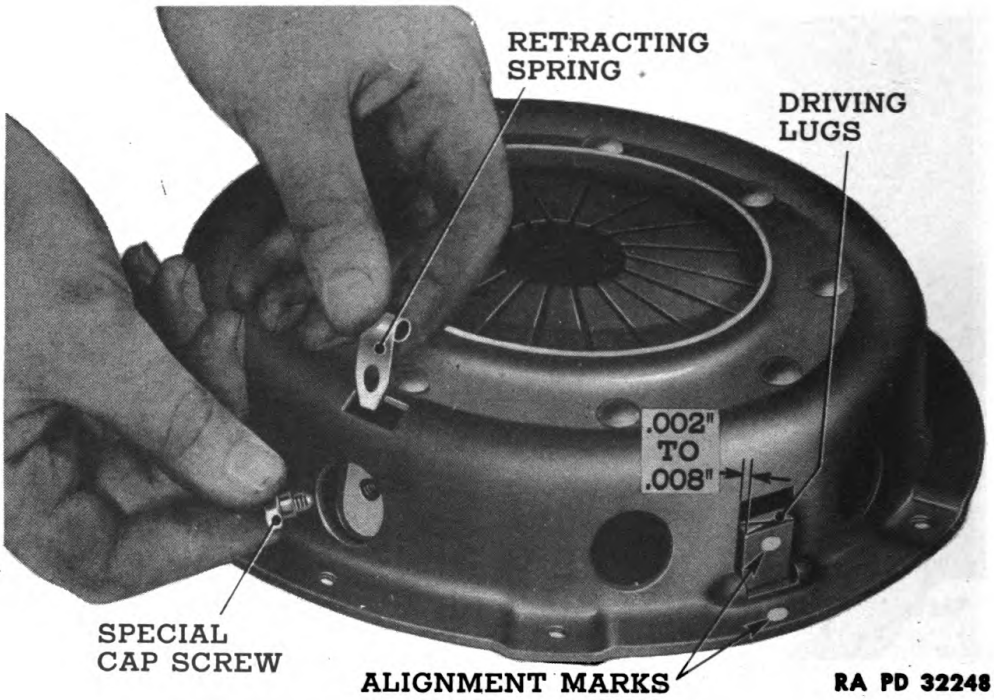

Figure 35—Retracting Spring Removal

69. ADJUSTMENT.

a. The free pedal travel before the throwout bearing contacts the diaphragm spring should be between 1 inch and 1¼ inches. To make this adjustment, loosen the adjusting lock nut (fig. 33), and turn the adjusting nut until 1¼-inch free travel of the pedal is obtained. Tighten the lock nut.

70. CLUTCH REPLACEMENT (fig. 34).

a. Removal.

(1) REMOVE TRANSMISSION ASSEMBLY (par. 97).

CLUTCH

(2) REMOVE CLUTCH FORK. Remove throwout bearing from the fork. Disconnect pull-back spring, and remove adjusting link from the clutch fork. Remove the clutch fork by pressing it away from its mounting with a screwdriver until the fork snaps loose from the ball. The spring retainer may be removed from the fork by prying it out of the groove, one end at a time. Remove the throwout fork mounting ball stud from the clutch housing.

(3) REMOVE COVER ASSEMBLY AND DISK. Loosen the nine clutch to flywheel bolts one turn at a time (to prevent cover distortion), until the diaphragm spring pressure is released. Remove the clutch cover assembly and disk from the clutch housing.

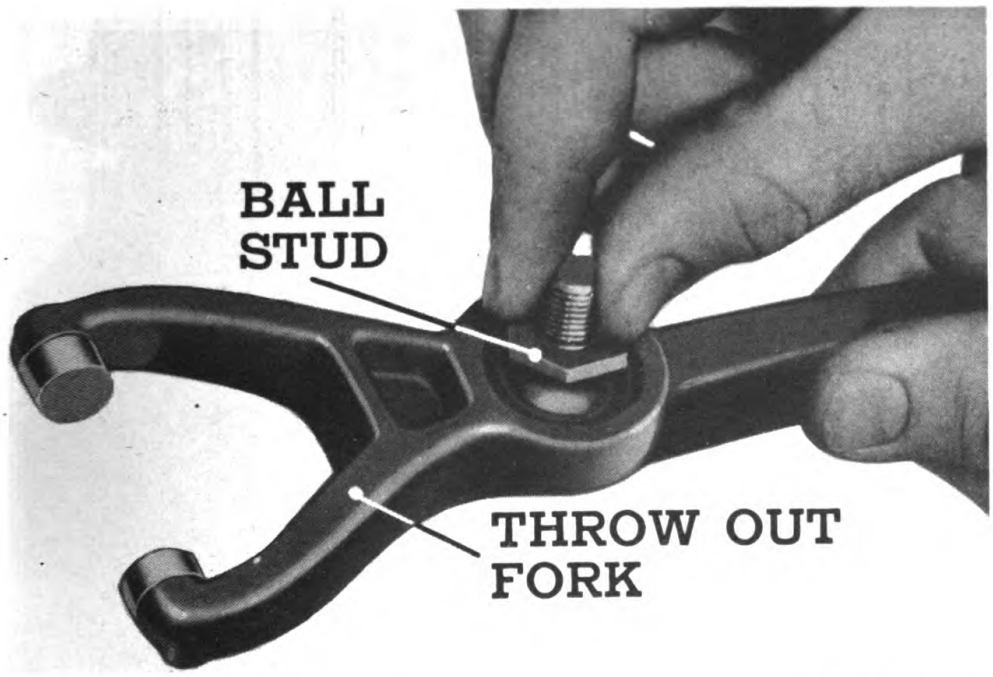

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Figure 36—Checking Fit of Ball in Throwout Fork

(4) DISASSEMBLE COVER (fig. 35). Remove the three clutch pressure plate retracting springs, and remove the pressure plate from the clutch cover assembly. The clutch cover, diaphragm spring, and two pivot rings are riveted together and serviced as an assembly.

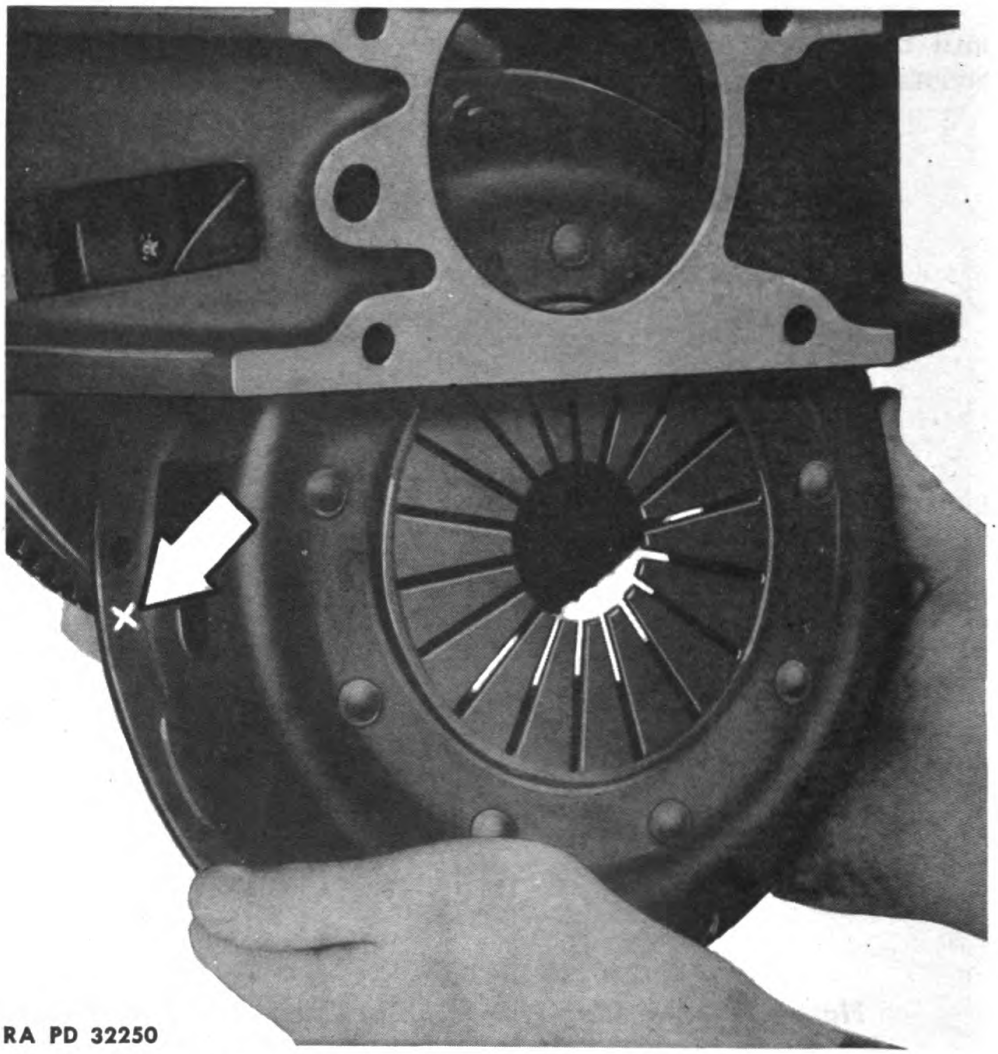
b. Inspection.

(1) Wash all parts (except the throwout bearing and disk) in dry-cleaning solvent.

(2) Inspect the pressure plate and flywheel for scores or cracks that would affect normal clutch operation.

(3) Check the three pressure plate drive lugs for excessive wear or burs. Check their fit in the cover. They should have from 0.002-inch to 0.009-inch clearance (fig. 35).

(4) Check the throwout bearing for roughness and free fit on the extension of the transmission main drive gear bearing retainer. CAUTION: *This is a permanently lubricated bearing, and must not be washed in dry-cleaning solvent.*



RA PD 32250

Figure 37—Alining Cover Assembly with Flywheel

(5) Check fit of the ball stud in the throwout fork (fig. 36). NOTE: *This should be snug without side play.*

(6) Inspect the clutch disk for worn, loose, or oil-soaked facings, for broken disk springs, or loose hub rivets. Check to see that the splines are not excessively worn, and that they move freely on the splines of the clutch gear. If the splines are worn, the disk should be replaced.

(7) Place clutch disk on clutch shaft, and turn shaft to check for sprung clutch disk.

c. Clutch Reassembly.

(1) ASSEMBLE CLUTCH COVER. Install the pressure plate in the cover assembly, making sure to mate the "O" mark on the pressure plate lug with the "O" mark on the cover (fig. 35). This is necessary to maintain proper balance. Install the three pressure plate retracting springs. The clutch is now ready to be reassembled to the engine.

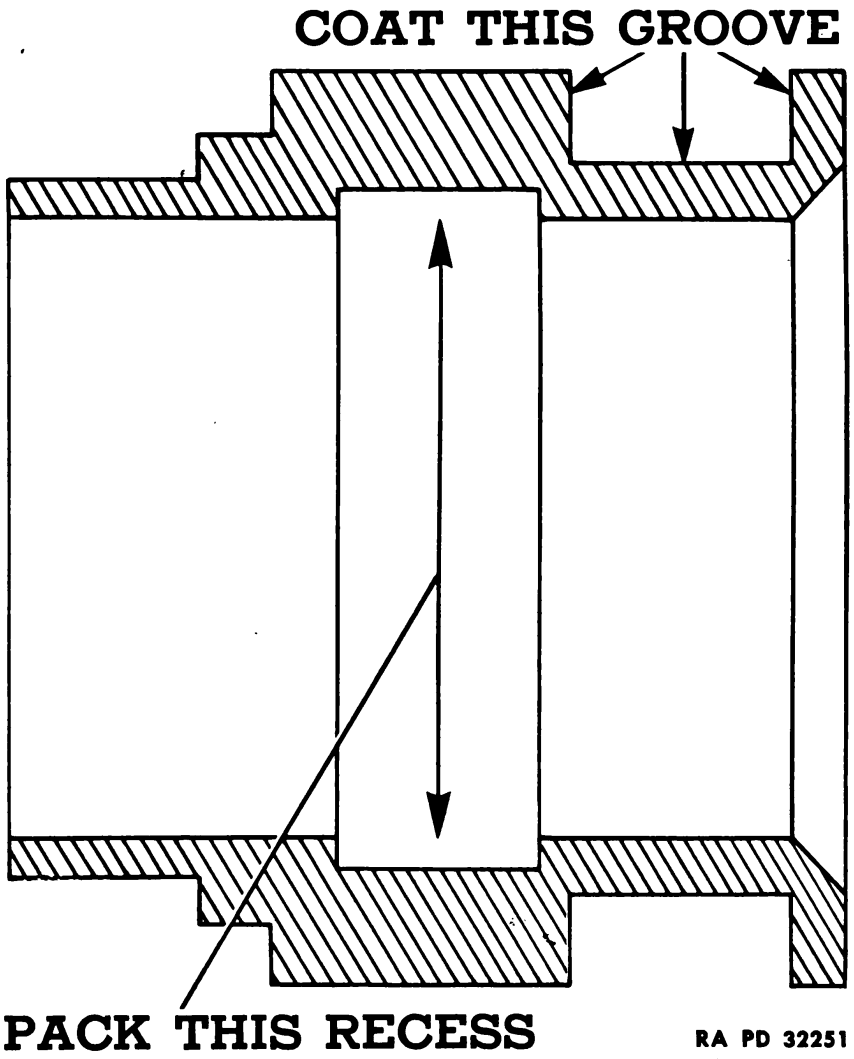


Figure 38—Throwout Bearing Collar Lubrication

(2) INSTALL COVER AND DISK. Hand-crank the engine until the "X" mark on the flywheel is at the bottom. Install the clutch disk, pressure plate, and cover assembly. Turn the clutch assembly until the "X" mark on the cover lines up with the "X" mark on the flywheel (fig. 37). Install the nine bolts, and tighten them each a turn at a time to prevent distorting the cover as the spring pressure is being taken up.

(3) INSTALL CLUTCH FORK. Install the throwout fork mounting ball in the clutch housing. Pack the ball seat in the fork with a small amount of ball and roller bearing grease. Install a new spring retainer in the groove in the clutch fork if the old retainer is worn or damaged. Make certain the retainer is installed with the high side of the retainer up, away from the ball bearing, and the open end of the retainer on the horizontal. Replace the fork in position in the clutch housing, and snap the fork onto the ball.

(4) INSTALL THROWOUT BEARING. Lubricate the recess on inside of throwout bearing collar, and coat the throwout fork groove with a small amount of ball and roller bearing grease (fig. 38). Then install throwout bearing on the throwout fork. CAUTION: *Be careful not to use too much lubricant.* Install the adjustment link and pull-back spring.

(5) INSTALL TRANSMISSION. Install the transmission (par. 98).

(6) ADJUST CLUTCH PEDAL. Adjust the clutch pedal (par. 69).

Section XVI

FUEL SYSTEM

71. DESCRIPTION.

a. The fuel system consists of a large fuel supply tank, a fuel filter, a cam-operated fuel pump, carburetor, air cleaner, and the necessary pipes and fittings.

72. CARBURETOR.

a. Description and Tabulated Data.

(1) DESCRIPTION. The carburetor used is of the Carter downdraft design. It is mounted at the top center of the intake manifold.

(2) DATA.

Type	Downdraft
Make	Carter
Model	W1-515-S
Metering rod (marked)	67-46
Float level	3/8 in.

b. Adjustments. The only adjustments on this carburetor are throttle opening (idling speed) and idling mixture. Before attempting to adjust the carburetor, make sure the carburetor to manifold and manifold to cylinder head bolts are tight to prevent air leaks. Make sure the air cleaner is properly cleaned, and that the valves are properly adjusted. Adjust the idle and throttle stop screws (fig. 17) in combination with each other to secure the best idling performance. The correct idling speed is 500 to 550 revolutions per minute.

c. Removal (fig. 17). Remove air cleaner, disconnect choke and throttle controls, and disconnect the fuel line from float chamber cover fitting. Remove the two nuts that attach the carburetor and governor to manifold, and remove the carburetor assembly.

d. Installation. Install a new gasket, place the carburetor in position, and install the retaining nuts. Connect the throttle and choke controls and check their operation. Open the idle adjusting screw 1½ turns. Connect the fuel line, and install the air cleaner. Fill the carburetor float chamber by working lever on fuel pump. Start the engine, and adjust the throttle and idle adjusting screws in combination with each other to obtain a smooth idle at between 500 and 550 revolutions per minute.

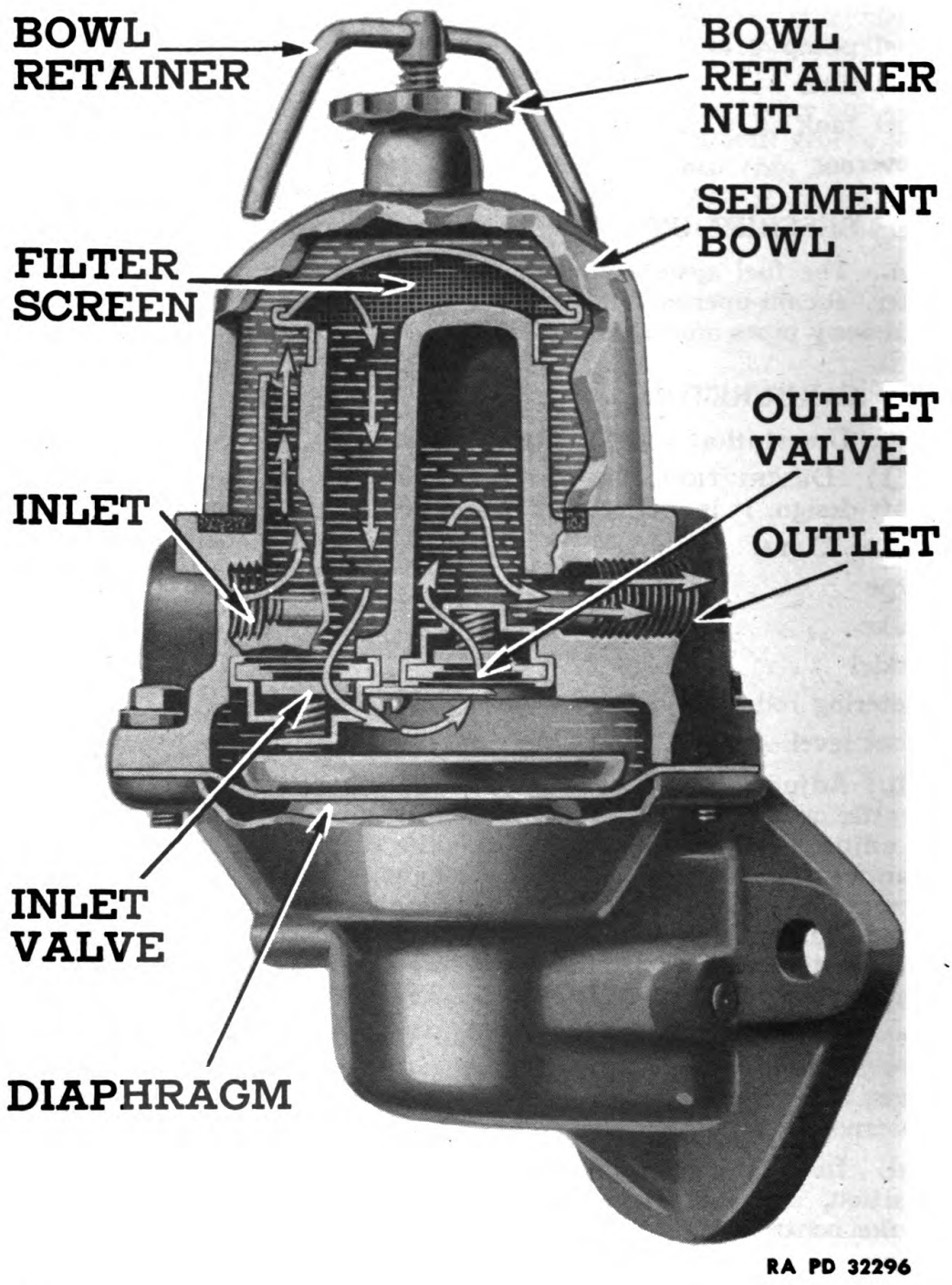


Figure 39—Fuel Pump

FUEL SYSTEM

73. FUEL PUMP.

a. Description and Tabulated Data.

(1) DESCRIPTION (fig. 18). The diaphragm-type fuel pump is mounted on the right side of the engine crankcase, and is operated by an eccentric on the camshaft. The float controlled needle valve in the carburetor controls the amount of fuel flow, and a coil spring in fuel pump maintains constant pressure in pump to carburetor fuel line. A lever on the pump provides a means of priming the pump and filling the carburetor bowl.

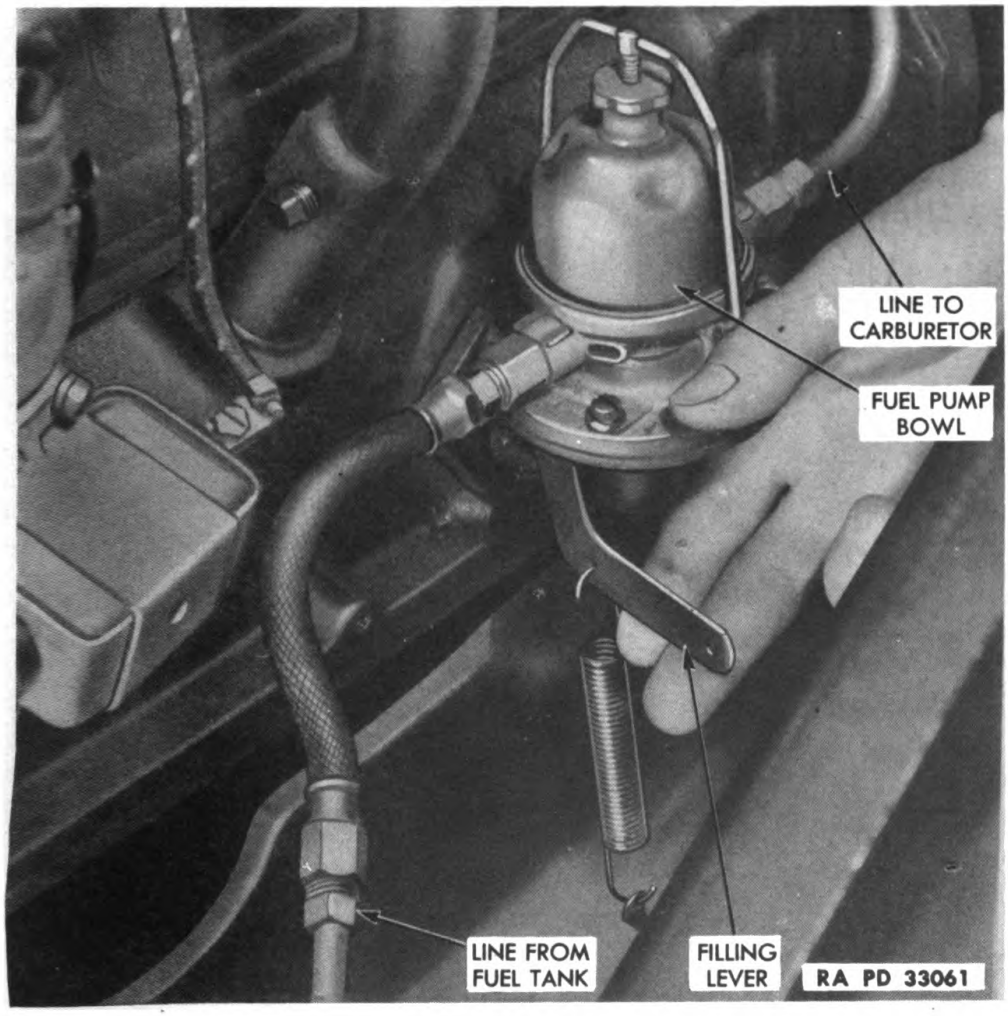


Figure 40—Filling Carburetor Bowl

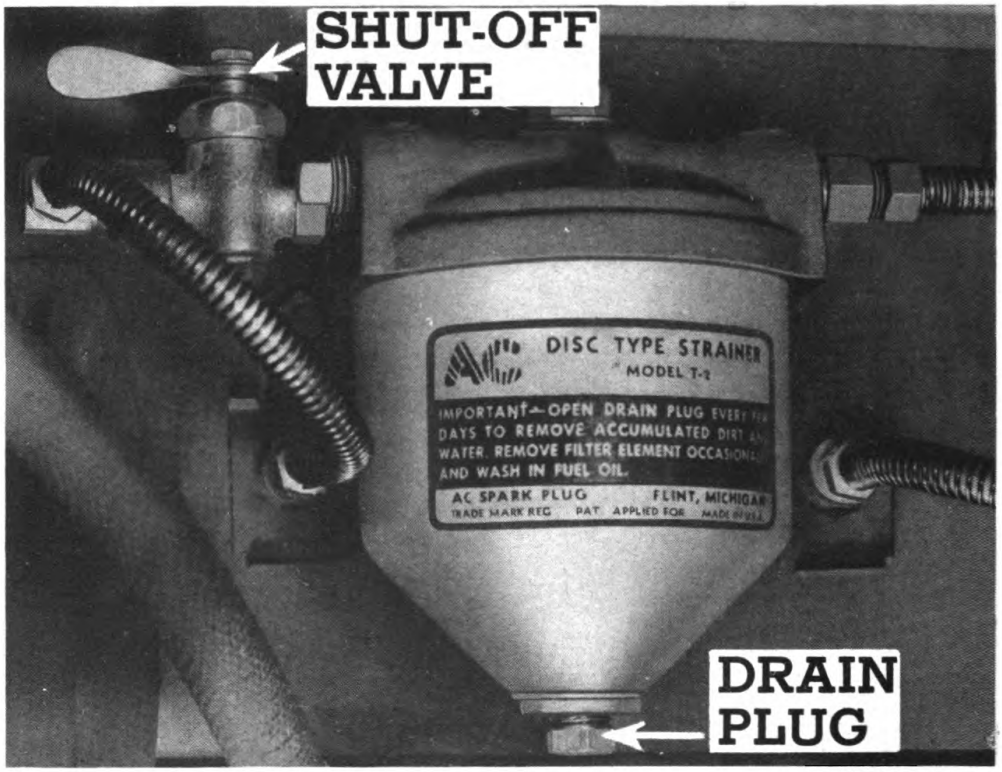
(2) DATA.

Type	Diaphragm
Make	AC No. 1537272
Model	AF
Pressure	3¾ lb maximum

b. Maintenance. Keep the attaching cap screws and fuel line connections tight. Remove and clean glass sediment bowl on top of pump when presence of water or sediment is noticed.

c. Removal. Disconnect the fuel pump inlet and outlet lines. Disconnect the pump primer spring, remove the retaining cap screws, and remove fuel pump and gasket (fig. 39).

d. Installation. Place a new gasket on the flange of fuel pump, place the pump in position against the engine crankcase, and install the attaching cap screws. Connect the inlet and outlet fuel lines securely, and attach the primer spring. Fill the fuel pump and lines with the primer lever (fig. 40).



RA PD 32298

Figure 41—Fuel Filter

74. FUEL FILTER.

a. Description and Tabulated Data.

(1) DESCRIPTION (fig. 41). The multiple-disk type fuel filter is mounted on the outside of the right frame side rail. It is connected in the fuel line between the fuel tank and fuel pump. A shut-off valve is located on the tank side of filter, and a drain plug is in the bottom of filter bowl. The fuel enters the filter, is filtered between the closely spaced disks of the filter element, and then passes to the fuel pump. Water and dirt that accumulate in the filter can be drained off by removing the drain plug.

FUEL SYSTEM

(2) DATA.

Type	Multiple-disk
Make	AC No. 1595134
Model	T-2

b. Maintenance (fig. 42). Make sure that all connections are kept tight to prevent fuel or air leaks. Drain and flush out the filter bowl regularly by closing the shut-off cock and removing the drain plug. After draining, flush bowl by opening valve and admitting a small amount of fuel. Install the drain plug and open shut-off valve. To clean the filter element close the shut-off valve, remove the cover bolt, bowl, and filter element. Wash all parts of the filter in dry-cleaning solvent. Slush the filter element back and forth in clean gasoline to remove all particles of dirt. Assemble the filter element, bowl, and cover bolt, using new gaskets. Open the shut-off valve.

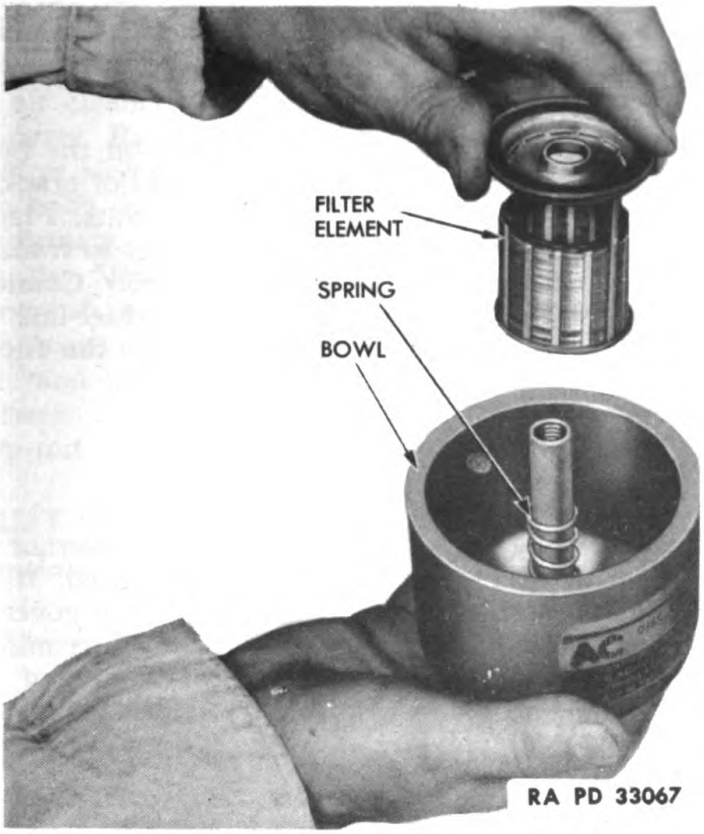


Figure 42—Fuel Filter Element Replacement

c. Removal. Drain fuel from main tank until fuel level is below outlet pipe. Disconnect the fuel inlet and outlet lines, and remove the two filter to frame attaching bolts.

d. Installation. Place the filter assembly in position against the frame, and install the retaining bolts. Connect the fuel lines to the filter, open the shut-off valve, fill fuel tank, and check for fuel leaks.

1½-TON 4 x 4 TRUCK (Chevrolet)

75. FUEL TANK.

a. Description. The heavy steel seam-welded tank is fitted with baffle plates to prevent surging of the fuel and to give additional strength to the tank. It is mounted on two support brackets extending to the left from the frame right side rail. The tank is held in place by two steel straps that go over the tank and attach to the support brackets. An L-section brace is attached to the two steel straps at the left side of tank. A heavy bracket extends from the frame left side rail and is attached to the center of the L-brace by one bolt. The capacity of the fuel tank is 30 gallons.

b. Removal. Drain the fuel from tank and install drain plug. Disconnect the filler neck coupling hose, the tank to filter fuel line, and the fuel gage lead wire. Remove the support bracket to frame right side rail bolts, and the bolt that attaches the side support at left side of tank to support bracket. Lower the tank and bracket assembly until it rests on the propeller shaft, then tip outer edge of tank down to clear the frame side rail. Remove the nuts from strap to bracket anchor bolts, and swing the straps up away from tank. Lift tank off brackets.

c. Installation. Place the tank in position on the brackets with the fuel line outlet on the side toward frame end of bracket. Securely tighten the anchor strap to support bracket nuts. Place the tank assembly in position, install the support bracket to frame bolts, and the left support bracket to tank side support bolt. Connect the filler neck hose, and tighten the clamp. Connect the fuel line to tank and the fuel gage lead to fuel gage tank unit. Fill the fuel tank, and check for leaks.

76. GOVERNOR.

a. Description and Tabulated Data.

(1) DESCRIPTION (fig. 17). The adjustable governor is designed to provide control of the engine and vehicle speed. It is mounted between the carburetor and intake manifold. The governor throttle valve is opened by spring tension and closed by manifold vacuum and flow of fuel mixture, thus controlling the volume of fuel mixture admitted to the engine.

(2) DATA.

Type	Velocity
Make	Handy
Model	V5-160

b. Removal. Remove carburetor (par. 72). Lift the governor and gasket off manifold flange studs.

c. Installation. Place a new gasket in position on the manifold flange studs and place the governor in position. Install the carburetor (par. 72).

Section XVII

INTAKE AND EXHAUST SYSTEM

77. AIR CLEANER.

a. Description and Tabulated Data.

(1) DESCRIPTION (fig. 17). The oil-bath type air cleaner mounts on the top of the carburetor, and filters dirt from the air before it enters the carburetor.

(2) DATA.

Make ..... A.C.
Type ..... Oil-bath
Part number 1542078

b. Air Cleaner Maintenance (fig. 22). Loosen the clamp screw and remove air cleaner. Remove the wing nut from top of cleaner, and remove cover. Remove the filter element assembly. NOTE: *Do not pry on filter element, or damage will result.* Empty the oil out of the cleaner body and wash it thoroughly with dry-cleaning solvent. Wash filter element by slushing it up and down in dry-cleaning solvent. Dry the filter element with an air hose. Fill the cleaner with two pints of crankcase oil. Install the filter element, making sure that the flange seats on the top of the cleaner body. Install the gasket, cover, and wing nut, making sure that the gasket makes a good seal between cover and body. Install cleaner on carburetor and tighten clamp nut.

78. EXHAUST SYSTEM.

a. Description. The exhaust system consists of the exhaust pipe, muffler, and tail pipe. This system carries the exhaust gases from the manifold along the chassis frame, and out from under the left side or rear of body. The muffler employs the reverse-flow and diffusion principles to silence the exhaust.

b. Exhaust Pipe Replacement (fig. 43).

(1) REMOVAL. Disconnect the muffler support spring from exhaust pipe clamp and remove clamp. Loosen the exhaust pipe clamp, remove the exhaust pipe to manifold stud nuts, and remove the exhaust pipe.

(2) INSTALLATION. Install muffler support spring anchor clamp. Place the exhaust pipe with packing flange in position, and hook the muffler support spring to exhaust pipe. Place a new exhaust pipe packing in position, and install the exhaust pipe to manifold stud nuts. Tighten the exhaust pipe clamp at muffler, and the exhaust pipe to manifold stud nuts securely.

1½-TON 4 x 4 TRUCK (Chevrolet)

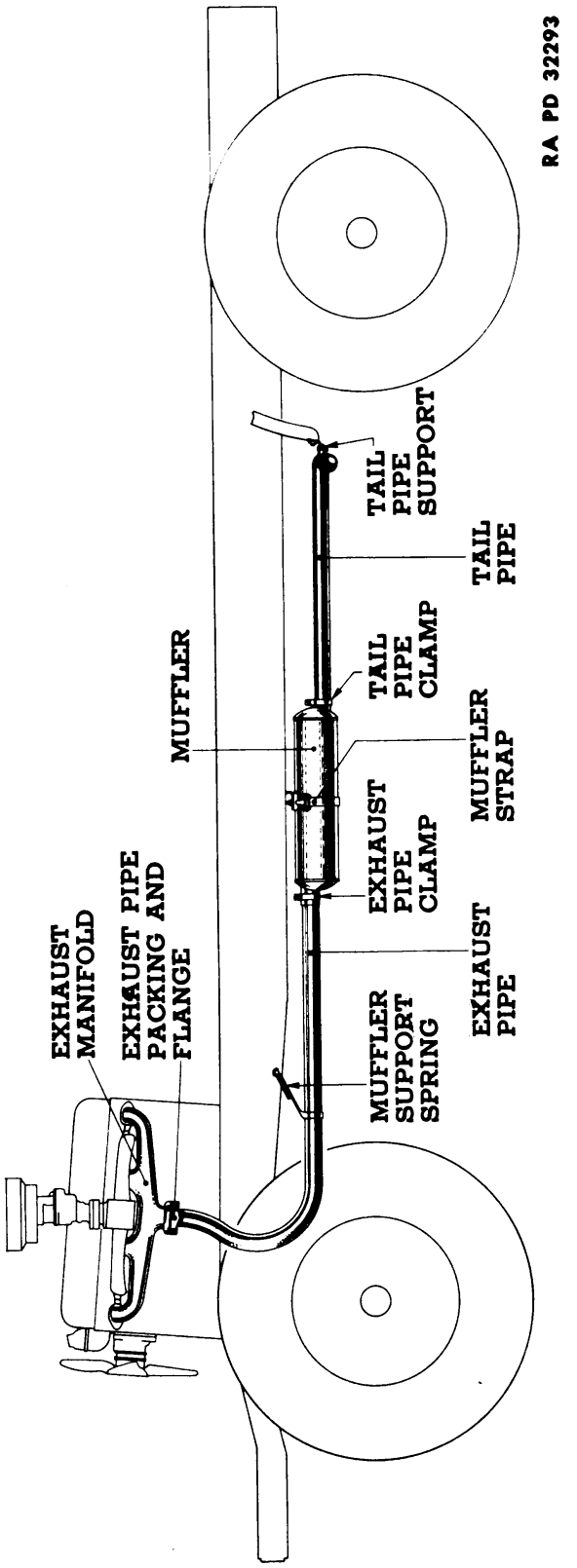


Figure 43—Exhaust System

INTAKE AND EXHAUST SYSTEM

c. Tail Pipe Replacement. Disconnect the tail pipe support at rear of tail pipe, and the two brackets at frame side rail. Loosen the tail pipe clamp at muffler, and pull the pipe off muffler. Place the new pipe in position, and install the tail pipe clamp brackets and support.

d. Muffler Replacement. Remove the tail pipe (subpar. c above). Loosen the exhaust pipe clamp, and disconnect the muffler strap. Pull the muffler off the exhaust pipe. Place the new muffler in position and attach the muffler strap, but do not tighten it. Connect the exhaust and tail pipes. Rotate the muffler slightly, if necessary, to correctly position the inlet and outlet tubes. Tighten the muffler strap, exhaust pipe clamp, tail pipe clamp, tail pipe brackets, and tail pipe support.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XVIII

COOLING SYSTEM

79. DESCRIPTION AND TABULATED DATA.

a. Description (fig. 44). The cooling system consists of a radiator, fan shroud, fan, thermostat, centrifugal water pump, fan belt, hose, and connections.

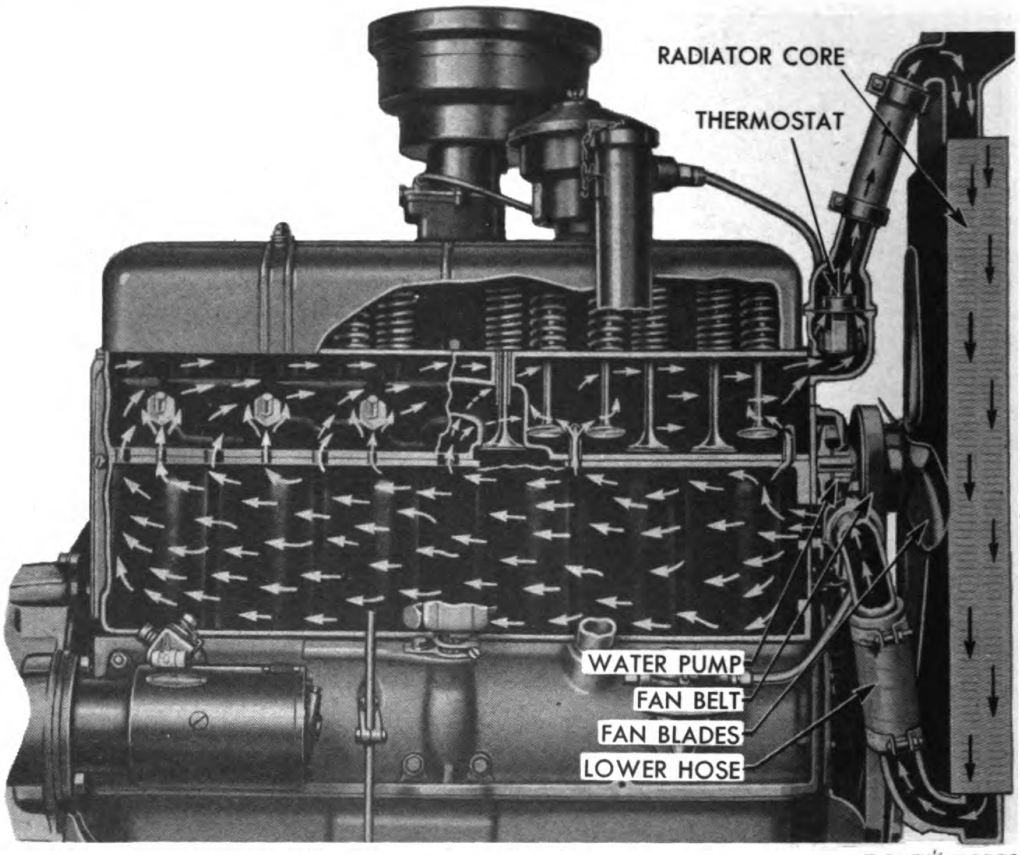


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Figure 44—Cooling System

b. Data.

Cooling system capacity	17¼ qt
Water pump type	Centrifugal
Water pump drive	Belt
Water pump bearings	Permanently sealed and lubricated

COOLING SYSTEM

Fan belt deflection	¾ in.
Adjustment	Moving generator
Thermostat	Starts to open at 140° to 147°F Fully opened, 170°F
Number of fan blades	4

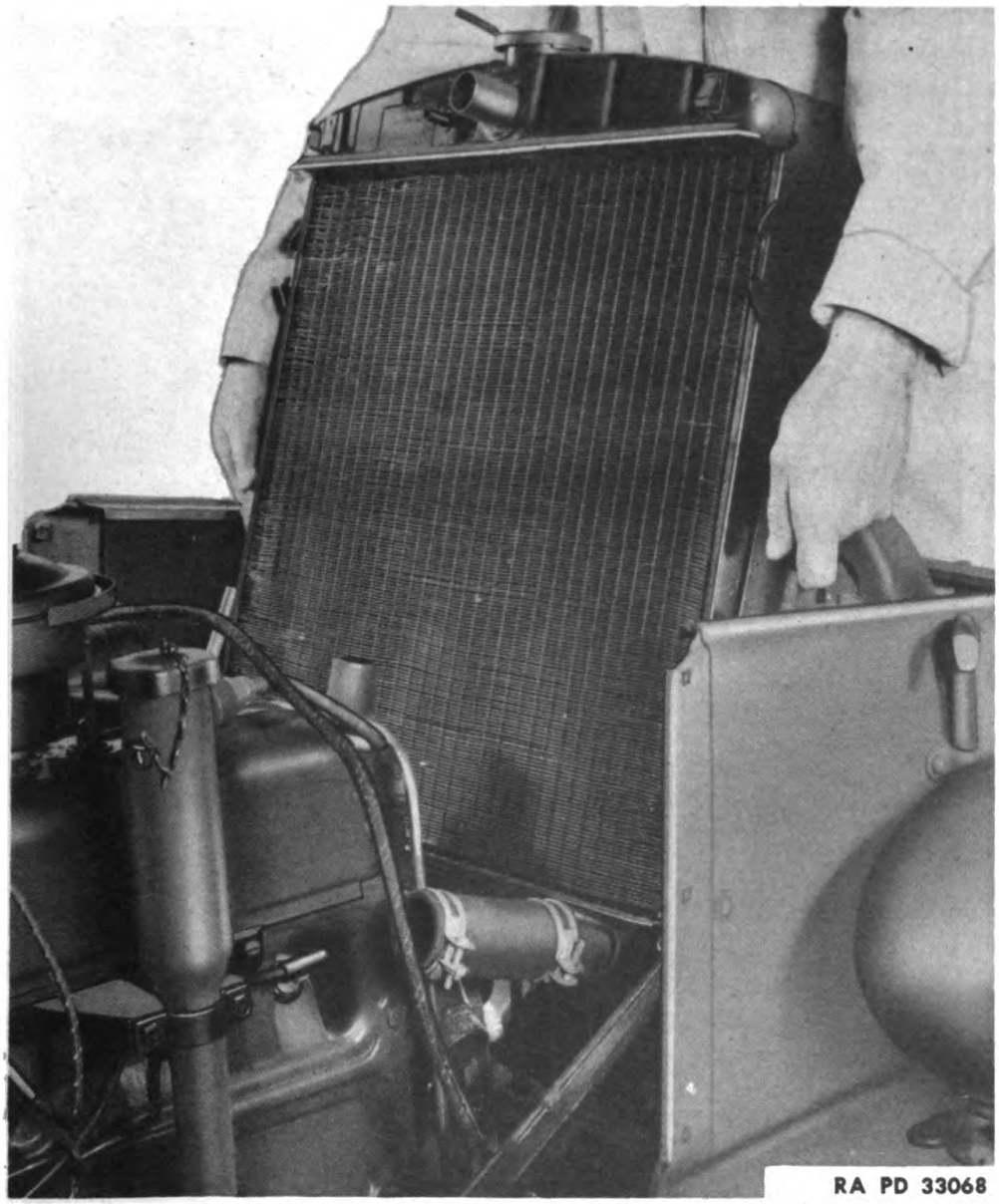


Figure 45—Radiator Core Removal

Clearance fan to radiator	Approximately 2¾ in.
Radiator type	Fin and tube
Frontal area	403.75 sq in.
Core thickness	3⅜ in.

Figure 46—Water Pump Removal

COOLING SYSTEM

80. RADIATOR CORE.

a. Description. The radiator core is of the tube and fin construction and is made of copper. The core is supported in a steel anchorage and bolted in a support. The support is bolted to the front cross member through a rubber cushion.

b. Radiator Core Removal (fig. 45). Remove radiator cap, drain the radiator, and remove all hose connections. Disconnect the steam relief tube from radiator. Remove the two bolts that attach radiator brace to the radiator support, loosen brace rod nuts at the dash, and tie front end of brace rod to hood. Remove the fan blades. Disconnect headlight wiring loom from the clips along the top and sides of radiator. Remove the six cap screws (three on each side) that hold fan shroud and radiator to the support. Push the fan shroud to one side, slipping it past bolt that attaches radiator support, and lift fan shroud up and out. Lift radiator core up and out, being careful not to damage core.

c. Radiator Core Installation. Lower the radiator core into place, and work fan shroud into position back of radiator. Install the six cap screws through fan shroud and radiator core to the support. Install headlight wiring loom in clips along top and sides of radiator. Install fan blades, and connect radiator brace to radiator support. Install all hose connections and clamps. Connect steam relief tube to radiator. Tighten nuts on brace rods at dash. Refill cooling system, and check to make sure there are no water leaks.

d. Draining Cooling System. To drain the radiator, remove filler cap and open the valve located at bottom of radiator on the right side. To drain the cylinder block, open the valve located on left side of engine at the rear cylinder (fig. 30).

e. Filling Cooling System. When cooling system has been drained, run engine at idling speed while filling radiator to prevent air pockets from forming in the cooling system. CAUTION: *Never pour cold water into radiator when engine is unusually hot, as the cold water may crack the cylinder head.* When using antifreeze, never fill the radiator full. Leave about 1 inch of air space between top of water and top of radiator to allow for expansion of the antifreeze. This will prevent loss of antifreeze.

81. WATER PUMP.

a. Description (fig. 44). The centrifugal-type water pump is mounted on the front of the cylinder block, and is belt-driven from the crankshaft. The pump shaft is ball-bearing mounted. The bearings are packed with a high melting point lubricant and require no additional lubrication.

b. Water Pump Removal (fig. 46). Remove radiator cap and drain the radiator. Loosen hose clamps that secure hose to water pump and elbow. Slide hose away from water pump. Loosen bolt in slotted end of generator brace and mounting bracket, and loosen fan belt. Remove belt from water pump pulley. Remove the four cap

screws that attach pump to cylinder block, and remove pump and fan blades as an assembly by turning it as it is removed.

c. Installation. Place pump and fan blade assembly in position, using a new gasket. Install the four cap screws that hold the pump to cylinder block. Install fan belt over the three pulleys, and adjust to proper tension. Slide hose connection over water pump opening, and tighten hose clamps. Close both drain cocks, fill the radiator, and make sure there are no water leaks.

