TM10-1287

MAINTENANCE MANUAL

CHEVROLET

CHEVROLET

¾-TON (LC) 4 x 2 TRUCK

Built for

UNITED STATES ARMY

Model 3605

CONTRACT NUMBER
W-398-QM-1092

U.S.A. Registration Numbers
W-243622 TO W-243665

Chevrolet Motor Division
General Motors Sales Corporation
Detroit, Michigan

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WAR DEPARTMENT

Washington, November 15, 1941

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By order of the Secretary of War:

G. C. MARSHALL,
Chief of Staff

Official:
E. S. ADAMS,
Major General
The Adjutant General

TM10-1287

MAINTENANCE MANUAL

CHEVROLET ¾-TON 4 x 2 TRUCK

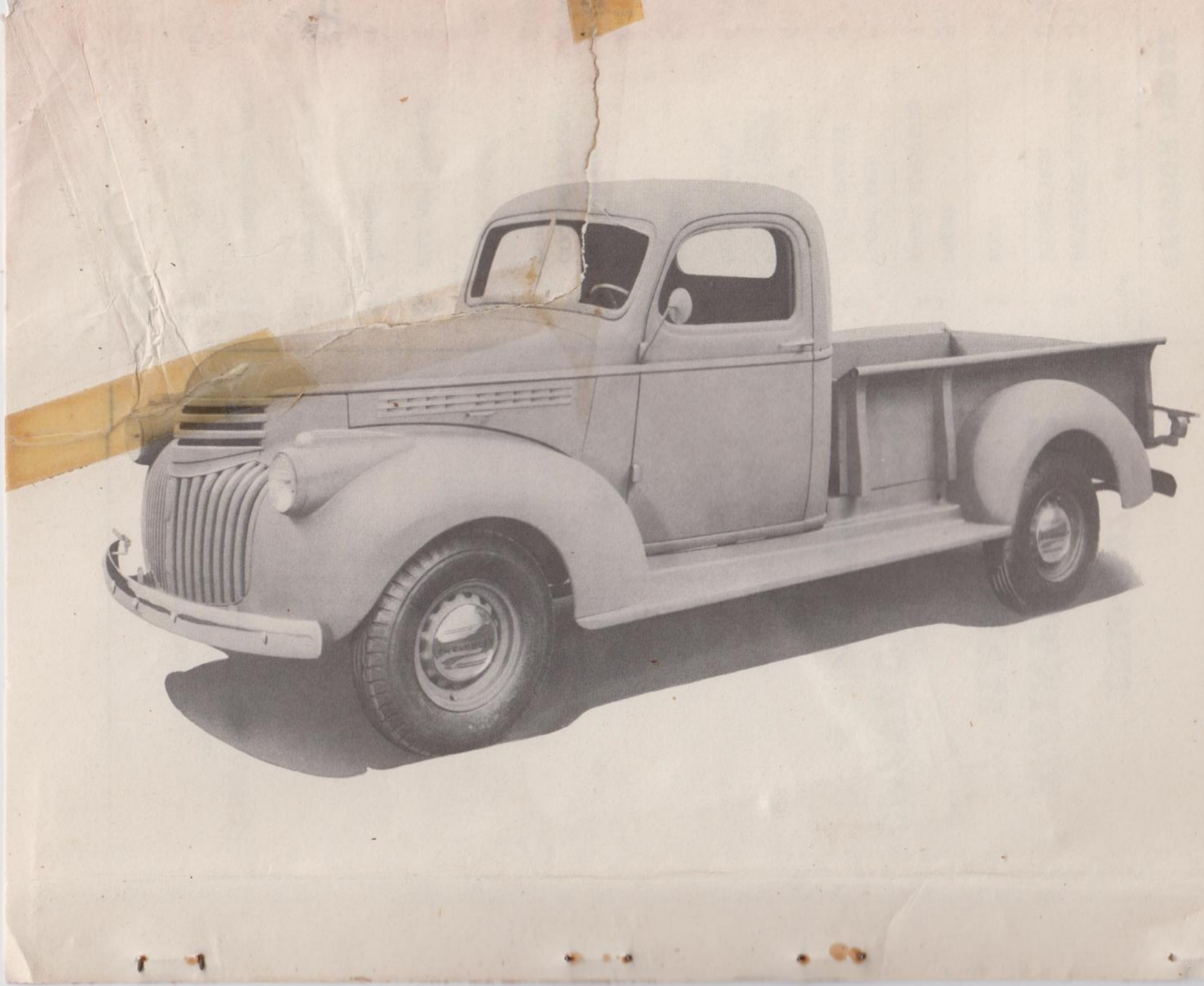
FOREWORD

This manual contains information covering the Operation, Maintenance and Repair of Chevrolet ¾-Ton — 4 x 2 Trucks.

For the convenience of the user it is arranged in sections. All information pertaining to a given unit will be found in the section devoted to that unit. The manual is written for the guidance of the operator and repair men who are responsible for the vehicle. Keep it handy and refer to it often.

CHEVROLET MOTOR DIVISION
General Motors Sales Corporation
DETROIT, MICHIGAN

SECTION INDEX



Section 0

DRIVER INSTRUCTIONS

It is of definite importance that the driver of one of these vehicles be thoroughly familiar with the various controls and instruments and their proper use. Even the experienced driver should study the controls before attempting to start the engine or move the vehicle.

Fig. 1 illustrates the controls and instruments; in the following paragraphs dealing with the purpose and use of the instruments and controls we will refer to the key number of the instrument or control being discussed, so the reader may easily follow the instructions. Starting with Fig. 1 we find the following:

IGNITION SWITCH No. 1 is operated by the ignition key; turning the switch to the right turns on the ignition and turning the switch to the left turns the ignition off.

HAND THROTTLE No. 2 is located on the instrument 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.

CARBURETOR CHOKE No. 3 is used when starting a cold engine. Pulling out this control button shuts off the air to the carburetor, providing a rich mixture for easy starting. The choke button should be pushed in when the engine starts. If the engine is warm, the use of the choke should be unnecessary.

FUEL GAUGE No. 4 registers the amount of fuel in the tank when the ignition switch is turned on. The dial has graduations for empty, half full and full.

TEMPERATURE INDICATOR No. 5 indicates the temperature of the liquid in the cooling system at all times. The driver should watch this instrument closely. A red band at the right of the dial is used to indicate excessive temperature. Whenever the indicator hand enters this band, the driver should immediately investigate the cause of the excessive temperature. Continuing to drive an overheated engine may cause permanent damage to its working parts.

AMMETER No. 6 is used to indicate whether the battery is being charged or discharged when the vehicle is in operation. If the ammeter shows discharge at all times, the cause should be investigated and corrected, otherwise the battery will be discharged.

OIL GAUGE No. 7 indicates the oil pressure. The dial has three divisions showing 0, 15 and 30. The driver should watch this instrument closely and, if the indicator hand drops below zero, the engine should be stopped immediately and the cause of the oil pressure failure investigated and corrected before continuing to run the engine.

SPEEDOMETER No. 8 indicates the speed at which the vehicle is being driven. The odometer registers the total number of miles the vehicle has been driven.

LIGHTING SWITCH No. 9 controls the lighting circuits. When the switch button is pulled out to the first position, it turns on the parking lights and tail light. Pulling the switch button all the way out turns on the headlights; the tail lamp is also turned on in this position.

WINDSHIELD WIPER SWITCH No. 10 is used to turn the windshield wiper on or off, by turning the button alongside the switch.

WINDSHIELD QUADRANT ADJUSTING SCREWS No. 11 are used to lock the windshield at various degrees of opening.

GLOVE COMPARTMENT LOCK No. 12. Pressing downward on the glove compartment lock cylinder opens the glove compartment door. A key is provided to lock this compartment.

ASH RECEIVER No. 13 is for the convenience of the driver; pulling the receiver outward uncovers the tray. The tray may be lifted out to empty the ashes.

VENTILATOR CONTROL LEVER No. 14 is used to open and close the cowl ventilator.

CLUTCH PEDAL No. 15 is used to disengage the engine from the transmission when shifting gears. The clutch pedal should never be engaged quickly when the vehicle is in gear. Driving with foot on pedal will cause wear of clutch facings and throw-out bearing. There should be one to one-and-a-quarter inches of free travel of the clutch pedal before the clutch starts to disengage.

BRAKE PEDAL No. 16. Pressing down 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.

HEADLIGHT DIMMER SWITCH No. 17 is a foot switch used to select the headlight beam (upper or lower) desired after the headlights are turned on, by pressing down on the switch button with the foot. When the upper beam is turned on, the headlight beam indicator is automatically turned on. This is a small red light located below the 50-mile graduation on the speedometer scale. When the lower beam is in use, the beam indicator is turned off. Always use the lower beam when passing approaching vehicles. This is an important highway safety rule in night driving.

INSTRUMENT LIGHT SWITCH No. 18 is used to turn on the instrument and ignition switch light. Moving the switch handle to the right turns on the ignition switch light, while moving it to the left turns on the instrument lights.

ACCELERATOR No. 19 is used in driving to control the speed of the engine.

STARTER SWITCH PEDAL No. 20. Pressing down on pedal with foot engages the starter and flywheel gears and also closes the starter switch, com-

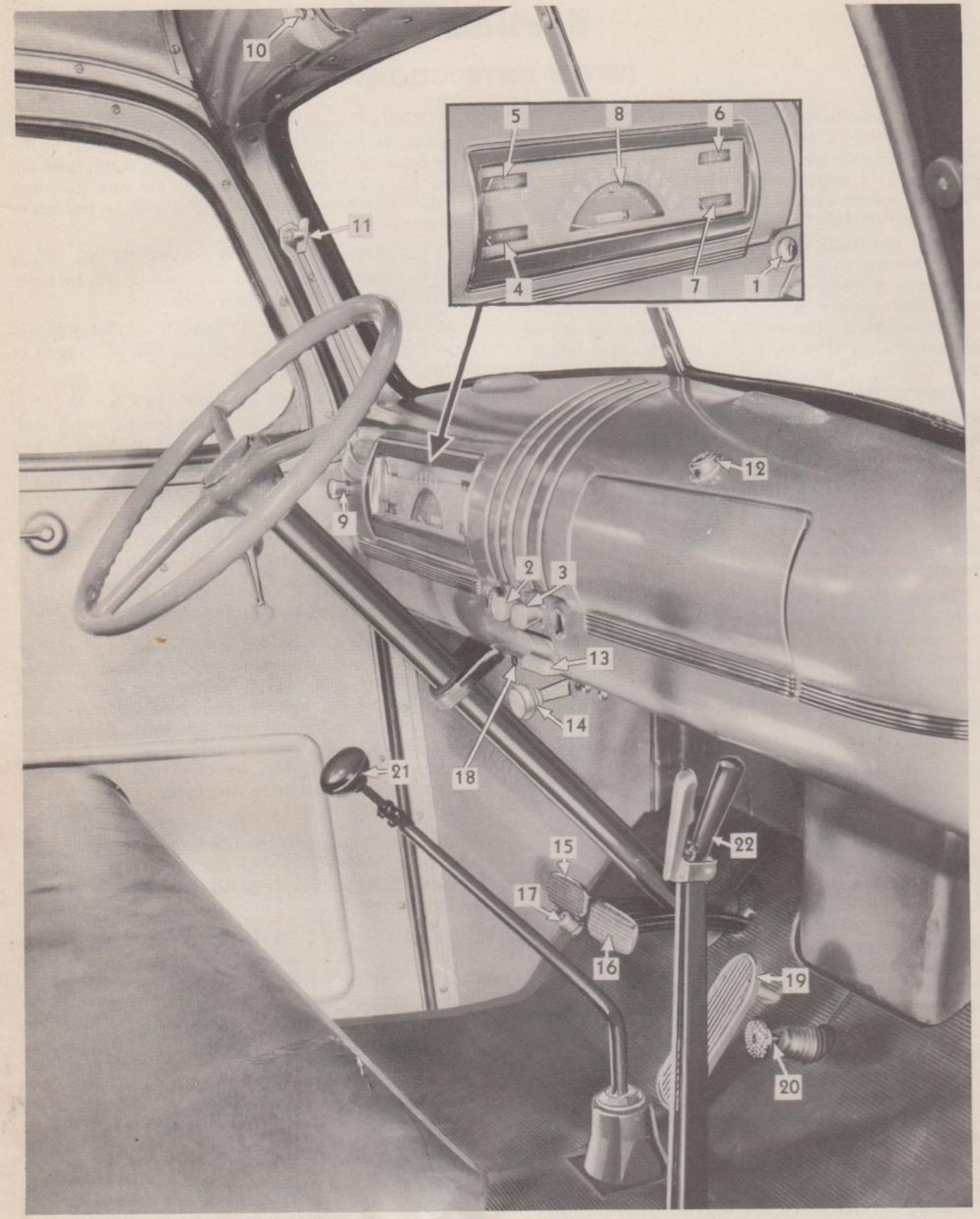


Fig. 1—Interior of Cab showing Location of Instruments and Controls

1—Ignition Switch
2—Hand Throttle
3—Carburetor Choke
4—Fuel Gauge
5—Temperature Indicator
6—Ammeter
7—Oil Gauge
8—Speedometer
9—Lighting Switch
10—Windshield Wiper Switch
11—Windshield Control Handle
12—Glove Compartment Lock
13—Ash Receiver
14—Ventilator Control Lever
15—Clutch Pedal
16—Brake Pedal
17—Headlight Dimmer Switch
18—Instrument Light Switch
19—Accelerator
20—Starter Switch Pedal
21—Transmission Gearshift Lever
22—Hand Brake Lever

pleting the electrical circuit between battery and starter. Rotation of the starter armature through the gears cranks the engine. When the engine starts, foot should be removed from pedal immediately.

TRANSMISSION GEARSHIFT LEVER No. 21 is used to select various gear ratios provided in the transmission. There are four speeds forward and one reverse. Reverse gear can only be engaged when latch on gearshift lever is raised. Lever positions for various gears are shown on the shifting diagram, Fig. 2.

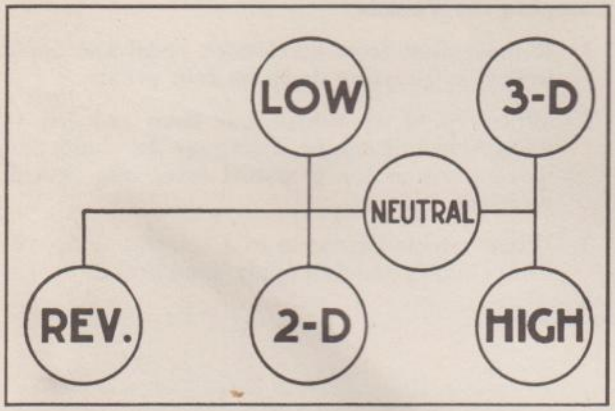


Fig. 2—Four-Speed Transmission Gearshifting Diagram

Half-ton Trucks are equipped with a three-speed transmission having three speeds forward and one reverse. Fig. 3, shifting diagram, shows the gearshift lever positions for the various speeds.

HAND BRAKE LEVER No. 22 operates the brakes on the rear wheels mechanically. Whenever the vehicle is parked, the lever should be pulled toward the rear as far as possible. Before moving the vehicle, lever should be in released position.

OPERATING INSTRUCTIONS

Each day the following inspections should be made before starting the vehicle:

1. Check the oil level on the dip stick. If oil is down to the low mark, add oil.
2. Check the water in the radiator, and fill if necessary. Check hose connections for leaks. Check fan belt for looseness.
3. Note condition of tires and see that they are properly inflated.

Starting the Engine

1. Transmission gearshift lever must be in neutral position. See shifting diagram.
2. Pull out hand throttle about ⅜ inch. This is not necessary if engine is warm.
3. Pull out choke button to obtain proper fuel and air mixture for starting. If the engine is warm, choking will be unnecessary.

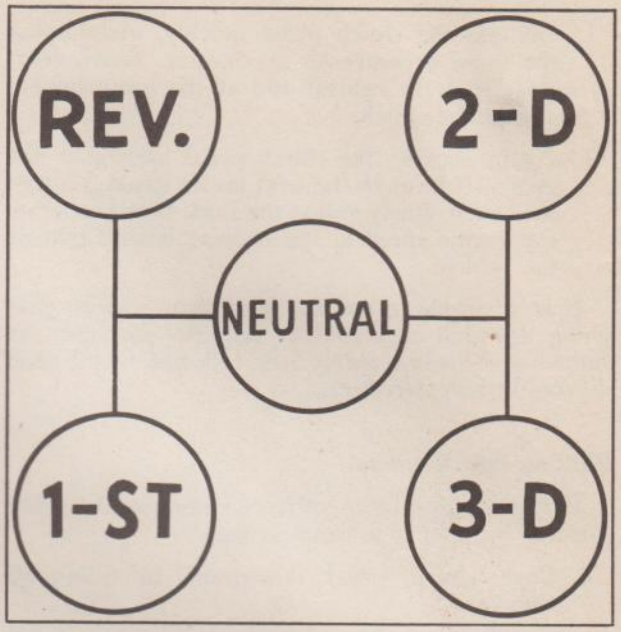


Fig. 3—Three-Speed Transmission Gearshifting Diagram

4. Insert key in ignition switch and turn 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.

Starting the Vehicle

1. Push clutch pedal downward to disengage the clutch.
2. On four-speed transmissions, move transmission gearshift lever to the left and forward into first gear position; on three-speed transmissions, move the gearshift lever to the left and backward into first gear position—see shifting diagram.
3. Release the hand brake lever.
4. Step down on accelerator pedal to speed up the engine. Release clutch pedal slowly and push accelerator pedal down as necessary to pick up the load and prevent stalling the engine as the vehicle starts to move.
5. As vehicle speed increases, release accelerator pedal, depress the clutch, move gearshift lever to neutral and then to next higher speed. Step down on accelerator and engage clutch as explained above. Repeat this operation until transmission is in high gear.

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.

It is advisable to use the same transmission gear going downhill as would be required to climb the same hill. This is a safety rule followed by all good drivers in hilly territory.

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. On four-speed transmissions, raise latch on gearshift lever and move lever to left as far as possible, then toward the rear; on three-speed transmissions, move the gearshift lever to left, then forward into reverse—see shifting diagram.
3. Engage clutch and accelerate the engine in the same manner as previously explained under the heading "Starting the Vehicle."

Stopping the Vehicle

1. Remove foot from accelerator pedal and apply brakes by pressing down on foot pedal.
2. When speed of vehicle has been reduced to idling speed of engine, disengage the clutch and move transmission gearshift lever into neutral position.
3. When vehicle has come to a complete stop, release clutch pedal and apply hand brake.

GENERAL LUBRICATION

Lubrication of a truck is important to prevent damage to moving parts due to friction, heat or foreign material. As all moving parts are not subjected to the same type of operating conditions the lubricant to be used is that which most nearly meets the requirements of the part involved. In some places excessive heat or cold is the problem to overcome, in others it is extreme pressure, water, sand or grit. The type of operating surface must also be taken into consideration as certain parts rotate or oscillate on bronze bushings, roller bearings, ball bearings or cast iron bearings. Each of the above conditions or constructions make necessary the application of a specialized lubricant.