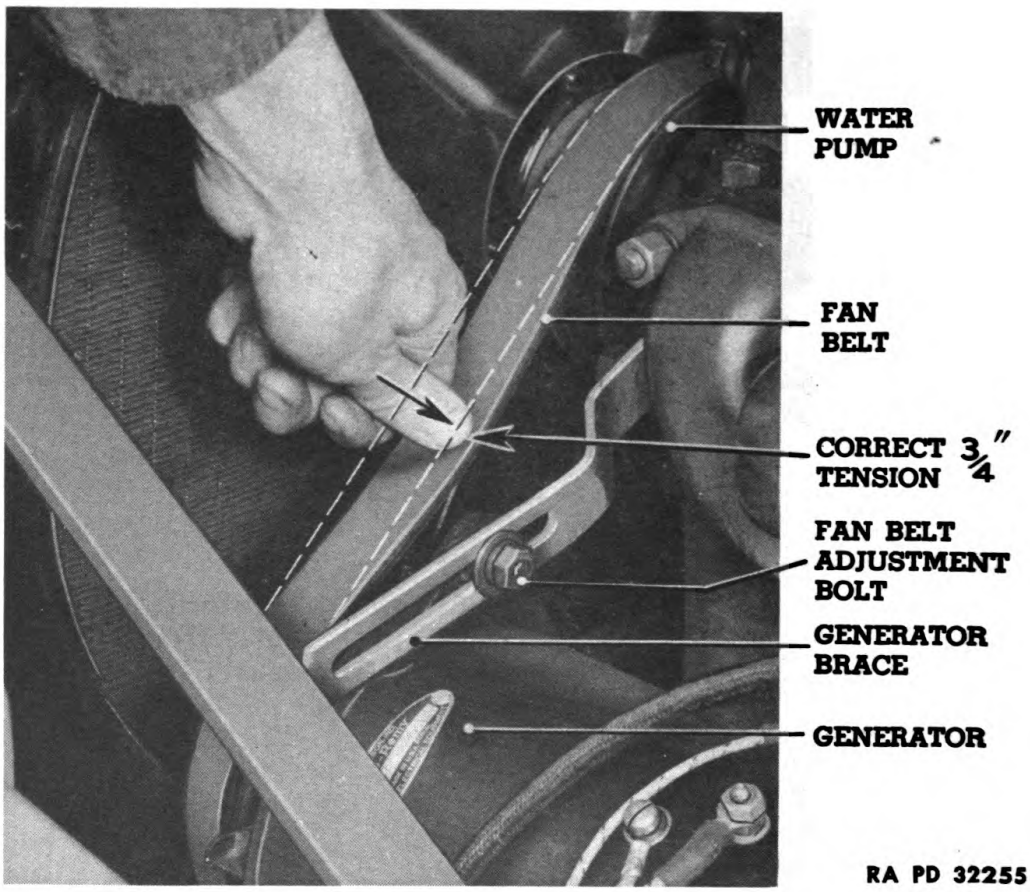


Figure 47—Fan Belt Adjustment

82. FAN BELT.

a. Description. The fan belt is of the V-type and drives the fan, water pump, and generator.

b. Fan Belt Adjustment (fig. 47). Loosen bolt at generator mounting bracket and end of slotted brace. Rock the generator on its mounting bracket. Moving generator away from engine tightens the belt. Moving generator toward engine loosens the belt. The

correct adjustment is obtained when the belt can be depressed 3/4 inch from normal. Tighten the bolt at generator mounting bracket and end of slotted brace, and recheck for proper tension.

83. THERMOSTAT REPLACEMENT.

a. Remove radiator cap, drain radiator, and loosen upper hose clamps. Remove cap screws that attach water outlet connection to thermostat housing (fig. 44). Remove water outlet connection and remove thermostat. Install thermostat, making sure exposed parts of bellows are to front and rear. Install new gasket and water outlet connection. Install hose connection and hose clamps. Fill cooling system.

84. STEAM RELIEF TUBE (fig. 30).

a. The steam relief tube is connected to the top of the radiator at the front and to the left side of cylinder head at the rear. It is for the purpose of relieving any air pockets that may be caused by steam or surging of water when the vehicle is descending steep grades. The steam relief tube requires no attention other than keeping it from leaking. If leaks occur at front end of tube, tighten or replace hose connection. If leak occurs at rear of tube, tighten packing nut to shut-off valve. Keep shut-off valve closed except when operating on extreme grades when the temperature is above 60°F.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XIX

ELECTRICAL SYSTEM, INSTRUMENTS AND GAGES

85. DESCRIPTION.

a. The electrical system consists of the ignition system, generator and regulator, cranking motor and switch, instruments and gages, lights, battery, radio suppression, and the necessary battery cables and wiring (fig. 48).

86. IGNITION TIMING.

a. Set Octane Selector. Set the octane selector so that center calibration mark on rear of distributor clamp is in line with the mark on machined surface of block.

b. Set Timing (fig. 49). Connect a timing light to the No. 1 spark plug, then start the engine and run it at idling speed. Loosen the distributor clamp, and turn the distributor body either in a clockwise or counterclockwise direction, until steel ball in flywheel lines up with pointer in flywheel housing. Tighten the distributor clamp.

87. DISTRIBUTOR.

a. Description (fig. 18). The distributor directs the high tension current to the various cylinders at exactly the proper time.

b. Data.

Make	Delco-Remy
Model	1110136
Type of advance	Centrifugal
Firing order	1-5-3-6-2-4
Breaker point gap	0.018 in.
Breaker arm spring tension	17-21 oz
Spark advance starts at	800 rpm

c. Breaker Points.

(1) CLEANING. Remove the distributor cap and rotor, and insert a fine-cut ignition point file between the points. File with a straight steady motion to keep the points flat.

(2) ADJUSTMENT (fig. 21). Remove the distributor cap and rotor. Hand-crank the engine until the breaker arm cam follower is on the peak of one of the lobes. Loosen the stationary mount lock screw (the screw nearest the point), and turn the eccentric adjusting screw to the right or left until an 0.018-inch feeler gage just fits in the gap. Tighten the lock screw, and recheck the gap clearance.

(3) REMOVAL (fig. 21). Remove the distributor cap and lift off the rotor. Loosen the nut that retains the movable arm spring to the terminal on the side of the distributor, and lift out the movable arm. Remove the stationary point lock screw and lift out the stationary point.

(4) INSTALLATION. Place stationary point in position in distributor, and install the lock screw, but do not tighten it. Place the movable point in position, with the spring in place on the terminal on side of distributor. Tighten the terminal nut securely. Hand-crank the engine until the breaker arm cam follower is on the peak of one of the lobes, then turn the eccentric adjusting screw to the right or left until an 0.018-inch feeler gage just fits in the gap. Tighten the lock screw, and recheck the gap.

d. Condenser.

(1) REMOVAL. Remove the distributor cap and lift off the rotor. Loosen the nut that retains the condenser pigtail to the terminal, and lift the pigtail off the terminal. Remove the screw that retains the condenser to the distributor, and lift out the condenser.

(2) INSTALLATION. Place the condenser in position in the distributor and install the retaining screw and lock washer. Connect the pigtail to the terminal and tighten the nut securely.

e. Distributor Replacement.

(1) REMOVAL (fig. 18).

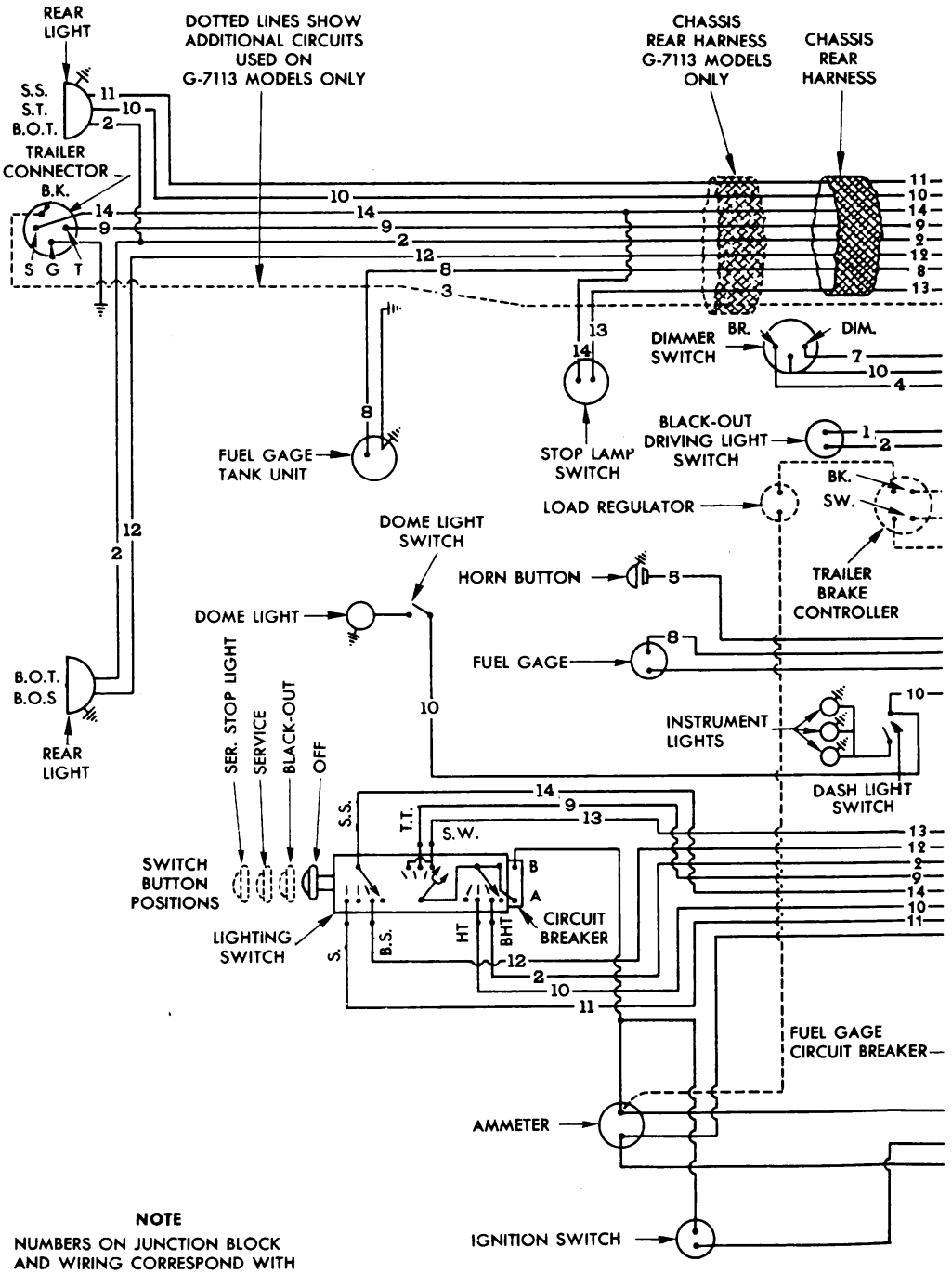
(a) Mark Distributor for Installation. Remove the valve cover air cleaner and valve cover; then hand-crank the engine until No. 6 cylinder exhaust valve opens, and continue to hand-crank the engine until the exhaust valve just closes. Remove the cap from the distributor, and scratch a mark on the distributor housing in line with the contact tip on the distributor rotor. NOTE: *This procedure locates No. 1 cylinder firing position to insure that the timing will be correct when the distributor is installed.*

(b) Remove Distributor. Remove the nut and washer that attaches the primary lead to the primary terminal, and remove the wire. Loosen the distributor clamp screw, and then work the distributor assembly up and out of the cylinder block.

(2) INSTALLATION (fig. 50).

(a) Install Spark Plug Wires. Obtain a new or rebuilt distributor assembly, and scratch a mark on the housing in the same location

1½-TON 4 x 4 TRUCK (Chevrolet)

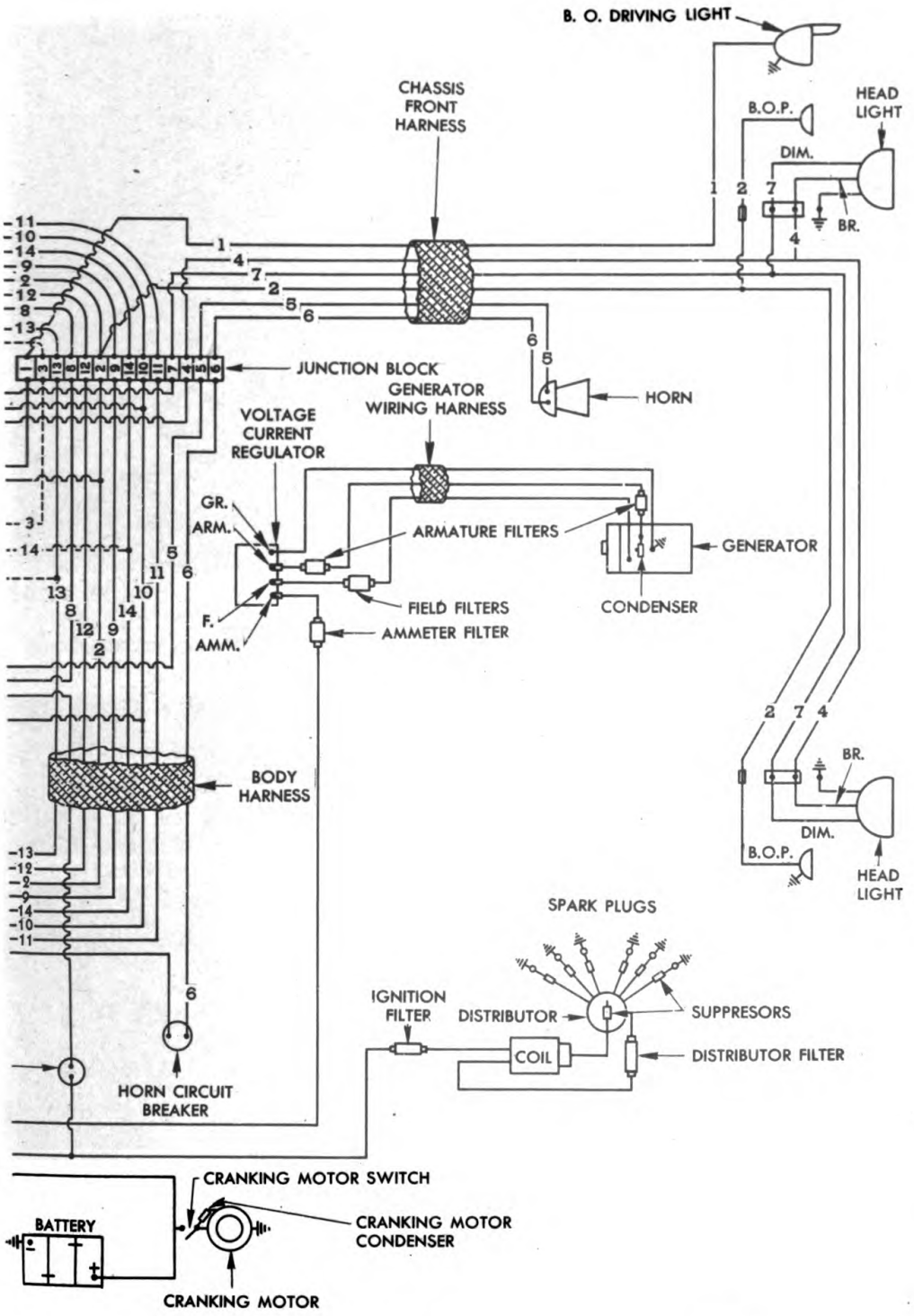


NOTE

NUMBERS ON JUNCTION BLOCK AND WIRING CORRESPOND WITH NUMBERS SHOWN ON WIRING HARNESS CONNECTION TABLES

Figure 48

ELECTRICAL SYSTEM, INSTRUMENTS AND GAGES



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Wiring Diagram

1½-TON 4 x 4 TRUCK (Chevrolet)

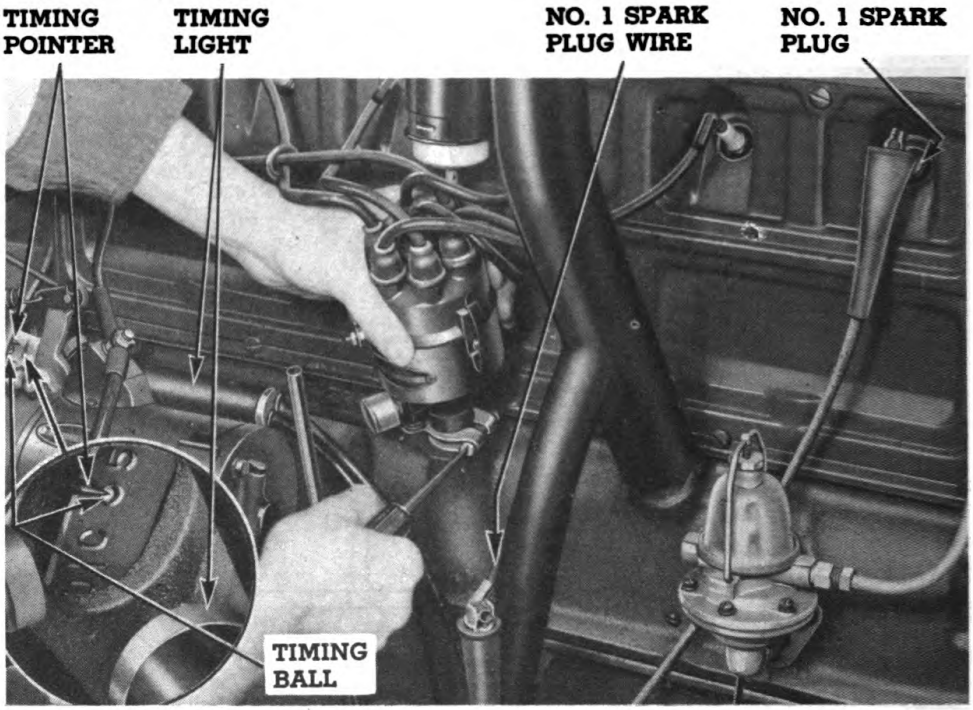


Figure 49—Setting Engine Timing

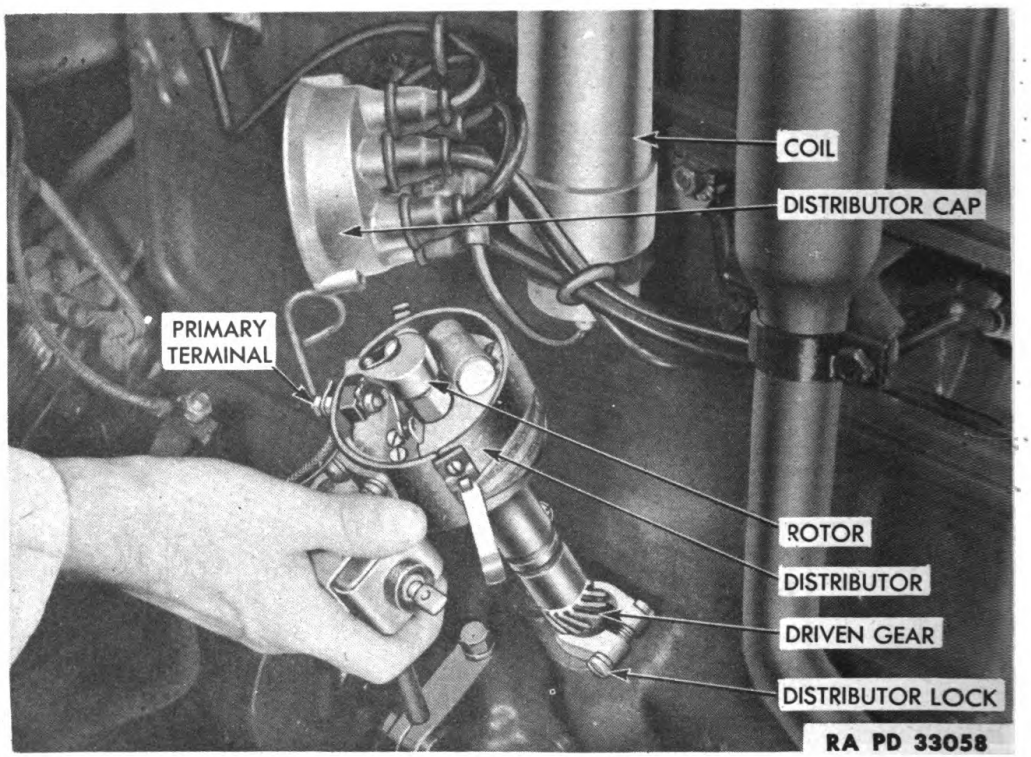


Figure 50—Distributor Installation

as the one placed on the distributor just removed. Remove the cap from the new distributor, and transfer the spark plug wires from the old cap to the new one, one at a time, to make sure the firing order will be correct.

(b) Set Distributor for Installation. If the engine crankshaft has been turned, since the distributor was removed, hand-crank the engine to place the engine in No. 1 cylinder firing position. Turn the distributor shaft by the rotor in a clockwise direction until the contact tip on the rotor lines up with the scratch mark made on the housing, and then about ¼ inch further. This is necessary to compensate for the angle of the distributor gear when it engages the gear on the camshaft.

(c) Install Distributor. Install distributor through distributor clamp, and into opening in block with grease cup on distributor at right angles to cylinder block; continue to push distributor down until the gears are engaged. If the distributor bottoms before it is pushed all the way down, it will be necessary to crank the engine slowly, while at the same time pressing down lightly on the distributor, until the distributor moves all the way down. This is necessary in order to pick up the drive tang on the oil pump shaft. Tighten distributor clamp screw just snug while making sure that grease cup is at right angles to the cylinder block.

(d) Install Distributor Cap. Install cap on distributor and clamp in place. Set octane selector so that center calibration mark on rear of distributor clamp is in line with mark on machined surface of the block.

(e) Time Engine. Connect a timing light to the No. 1 spark plug; then start the engine and run it at idling speed. Loosen the distributor clamp, and turn the distributor body either in a clockwise or counterclockwise direction, until steel ball in flywheel lines up with pointer in flywheel housing (fig. 49). Tighten the distributor clamp, and replace the valve cover and valve cover air cleaner.

88. IGNITION COIL, IGNITION SWITCH, AND SPARK PLUGS.

a. Ignition Coil.

(1) REMOVAL (fig. 18). Remove the two nuts and lock washers from the two terminals on top of the coil. Tag the wires "positive" (+) and "negative" (−) so they can be installed on the proper terminals. Pull the high tension wire out of terminal at bottom of coil. Remove the two screws that retain coil to side of engine, and lift off the coil.

(2) INSTALLATION. Place coil in position on engine, and install the two retaining screws and lock washers. Push the high tension wire in place in the lower terminal. Install positive wire on positive terminal, and negative wire on negative terminal on top of coil, and install the retaining nuts and lock washers. Tighten the nuts and mounting screws securely.

b. Ignition Switch Replacement. Unscrew the ignition switch retaining ring on face of instrument panel, and push the switch out of hole in panel. Reach under panel and bring the switch down as far as it will go, so that it will be accessible. Obtain a new switch, and change the wires from the old switch to the new switch. Place switch in panel, and install the retaining ring.

c. Spark Plug Adjustment (fig. 20). Remove spark plugs, and use a round feeler gage to set the gap at 0.040 inch. Place a new gasket on plug and screw plug in finger-tight; then tighten ½ to ¾ turn with a wrench. NOTE: *If it is necessary to use the old gasket, tighten ⅛ to ¼ turn with a wrench.*

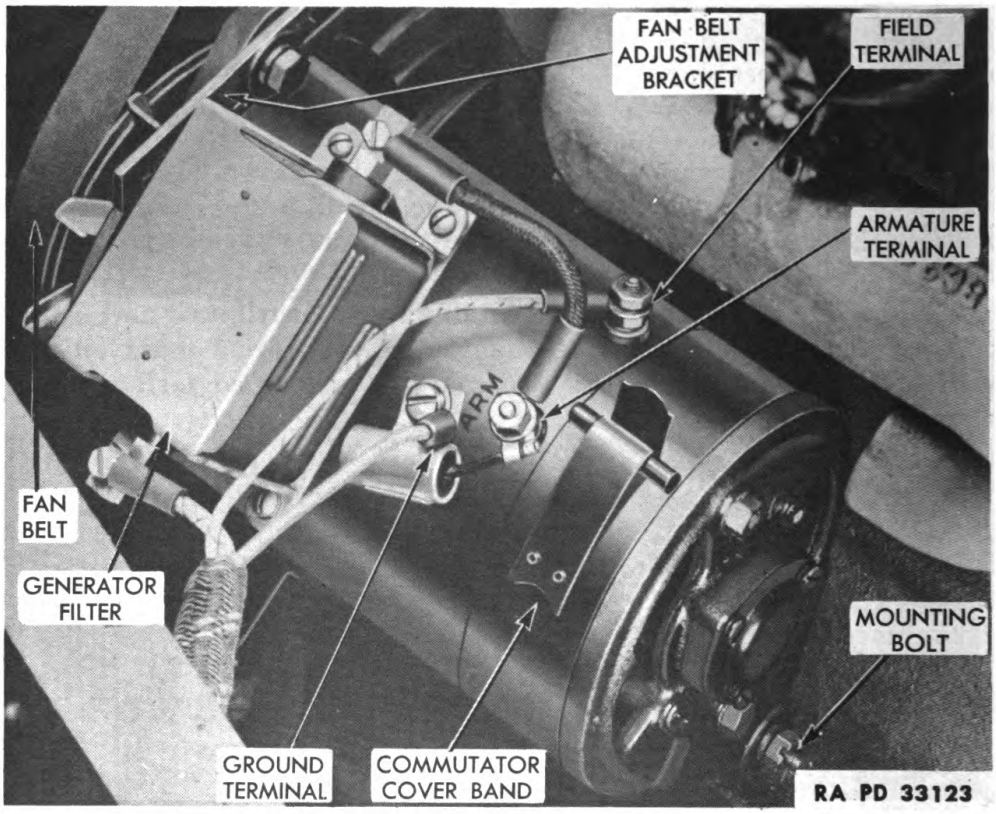
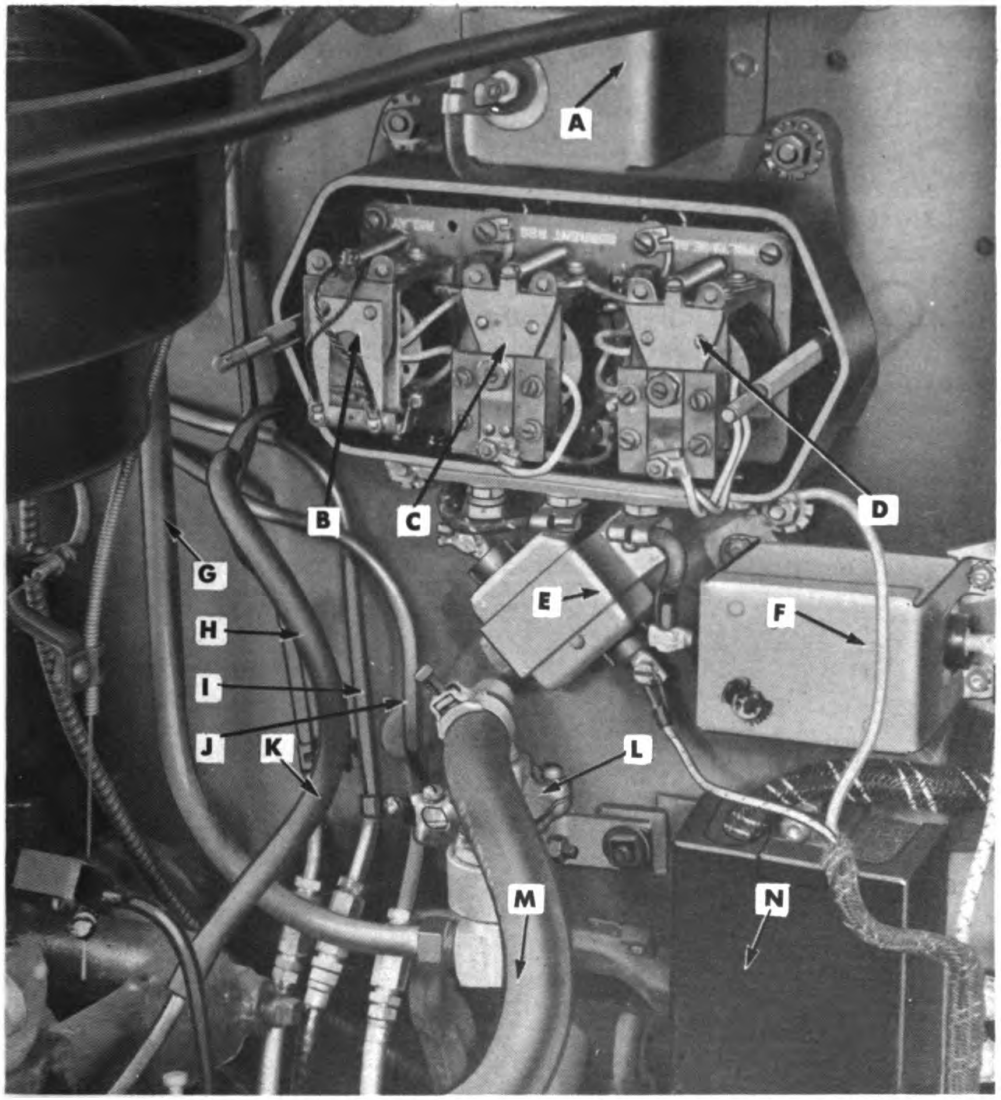


Figure 51—Generator Assembly

89. GENERATOR AND REGULATOR.

a. Description and Tabulated Data.

(1) DESCRIPTION (fig. 51). The generator is mounted on a bracket at the left side of the engine near the front, and is driven by the fan belt. The function of the generator is to convert a small amount of mechanical energy from the engine into electrical energy which is stored in the battery. The output of the generator is controlled by a combination voltage and current regulator mounted on the dash. This regulator is adjusted to prevent the voltage rising above 7.5



A—AMMETER FILTER
B—CUT-OUT RELAY
C—CURRENT REGULATOR
D—VOLTAGE REGULATOR
E—GENERATOR FIELD FILTER
F—ARMATURE FILTER
G—VACUUM LINE TO HYDROVAC
H—LINE TO OIL PRESSURE GAGE
I—OIL FILTER INLET LINE
J—OIL FILTER OUTLET LINE
K—WINDSHIELD WIPER VACUUM LINE
L—HYDROVAC VACUUM CHECK VALVE
M—VACUUM LINE TO CHECK VALVE
N—WIRING HARNESS JUNCTION BLOCK

RA PD 33070

Figure 52—Voltage Regulator (Cover Removed)

volts, and the current from rising above 40 amperes, thereby preventing damage to either the battery or generator.

(2) DATA.

(a) Generator.

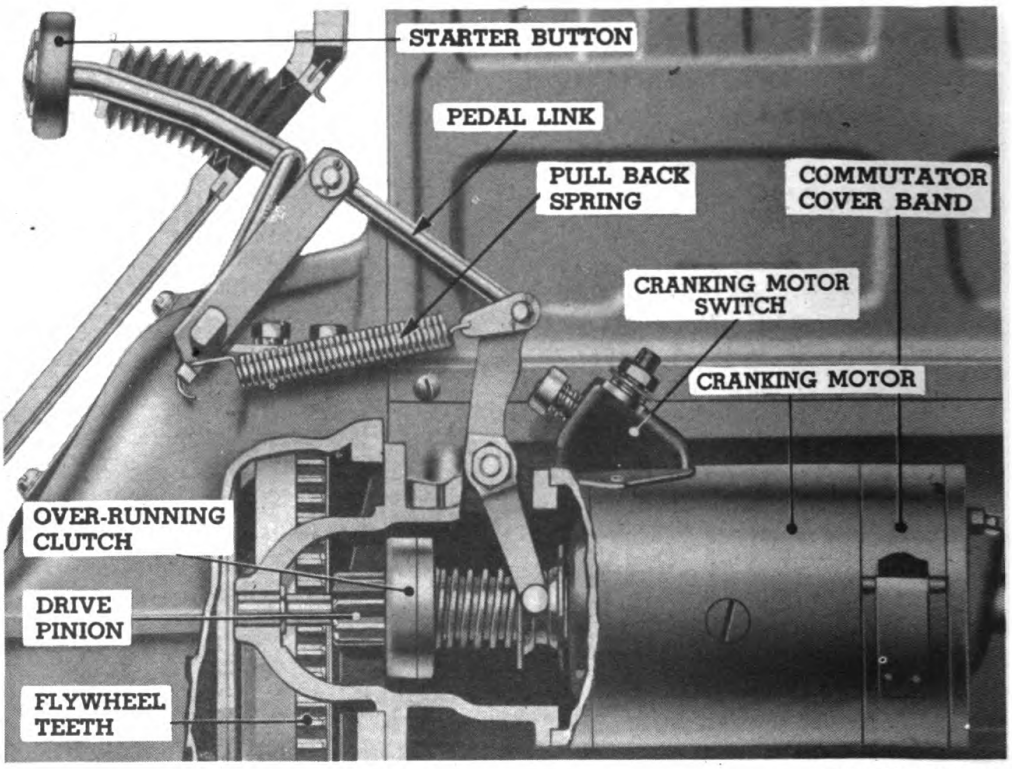
Make	Delco-Remy
Model	1105860
Voltage	6

(b) Regulator.

Make	Delco-Remy
Model	1118468
Voltage setting	7.5 volts (hot)
Current setting	40 amps (hot)

b. Generator.

(1) REMOVAL. Disconnect the three wires from terminals on top of generator. Identify each wire with a tag. Remove the cap screw from slotted brace on top of generator. Push generator toward engine, and lift the fan belt off generator pulley. Remove the two bolts and nuts at bottom of generator that retain generator to mounting bracket, and lift off the generator.



RA PD 330813

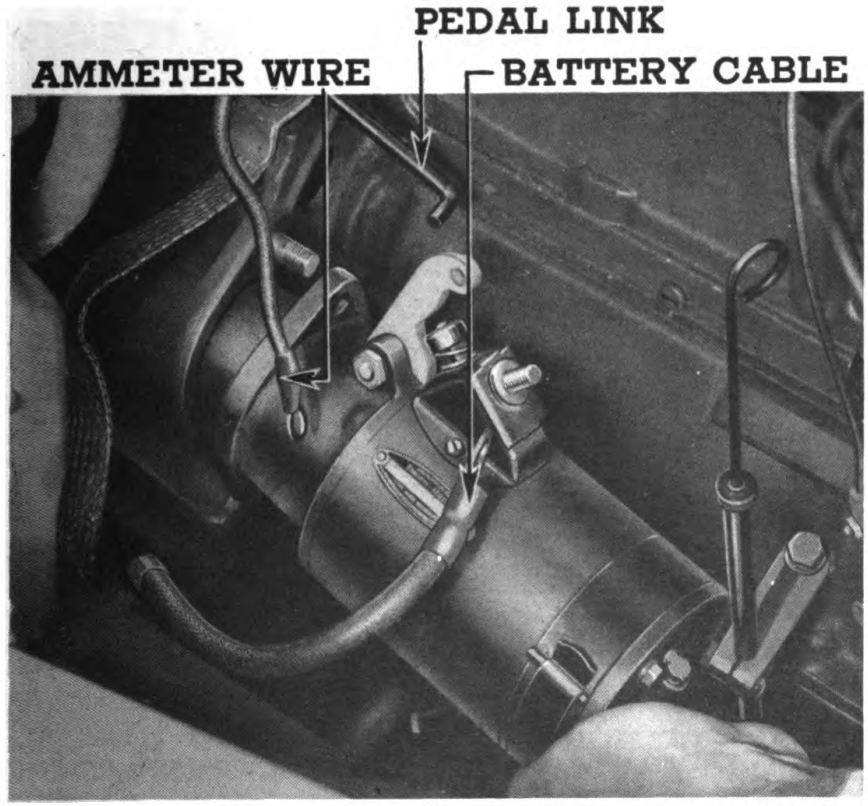
Figure 53—Cranking Motor and Pedal Linkage

(2) INSTALLATION. Place the generator in position on the mounting bracket and install the two retaining bolts, nuts, and lock washers. Install the bolt, flat washer, lock washer, and slotted brace, but do not tighten the bolt and nut. Place fan belt on generator pulley and adjust the fan belt (par. 82). Install the three wires on the same terminals on generator from which they were removed.

c. Regulator (fig. 52).

(1) REMOVAL. Disconnect the four wires from the regulator. Identify each wire with a tag and tape end of wire that was removed from battery terminal to prevent it from touching metal, causing a short circuit. Remove the four nuts and lock washers attaching regulator to dash, and lift off the regulator.

(2) INSTALLATION. Check and make sure the dash is clean at regulator mounting holes, and also that the four mounting legs on regulator are clean. Then place regulator in position on dash and install the four mounting bolts with a lock washer on each side of mounting legs. Connect the four wires on the same terminals from which they were removed. Start engine and check the operation by noting reading of ammeter.



RA PD 330814

Figure 54—Cranking Motor Removal

90. CRANKING MOTOR AND SWITCH.

a. Description and Tabulated Data.

(1) DESCRIPTION (fig. 53). The starting system consists of the battery, cranking motor, cranking motor switch, battery cable, and ground strap. The battery supplies the electrical energy to turn the

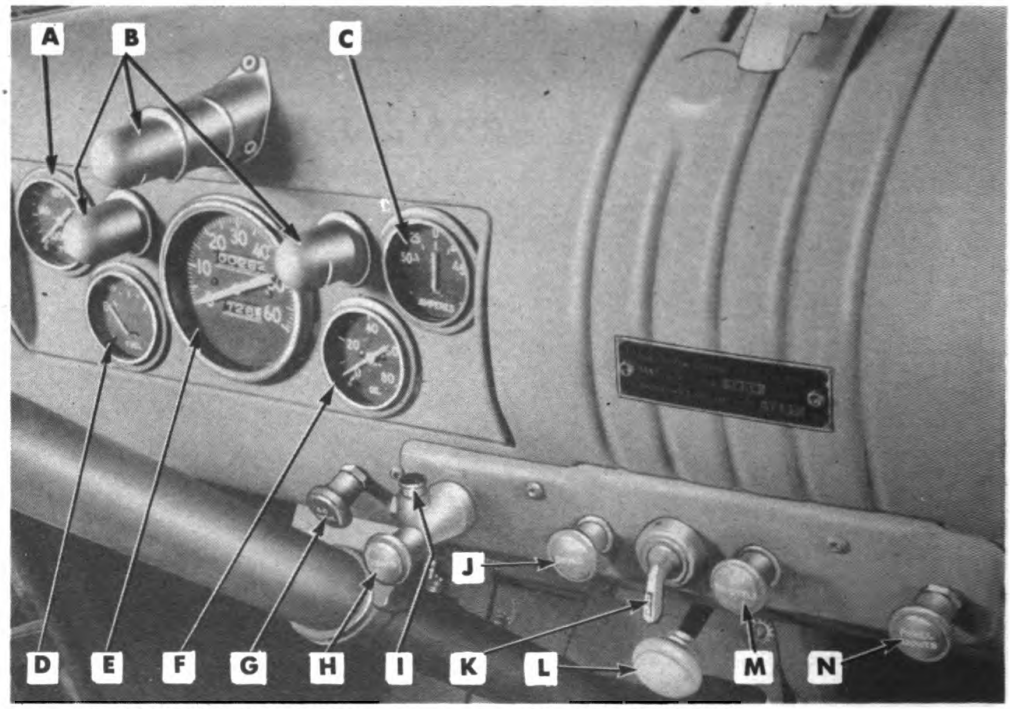
cranking motor when the switch is closed, and the cranking motor converts the electrical energy into mechanical energy which does the actual work of cranking the engine.

(2) DATA.

Cranking motor make	Delco-Remy
Model	1107055
Voltage	6

b. Cranking Motor.

(1) REMOVAL (fig. 54). Remove the nut and lock washer that retain the battery cable and ammeter wire to the cranking motor



A—TEMPERATURE INDICATOR
B—INSTRUMENT PANEL LIGHTS
C—AMMETER
D—FUEL GAGE
E—SPEEDOMETER
F—OIL PRESSURE GAGE
G—BLACKOUT DRIVING LIGHT SWITCH
H—LIGHT SWITCH
I—BLACKOUT LIGHT BUTTON
J—CARBURETOR CHOKE CONTROL
K—IGNITION SWITCH
L—COWL VENTILATOR CONTROL LEVER
M—HAND THROTTLE
N—INSTRUMENT PANEL LIGHT SWITCH

RA PD 33076

Figure 55—Instruments and Switches

switch, and lift off the cable and ammeter wire. Wrap tape around end of battery cable so that the terminal does not contact any metal. Disconnect the lever linkage pull-back spring. Then remove the cotter pin, and disconnect pedal link from top of drive mechanism shift lever. Remove the two nuts and lock washers that retain cranking motor assembly to clutch housing, and lift out the assembly.

(2) INSTALLATION. Place the cranking motor in position in clutch housing and install the two retaining nuts and lock washers. Connect the pedal link to drive mechanism lever, and install the spring clip and cotter pin. Install the pull-back spring. Place the battery cable and ammeter wire on the cranking motor switch post, and install the retaining nut and lock washer.

d. Cranking Motor Switch.

(1) REMOVAL. Remove the nut and lock washer that retain the battery cable to the switch terminal and lift the cable, ammeter wire, and condenser wire off the switch. Tape end of cable to prevent shorts. Remove the two screws that retain switch to cranking motor, and lift off the switch assembly.

(2) INSTALLATION. Make sure that the two bakelite insulators are in place on each side of inside of switch, then place the switch in position on cranking motor, and install the condenser and two mounting screws and lock washers. Place the condenser lead, battery cable, and ammeter wire on the switch terminal, and install the retaining nut and lock washer.

91. INSTRUMENTS AND GAGES.

a. Description (fig. 55). The instruments and gages are located on the left side of the instrument panel, and consist of a temperature indicator graduated in degrees Fahrenheit, fuel gage, speedometer, oil pressure gage, ammeter, and light switches.

b. Temperature Indicator Replacement. Drain the radiator and remove the heat unit from adapter at left rear of cylinder head. Remove bolt and clip attaching temperature indicator lead to bond strap. Remove the two nuts and lock washers that retain indicator unit to clamp in back of instrument panel, and pull indicator unit out of face of instrument panel, at the same time pulling the heat unit through the dash. Install a new assembly in the reverse manner.

c. Fuel Gage.

(1) INTRODUCTION. The fuel gage is composed of two units; the indicating unit on the instrument panel, and the unit in the fuel tank.

(2) INDICATOR UNIT REPLACEMENT. Disconnect the two wires from back of indicator unit. Remove the two nuts from back of unit, and lift out unit. Install a new unit in the reverse manner, making sure to install the insulators over posts and in holes in clamp.

(3) TANK UNIT REPLACEMENT (fig. 56). Remove the wire from terminal on tank unit and the ground wire from under one of the mounting screws. Remove the screws that attach tank unit to top of tank, and remove the unit. Install a new tank unit in the reverse manner.

d. Light Switch Replacement. Loosen the set screw in side of knob, and unscrew knob until it comes off the shaft. Remove the

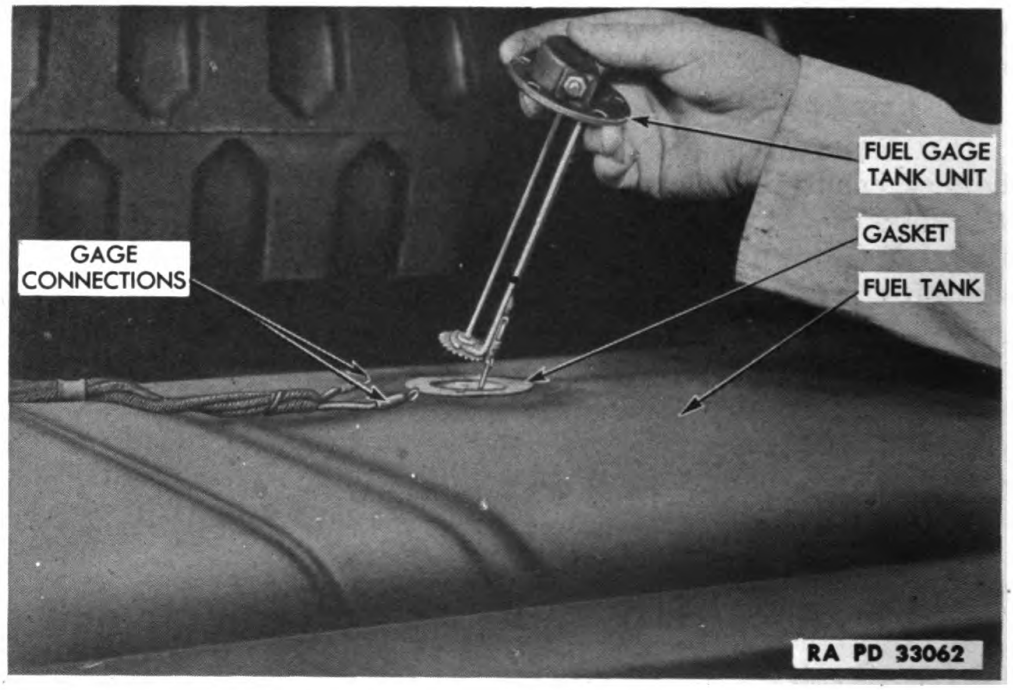


Figure 56—Fuel Gage Tank Unit Replacement

cap screw from left side of release button housing, and lift off the housing. Unscrew nut that retains the switch to the panel. Push switch through panel, remove one wire at a time, and install it on the new switch. Install the switch in the reverse manner.

e. Blackout Driving Light Switch Replacement. Loosen the set screw in the knob and unscrew the knob. Remove nut that retains switch to panel, and push switch out of panel. Remove one wire at a time, and install it on the new switch. Install the switch in the reverse manner.

f. Speedometer.

(1) DESCRIPTION. The speedometer is driven by a flexible shaft which in turn is driven by gears in the transfer case. The flexible shaft is housed in a cable.

(2) REPLACEMENT. Disconnect the flexible cable from the head, remove the two wing nuts that retain head to clamp bracket, and lift head out of face of instrument panel. Install a new speedometer head in the reverse manner.

g. Oil Pressure Gage Replacement. Disconnect the oil line from the back of gage at rear of instrument panel, and remove gage from back of instrument panel. Install a new gage in the reverse manner.

h. Ammeter Replacement. Disconnect wires from back of ammeter, being careful not to let the positive wire touch any metal. Remove the two nuts that retain ammeter to clamp bracket, and pull

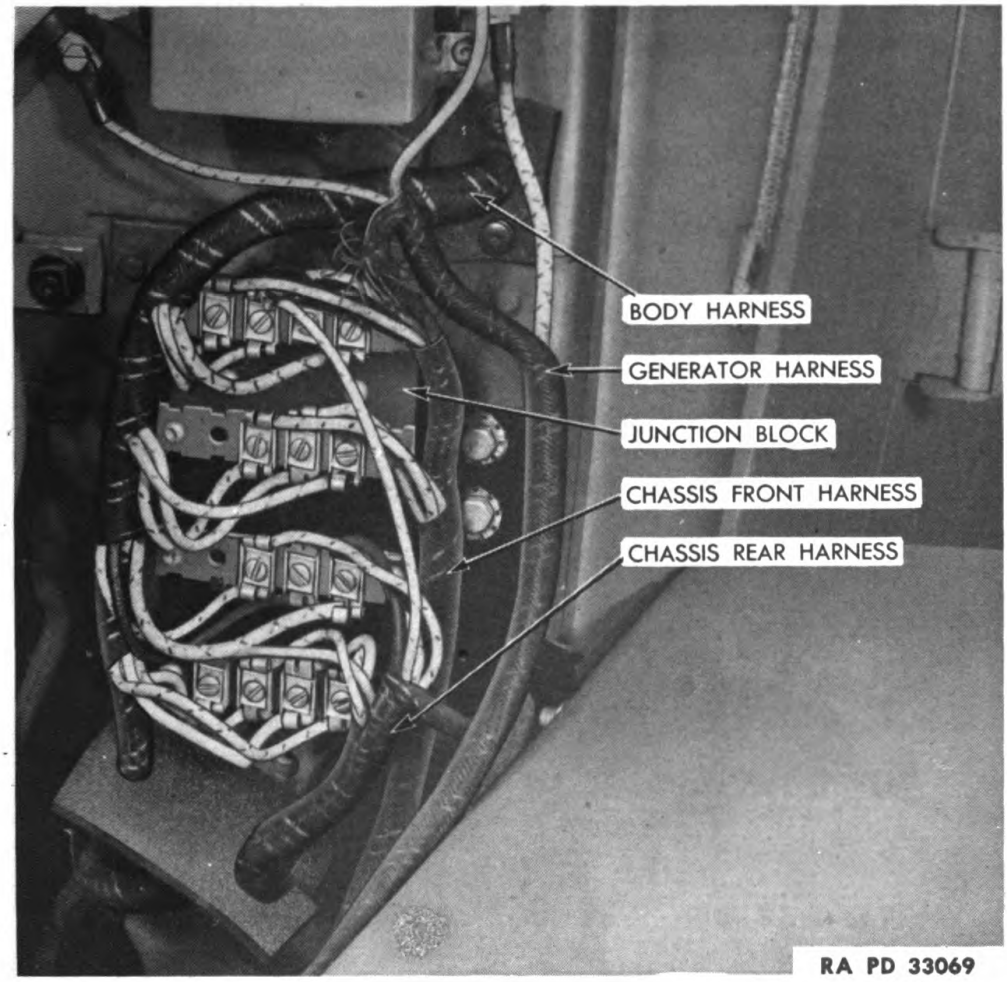


Figure 57—Wiring Harness Connections to Junction Block

ammeter out of face of instrument panel. Install a new ammeter in the reverse manner, making sure to install insulators over terminal posts.

92. WIRING (fig. 48).

a. Introduction. The wiring system that connects the various units of the vehicle with the battery consists of a battery cable, individual wires, and wiring harnesses which consist of several wires in

a loom. There are four main harnesses (fig. 57); namely, the front harness, rear harness, body harness, and the generator-to-regulator wiring harness. To assist in understanding the various electrical circuits, the major harnesses and junction block are explained and illustrated, giving the name of the circuit and color of the wire.

(1) BODY HARNESS. The body harness leads from the switches, instrument panel lights, and instruments on the instrument panel to the junction block on the left side of the dash.

(2) FRONT HARNESS. The front harness leads from the junction block on the left side of the dash to the headlight junction blocks on the lower hood side panels with leads taken off for the horn.

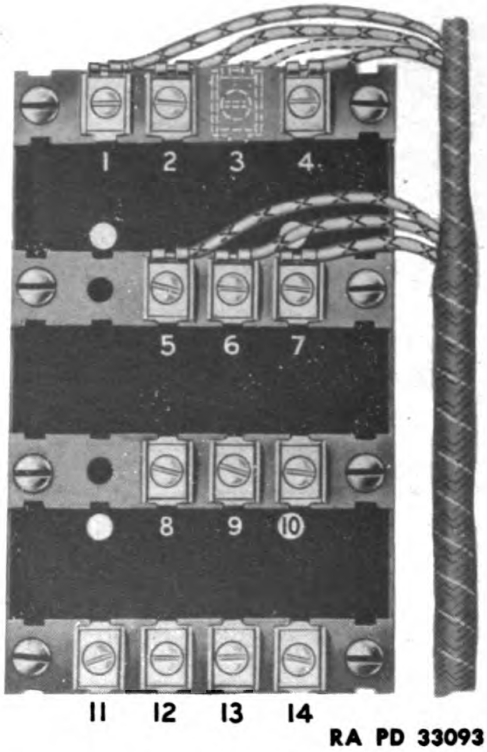


Figure 58—Chassis Front Wiring Harness Connections to Junction Block

(3) REAR HARNESS. The rear harness leads from the junction block on the left side of the dash to the taillight junctions at the left rear corner of the frame. A lead is also taken off for the fuel gage tank unit.

(4) GENERATOR-TO-REGULATOR HARNESS. The generator-to-regulator harness contains three wires, connecting the armature, field, and ground terminals of the generator to the regulator on the dash.

(5) CRANKING MOTOR TO AMMETER AND COIL WIRING. The cranking motor to ammeter and coil wires lead from the cranking motor switch to the ammeter, and also from the ignition switch to

the coil, with a jumper wire to the fuel gage circuit breaker. The wire that leads from the cranking motor switch to the ammeter supplies the current to all of the instrument panel connections.

(6) JUNCTION BLOCK (figs. 58, 59, and 60). The front and rear harnesses are connected to the body harness at the junction block on left side of dash under the hood. The terminals are not numbered, but for explanatory purposes, the terminals in the illustrations are numbered, and cross-referenced to the wiring diagram (fig. 48). In addition, the name of the circuit, and the color and size of the wires are given. These illustrations and explanations will simplify the replacement of the wiring harnesses, and checking the various circuits for short or open circuits.

b. Front Wiring Harness Connection Table (fig. 58).

Terminal No.	Connects to	Wire Size No.	Wire Color
1	Blackout driving light	16	Natural with red tracer
2	Blackout headlights	16	Natural with green tracer
4	Headlight upper beam	12	Natural with black cross tracer
5	Horn	14	Natural with black tracer
6	Horn	14	Natural with red tracer
7	Headlight lower beam	14	Natural with green tracer

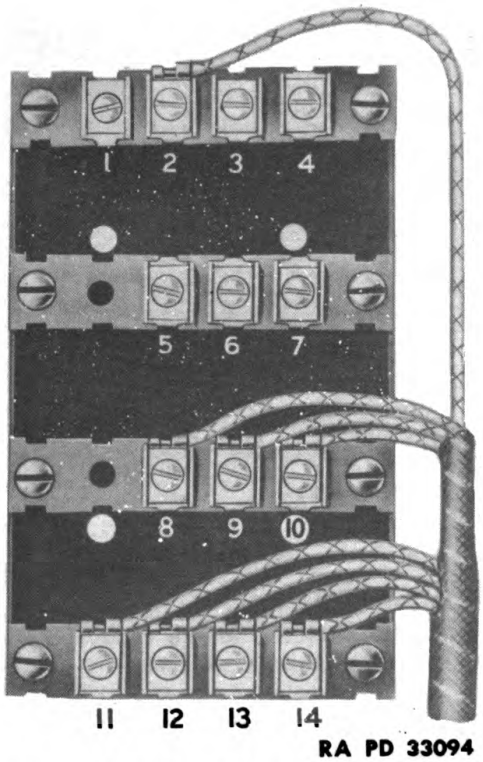


Figure 59—Chassis Rear Wiring Harness Connections to Junction Block

1½-TON 4 x 4 TRUCK (Chevrolet)

c. Rear Wiring Harness Connection Table (fig. 59).

Terminal No.	Connects to	Wire Size No.	Wire Color
2	Blackout taillights	16	Natural with green tracer
3	Trailer connector BK terminal (G-7113 models only)	16	Natural with green tracer
8	Fuel gage	16	Natural with black tracer
9	Trailer connection taillight	14	Black
10	Service taillight	16	Natural with black cross tracer
11	Service stop light	16	Natural
12	Blackout stop light	16	Natural with green cross tracer
13	Stop light switch	14	Natural
14	Stop light switch and stop light terminal on trailer connection	14	Natural with black tracer

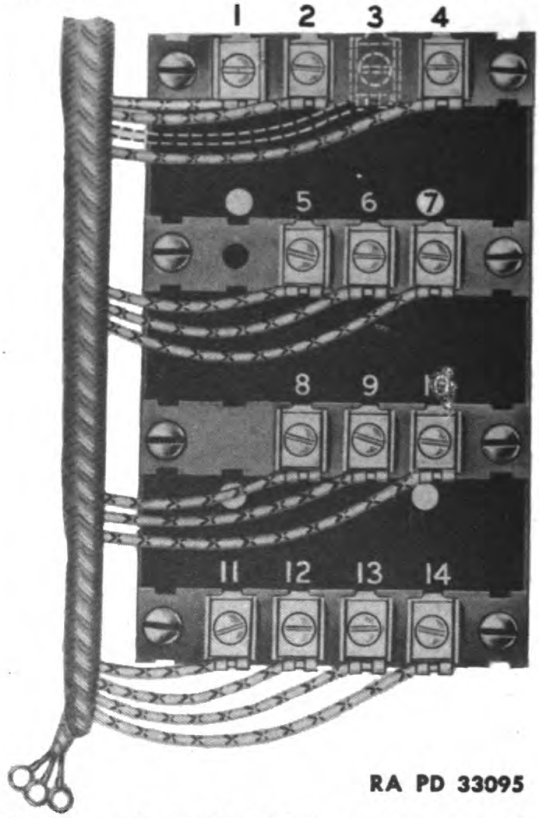


Figure 60—Chassis Body Wiring Harness Connections to Junction Block

d. Body Wiring Harness Connection Table (fig. 60).

Terminal No.	Connects to	Wire Size No.	Wire Color
1	Blackout driving light	16	Natural with red tracer

ELECTRICAL SYSTEM, INSTRUMENTS AND GAGES

Terminal No.	Connects to	Wire Size No.	Wire Color
2	Lighting switch blackout headlight terminal "BHT"	16	Natural with green tracer
3	Trailer brake controller BK terminal (G-7113 models only)	16	Natural with green tracer
4	Dimmer switch bright (upper beam) terminal	12	Natural with black cross tracer
5	Horn button	14	Natural with black tracer
6	Horn circuit breaker	14	Natural with red tracer
7	Dimmer switch dim (lower beam) terminal	14	Natural with green tracer
8	Fuel gage	16	Natural with black tracer
9	Lighting switch trailer taillight terminal "TT"	14	Black
10	Lighting switch terminal "HT," also center terminal on dimmer switch and instrument panel light switch	12	Natural with black and red cross tracers
11	"S" terminal on light switch	16	Natural
12	"BS" terminal on light switch	16	Natural with green cross tracer
13	"SW" terminal on light switch	14	Natural
14	"SS" terminal on light switch	14	Natural with black tracer

e. Light Switch (fig. 61). The light switch has four positions. When the button is pushed in all the way, the switch is in the "OFF" position. Pulling the knob out to the first position turns on the blackout marker lights, the blackout taillights, and also provides a circuit for the blackout stop light and blackout driving light. Pulling the knob to the next position turns on the main driving lights and service tail and stop light. When the switch is all the way out, the service stop light is connected for use in daylight driving. The terminals are marked as shown in figure 61, and the connections to the junction block and ammeter are shown in the following table.

1½-TON 4 x 4 TRUCK (Chevrolet)

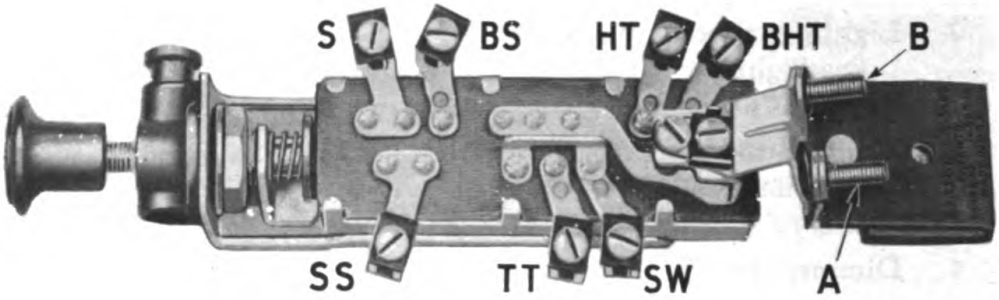


Figure 61—Main Light Switch

MAIN LIGHT SWITCH CONNECTION TABLE

Terminal Marking	Connection	Connects to
S	Service stop light	No. 10 terminal on junction block
BS	Blackout stop light	No. 11 terminal on junction block
HT	Head and taillight	No. 9 terminal on junction block

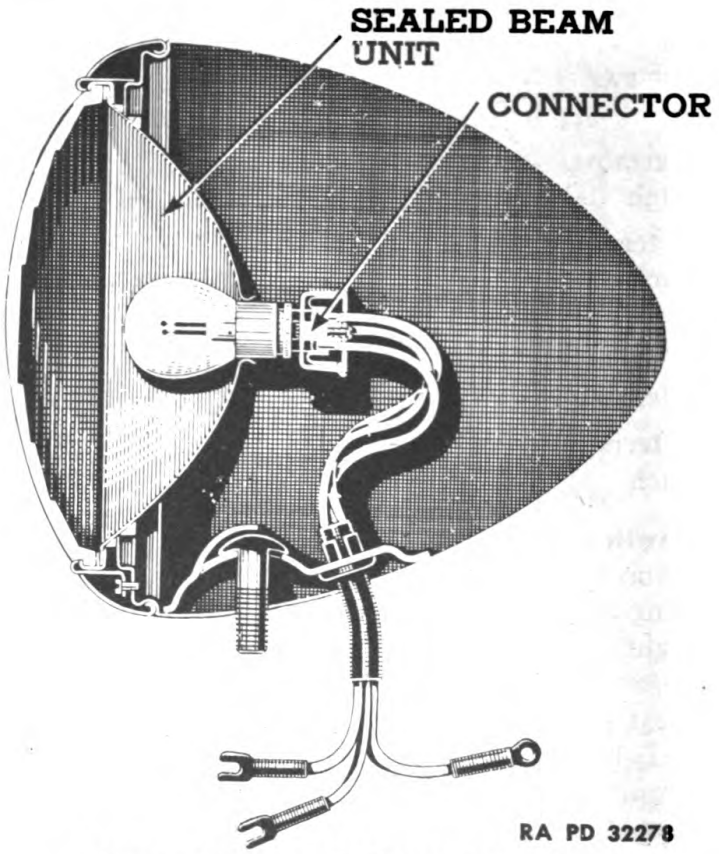


Figure 62—Headlight Construction

Terminal Marking	Connection	Connects to
BHT	Blackout head and taillights	No. 1 terminal on junction block
B	Light switch supply	Ammeter
SS	Stop light switch and stop light wire to trailer connector	No. 3 terminal on junction block
TT	Trailer taillight	No. 8 terminal on junction block
SW	Stop light switch feed	No. 12 terminal on junction block
A	No connections	

93. LIGHTING.

a. Description.

(1) HEADLIGHTS (fig. 62). The headlights are the "sealed beam" type; the reflector, lamp, and lens are a complete unit, and can only be replaced as a unit. The lower beam filament is positioned slightly to one side of the focal point in the reflector. This results in deflecting the lower beam to the right side of the road when approaching other vehicles going in the opposite direction. The headlights use a 6- to 8-volt, 45- to 35-watt triple-contact lamp.

(2) BLACKOUT DRIVING LIGHT (fig. 9). The blackout driving light is mounted on the left front fender alongside the headlight. It is used when driving in a blackout. The diffused beam pattern does not have a hot spot concentrated on the road; it casts illumination from 30 to 100 feet in front of the vehicle. The blackout driving light is equipped with a "sealed" unit that has a 6-volt, 10-candlepower lamp, and a hood and mask that diffuse the beam and prevent detection from overhead.

(3) BLACKOUT MARKER LIGHTS (fig. 9). The blackout marker lights are mounted on the front fenders; a dowel in the fender assures proper positioning of the light. These lights use a 6- to 8-volt, 3-candlepower, single-contact, bayonet-base lamp.

(4) BLACKOUT TAIL AND STOP LIGHT. The blackout tail and stop light is mounted on the rear of chassis at the right side, and contains two sealed units; one for the taillight, and the other for the stop light. Each unit consists of a housing, a lamp soldered to the housing, a filter, and lens. Both units use a 6- to 8-volt, 3-candlepower, single-contact lamp.

(5) BLACKOUT TAIL, SERVICE TAIL AND STOP LIGHT. The blackout tail, service tail, and stop light is mounted at the rear of the chassis on the left side. It is constructed similar to the blackout tail and stop light, the difference being in the service tail and stop light unit that contains a double-filament lamp, 3-candlepower for the taillight, and 21-candlepower for the stop light, and a lens made of ruby glass.

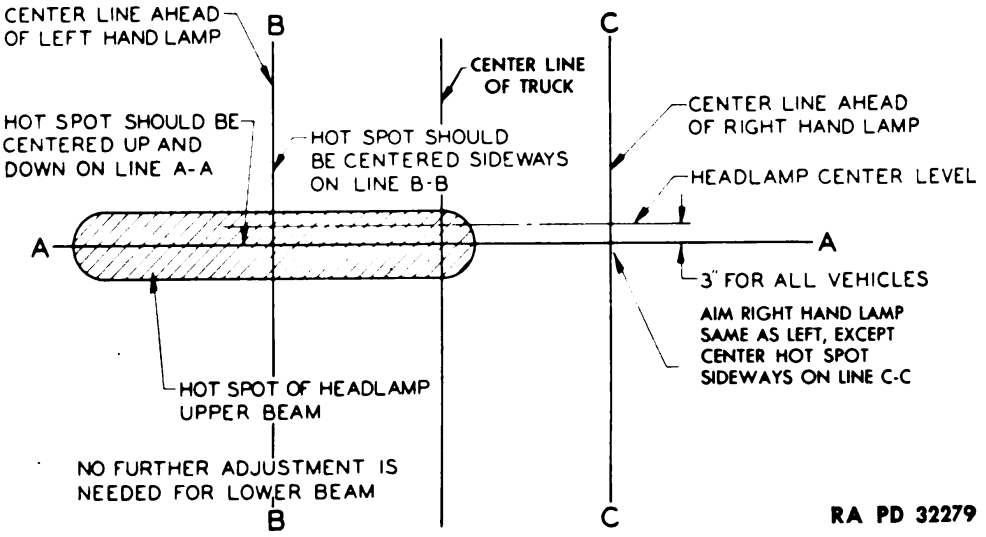


Figure 63—Headlight Aiming Diagram

b. Headlight Aiming.

(1) INTRODUCTION (fig. 63). Headlights may be aimed by the use of a portable aiming screen which can be constructed very easily. Construct a frame approximately 5 feet high and 8 feet long. The frame can be constructed of common lumber approximately 1 inch x 3 inches. Cover the frame with a piece of light-colored cloth; make a narrow, dark, vertical stripe down the center, and two stripes, 18 inches from each side of the center stripe and parallel to it, as shown by lines "B" and "C" in the illustration. Then place nails on the end upright of the frame so that the nails are 1 inch apart, beginning at about 2 feet from the bottom of the screen and continuing upward about 2 feet. Then secure a piece of black tape about ½- or ¾-inch wide and about 6 inches longer than screen is wide. Fasten a weight on each end of the tape to keep the tape stretched when laid across the nails as shown by line "A" in the illustration.

(2) AIMING HEADLIGHTS. Place the screen against a wall in a fairly dark corner of room that is fairly level. Run the vehicle directly in front of the screen so that the headlights are 25 feet from the screen. Measure from the floor to the center of the headlights, and place the black tape across the screen so that it is 3 inches below the center of the headlights. Turn on the upper beam of the headlights, and cover one of the lights. Check the location of the beam on the screen. The center of the hot spot should be centered on the intersection of the vertical and horizontal lines as shown in figure 63. If the aim is incorrect, loosen the nut on the headlight mounting bolt, and move the headlight body on its ball and socket joint until the beam is aimed as described above. Then tighten the mounting bolt nut, and check the other headlight in the same manner.

c. Headlight Replacement. Remove the two headlight harness leads and the ground lead from terminal block on inside of hood side panel, and pull the three wires through hole in side of vehicle in under the front fender. Remove the nut and washer that retain light to mounting bracket; then lift off the light, and pull the wire harness through hole in fender. Install a new light in the reverse manner, and aim.

d. Blackout Driving Light Replacement. Pull the sleeve connector apart on wire that leads from driving light to front wiring harness just inside of hood side panel. Pull the wire through hole in side of vehicle in under the front fender. Remove nut from bottom of light that secures light to fender, lift off the light, and pull the wire through hole in fender. Install a new light in the reverse manner.

e. Blackout Marker Light Replacement. The blackout marker lights are replaced in the same manner as the blackout driving light.

f. Blackout Tail and Stop Light Replacement. Push the bayonet connections in the light, at the same time turning them counterclockwise about ¼ of an inch; then pull the connection out of the lights. Remove the two nuts and lock washers that retain light to mounting bracket, and lift off the light. Install a new light in the reverse manner.

g. Blackout Tail, Service Tail, and Stop Light Replacement. The blackout tail, service tail, and stop light is replaced in the same manner as the blackout tail and stop light.

h. Headlight Sealed Beam Unit Replacement. Remove the three bolts that retain headlight mounting bracket to fender, and turn light away from the vehicle. Loosen the lens rim clamp screw, and lift off the rim. Remove the three screws that secure retainer ring to light body, and remove the ring. Pull the sealed beam unit out of the light body, and disconnect wiring connector from rear of the unit. Install a new sealed beam unit in the reverse manner. NOTE: *By removing the three bracket mounting bolts to turn the headlight, it will not be necessary to reaim the headlight after replacing a sealed beam unit.*

i. Blackout Marker Light Lamp Replacement. Remove the light rim retaining screw, and pull the rim out at the bottom; then raise it upward to release the stamped catch in cover from slot in top of light body. Push in the lamp and at the same time turn it counterclockwise about ¼ of an inch; then pull out the lamp. Install a new lamp in the reverse manner.

j. Blackout Driving Light Unit Replacement. Remove rim retaining screw at bottom of rim, and pull out rim and light unit. Disconnect the two wires from the light. Release the spring retainers and remove the lamp-unit retainer and lamp unit. Install a new sealed unit in the reverse manner.

k. Blackout Tail and Stop Light Unit Replacement. Push in bayonet connection at rear of light, turn it counterclockwise about ¼ of an inch, and pull out the bayonet connection. Remove the two screws that retain rim to light body, and lift off the light rim. Pull

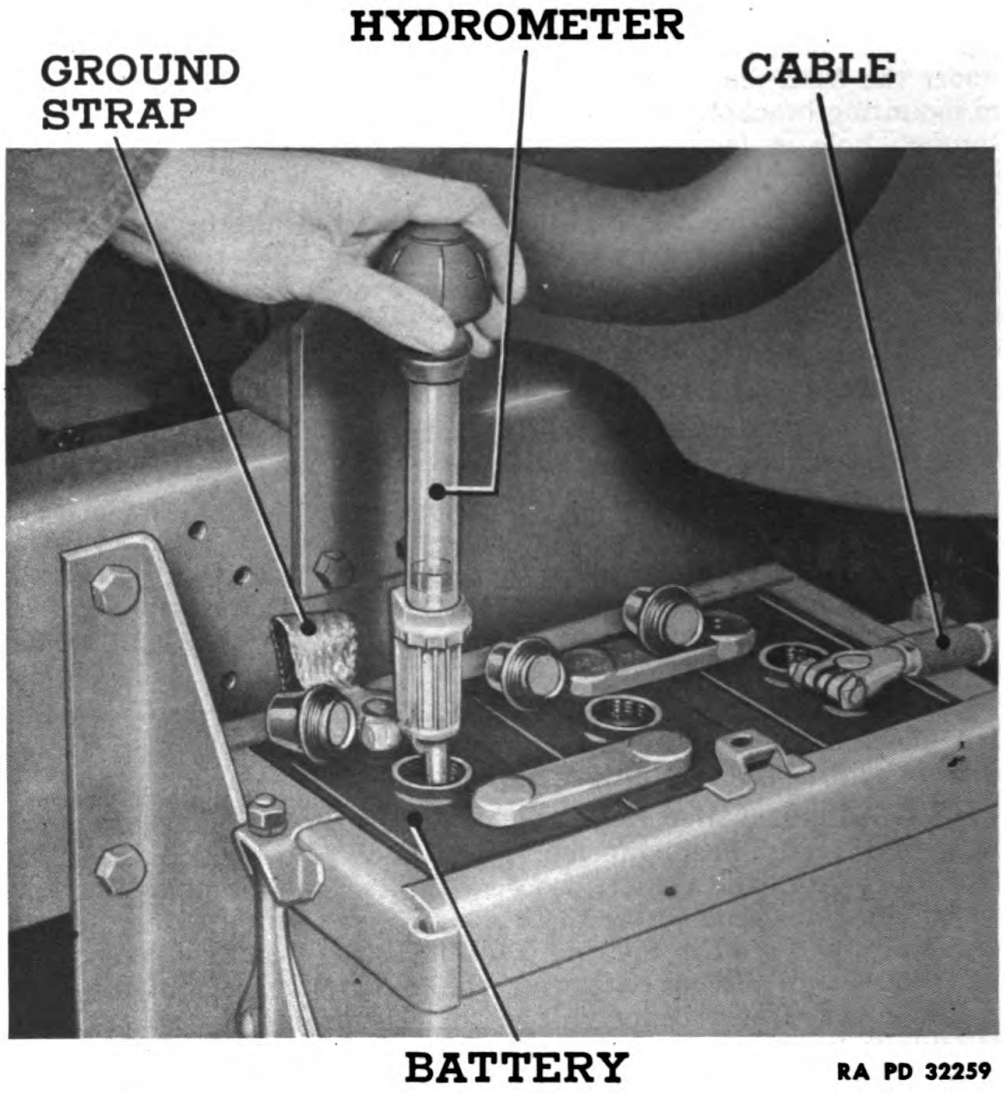


Figure 64—Specific Gravity Test of Battery

the lamp unit out of the socket and light body. Install a new lamp unit in the reverse manner.

l. Blackout Tail, Service Tail, and Stop Light Unit Replacement. The blackout tail, service tail, and stop light units are replaced in the same manner as the blackout tail and stop light units.

94. BATTERY.

a. Description and Tabulated Data.

(1) DESCRIPTION (fig. 64). The battery is mounted in a hanger located outside of the frame side rail to the rear of cab step on the right side of the truck. It is protected by a removable cover, attached by two thumb screws, that provides access for testing and filling the battery.

(2) DATA.

Make	Delco
Model	19C1
Number of plates	19
Ampere hour capacity at 20-hour rate	150

b. Inspection and Maintenance. Operation of the vehicle in zero or subzero temperatures makes frequent checking of the specific gravity of the electrolyte imperative, as a discharged or partially discharged battery will freeze at a higher temperature than a fully charged battery. The temperatures at which electrolyte will freeze are as follows:

Specific Gravity	Temperature (Fahrenheit)
1.180	−6°
1.200	−17°
1.220	−31°
1.240	−51°

After testing and filling the battery, install the three filler plugs, then check the terminals to see that they are tight and free of corrosion. If corrosion exists, scrape the terminal, and apply a coating of grease to the terminals. Check to see that the battery is tight in the hanger to prevent physical damage to the battery. Install the battery cover, and tighten the two wing nuts securely.

c. Removal. Unscrew the two thumb screws, and lift off the terminal cover. Loosen nuts on cable clamp bolts several turns, and spread ends of clamps to loosen them; then lift the cables with clamps off the battery posts. Remove the two nuts and lock washers that retain the battery retainer, and lift off the retainer. Lift the battery out of the hanger.

d. Installation. Place battery in hanger with positive or largest terminal post to the front. Place retainer on battery, install the two nuts and lock washers, and tighten them alternately until they are quite snug. Clean the terminal posts and cable terminals, and tap the cable clamps in position on the posts. Tighten the clamp bolts and nuts securely. Apply a coating of grease on the terminals; then install the terminal cover, and tighten the thumb screws securely.

95. RADIO SUPPRESSION EQUIPMENT.

a. Introduction.

(1) Radio suppression equipment is installed to control the radiation of radio interference by the electrical equipment of a vehicle, and also to control noise in the vehicle radio receiving set. It is important that the suppression system be maintained in perfect condition, as vehicles that radiate interference can be easily located by the use of short wave listening devices in the hands of the enemy.

(2) Radio suppression is accomplished on these vehicles by the use of two systems: one using resistor suppressors, filters, condensers, and bonding; and the other using suppressors, shielding and condensers. The first system is used on earlier production vehicles, and the second on later models.

1½-TON 4 x 4 TRUCK (Chevrolet)

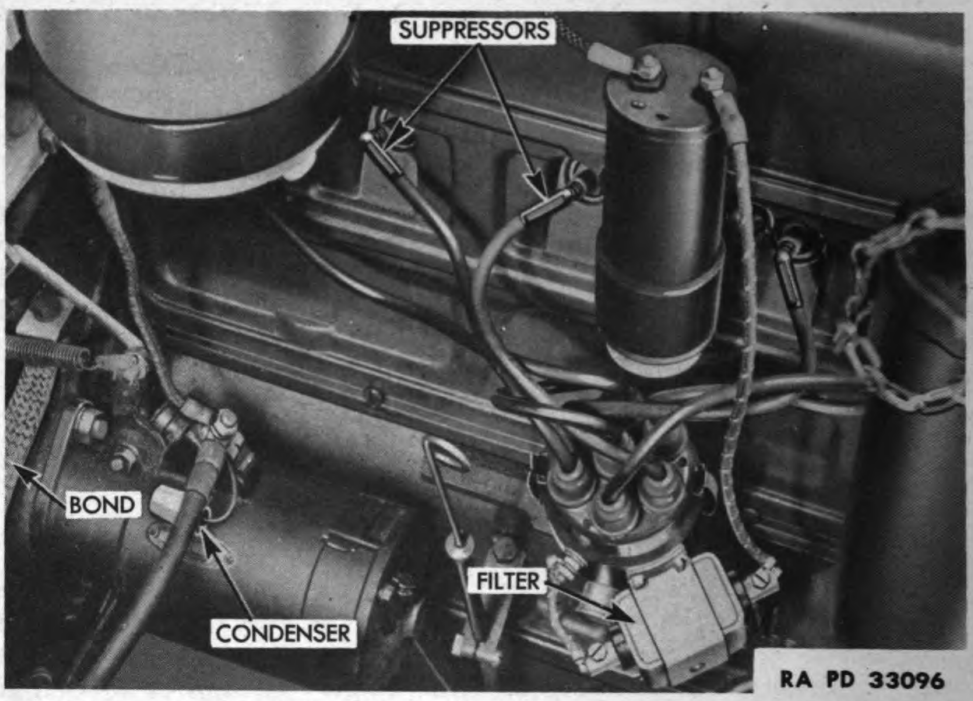


Figure 65—Suppressors, Distributor Filter, and Cranking Motor Condenser

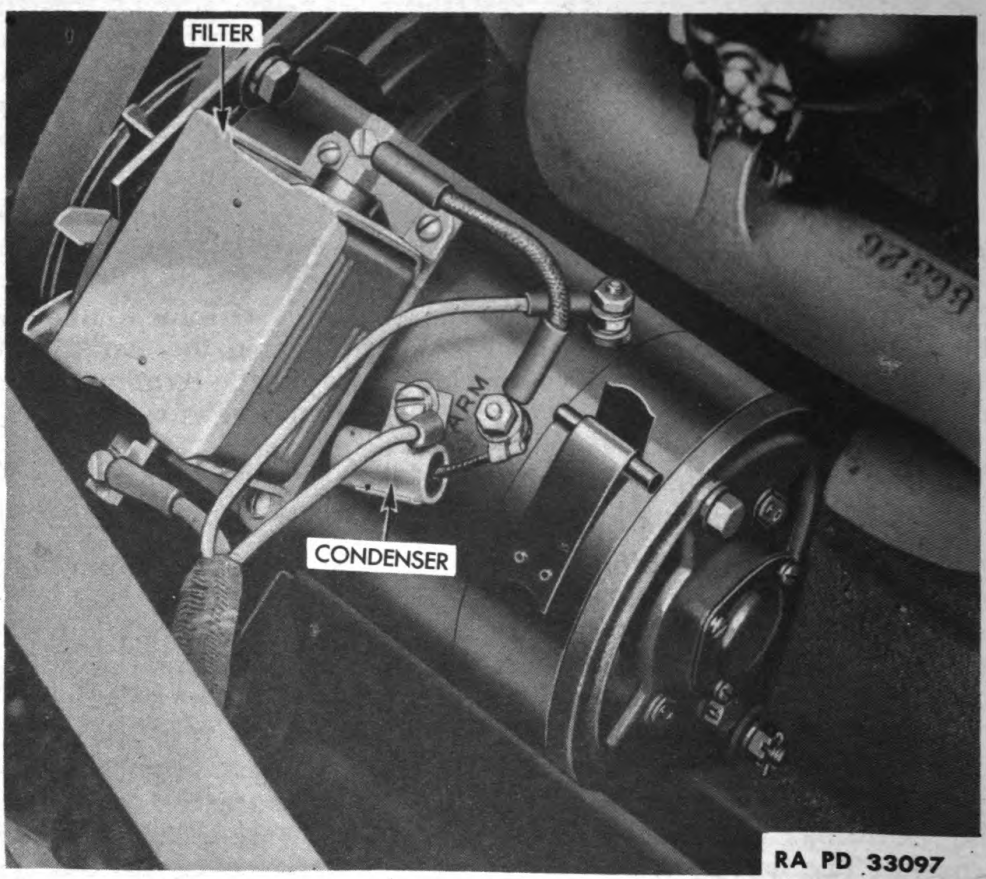


Figure 66—Generator Filter and Condenser

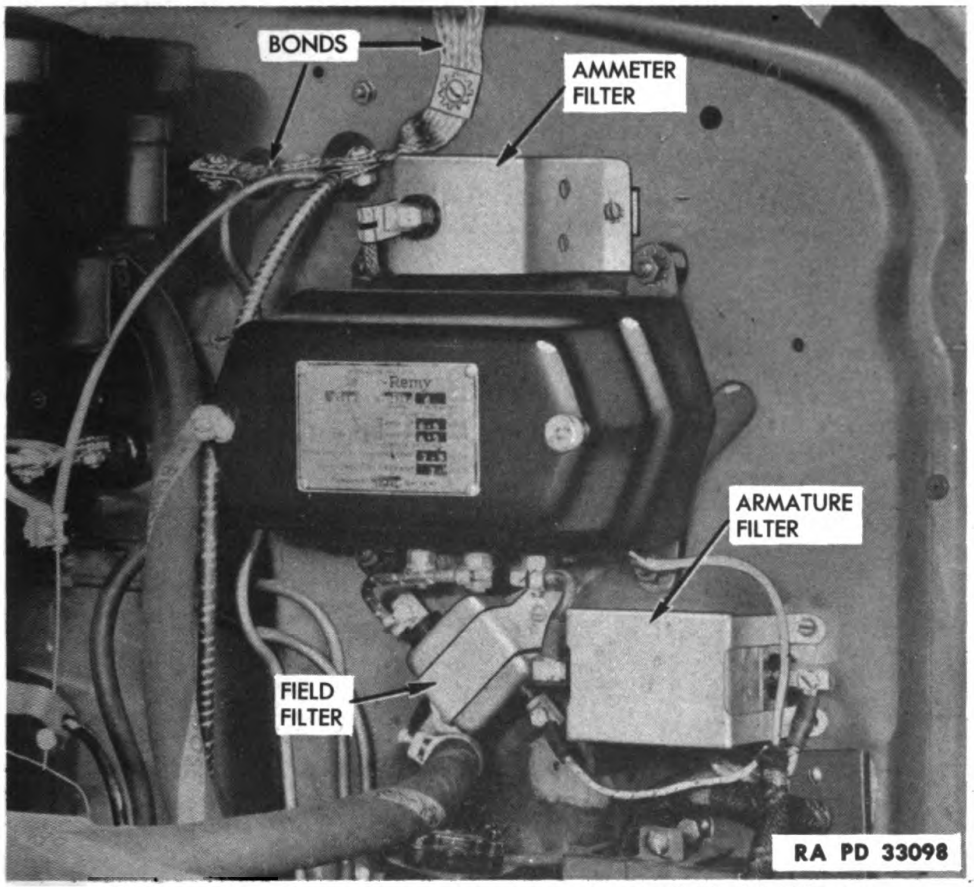


Figure 67—Armature, Ammeter, and Field Filters

b. Early Production System.

(1) GENERAL. Many early production models included radio suppression equipment of the first type mentioned in subparagraph **a** (2) above, consisting of 7 suppressors, 6 filters, 2 condensers, 13 flexible metal bond straps, a metal screen, and a number of plated bolts, nuts, and toothed lock washers.

(2) SUPPRESSORS (fig. 65). Suppressors are used on each high tension lead to the spark plugs, and also on the high tension lead from the coil to the center of the distributor cap. When installing a suppressor on a high tension wire, the wire and insulation should be cut flush and the suppressor screwed on to the wire, making sure the screw enters in the center of the wire strands. The snap-on terminal must make a good contact with the spark plug. The resistance of these suppressors is approximately 10,000 ohms.

(3) FILTERS (figs. 65, 66, 67, and 68). Six filters are used to prevent the continued transmission of any disturbance along the wires by bypassing it to ground. Four are used in the generator circuit, and two in the ignition circuit. When replacing a filter it is important that the terminal screws and mounting bolts be tightened securely.

(4) CONDENSERS. Two condensers are used; one on the generator (fig. 66), and the other on the cranking motor (fig. 65), to accomplish

1½-TON 4 x 4 TRUCK (Chevrolet)

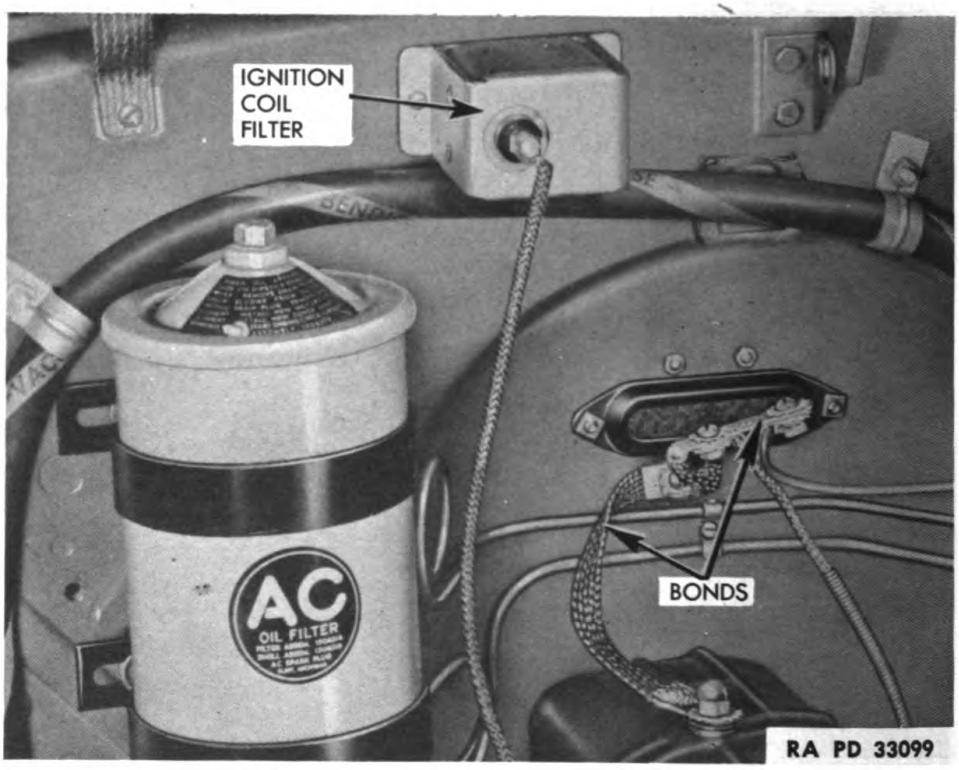


Figure 68—Ignition Coil Filter

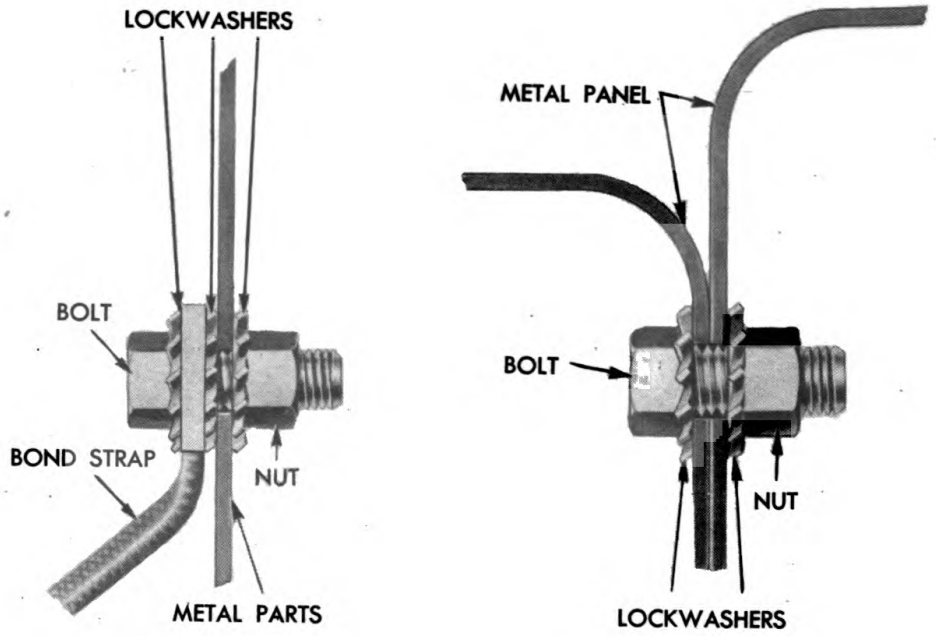


Figure 69—Methods Used in Bonding

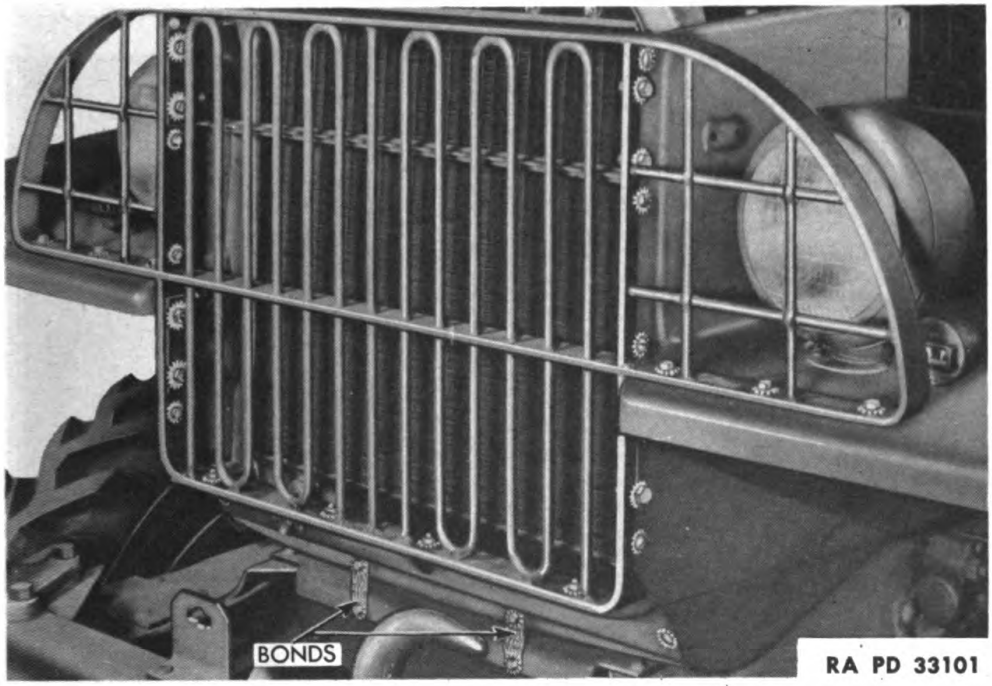


Figure 70—Front-end Bond Locations

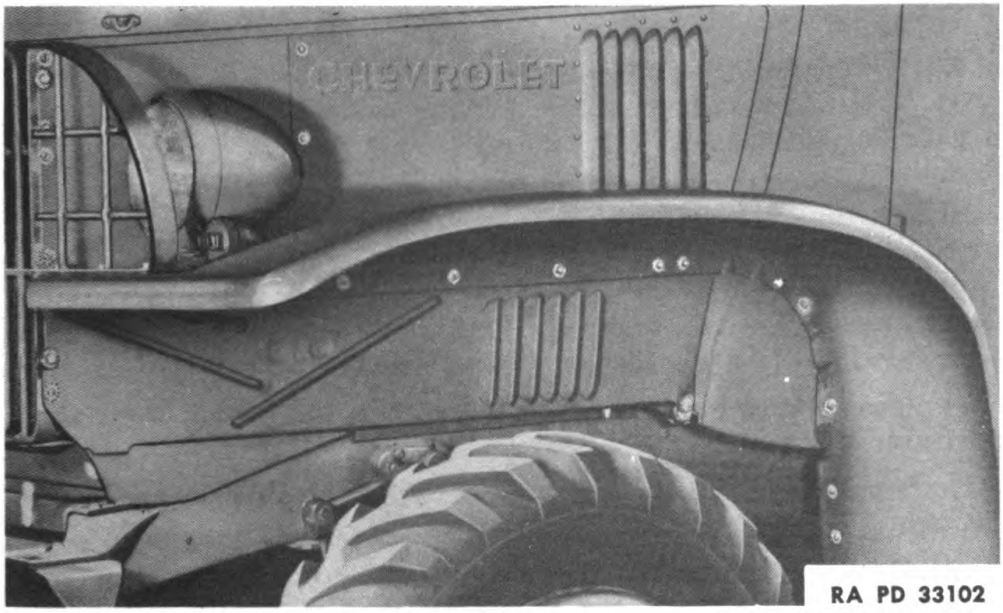


Figure 71—Bonding at Fender and Hood

the same purpose as the filters mentioned in subparagraph (3) above. The condenser retaining screws and terminals must be kept tight.

(5) BONDING. Bonding is accomplished by the use of 13 flexible metal straps, a metal screen welded at the hood side panel louvers, and numerous plated bolts, nuts, and toothed lock washers. The purpose of bonding is to keep all metal parts at a common potential. The method used to install the flexible metal straps is illustrated in figure 69. The bond straps are located at the following points:

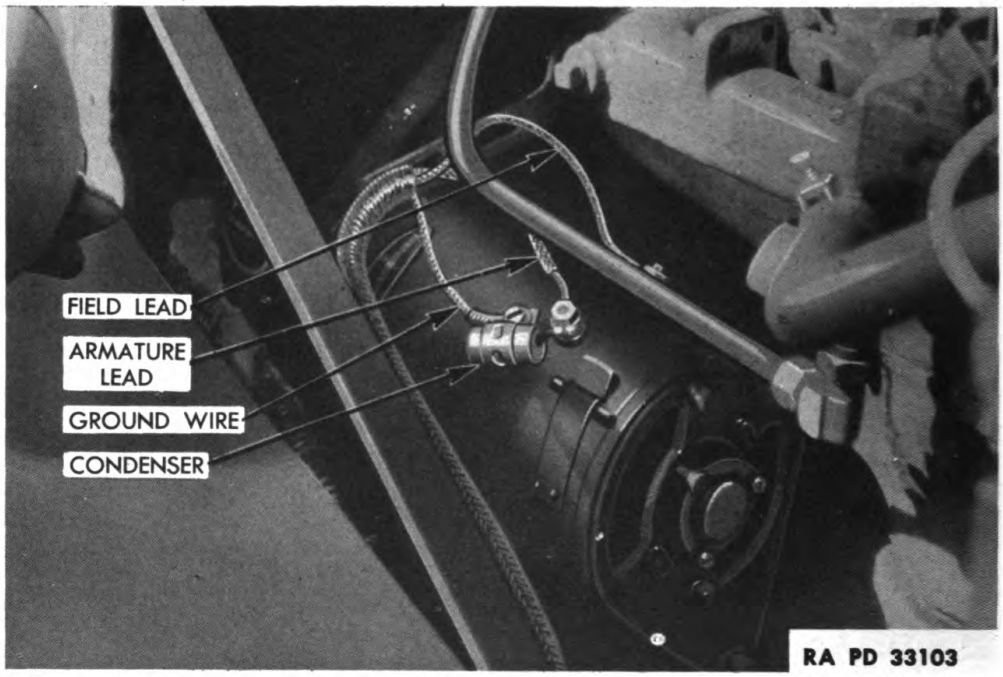


Figure 72—Generator Condenser

(a) Two bonds between the dash and hood.

(b) One bond connecting speedometer cable, throttle control, and oil gage line to dash.

(c) Two bonds, one between rear bolt on rocker arm cover and dash; the other connects the choke control and temperature indicator line to the dash.

(d) Two bonds between radiator support bracket and radiator lower baffle. On trucks equipped with front winch, the lower ends of the bond straps are attached to the front cross member.

(e) Two bonds, one on each side between the fender lower skirt and frame side rail.

(f) Two bonds, one on each side between cab side sill and frame side rail.

(g) One bond between clutch housing and left side pan rear bracket.

(h) One bond between front of oil pan and frame front cross member left side.

(i) The hood side panel louvers are shielded by welding a piece of metal screen to the inside of the side panel. It will be noted that toothed lock washers are placed under the head of the bolt and also the nut.