Lubricants are much cheaper than repair bills and should be applied regularly to secure a maximum of useful service from a truck. Consequently, it is of equal importance that not only the proper grade of lubricant be used but that it be applied in accordance with a definite schedule.

The chart at the end of this section should be referred to for instructions on the mileage of application and the grade and quantity of lubricant required for all parts of the truck. A more detailed account of certain phases of lubrication is given in the following paragraphs.

ENGINE

Oil Gauge

When starting a cold engine, it will be noted that the oil gauge on the instrument panel will register a high oil pressure. As the engine warms up, the pressure will drop until it reaches a point where changes to higher speeds will raise the pressure very little, if at all.

If the oil pressure registers abnormally high after the engine is thoroughly warmed up, an inspection should be made to ascertain if the oil lines and passages are "plugged."

Lubrication

First 500 Miles

Proper selection of the oil to be used will add much to the performance, reliability, economy and long life of an engine.

It is important that the recommended light oils be used in the engine during the "breaking-in" period as they assure ease of starting the engine; prompt flow of a sufficient quantity of oil to the bearings; less friction between moving parts; less wear of moving parts, etc.

The crankcase of the engine, as delivered from the factory, is filled with 10-W oil. This should be left in during the first 500 miles and then the crankcase should be drained (while hot) and refilled to the proper level.

After 500 Miles

After the first 500 miles the crankcase oil should be selected to give the best performance for the climatic and driving conditions under which the truck is being operated.

Climatic Conditions

During the colder months of the year, an oil which will permit easy starting at the lowest atmospheric temperature likely to be encountered should be used.

When the crankcase is drained and refilled, the crankcase oil should be selected not on the basis of the existing temperature at the time of the change, but on the lowest temperature anticipated for the period during which the oil is to be used.

If oil is selected for existing temperatures, starting trouble may be encountered due to slower cranking speeds caused by too heavy an oil.

The viscosity grade of crankcase oil will, therefore, depend upon the climatic conditions under which the truck is operated.

Fall — Winter — Spring

The viscosity grade best suited for use in the engine at the various temperatures is given under reference Note 5 at the end of this section. Use the grade indicated for the lowest temperature expected. Always use the lighter grade oil when in doubt.

10-W oil plus 10% kerosene is recommended only for those territories where the temperature falls below 10 degrees below zero for protracted periods.

Summer

The use of 20-W or SAE 20 oils during the summer months will permit better all around performance than will the heavier body oils, with no appreciable increase in oil consumption.

If SAE 20 or 20-W oil is not available, SAE 30 oil may be used if it is expected that the average prevailing daylight temperature will consistently be above 90° F.

Maintaining Oil Level

The Oil Gauge Rod (Fig. 1) is marked "Full" or "Add Oil." These notations have broad arrows pointing to the level lines.

The oil level should be maintained between the two lines; neither going above the "Full" line nor under the "Add Oil" line.

Check the oil level frequently and add oil when necessary. Always be sure the crankcase is full before starting on a long drive.

Fig. 1—Oil Gauge Rod

When to Change Crankcase Oil

Some oils have been greatly improved, driving conditions have changed, and improvements in en-

gines. such as the crankcase ventilating system, have greatly lengthened the life of good lubricating oils. However, to insure continuation of best performance, low maintenance cost and long engine life, it is necessary to change the crankcase oil whenever it becomes contaminated with harmful foreign materials. Under normal driving conditions draining the crankcase and replacing with fresh oil every 2000 or 3000 miles is recommended. Under the adverse driving conditions described in the following paragraphs, it may become necessary to drain the crankcase oil more frequently.

Driving over dusty roads or through dust storms introduces abrasive material into the engine. Carburetor Air Cleaners decrease the amount of dust that may enter the crankcase. The frequency of draining depends upon severity of dust conditions and no definite draining periods can be recommended.

Short runs in cold weather, such as city driving, do not permit thorough warming up of the engine and water may accumulate in the crankcase from condensation of moisture produced by the burning of the fuel. Water in the crankcase may freeze and interfere with proper oil circulation. It also promotes rusting and may cause clogging of oil screens and passages. Under normal driving conditions this water is removed by the crankcase ventilator. But if water accumulates it should be removed by draining the crankcase as frequently as may be required.

It is always advisable to let the engine reach normal operating temperature before draining the crankcase. The benefit of draining is, to a large extent, lost if the crankcase is drained when the engine is cold as some of the suspended foreign material will cling to the sides of the oil pan and will not drain out readily with the slower moving oil.

Crankcase Dilution

Probably the most serious phase of engine oil deterioration is that of crankcase dilution, which is the thinning of the oil by fuel vapors leaking by the pistons and rings and mixing with the oil.

Leakage of fuel, or fuel vapors, into the oil pan occurs mostly during the "warming-up" period, when the fuel is not thoroughly vaporized and burned.

Automatic Control

The Chevrolet engine is equipped with automatic devices which aid greatly in minimizing the danger of crankcase dilution.

Rapid warming up of the engine is aided by the thermostatic water temperature control, which automatically prevents circulation of the water in the cooling system until it reaches a predetermined temperature.

Thermostatic heat control on the exhaust manifold, during the "warming-up" period, automatically directs the hot exhaust gases against the center of the intake manifold, greatly aiding the proper vaporization of the fuel.

The down-draft carburetor is an aid to easy starting, thereby minimizing the use of the choke. Sparing use of the choke reduces danger of raw, or unvaporized, fuel entering the combustion chamber and leaking into the oil reservoir.

An efficient crankcase ventilating system drives off fuel vapors and aids in the evaporization of the raw fuel and water which may find its way into the oil reservoir.

Control by Truck Operator

Ordinarily the above automatic control devices will minimize, or eliminate, the danger of crankcase dilution.

However, there are abnormal conditions of service when the truck operator must aid in the control of crankcase dilution.

Short runs in cold weather, such as city driving, do not permit the thorough warming up of the engine nor the efficient operation of automatic control devices. It is recommended that the oil be changed more often when the truck is subject to this type of operation.

Poor mechanical condition of the engine, such as scored cylinders, poor ring fit, "sloppy" or loose pistons, faulty valves, poor ignition, will increase crankcase dilution. Keep the truck in good mechanical condition.

Poor fuels which contain portions hard to ignite and slow to burn will increase crankcase dilution. Use good fuel.

Water in Crankcase

Serious lubrication troubles may result in cold weather by an accumulation of water in the oil pan. This condition is, as a rule, little understood by the truck operator. To demonstrate the chief cause of water in the oil pan, hold a piece of cold metal near the end of the exhaust pipe of the engine and note the rapid condensation and collection of drops of water on it. The exhaust gases are charged with water vapor and the moment these gases strike a cold surface, they will condense, forming drops of water.

A slight amount of these gases pass the pistons and rings, even under the most favorable conditions, and cause the formation of water in the oil pan, in a greater or less degree, until the engine becomes warm. When the engine becomes thoroughly warm, the crankcase will no longer act as a condenser and all of these gases will pass out through the crankcase ventilator system.

Short runs in cold weather, such as city driving, will aggravate this condensing action.

Corrosion

Practically all present-day engine fuel contains a small amount of sulphur which, in the state in which it is found, is harmless; but this sulphur on burning, forms certain gases, a small portion of which is likely to leak past the pistons and rings and reacting with water, when present in the crankcase, form very corrosive acids. The more sulphur in the fuel, the greater the danger from this type of corrosion. This

is a condition which we cannot wholly avoid, but it may be reduced to a minimum by proper care of the engine.

As long as the gases and the internal walls of the crankcase are hot enough to keep water vapor from condensing, no harm will result; but when an engine is run in low temperatures, moisture will collect and unite with the gases formed by combustion; thus, acid will be formed and is likely to cause serious etching or pitting. This etching, pitting or corrosion, when using fuel containing considerable sulphur, manifests itself in excessively rapid wear on piston pins, camshaft bearings and other moving parts of the engine, oftentimes causing the owner to blame the truck manufacturer or the lubricating oil when in reality the trouble may be traced back to the character of fuel used, or a condition of the engine, such as excessive blow-bys or improper carburetor adjustment.

SAE Viscosity Numbers

The viscosity of a lubricant is simply a measure of its body or fluidity. The oils with the lower SAE numbers are lighter and flow more readily than do the oils with the higher numbers.

The SAE viscosity numbers constitute a classification of lubricants in terms of viscosity or fluidity, but with no reference to any other characteristics or properties.

The refiner or marketer supplying the oil is responsible for the quality of its product. His reputation is your best indication of quality.

The SAE viscosity numbers have been adopted by practically all oil companies, and no difficulty should be experienced in obtaining the proper grade of lubricant to meet seasonal requirements.

REAR AXLE AND TRANSMISSION

The rear axle and transmission case are filled with SAE 90 Universal Gear lubricant at the factory—this being satisfactory for "year around" use.

Although SAE 90 grades of lubricants are recommended for "year around" service, whenever extremely low or high temperatures are encountered for protracted periods, or when the truck is excessively overloaded or subject to other severe service conditions, the recommendations given in reference notes 1 and 2 at the end of this section should be followed.

"All Purpose" or "Universal" Gear Lubricants

Due to the increase in the number of truck manufacturers using Hypoid Rear Axles, "All Purpose" or "Universal" Gear Lubricants have been developed.

These lubricants can be satisfactorily used in truck rear axles, transmissions, steering gears, and universal joints requiring a fluid lubricant.

"All Purpose" or "Universal" Gear Lubricants must be manufactured under carefully-controlled conditions and the lubricant manufacturer must be responsible for the satisfactory performance of his product. His reputation is your best indication of quality.

Lubricant Additions

The lubricant level in these units should be checked periodically.

It is recommended that any additions required to bring up the lubricant level be made, using the same type of lubricant as in the housing.

Lubricant Changes

While seasonal changes of the lubricant are not required, it is recommended that the housing be drained and refilled with the recommended lubricant at least twice a year, or every 6,000 to 10,000 miles.

It may be necessary and desirable to drain rear axles and transmissions in trucks subject to severe service more frequently than recommended above.

CAUTION—Use a light flushing oil to flush out the housings when draining. DO NOT use water, steam, kerosene, gasoline, alcohol, etc.

OIL FILTER

The drain plug on the bottom of the oil filter should be removed periodically to drain off any water or sludge deposit trapped in the filter. The filter element should be replaced every 8,000 to 10,000 miles, or when the oil gauge rod shows the oil to be dark.

OIL BATH AIR CLEANER

About once every 2,000 miles or oftener if the truck is being operated where an unusual amount of dust and dirt is in the air, remove the oil bath air cleaner and empty out the old oil and accumulated dirt. Wash out with clean gasoline and wipe dry. Wash the filter element by slushing up and down in clean gasoline. Dry thoroughly and fill the body with SAE 50 viscosity oil according to instructions given on the cleaner. Air cleaner oil capacities vary, and it is extremely important that the correct amount of oil be installed for satisfactory performance. SAE 50 viscosity oil is satisfactory for summer or winter use, however, in certain localities where exceptionally cold weather is encountered for protracted periods of time, an oil of lower viscosity should be used.

SHOCK ABSORBERS

The shock absorbers should be kept filled with a low viscosity (light body) shock absorber fluid that has a pour test not higher than 30° below zero.

The same fluid is used both summer and winter and will have similar operating characteristics the year around.

The shock insulation fluid recommended should have a viscosity of from 70 to 80 seconds at 100° F. (Sayboldt Universal) and should not exceed 975 to 1,000 seconds at 20° F. This type of fluid is carried by all Chevrolet Dealers.

NOTE—Do not, under any circumstances, use a shock insulation fluid heavier in viscosity, or body, than that recommended above. Heavy body fluids are detrimental to the proper functioning of the unit.

STEERING GEAR LUBRICATION

The steering gear is filled at the factory with an all-season gear lubricant. Seasonal change of this lubricant is unnecessary and the housing should not be drained. Whenever required, additions should be made using steering gear lubricants marketed by many oil companies, "All Purpose" or "Universal" gear lubricants or chassis lubricants.

A pipe plug is installed at this point to prevent over-lubrication, generally occasioned by the use of a pressure gun.

Over-lubrication of this unit might result in forcing lubricant up the steering gear tube to the horn button and steering wheel.

PERMANENTLY LUBRICATED PARTS

Water Pump

The water pump bearing is of the permanently sealed and lubricated type and requires no lubrication throughout its life.

Clutch Throwout Bearing

The clutch throwout bearing is packed with lubricant at the time of assembly and requires no further attention. Upon removal for clutch overhaul, however, the recess in the throwout bearing collar should be cleaned and repacked with a high-melting-point lubricant.

Clutch Pilot Bearing

No lubrication of the clutch pilot bearing is necessary unless the clutch is being overhauled, at which time it should be removed from the crankshaft, cleaned, inspected and repacked with a small amount of high-melting-point lubricant.

CHASSIS LUBRICATION

For complete chassis lubrication consult the lubrication charts and Figs. 2 and 3 to which the "Key" numbers refer. These charts indicate the location of the units to be lubricated, capacity, type of lubricant, grade and mileage of lubrication or change.

The term "Chassis Lubricant" as used in this manual, describes a semi-fluid lubricant designed for application by commercial pressure gun equipment. For its composition refer to specification note "B" at the end of the lubrication chart.

Wheel Bearings

To lubricate the front wheel bearings, remove the drive flange and wheel hub according to instructions given in Section 3 of this Manual. Wash all old grease from the bearings and hub. Hand pack the bearings with Marfak lubricant or its equivalent, using No. 2 in Summer and No. 1 in Winter. In addition, distribute one pint of lubricant in the space between the bearings in the wheel hub. Reassemble wheel hub and adjust bearings according to instructions given in Section 3 of this Manual.

To lubricate the rear wheel bearings, remove the rear axle shaft and wheel hub according to instructions in Section 4 of this Manual. Wash out the old lubricant and hand pack the bearings with Marfak lubricant or its equivalent, using No. 2 in Summer and No. 1 in Winter. In addition, distribute one pint of lubricant in space between the bearings in the wheel hub.

Lubrication Charts showing the location of lubrication points and also the kind and quantity of lubricant to use will be found on the following pages.

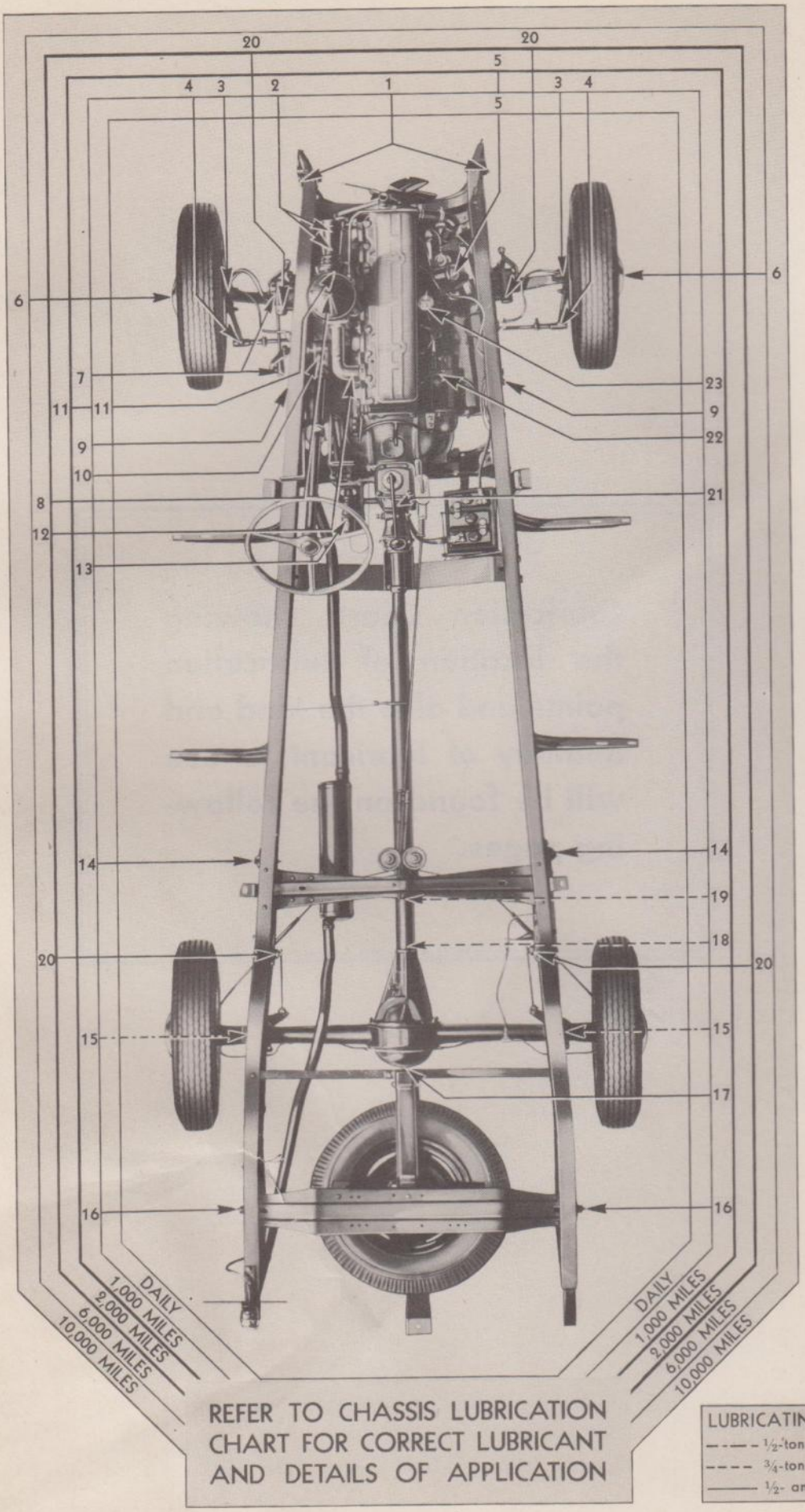


Fig. 2—½- and ¾-Ton Truck Lubrication Chart

CHASSIS LUBRICATION CHART—½ AND ¾ TON TRUCKS

Key	Location	How Applied	Capacity	Lubricant	Type (See Specification Notes)	Grade Recommended		See Ref. Note	Miles
						Summer	Winter		
1	Front Spring Shackles	2 Fittings each side	——	Chassis	B	No. 2	No. 1	—	1,000
2	Generator	1 Oil Cup each end	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	1,000
3	King Pin	2 Fittings—top and bottom	——	Chassis	B	No. 2	No. 1	—	1,000
4	Tie Rod	1 Fitting each end	——	Chassis	B	No. 2	No. 1	—	1,000
5	Crankcase	Filler Neck—Right Side	5 qts. (when filter is drained 6½ qts.)	Engine Oil	—	——	——	5	Change 2,000-3,000 Miles (Check Daily—Keep Up Level)
6	Front Wheel Bearings	Hand Pack	——	Marfak or equivalent	B	No. 2	No. 1	—	10,000
7	Steering Connecting Rod	1 Fitting each end	——	Chassis	B	No. 2	No. 1	—	1,000
8	Carburetor Pump Arm Shaft	Remove Dust Cover, Saturate Felt Ring	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	6,000
9	Front Spring Rear Eye Bolt	1 Fitting each side	——	Chassis	B	No. 2	No. 1	—	1,000
10	Steering Gear	Filler Hole—Top of Housing	——	Universal Gear	A	S.A.E. 90	S.A.E. 90	4	Check every 1,000 miles and add lubricant if required
11	Air Cleaner	Remove Cover	(See Instructions on Cleaner Body)	Engine Oil	—	S.A.E. 50	S.A.E. 50	6	2,000 (Check every day under extreme dust conditions)
12	Throttle Bell Crank	At Bell Crank Shaft	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	6,000
13	Brake Master Cylinder	Filler Hole—Top of Master Cylinder	1 pt.	Hydraulic Brake Fluid	—	——	——	—	1,000 mile inspection
14	Rear Spring Front Eye Bolt	1 Fitting each side	——	Chassis	B	No. 2	No. 1	—	1,000
15	Rear Spring Seat (½ Ton Trucks only)	1 Fitting each seat	——	Chassis	B	No. 2	No. 1	—	1,000
16	Rear Spring Shackles	2 Fittings each side	——	Chassis	B	No. 2	No. 1	—	1,000
17	Rear Axle Housing	Filler Hole in Differential Cover	4½ pts.	Universal Gear	A	S.A.E. 90	S.A.E. 90	1	Change 6,000-10,000 miles (Check every 1,000 miles and add lubricant if required)
18	Rear Universal Joint and Propeller Shaft Slip Joint (¾ Ton Trucks only)	1 Fitting each joint and slip joint	——	Transmission or Universal Gear	A	S.A.E. 90	S.A.E. 90	3	1,000

CHASSIS LUBRICATION CHART—(Cont.)

Key	Location	How Applied	Capacity	Lubricant	Type (See Specification Notes)	Grade Recommended		See Ref. Note	Miles
						Summer	Winter		
19	Intermediate Universal Joint and Propeller Shaft Slip Joint (¾ Ton Trucks only)	1 Fitting each joint and slip joint	——	Transmission or Universal Gear	A	S.A.E. 90	S.A.E. 90	3	1,000
20	Shock Absorbers	Filler Hole— Top of Housing	——	Shock Absorber Fluid	—	——	——	—	6,000 miles or 6 months
21	Transmission 3-Speed 4-Speed	Filler Hole Filler Hole	1½ pts. 5½ pts.	Navy No. optional 3080-3100-1100 or Universal Gear	A	S.A.E. 90	S.A.E. 90	2	Change 6,000-10,000 (Check every 1,000 miles and add lubricant if required)
22	Starting Motor	1 Oil Cup	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	1,000
23	Ignition Distributor	1 Grease Cup— Fill and turn down	——	Marfak or Petrolatum	C A	No. 2	No. 1	—	1,000

LUBRICATION SPECIFICATION AND REFERENCE NOTES

The following "Specification Notes" and "Reference Notes" apply to the ½ and ¾-Ton Truck Lubrication Chart shown on pages 0-106 and 0-107; they also apply to the 1½-Ton Truck Lubrication Chart shown on pages 0-111 and 0-112.

SPECIFICATION NOTES

A. See Federal Stock Catalogue or General Schedule of Supplies, 14-L-188, also circular letter No. 78.

B. See Contract Bulletin No. 123, Subject—Q.M.C. Contract for Greases Lubricating, Mineral (for Automotive Use) Office Q.M. General. Sept. 14, 1940.

C. See U. S. Army Specifications No. 2-67 or Federal Stock Catalogue No. 51-P-364.

REFERENCE NOTES

1. For Rear Axle Housing—For extremely low temperatures Class 1 Universal Gear Lubricant may be used.

2. For Transmission—**Summer**—When temperatures are very high or for severe service conditions S.A.E. 140, Navy No. 1150—3120—1120—5150 may be used or Class 3 Universal Gear Lubricant.

   For Transmission—**Winter**—Extremely low temperatures—S.A.E. 80, Navy No. 3065—1080 or S.A.E. 90 to which has been added 10% to 20% transformer oil Navy No. 9045 may be used or Class 1 Universal Gear Lubricant.

3. Propeller Shaft Universal Joints—**Summer**—When temperatures are very high S.A.E. 140, Navy No. 1150—3120—1120—5150 may be used or Class 3 Universal Gear Lubricant.

4. Steering Gear—When temperatures are very high, Class 3 Universal Gear Lubricant may be used.

5. Engine Crankcase—Use Navy No. or S.A.E. No oil for temperatures indicated in the following chart.

Atmospheric Temperatures	Navy No.	S.A.E. No.
Above 90° F.	3065	30
32° to 90° F.	3050	20 or 20W
10° to 32° F.	3050	20W
Plus 10° F. to Minus 10° F.	2110	10W
Below Minus 10° F.	2110 plus 10% No. 9045	10W plus 10% kerosene

6. Oil Bath Air Cleaner—When exceptionally cold temperatures are encountered use S.A.E. 30 Navy No. 3065 or S.A.E. 20 Navy No. 3050.

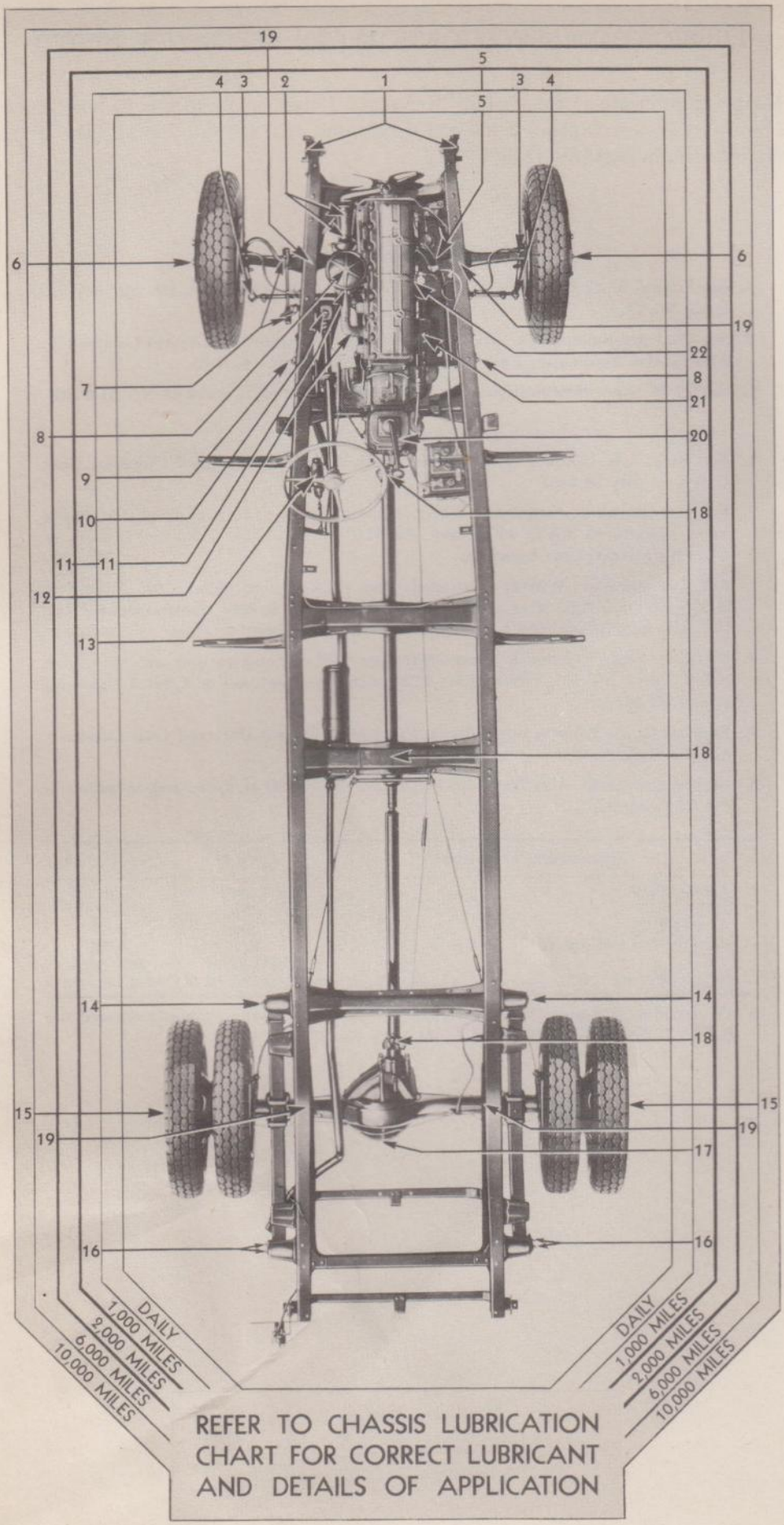


Fig. 3—1½-Ton Truck Lubrication Chart

CHASSIS LUBRICATION CHART—1½ TON TRUCKS

Key	Location	How Applied	Capacity	Lubricant	Type (See Specification Notes)	Grade Recommended		See Ref. Note	Miles
						Summer	Winter		
1	Front Spring Shackles	2 Fittings each side	——	Chassis	B	No. 2	No. 1	—	1,000
2	Generator	1 Oil Cup each end	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	1,000
3	King Pin	2 Fittings—top and bottom	——	Chassis	B	No. 2	No. 1	—	1,000
4	Tie Rod	1 Fitting each end	——	Chassis	B	No. 2	No. 1	—	1,000
5	Crankcase	Filler Neck—Right Side	5 qts. (when filter is drained 6½ qts.)	Engine Oil	—	——	——	5	Change 2,000-3,000 Miles (Check Daily—Keep Up Level)
6	Front Wheel Bearings	Hand Pack	——	Marfak or equivalent	B	No. 2	No. 1	—	10,000
7	Steering Connecting Rod	1 Fitting each end	——	Chassis	B	No. 2	No. 1	—	1,000
8	Carburetor Pump Arm Shaft	Remove Dust Cover, Saturate Felt Ring	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	6,000
9	Front Spring Rear Eye Bolt	1 Fitting each side	——	Chassis	B	No. 2	No. 1	—	1,000
10	Steering Gear	Filler Hole—Top of Housing	——	Universal Gear	A	S.A.E. 90	S.A.E. 90	4	Check every 1,000 miles and add lubricant if required
11	Air Cleaner	Remove Cover	1 pt.	Engine Oil	—	S.A.E. 50	S.A.E. 50	6	2,000 (Check daily under extreme dust conditions)
12	Throttle Bell Crank	At Bell Crank Shaft	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	6,000
13	Brake Master Cylinder	Filler Hole—Top of Master Cylinder	1 pt.	Hydraulic Brake Fluid	—	——	——	—	1,000 mile inspection
14	Rear Spring Front Eye Bolt	1 Fitting each side	——	Chassis	B	No. 2	No. 1	—	1,000
15	Rear Wheel Bearings	Hand Pack	——	Marfak or equivalent	B	No. 2	No. 1	—	10,000
16	Rear Spring Shackles	2 Fittings each side	——	Chassis	B	No. 2	No. 1	—	1,000
17	Rear Axle Housing	Filler Hole in Differential Cover	11 pts.	Universal Gear	A	S.A.E. 90	S.A.E. 90	1	Change 6,000-10,000 miles (Check every 1,000 miles and add lubricant if required)
18	Universal Joint and Propeller Shaft Slip	1 Fitting each joint and slip joint	——	Transmission or Universal Gear	A	S.A.E. 90	S.A.E. 90	3	1,000

CHASSIS LUBRICATION CHART—(Cont.)

Key	Location	How Applied	Capacity	Lubricant	Type (See Specification Notes)	Grade Recommended		See Ref. Note	Miles
						Summer	Winter		
19	Shock Absorbers	Filler Hole—Top of Housing	——	Shock Absorber Fluid	—	——	——	—	6,000 miles or 6 months
20	Transmission	Filler Hole—Right Rear Side	5½ pts.	Navy No. optional 3080-3100-1100 or Universal Gear	A	S.A.E. 90	S.A.E. 90	2	Change 6,000-10,000 miles (Check every 1,000 miles and add lubricant if required)
21	Starting Motor	1 Oil Cup	——	Engine Oil	—	S.A.E. 30	S.A.E. 10	5	1,000
22	Ignition Distributor	1 Grease Cup—Fill and turn down	——	Marfak or Petrolatum	C A	No. 2	No. 1	—	1,000

Section 1

BODY

TRUCK CAB ATTACHMENT TO FRAME

The Chevrolet truck cab is all-steel construction with mountings that provide a secure, yet flexible, attachment to the chassis frame.

The cab mounting of the 1½-ton truck is illustrated in Fig. 1. The mounting consists of four through-bolts on each side with fabric rubber insulation between the cab sill and the top of the frame side member to absorb shock. In order to prevent wrenching of the cab as the truck moves over uneven terrain or road, the two rear mounting bolts on each side of the cab are spring-loaded, as shown in Fig. 1. The cab is further insulated at each rear mounting bolt by a hard rubber bumper encased in a metal retainer. The mounting bolt passes through the center of the rubber bumper and retainer, and a heavy cushioning coil spring is placed between the bolt head and cab sill. The lower end of the bolt passes through the top channel of the frame side rail and terminates in a castellated nut, locked with a cotter pin.

The position of the rear center cab mounting bolt is reversed from that of the rear bolt in that the cushioning spring is placed below the top channel of the frame side rail and between it and the castellated retaining nut. The other two mounting bolts are not spring-cushioned but fabric rubber insulators are used between the cab sill and frame upper channel at each of these bolt positions.

The cushion spring method of mounting is designed to permit the truck frame to weave under certain conditions without placing undue strain on the cab structure. The cushion mounting bolt retaining nuts should only be tightened to a point where it is most possible to insert the cotter pin and no further. Greater tightening would compress the springs to such an extent that flexibility would be destroyed.

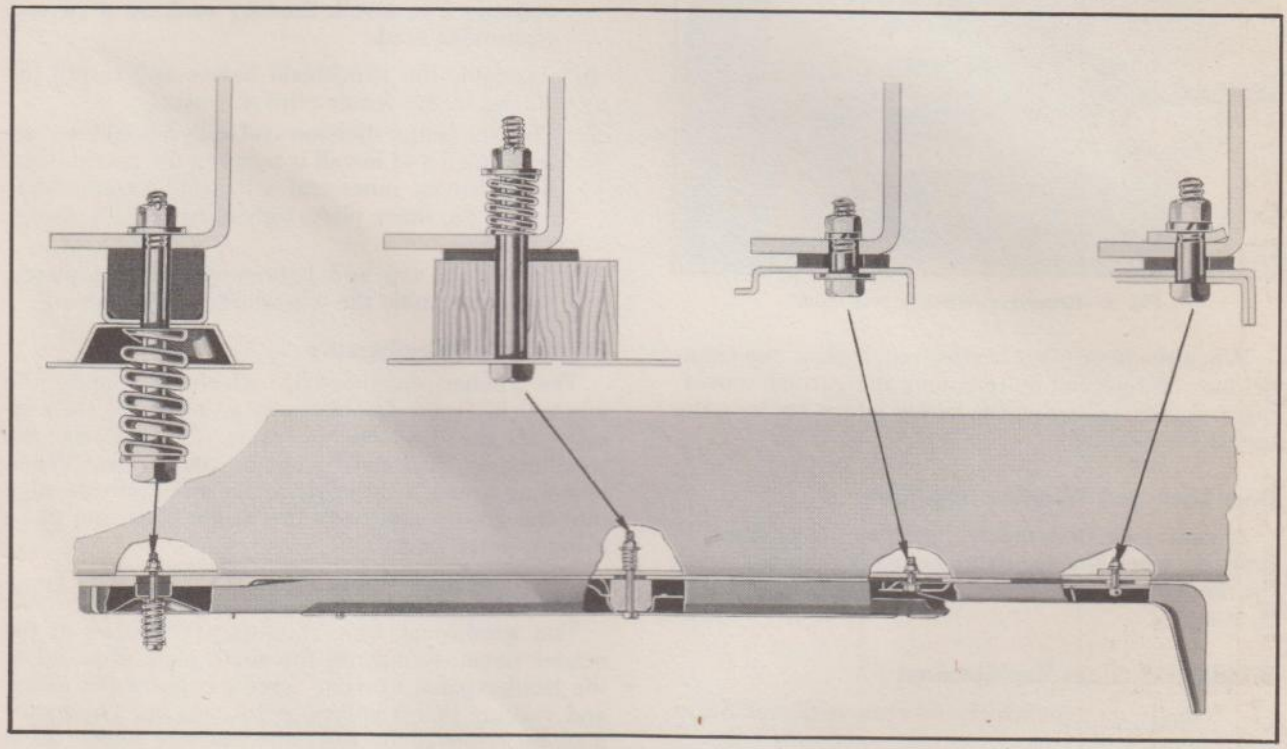


Fig. 1—Truck Cab Mounting

Door Glass

A metal frame is mounted on the door glass with the conventional rubber filler strip; this frame reinforces the glass and at the same time provides freedom from looseness and rattles. Procedure for installation of a door glass is as follows:

1. Remove door lock handle, window regulator and remote control handles.
2. Remove the door inner panel screws and remove the panel.
3. Remove the screws which mount the regulator board, and tip the regulator board away from the door. This disengages the regulator from the cam channel, as shown in Fig. 4.
4. Raise the glass and remove the glass run channel from its retainers on the lock pillar side, then remove the glass.
5. To install the metal channels, place a length of rubber filler strip over the edge of the glass, then

tap the channel over the glass and filler strip; trim the filler flush with the channel using a sharp knife or safety razor blade.

6. Install the glass in the door opening, lubricate the cam channel with graphite grease, connect the regulator to the cam channel, as shown in Fig. 2. Reassemble the regulator board, door inner panel, and control handles.

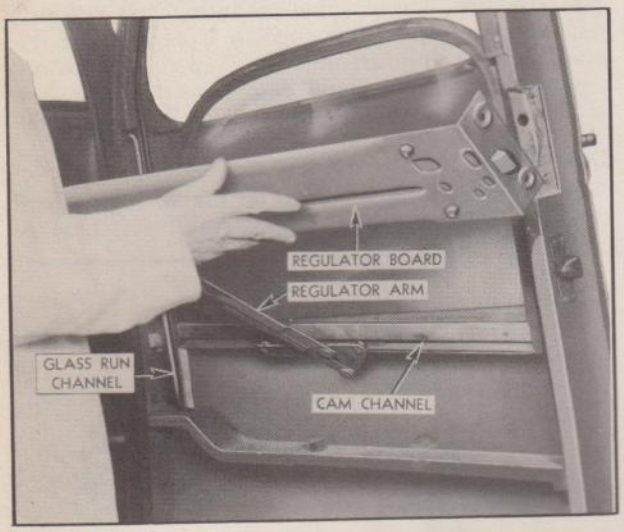


Fig. 2—Removing Window Regulator

When the door glass is removed, a glass run channel may be replaced by removing the garnish moulding and then removing the screw which anchors the top of the channel.