(j) Whenever any of the bonded parts are removed, make sure that the metal surfaces are clean at the bolt locations before installing the bolts and toothed lock washers; also tighten the bolts and

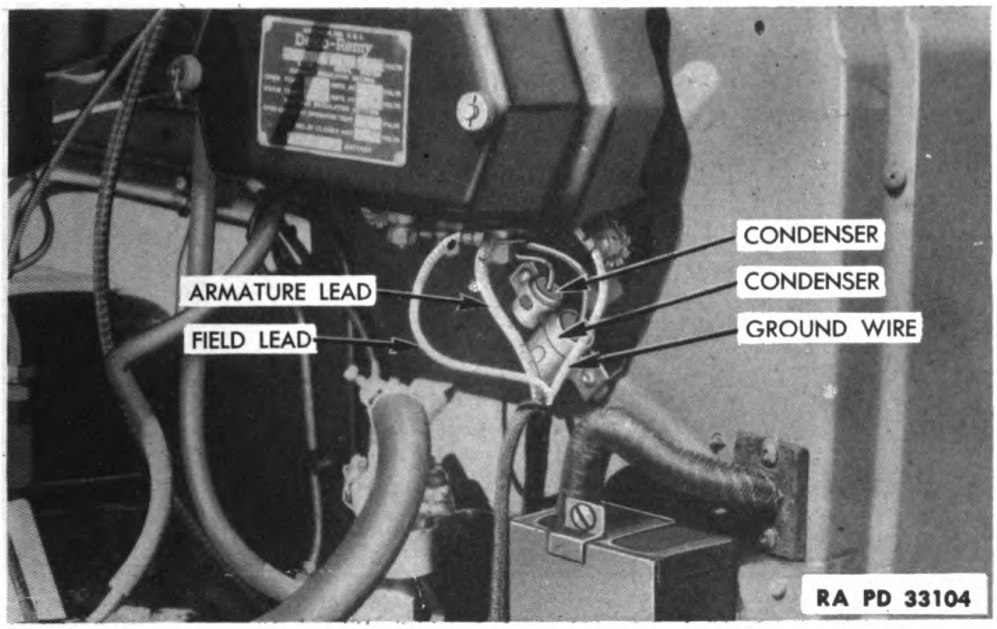


Figure 73—Regulator Condensers

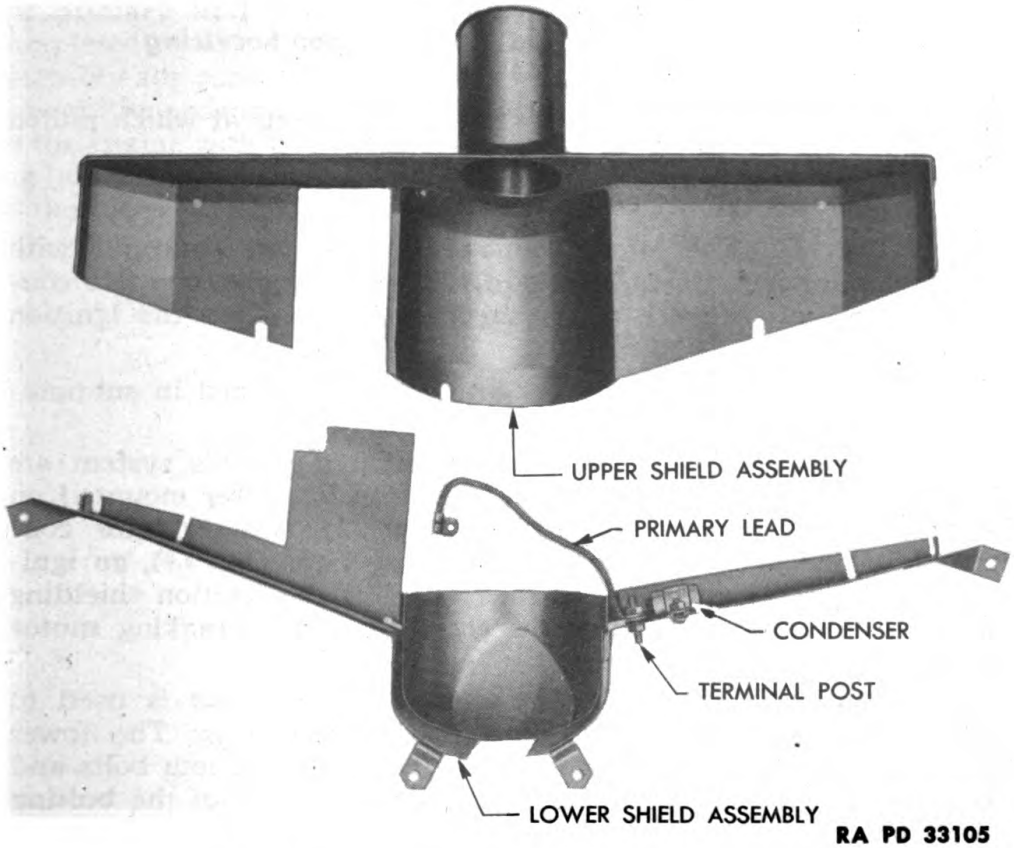
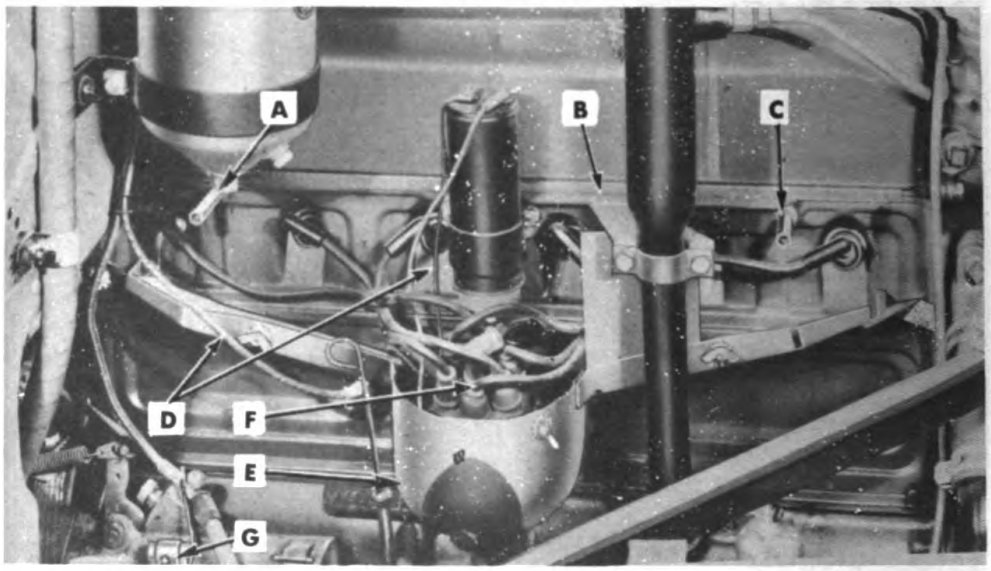


Figure 74—Layout of Shielding Parts



A—SPECIAL STUD PART NO. 3679110
B—BREATHER TUBE BRACKET
C—SPECIAL STUD PART NO. 3679109
D—PRIMARY WIRE FROM IGNITION SWITCH
E—LOWER SHIELD ASSEMBLY
F—NO. 1 SPARK PLUG WIRE
G—CRANKING MOTOR CONDENSER

RA PD 33106

Figure 75—Upper Shield Removed for Servicing

nuts securely. Figures 70 and 71 show the locations at which plated bolts, nuts, and toothed lock washers are used.

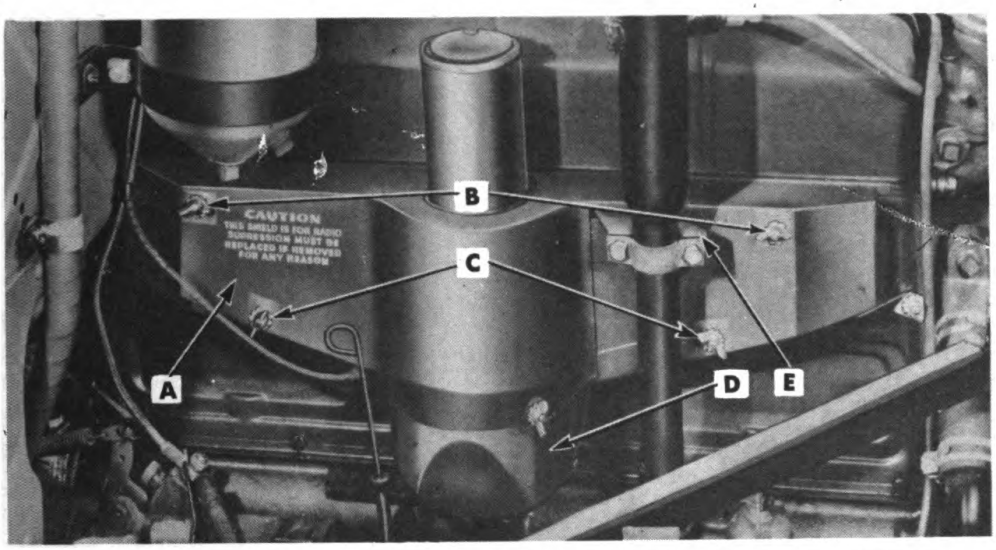
c. Late Production System.

(1) GENERAL. The later production models are equipped with a radio suppression system consisting of seven suppressors, five condensers, and a two-piece metal shield which encloses the ignition system.

(2) SUPPRESSORS. Suppressors are used as outlined in subparagraph **b** (2) above.

(3) CONDENSERS. The five condensers used on this system are installed at the following points: a generator condenser mounted on the outside of the generator housing (fig. 72), two regulator condensers located just below the generator regulator (fig. 73), an ignition condenser mounted on the lower half of the ignition shielding (fig. 74), and a starter condenser attached to the cranking motor housing (fig. 75).

(4) SHIELDING (fig. 74). A two-piece metal shield is used to enclose the spark plugs, distributor, coil, and wiring. The lower shield assembly is attached to the engine side cover by four bolts and eight lock washers, with a lock washer on each side of the bolting brackets. The primary ignition wire from the ignition switch is attached to the insulated terminal post, and the ignition primary circuit is completed to the coil by a lead from the terminal post to



A—UPPER SHIELD
B—THUMB SCREWS
C—WING NUTS
D—LOWER SHIELD
E—BREATHER TUBE BRACKET

RA PD 33107

Figure 76—Upper Shield Installed

the primary lead terminal on top of the coil (fig. 75). The circuit completed in this manner permits the removal of the upper shield assembly for service inspection and adjustments, without disturbing the ignition primary circuit. The upper shield assembly is attached to the engine with two special studs (fig. 75) in the side cover attaching holes and two thumb screws (fig. 76). The upper shield is retained to the lower shield by three wing nuts and lock washers.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XX

TRANSMISSION

96. DESCRIPTION AND TABULATED DATA.

a. Description (figs. 30 and 31). The selective sliding-gear type transmission incorporates four forward speeds and one reverse speed. Provision is made on the left side of the case for mounting a power take-off when the vehicle is equipped with a winch or hoist. The transmission assembly is bolted to the clutch housing, and becomes a part of the unit power plant assembly.

b. Data.

Type	Selective sliding gear
Make	Chevrolet
Speeds	4 forward, 1 reverse
Mounting	Unit power plant
Gear ratio:	
First speed	7.06 to 1
Second speed	3.48 to 1
Third speed	1.71 to 1
Fourth speed	1.00 to 1
Reverse speed	6.98 to 1

97. REMOVAL (fig. 77).

a. Disconnect Controls and Drain Lubricant. Remove the floor and toeboards. Drain the lubricant, and reinstall the drain plug. Remove the two right rear transmission cover bolts. Remove transfer case control lever and emergency brake bracket bolts from right side of transmission, and push control levers away from transmission. Install two cover bolts. Disconnect pull-back spring from transmission. NOTE: *If the transmission is equipped with a power take-off, disconnect the propeller shaft (or shafts) and controls, and remove power take-off (par. 155).*

b. Disconnect Propeller Shaft. Remove the U-clamps from the transmission to transfer case propeller shaft front universal joint. Hold the trunnion bearings in place and slide the joint back on splines of shaft. Leave the bearings on the trunnions, holding them in place with a piece of tape wrapped endwise over the bearings.

c. Remove Transmission. Remove the flywheel underpan. Remove the transmission to clutch housing attaching bolts. Slide the transmission back to clear the splines in the clutch disk, and lower the transmission to the floor. NOTE: *It is very important that the weight of the transmission be supported until the end of the clutch gear splines are out of the splines in the clutch disk.*

RA PD 32322

Figure 77—Transmission Removal

1½-TON 4 x 4 TRUCK (Chevrolet)

98. INSTALLATION.

a. Install Transmission. Clean the mating surfaces of the transmission and clutch housing. Raise the transmission until the main drive gear shaft lines up with the splines in clutch disk, and work the transmission forward until the case contacts clutch housing. NOTE: *Do not release the weight of transmission until the main drive gear bearing retainer pilots into clutch housing, or the clutch disk will be damaged.* Install the four transmission to clutch housing bolts and tighten securely. Install the flywheel underpan.

b. Connect Propeller Shaft. Remove tape from trunnion bearings, and place the propeller shaft slip joint in position against the flange. Install the U-clamp and tighten securely.

c. Connect Controls and Fill with Lubricant. Hook up the brake pedal pull-back spring. Remove the two right rear transmission cover bolts. Place the emergency brake lever and transfer case shift levers with bracket in position on right side of transmission, and install the four attaching bolts. If vehicle is equipped with a power take-off, bolt it to transmission and connect propeller shaft (or shafts) and controls. Fill the transmission case to correct level (par. 28 **c** (6)), lubricate the universal joint, and install the floorboards. Test the transmission for correct operation.

Section XXI

TRANSFER CASE

99. DESCRIPTION AND TABULATED DATA.

a. Description. The transfer case is a two-speed gear box mounted on the frame between the transmission and rear axle. It provides a drive for the front and rear axles.

b. Data.

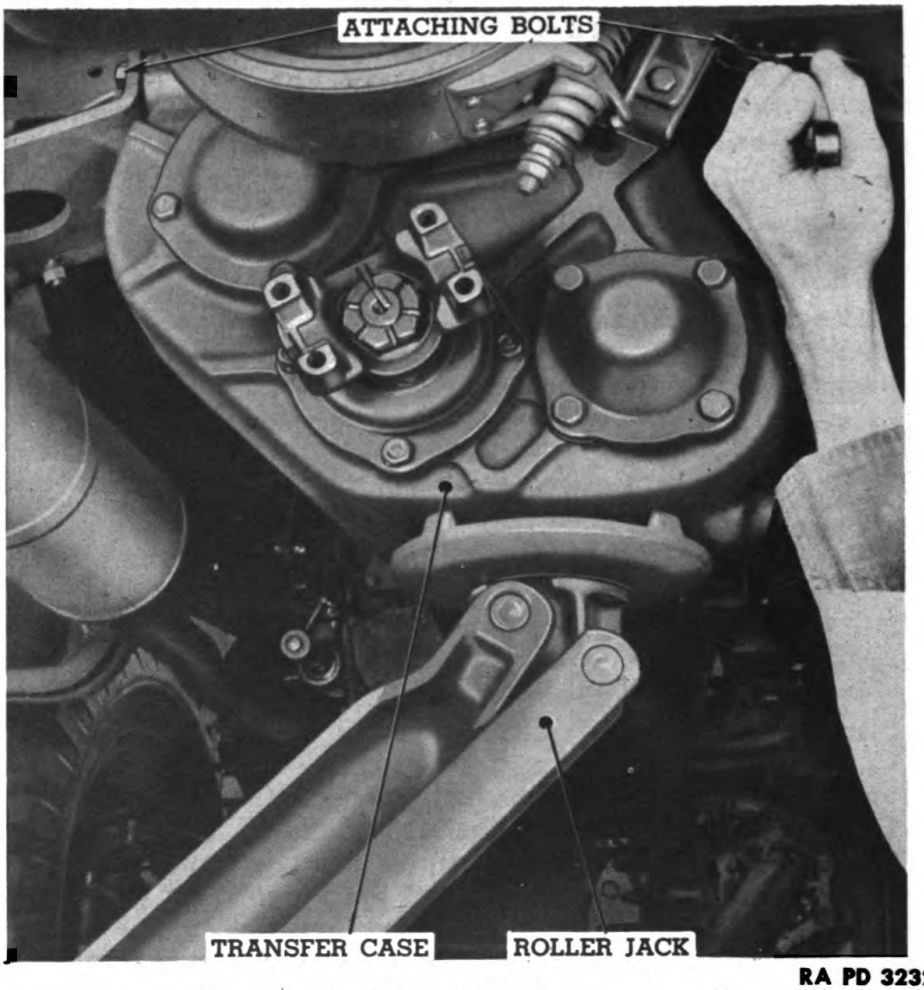
Type	Two speed with front axle declutching
Gear ratio:	
High speed	1 to 1
Low speed	1.9411 to 1

100. SHIFTER SHAFT CONTROL ROD ADJUSTMENT.

a. Remove the clevis pins from the adjusting eyes of both the front axle and low speed shifter shaft pull rods at the transfer case end. Loosen the adjusting eye lock nuts. With a punch, installed through the eye of the shifter shaft, force both transfer case shifter shafts in toward the case until the lock balls seat in the shafts in the last position. In this position the upper shaft will place the transfer case in the "HIGH" gear range, and the lower shaft will be in the "FRONT AXLE DRIVE" range. Next, position the shifter levers in the cab so that the front axle drive lever is in the "DRIVE" position (all the way forward), and the low speed shifter lever is in the "HIGH" position (all the way back). Center the two levers in the space in the floorboard to provide end clearance. Holding the two levers in this position, turn the adjusting eye on the low speed pull rod until the clevis pin will drop through the adjusting eye and the shifter shaft. With the low speed pull rod clevis pin in place, hold the front axle drive shift lever forward, and adjust the pull rod until the clevis pin will drop through adjusting eye and shifter shaft. Lengthen the shaft one turn from this position for normal clearance, and install clevis pin. Check the movement of both shifter levers to make certain the detent ball locks in place in the shifter shafts in all positions. Tighten the adjusting eye lock nuts and install cotter pins.

101. REMOVAL.

a. Drain the lubricant from the transfer case. Disconnect all three propeller shafts and the shifter pull rods from the transfer case. Disconnect the speedometer cable from the speedometer driven gear. Place a roller jack under the transfer case from the right side of the truck, and raise the jack to support the unit (fig. 78). Remove the locking wire and eight cap screws that attach the transfer case to the frame brackets. Support the transfer case while the jack is being lowered and pull the jack and case out from under the truck.



RA PD 32320

Figure 78—Transfer Case Removal

102. INSTALLATION.

a. Place the transfer case on a roller jack. Move the jack and transfer case under the truck from the right side. Raise the jack until the transfer case is in position. Using a taper punch, line up the holes, and install eight transfer case to frame bracket bolts. Tighten the bolts and install locking wire in bolts. Connect speedometer cable to speedometer driven gear in transfer case idler shaft front retainer. Connect the shifter shaft pull rods to the shifter shafts, and install clevis pins and cotter pins. Connect the three universal joints to the transfer case. Remove filler plug, and fill transfer case to correct level (par. 28 **c** (6)). Install filler plug, and tighten the filler and drain plugs.

PROPELLER SHAFTS

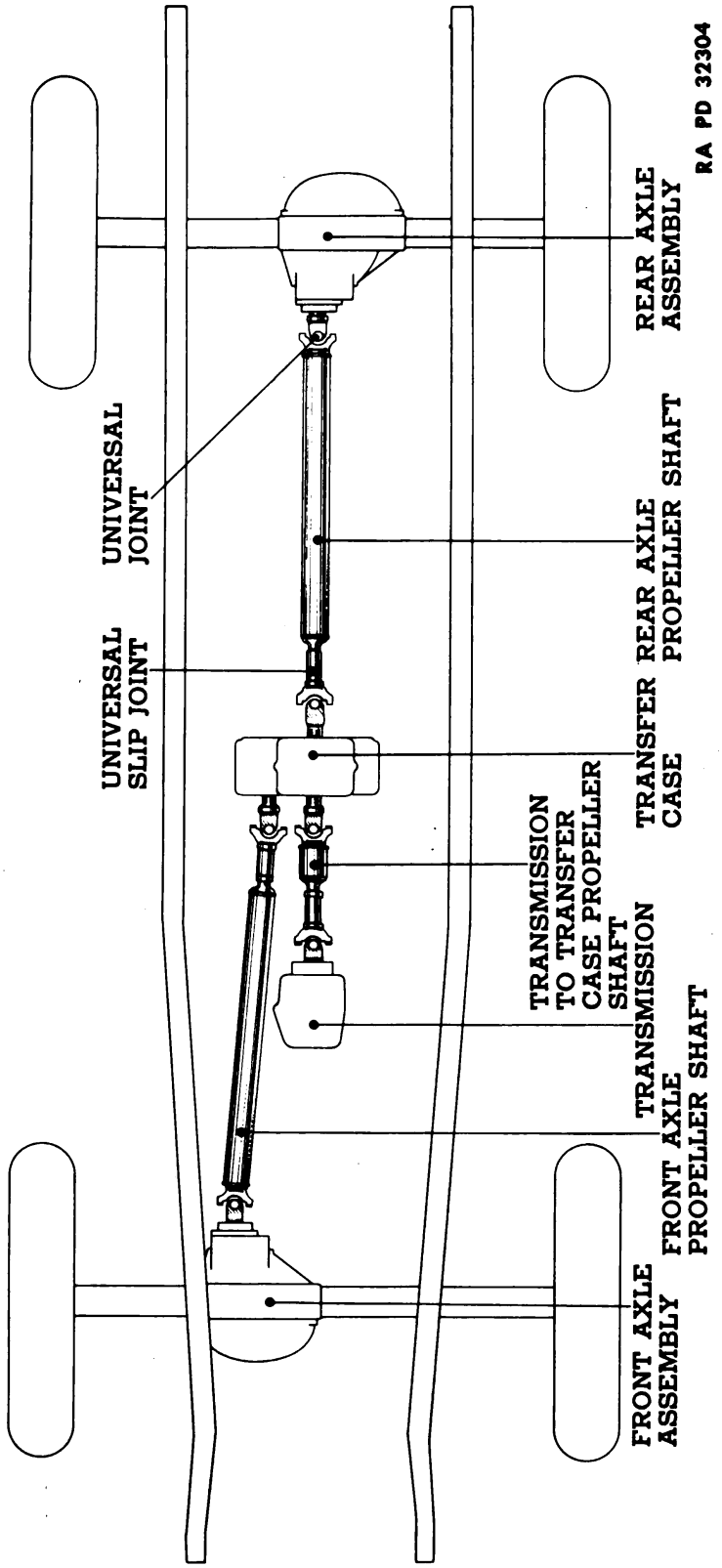


Figure 79—Propeller Shaft Drive Line

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XXII

PROPELLER SHAFTS

103. DESCRIPTION AND TABULATED DATA.

a. Description (fig. 79). The propeller shafts are of tubular construction, and are used to transmit the power from the transmission to the transfer case, and from the transfer case to the front and rear axles. Needle bearing universal joints are used at each end of the propeller shafts.

b. Tabulated Data.

PROPELLER SHAFTS.	UNIVERSAL JOINTS.
Number used—3	Type—Needle bearing
Shaft diameter—3 in.	Number used—6

104. PROPELLER SHAFT ASSEMBLY REMOVAL (fig. 80).

a. Remove the U-bolts holding the universal joint to the yoke at each end of the shaft, and tape the trunnions to the yokes so that the bearings will not fall off. Remove the shaft with joints.

105. PROPELLER SHAFT ASSEMBLY INSTALLATION.

a. Place the shaft in position, install the U-bolts, and tighten the nuts securely. Lubricate the joints (par. 28 c).

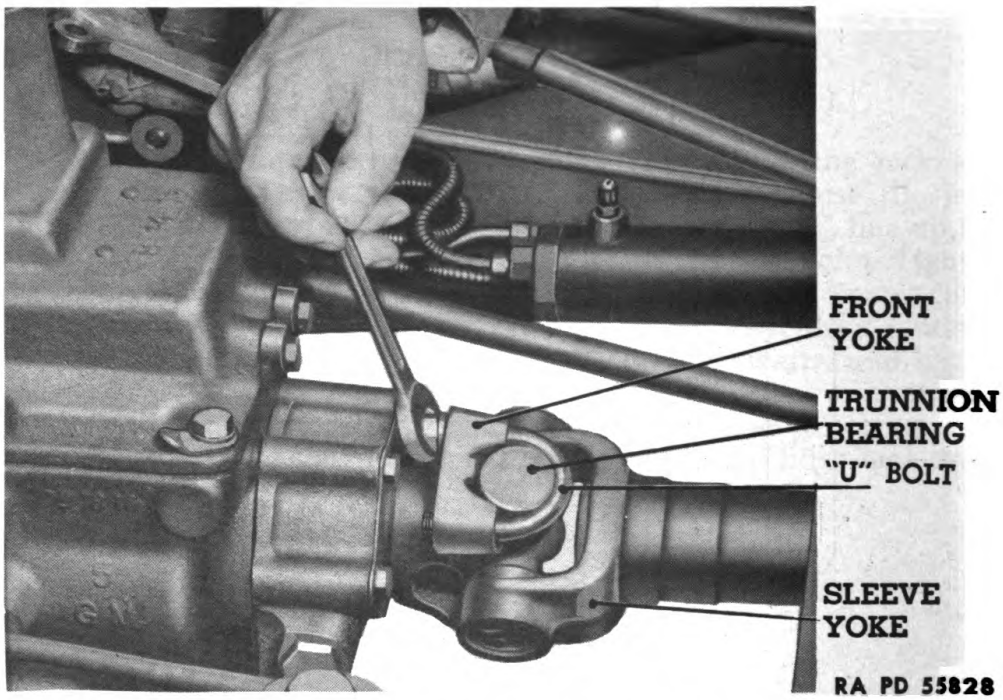


Figure 80—Disconnecting Universal Joint

Section XXIII

FRONT AXLE

106. DESCRIPTION AND TABULATED DATA.

a. Description. The front axle assembly is a front wheel driving unit, consisting of a banjo-type housing, on which there is provision for mounting the steering knuckle, and a conventional type differential. The front wheels are driven by axle shafts equipped with constant-velocity type universal joints that are enclosed in the steering knuckle support housing.

b. Data.

Housing type	Banjo
Drive	Through springs
Drive type	Hypoid
Gear ratio	6.67 to 1
Front wheel camber	½ to 1 degree
Front wheel caster	1 degree, 30 min. to 2 degrees
Front wheel toe-in	0 in. to ⅛ in.

107. TIE ROD REPLACEMENT.

a. Removal. Remove the two tie rod bolts, and remove the tie rod assembly with yokes. Remove the left tie rod yoke clamp bolt retaining the tie rod lock, and remove the lock. Loosen the three remaining tie rod yoke clamp bolts, and remove both tie rod yokes.

b. Installation. Install the tie rod yokes on ends of tie rod, and turn them on an equal amount until tie rod is 54⅝ inches long (center to center of tie rod bolt holes). Place the tie rod in position with the end with coarse threads to the right, and install the tie rod bolts. Install the two tie rod yoke clamp bolts loosely in each yoke, placing the tie rod lock on the inner bolt at left yoke. Turn the front wheels first to left, and then to right, until they hit the stops; and check clearance between tie rod and lower rib of differential at each side. If tie rod comes within ⅛ inch of differential when wheels are turned to left, turn left tie rod yoke onto tie rod, and right yoke off an equal distance. If tie rod comes within ⅛ inch of the differential when wheels are turned to right, turn right tie rod end on further, and lift tie rod off an equal distance. Tighten tie rod yoke clamp bolts at right side and adjust toe-in (par. 108 **b**).

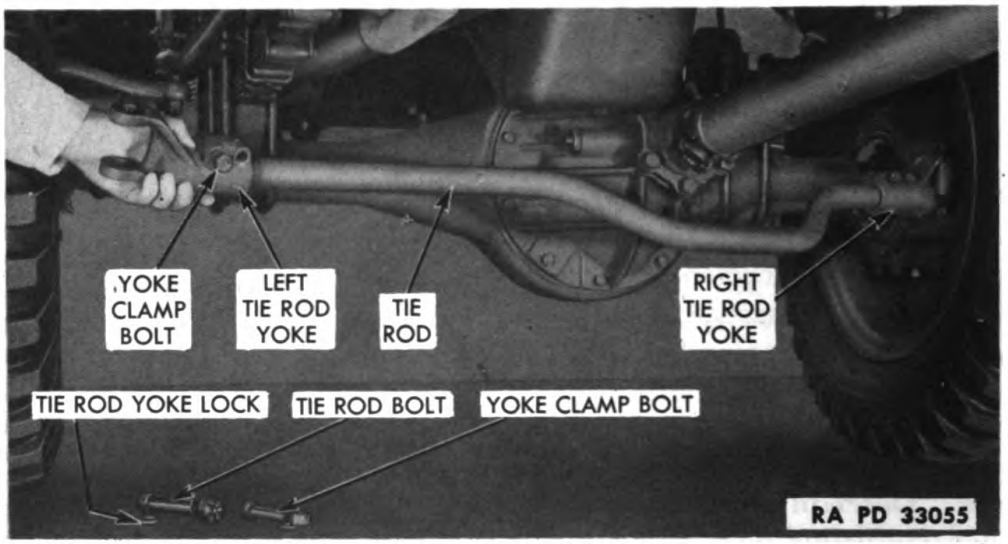


Figure 81—Tie Rod Adjustment

108. TOE-IN ADJUSTMENT.

a. Checking Toe-In. To check toe-in, mark a fine chalk line at the center of the tread of both front tires. Set the two tires so that the chalk mark is toward the front of the vehicle on a line with the center of the wheel. Then carefully measure the distance from the center of one chalk line to the other. Now revolve the wheels so that the chalk lines are facing the back of the car and on center with the wheel. Again measure the distance between the chalk marks. For the correct toe-in setting the difference between the measurements obtained should be between 0 inch and ⅛ inch, with the shorter distance, if any, at the front.

b. Adjusting Toe-In (fig. 81). Remove tie rod bolt. Remove the left tie rod yoke inner clamp bolt and washer, and loosen the outer clamp bolt. Turn the tie rod yoke onto rod to decrease toe-in, and off the rod to increase toe-in. If difficulty is experienced in securing proper toe-in, it may be necessary to disconnect the tie rod from the right steering arm and screw the end either on or off the tie rod one turn. Then screw the left tie rod end on or off the rod to secure the proper toe-in. Install the one tie rod and clamp bolt, and lock and tighten all clamp bolts. Install the nuts on the tie rod bolts. Tighten nuts wrench-tight, and back off ⅓ to ½ turn. Lock the nut with a cotter pin.

109. STEERING ARM REPLACEMENT (fig. 82).

a. Remove steering connecting rod end at arm by removing cotter pin and end plug. Then remove safety plug, tension spring, and ball seat. Lift steering connecting rod off arm ball. Remove the four nuts attaching arm to knuckle support. Remove the two studs nearest the brake drum, and remove steering arm. Install new arm, the two studs, four nuts and lock washers, and securely place the steer-

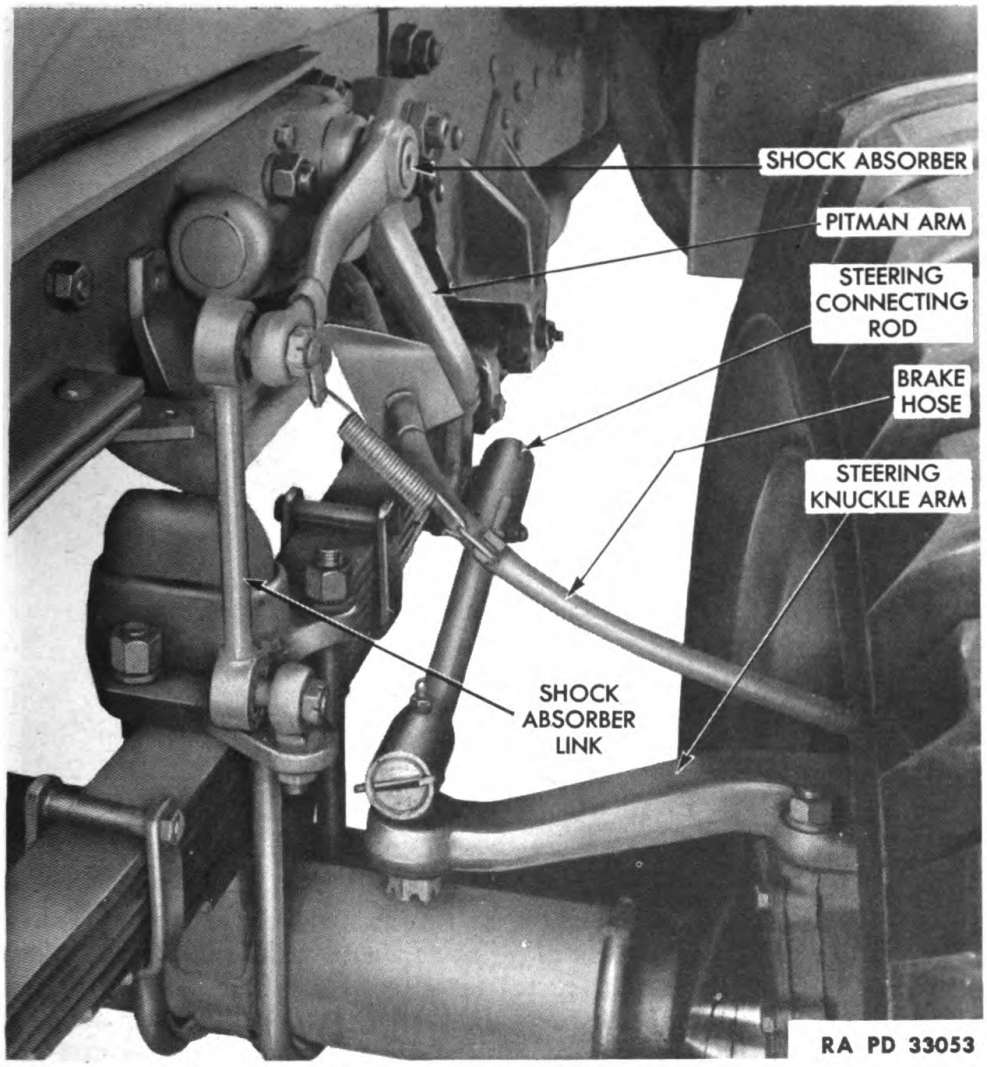


Figure 82—Steering Knuckle Arm Removal

ing connecting rod on arm ball. When assembling the parts in the rod ends, make sure they are assembled in the order they were removed, as this method of assembly relieves steering gear from road shocks in both directions. To adjust the ball joint, screw end plug in tight, then back off ½ to one full turn. Lock the adjusting plugs with a new cotter pin.

110. AXLE HOUSING OUTER END SEAL REPLACEMENT (fig. 83).

a. Removal. Remove the 12 cap screws attaching inner retainer to steering knuckle support, and remove inner retainer. Slide the spring-loaded seal retainer and seal back on housing as the spring-loaded seal cannot be replaced without removing steering knuckle. Work the outer end seal (felt and rubber) out of the seal retainer, and remove it from housing, as this seal is split. Remove the seal retainer and gasket.

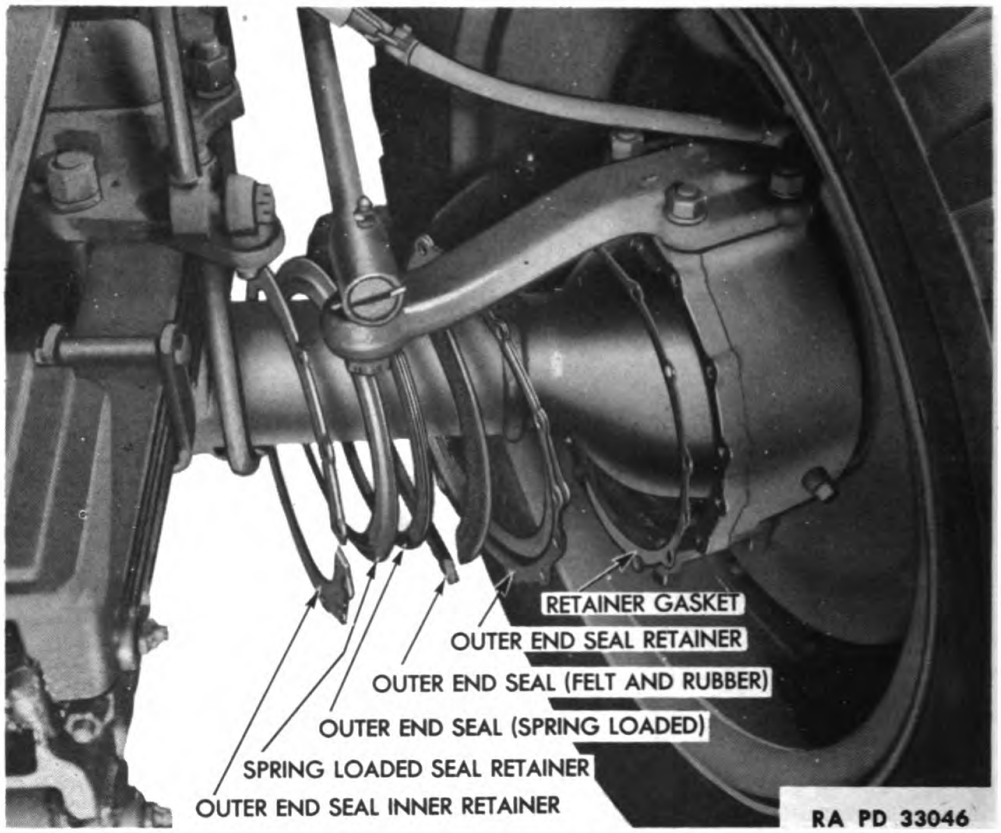


Figure 83—Outer Seal Replacement

b. Installation. Place a new seal retainer gasket on knuckle support with the diagonal cut as close to top as possible, and make sure bolt holes line up. Install the seal retainer. Place the new outer end seal (felt and rubber) in the retainer so that the taper of seal fits the curvature of the axle outer end ball, and the diagonal cut will be at the top. Place the spring-loaded seal and seal retainer against the felt and rubber seal, and install the lower half of the inner retainer, holding it in place with two or three cap screws installed loosely. Position the spring-loaded seal uniformly around the spherical bolt with a small screwdriver, and install the upper half of the inner retainer. Install and tighten all of the retainer cap screws.

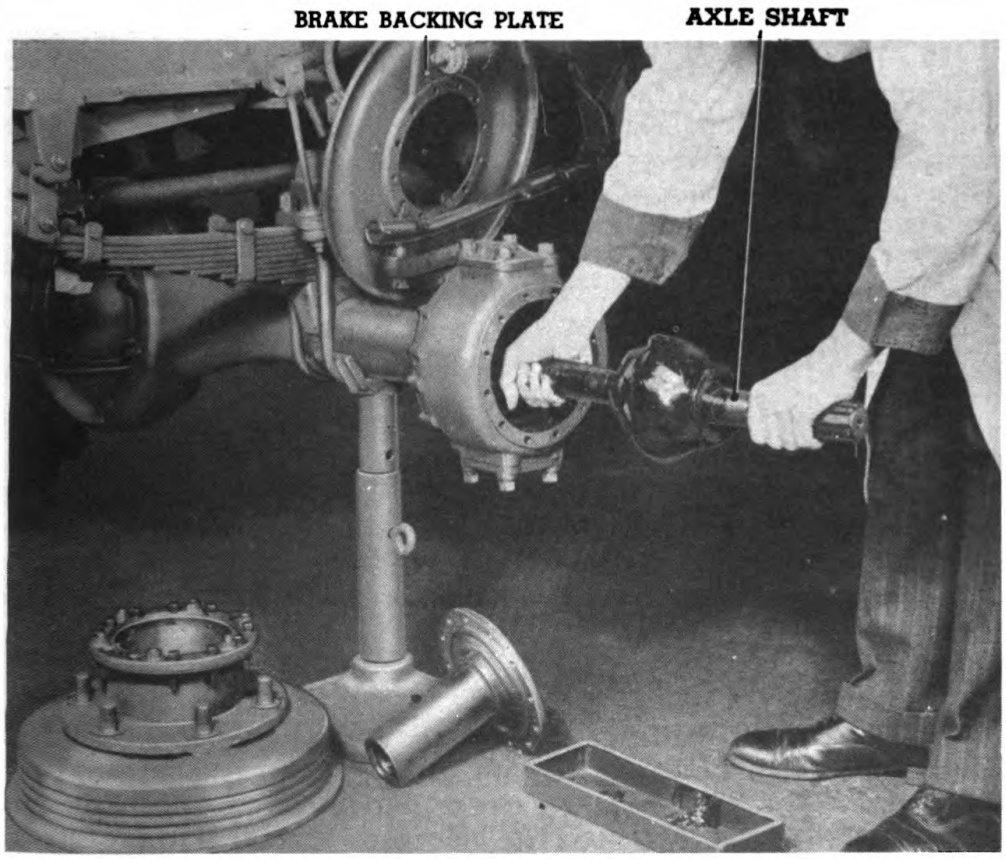
111. AXLE SHAFT REPLACEMENT (EITHER SHAFT).

a. Removal (fig. 84).

(1) REMOVE WHEELS. Loosen the six wheel stud nuts on front wheel two turns. Raise front of vehicle until the wheel clears the ground, and support axle housing on jack stand or suitable blocks. Remove the six wheel stud nuts that were previously loosened, and remove the wheel.

(2) REMOVE HUB. Remove the eight bolts and lock washers attaching drive flange to hub. Install two bolts in the tapped holes of flange; screw them in alternately to remove flange. Raise the tangs

FRONT AXLE



RA PD 55803

Figure 84—Front Axle Shaft Removal

that lock the wheel bearing outer lock nut and remove the nut, lock the inner lock nut, spacer washer, roller bearing assembly, and wheel hub. Install brake wheel cylinder clamp.

(3) REMOVE FLANGE PLATE. Remove brake retracting spring. Remove the six cap screws that attach the brake shoe anchor plate to the steering knuckle, and remove anchor plate. Remove the 12 cap screws that attach brake shoe anchor plate spacer, inner oil deflector, brake flange plate, and steering knuckle to the steering knuckle support. Remove the spacer and oil deflector. Slide brake flange plate off the steering knuckle and support it with a piece of wire. This procedure saves removing the brake line hose and bleeding brakes after performing the repairs.

(4) REMOVE AXLE SHAFT. Remove steering knuckle from support and pull the axle shaft from the housing, supporting it throughout its full length to prevent damaging oil seal in the end of housing.

b. Installation.

(1) INSTALL AXLE SHAFT. Pack axle shaft universal joint with general purpose grease No. 0, and rub a thin layer of grease on the surfaces that contact the bushing and thrust washer. CAUTION: *When entering the axle shaft, care must be taken not to damage the*

axle shaft oil seal. The universal joint should be supported from below when entering the shaft in the differential gear.

(2) INSTALL BRAKE FLANGE PLATE. Place new gasket in position on support, and place steering knuckle in position over axle shaft with keyway at top. Place brake flange plate and oil deflector in position on the steering knuckle, with the wheel cylinder at top. Then place the anchor plate spacer in position so that two bosses are spaced equally with reference to the wheel cylinder, and install the 12 cap screws and tighten. Place anchor plate with brake shoes attached in position and install cap screws; tighten them securely.

(3) INSTALL HUB AND BEARINGS. Hook one end of brake spring in second hole of right-hand brake shoe, and stretch spring to fit in second hole of left-hand shoe. Hand-pack the inner and outer bearings with general purpose grease No. 2. Place hub assembly in position on steering knuckle and install the outer bearing, washer, and adjusting nut. Tighten the adjusting nut snugly, wrench-tight, then back the nut off a distance equal to that between two adjacent flange bolt holes, which is equal to 45 degrees. Place nut lock in position, and aline nearest slot in nut with a short tang on nut lock. Bend tang of lock down in slot of nut. Install locking nut and tighten securely. Bend one of the tangs to fit in slot of lock nut.

(4) INSTALL DRIVE FLANGE (fig. 84). Place a new drive flange gasket over the drive flange and install the flange, making sure to line up the holes in the flange with those in the gasket. Install the eight cap screws with lock washers and tighten securely. Fill universal joint to level of filter plug hole with general purpose grease No. 0. Install wheel and remove blocking.

112. THIRD MEMBER ASSEMBLY REPLACEMENT.

a. Removal. Remove tie rod bolt at left end of tie rod and swing tie rod around out of the way. Pull both front axle shafts back to clear differential (par. 111). Jack up front end of frame to provide clearance at the oil pan. Follow instructions in paragraph 116 **a**, except that pertaining to axle shafts.

b. Installation. Follow instructions in paragraph 116 **b**, except that pertaining to axle shafts. Install axle shafts (par. 111). Place tie rod in position, install tie rod bolt and nut; tighten nut wrench-tight and back off from ⅓ to ½ turn. Install cotter pin. Lubricate tie rod and fill differential to correct level (par. 28 **c** (6)). Remove jack from front end of frame.

113. AXLE ASSEMBLY REMOVAL (fig. 85).

a. Jack up front of vehicle and support the frame on suitable stands. Split universal joint and tape trunnion bearings to prevent them from falling off trunnion yoke. Disconnect steering connecting rod and lift connecting rod off the knuckle arm ball. Disconnect brake hose and shock absorber links. Support the axle with a roller jack. Remove the four nuts from the two front spring U-bolts on each side, and remove the U-bolts and bumper retainer. Remove

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Figure 85—Front Axle Assembly Removal

axle assembly by lowering jack carefully, and roll the entire front axle assembly out from under vehicle. Block up axle and remove the six wheel nuts from each wheel and remove wheels.

114. AXLE ASSEMBLY INSTALLATION.

a. Install wheels, and roll front axle assembly under vehicle and raise to proper position with suitable jack. Place U-bolts in position around axle housing and front springs, and install bumper retainer, lock washers, and nuts. Tighten nuts securely. Connect shock absorber links and brake connections, and install steering connecting rod. Remove tape from universal joint trunnion bearings and install U-bolts, lock washers, and nuts. Tighten nuts. Lubricate grease fitting, and check differential for lubricant. Remove jack stands and tighten wheel nuts; adjust toe-in (par. 108), and bleed brake system (par. 123).

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XXIV

REAR AXLE

115. DESCRIPTION AND TABULATED DATA.

a. General. The rear axle is of the single-reduction, full-floating, hypoid type with a straddle-mounted pinion gear, and a high-traction type differential. Being of the full-floating type, the axle shafts can be removed with the weight of the vehicle on its wheels.

b. Data.

Housing type	Banjo
Drive	Through springs
Gear ratio	6.67 to 1
Drive type	Hypoid

116. THIRD MEMBER ASSEMBLY REPLACEMENT.

a. Removal (fig. 86). Drain the differential, remove the axle shaft cap screws, and pull both axle shafts out far enough to clear the differential. Remove rear universal joint U-clamps, tape the trunnion bearings to the trunnions, and tie the propeller shaft to a frame side rail. Remove the cap screws that retain third member assembly to axle housing. Before the last cap screw is removed, place a long drift punch through upper bolt hole in third member and housing to support third member. Place a roller jack under third member, and block it to support the assembly. Work the assembly forward until it clears the axle housing, steady third member on jack, remove drift, and lower the third member to floor.

b. Installation. Place third member on jack and block it in position. Install a new gasket. Roll the assembly under vehicle, raise it in line with axle housing, and place a long drift punch through upper hole in third member and axle housing. Work the assembly into axle housing, being careful not to damage gasket. Install the cap screws, and tighten them securely. Remove tape from universal joint trunnion bearings, place the propeller shaft in position, and install the U-clamps. Install the axle shafts and retaining cap screws. Fill differential to correct level (par. 28 c (6)).

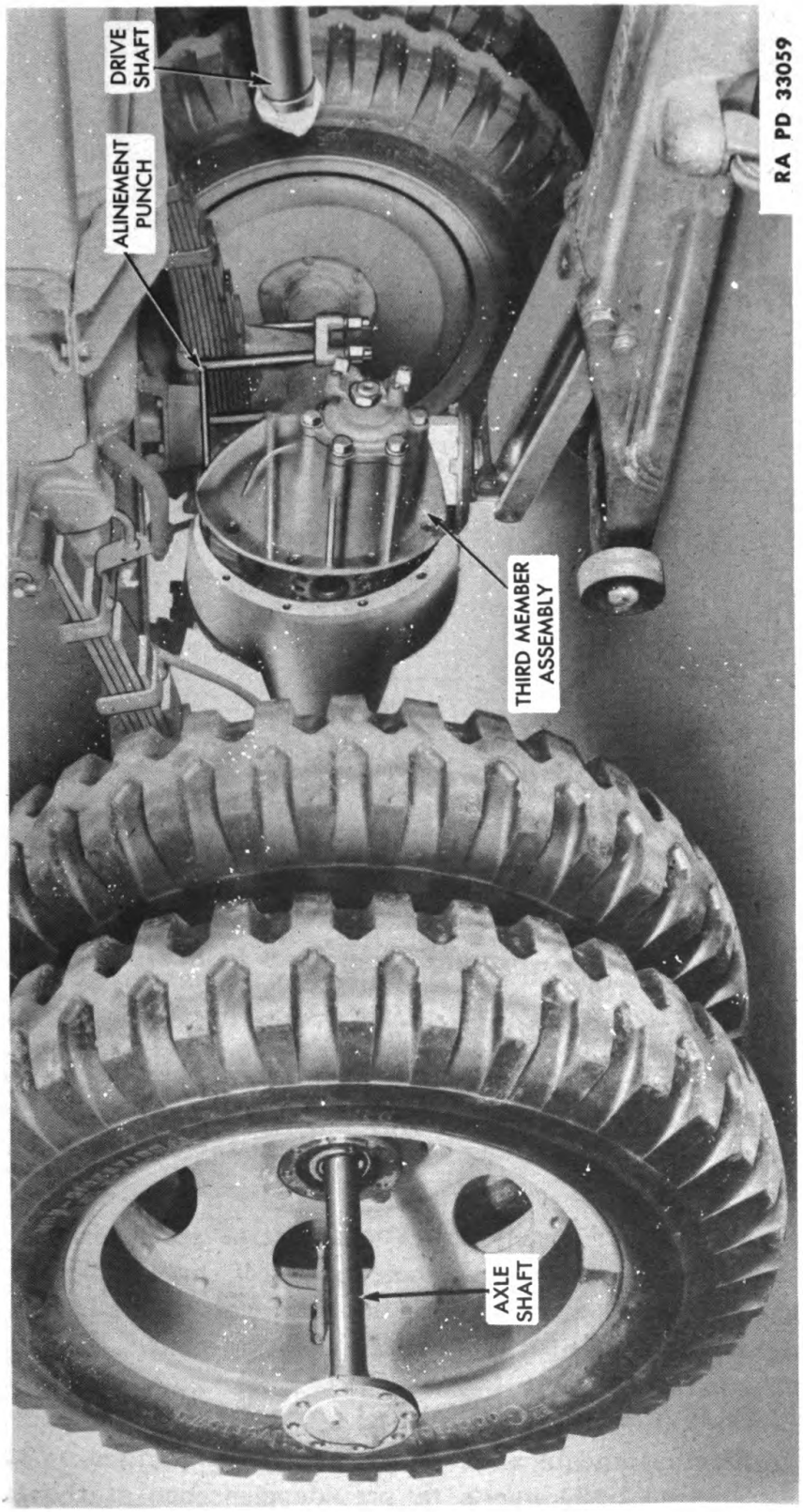


Figure 86—Third Member Assembly Replacement

Figure 87—Pulling Axle Shaft from Hub

117. AXLE SHAFT REPLACEMENT.

a. Removal (fig. 87). Remove cap screws and lock washers. Install two of the cap screws in the threaded holes provided in axle shaft flange, and by turning these cap screws alternately, remove the axle shaft.

b. Installation (fig. 88). Place a new terne plate gasket on axle shaft and push the shaft into place, turning it slightly to engage the splines in differential side gears. Install the cap screws in the flange and, tightening them alternately, draw them up tight.

118. AXLE ASSEMBLY REMOVAL (fig. 89).

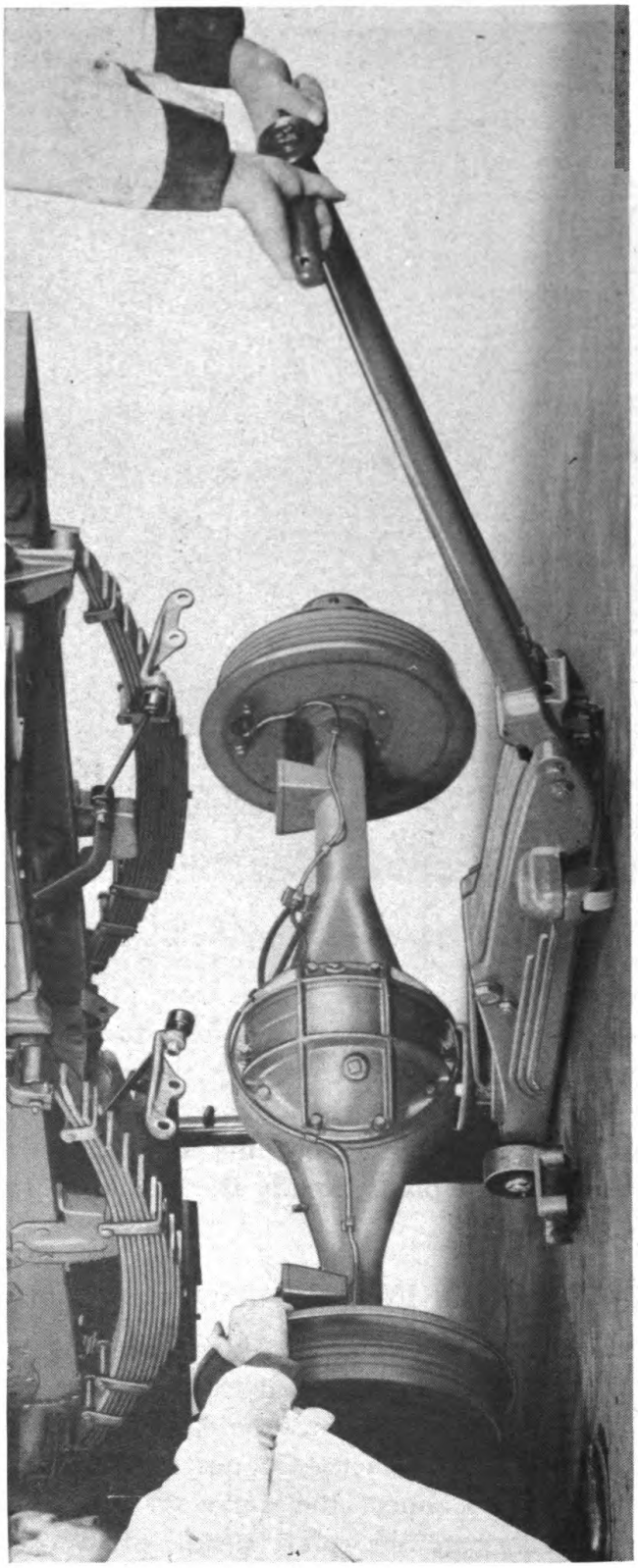
a. Raise rear end of vehicle, and support the frame on suitable stands. Remove both wheels to provide clearance at the fenders. Disconnect rear universal joint, and lower the shaft to floor. Tape

Figure 88—Replacing Axle Shaft

trunnion bearings in place to keep them from falling off. Disconnect brake line from master cylinder where it joins the line running across the axle to wheel cylinders. Place a jack under differential to support the axle, and remove the eight (four on each side) spring U-bolt attaching nuts. Move shock absorber link and bracket up out of the way, and remove anchor plate. Steady the assembly, and pull it out from under the vehicle.

119. AXLE ASSEMBLY INSTALLATION.

a. Place the axle assembly on a roller jack, and move the jack and axle into position under the vehicle. Raise the axle up against the springs and install the anchor plate, shock absorbers, anchor plates, U-bolt nuts and washers. Connect the brake hose to axle brake connector "T." Connect the universal joint to pinion shaft joint flange, and lubricate the joint. Install the wheels. Check the differential lubricant level, and add lubricant if necessary (par. 28 **c** (6)). Bleed the brakes (par. 123).



RA PD 32218

Figure 89—Rear Axle Assembly Replacement

Section XXV

BRAKE SYSTEM

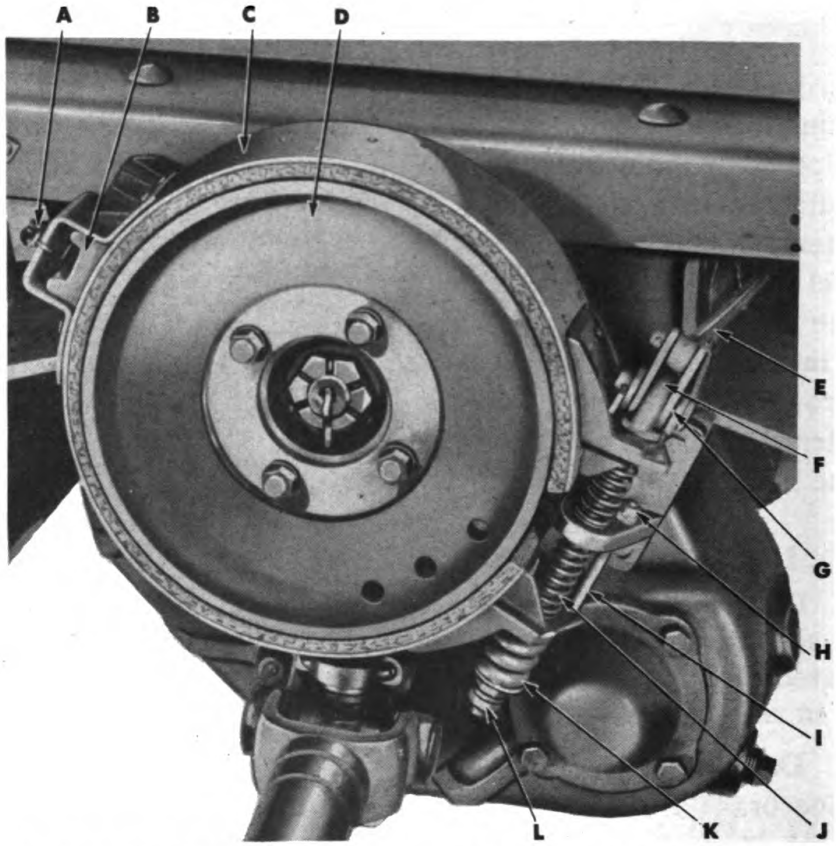
120. DESCRIPTION AND TABULATED DATA.

a. Description. The braking system combines hydraulically operated service brakes, a hydrovac booster system, and mechanically operated parking brakes. Electrically controlled trailer brakes are used in conjunction with the above on certain models.

b. Data.

Service brake type	4-wheel hydraulic
Parking brake type	Drive shaft
Master cylinder size	1¼ in.
Wheel cylinder size:	
Front	1¼ in.
Rear	1½ in.
Brake shoe size:	
Front	14 x 2 in.
Rear	16 x 2 in.
Hand brake lining:	
Length	29½ in.
Width	3 in.
Thickness	5/16 in.
Adjustments:	
Front shoe	From slight drag on drum, back off adjusting screw 4 notches
Rear shoe	From slight drag on drum, back off adjusting bolt ⅔ turn or 4 sides of hex head
Foot pedal to toeboard clearance	¼ in.
Hydrovac model:	
Double-piston type	H-66-3.3
Single-piston type	HS25-22P-51

1½-TON 4 x 4 TRUCK (Chevrolet)



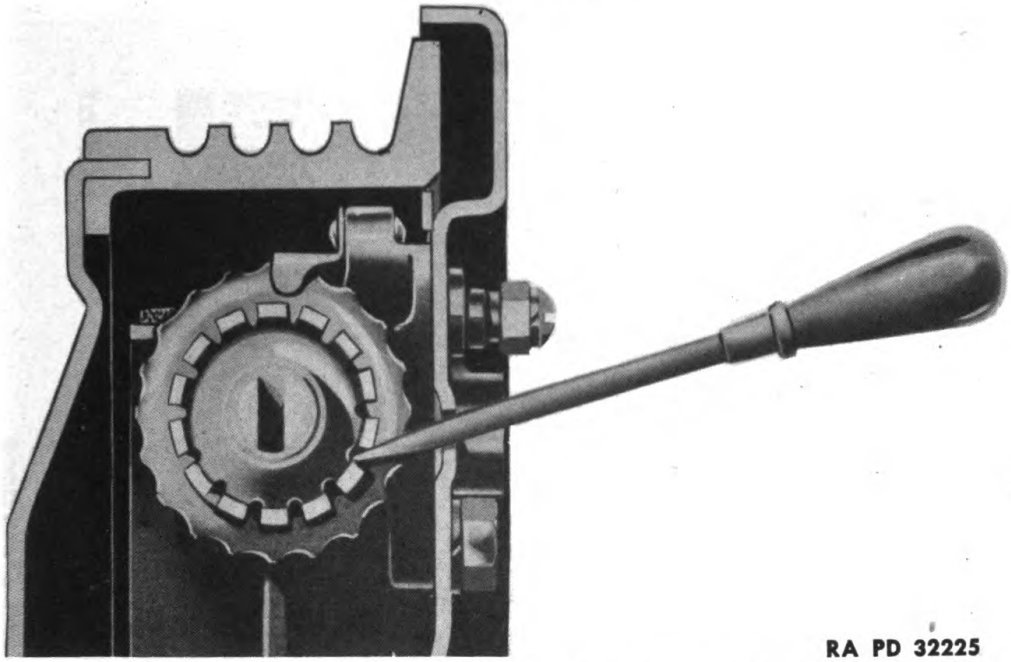
A—REAR ANCHOR SCREW
B—BRAKE ANCHOR
C—BRAKE BAND WITH LINING
D—BRAKE DRUM
E—BRAKE PULL ROD
F—ADJUSTING BOLT
G—OPERATING CAM
H—ADJUSTING SCREW LOCK NUTS (LOWER SHOE)
I—ADJUSTING SCREW (LOWER SHOE)
J—SPRINGS (SHOE RELEASE)
K—SPRING (UPPER SHOE ADJUSTING)
L—ADJUSTING BOLT NUTS (UPPER SHOE)

RA PD 33109

Figure 90—Parking Brake Adjustment

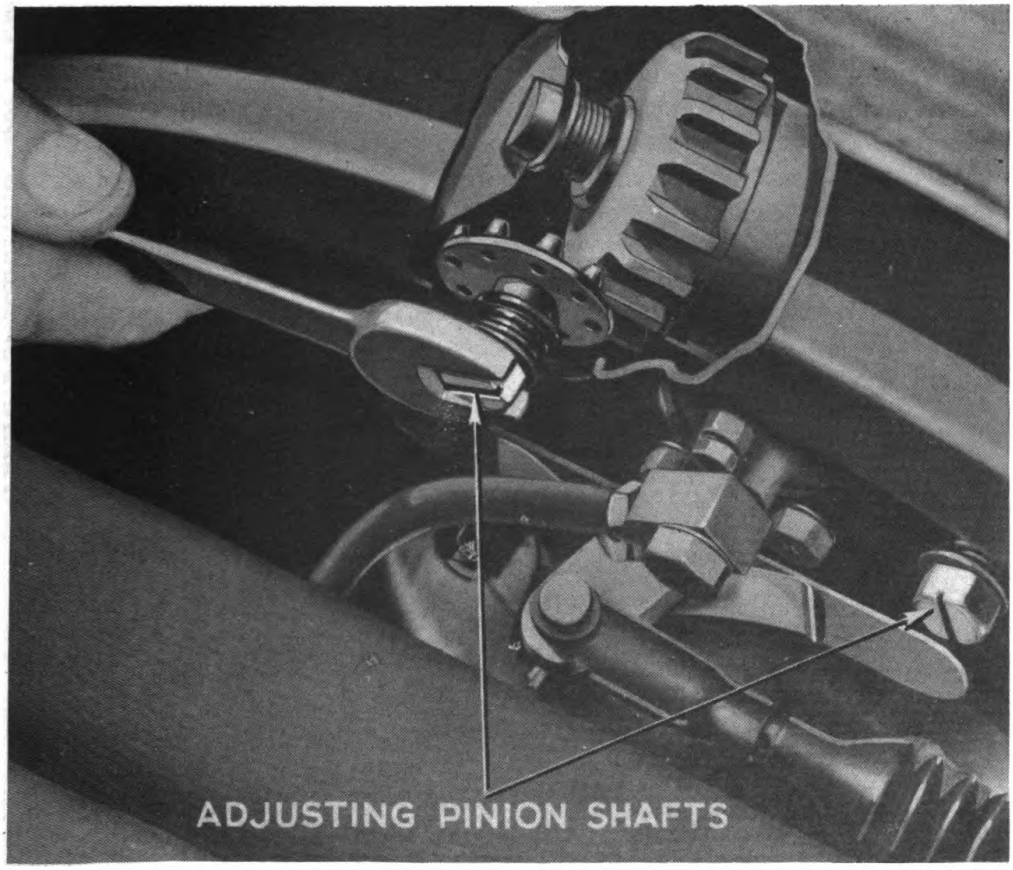
121. PARKING BRAKE ADJUSTMENT (fig. 90).

a. The parking brake adjustment should be checked each time the hydraulic service brakes are adjusted. Set hand brake lever in fully released position, then detach pull rod. Remove rear anchor screw lock wire, and turn the adjusting screw to secure 0.010-inch to 0.015-inch clearance between the brake band and drum underneath brake anchor. Lock the anchor adjusting screw with a lock wire. Loosen lower shoe adjustment lock nut, and turn the adjusting screw to secure 0.020-inch clearance between the lower end of the band and drum. Tighten adjusting screw lock nut. Loosen lock nut on large adjusting bolt, and back it off until it is free of the adjusting nut. Turn adjusting nut on adjusting bolt to secure 0.020-inch clearance between upper end of band and the drum. Then tighten the lock nut securely while holding the adjusting nut. Check the pull rod adjustment by moving the operating cams forward until they contact the pad on brake band bracket. Set the brake pedal in the first notch from the fully released position. The pin hole in the



RA PD 32225

Figure 91—Adjusting Brakes, Front Wheel



RA PD 32226

Figure 92—Adjusting Brakes, Rear Wheel

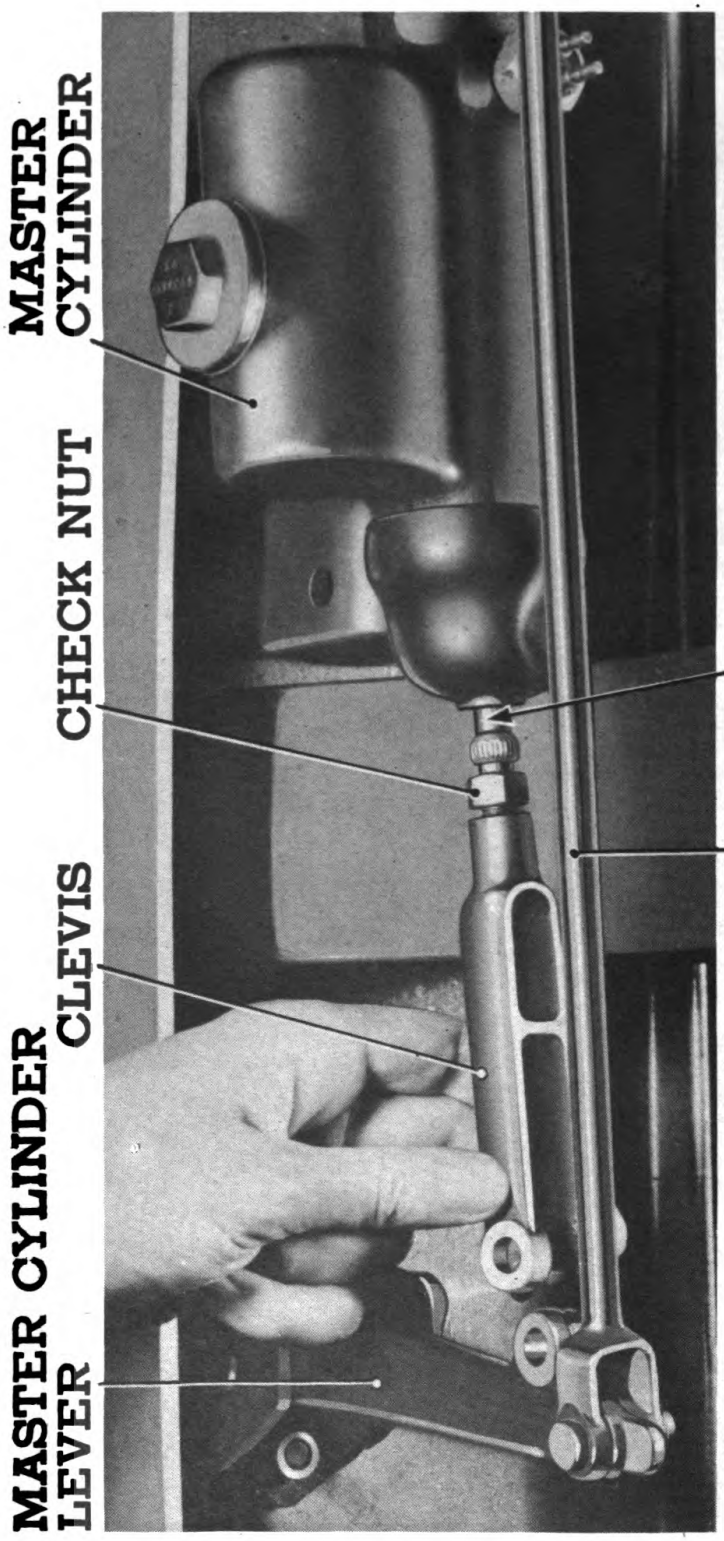


Figure 93—Adjusting Foot Pedal Toeboard Clearance

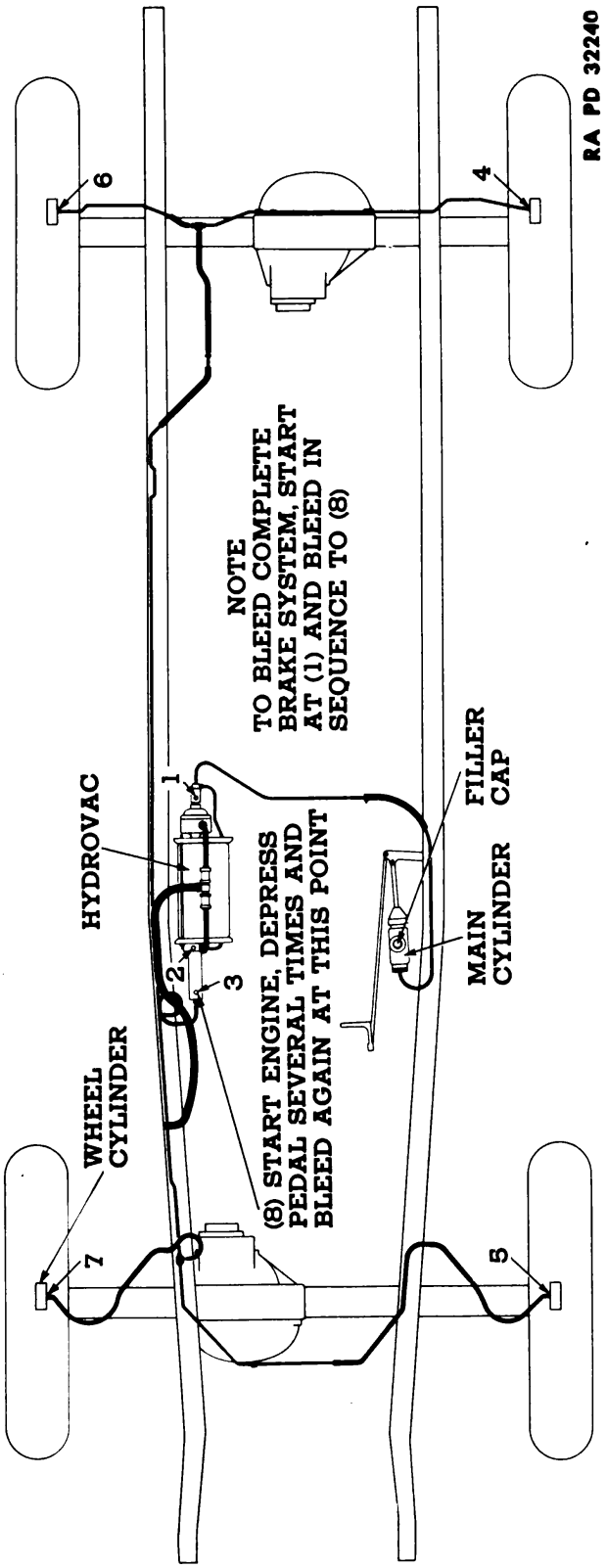
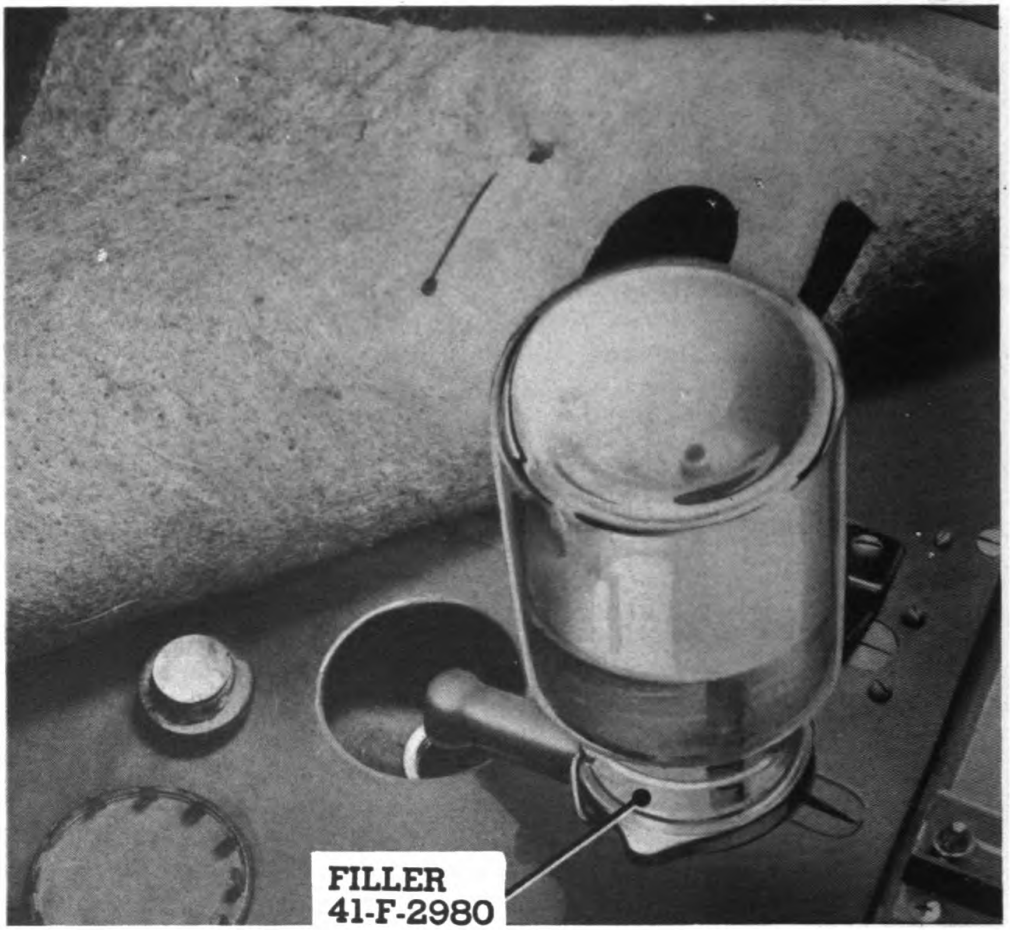


Figure 94—Brake Bleeding Diagram



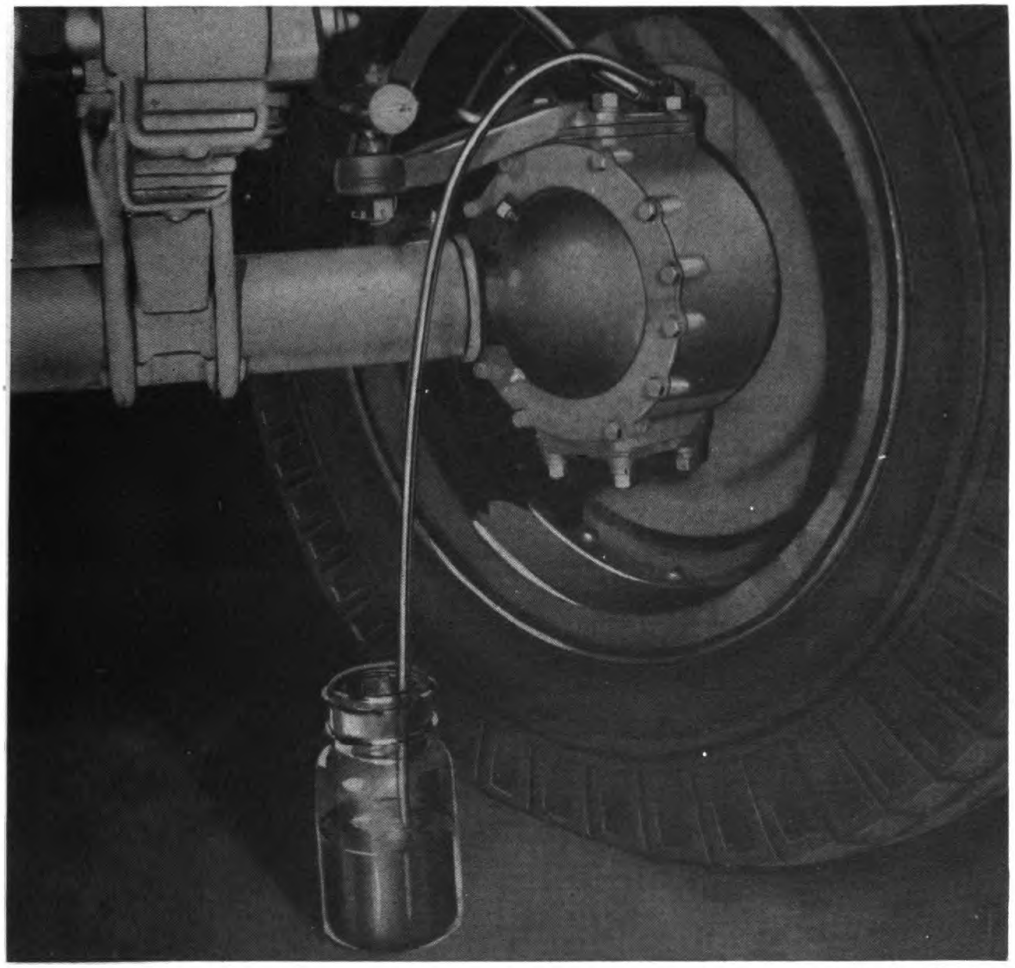
RA PD 32229

Figure 95—Master Cylinder Filler

pull rod should then line up with the holes in the operating cams for proper adjustment. If they do not line up, loosen the lock nut at the clevis on the brake pedal end of the pull rod, and turn the rod in the clevis until the proper adjustment as mentioned above, is obtained. Tighten lock nut at clevis, and install cotter pin in pull rod pin. Lubricate all frictional surfaces of the brake control linkage and anchor bolts with engine oil.

122. SERVICE BRAKE ADJUSTMENT.

a. Adjustment at Wheels. Raise the truck and place jack stands front and rear so that all four wheels rotate freely. Remove the adjusting hole covers from the front flange plates, insert a screwdriver through the adjusting hole, and engage the teeth on the adjusting cover of the wheel cylinder (fig. 91). Turn the adjusting cover in a clockwise direction, looking at the end of the cylinder,



RA PD 32230

Figure 96—Bleeding Wheel Cylinder

until the shoes cause a slight drag on the drum. Turn the adjusting cover back four notches. Backing off the adjusting cover moves the brake shoe away from the drum to insure proper running clearance of the shoes in the drum. Replace the adjusting hole covers. To adjust the rear brakes turn the adjusting pinion (fig. 92) in a clockwise direction until shoe causes a slight drag on the drum. Turn the adjusting pinion back ⅔ of a turn, or four sides of the hexagon on pinion shaft, to provide running clearance.

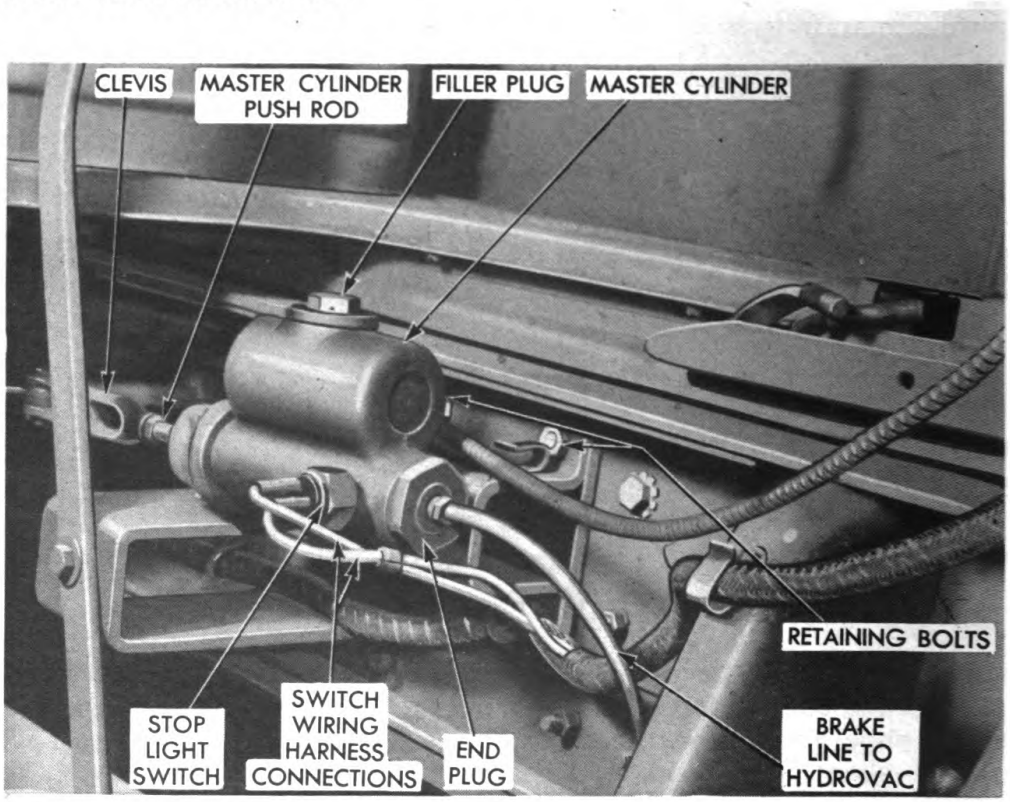
b. Toeboard Clearance (fig. 93). Toeboard clearance very seldom needs to be adjusted. The pedal stop, which is located in the brake main cylinder, is permanent. Before attempting to adjust toeboard clearance, be certain that the pedal returns to the full-released position freely, with no binding, and that the pedal retracting spring has not lost its tension. Loosen the check nut on the rear of the clevis on the master cylinder push rod. Remove clevis pin, and turn the clevis attached to the master cylinder push rod in the proper

direction to secure ¼-inch toeboard clearance, measurement being taken between pedal arm and underside of toe-pan. Tighten the check nut against the clevis.

123. BLEEDING BRAKE SYSTEM.

a. General. The hydraulic brake system must be bled whenever a pipe line has been disconnected, or when a leak has allowed air to enter the system. The hydrovac booster system should be bled first, and then the wheel cylinders; follow the bleeding sequence shown in figure 94.

b. Install Automatic Filler (fig. 95). Clean all dirt from around the master cylinder filler plug. Remove the filler plug and install the bleeder adapter and automatic filler (41-F-2982). Open the automatic valve in the filler.



RA PD 33110

Figure 97—Brake Master Cylinder

c. Install Drain Tube (fig. 96). Remove the bleeder valve screw and attach the bleeder drain tube (41-T-4170) to the bleeder valve at the relay valve end of the hydrovac (No. 1, fig. 94). Place the end of the drain hose below the surface of brake fluid in a jar.

d. Bleed System. Unscrew bleeder valve ½ to ¾ turn. Depress the foot pedal by hand, allowing it to return slowly. Continuing this pumping action forces the fluid through the lines and out at the bleeder drain, carrying with it any air in the system. When bubbles

cease to appear at the end of the bleeder drain hose and the stream is a solid mass of fluid, tighten the bleeder valve and remove the drain hose. Replace and tighten the screw at the end of the bleeder valve. In numerical sequence, proceed in the same manner with the other bleeding points. After the bleeding operation has been completed at the hydrovac and wheel cylinders, start the engine, and depress the brake pedal several times. Then bleed again at point

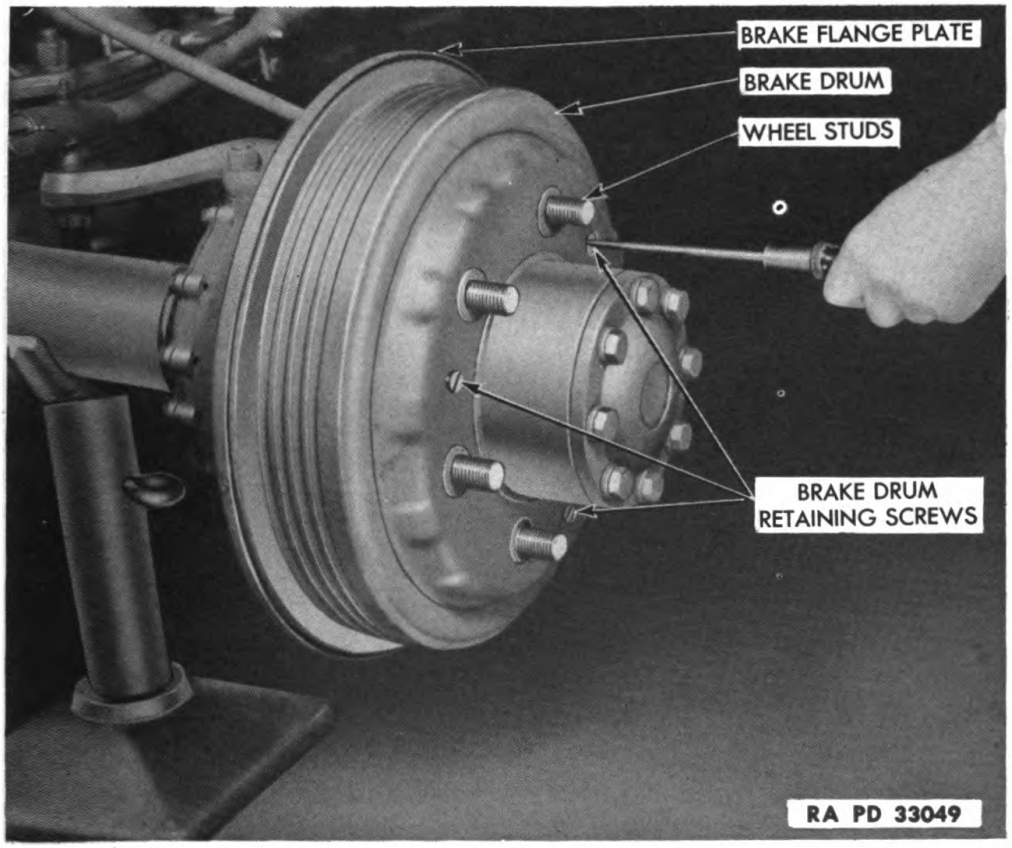


Figure 98—Brake Drum Replacement

No. 3. After bleeding at all points, fill the master cylinder reservoir ¾ full and replace the filler plug. NOTE: *Fluid withdrawn in the bleeding operation should not be used again.*

124. MASTER CYLINDER REPLACEMENT (fig. 97).

a. Remove the clevis pin from the master cylinder link to idler lever. Disconnect the brake pipe from the master cylinder end plug. Disconnect wires from stop light switch. Remove the four bolts attaching the master cylinder and bracket to the frame, and lift off the cylinder. Remove cylinder from bracket. When installing a new cylinder, proceed in the reverse order of removal and fill the cylinder with fluid. It is then necessary to bleed the entire system (par. 123).

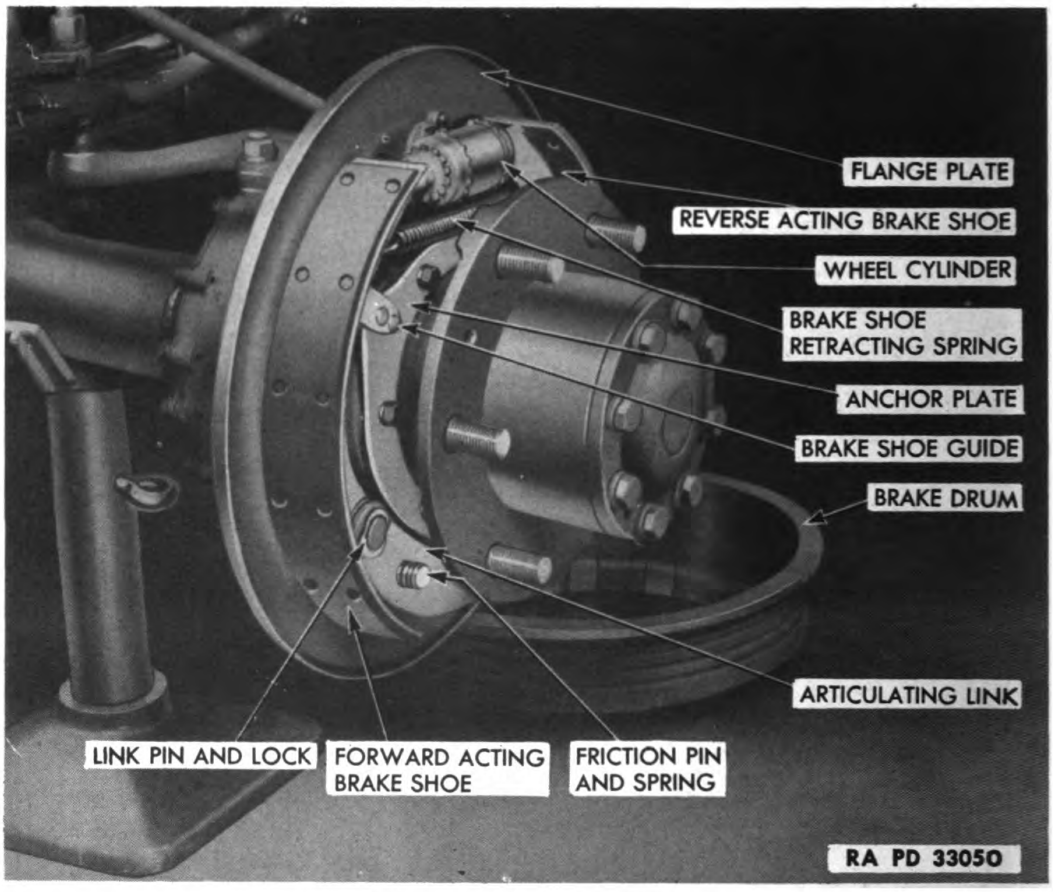


Figure 99—Brake Construction, Front Wheel

125. WHEEL CYLINDER REPLACEMENT.

a. Place vehicle on a level spot and remove the wheel. Remove the three brake drum attaching screws and brake drums (fig. 98). Disconnect pipe or hose from the wheel cylinder. Disconnect the brake shoe retracting spring with pliers (41-P-1579). Remove the two cap screws holding the cylinder to the flange plate and remove cylinder (figs. 99 and 100). Install a new wheel cylinder assembly in the reverse order of removal, and bleed the entire system (par. 123).

126. BRAKE SHOE REPLACEMENT (figs. 99 and 100).

a. Removal. Place vehicle in jack stands and remove all wheels. Remove the three screws that attach each brake drum (fig. 98), and remove the drums. Install wheel cylinder clamps (fig. 101) to prevent leakage of brake fluid. Using brake spring pliers (41-P-1579) remove the brake shoe retracting springs. Remove the brake shoe anchor pin lock and pin; one on front brakes, two on rear; and lift off brake shoes. Remove the articulating link friction spring pin lock, pin, and spring. Disassemble the articulating links from the shoes by removing pin lock and pin.