Door Lock and Window Regulator

A door lock or window regulator may be easily replaced when the regulator board is removed from the door, as they are mounted on the regulator board by screws.

Windshield Glass Replacement

1. Release the center lock and remove the quadrant adjusting screws.
2. Remove the two screws and sleeve nuts from each windshield hinge.
3. Remove the three screws from the top and bottom reinforcing plates, then remove the four screws from the center division channel and remove the inner and outer channels with their seals.
4. Remove the screws which attach the top and bottom channels to the frame reinforcement on one side of the center division channel. Then pull the two halves of the windshield apart at the center, as shown in Fig. 3.
5. When replacing a windshield glass, place a strip of Everseal filler channel over the edge of the glass, with the soap-stoned side out. Brush the inside of the windshield channel with light lubricant oil. Push the glass with the channel filler into the windshield channel by hand.

   NOTE—The oil acts on the channel filler, causing it to swell, thereby making a perfect watertight seal.
6. Assemble the windshield halves and install the screws in the center reinforcement.
7. Coat the center division seal with FS-638 sealing compound and install it between the two glasses, then coat the inner seal with sealing compound; install the inner plate, tightening the screws securely.
8. Install the top and bottom reinforcing plates, and reassemble the windshield in its opening.

Windshield Weatherstrip

The rubber weatherstrip which surrounds the windshield frame fits into a groove around the outside of the windshield frame. To remove the weatherstrip, just pull it out of the groove. When installing a new weatherstrip, place the outside edge into the groove and push the inside edge into place using a putty knife.

Windshield Wiper

The windshield wiper motors are located in the header panel. Removing the small plate attached to the header panel by four screws exposes the motor and vacuum line connections for service. The motor may be removed by disconnecting the wiper blade and removing the mounting nut on the front of the header panel.

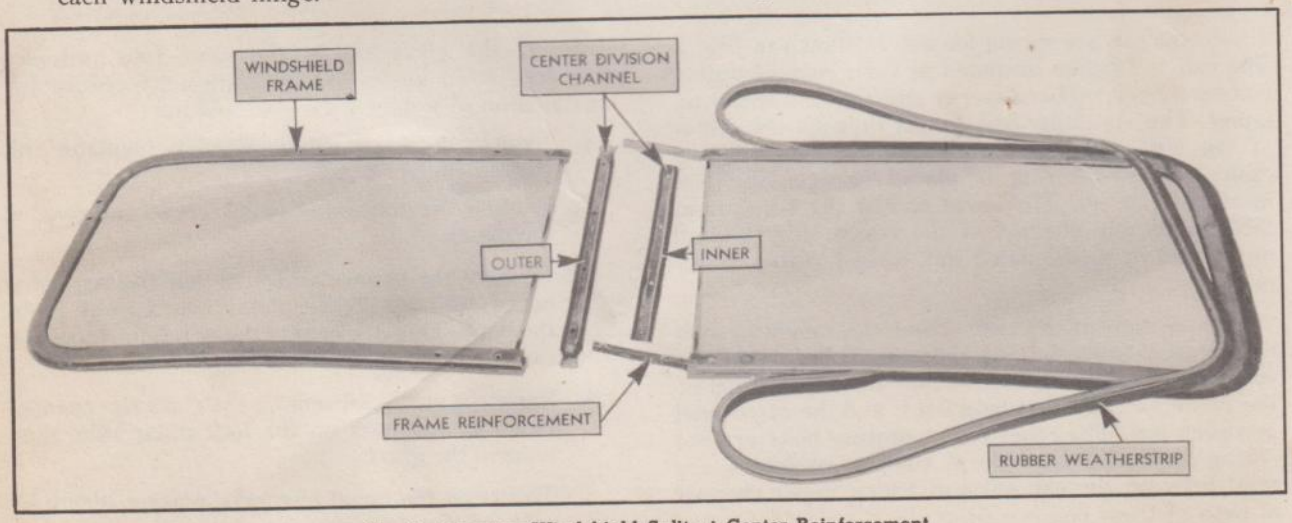


Fig. 3—Showing Windshield Split at Center Reinforcement

Section 2

FRAME

½ Ton Truck

The ½ ton truck frame is a five cross member frame with a flat kick-up over the rear axle. At the rear of the kick-up, the side members continue at the same level as the portion ahead of the kick-up. This provides a very satisfactory surface upon which to mount bodies. The cross members are very rigid being of a flanged "U" and box section construction.

The engine rear support is a flanged inverted "U" member. This member is secured to the side members by means of a construction known as "alligator jaw" attachment.

The second cross member is of box member construction for its entire width. Bolt attachment to the side members provides easy removal for the servicing of the transmission.

The third cross member, also a flanged inverted "U" section, supports the hand brake cable pulleys and the pulley bracket forms a box section with the cross member.

A single rear cross member is used. This member is formed upward at the center for spare wheel mounting.

¾ Ton Truck

The ¾ ton truck frame incorporates in its design many of the construction features of the ½ and 1½ ton truck frames.

The frame tapers from the front end to the second cross member, beyond which it forms a straight section. This arrangement supplies an excellent mounting for the bodies, as the straight section extends under the entire length of the load platform.

The side members are formed in a deep channel section from thick sheets of steel. The top flange is uniform in width over its entire length, but the lower flange is wider for a short distance at the front and rear to provide greater strength for the attachment of the cross members. Each side member is reinforced at the rear hanger of the front spring by a special channel. There is a small kick-up over the rear axle for clearance.

Cross members are of the flanged "U" and box-section construction—the type of design most suitable for truck service. Since the front end is similar to the ½ ton design, the rugged front cross member and engine rear support member of

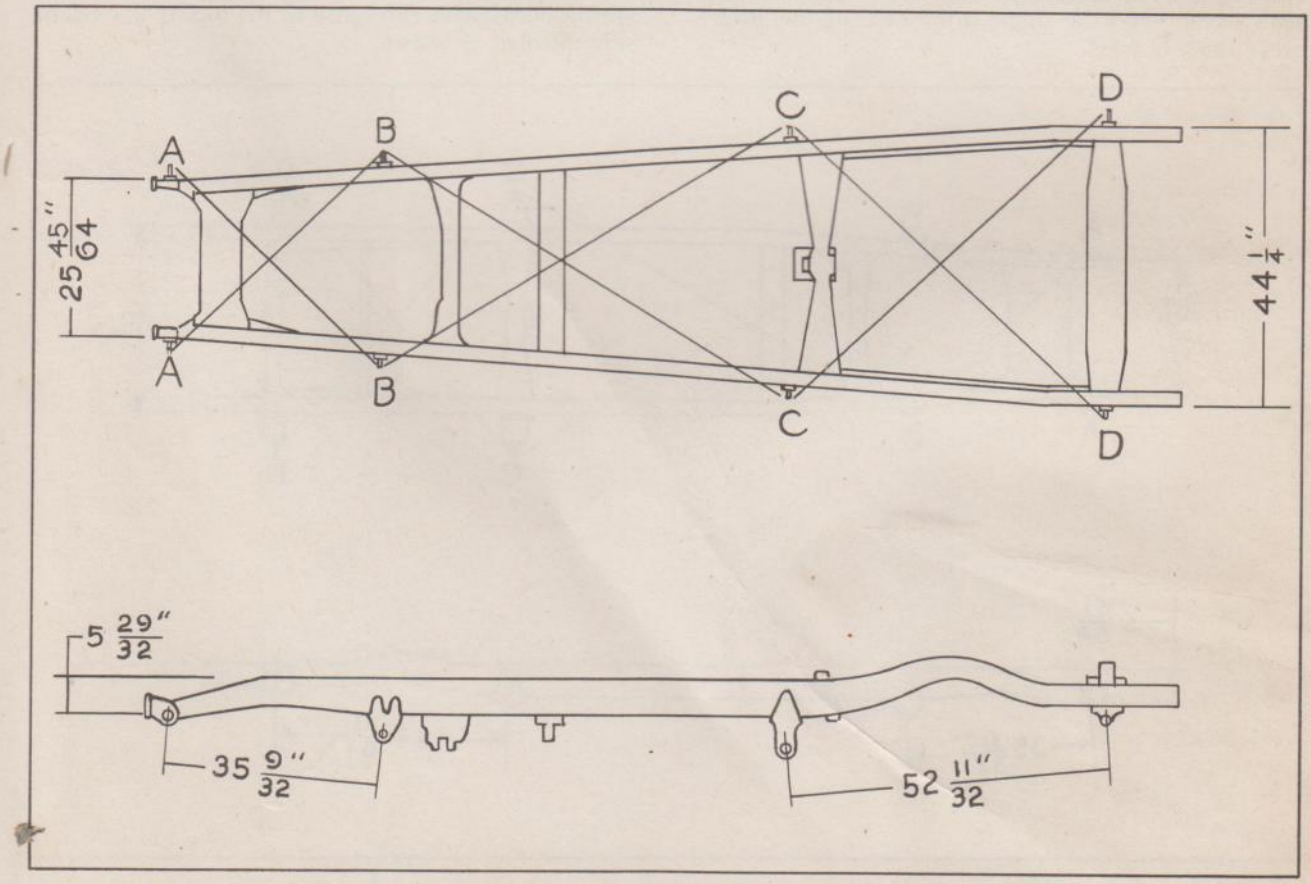


Fig. 1—½ Ton Truck Frame

that frame are utilized in this unit. In addition to supporting the rear of the power plant, the rear support also functions as a cross member.

The second cross member of box-section construction is identical to the ½ ton member, including the holes at the center section for attaching the universal joint support bracket. The plate of this support doubly ties together the flanges of the cross member in a reinforced box section, greatly increasing its strength over the entire center section. The side members and rear universal joint support are bolted to this cross member so that the transmission can be removed for servicing without disturbing the rear axle.

The third cross member is similar in design to the corresponding member in the ½ ton frame. It is of the inverted flange "U" type with alligator jaw attachment to the side members.

The rear cross member is identical to the one on the 1½ ton frame. It is a strong panel rigidly riveted at each end to the flanges of the side members. This member continues to be located at the rear bracket of the rear spring, and in addition to being riveted to the lower flanges of the side members, it is reinforced at each end by a gusset that joins the upper flange of the member and side member in a sturdy connection. The gusset is the same part as used on the 1½ ton truck.

134½" W.B. 1½ Ton Trucks

The 134½" wheelbase 1½ ton truck frame has five cross members. It is similar to the ¾ ton truck frame with exception to a slight difference in the brake cross shaft bracket.

1½ Ton 160" W.B. Trucks

Six cross members are used on the 160" wheelbase 1½ ton truck. Its frame is similar in construction to the ¾ ton truck frame with exception to a slight difference in the brake cross shaft bracket.

STRAIGHTENING THE FRAME

In the case of a collision or accident where the bending or twisting of the frame is not excessive, it is permissible to straighten the frame. This must be done cold, as heat applied to the frame will change the structure of the metal and weaken the frame at the point where heat is applied.

Checking Frame Alignment

When checking a frame for misalignment in case of damage, the most efficient method is "X" checking with a tram from given points on each side rail.

In the Figures 1, 2 and 3, reference points are indicated—"A," "B," "C" and "D" on each frame side member.

When making checks, the tram points should be set at the center of the lubrication fittings.

When "X" checking any section of the frame, the measurements should agree within 5/16". If the measurements do not agree within the above limit, it means that corrections will have to be made between those measurement points that are not equal.

The minimum dimensions between the spring hangers both front and rear are also shown on the illustrations. In addition the height of the front spring horns with reference to the top of the frame side member is shown.

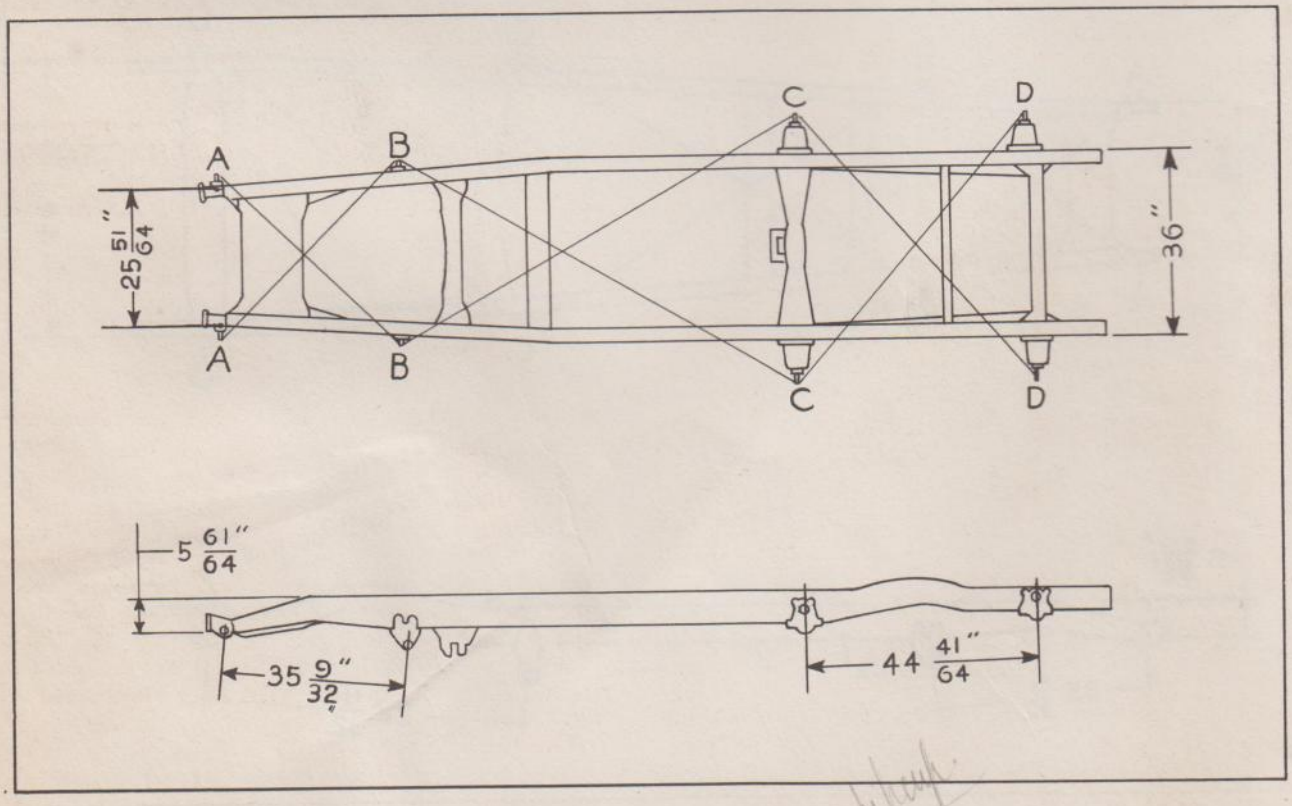


Fig. 2—¾ Ton Truck Frame

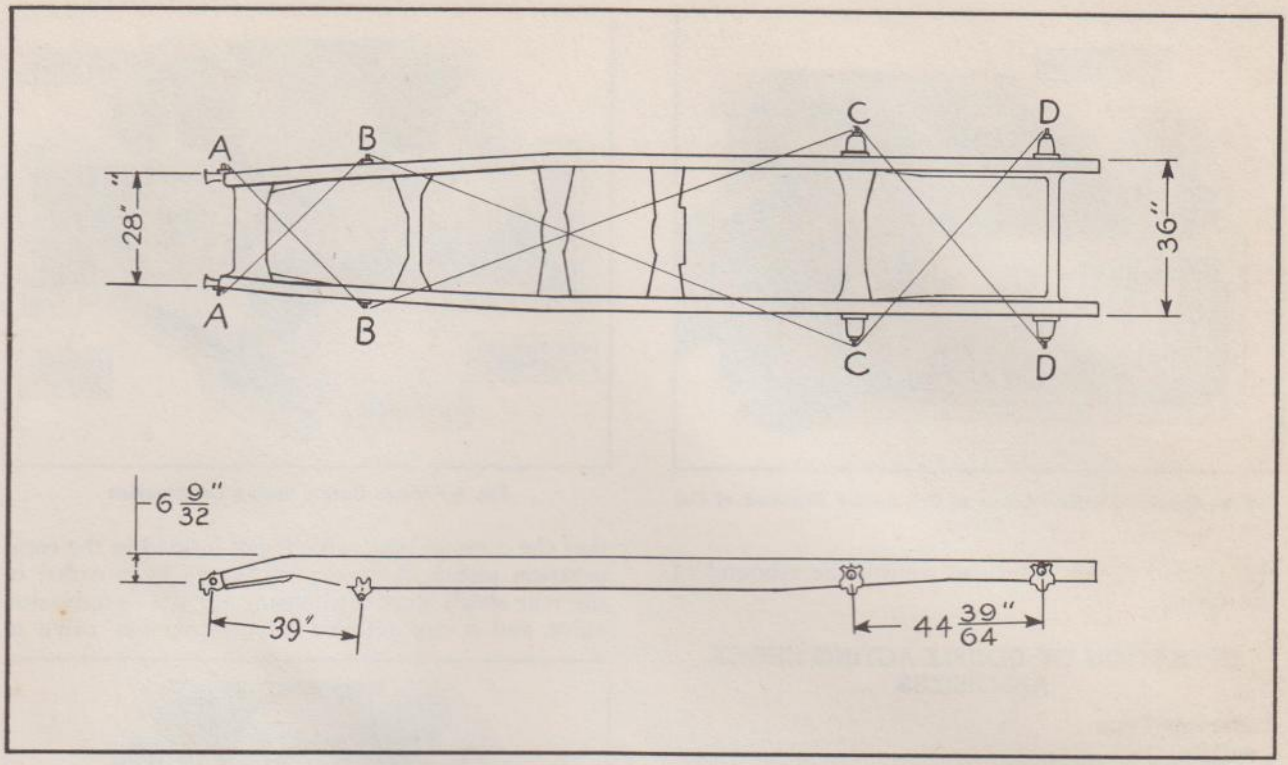


Fig. 3—1½ Ton Truck Frame

SHOCK ABSORBERS

Shock absorbers provide a smoother ride for the occupants by dampening the spring vibrations as the truck passes over irregularities in the road. There are two types of shock absorbers: single-acting, and double-acting. The single-acting shock absorbers control the speed of REBOUND of the truck springs. Double-acting shock absorbers control the speed of both REBOUND and COMPRESSION of the truck springs.