BRAKE SYSTEM

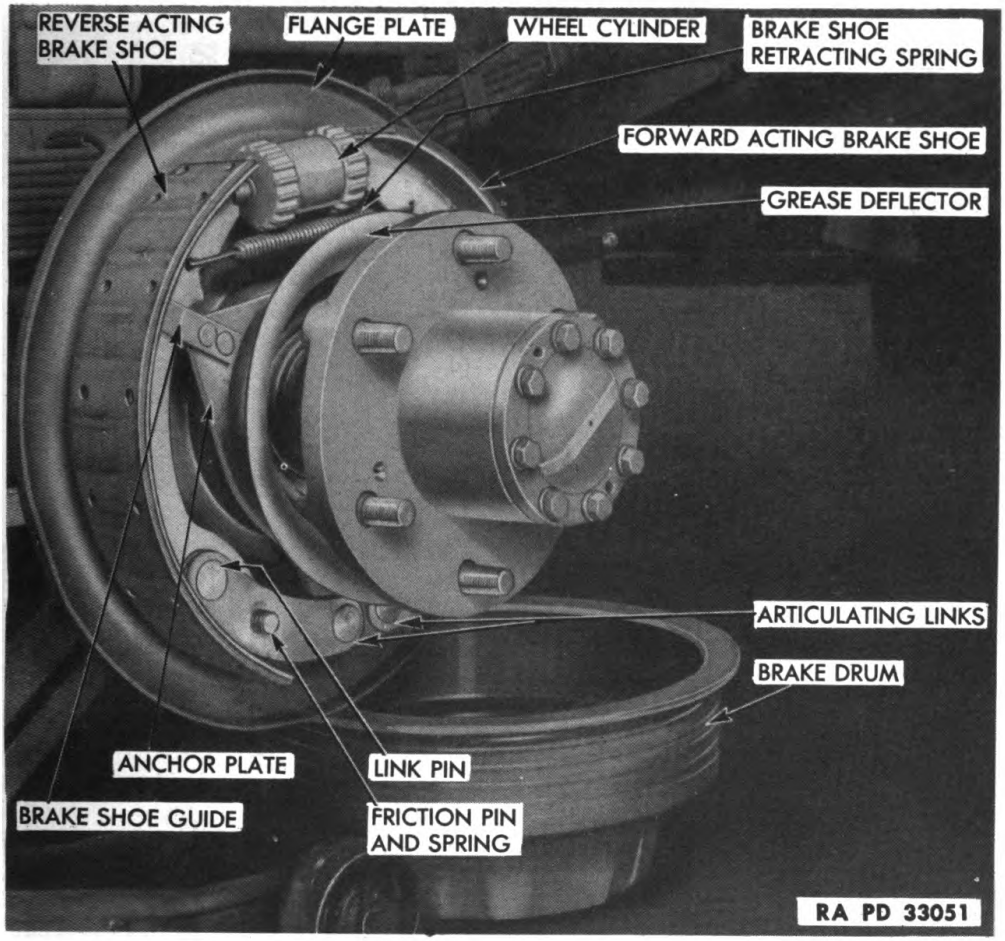


Figure 100—Brake Construction, Rear Wheel

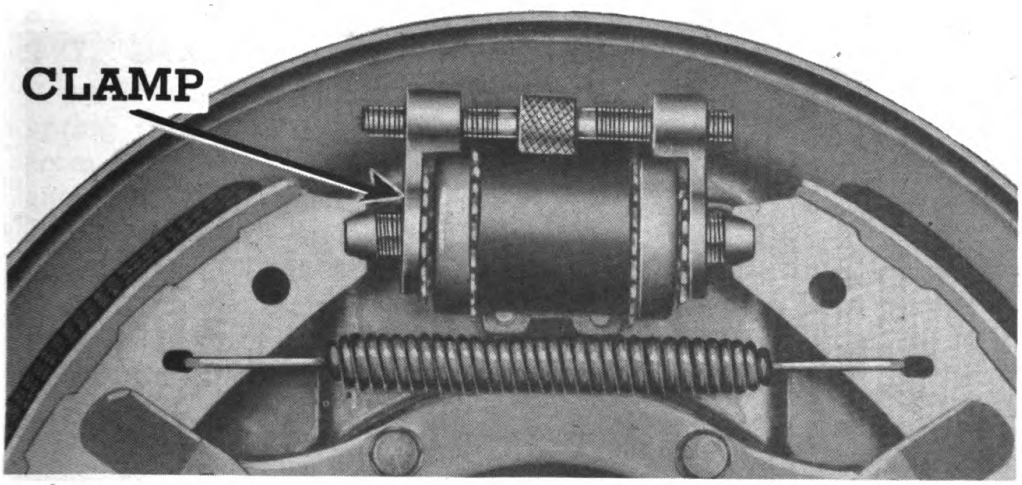


Figure 101—Brake Wheel Cylinder Clamp

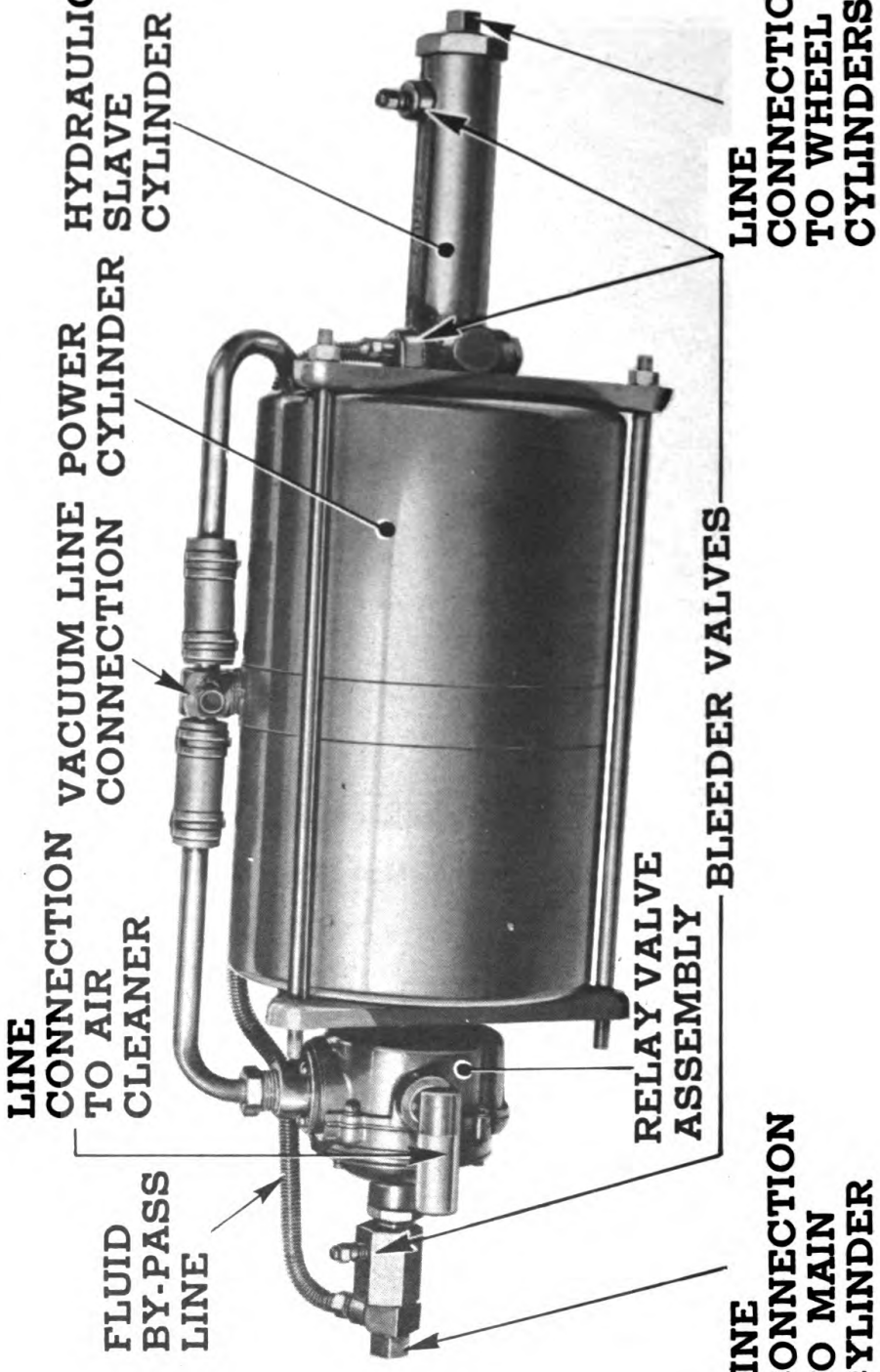


Figure 102—Hydrovac Assembly

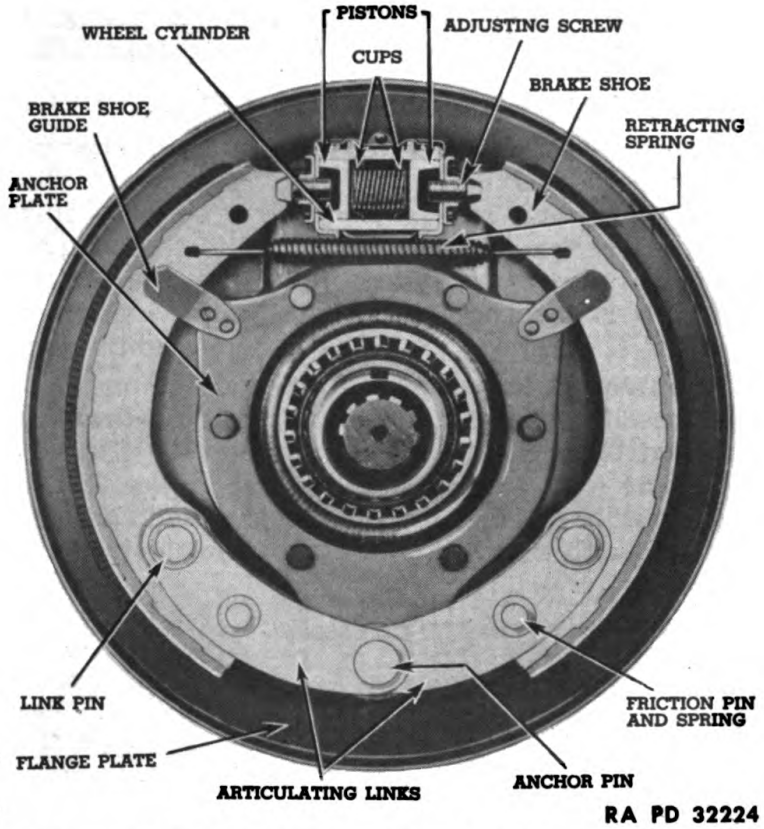


Figure 103—Electric Trailer Brake Adjustment

b. Installation. Assemble articulating links, pins, friction springs, and locks to the new brake shoes. Then assemble shoes to anchor plate and check fit of shoe in guide riveted to anchor plate. NOTE: *The shoes should be free without excessive side movement.* Install the brake shoe retracting spring, and remove wheel cylinder clamp. Install brake drums and wheels. Jack up vehicle and remove stands.

127. PARKING BRAKE BAND REPLACEMENT.

a. Remove lock nut, lock washer, adjusting nut, flat washer, and spring from the large adjusting bolt (fig. 90). Remove clevis pin from operating cam and adjusting bolt. Remove adjusting bolt and shoe springs. Remove lower shoe adjusting screw, nut, and washer. Remove the rear anchor screw lock wire and the screw. Then slide the band assembly off the anchor, and catch the release spring at anchor. Assemble the brake band to the drum, and form it as necessary to conform to the shape of the drum. Adjust according to instructions given in paragraph 121.

128. HYDROVAC REPLACEMENT (fig. 102).

a. Disconnect hydraulic brake lines from the hydrovac unit. Remove the hose connections to the air cleaner and the vacuum line. Remove the four bolts retaining the hydrovac unit to the frame

side rail, and lift off the unit. Installation is the reverse of removal, except that the entire brake system must be bled (par. 123).

129. TRAILER ELECTRIC BRAKE CONTROL.

a. General (fig. 103). On certain vehicles an electric control unit for the trailer brakes is mounted under the driver compartment floorboards. The control unit is connected by an adjustable rod clamped to the foot brake pedal pull rod, so that when the truck foot brakes are applied, the trailer brakes also are applied. A stop light switch also is incorporated in this unit which controls both truck and trailer stop lights, according to main light switch position.

b. Load Control. A load control unit mounted on the instrument panel has four positions for light, medium, medium-heavy, and heavy loads, designated by the numbers 1, 2, 3, and 4. If the load in the trailer is light, the load control should be set at No. 1; if it is heavy, it should be set at No. 4. In other words, the load control should be set in accordance with the weight of the load in the trailer.

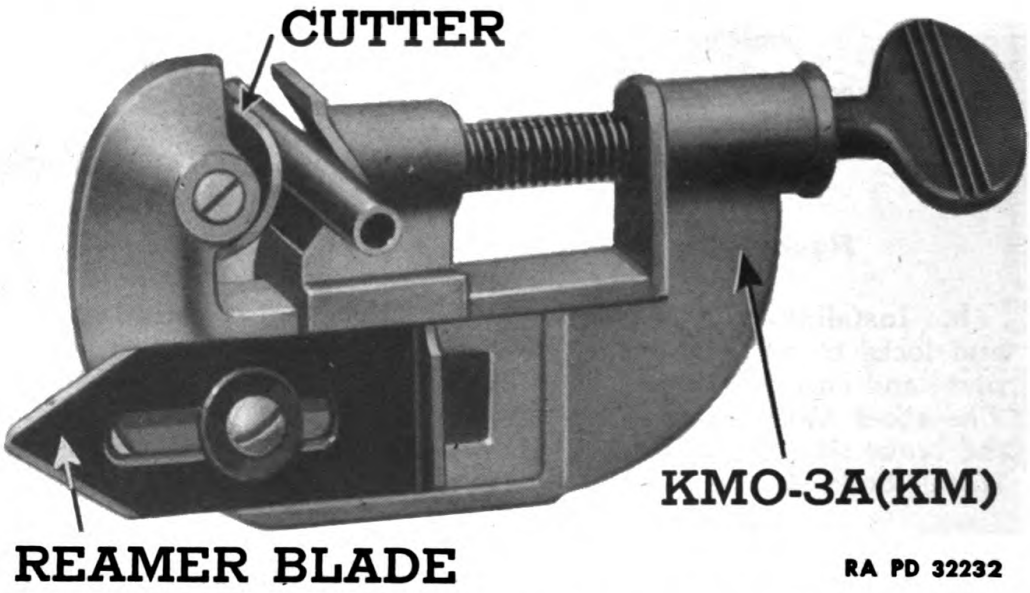


Figure 104—Brake Tube Cutting Tool KM-KMO-3A (41-C-2825)

c. Adjustment. Remove clevis pin from front clevis at clamp. Place control unit operating arm in full "OFF" position (toward rear). Adjust clevis so that with operating arm in full "OFF" position and foot brake pedal in released position, clevis pin can be inserted without altering either the arm or pedal position. Install the clevis pin and cotter pin. Tighten clevis lock nut. The switch blade and contacts should be cleaned occasionally with No. 00 flint paper.

130. BRAKE LINE FLARING.

a. Cut Tube. Cut the tubing to the desired length, using tube cutter to prevent flattening the tubing (fig. 104). Square-off the end

with a fine-cut mill file, then ream the sharp edges with the reamer blade provided on the tube cutter.

b. Install Tube in Die. Place new inverted flared tube nuts on the tubing. Dip end of tubing to be flared in hydraulic brake fluid. NOTE: *This lubrication results in a better formation of the flare.* Loosen the clamping nuts on the flaring tool (41-T-3076-35), and insert finished end of the tubing in the channel of the die until it bears against the stop pin (fig. 105).

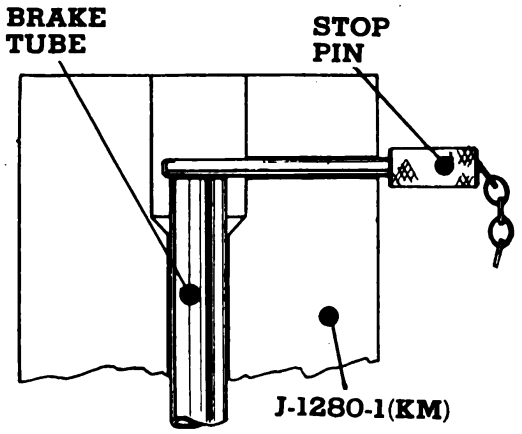


Figure 105—Installing Tube in Tool KM-J-1280 (41-T-3076-35)

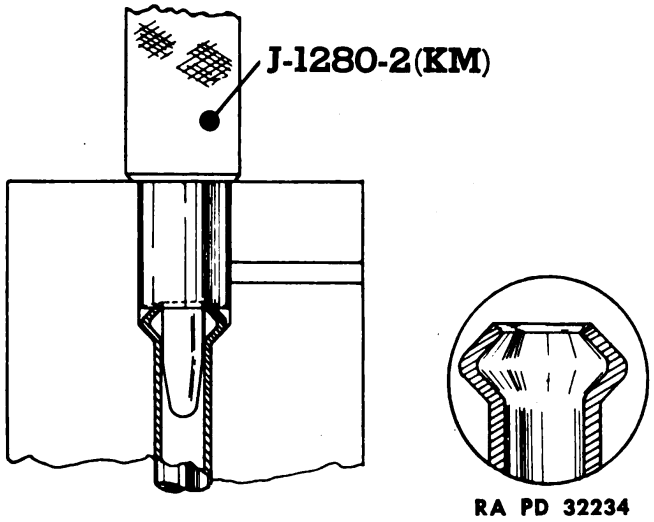


Figure 106—First Flare-forming Operation, Using Special Flaring Tool KM-J-1280 (41-T-3076-35)

c. Install Tool in Vise. Tighten the clamping nuts by hand, and place the fixture in a bench vise. Then tighten down the clamping nuts firmly with a wrench, and remove the stop pin from the die. The tubing is now firmly gripped in the die, and ready for the first flare-forming operation.

1½-TON 4 x 4 TRUCK (Chevrolet)

d. First Flare-forming Operation. Using the flare-forming tool (41-T-3076-35) having the concave die, insert the forming tool in the die and strike firm blows, using a 1-pound hammer, until the shoulder of the tool contacts the top of the die. The cross-section drawing (fig. 106) shows the first step in forming the double-flap flare.

e. Second Flare-forming Operation. Next, using the flare-forming tool (41-T-3076-35) having the 46-degree die at its lower end, insert the tool in the die and strike firm blows, using a 1-pound hammer, until the shoulder of the tool contacts the top of the die. The cross-section drawing (fig. 107) shows the second and final forming operation in making a double-lap flare.

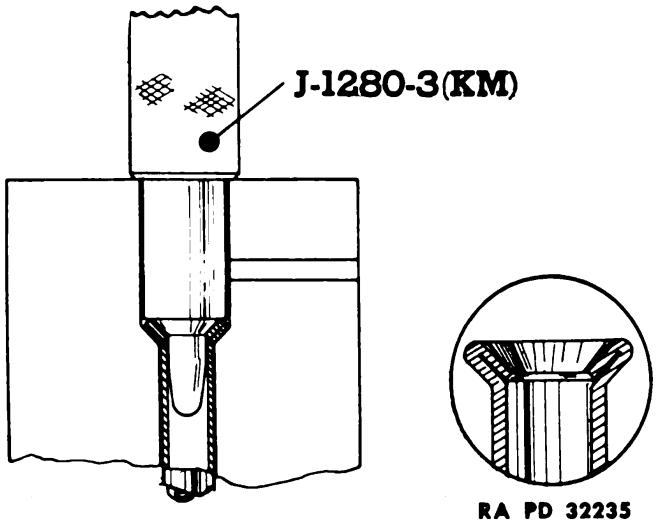


Figure 107—Final Flare-forming Operation, Using Special Flaring Tool KM-J-1280 (41-T-3076-35)

Section XXVI

WHEELS, WHEEL BEARINGS, HUBS, AND TIRES

131. DESCRIPTION AND TABULATED DATA.

a. Description.

(1) WHEELS. Interchangeable pierced-steel disk-type wheels are used both front and rear. The wheel is attached to the hub with six stud nuts. Dual wheels are used at the rear, and the construction is such that duals can be attached at the front for severe operating conditions.

(2) WHEEL BEARINGS. Timken tapered roller bearings are used in the front wheel hubs, while Hyatt roller bearings are used in the rear wheel hubs.

(3) HUBS. Each hub is fitted with an external flange for attaching the brake drum and wheel. These are machined to take the inner and outer wheel bearing cups and oil seal. The outer end of hub has eight tapped holes for bolting the axle flange or drive flange.

(4) TIRES. Heavy-duty mud- and snow-type tires are used on all wheels. A removable clamp ring holds the tire on the wheel.

b. Data.

(1) WHEELS.

Wheel size	20 x 7
Rim size	20 x 5.005 (7 in.)
Wheel offset	5⅛ in.

(2) WHEEL BEARINGS (FRONT).

Inner cone and roller assembly	Timken 33275
Inner cup	Timken 33472
Outer cone and roller assembly	Timken 399A
Outer cup	Timken 394A

(3) WHEEL BEARINGS (REAR).

Inner assembly	Hyatt KD-12051Z
Outer assembly	Hyatt KB-11786Y

(4) TIRES.

Size	7.50 x 20
Number plies	8
Inflation:	
Front—with single wheels	55 lb
Front—with dual wheels	27½ lb
Rear—with single wheels	55 lb
Rear—with dual wheels	40 lb

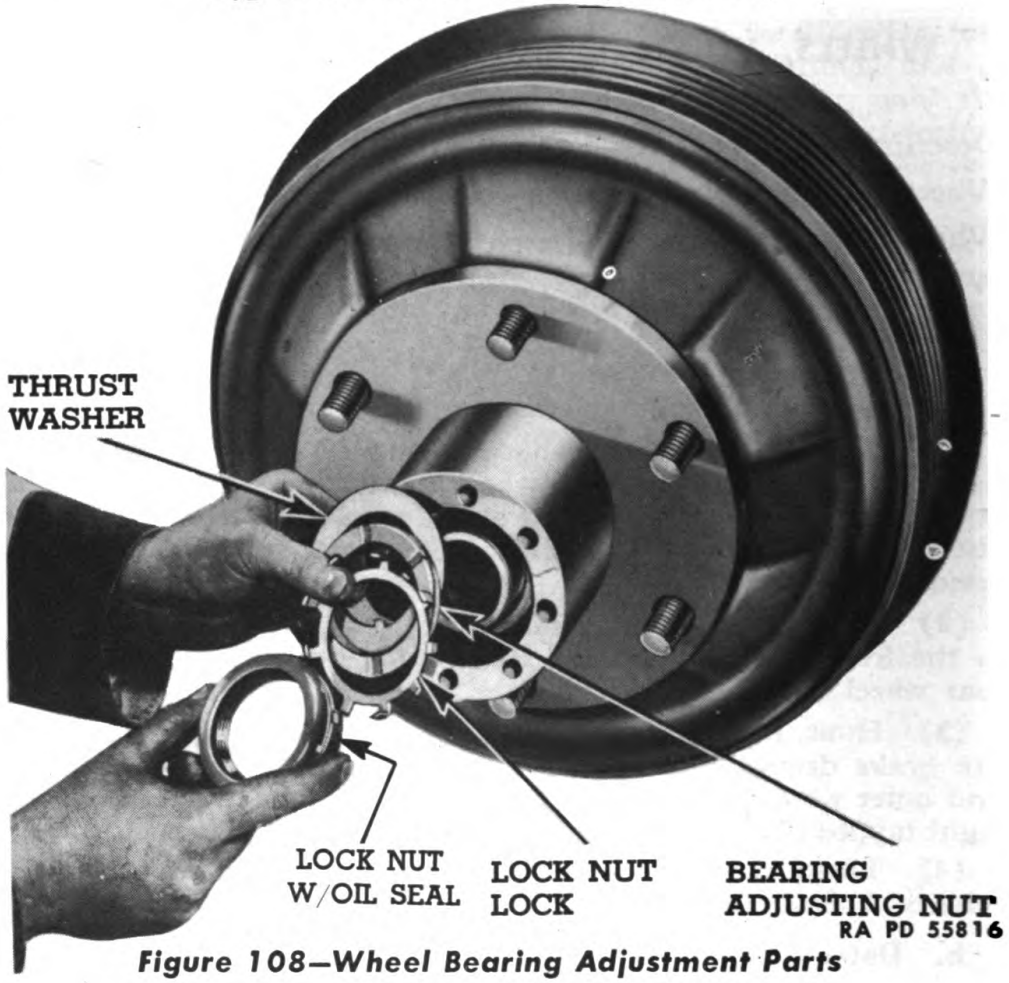


Figure 108—Wheel Bearing Adjustment Parts

132. WHEEL AND TIRE REPLACEMENT.

a. Removal. Set truck in level place, loosen wheel to hub retaining nuts one turn, and block wheel at opposite end of vehicle. NOTE: *The wheel nuts on left side of vehicle have left-hand threads. Those on right side have right-hand threads.* Raise axle until wheel is free; remove wheel nuts, and wheel and tire assembly. Deflate tire completely. Force clamp ring in until it drops into groove in wheel. Insert a heavy screwdriver into the recess in the clamp ring, and pry this side of the ring out over the edge of wheel. Work the ring off wheel with tire irons, and remove the tire and tube assembly.

b. Installation. Place the tube in tire, place the tire on wheel, and install clamp ring. NOTE: *Make sure the clamp ring is seated against the rim of the wheel throughout its entire circumference before inflating the tire.* Inflate tire slowly and watch to see that the ring stays in place. Install wheel, tighten nuts, and remove jack and wheel blocking.

133. WHEEL BEARING ADJUSTMENT (front or rear wheels).

a. Remove Wheel and Axle Flange. Set emergency brake or block a wheel. Loosen the wheel stud nuts one turn on the wheel to

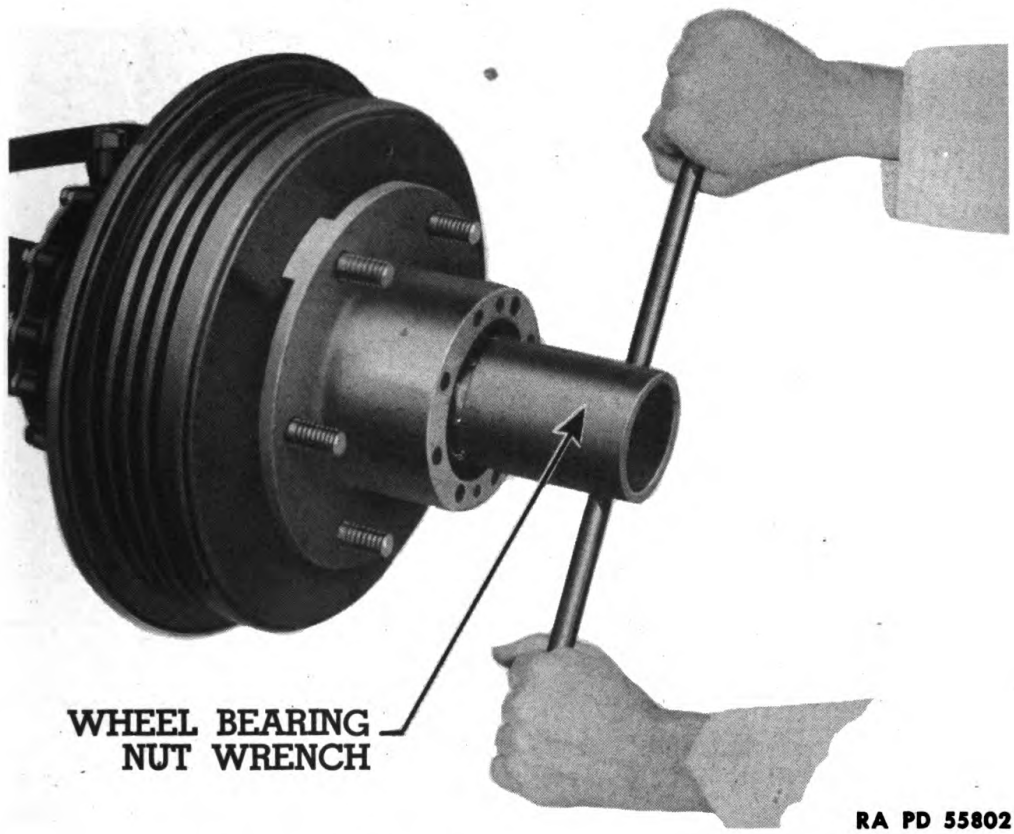


Figure 109—Wheel Bearing Adjustment

be adjusted. Raise axle until wheel is free, remove wheel stud nuts and wheel assembly. Remove the rear axle shaft bolts or front axle drive flange bolts and axle shaft or flange.

b. Adjust Bearing. Raise the tang of the lock nut lock (fig. 108), and remove lock nut and seal assembly and lock nut lock. Tighten the bearing adjusting nut wrench-tight (fig. 109). Then back the adjusting nut off 45 degrees, which is equal to the distance between two adjacent flange bolt holes. Install lock nut lock and aline nearest slot in adjusting nut with short tang on lock nut lock, and bend tang into slot. Install lock nut and seal, and tighten securely. Bend one long tang on lock into slot in nut.

c. Install Flange or Axle and Wheel. Place a new terne plate gasket on the drive flange (fig. 110), or axle shaft (fig. 88), and install the shaft or flange. Install the lock washers and flange bolts. Install wheel assembly, and remove blocking and jack. Tighten axle flange bolts to a torque-load of 95 to 115 foot-pounds.

134. WHEEL BEARING REPLACEMENT.

a. Front Wheels.

(1) REMOVAL. Remove the wheel and axle flange (par. 111 a). Remove the bearing adjusting lock nut and lock. Remove the bearing

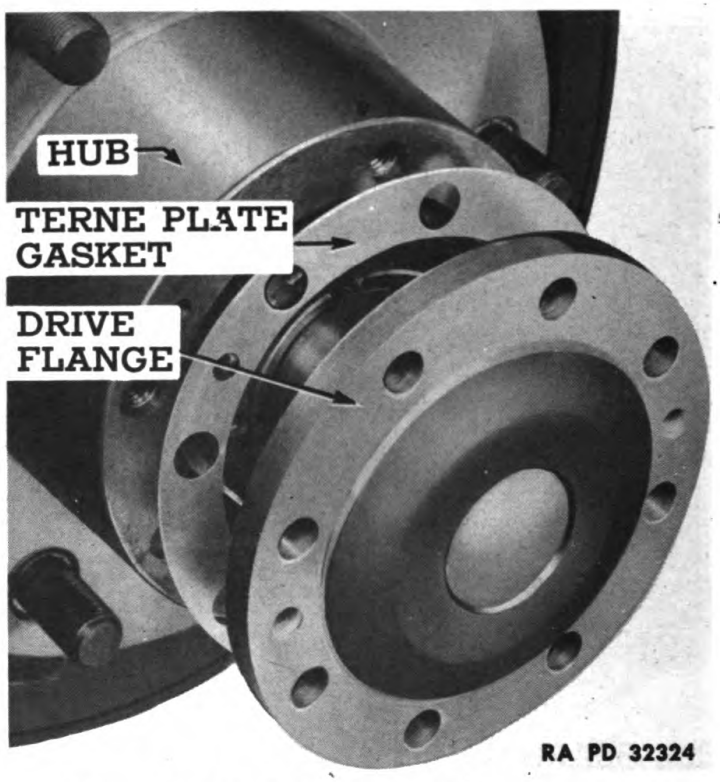


Figure 110—Installing Drive Flange

adjusting nut (fig. 108), spacer washer, roller bearing, and wheel hub. Pull the bearing and oil seal. Drive the outer bearing cup out of hub working from inner end of hub. Wash the bearings and inside of hub with dry-cleaning solvent and inspect the bearings for being worn, chipped, or cracked. Replace all damaged parts.

(2) INSTALLATION. Start the bearing cups into hub with the bearing surface of cups facing away from center of hub. Drive or press the bearing cups into hub. Hand-pack the inner bearing roller assembly with grease (par. 28 **c** (10)). Install the bearing, coat the outside of oil seal lightly with sealing compound, and drive it into place against bearing cup. Coat the oil seal lightly with engine oil to lubricate it. Install the hub, hand-pack the outer bearing roller assembly, and place it over end of steering knuckle and into hub. Install spacer washer and adjusting nut. Adjust bearing and reassemble (par. 133).

b. Rear Wheels.

(1) REMOVAL. Remove the wheel and axle shaft (par. 117 **a** and 132). Remove the bearing adjusting lock nut and lock. Remove the bearing adjusting nut, spacer washer, and roller bearing and wheel hub assembly. Pull the bearing and oil seal. Tap the outer bearing cup away from snap ring (fig. 111), remove ring, and press or drive the cup out of hub; wash the bearings, inside of hub, and end of axle housing with dry-cleaning solvent, and inspect the bearings for wear, chips, and cracks. Replace all damaged parts.

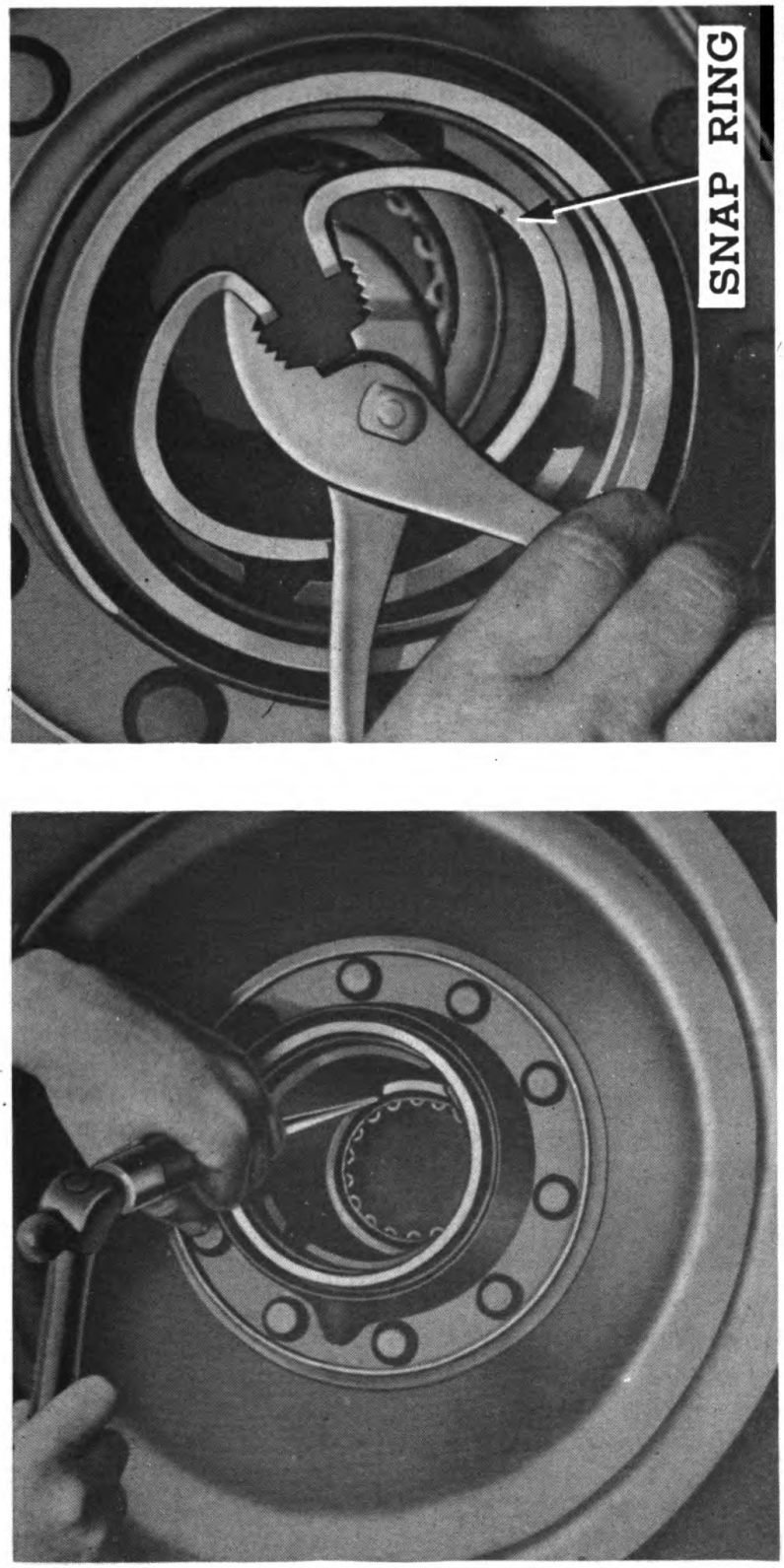


Figure 111—Removing Outer Bearing Snap Ring

(2) INSTALLATION. Install the snap ring and press both bearing cups into the hub, with the thick edge of cups toward center of hub. Hand-pack the inner bearing with grease (par. 28 c 10). Install the bearing, coat the outside of oil seal lightly with sealing compound, and drive it into place against bearing cup. Lock the seal in place by prick-punching end of hub in three equally spaced places. Coat the oil seal lightly with engine oil to lubricate it. Install the hub, hand-pack the outer bearing roller assembly, and place it over end of steering knuckle and into hub. Install spacer washer and adjusting nut. Adjust bearings and reassemble (par. 133).

Section XXVII

SPRINGS AND SHOCK ABSORBERS

135. DESCRIPTION AND TABULATED DATA.

a. Description.

(1) SPRINGS. The springs are the semielliptic type. Bronze bushings are pressed into the eyes at the ends of the springs. A Berlin eye is formed on the rear of the second leaf of the front spring as a safety measure in case the main leaf should break. The front springs are shackled at the front end of the spring, and the rear springs are shackled at the rear end. On some models an auxiliary spring having six leaves is used in conjunction with the rear spring.

(2) SHOCK ABSORBERS. The shock absorbers are the hydraulic double-acting, opposed-cylinder type, and are used to provide a smoother ride by dampening the spring vibration as the truck passes over irregularities in the road.

b. Data.

(1) FRONT SPRINGS.

Length	40 in.
Center of rear eye to seat center	20 3/8 in.
Width	2 in.
Number of leaves	9

(2) REAR SPRINGS.

Length	45 15/16 in.
Front eye to center bolt	22 13/32 in.
Width	2 1/2 in.
Number of leaves	10

(3) AUXILIARY SPRINGS.

Length (between frame brackets)	31 in.
Width	2 1/2 in.
Number of leaves	6

(4) SHACKLE PIN.

Diameter	0.874 in. to 0.875 in.
Bushing diameter (I.D.)	0.876 in. to 0.880 in.

(5) SHOCK ABSORBERS.

	Front	Rear
Make	Delco	Delco
Type	Hydraulic	Hydraulic
Action	Double	Double
Rebound valve marking	2R	2J
Compression valve marking	L0	G2

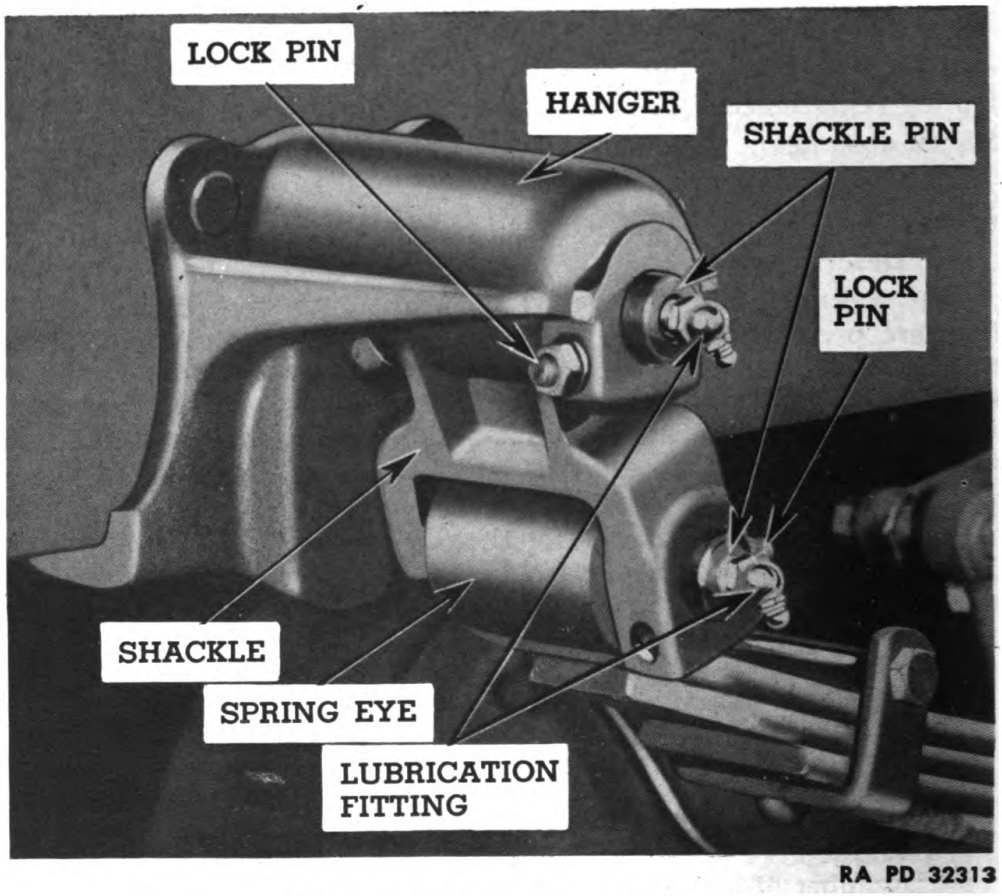


Figure 112—Spring Shackle

136. SHACKLE AND HANGER PIN REPLACEMENT (fig. 112).

a. Raise the truck until the weight is off the springs, and support the frame. Remove the bolt and nut that locks the shackle bolt in the shackle, and drive the shackle pin(s) out from the inside. When installing the shackle bolts, be sure to line up the groove in the bolt with the lock bolt hole. Lubricate the shackle pins.

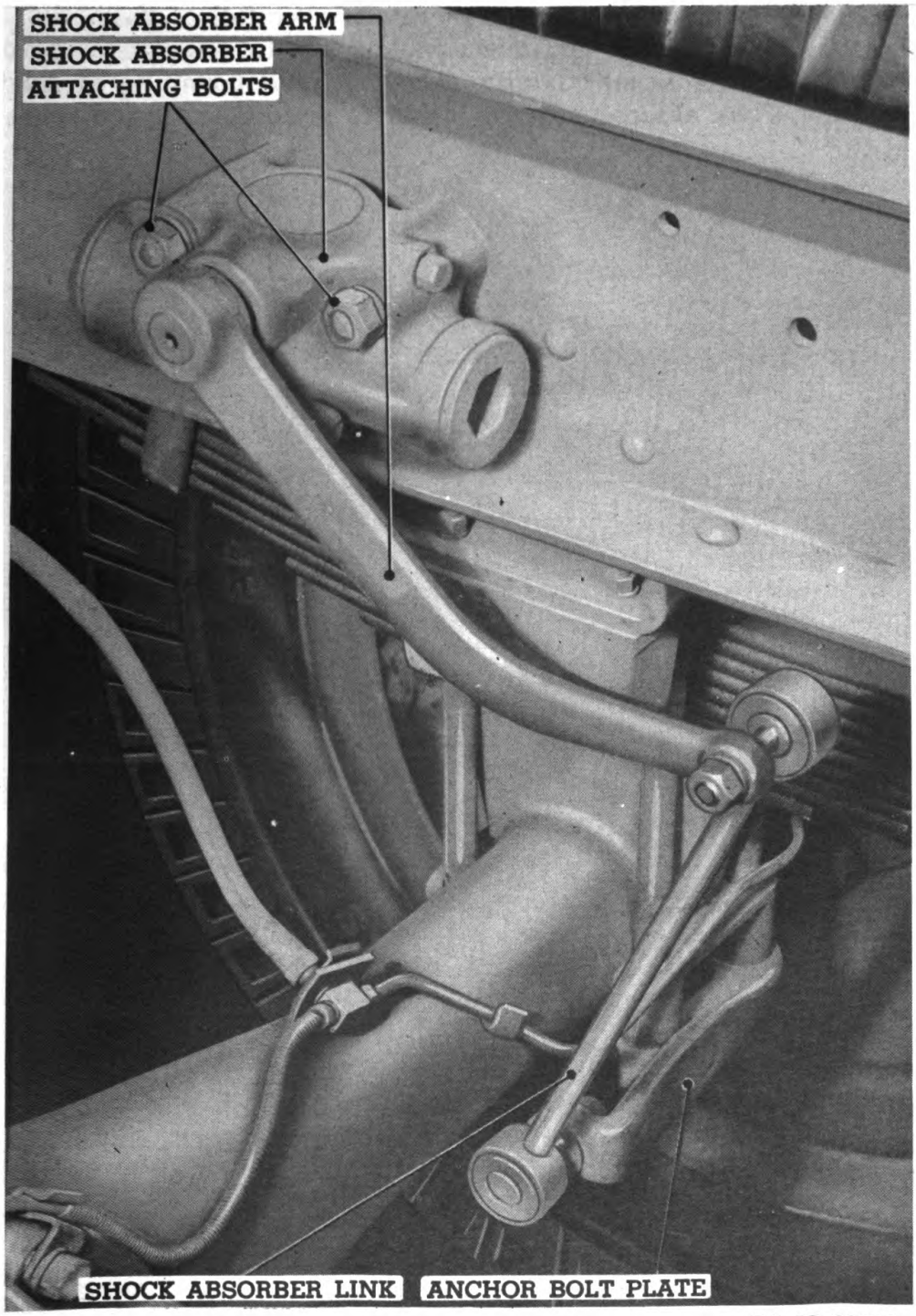
137. SPRING REPLACEMENT.

a. Remove the shackle and hanger pins (par. 136), and remove the spring U-bolts. The spring can then be lifted from the axle. When installing the springs, be sure to place the spring center bolt in the hole in the spring seat, and the Berlin eye on the front spring toward the rear of the vehicle. Lubricate the shackle pins.

138. SHOCK ABSORBER (figs. 82 and 113).

a. Replacement. Disconnect the link from the shock absorber arm, and remove the four frame mounting bolts. Lift the shock

SPRINGS AND SHOCK ABSORBERS



RA PD 32314

Figure 113—Shock Absorber, Rear

absorber from the frame. Install the shock absorber in the reverse manner.

b. Filling. Clean all dirt from around filler plug, and remove the plug. With a fluid injector, fill shock absorber full of fluid. Work shock absorber arm up and down while filling to eliminate trapped air. Withdraw a small quantity (about 2 tablespoonfuls) of fluid from the shock absorber after it is full to provide expansion space.

Section XXVIII

STEERING GEAR

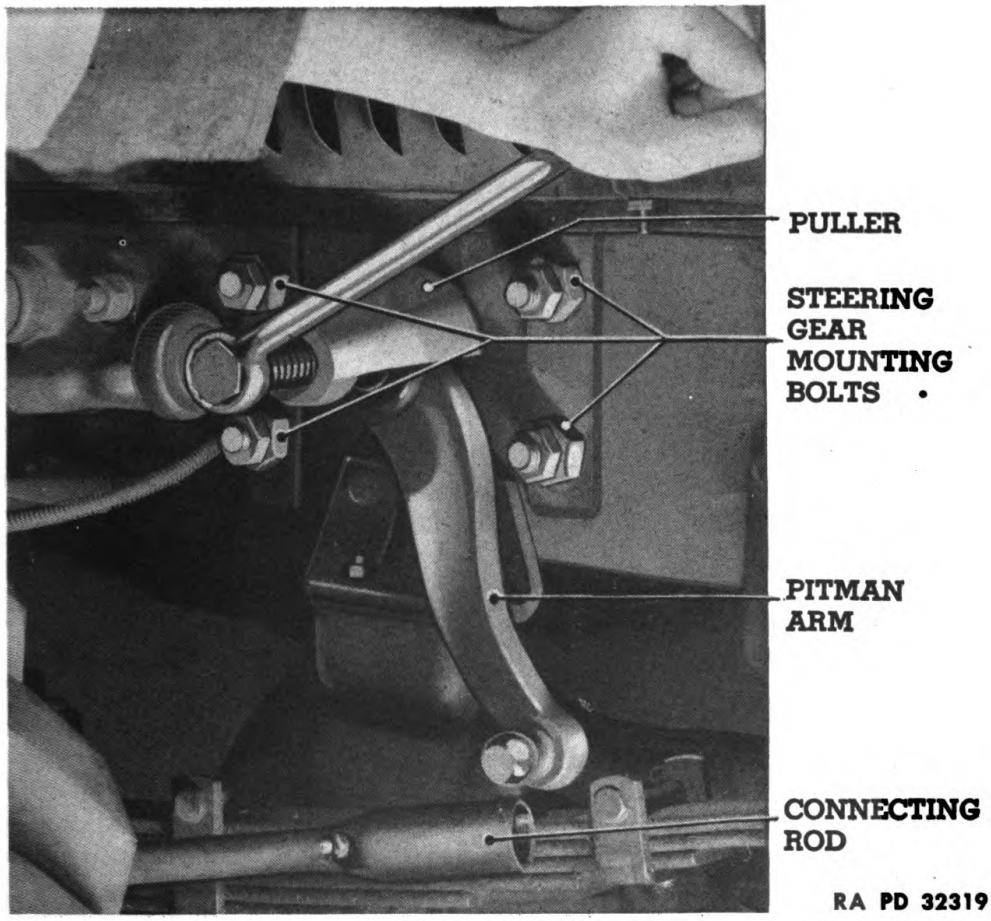


Figure 114—Pitman Arm Removal, Using Puller (41-P-2952)

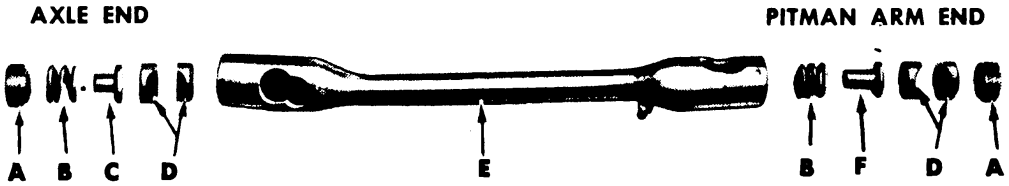
139. DESCRIPTION.

a. The steering gear is of the recirculating ball type, having a reduction ratio of 23.6 to 1. When the steering wheel is turned, helical grooves on the main shaft cause ball bearings to climb up or down the path carrying with them the ball nut. The rack teeth on the ball nut cause the sector teeth on the Pitman shaft to follow them, thus turning the Pitman shaft and Pitman arm. The steering connecting

rod is of the ball-and-socket type, having identical ball seats, springs, and adjusting plugs on the ends; but the safety plugs are of different lengths. The 20-inch steering wheel is of the three-spoke type which is serrated to the main shaft, and held in place with a retaining nut. The horn blowing mechanism is built into the mast jacket and steering wheel.

140. PITMAN ARM REPLACEMENT (fig. 114).

a. Remove the end plug from the rear end of the steering connecting rod, and pull the rod off the ball on the Pitman arm. Remove the nut and lock washer from the end of the Pitman shaft, and pull the Pitman arm off the Pitman shaft with puller (41-P-2952). Install the new Pitman arm, lock washer, and nut; and tighten the nut securely. Install the steering connecting rod on the Pitman arm ball, making sure that the ball seats are in the proper position around the ball (fig. 115). Then tighten the end plug until it bottoms, back it off ½ turn, and install a new cotter pin. Lubricate the fitting on the steering connecting rod.



A—ADJUSTING PLUG
B—TENSION SPRING
C—SAFETY PLUG (SHORT)
D—BALL SEAT
E—STEERING CONNECTING ROD
F—SAFETY PLUG (LONG)

RA PD 33111

Figure 115—Steering Connecting Rod

141. STEERING CONNECTING ROD REPLACEMENT.

a. Remove the end plugs from each end of the connecting rod, and pull the rod off the two ball ends. Install the steering connecting rod on the steering arm and Pitman arm ball with the springs, safety plugs, and ball seats in the correct position in the rod (fig. 115), making sure that the ball seats fit properly around the balls. Tighten the end plugs in tight, back them off ½ turn, and install a new cotter pin. Lubricate the steering connecting rod.

142. STEERING WHEEL REPLACEMENT.

a. Remove the two screws that retain the horn button, and lift out the button. Remove the nut from the upper end of the main shaft and pull the steering wheel off the main shaft, using puller (41-P-2954). Place the steering wheel on the main shaft, and install the

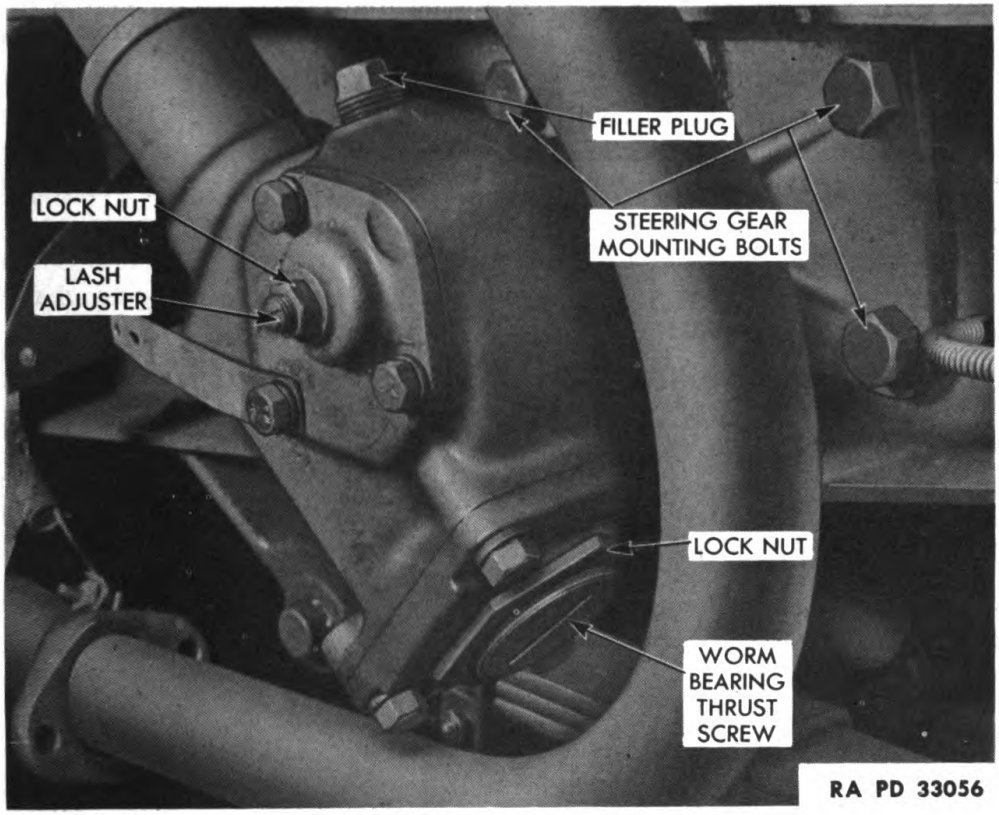


Figure 116—Steering Gear Adjustment

lock washer and nut. Tighten the nut securely. Install the horn button spring, insulator, contact plate, horn button, retainer plate, and screws.

143. STEERING GEAR ADJUSTMENT (fig. 116).

a. Remove Load from Worm Bearing. Disconnect the steering connecting rod from the Pitman arm (par. 141). Loosen the mast jacket to instrument panel clamp nuts at the instrument panel; then loosen the lash adjuster lock nut, and turn the lash adjuster two or three turns in a counterclockwise direction to remove any worm bearing load caused by close meshing of the rack and sector teeth.

b. Adjust Worm Bearing Load. Turn the steering wheel slowly to the right or left until it stops; then turn it back one complete turn. CAUTION: *Do not turn the wheel hard against the stop as damage to the ball guides may result.* Loosen the worm bearing thrust screw lock nut at the bottom of the steering gear, and tighten the thrust screw until it requires between 1- and 1½-pound pull to keep the wheel in motion. After setting the thrust screw properly, tighten the lock nut, and check again to see that it requires between 1- and 1½-pound pull to keep the wheel in motion. If there is a noticeable roughness when turning steering wheel after adjusting the bearings, the bearings are probably damaged, and the steering gear must be replaced.

c. Tighten Mast Jacket Clamp. Tighten the mast jacket to instrument panel clamp nuts, and again check the tension on the steering wheel to see that the shaft is not binding, caused by tightening the clamp nuts. If it requires more than 1/2-pound pull to keep the wheel in motion, loosen the clamp nuts again; then loosen the four bolts that retain the steering gear to the frame side rail, and shift the steering gear so that the clamp nuts at the instrument panel will not cause the shaft to bind when the nuts are tightened. Then tighten the clamp nuts and the four mounting bolts, and again check the tension on the wheel.

d. Centralize Rack and Sector Teeth. Locate the center of the sector shaft travel by turning the steering wheel gently from the left stop to the right stop while counting the number of turns the steering wheel travels. Then turn the wheel back ½ the number of turns; this will place the steering gear in the center position. Mark the steering wheel with a piece of tape.

e. Lash Adjustment. Turn the lash adjuster clockwise to take out all of the lash in the gear teeth. Check the pull at the steering wheel while the wheel is passing through the center position. NOTE: *It should now require between 2 and 2½ pounds to pull the wheel through the center position.* Adjust the lash adjuster until all the lash in the gear teeth has been eliminated; then tighten the lock nut, and recheck the pull.

f. Assemble Steering Connecting Rod. Install the steering connecting rod over the ball on the Pitman arm, making sure the parts are assembled according to the sequence shown in figure 115. Then tighten the adjusting plug until it bottoms, and back it off ½ turn and install a new cotter pin. Lubricate the fitting on the steering connecting rod.

144. STEERING GEAR REMOVAL.

a. Remove Steering Wheel and Disconnect Horn Wire. Remove the two screws that retain the horn button, and lift off the button. Remove the nut and washer and pull off the steering wheel, Woodruff key, and upper bearing tension spring. Remove the clamp that retains the mast jacket to the instrument panel. Remove the horn wire from the terminal on the mast jacket.

b. Disconnect Brake Pedal. Remove the floor and toeboards; then remove the clevis pin from the brake pedal pull rod at the master cylinder, and pull the brake pedal back as far as it will go.

c. Remove Steering Gear. Disconnect steering connecting rod. Remove the nut and lock washer from the Pitman shaft, and pull off the Pitman arm. Remove the left engine side pan bolts. Remove the four bolts that mount the steering gear to the frame side rail, lift the assembly up and out through the left door opening.

STEERING GEAR

145. STEERING GEAR INSTALLATION.

a. Install Steering Gear. Slide steering gear assembly in through the left door opening, and position the housing in frame side rail. Install the four bolts and two anchor plates, and start the four mounting bolt nuts. Install and tighten the clamp bracket at the instrument panel; then tighten the mounting bolt nuts securely, and install the lock nuts.

b. Check Steering Gear Adjustment. Install the steering wheel and check to see that it requires between 2- and 2½-pound pull to pull the wheel through the center position. If not, it will be necessary to adjust the steering gear (par. 143).

c. Install Steering Connecting Rod. Install the Pitman arm, lock washer, and nut; and tighten securely. Install the steering connecting rod on the Pitman arm, making sure the ball seats fit around the Pitman arm ball properly; then tighten the end plug until it bottoms, and back it off ½ turn, and install a new cotter pin. Install the left engine side pan bolts. Connect the brake pedal to the master cylinder, and install the toeboard and floor board.

d. Install Horn Button. Connect the horn wire to the terminal, and install the horn button. Lubricate the steering gear and steering connecting rod.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XXIX

CAB, BODY, AND FRAME

146. CAB.

a. The cab is of all-steel construction fitted with a hinged V-type windshield, a cowl ventilator, adjustable door windows, and a stationary back window. The three-point cab to frame mounting provides a secure, yet flexible, cab mounting.

b. Cushions, Seat and Seat Back.

(1) ADJUSTMENT. The cab seat and seat back cushions are adjustable to provide correct position for the individual driver. To adjust, lift front of seat and move seat forward or back to line up one of the four holes in the bottom of the seat frame with the pins (one on each side) of the seat riser brackets. The seat cushion is hooked to the seat back cushion; therefore, when the seat cushion is moved forward or back to obtain correct adjustment, the back cushion moves with it.

(2) CUSHION REMOVAL. Raise the front edge of seat cushion and pull the cushion forward. Unhook the seat cushion from back cushion, and remove the cushion. Raise the seat back cushion to unhook it from the cab brackets, and remove back cushion.

(3) CUSHION INSTALLATION. Place the seat cushion and seat back cushion in the cab and hook the brackets on the bottom of back cushion to brackets at back edge of seat cushion. Raise the back cushion, and hook the brackets at the top of cushion in the brackets on cab. Slide the cushion assembly back to the desired position, and enter the seat adjuster holes over the seat riser bracket pins.

c. Windshield Assembly and/or Weatherstrip Replacement.

(1) REMOVAL. Release the windshield clamp at center of windshield. Remove the windshield adjusting arm bracket to windshield frame screws on each side of windshield. Remove the two screws attaching each hinge to windshield frame, and remove windshield assembly. Work the weatherstrip out of the groove in the windshield frame.

(2) INSTALLATION. Coat the weatherstrip groove in windshield frame with liquid soap, place the outer (front) edge of weatherstrip in groove, and push inside edge into place, using a putty knife. Carefully position the windshield assembly in the windshield opening, line up the hinges with the windshield, and install the screws. Install

the windshield adjusting arm bracket screws. Push both windshield arms down to fully close the windshield, and hook the clamp at center of windshield. Check to see that windshield is properly centered in opening, and that the weatherstrip seals all the way around the windshield.

d. Windshield Wiper Replacement.

(1) REMOVAL. To remove either the left or right windshield wiper motor, remove the windshield header cover panel covering the wiper motor to be removed. Disconnect the hose from motor, remove the wiper blade and arm assembly, and remove the mounting nut on the front of header panel.

(2) INSTALLATION. Place the wiper motor in position, and install the retaining nut. Install the wiper arm and blade assembly. Connect the hose to motor, start the engine, and check wiper operation. Install the windshield header cover plate.

147. BODY.

a. Description.

(1) PANEL BODY (MODEL G-7105). The panel body is a single unit, providing driver and passenger space, as well as a fully enclosed cargo space. The front end of the panel body is constructed like the conventional cab; however, the roof and side panels extend back to enclose the cargo space. The rear end of body is fitted with a large double door to provide convenience in loading.

(2) CARGO BODY. The steel cargo body is fitted with five bows to support the tarpaulin. The tarpaulin when completely installed fully encloses the cargo space. Hooks are provided around the body for tying the tarpaulin in place. The tail gate is hinged at the bottom and can be held in any position with the end gate chains. The lower section of each side panel can be lowered to provide troop seats. A tool compartment is provided under the back end of body.

(3) DUMP BODY. The dump body construction is very similar to the cargo body; however, it is mounted on a subframe above the chassis frame. The subframe is fitted with a hydraulic hoist so constructed that the front end of body can be raised to automatically dump bulk material. The tail gate is so hinged that it can be released and allowed to swing out as the body is raised.

(4) TELEPHONE EARTH BORER BODY (MODEL G-7163). This special body is designed primarily for mounting an earth borer (for drilling pole holes) and a rear-mounted winch to use in connection with the earth borer derrick for setting poles. Special supports are hinged at the rear corners of the body; these supports are to be adjusted to support the rear end of body when earth borer is in use.

(5) TELEPHONE MAINTENANCE BODY (MODEL G-7173). This is a special body designed to provide for use of a rear-mounted winch,

pole derrick, and wire reels. Special lockers, compartments, and brackets are provided for carrying standard lineman's supplies, tools, and equipment.

b. Cargo or Dump Body Tarpaulin Replacement.

(1) REMOVAL. Untie the tarpaulin ropes from the hooks around the body. Remove tarpaulin assembly. Untie the front and rear curtains and remove them. Fold or roll the tarpaulin and end curtains. Do not leave the tarpaulin folded or rolled unless thoroughly dry.

(2) INSTALLATION. Place the end curtains in position, and properly fasten them to end bows and body. Place the tarpaulin in position over top of body bows, and tie the ropes securely to hooks on body.

c. Cargo or Dump Body Bows Replacement. Remove tarpaulin as explained in subparagrahp **b** above. Lift the complete top bow or bows out of the stake assemblies. Remove the eight bolts to separate the upper bow, side bows, and corner assemblies. Reverse this procedure when installing.

d. Troop Seat Assembly Replacement. Remove the bolts that attach the seat hinge to the body, and remove the seat. Place the seat in position, and install the hinge bolts.

148. FRAME.

a. Description. The chassis frame is composed of heavy channel steel side rails having heavy cross members and brackets riveted to the side rails. A frame extension at the front end provides a mounting for the front bumper as well as the winch, on some models. A special reinforcement at the back end of frame provides for the mounting of a pintle hook.

b. Towing Hook Replacement. Remove the three bolts that attach either towing hook to frame and front bumper, and remove hook. Place the new towing hook in position on frame and bumper, and install the three bolts.

c. Front Bumper Replacement.

(1) WINCH EQUIPPED MODELS. Remove the three towing hook bolts on each side and remove hooks. Remove the two winch support to bumper bolts, and cut the head from the four bumper to frame extension rivets on each side. Drive the rivets out and remove bumper. Place the new bumper in position, and install the towing hooks loosely. Start the two winch support to bumper bolts. Install bolts, nuts, and lock washers where the eight rivets were removed. Tighten all attaching bolt nuts securely.

(2) VEHICLES NOT EQUIPPED WITH WINCH. Remove the three bolts attaching each towing hook and remove hooks. Cut the heads from the six attaching rivets at each frame member, drive out the rivets, and remove the bumper. Remove the two rivets that attach

the starting crank support to center of bumper, and bolt the support to new bumper. Place the new bumper in position, and install the towing hooks loosely. Install 3/8-inch bolts, nuts, and lock washers in the 12 bumper to frame holes, and tighten all attaching bolts and towing hook bolts securely.

d. Rear Bumper Replacement. Remove the six bolts attaching each rear bumper to frame, and remove the bumpers. Place the bumpers in position at the rear corners of frame, and install the six bolts that attach each bumper.

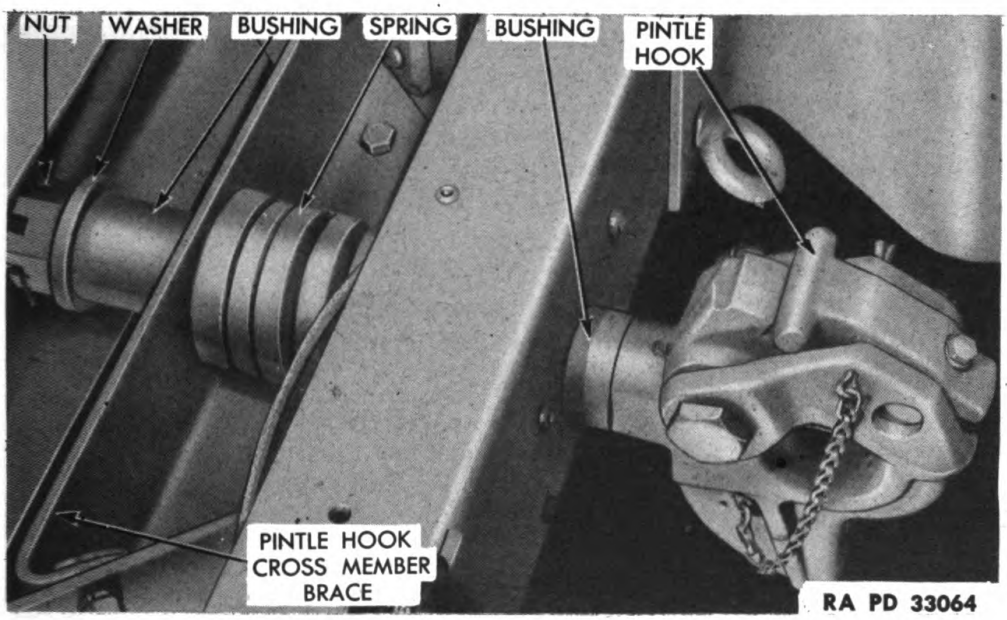


Figure 117—Pintle Hook Replacement

e. Pintle Hook Replacement (fig. 117). Remove the cotter pin, nut, and washer from front end of pintle hook, and pull the pintle hook out of bushings. Push the new pintle hook through the bushings, and install the washer and nut. Tighten the nut until there is just enough spring tension to hold the bushings tight in frame. Install cotter pin.

f. Pintle Hook Spring and/or Bushings Replacement.

(1) REMOVAL. Remove cotter pin from end of pintle hook, and tighten nut to relieve spring tension from pintle hook cross member brace. Remove the six cross member brace bolts. Remove pintle hook nut, washer, pintle hook, brace, spring, and bushing.

(2) INSTALLATION. Place the short end of one bushing through frame rear cross member with collar against front side of frame member. Place the long end of other bushing through pintle hook cross member brace so that the collar will be on rear side of brace. Place the spring over collar on rear bushing, and put cross member

brace in position with short end of bushing piloting into spring. Push pintle hook through bushings, and install washer and nut. Tighten nut until cross member brace bolt holes are in position. Install six bolts and tighten securely. Loosen pintle nut until spring tension just tightens bushings in frame to prevent rattle. Install cotter pin. The position of the pintle hook can be extended back several inches farther away from the rear cross member by reversing the position of the two bushings.

Section XXX

CHASSIS SHEET METAL

149. DESCRIPTION.

a. The chassis sheet metal consists of front fenders, front fender skirts, rear fenders (some models), running boards, hood, and hood side panels. To facilitate manufacturing and service operations, the radiator, radiator guard, radiator support, fan shroud, front fenders, fender skirts, and headlights are assembled into a single unit known as the front-end sheet metal assembly.

150. FRONT-END SHEET METAL REMOVAL.

a. Remove Hood. Release the hood catches, raise the hood, and disconnect the radio suppression bond straps from the hood. Remove the hood brace rod anchor screws, the hood hinge pins, and the hood assembly. Remove the two hood side panels.

b. Disconnect Cooling System. Disconnect the radiator brace rod from radiator support and cowl, and remove brace rod. Drain the cooling system, and remove radiator drain cock. Disconnect the top and bottom radiator hose, and the steam relief tube.

c. Disconnect Electrical Connections. Disconnect the electrical wiring at the junction block on each side, and the blackout wires at bayonet connectors. Remove wiring harnesses from clips on left fender skirt and radiator. Disconnect wiring harness from generator. Disconnect the radio suppression bond straps from rear end of each fender skirt, and the two from bottom of radiator support.

d. Remove Sheet Metal Assembly. Remove the fender to running board and fender to cowl bolts on each side. Remove the bolts attaching rear end of radiator diagonal support to cab bracket. Remove the nuts from lower radiator anchorage to frame cross member bolts and remove the washers, springs, and bolts. Remove the fan blades if the vehicle is equipped with a front-mounted winch. Slide the front end sheet metal assembly forward until the fan shroud clears the fan or fan hub, and lift the assembly off chassis (fig. 118). If any of the individual items of this assembly require repairs or replacement they can be removed from the assembly very easily.

151. FRONT-END SHEET METAL INSTALLATION.

a. Install Sheet Metal Assembly. Make sure the lower hose is securely clamped to radiator outlet. Place the sheet metal assembly on the frame, and slide it back into position. Make sure the shroud clears the fan to prevent damage to the fan, shroud, or radiator. If the vehicle is equipped with a front-mounted winch it will be neces-

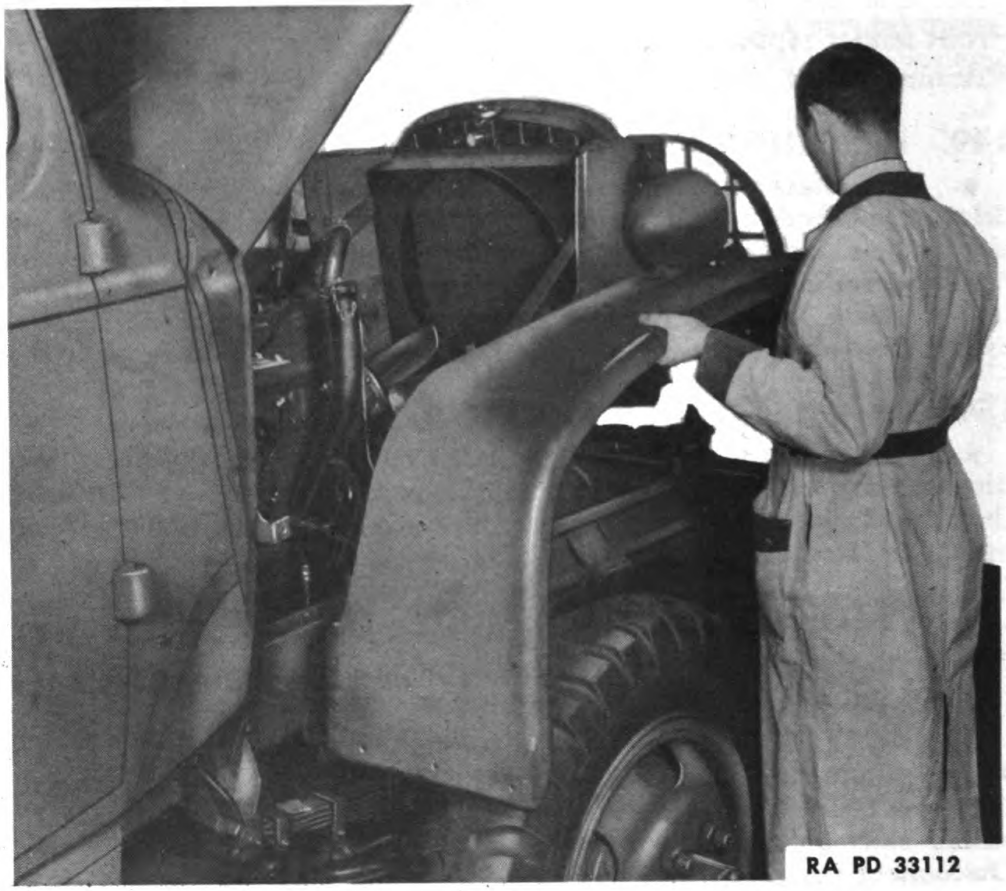


Figure 118—Front-end Sheet Metal Removal

sary to have the fan blades removed when installing sheet metal assembly. Line up the holes in the radiator anchorage, insulator, and frame cross member. Install the mounting bolts, shims, springs, washers, nuts, and lock nuts. Install and tighten the fender to cowl and fender to running board bolts. Install the bolts attaching the diagonal brace to cab bracket, and tighten them securely. Install the fan if it was removed for sheet metal replacement.

b. Connect Electrical Equipment. Connect the radio suppression bond straps to lower radiator anchorage and fender skirts. Connect the wiring harness to generator. Place wiring harnesses in the clips on left fender skirt and radiator. Connect the electrical wiring at the junction blocks and the bayonet connectors.

c. Connect Cooling System. Connect and tighten both radiator hoses and the steam relief tube. Fill the cooling system and check for

leaks. Check the operation of front lights. Start the engine and check the generator output. Install the radiator brace rod, but leave the nuts at dash loose.

d. Install Hood. Install the hood side panels, and tighten the radiator brace rod nuts at dash evenly. Place the hood in position, and install the hood hinge pins. Install the hood brace rod anchor screws, and connect the radio suppression bond straps.

152. FRONT FENDER REPLACEMENT.

a. Removal. Raise the hood and place pin through hole in hood brace to lock the hood up. Disconnect electrical wiring at junction block, and blackout wires at bayonet connectors. Disconnect wiring harnesses from clips on fender skirt if left fender is being removed. Remove the front and rear hood side panels from side on which fender is to be removed. Remove the fender to running board and fender to cowl bolts. Remove radio suppression ground strap from fender skirt. Remove the bolts attaching the fender to radiator guard. Remove the fender and skirt assembly. Remove the bolts that attach fender skirt to fender. Remove lights from fender.

b. Installation. Install the lights on the fender. Place the fender skirt in position on the fender, and install the attaching bolts. Place the fender assembly in position, and install the fender to radiator guard, fender to cowl, and fender to running board bolts. Connect the radio suppression ground strap to fender skirt. Install the hood side panels. Connect the electrical wiring, and place the harnesses in clips on left fender skirt. Test the operation of all front lights. Remove pin from hood brace and lower hood.

153. RUNNING BOARD REPLACEMENT.

a. Remove the five bolts attaching the running board to fender, and the two bolts attaching it to each step hanger. Remove the running board. Place the new running board in position, and install the nine attaching bolts.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XXXI

POWER TAKE-OFF

154. DESCRIPTION.

a. The power take-off is an auxiliary gear case (fig. 30) driven by the transmission or transfer case, and provides a means of using engine power to operate winches, hoists, earth borers, and other auxiliary equipment used on certain vehicles. Due to the requirements and mounting of certain auxiliary equipment, several different types and makes of power take-offs are required.

155. HOIST DRIVE POWER TAKE-OFF (Central Fibre Products Co.).

a. Description. This is a transmission-mounted, single-drive, one-speed power take-off having the power output shaft at the rear of case. The drive gear is shifted into or out of mesh with the transmission countershaft gear by the use of a shift lever located just in front of the driver's seat on the left side of cab. A drive shaft connects the output shaft to the hoist pump shaft.

b. Data.

Make	Central Fibre Products Co.
Model	2-B-13
Type	Single speed
Drive	Sliding gear
Mounting	Left side of transmission
Drive shaft mounting	Bronze bushings

c. Removal. Remove the set screw that retains the universal joint yoke on the power take-off output shaft, and slide the universal yoke off of drive shaft. Remove cotter pin and clevis pin from control lever link. Drain lubricant from transmission, remove the six power take-off attaching screws, and remove power take-off and gasket.

d. Installation. Place a $\frac{1}{32}$-inch gasket between the power take-off and transmission case, and install the six cap screws. Line up the keyway in drive shaft front universal joint yoke with key in output shaft, and slide the joint onto shaft. Install the set screw that retains the joint to output shaft. Connect the control lever link to shifter shaft. Fill the transmission to correct level (par. 28).

POWER TAKE-OFF

156. WINCH DRIVE POWER TAKE-OFF (Spicer or Gar Wood).

a. Description. These are transmission-mounted, single-drive, two forward speeds and one reverse speed power take-offs having the power output shaft at the front of case. Although the internal construction of these two makes varies somewhat, the operating principles are identical, and they are interchangeable. The intermediate gear is constantly in mesh with a transmission countershaft gear and the "LOW" and "HIGH" speed gears on the idler shaft (front two gears). The winch drive sliding gear can be shifted to the different gear and neutral positions by use of the power take-off control lever in the cab. A drive shaft connects the output shaft to the winch worm shaft.

b. Data.

(1)	Make	Gar Wood
	Model	69Y9000C-Rev.
	Type	Two-speed and reverse
	Mounting	Left side of transmission
	Drive	Constant mesh gear
	Intermediate gear mounting	Two roller bearings
	Idler gear shaft mounting	Two needle bearings
	Low speed idler gear	Roller bearing
	Winch drive shaft mounting	Two ball bearings
(2)	Make	Spicer Manufacturing Co.
	Model	YAC7
	Type	Two-speed and reverse
	Mounting	Left side of transmission
	Drive	Constant mesh gear

c. Removal. Loosen set screw in shaft collar, and slide collar forward. Remove the set screw that holds the universal joint on the front end of power take-off winch drive shaft, and slide the joint off shaft. Remove the drive key from end of shaft. Remove the control rod to shifter shaft arm cotter pin and clevis pin. Drain the transmission lubricant, remove the six power take-off attaching cap screws, and remove the power take-off.

d. Installation. Place two $\frac{1}{32}$-inch gaskets on the flange of power take-off, place the power take-off in position, and install the six retaining cap screws. Install the key in winch drive shaft keyway. Line up the joint keyway with key, and push joint onto end of shaft. Install and tighten the set screw that attaches joint to shaft. Slide collar into position, and tighten set screw. Connect the control rod to shifter shaft arm, and install clevis pin and cotter pin. Fill the transmission to correct level (par. 28), and test power take-off operation.

157. WINCH AND HOIST DRIVE POWER TAKE-OFF (Spicer or Gar Wood).

a. Description. Both manufacturers use the winch drive power take-off described in paragraph 156 **a** with a special cover to provide

a hoist drive. This special cover incorporates a hoist drive shaft, hoist drive sliding gear, and hoist shifter shaft in addition to the standard shifter shaft. This provides an output shaft at the front for winch drive, and an output shaft at the rear for hoist drive.

b. Data.

(1)

Make	Gar Wood
Model	69Y9000CD-Rev.
Type	Two-speed and reverse, plus one speed hoist drive
Mounting	Left side of transmission
Drive	Constant mesh gear
Intermediate gear mounting	Two roller bearings
Idler gear shaft mounting	Two needle bearings
Low speed idler gear mounting	Roller bearing
Winch drive shaft mounting	Two ball bearings
Hoist drive shaft mounting	Two bushings in cover

(2)

Make	Spicer Manufacturing Co.
Model	YAC7M
Type	Two-speed and reverse, plus one speed hoist drive
Mounting	Left side of transmission
Drive	Constant mesh gear
Intermediate gear mounting	One roller bearing
Idler gear shaft mounting	Two needle bearings
Low speed idler gear mounting	Roller bearing
Winch drive shaft mounting	Two ball bearings
Hoist drive shaft mounting	Two needle bearings in cover

c. Removal. Loosen collar set screw on winch drive shaft, and move collar forward. Remove the universal joint yoke to power take-off winch drive shaft set screw, slide the universal joint off shaft, and remove drive key. Remove the universal joint yoke to power take-off hoist drive shaft set screw. Slide the joint off shaft, and remove shaft key. Remove the cotter pins and clevis pins that attach the control rods to the shifter shafts. Drain the transmission and power take-off lubricant, and remove the two cap screws that retain the power take-off brace. Remove the six power take-off attaching cap screws, and remove the power take-off and gasket.

d. Installation. Place a new gasket on the flange of power take-off, place the power take-off in position, and install the six cap screws. Place the power take-off brace in position, and install the two retaining cap screws. Place the drive keys in the keyways in the winch and hoist drive shafts. Line up the keyways in universal joint yokes with keys in shafts, slide joints over shafts, and install set screws. Slide winch drive shaft collar into position, and tighten set screw. Place the winch and hoist control rods on their respective shifter shafts, and install the clevis pins and cotter pins. Fill the transmission (par. 28) and check the operation of power take-off.

POWER TAKE-OFF

158. TELEPHONE SERVICE WINCH DRIVE.

a. Description. This is a frame-mounted, single-drive one-speed and reverse power take-off having the output shaft at rear of case. It is shaft driven from the transfer case main shaft. The input shaft is fitted with a sliding gear that can be shifted along the shaft to provide "NEUTRAL," "REVERSE," and "FORWARD" speed. The shift is accomplished by use of a shift lever located in the cab to the right of transfer case shift levers.

b. Data.

Make	American Coach and Body Co.
Model	A-328
Type	Single speed and reverse
Mounting	Special frame brackets
Drive	Transfer case main shaft through double universal joint
Input shaft mounting	1 ball and 1 roller bearing
Power shaft mounting	2 ball bearings
Reverse idler gear mounting	2 roller bearings

c. Removal. Loosen the idler pulley adjusting bolt, and slide the pulley away from chain. Remove the winch drive chain removable link and remove chain. Remove the nuts and lock washers from the U-clamps that retain the universal joint trunnion bearings in the yoke attached to the power take-off input shaft. Remove the cotter pin and clevis pin that attach the shifter shaft. Place a jack under power take-off; remove the four bolts that attach the power take-off support channels to the frame brackets; lower the jack, and remove the power take-off with support channels attached. Mark the channels so that they can be installed in their original positions. Remove the four cap screws that attach the support channels to the power take-off case.

d. Installation. Place the support channels on the power take-off assembly according to the marks made when disassembling, and install the four cap screws. Place the power take-off assembly in position. Install the four bolts that attach the support channels to the frame brackets. Connect the shift control rod to the shifter shaft. Place the power take-off drive shaft in position and install the U-clamps. Place the winch drive chain over sprockets, and install the removable link. Move the idler firmly against the chain, and tighten the idler lock bolt. Fill the unit with lubricant (par. 28), and test the power take-off operation in all gears.

159. TELEPHONE SERVICE WINCH AND EARTH BORER DRIVE.

a. Description. The regular shift positions for this winch are the same as they are on the winch drive power take-off, but the shift lever can be pulled farther back, engaging the clutch gear with the gear on the output shaft. This drives the earth borer only. If the lever is pulled still farther back, the external teeth on the sliding gear engage the back gear on the power shaft, providing drive for the winch as well as the earth borer.

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b. Data.

Make	American Coach and Body Co.
Model	A-332
Type	Single speed, reverse, and earth borer drive
Mounting	Special frame brackets
Drive	Transfer case main shaft through double universal joints
Input shaft mounting	One ball, one roller bearing
Output shaft mounting	One ball, one roller bearing
Power shaft mounting	Two ball bearings
Reverse idler gear mounting	Two roller bearings

c. Removal. Loosen the chain idler pulley adjusting bolt and slide the pulley away from the chain. Remove the chain removable link and chain. Remove the U-clamps that retain the universal joint trunnion bearings in the joint yokes on the power take-off input and output shafts. Disconnect the shifter control rod from the shifter shaft. Support the power take-off with a roller jack, remove the four support channel to frame bracket attaching screws, and remove power take-off with support channels. Mark the support channels so that they can be installed in their original positions. Remove the four cap screws attaching the support channels to power take-off case.

d. Installation. Place the support channels on the power take-off assembly according to the markings made when disassembling, and install the four cap screws. Place the power take-off assembly in position in the frame, and install the four bolts that attach the support channels to the frame brackets. Connect the shift control rod to the shifter shaft, and install the clevis pin and cotter pin. Place the power take-off drive shaft and earth borer drive shaft universal joint trunnion in their seats on the power take-off flanges, and install the U-clamps. Place the winch drive chain over the sprockets, and install the removable link. Move the idler firmly against the chain, and tighten the idler adjustment lock bolt. Fill the power take-off with lubricant (par. 28) and test the power take-off operation.

Section XXXII

WINCH

160. DESCRIPTION.

a. Both the front- and center-mounted winches are power driven. The winch consists of the cable, drum, drum shaft, worm gear, worm, worm case brake, clutch, and miscellaneous component parts.

161. FRONT-MOUNTED WINCH.

a. Description (fig. 13). The jaw-clutch type power winch is mounted between the extended frame side rails in front of the front cross member. The winch is driven from the power take-off by a drive shaft. The power take-off provides two speeds for pulling the winch cable in, and one speed (reverse) for paying out cable. The winch may be used when the vehicle is standing, or to assist the vehicle when in motion. By disengaging the jaw clutch the cable can be unreeled by hand.

b. Data.

Make	Gar Wood
Make	Heil*
Model	2-U-512
Part number	22Y6222
Drum drive	Jaw clutch
Power source	Engine through transmission power take-off
Mounting	Frame extension

c. Maintenance.

(1) DRUM BRAKE ADJUSTMENT (fig. 119). The correct drum brake adjustment exists when there is sufficient drag on the drum to prevent the drum from spinning while the cable is being pulled out with the clutch disengaged. If it is necessary to make this adjustment, shift the clutch to the released position, and engage the poppet in the hole in frame member. Loosen the brake adjusting screw check nut, and turn the adjusting screw until the brake engages the drum flange with sufficient tension to prevent the cable from loosening up on drum. Tighten adjusting screw check nut.

(2) WORM BRAKE ADJUSTMENT (fig. 120). The worm brake is located in a case at the front end of the winch worm. Adjustment can be made by tightening or loosening the spring-loaded adjusting nut located at the bottom of the brake case. Loosen the worm brake adjusting nut lock nut, and turn the adjusting nut ½ turn at a time until the brake is sufficiently tight to hold the load. When adjustment is completed, tighten adjusting nut lock nut. CAUTION: *Avoid excessively tight brake adjustment, or overheating will result.* It is

*Identical with Gar Wood. All parts interchangeable.

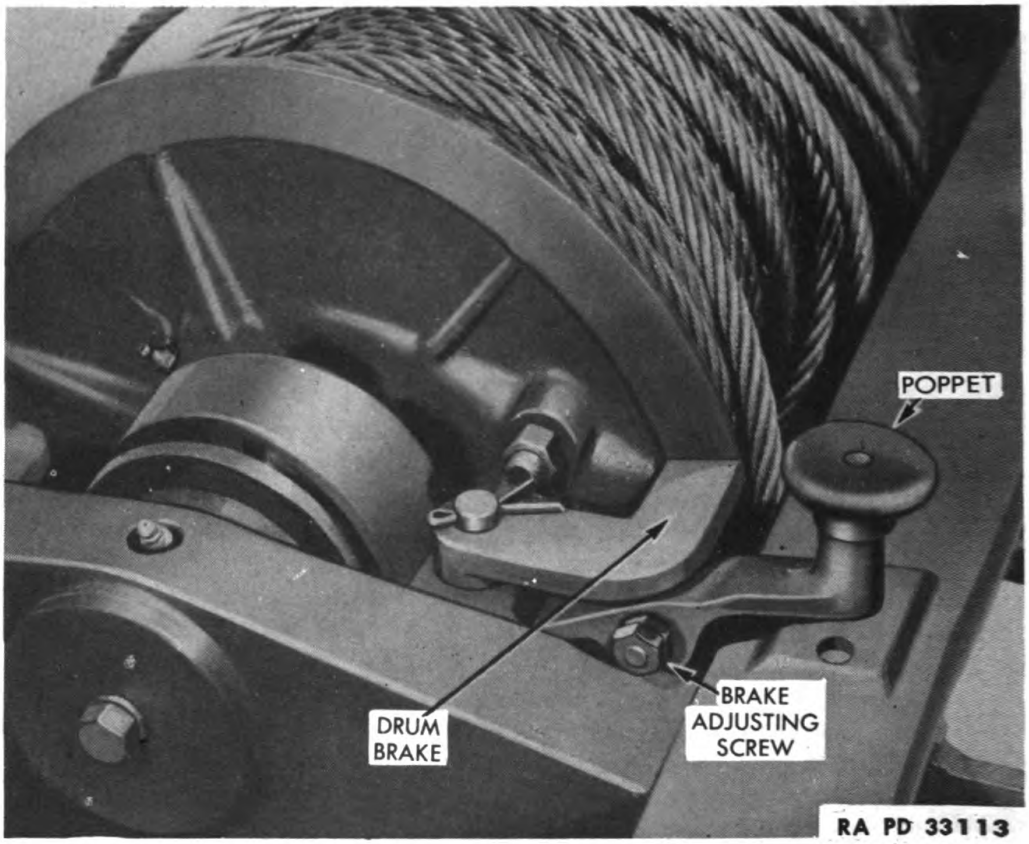

Figure 119—Drum Brake Adjustment

natural for the brake to heat up somewhat, especially in reverse operation; however, a check should be made after adjustment. If brake case gets so hot that the hand cannot be held on it, the brake adjusting nut should be loosened ½ turn, and the operation rechecked.

(3) SHEAR PIN REPLACEMENT (fig. 121). The winch drive propeller shaft front universal joint is attached to the worm shaft by a soft iron shear pin to prevent overloading of the winch and possible breakage of the winch cable. When the winch is excessively overloaded the pin will shear off, allowing the joint yoke to turn on the worm shaft, thereby releasing the load from the winch. The worm brake will hold the drum and prevent the cable from unreeling. To replace, drive the pieces of the old pin out of worm shaft and joint yoke, line up the hole in the yoke with the hole in shaft, and install a new shear pin and cotter pin. NOTE: *Standard shear pins must be used, as rivets or bolts do not have correct tensile strength to provide the required safety and efficiency.*

(4) DRIVE SHAFT REPLACEMENT.

(a) Removal (fig. 121). Remove cotter pin and shear pin from front universal joint front yoke, loosen socket head set screw in thrust collar at power take-off end of shaft, and slide the drive shaft

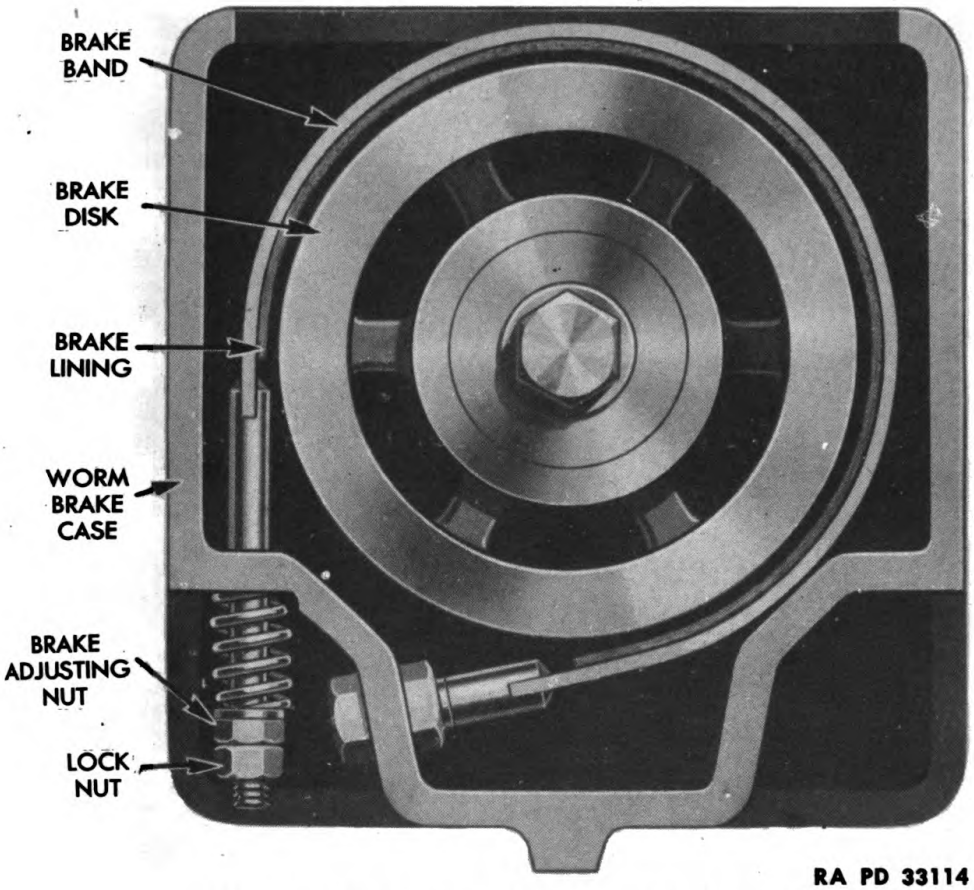

Figure 120—Worm Brake Adjustment

back until front joint is off worm shaft. Remove the set screw that attaches the rear universal joint rear yoke to the power take-off winch drive shaft, and remove the drive shaft assembly.

(b) Installation. Place the rear yoke of the splined joint on the end of power take-off winch drive shaft and install the set screw that retains the joint to shaft. Place the drive shaft in position, and line up the shear pin hole in front joint front yoke with the shear pin hole in winch worm shaft. Install the shear pin and cotter pin. Position the thrust collar on the drive shaft ¾ inch from the front end of rear universal joint sleeve, and tighten the set screw.

d. Winch Removal. Remove cotter pin and shear pin from front universal joint front yoke. Loosen set screw in thrust collar on drive shaft at rear universal joint, and slide the front universal joint off the worm shaft. Place a sling around winch drum, attach sling to a chain hoist or wrecker crane, and raise just enough to support the winch. Remove winch to cross member cap screws and bolt at rear of winch. Remove winch to frame side rail attaching bolts and nuts, remove winch support bracket bolts at bumper, and remove brackets. Lower hoist and remove winch from vehicle. Remove sling from winch.

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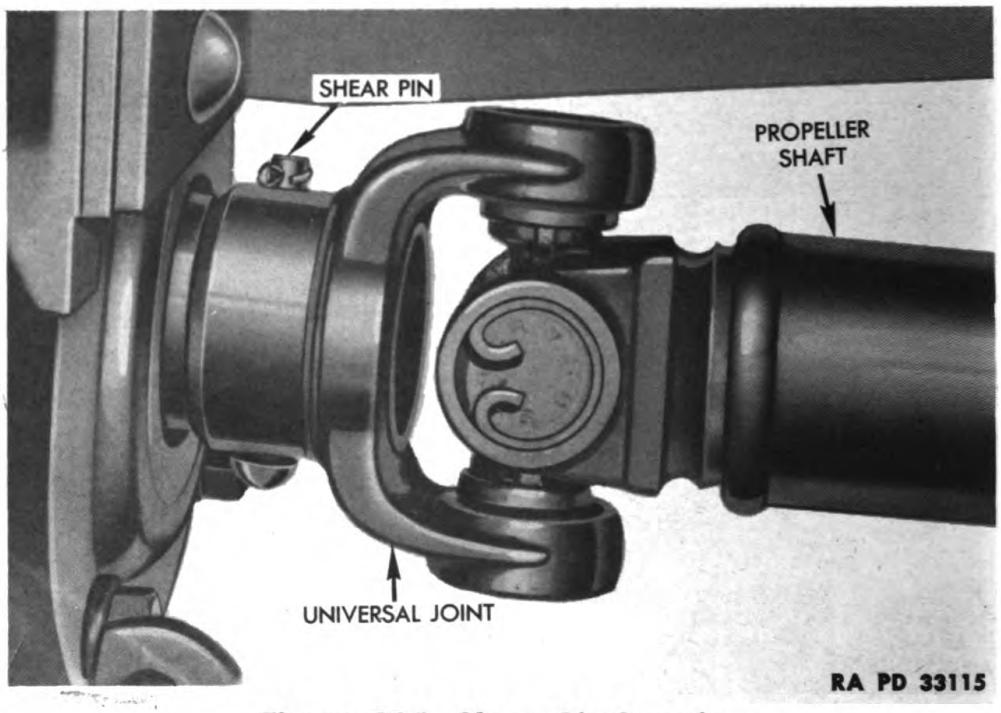

Figure 121—Shear Pin Location

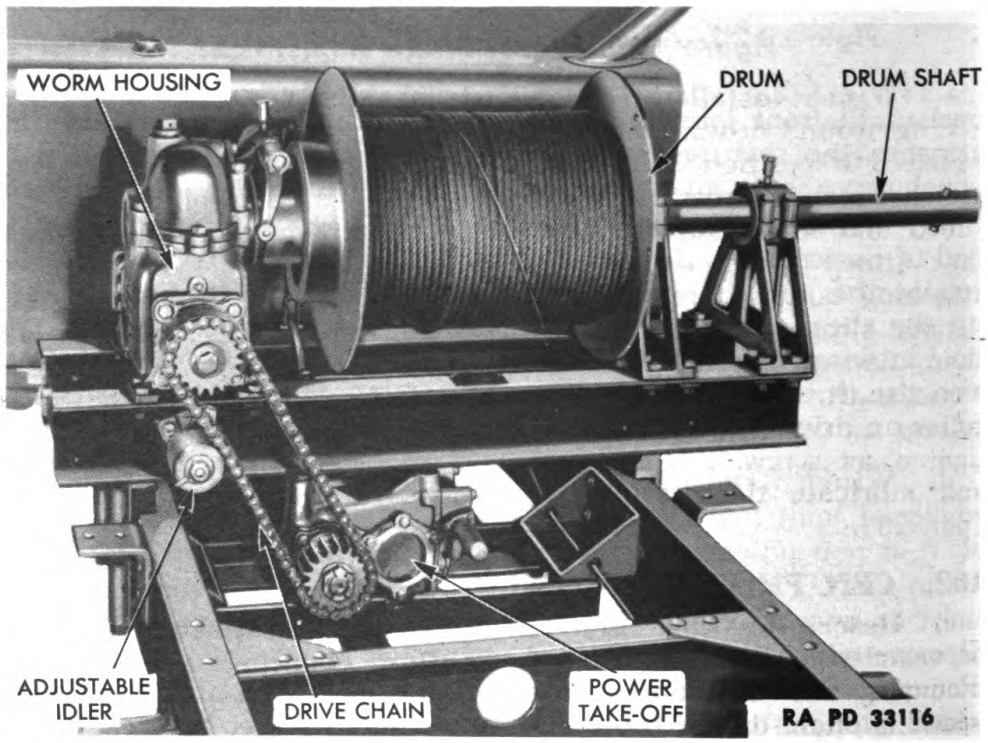

Figure 122—Center-mounted Winch

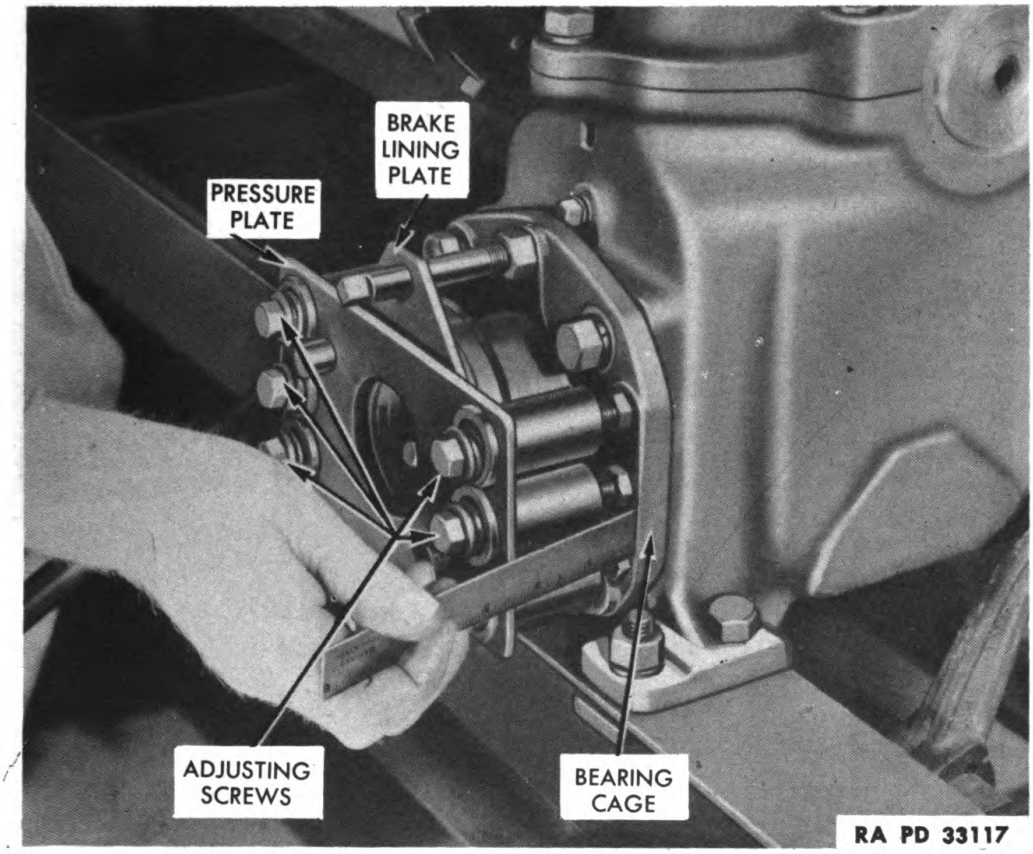

Figure 123—Adjusting Winch Brake Pressure Plate

e. Winch Installation. Place winch under front of frame, place a sling around drum, attach a chain hoist or crane to sling, and raise winch into position in frame. Install the cap screws and bolt that attach winch to cross member at rear of winch, the bolts that attach winch and winch support bracket to frame side rail, and the bolts that attach winch support bracket to front bumper. Tighten all attaching bolts securely. Disconnect the chain hoist from winch and remove sling. Slide the winch drive shaft front universal on worm shaft, line up the shear pin hole in universal yoke with the hole in worm shaft, install the shear pin and cotter pin. Position the thrust collar on drive shaft ¾ inch from splined yoke of rear universal, and tighten set screw. Fill the gear case to correct level with lubricant, and lubricate the assembly according to lubrication instructions (par. 28).