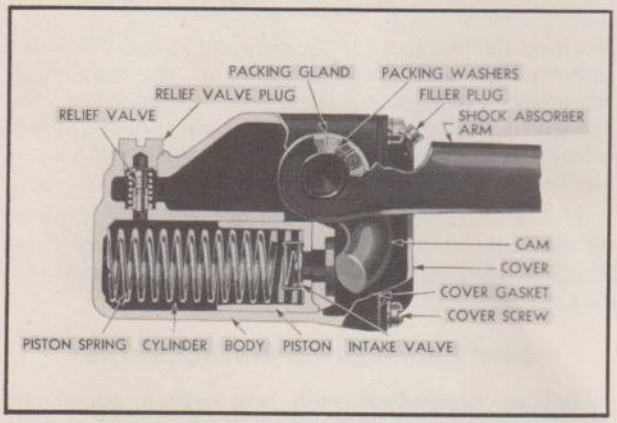


Fig. 4—Single-Acting Shock Absorber

OPERATION OF SINGLE-ACTING SHOCK ABSORBERS

The construction of the single-acting shock absorber is shown in the cross section view, Fig. 4.

When the wheels strike a bump, the car springs compress and the car frame moves downward, carrying the shock absorber with it. This causes the shock absorber arm to move upward, relieving the cam pressure on the piston. Relieving this pressure allows the piston spring to force the piston outward, creating a vacuum behind the piston. The vacuum causes the intake valve under the head of the piston to open, permitting the fluid to flow under the piston head and fill the piston chamber, Fig. 5.

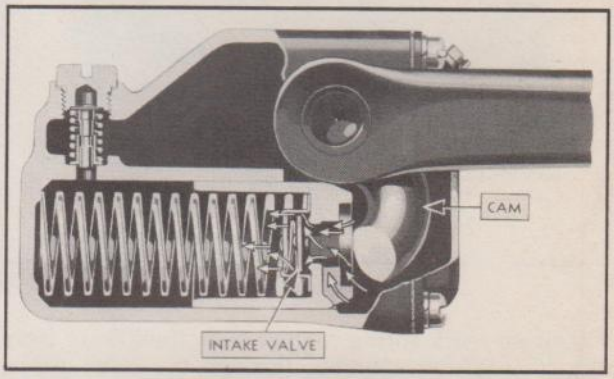


Fig. 5—Shock Absorber Action When Car Strikes a Bump

As the wheels pass over the bump, the car springs rebound and the car frame moves upward, carrying the shock absorber with it. This causes the shock absorber arm to move downward, applying cam pressure on the piston. The cam forces the piston into the cylinder, closing the intake valve. The oil, trapped in the cylinder, forces the relief valve off its seat and passes slowly into the reservoir. This action, Fig. 6, slows up the rebound of the truck springs.

The type of single-acting shock absorber shown in Fig. 4, with a separately mounted intake valve and relief valve, is used on the front and rear of

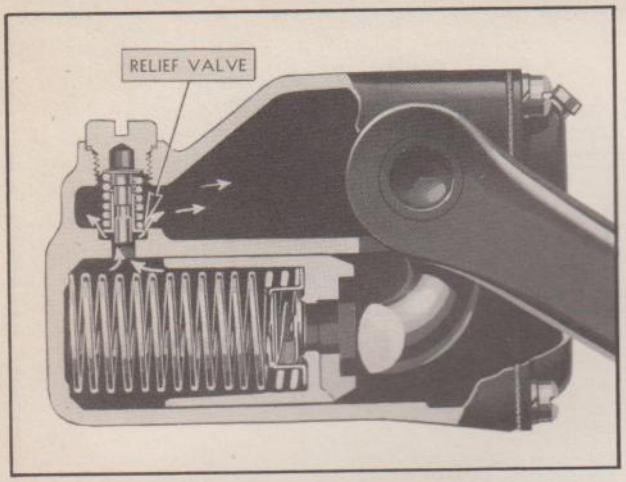


Fig. 6—Shock Absorber Action in Controlling Rebound of Car Spring

the ½ and ¾ ton trucks to control the rebound of the springs.

OPERATION OF DOUBLE-ACTING SHOCK ABSORBERS

Reservoir Type

This type of shock absorber, available on all trucks, has both pistons contained in one housing. A cross section view of the double-acting shock absorber is shown in Fig. 7.

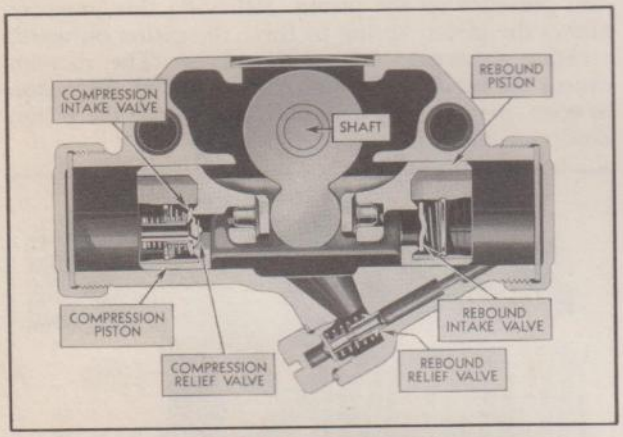


Fig. 7—Front Shock Absorber

During truck spring compression, fluid flows from the compression cylinder, through the relief valve, into the reservoir, and thus dampens the spring compression. At the same time, fluid enters the rebound cylinder through the intake valve. This action is shown in Fig. 8.

During truck spring rebound, fluid flows from the rebound cylinder, through the relief valve, into the reservoir, thereby dampening the spring rebound. At the same time, fluid flows into the compression cylinder through the intake valve. This sequence of events may be followed by referring to Fig. 9.

The cross-section views shown, Figs. 7, 8, 9, illustrate the type of shock absorber used at the front of the truck, but the operating principles of the rear shock absorbers are quite similar, the exception being

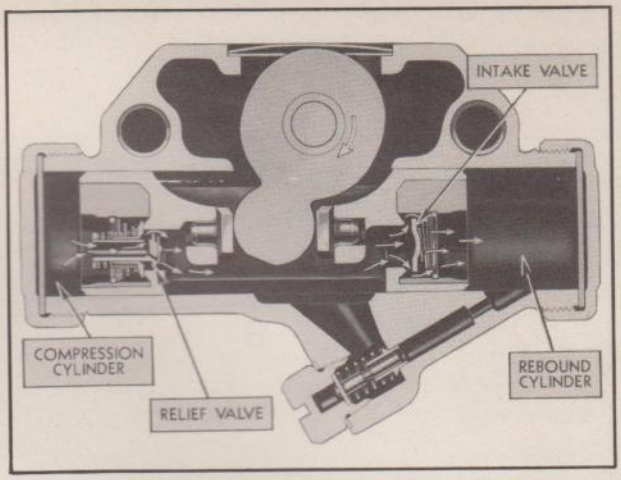


Fig. 8—Action During Spring Compression

that the compression valve is not located in the compression piston. A separate passage is provided in the rear shock absorber housing for the compression valve and a cap retains the compression valve in

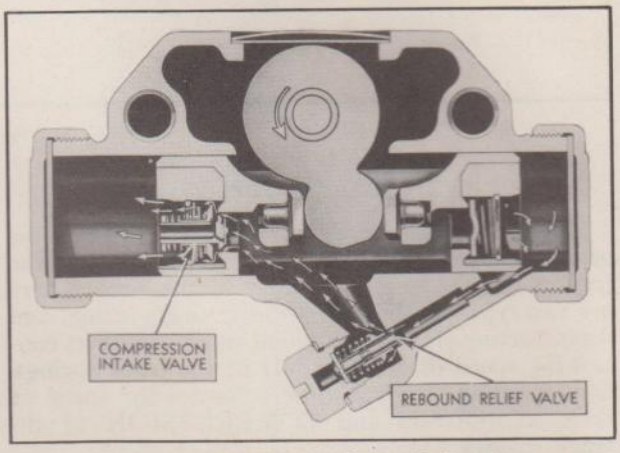


Fig. 9—Action During Spring Rebound

position the same as for the rebound valve. While the compression and rebound valves of the rear shock absorbers are identical with those of the front, the design of the rear shock absorbers differs slightly to allow for increased load distribution at the rear of the unit.

Valve markings are located on the valve caps or in the case of the compression valve on the front shock absorbers, on the end of the compression piston cover.

GENERAL SERVICE INSTRUCTIONS

Before proceeding with any repair operations on the shock absorbers, lubricate the truck springs and shackles and check the air pressure in the tires to see that it does not exceed the recommended pressure. In order to obtain a smooth ride, shackles must act freely and the tires must not be over-inflated.

After these preliminary operations have been completed, disconnect the link from the axle and pull the shock absorber arm down. If the arm comes down easily, part way, then comes to a stop

and moves down slowly the rest of the way, there is not enough fluid in the shock absorber.

Clean the shock absorber thoroughly, then remove the filler plug. With fluid injector, KMO-1026, fill the shock absorber with shock insulating fluid, to a level with the filler plug hole.

NOTE—This method of filling applies to all shock absorbers.

Replace the filler plug and move the arm up and down vigorously several times to work the oil into the piston cylinder.

After the arm has been moved up and down to fill the cylinder, insert additional fluid to fill the reservoir. Allow the fluid to escape down to the bottom edge of the filler plug hole before replacing the plug. This provides the necessary air space in the shock absorber.

Leaks at the cover or at the valve plug can be corrected by installing a new cover gasket or filler plug lead gasket washer.

On double-acting shock absorbers, leaks at the end caps, valve plug, or filler plug can be eliminated by installing new end cap fibre gaskets, or valve and filler plug lead gaskets.

Packing washers on shock absorbers which have been operating with oil below the proper level, are apt to become worn, causing oil leaks around the shaft. Such leaks can only be corrected by replacing the shock absorbers.

SERVICE OPERATIONS—SINGLE-ACTING SHOCK ABSORBERS

Disassembly

Remove the shock absorber from the truck and place in an assembly fixture as shown in Fig. 10.

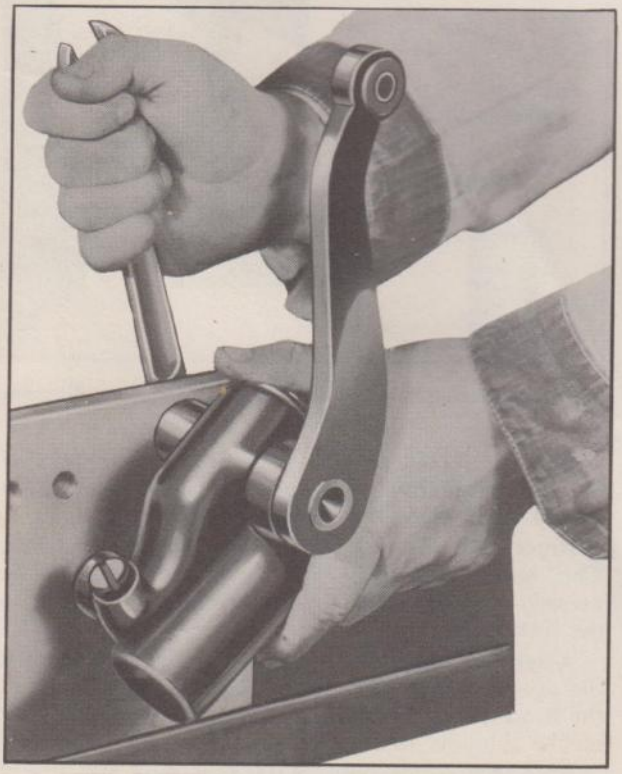


Fig. 10—Shock Absorber Holding Fixture

CAUTION—Do not clamp the shock absorber in a vise as pressure on the cylinder will bind the piston.

Remove the valve plug, relief valve, and cover from the shock absorber. Remove the piston, intake valve, and the piston spring. DO NOT attempt to remove the shock absorber arm, shaft, or cam, as these parts are assembled under 24,000 pounds pressure and are NOT to be removed.

If the bearings show excessive wear the shock absorber should be replaced.

Wash all parts in kerosene; inspect the piston, cylinder bore, valves, and springs before reassembling. Replace any worn or broken parts.

Reassembly

Assemble the intake valve onto the spring and place the piston over the spring and valve. Insert the assembly into the cylinder.

Push the piston into place and pull the shock absorber arm over until the cam holds the piston in the cylinder, then assemble the cover to the shock absorber, using a NEW gasket.

Fill the shock absorber with shock insulating fluid and install the relief valve and plug, using a NEW lead washer under the plug. Install the shock absorber on the truck.

SERVICE OPERATIONS—DOUBLE-ACTING SHOCK ABSORBERS

Reservoir Type—Disassembly

Remove the shock absorber from the truck and place it in the assembly fixture. Remove the filler plug and valve and drain the fluid from the shock absorber, working the arm back and forth until completely drained. Remove both end caps, using special serrated wrench, J-766, Fig. 11.

Remove the valve retaining snap rings and valves from both pistons. Clean and inspect all parts.

Reassembly

Install valves and snap ring, using special tool, J-896-A, Fig. 12.

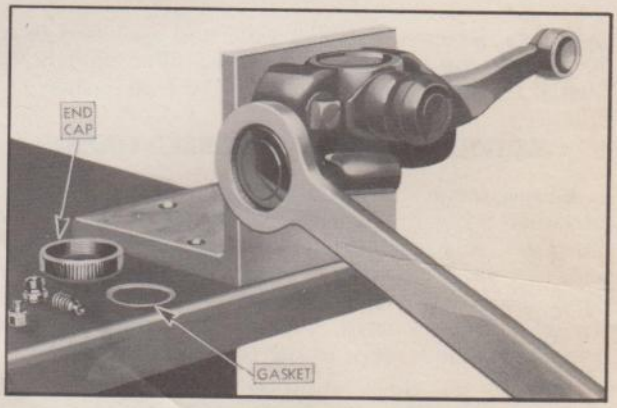


Fig. 11—Removing End Caps from Double-Acting Shock Absorbers

CAUTION—Be sure to install the inlet valve in the piston, located at the same end as the separately mounted relief valve.

The open side of the snap ring should be installed as shown in Fig. 13. If it is installed in any other position it is very difficult to remove.

After the valves have been installed, flip the valve with a screwdriver to make sure that the valve and spring are free.

Reassemble the end caps, using NEW lead gaskets under the plugs.

Fill the shock absorber with shock insulating fluid. Install the filler plug and move the arm up and down vigorously several times to insure filling the

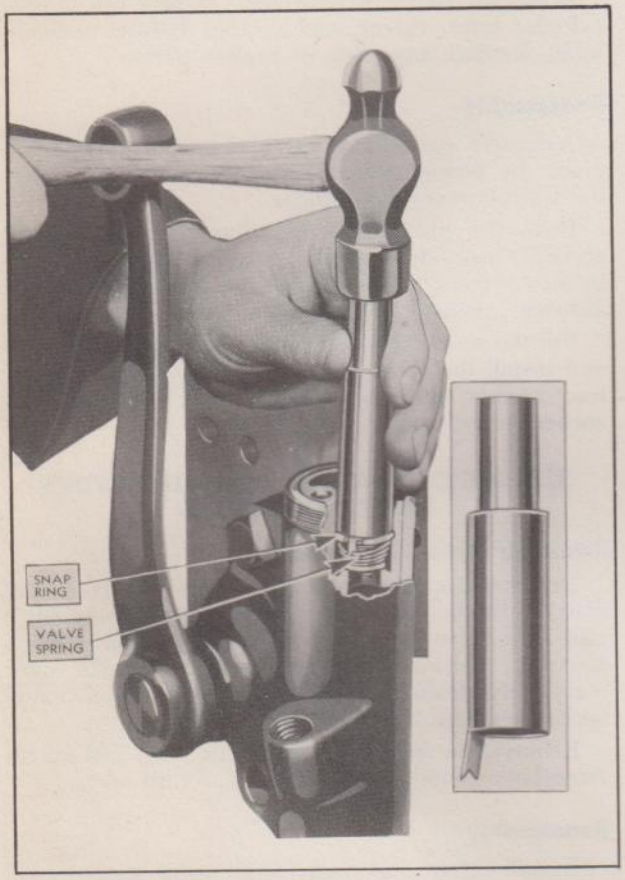


Fig. 12—Installing Valve and Snap Ring

cylinders. Remove the filler plug and add fluid to a level with the bottom edge of the filler plug hole. Install the filler plug, using a NEW lead gasket.

SERVICING SHOCK ABSORBER LINKS

Unsatisfactory shock absorber action and shock absorber noise are usually due to worn links, link bushings, and grommets. To determine if one or more of these conditions exist, disconnect the link from the axle and check for lost motion at both ends. If wear has occurred, replace the grommets and bushings at both ends, in the following manner.

Remove the shock absorber from the truck and disconnect the link. Press the worn bushings and grommet from the shock absorber arm, using the bushing remover and support, J-903, in an arbor press, as shown in Fig. 14.

Coat a new rubber grommet with liquid soap, for easy installation, and press it into the shock

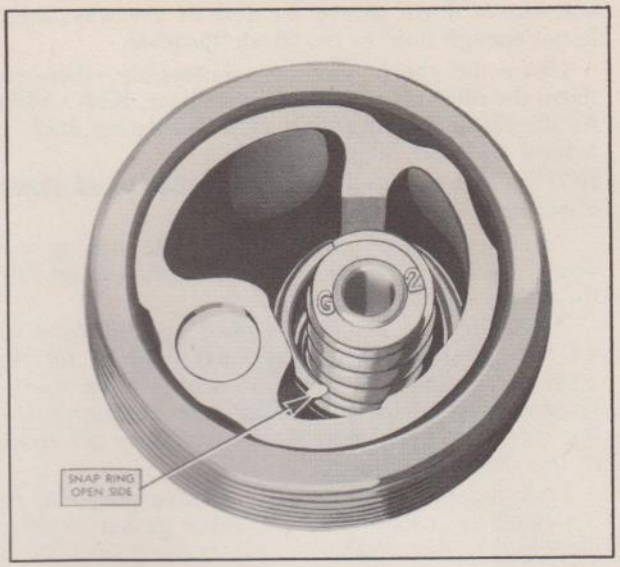


Fig. 13—Correct Position of Snap Ring

absorber arm, using tool, J-901, to insure proper seating of the grommet.

Place a new bronze bushing on the pilot of the bushing replacer and press the bushing into the grommet, Fig. 15. The replacing tool, J-899, expands the grommet and should be used for this operation to prevent damaging the grommet.

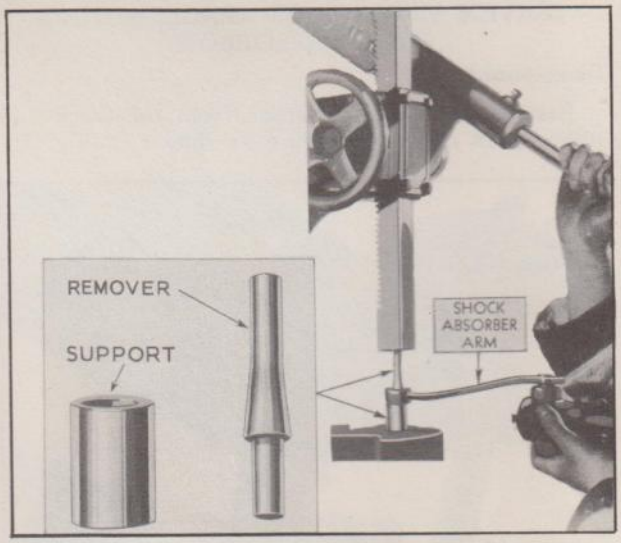


Fig. 14—Removing Bushing and Grommet from Shock Absorber Arms

The pin holes at the ends of the link are of different diameters and the knurled end of the pin should be inserted through the large hole.

Press the pin into the link, using tool, J-902. This tool limits the depth that the pin can be pressed through the link, preventing damage to the link holes.

After the pin is installed, strike the link against the press plate of the arbor press. A sharp blow on the head of the pin will properly seat the large hole on the shoulder of the pin.

Assemble cotter pins to the link pins and install the shock absorber on the truck.

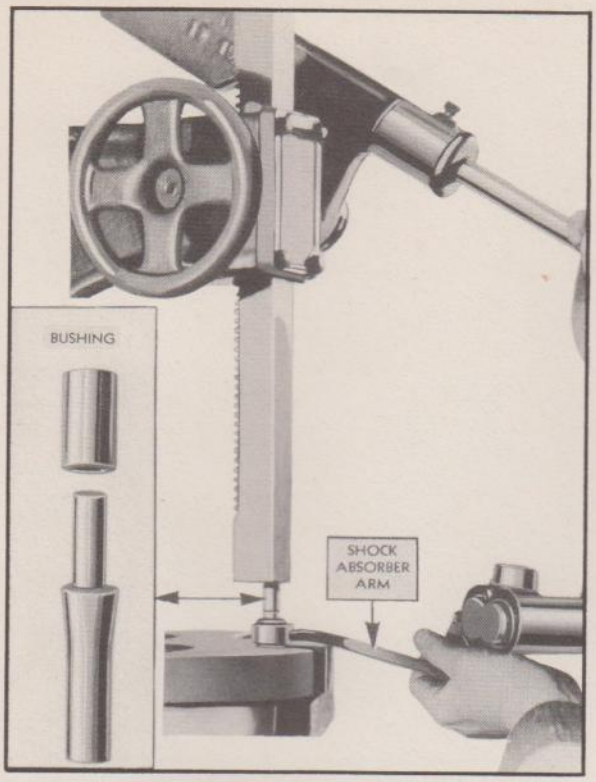


Fig. 15—Installing Bronze Bushing in the Grommet in the Shock Absorber Arm

TOOLS REQUIRED

The following tools manufactured by the Kent-Moore Organization or their equivalent are recommended for use when overhauling shock absorbers:

Tool Number	Description
KMO-1026	Fluid Gun
J-766	Knurled End Cap Wrench
J-896-A	Valve Installing Tool
J-899	Link Bushing Driver, Small
J-902	Link Pin Setting Tool
J-901	Rubber Bushing Depth Spacer
J-903	Link Bushing Remover Support

SHOCK ABSORBER SPECIFICATIONS

	½ and ¾-Ton	½-Ton	¾-Ton
	Front	Rear	Rear
Model Number	1430CA-DA	1430LA-MA	1431X-Y
Type	Reservoir	Reservoir	Reservoir
Make	Delco-Hydraulic	Delco-Hydraulic	Delco-Hydraulic
Action	Single	Single	Single
Valve Markings: Rebound	4CG	3CG	3CG
Compression	—	—	—

	½, All ¾ and 1½-Ton	½-Ton	All ¾-Ton	1½-Ton
	Front	Rear	Rear	Rear
Model Number	1731-C-D	1731-T-U	1732-N-P	2000-V-W
Type	Reservoir	Reservoir	Reservoir	Reservoir
Make	Delco-Hydraulic	Delco-Hydraulic	Delco-Hydraulic	Delco-Hydraulic
Action	Double	Double	Double	Double
Valve Markings: Rebound	2-J	2-G	1-J	1-J
Compression	G-2	G-2	G-0	G-0

Section 3

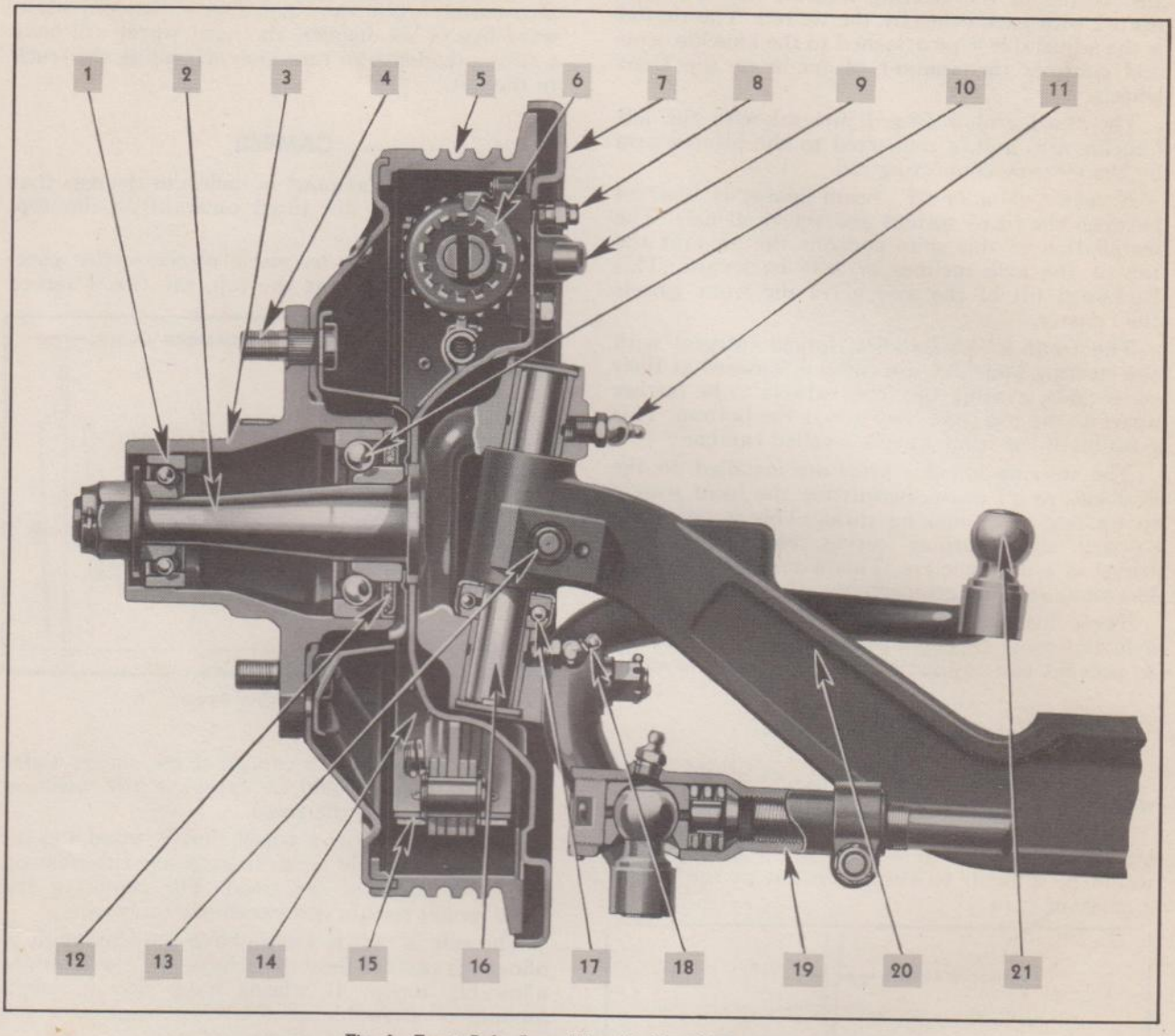


Fig. 1—Front Axle Assembly—½, ¾, 1½-Ton Trucks

1—Outer Wheel Bearing
2—Wheel Spindle
3—Wheel Hub
4—Wheel Hub Bolt
5—Brake Drum
6—Brake Wheel Cylinder
7—Brake Flange Plate
8—Brake Bleeder Valve and Screw
9—Brake Wheel Cylinder Hose Connection
10—Inner Wheel Bearing
11—Lubrication Fitting
12—Inner Bearing Oil Seal
13—Kingpin Lock Pin
14—Brake Shoe
15—Brake Lining
16—Kingpin
17—Kingpin Thrust Bearing
18—Lubrication Fitting
19—Tie Rod End
20—Axle I-Beam
21—Steering and Third Arm

FRONT AXLE

½, ¾ AND 1½-TON TRUCKS

CONSTRUCTION

The front axle used in the ½, ¾ and 1½-ton trucks is known as the reverse Elliot type. It is a steel dropforging with the spring seats forged integral with the "I" beam. The "I" beam is heat-treated for extreme toughness and is machined to very close limits.

The kingpin is recessed and held in position by a tapered pin drawn tightly into the recess by a lock washer and nut. The holes at each end of the "I" beam are bored at a slight angle to permit the kingpin to tilt inward at the top. This inward tilt is called kingpin inclination.

The steering knuckle is mounted to the front axle by means of this kingpin, and rides on a ball bearing which makes steering easy.

The brake flange plate is securely bolted to the steering knuckle and carries the brake shoes and

wheel cylinders. The steering knuckle arms are also bolted to the steering knuckle and are connected with each other by the tie rod. The tie rod is the adjustable type attached to the knuckle arms and controls the amount of toe-in of the front wheels.

The third arm is forged integral with the left knuckle arm and is connected to the pitman arm by the steering connecting rod.

A caster shim or "I" beam spacer is inserted between the front springs and the front axle. The installation of this shim controls the amount the top of the axle inclines or tilts backward. This backward tilt of the axle gives the front wheels their caster.

The front wheel spindles, forged integral with the steering knuckles, are tilted downward at their outer ends, causing the front wheels to be farther apart at the top than they are at the bottom. This position of the front wheels is called camber.

The steering knuckle arms are installed on the knuckles at an angle, permitting the front wheels to toe-out when making turns. This is necessary so that when turning curves, each wheel may travel in a different arc. This toe-out on curves is known as steering geometry.

These five front end factors are built into the axle and must be in proper relation to each other to prevent steering faults and excessive tire wear.

CASTER

Caster is the amount in degrees of the backward tilt of the axle and kingpin. See Fig. 2.

A truck without caster would lack steering stability, would tend to wander over the road and would be difficult to straighten out at the end of a curve or turn.

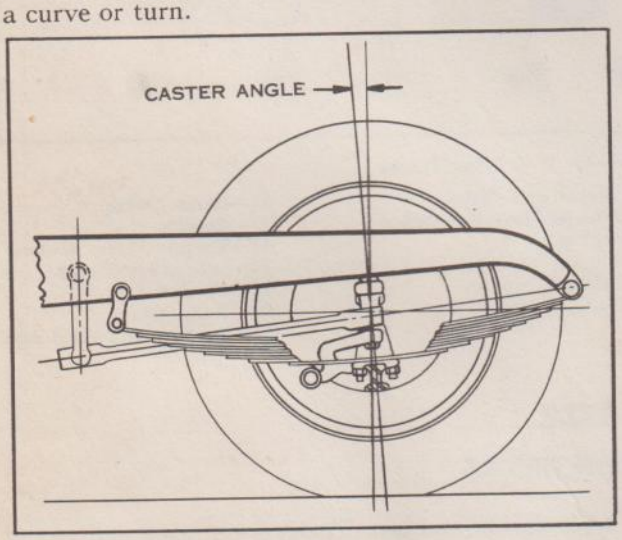


Fig. 2—Caster Angle

Unequal caster shows itself in the tendency of the truck to pull to the right or left This condition comes about through the axle having been twisted so that there is a greater amount of caster in one kingpin than in the other. The direction in which the truck will tend to pull is towards the side with less caster. Suppose that an accident has put a twist into the front axle so that the left side is zero caster, while the right side is castered backward five or six degrees, the right wheel will have a strong tendency to turn inward, pulling the truck to the left.

CAMBER

Camber is the amount in inches or degrees that the front wheels are tilted outward at the top. See Fig. 3.

When a wheel has *too much camber*, or the wheel is tilted too far out at the top, the tire is forced

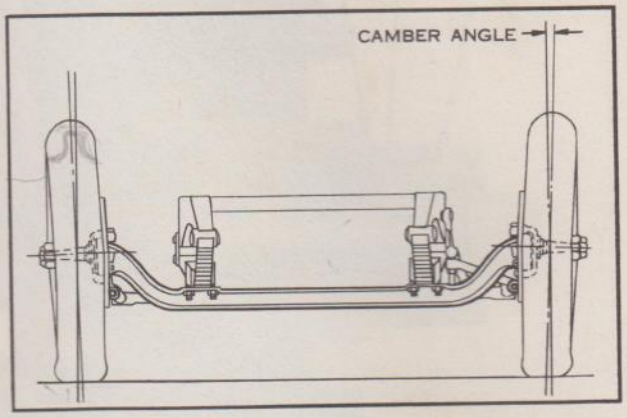


Fig. 3—Camber Angle

by road contact into a conical shape, on its under side. The result would be excessive tire wear on the outer edges of the tread.

Reverse camber, or a wheel that is tilted too far in at the top, would result in excessive tire wear on the inner edges of the tread. The center of the tread would remain comparatively unworn.

The rule is that if wheels have the maximum of allowable camber they must have the maximum of allowable toe-in. If wheels have the minimum amount of allowable camber they must have the minimum amount of allowable toe-in.

Kingpin inclination is the amount in degrees that the tops of the kingpins are inclined toward the center of the truck. See Fig. 4.

Kingpin inclination tends to keep the wheel spindles pointed outward, in line with the axle,

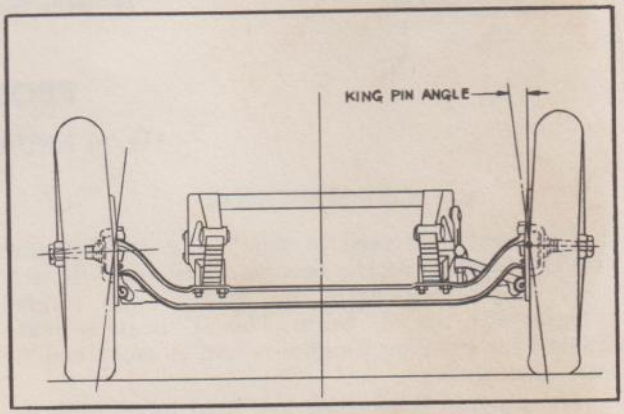


Fig. 4—Kingpin Inclination

just as caster tends to keep the wheels of an automobile pointed straight ahead. The effect is the same, since if the spindles are kept pointing out at right angles of the truck, the wheels will, as a result be kept pointing ahead. It makes the truck steer easier.

We have already referred to the close relationship between the factors that enter into the front axle assembly. It is a point that cannot be overstressed. One must keep this close interrelation constantly in mind to gain a full and true understanding of this cleverly designed mechanism. In order to correct any wrong adjustment, it is necessary to realize what effect a change in one element of the mechanism may have on the operation of the other parts.

TOE-IN

Toe-in is the amount in inches that the wheels toe-in, that is, the distance between the wheels at the front "A," is less than it is at the rear "B." See Fig. 5.

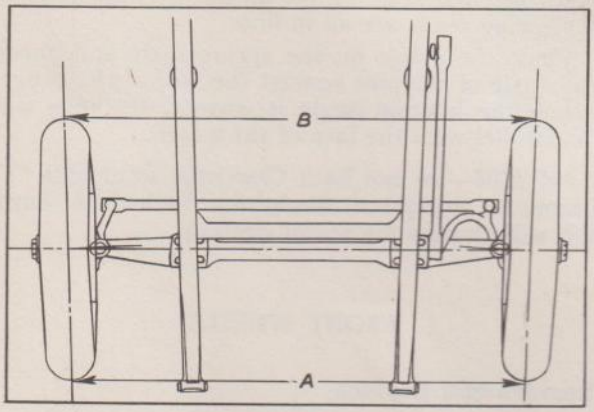


Fig. 5—Toe-In

Cambering the wheels out at the top makes it necessary to draw them in at the front.

Toe-in is a necessity growing out of camber and directly related to it. It might seem that since the wheels are headed inward toward the center of the road, while actually traveling a parallel course, there must be a constant grinding of their surfaces on the road surface. As a matter of fact, it is to avoid this tire-wearing surface grind that toe-in is employed.

Just as the purpose of camber is to give the wheel a setting so it will be in nearly a balanced free-running position as possible, so with toe-in, the purpose is to set the wheel in a position to reduce to a minimum the road friction on the tire.

STEERING GEOMETRY

Steering geometry is the mechanics of keeping the front wheels in proper relative alignment as the wheels are turned left or right. Fig. 6.

The front wheels, when the truck is making a turn, are not on the same radius line, drawn from the center around which the truck is turning, and because of this, it is necessary for the front wheels to assume a toed-out position when rounding curves. This position is governed by the angle of the steering arms.

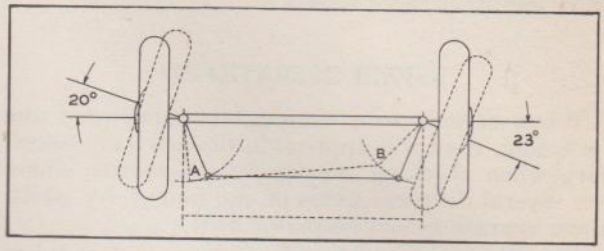


Fig. 6—Steering Geometry

The accuracy of the steering geometry is governed by the condition of the steering arms. For example, suppose a steering arm has been bent by bumping against a curb in such a way as to cause the right wheel to toe-in excessively when the car was turned around a corner. This tire would drag, causing rapid wear of that tire. The condition accounts for the cars and trucks we see once in a while that wear out one front tire twice as fast as the other, although, by usual tests, it is perfectly set for straight ahead driving.

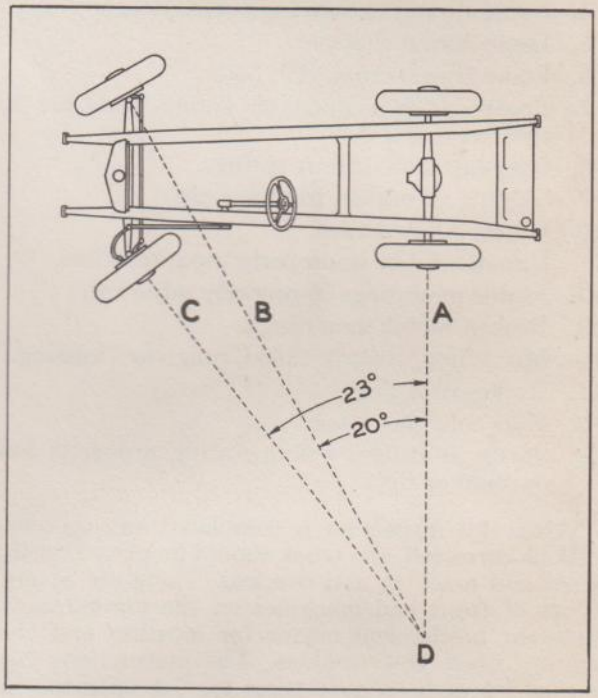


Fig. 7—Toe-Out on Curves

The wheel of any vehicle, if properly set on the curves, will be at a right angle to the radius line from the center or point around which the vehicle is turning.