162. CENTER-MOUNTED WINCH.

a. Description (fig. 122). The center-mounted winch is used only on vehicles equipped for telephone service. The winch assembly with mounting sills is mounted on the frame just back of the cab. The winch is chain-driven from a frame-mounted power take-off that is driven by the transfer case through a short drive shaft. The power take-off provides a forward and a reverse gear.

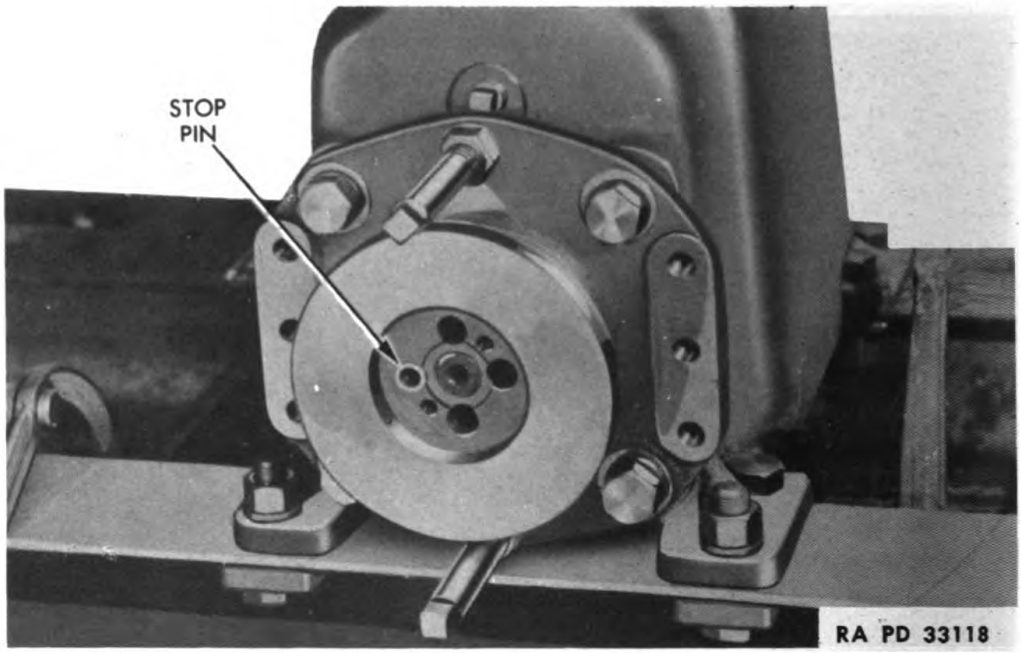

Figure 124—Worm Brake Nut Stop Pin

b. Data.

Make	American Coach
Model	L-18
Part number	101W20
Drum drive	Jaw clutch
Power source	Engine through transfer case power take-off and chain
Mounting	Frame back of cab

c. Maintenance.

(1) WORM BRAKE ADJUSTMENT (fig. 123). The winch worm brake is located at the front end of the worm shaft. Adjustment is accomplished by loosening or tightening the six pressure plate adjusting screws. The brake is applied by end movement of the worm brake nut. Force the worm and worm brake nut forward (toward the pressure and brake lining plates) as far as it will go. The worm has a minimum of $\frac{3}{16}$-inch and a maximum of $\frac{1}{4}$-inch end movement. Screw worm brake nut toward winch until pin hits stop (fig. 124). Adjust clearance between pressure plate and brake lining plate to provide uniform clearance of from $\frac{1}{32}$ to $\frac{1}{16}$ inch. This is accomplished by loosening the six adjusting bolt lock nuts, and turning the adjusting bolts. When the adjustment is completed, tighten the lock nuts.

(2) DRIVE CHAIN REPLACEMENT (fig. 125). Loosen the idler pulley lock bolt, and slide the pulley away from chain. Remove cotter pins from chain removable link pins, and remove link from chain. Place the chain over the sprockets, install the removable link, and install new cotter pins in the link pins. Push the idler firmly against the chain, and tighten the lock bolt.

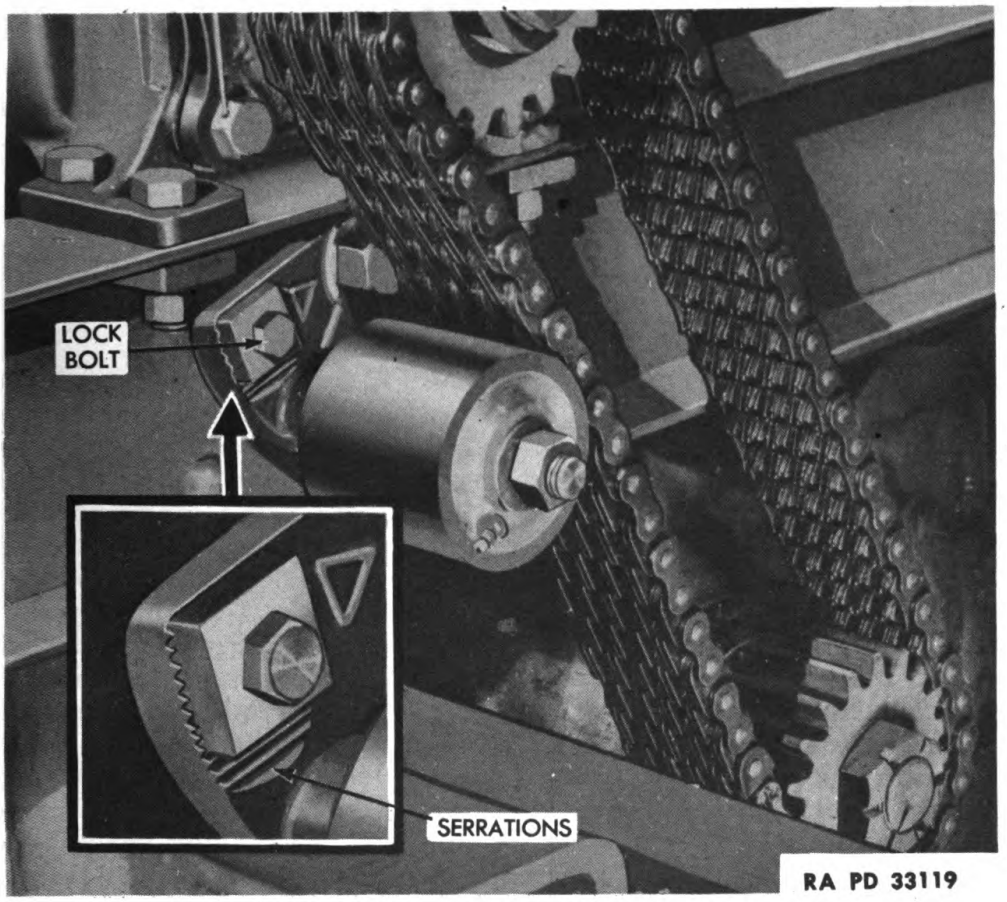

Figure 125—Winch Drive Chain Adjustment

d. Winch Removal. Loosen the idler pulley adjusting bolt, and slide the pulley away from the chain (fig. 125). Remove the cotter pins from removable chain link, and remove the link. Disconnect the winch clutch and brake control rod from clutch shifter yoke and lever, and remove control rod. Remove the four mounting sill to frame attaching bolts. Place a sling around the winch drum, and connect the sling to a chain hoist or crane; slide the hoist to the right side of body; raise the left end of winch, and work it up and to the left until end of shaft clears side of body. Lower the chain hoist, disconnect it from sling, and remove sling from winch.

e. Winch Installation. Place a sling around the winch, and raise it with a chain hoist. Lower shaft end of winch first, and thread end of shaft through opening in side of body as winch is lowered into position. Line up the four sill to frame mounting bolt holes; install the bolts and tighten securely. Install cotter pins. Disconnect hoist and sling from winch. Place winch clutch and brake control rod in position; install the clevis pins and cotter pins. Place drive chain over sprockets; install removable link, link plate, and cotter pins. Move the idler firmly against the chain, and tighten the lock bolt. Fill the worm housing to correct level with lubricant, and lubricate the winch (par. 28).

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Section XXXIII

HYDRAULIC HOIST

163. DESCRIPTION.

a. Description. The hydraulic hoist is used on trucks equipped with a dump body. The body is mounted on a subframe, and hinged at the back end. The hoist is mounted in the subframe and hydraulically raises the front end of body so that the load can be dumped from the body through the hinged tail gate at rear. The hydraulic hoist pump is shaft driven from a transmission-mounted power take-off. Two levers in the driver's compartment are required to operate the hoist. One engages the power take-off to drive the hoist pump, and the other controls the valve for raising, holding, or lowering the dump body. By shifting the control valve the hydraulic fluid can be directed into the cylinder, either in front of the piston, or back of the piston. This provides a means of forcing the piston to travel in either direction. The piston is connected to the dump body by links and arms that raise or lower the body as the piston is forced back and forth in the cylinder. Dump body trucks may be equipped with Hercules, Heil, or Perfection hoists. The removal, installation, and service instructions vary somewhat for the different makes; however, their duty is identical.

164. HERCULES HOIST.

a. Data.

Make	Hercules Steel Products
Model	K.D.O.
Type	Hydraulic
Mounting	Subframe above chassis frame
Drive	Transmission power take-off
Pump	Gear type

b. Maintenance (fig. 126).

(1) ADD OIL TO HYDRAULIC SYSTEM. When the body fails to raise to its maximum angle, it indicates lack of oil in the hydraulic system. To add oil, run the pump slowly. Set the hoist valve control lever in the center ("RAISE") position. Remove filler hole cover on top of cylinder and fill with SAE 10 engine oil. Lower body slowly to force out excessive oil, then raise body slowly to top of travel, and install filler hole cover and gasket. Recheck the hoist operation. NOTE: *During extremely cold weather a small amount of kerosene may be added to the oil to improve hydraulic operation. This should be drained out, and new oil installed, when weather permits.*

HYDRAULIC HOIST

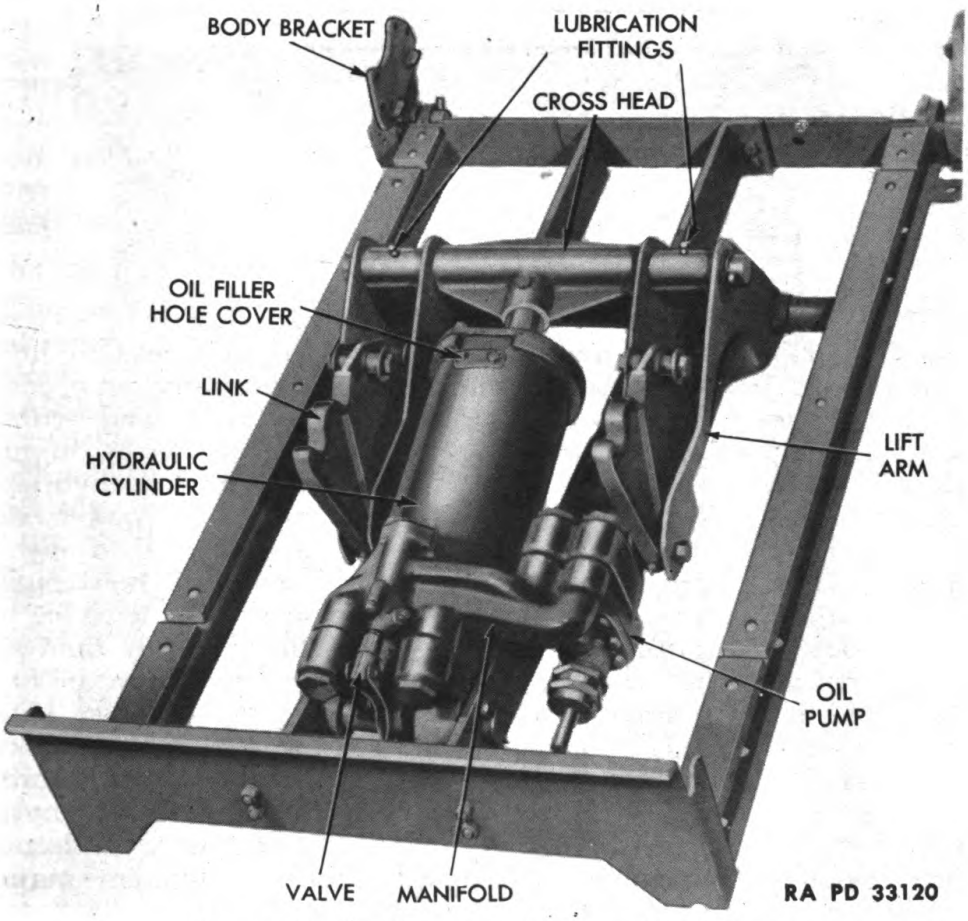

Figure 126—Hercules Hydraulic Hoist

(2) CORRECT OIL LEAKS. The hydraulic hoist cylinder and pump system should be checked regularly for oil leaks. Oil leaks at the cylinder cover, piston rod packing, valve piston packing, cylinder to manifold studs, pump to manifold studs, pump shaft packing, or pump cover are often caused by loose bolts or packing glands. If proper tightening does not correct the leak, new packings must be installed, or the assembly replaced.

c. Removal. Raise the dump body and securely block it in the raised position. Disconnect the valve control rod from the shifter lever. Loosen the socket head set screw in rear yoke of rear universal joint of the hoist pump drive shaft. Place a sling around the hoist cylinder; attach it to a chain hoist, and raise the chain hoist enough to support the unit. Remove cotter pin from hoist cross head shaft, and drive out shaft. Raise hoist cylinder and pump assembly, and remove it from chassis.

d. Installation. Place a sling around hoist and raise the assembly with a chain hoist. Swing the assembly into position in the hoist frame; install the hoist cylinder shaft, and lock it in place with a new cotter pin. Install hoist cross head shaft, and lock it in place with the

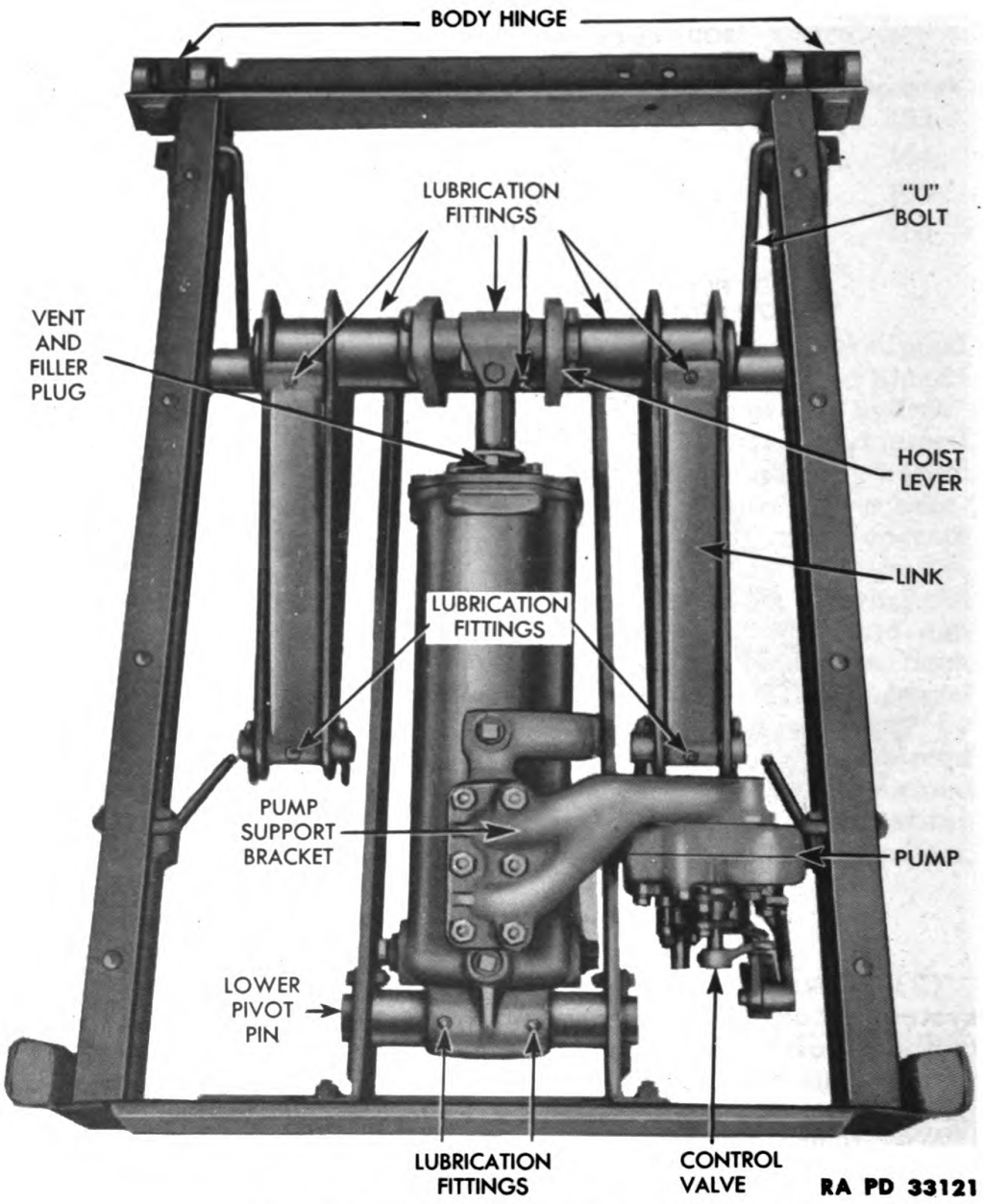

Figure 127—Heil Hydraulic Hoist

cotter pin. Install Woodruff key in pump drive shaft; push the drive shaft universal joint yoke on pump drive shaft, and lock it in place with the socket head set screw. Connect valve control rod to valve shift lever by installing clevis pin and cotter pin. Remove chain hoist and sling from cylinder. Fill the hoist with oil following the instructions in subparagraph **b** above. NOTE: *Do not remove the blocking from dump body until the cylinder is filled, and the body is to be lowered.*

HYDRAULIC HOIST

165. HEIL HOIST.

a. Data.

Make	The Heil Co.
Model	SL-1
Type	Hydraulic
Mounting	Subframe above chassis frame
Drive	Transmission power take-off
Pump	Gear type

b. Maintenance (fig. 127).

(1) ADD OIL TO HYDRAULIC SYSTEM. Run the body up halfway, and remove the ¾-inch vent and filler plug. Pour oil in through this opening while the pump is running slowly and the valve is in the "RAISE" position, until body raises to full height. Add about ½ pint more oil, then lower body slowly with pump running. Raise body again to full height, and install the special ¾-inch vent and filler plug. See lubrication section (par. 28) for correct grade of oil. If the filler plug is installed before lowering and raising the hoist, the body may not properly seat on the sills. The oil may be thinned with a small amount of kerosene to provide better operation in extremely cold climates. Drain and refill with fresh oil again as soon as weather permits.

(2) CORRECT OIL LEAKS. The hydraulic hoist cylinder and pump system should be checked regularly for oil leaks. Oil leaks at the cylinder head, piston rod packing, pump support bracket, control valve packing, pump shaft packing, pump gear end plate, or pump housing cover, are often caused by loose bolts or packing glands. If proper tightening does not correct the leaks, new packings must be installed, or the assembly replaced.

c. Removal. Remove the cotter pins from the hoist lifting link to body pins, and drive out the pins. Remove the cotter pins from the body to hoist frame hinge pins, and drive out the pins. Attach two chain hoists to the body, and lift it off the hoist unit. Remove the cotter pin and clevis pin attaching control rod to valve operating bell crank. Remove set screw from drive shaft rear universal joint rear yoke, and slide the universal joint off the pump drive shaft. Place a sling around the hoist cylinder, and attach it to chain hoist to support unit. Remove frame lever pin, cylinder pivot pin lock bolts, and pivot pin. Lift the cylinder and pump assembly out of hoist frame.

d. Installation. Place the cylinder and pump assembly in position in the hoist frame with a chain hoist. Install cylinder pivot pin and frame lever pin, and lock them securely. Install Woodruff key in pump drive gear shaft; install the universal joint, and tighten the socket head set screw. Connect valve control rod to valve control bell crank. Remove ¾-inch vent plug from cylinder head; fill the cylinder with engine oil, and install the plug loosely. Place the body in position on the hoist frame; install body hinge pins; line up lifting link pin holes with holes in body, and install the pins. Fill the hydraulic system according to instructions in subparagraph **b** above.

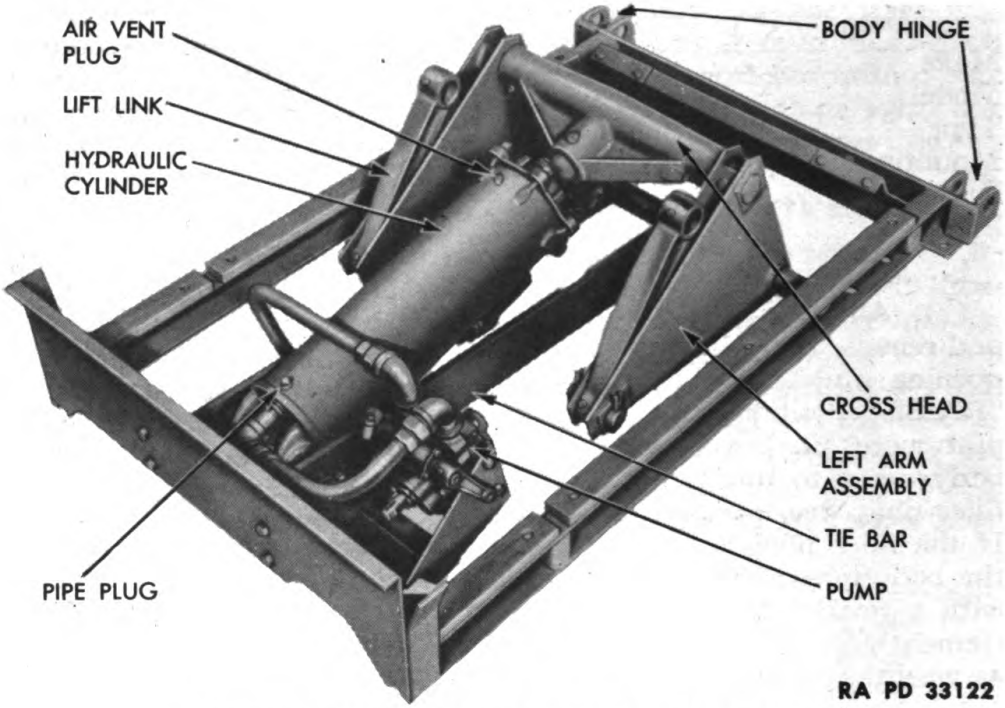

Figure 128—Perfection Hydraulic Hoist

166. PERFECTION HOIST.

a. Data.

Make	Perfection Steel Body Co.
Model	615 Special
Type	Hydraulic
Mounting	Subframe above chassis frame
Drive	Transmission power take-off
Pump	Gear type

b. Maintenance (fig. 128).

(1) ADD OIL TO HYDRAULIC SYSTEM. Remove filler plug; raise body to maximum lift; fill cylinder full, and install filler plug. See lubrication section (par. 28) for correct lubricants. Loosen (do not remove) plug at front top of cylinder and lower body. This action bleeds all air and surplus oil from the cylinder. After body is completely lowered, again raise body and tighten plug. Recheck hoist operation. The oil may be thinned with kerosene to provide better operation in extremely cold climates. Drain and refill with fresh oil as soon as weather permits.

(2) CORRECT OIL LEAKS. The hoist hydraulic system should be checked regularly for oil leaks. Oil leaks at the cylinder head, piston rod packing, pipe fittings, control valve packings, or pump covers, are often caused by loose bolts or packing glands. If proper tightening does not correct the leaks, new packings must be installed, or the assembly replaced.

HYDRAULIC HOIST

c. Removal. Remove the cotter pins from the two lift link to body pins, and the two body hinge pins. Remove the four pins; attach chain hoist to body, and lift body from hoist unit. Disconnect valve control rod from control valve control lever. Remove set screw from drive shaft rear universal joint rear yoke, and slide universal joint off pump drive gear shaft. Remove the four hoist unit to chassis frame U-bolts, and the two guide bolts. Lift the hoist unit from chassis frame with chain hoist.

d. Installation. Place the hoist assembly on the chassis frame. Install the two guide bolts and the four U-bolts. Place drive shaft rear universal joint on pump drive gear shaft. Install and tighten the set screw attaching universal joint to pump gear shaft. Place the valve control rod on the control valve control lever, and install clevis pin. Remove the filler plug and fill cylinder with engine oil; install filler plug loosely. Place the body on the hoist frame, and install the body hinge pins and lift to body pins. Fill and bleed the hydraulic system according to instructions in subparagraph **b** above.

1½-TON 4 x 4 TRUCK (Chevrolet)

Section XXXIV

NEW VEHICLE RUN-IN TEST

167. PURPOSE.

a. When a new or reconditioned vehicle is first received at the using organization, it is necessary for second echelon personnel to determine whether or not the vehicle will operate satisfactorily when placed in service. For this purpose, inspect all accessories, subassemblies, assemblies, tools, and equipment to see that they are in place and correctly adjusted. In addition, they will perform a run-in test of at least 50 miles as directed in AR 850-15, paragraph 25, table III, according to procedure in paragraph 169 below.

168. CORRECTION OF DEFICIENCIES.

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

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

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

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

169. RUN-IN TEST PROCEDURES.

a. Preliminary Service.

(1) FIRE EXTINGUISHER. See that portable extinguisher is present and in good condition. Test it momentarily for proper operation, and mount it securely.

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

(3) FUEL FILTER. Inspect fuel filter for leaks, damage, and secure mountings and connections. Drain filter sediment bowl. If any appreciable amount of water or dirt is present, remove bowl, and clean bowl and element in dry-cleaning solvent. Also drain accumulated water or dirt from bottom of fuel tank. Drain only until fuel runs clean.

NEW VEHICLE RUN-IN TEST

(4) BATTERY. Make hydrometer and voltage test of battery, and add clean water to bring electrolyte 3/8 inch above plates.

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

(6) ACCESSORIES AND BELT. See that accessories such as carburetor, generator, regulator, cranking motor, distributor, water pump, fan, and oil filter, are securely mounted. Make sure that fan and generator drive belt is in good condition, and adjusted to have 3/4-inch finger-pressure deflection.

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

(8) TIRES. See that all tires, including spare, are properly inflated to 55 pounds, cool; that stems are in correct position; all valve caps present and finger-tight. Inspect for damage, and remove objects lodged in treads and carcasses and between duals.

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

(10) FENDERS AND BUMPER. Examine fenders and front bumper for looseness and damage.

(11) TOWING CONNECTIONS. Inspect all towing shackles, pintle hook, and fifth wheel (where used), for looseness or damage. See that pintle, or fifth-wheel connecting mechanism operates properly, and latches securely.

(12) BODY AND TARPAULINS. Inspect cab and body for looseness and damage. See that all attachments and items of special equipment are in good condition. On **cargo bodies** be sure tail gate operates and latches properly, and that tarpaulin is in good condition; and if in use, securely lashed to body hooks. Inspect end curtains for damage and loose fastenings. On **dump bodies** test hoist for proper operation, and while raised examine mechanism for looseness, damage, and oil leaks. Be sure body when lowered is guided to a correct alinement with frame sill, and that tail gate latching device locks securely. On **panel bodies** be sure rear doors fit, close, and latch properly. On all body types examine door and windshield glass for damage; see that lift mechanism and all hardware is in good operating condition and secure. Inspect drivers' and/or troop seats, safety straps, floors, skid strips, and stowage compartments, for good condition, correct assembly, and secure mounting. On **telephone maintenance and earth-borer** equipped vehicle see that the special boring or crane equipment is in proper position in vehicle, and securely assembled and attached, and that all loose items are properly stowed.

1½-TON 4 x 4 TRUCK (Chevrolet)

(13) WINCH. Inspect winch for damage, secure mounting, and oil leaks. Test winch clutch mechanism for proper operation. Test drag brake to see if it holds drum from spinning as cable is unwound; inspect it for wear, damage, and adequate lubrication. Test winch automatic brake by placing vehicle at top of steep incline and attaching cable to another vehicle at bottom. While drawing towed vehicle up hill, release engine clutch; if towed vehicle backs down hill, brake needs adjustment. Start lowering vehicle down hill with winch; throw out engine clutch; if towed vehicle does not stop or drifts more than 1 or 2 inches, brake needs adjustment. See paragraphs 161 and 162. After test, rewind cable evenly and tightly on drum and as winding, clean cable thoroughly, and apply a film of engine oil. If winch is center-mounted, inspect drive chain and sprockets to see that they are in good condition and not excessively worn. Chain idler should be adjusted so chain has no slack.

(14) LUBRICATE. Perform a complete lubrication of the vehicle, covering all intervals, according to the instructions on the Lubrication Guide, paragraph 28, except gear cases, wheel bearings, and other units covered in preceding procedures. Check all gear case oil levels, and add as necessary to bring to correct level. Change only if condition of oil indicates the necessity, or if gear oil is not of proper grade for existing atmospheric temperature. NOTE: *Perform items (15) to (18) during lubrication.*

(15) SPRINGS AND SUSPENSIONS. Inspect front and rear springs and "shocks" to see that they are in good condition, correctly assembled, secure, and that bushings and shackle pins are not excessively loose, or damaged.

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

(17) PROPELER SHAFTS. Inspect all shafts and universal joints to see that they are in good condition, correctly assembled, alined, secure, and not leaking excessively.

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

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

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

(21) INSTRUMENTS.

(a) Oil Pressure Gage. Immediately after engine starts, observe if oil pressure is satisfactory. (Normal operating pressure, hot, at runnning speeds is 12 to 17 lb; at idle, 5 lb). Stop engine if pressure is not indicated in 30 seconds.

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

(c) Temperature Gage. Engine temperature should rise gradually during warm-up period to normal operating range, 140°F to 170°F.

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

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

(23) HORN AND WINDSHIELD WIPERS. See that these items are in good condition and secure. If tactical situation permits, test horn for proper operation and tone. See if wiper arms will operate through their full range, and that blade contacts glass evenly and firmly.

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

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

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

(27) TOOLS AND EQUIPMENT. Check tools and on vehicle stowage lists, paragraphs 30 to 32, to be sure all items are present, and see that they are serviceable, and properly mounted or stowed.

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

(1) DASH INSTRUMENTS AND GAGES. Do not move vehicle until engine temperature reaches 135°F. Maximum safe operating temperature is 190°F. Observe readings of ammeter, oil, temperature, and fuel gages to be sure they are indicating the proper function of the units to which they apply. Also see that speedometer registers the vehicle speed, and that odometer registers accumulating mileage.

(2) BRAKES: FOOT AND HAND. Test service brakes to see if they stop vehicle effectively, without side pull, chatter, or squealing; and observe if pedal free travel before meeting resistance is 1½ inches. Parking brake should hold vehicle on a reasonable incline, with ⅓ reserve lever travel available. Observe if hydrovac brake booster operates properly to assist in service brake application. CAUTION: *Avoid long application of brakes until shoes become evenly seated to drums.*

(3) CLUTCH. Observe if clutch operates smoothly without grab, chatter, or squeal on engagement, or slippage (under load) when fully engaged. See that pedal has 1-inch free travel before meeting resistance. CAUTION: *Do not ride clutch pedal at any time, and do not engage and disengage new clutch severely or unnecessarily, until driven and driving disks have become properly worn in.*

(4) TRANSMISSION AND TRANSFER. Gearshift mechanism should operate easily and smoothly, and gears should operate quietly, and not slip out of mesh. Test front axle declutching, and power take-off mechanism (on vehicles so equipped) for proper operation.

(5) STEERING. Observe steering action for binding or looseness; and note any excessive pull to one side, wander, shimmy, or wheel tramp. See that column, bracket, and wheel are secure.

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

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

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

(9) BRAKE BOOSTER OPERATION. Listen at the hydrovac air cleaner for air movement as the brake pedal is applied and released several times, as a quick test to determine if system is operating.

(10) TEMPERATURES. Cautiously hand-feel each brake drum and wheel hub for abnormal temperatures. Examine transmission, transfer case, and differential housings for indications of overheating and excessive lubricant leaks at seals, gaskets, or vents. NOTE: *Transfer case temperatures are normally higher than other gear cases.*

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

c. Upon completion of run-in test, correct or report any deficiencies noted. Report general condition of vehicle to designated individual in authority.

Section XXXV

SHIPMENT AND TEMPORARY STORAGE

170. GENERAL INSTRUCTIONS.

a. Preparation for domestic shipment of the vehicle is the same as preparation for temporary storage or bivouac. Preparation for shipment by rail includes instructions for loading and unloading the vehicle, blocking necessary to secure the vehicle on freight cars, number of vehicles per freight car, clearance, weight, and other information necessary to properly prepare the vehicle for rail shipment. For more detailed information, and for preparation for indefinite storage, refer to AR 850-18.

171. PREPARATION FOR TEMPORARY STORAGE OR DOMESTIC SHIPMENT.

a. Vehicles to be prepared for temporary storage or domestic shipment are those ready for immediate service, but not used for less than 30 days. If vehicles are to be indefinitely stored after shipment by rail, they will be prepared for such storage at their destination.

b. If the vehicles are to be temporarily stored or bivouacked, take the following precautions:

(1) LUBRICATION. Lubricate the vehicle completely (par. 28).

(2) COOLING SYSTEM. If freezing temperature may normally be expected during the limited storage or shipment period, test the coolant with a hydrometer and add the proper quantity of antifreeze compound, to afford protection from freezing at the lowest temperature anticipated during the storage or shipping period. Completely inspect the cooling system for leaks.

(3) BATTERY. Check battery and terminals for corrosion and if necessary, clean and thoroughly service battery (par. 94).

(4) TIRES. Clean, inspect, and properly inflate all tires. Replace with serviceable tires, all tires requiring retreading or repairing. Do not store vehicles on floors, cinders, or other surfaces which are soaked with oil or grease. Wash off immediately any oil, grease, gasoline, or kerosene which comes in contact with the tires under any circumstances.

(5) ROAD TEST. The preparation for limited storage will include a road test of at least 5 miles, after the battery, cooling system, lubrication, and tire services, to check on general condition of the vehicle. Correct any defects noted in the vehicle operation, before the vehicle

is stored, or note on a tag attached to the steering wheel, stating the repairs needed, or describing the condition present. A written report of these items will then be made to the officer in charge.

(6) FUEL IN TANKS. It is not necessary to remove the fuel from the tanks for shipment within the United States, nor to label the tanks under Interstate Commerce Commission Regulations. Leave fuel in the tanks except when storing in locations where Fire Ordinances, or other local regulations, require removal of all gasoline before storage.

(7) EXTERIOR OF VEHICLE. Remove rust appearing on any part of the vehicle exterior with flint paper. Repaint painted surfaces whenever necessary to protect wood or metal from deterioration. Exposed polished metal surfaces which are susceptible to rust, such as winch cables, chains, and, in the case of track-laying vehicles, metal tracks, should be coated with a protective, medium-grade lubricating oil. Close firmly all cab doors, windows, and windshields. Vehicles equipped with open-type cabs with collapsible tops will have the tops raised, all curtains in place, and the windshield closed. Make sure tarpaulins and window curtains are in place and firmly secured. Leave rubber mats, such as floor mats, where provided, in an unrolled position on the floor, and not rolled or curled up. Equipment, such as Pioneer and truck tools, tire chains, and fire extinguishers, will remain in place in the vehicle.

(8) INSPECTION. Make a systematic inspection just before shipment or temporary storage, to insure that all above steps have been covered, and that the vehicle is ready for operation on call. Make a list of all missing or damaged items, and attach it to the steering wheel. Refer to Before-operation Service (par. 23).

(9) ENGINE. To prepare the engine for storage, remove the air cleaner from the carburetor. Start the engine, and set the throttle to run the engine at a fast idle. Pour 1 pint of medium-grade, preservative, lubricating oil, Ordnance Department Specification AXS-674, of the latest issue in effect, into the carburetor throat, being careful not to choke the engine. Turn off the ignition switch as quickly as possible after the oil has been poured into the carburetor. With the engine switch off, open the throttle wide, and turn the engine five complete revolutions by means of the cranking motor. If the engine cannot be turned by the cranking motor with the switch off, turn it by hand, or disconnect the high-tension lead and ground it before turning the engine by means of the cranking motor. Then reinstall the air cleaner.

(10) BRAKES. Release brakes and chock the wheels or tracks.

c. Inspections in Limited Storage. Vehicles in limited storage will be inspected weekly for condition of tires and battery. If water is added when freezing weather is anticipated, recharge the battery with a portable charger, or remove the battery for charging. Do not attempt to charge the battery by running the engine.

SHIPMENT AND TEMPORARY STORAGE

172. LOADING AND BLOCKING FOR RAIL SHIPMENT.

a. Preparation. In addition to the preparation described in paragraph 171, when ordnance vehicles are prepared for domestic shipment, the following preparations and precautions will be taken:

(1) EXTERIOR. Cover the body of the vehicle with a canvas cover supplied as an accessory.

(2) TIRES. Inflate pneumatic tires from 5 to 10 pounds above normal pressure.

(3) BATTERY. Disconnect the battery to prevent its discharge by vandalism or accident. This may be accomplished by disconnecting the positive lead, taping the end of the lead, and tying it back away from the battery.

(4) BRAKES. The brakes must be applied and the transmission placed in low gear, after the vehicle has been placed in position with a brake wheel clearance of at least 6 inches ("A", fig. 129). The vehicles will be located on the car in such a manner as to prevent the car from carrying an unbalanced load.

(5) All cars containing ordnance vehicles must be placarded "DO NOT HUMP".

(6) Ordnance vehicles may be shipped on flat cars, end-door box cars, side-door box cars, or drop-end gondola cars, whichever type car is the most convenient.

b. Facilities for Loading. Whenever possible, load and unload vehicles from open cars under their own power, using permanent end ramps and spanning platforms. Movement from one flat car to another along the length of the train is made possible by cross-over plates or spanning platforms. If no permanent end ramp is available, an improvised ramp can be made from railroad ties. Vehicles may be loaded in gondola cars without drop ends by using a crane. In case of shipment in side-door box cars, use a dolly-type jack to fit the vehicles into position within the car.

c. Securing Vehicles. In securing or blocking a vehicle, three motions (lengthwise, sidewise, and bouncing), must be prevented. There are two approved methods of blocking the vehicles on freight cars, as described below. When blocking dual wheels, all blocking will be located against the outside wheel of the dual.

(1) METHOD 1 (fig. 129). Locate eight blocks "B", one to the front, and one to the rear of each wheel. Nail the heel of each block to the car floor, using five 40-penny nails to each block. That portion of the block under the tread will be toe-nailed to the car floor with two 40-penny nails to each block. Locate two blocks "D" against the outside face of each wheel. Nail the lower block to the car floor with three 40-penny nails, and the top block to the lower block with three 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "C" through the holes in the wheels, and then through the stake pockets. Tighten the wires enough to remove slack. When a box car is used, this strapping must be applied in a

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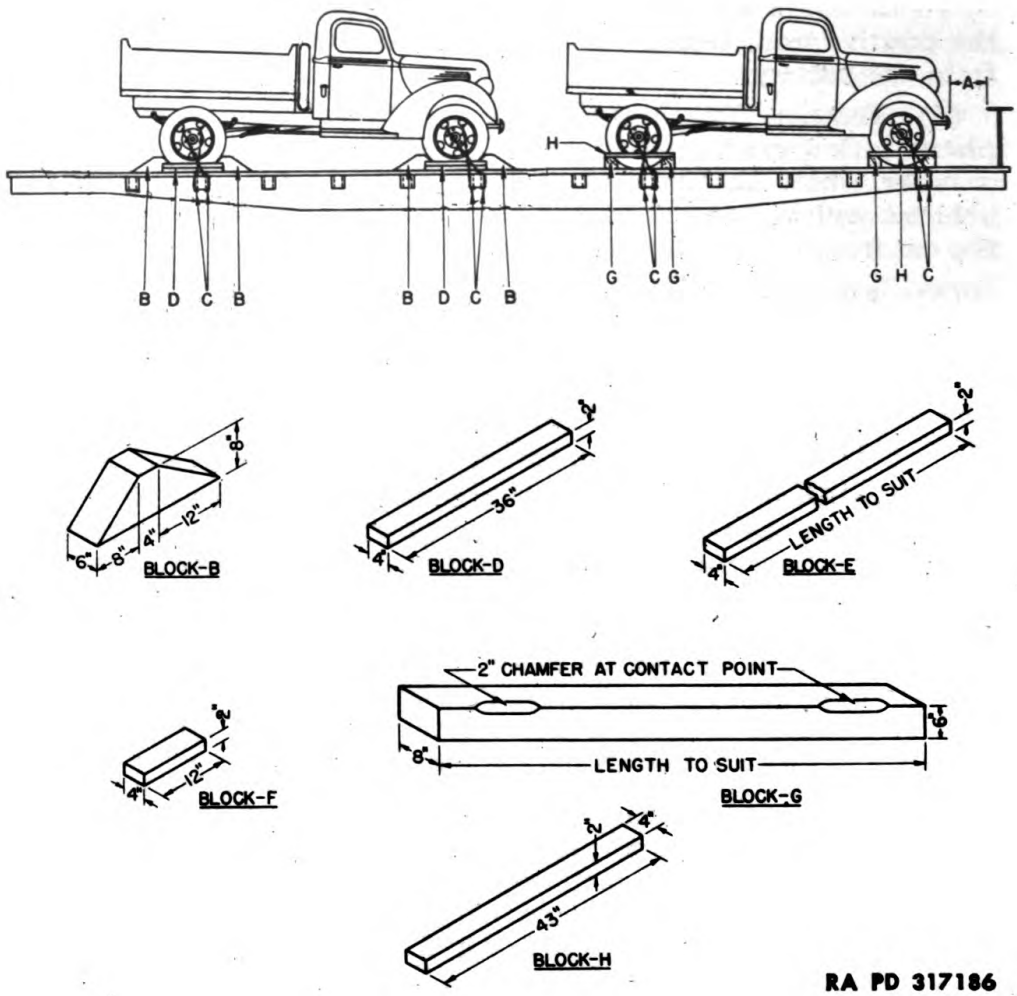

Figure 129—Blocking Requirements for Securing Wheeled Vehicles on Railroad Cars

similar fashion, and attached to the floor by the use of blocking or anchor plates. This strapping is not required when gondola cars are used.

(2) METHOD 2 (fig. 129). Place four blocks "G", one to the front and one to the rear of each set of wheels. These blocks are to be at least 8 inches wider than the over-all width of the vehicle at the car floor. Using 16 blocks "F", locate two against blocks "G" to the front of each wheel, and two against blocks "G" to the rear of each wheel. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "C" through the holes in the wheels, and secure as described in method 1 above.

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REFERENCES

STANDARD NOMENCLATURE LISTS.

Truck, 1½-ton, 4 x 4, (Chevrolet)	SNL G-506
Cleaning, preserving, and lubricating materials, recoil fluids, special oils, and miscellaneous related items	SNL K-1
Soldering, brazing, and welding materials, gases, and related items	SNL K-2
Tool-sets—motor transport	SNL N-19
Interchangeability chart of organizational special tools for combat vehicles	SNL G-19
Current Standard Nomenclature Lists are listed above. An up-to-date list of SNL's is maintained in the "Index to Ordnance Publications"	OFSB 1-1

EXPLANATORY PUBLICATIONS.

List of Publications for Training	FM 21-6

Automotive Materiel.

Automotive brakes	TM 10-565
Automotive electricity	TM 10-580
Automotive power transmission units	TM 10-585
Chassis, body, and trailer units	TM 10-560
Camouflage	FM 5-20
Driver's manual	TM 10-460
Electrical fundamentals	TM 1-455
Fuels and carburetion	TM 10-550
Motor transport	FM 25-10
Military motor vehicles	AR 850-15
Ordnance maintenance: Electrical equipment (Delco Remy)	TM 9-1825A
Ordnance maintenance: Carburetors (Carter)	TM 9-1826A
Ordnance maintenance: Vacuum power brake systems (Bendix BK)	TM 9-1827B
Standard military motor vehicles	TM 9-2800
The internal combustion engine	TM 10-570
The motor vehicle	TM 10-510

Care and Preservation.

Automotive lubrication	TM 10-540
Cleaning, preserving, lubricating, and welding materials, and similar items issued by the Ordnance Department	TM 9-850

REFERENCES

Detailed lubrication instructions for Ordnance Materiel	OFSB-series
Explosives and demolitions	FM 5-25
Motor vehicle inspections and preventive maintenance services	TM 9-2810
Maintenance and care of pneumatic tires and rubber treads	TM 31-200
Decontamination.	
Chemical decontamination materials and equipment	TM 3-220
Decontamination of armored force vehicles	FM 17-59
Defense against chemical attack	FM 21-40
Military chemistry and chemical agents	TM 3-215
Storage and Shipment.	
Registration of motor vehicles	AR 850-10
Storage of motor vehicle equipment	AR 850-18
Rules governing the loading of mechanized and motorized army equipment; also, major caliber guns, for the United States Army and Navy, on open top equipment, published by Operations and Maintenance Department of Association of American Railroads.	

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