Fig. 7 is a diagram of a truck making a left turn. The right wheel is set at an angle of twenty degrees —the angle being exaggerated to bring out the principles more clearly. A line "A" drawn through the rear axle and both rear wheels and a line "B"

drawn through the spindle of the right wheel meet at "D," which is the center around which the car is turning. Therefore, the left or inside wheel must be at right angles to the radius line "C" which passes through the spindle and strikes the lines from the other three wheels at "D."

REPAIR OPERATIONS

When service men thoroughly understand the foregoing, they will appreciate the accuracy necessary when checking the front end system. There are several different kinds of equipment, by which these operations can be performed.

It must be remembered that no matter what kind of equipment is used, that all of these checks must be made with the truck level, with the weight of the truck on the wheels and with no pay load.

Bad steering performance may be due to some cause not connected with front wheel alignment. Therefore, check to see that none of the following conditions are present before placing the car on the front end machine:

1. Loose or improperly adjusted steering gear.
2. Steering housing loose at frame.
3. Play or excessive wear in kingpins or bushings.
4. Loose tie rod or steering connections.
5. Loose spring shackles.
6. Loose front spring "U" bolts.
7. Front spring slipped on spring seat due to sheared center bolt.
8. Over-lubricated front springs.
9. Sagging or broken front springs.
10. Under-inflated tires.
11. Unbalanced or improperly mounted tires.
12. Motor mountings improperly adjusted.
13. Broken motor mountings.
14. Motor not properly tuned, rough or "missing."
15. Brakes dragging.
16. Hub bolt nuts loose.
17. Shock absorbers not operating properly, low on fluid or dry.

After this inspection is completed and the conditions corrected, the truck should be placed on the front end machine and checked. There are several types of front end machines on the market using different mechanical means for locating and correcting front end troubles. The instructions furnished by each manufacturer for the operation of his particular machine should be followed.

STRAIGHTENING FRONT AXLE "I" BEAM

When it is necessary to straighten the front axle "I" beam out of the truck, the gauge J-1185 illustrated in Fig. 8, should be used. The gauge consists of two pins that fit in the kingpin holes. These pins are tapered so that they properly fit and center in the axle.

The first operation in straightening "I" beams, is to properly level the spring seats either on an arbor press or with a bending bar. Assemble the kingpin pins into the holes in the end of the beam. Place a cord on each pin and slide a square on the spring seat until it touches the cord. Check from the square to center of the spring tie bolt hole.

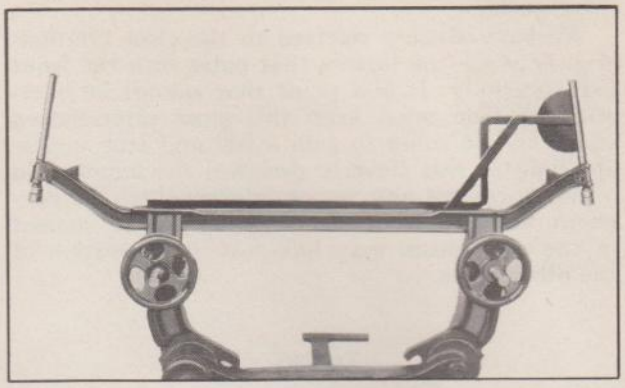


Fig. 8—Front Axle "I" Beam Gauge

When the axle is in proper alignment the kingpin holes and the hole for the spring tie bolt holes in the spring seats, are all in line.

Place the gauge on the spring seats and check the angle of the pins against the face of the gauge. When the kingpin angle is correct, the pins will be parallel with the face of the gauge.

CAUTION—Do not heat Chevrolet front axle "I" beams to straighten. Straighten them cold—heating will change the metal strength.

FRONT WHEELS

Remove and Replace

Lift the wheel from the ground with a jack under the front axle "I" beam. Remove hub cap. Pull out cotter pin locking the spindle nut. Remove the spindle nut and spindle washer. Remove front wheel.

The outer cone and balls and the inner cone are loose and may be easily removed. The inner balls may be removed by prying out the inner bearing felt retainer. If this is done, a new felt retainer assembly should be used when reassembling. The ball cups are pressed into the hubs and can be driven out by inserting a bar through the hub so that one end rests against the cup. By tapping lightly at several points around the circumference of the cup, through notches in shoulder inside of hub, it can be removed without damage. It is well to remember that the cups are very hard, therefore, extreme care should be used in removing not to crack them.

In replacing the cups, be sure that they are pressed into the hubs evenly and as far as they will go, that is, that their backs are against the shoulder in the bottom of the hole.

Before installing the separator and ball assemblies in the hub they should be packed with Marfak lubricant or its equivalent, using No. 2 in summer and No. 1 in winter.

When replacing the front wheel be sure the inner oil deflector is in its proper place between the inner bearing cone and the shoulder on the knuckle spindle. As the wheel is pushed onto the spindle it should be made certain that the inner oil deflector has passed inside of the outer oil deflector.

Be sure that the nuts which hold the wheel to the wheel hub are put on with the taper side to the wheel hub.

Adjustment

After the wheel has been replaced on the steering knuckle spindle, with the bearings and felt retainer in their proper location, install the spindle washer against the cone of the outer bearing then adjust the bearings as follows:—

1. Using an 8" wrench (never larger) and applying a steady force with one hand, pull up the adjusting nut until the wheel is somewhat hard to turn by hand. At the same time rotate the wheel to be sure that all parts are correctly seated.
2. Back off the adjusting nut one-half castellation or one-twelfth turn.
3. If the slot in the nut and the cotter pin hole line up, insert the cotter pin. If not, back the nut off until the slot and the hole are in line and then insert the cotter pin.

NOTE—In order to provide for close bearing adjustment, the cotter pin hole is drilled in the spindle in both the vertical and horizontal plane.

With the bearing inner cup an easy-push fit in the hub and the nut a free-running fit on the spindle threads, this will give an adjustment toward the tight side, which will allow for settling and working-in of the parts in service.

Front wheel bearings should never be set up on the loose side, as such an adjustment does not bring the balls and races into proper contact.

It is well to note that the slight friction of a new snugly fitting felt retainer assembly will temporarily produce a slight drag on the wheel, but this is easily recognized and should not be confused with adjustment of the bearing. Spin the wheel, making sure that all parts are in correct position, then clinch cotter pin securely.

FRONT AXLE TIE ROD

The front axle tie rod is of the ball, seat and spring type, similar to the steering connecting rod construction.

Refer to Fig. 9, and note how parts are assembled. The parts on both ends are assembled in the same manner. First the spring seat, then the spring and ball seat, then the ball and ball seat, and then the plug. Ball seats should be assembled so that notches line up with ball neck.

To properly adjust the front axle tie rod:

1. Remove cotter pins.
2. Screw plugs in tight until springs are compressed solid and back off to first cotter pin hole.
3. Insert and clinch cotter pins.
4. Lubricate both ends of tie rod.

To remove the tie rod from the front axle, remove the cotter pin, end plug and ball seat. Screw end plug back into the end of the tie rod until the ball is in the center of the opening. A light tap with a soft hammer will remove the tie rod from the ball.

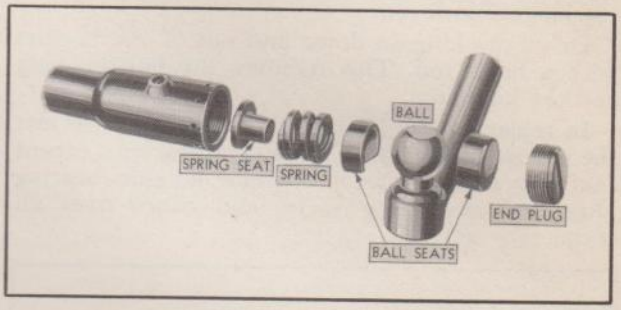


Fig. 9—Front Axle Tie Rod

Toe-In Adjustment

Front wheel toe-in can be adjusted by loosening the clamp bolts at each end of the tie rod and turning the tie rod to increase or decrease its length until a toe-in of 5/64" to 1/8" is secured, then tighten the clamp bolts securely.

½-TON PANEL TRUCK STABILIZER

A ride stabilizer is used at the front of the ½-Ton Panel Truck to prevent excessive side sway on turns.

To remove the stabilizer from the truck, first remove the spring "U" bolts attaching it to the top of the spring and then remove the large bolt at the upper end of the two-piece bracket which extends through the bracket, spacer, and frame side rail. The stabilizer assembly can then be removed. To remove the bracket from the bar it is necessary to remove the bolts holding the two-piece bracket together so as to relieve the pressure on the rubber bushings. The bracket and bushing can then be slipped off over the end of the bar.

Replacing the stabilizer on the truck is the reverse of the above, except that the bolts which clamp the two parts of the bracket together should not be tightened until after the stabilizer is in place on the truck, and the weight of the truck with no pay load on its wheels. This is important so that the rubber bushings will grip the bar in proper relation to the frame and axle, and prevent excessive up and down movement of one front wheel relative to the other.

CAUTION—Do not attempt to adjust the stabilizer by tightening the bolts in the bracket when there is a load in the truck. This would destroy its effectiveness.

All commercial frame front cross members are punched for the adaptation of this assembly if desired.

KINGPIN

Remove and Replace

To remove and replace the kingpin, jack up the front of the truck and remove the front wheel. Remove the nuts which attach the brake flange plate to the steering knuckle. Remove the brake flange plate. Remove the top kingpin bearing plug. This can be done with a sharp prick punch. Remove the kingpin lock pin.

Drive the kingpin down and out of the bottom with a brass rod. This removes the bottom plug and the kingpin.

In replacing the kingpin the operations are just the reverse of the above removal operations, except that you should always use new kingpin bearing plugs and new lockwashers, and clinch over all cotter pins securely.

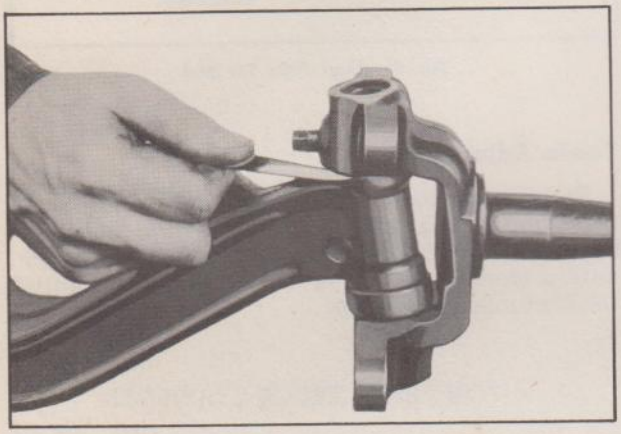


Fig. 10—Clearance Between Steering Knuckle and "I" Beam

The kingpin bearing plugs on all trucks have no "expansion" feature, and must be staked in place by peening or staking over the ends of the steering knuckle to hold the plugs securely in place.

Drive in the kingpin with a soft head hammer. After the kingpin is installed with the thrust bearing assembled at the bottom of the kingpin with the dust shield side at the top, check the clearance between the steering knuckle and axle "I" beam. See Fig. 10. If this clearance is more than .006″ install a steel shim between the steering knuckle and the "I" beam at the top of the kingpin.

In installing this shim, start the kingpin in at the top of the knuckle and place the shim over the kingpin. Mount the knuckle over the end of the "I" beam and drive the kingpin part way through the "I" beam. Insert bearing between the "I" beam and the knuckle and drive the kingpin into position.

Trucks that have been operated for a period of time with loose kingpin bushings, in many cases, tend to "bell mouth" the kingpin holes in the ends of the "I" beam. As a means of making a satisfactory repair and prevent future kingpin breakage due to the kingpins being loose in the "I" beam, .010″ and .020″ oversize kingpins and bushings are available for 1½-Ton Trucks.

Special reamers are available on the market for reaming the holes in the "I" beam ends for oversize kingpins.

KINGPIN FLOATING BUSHINGS

½ AND ¾-TON TRUCKS

On the ½ and ¾-ton trucks the kingpin bushings are bronze bushings of the "floating" type. When replacing these bushings it is not necessary to ream them to size, as service bushings are machined to finished dimensions. However, when replacing floating bushings care should be used to make sure that the oil groove in the bushing lines up with the lubrication fitting in the steering knuckle. These bushings should be free on the kingpin, but may be somewhat snug in the steering knuckle.

After the kingpin bushings have been installed, the front end alignment should be checked to make sure that all of the factors of front end alignment are within the specified limits.

REMOVE AND INSTALL STEERING KNUCKLE BUSHINGS, 1½-TON TRUCKS

A bushing puller should be used in removing steering knuckle bushings. If a tool of this kind is not available, an ordinary coarse threaded tap of the proper size can be threaded into the bushing, and with a bar whose diameter is slightly less than the diameter of the hole and 1 inch longer than the distance through the steering knuckle, drive out the tap and bushing.

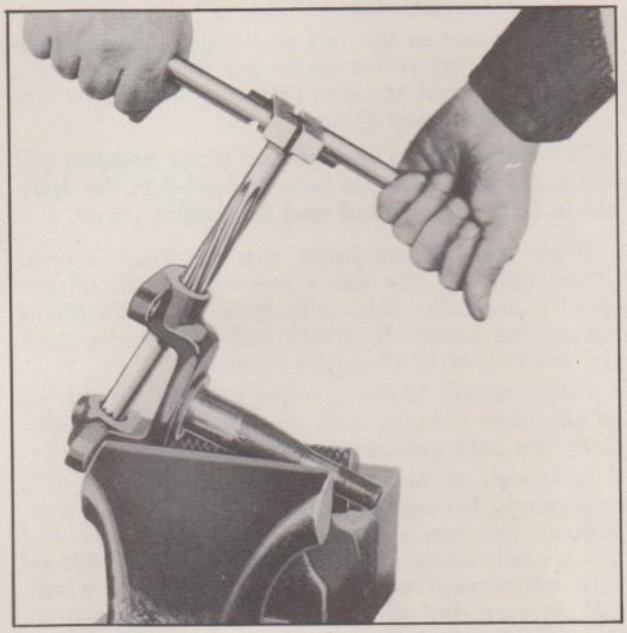


Fig. 11—Reaming Steering Knuckle Bushings

To install new bushing, round edges with a file; place in proper position with respect to knuckle to align oil holes, noting that the oil hole is nearer one end than the other. Press into place with a vise or arbor press, taking care to start bushing straight into the hole. Do not hammer on bushing or otherwise deform it.

After the bushings are in place, they should be carefully reamed to size, using a reamer long enough to reach through both bushings at once, or preferably a reamer having a long pilot bar which will just pass through the opposite bushing while one is

being reamed, the cutting flutes also being long enough to finish the bushings together. Fig. 11.

NOTE—When oversize kingpins are installed, it is necessary to ream the steering knuckle bushings first with the reamer used for fitting a standard size kingpin, and then with the special oversize reamer to fit the .010" or .020" oversize kingpin, to provide .002" clearance between the kingpin and bushing.

FRONT SPRINGS

½-TON TRUCK

The front springs on the ½-ton truck are flat under load, contributing to improved steering geometry by reducing to a minimum the fore and aft movement of the front axle and attaching parts. The rear eye of the front spring is of the "Berlin" type, meaning that the horizontal center is approximately level with the main leaf center.

¾-TON TRUCK

The front springs of the ¾-ton truck are "two-stage" type, or in other words the spring rate with the truck light is considerably lower than when loaded. The advantage of this type spring is that the rebound or "throw" is much less when the truck is light and the resistance to "bumping through" is greater when the truck is loaded. The change in spring rate from the low to the higher rate takes place at or near the rated load capacity of the truck.

1½-TON TRUCK

The front spring on the 1½-ton truck is a low camber spring of high load carrying capacity. The rear eye is also of the "Berlin" type, with a second leaf which partially wraps the main eye for additional safety.

Front spring data will be found under the heading "Spring Specifications" at the end of this section.

THREADED SHACKLE

A threaded type spring shackle is used at the front of the front spring on the ½, ¾ and 1½-ton truck models.

In this design threaded bushings are pressed into the spring hanger and into the eye of the spring. Threaded pins with tapered ends are screwed into the bushings with each end projecting the same distance. The shackles are plain, heavy gauge steel stampings with tapered holes which fit tightly on the tapered ends of the pins. A draw bolt, having a square shoulder under its rounded head, engages each outer shackle. A nut at the inner side of each inner shackle serves to draw both inner and outer shackle members up snugly on the pins. See Fig. 12.

The pins are drilled from their outer ends to the center where a cross hole connects it with the threaded portion. Lubrication fittings are assembled in the end of each central hole to provide for lubrication of the threads. Cork washers are assembled at each end between the shackle and the hanger and between the shackle and the spring, to retain the lubricant in the threaded portion.

In action, this shackle, being tight on the tapered pin end, oscillates the pin in the threaded portion. This design uses all of the relatively large threaded surface for a bearing, reducing wear to a minimum and insuring long bearing life to these members.

If it becomes necessary to remove these bushings from either the spring eye or the spring hanger, Tool No. J-553 is required. Remove the draw bolt and the shackles. Screw tapered pins from the bushing and thread the end of the tool into the bushing. Turning the pull nut with a wrench will remove the bushing.

To install a new bushing, insert the threaded end of the tool through the spring eye or spring hanger and screw on a new bushing, until it is centered up with the hole in the spring eye or spring hanger. Turning on the pull nut will press this bushing into place.

Inspect the pin that was removed from the bushing and if it is worn, replace. Screw it into the

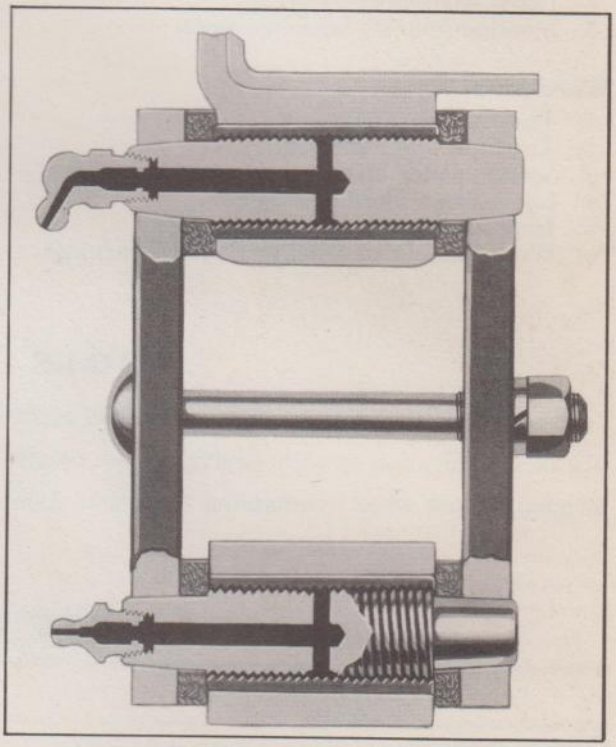


Fig. 12—Threaded Type Spring Shackle

bushing until each end projects 21/32" from the end of the bushing on either side. Place the four cork washers over the ends of the pins and assemble the shackle plates. Insert the draw bolt and draw the nut up snugly. Strike each end of each shackle a sharp blow with a hammer to insure seating of the tapers and retighten the shackle draw bolt.

Examine the lubrication fittings for damage, replacing when necessary and fill the pins completely full with chassis lubricant.

PLAIN BUSHING

A plain bushing type spring eye bolt is used at the rear of the front springs on the ½, ¾, and 1½-ton truck models. The construction and method of removing and replacing this type of eye bolt is the same as for the eye bolt in the plain bushed shackle, as described under "Rear Springs" in Section 4 of this Manual.

FRONT AXLE TROUBLES AND REMEDIES

Symptom	Probable Remedy
Hard Steering	
1. Lack of lubrication.	1. Lubricate the following points—tie rod ends, steering gear and steering connecting rod.
2. Tight steering gear.	2. Adjust steering gear according to instructions in Section 9 of this manual.
3. Improper toe-in.	3. Adjust toe-in.
4. Tires improperly inflated.	4. Inflate tires according to specifications given in Section 10 of this manual.
Front Wheel Shimmy	
1. Improper tire inflation.	1. Inflate tires to recommended pressure.
2. Wheels loose on hubs.	2. Tighten wheel hub bolts.
3. Improper toe-in.	3. Adjust toe-in.
4. Loose front wheel bearings.	4. Adjust front wheel bearings.
5. Steering knuckle bushings worn.	5. Replace bushings.
Wandering	
1. Tight steering gear.	1. Adjust steering gear.
2. Tires unevenly inflated.	2. Inflate tires.
3. Spring center bolt sheared and axle shifted.	3. Replace center bolt and relocate in spring seat.
4. Loose front wheel bearings.	4. Adjust front wheel bearings.
5. Improper toe-in.	5. Adjust toe-in.
6. Worn kingpin or steering knuckle bushings.	6. Replace worn parts.

TOOLS REQUIRED

The following tools manufactured by the Kent-Moore Organization or their equivalent are recommended for use when overhauling the Front Axle:

Tool Number	Description
J-1185	Axle Aligner Gauge
J-553	Shackle Bushing Tool
.923″	Steering Knuckle Bushing Reamer—1½-Ton Models

FRONT AXLE SPECIFICATIONS

	½ and ¾-Ton Trucks	1½-Ton Trucks
Caster—Degrees	$1\frac{3}{4} \pm \frac{1}{2}$	$2\frac{3}{4} \pm \frac{1}{2}$
Camber—Degrees	$1 \pm \frac{1}{2}$	$1 \pm \frac{1}{2}$
Kingpin Inclination—Degrees	7° 10′ ± 1°	7° 10′ ± 1°
Toe-In—Inches	$\frac{5}{64}$ to $\frac{1}{8}$	$\frac{5}{64}$ to $\frac{1}{8}$
Steering Geometry (Toe-Out on Turns);		
Outside Wheel—Degrees	20	20
Inside Wheel—Degrees	23 ± 2	23 ± 2

KINGPIN DIAMETER

½ and ¾-Ton Trucks	.866″ to .8665″
1½-Ton Trucks	.921″ to .9214″

THRUST BEARING (KINGPIN)

½ and ¾-Ton Trucks	Matthews Mfg. Co., No. 8261-TA4
1½-Ton Trucks	Matthews Mfg. Co., No. 7801-TA2

WHEEL BEARINGS

½ and ¾-Ton Inner	
Inner Race	ND-909502
Separator and Balls	ND-909702
Outer Race	ND-909602
½ and ¾-Ton Outer	
Inner Race	ND-909501
Separator and Balls	ND-909701
Outer Race	ND-909601
1½-Ton Inner	
Inner Race	ND-909526
Separator and Balls	ND-909726
Outer Race	ND-909626
1½-Ton Outer	
Inner Race	ND-909525
Separator and Balls	ND-909725
Outer Race	ND-909625

SPRING SPECIFICATIONS

	½-Ton	¾-Ton	1½-Ton 134½ & 160"
Length	36"	36"	40"
Leaf Width	1¾"	1¾"	2"
Stage	Single	Two	Single
Rate—Lbs. per Inch	260	(275 / 365)	475
No. of Leaves	7	8	7
Leaf Thickness			
Nos. 1, 2	.237	.237	.297
No. 3	.237	.214	.297
Nos. 4, 5	.194	.214	.297
Nos. 6, 7	.194	.262	.297
No. 8	—	.262	—
No. 9	—	—	—
Total Thickness	1.487	1.902	2.037
Spring Clip Type			
No. 1	Clinch	Clinch	Bolt
No. 2	—	—	—
No. 3	Clinch	Bolt	Bolt
No. 4	Clinch	Clinch	Bolt

Section 4

REAR AXLE ASSEMBLY
½ AND ¾-TON TRUCKS

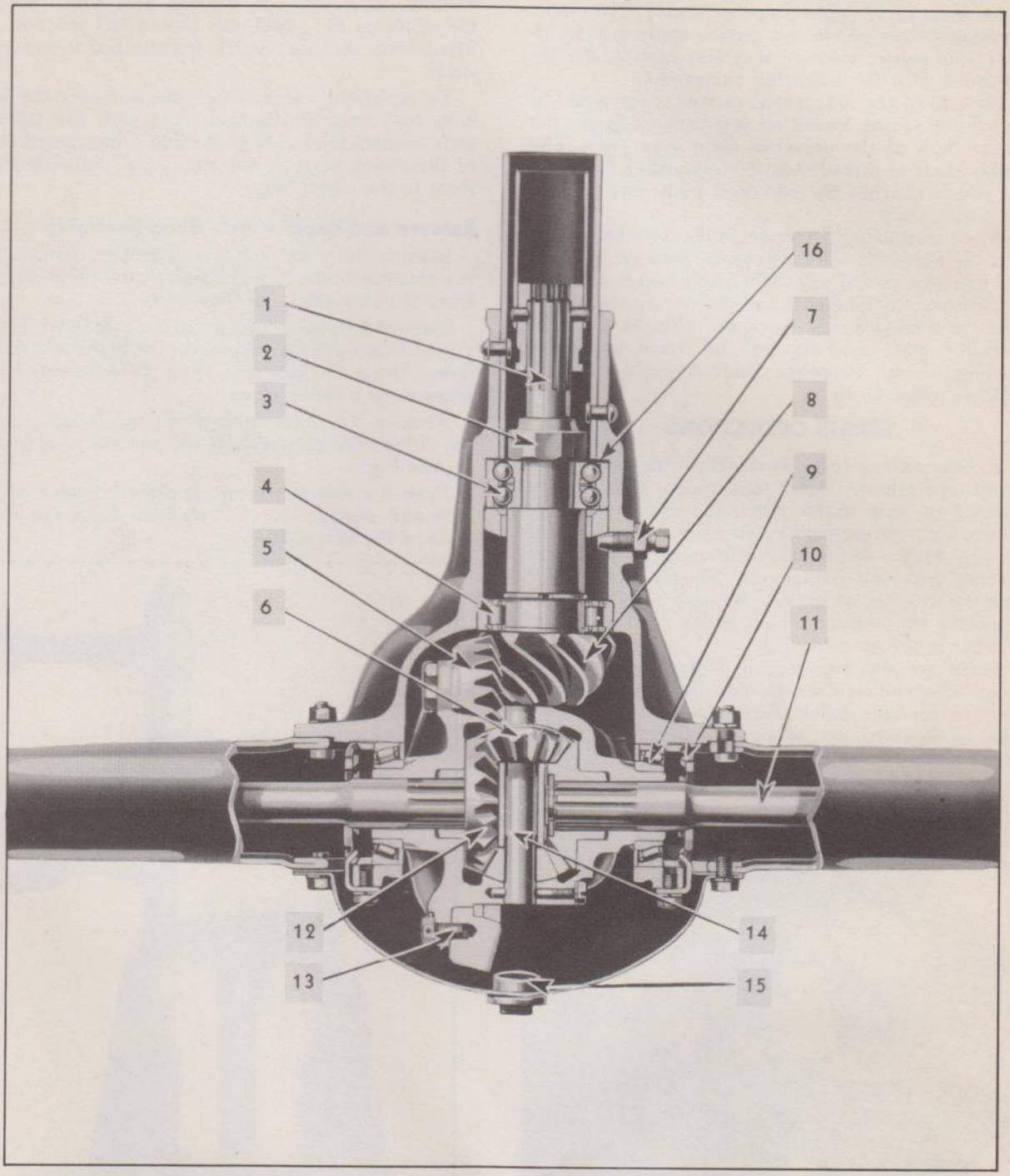


Fig. 1—Rear Axle Assembly ½-Ton Truck

1—Pinion Shaft
2—Pinion Bearing Retaining Nut
3—Front Pinion Bearing
4—Rear Pinion Bearing
5—Ring Gear
6—Differential Pinion Gear
7—Front Pinion Bearing Retaining Screw
8—Drive Pinion
9—Differential Side Bearing
10—Differential Side Bearing Adjusting Nut
11—Axle Shaft
12—Differential Side Gear
13—Ring Gear Cap Screw
14—Differential Pinion Gear Shaft
15—Filler Plug
16—Shims

The ½-ton truck rear axle is of the semi-floating type with Hypoid gears mounted in a one-piece banjo-type housing, Fig. 1.

The ½ and ¾-ton truck rear axles are similar in construction although the ½-ton is a torque tube drive (enclosed propeller shaft), while the ¾-ton is a Hotchkiss drive (open propeller shaft). The repair operations described in this section apply directly to the ½-ton truck; however, they also apply to the ¾-ton truck with the following exceptions.

The end of the differential carrier is machined to receive the spring loaded oil seal which engages the ground hub of the universal joint rear yoke. The pinion shaft is threaded at its forward end for the nut which attaches the universal joint rear yoke to the pinion shaft.

When assembling the pinion to the differential carrier, the universal joint rear yoke must be installed and its retaining nut tightened firmly before attempting to make any ring gear and pinion adjustment.

Instructions covering the repair of the ¾-ton front propeller shaft assembly will be found under the heading, "Front Propeller Shaft Assembly, ¾-Ton Trucks," page 4 - 16.

REPAIR OPERATIONS

In rear axle service work there are minor and major operations. Minor operations such as the removal of axle shafts, the replacement of brake drums, etc., can be performed with the axle under the car. Major operations, such as the replacement of ring gear and pinion, etc., must be performed with the axle out of the car, because it is impossible to obtain the correct pinion depth with the third member in the axle housing.

There are also two very important and essential points which all service men must keep in mind when working on rear axles. First—absolute cleanliness must be observed, and second—factory limits, clearances, and specifications must be maintained.

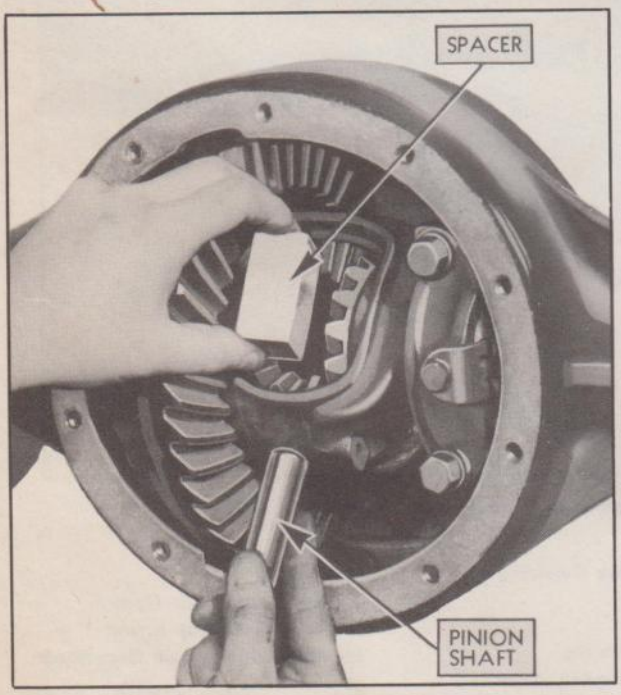


Fig. 2—Removing Axle Shaft Spacer

MINOR SERVICE OPERATIONS

To Remove and Replace Rear Wheel

Remove the hub cap by inserting a screwdriver between the inside edge of the hub cap and the wheel hub flange and turning the screwdriver until the cap becomes loose. Remove the hub nuts which are on the inside of the wheel hub. The wheel can now be lifted from the bolts which are attached to the axle shaft.

To replace the rear wheel, place it over the hub bolts and assemble the hub nuts with the tapered ends towards the inside of the hub. The tapered ends of these nuts must fit into the recesses provided for them in the wheel hub.

Remove and Replace Axle Shaft Assembly

Remove the wheel and tire assembly. Remove the two stamped brake drum retaining nuts (Zipon-type) from the two wheel, or hub, bolts.

Remove the brake drum from the axle shaft flange. Install wheel cylinder clamp on the brake wheel cylinder. Drain the lubricant from the differential and remove the housing cover.

Remove the differential pinion shaft lock screw, the differential pinion shaft and the axle shaft spacer. See Fig. 2.

Push the axle shafts in toward the center of the axle and remove the "C" washers from the inner ends of the axle shafts.

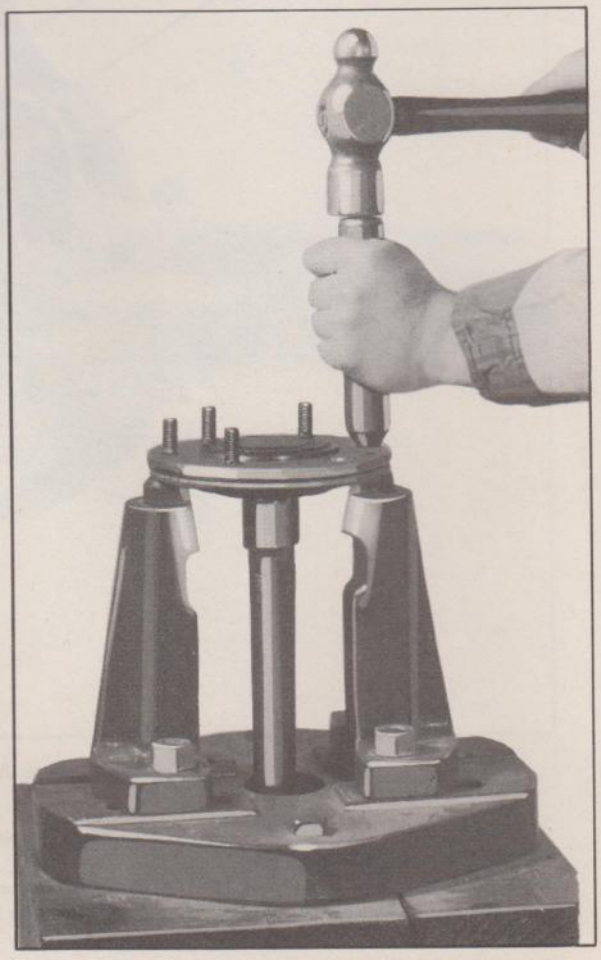


Fig. 3—Use of Peening Tool and Anvil

After this has been done, the axle shafts can be removed from the axle housing.

The wheel hub bolts are special serrated bolts pressed into the holes in the axle shaft flange, thus holding the bolts rigidly in place. These bolts are also used to hold the oil deflector and the gasket to the axle shaft flange.

When installing a new axle shaft, it is necessary to install new bolts, a new oil deflector, and a new gasket. Upon installing new hub bolts, the gasket between the deflector and the flange must be covered with a heavy shellac or paint on both sides to prevent oil leaks. The axle shafts have a hole through the flange which permits excess oil from the axle to drain out of the oil deflector, and keeps it out of the brake drum and brakes. The brake drums and gaskets have an extra hole, the center one of the three that are closest together should be lined up with the notch in the hub flange of the axle shaft. There is an oil pocket in the oil deflector which should also be in line with the notch in the hub.

When the axle shaft flange, the gasket, and the oil deflector are in line as mentioned above, insert the six special bolts and force the heads down to the deflector. The end of the shoulder on the bolts should then be peened into the countersink around the bolt holes in the flange, using the peening tool and anvil, J-554, shown in Fig. 3, thus riveting these parts securely together. It is good practice to turn the peening tool after each blow of the hammer to prevent damage to the tool.

CAUTION—This peening operation is very important from a safety standpoint.

It will be noticed that the axle shafts are of different lengths, the longer one being used on the right-hand side.

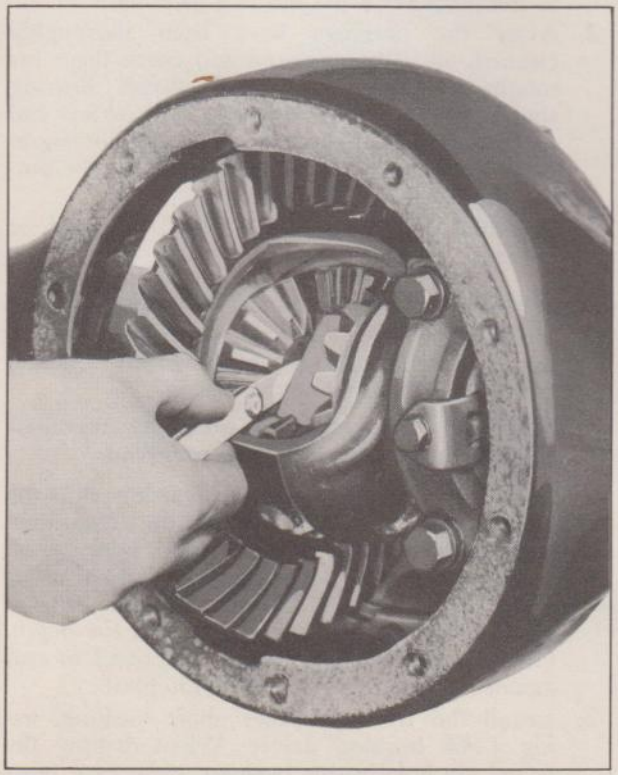


Fig. 4—Checking Clearance Between Axle Shaft and Spacer

Before replacing the axle shafts, examine the leather oil seal on the inside of the axle housing to be sure that it is not worn, damaged or out of place. Slide the axle shaft into place, being careful that the splines on the end of the shaft do not cut the leather oil seal, and that they engage with the splines of the differential gears. Replace the "C" washers on the inner end of the shaft and pry the shaft ends apart carefully (do not scratch or damage inner ends) so that the "C" washers are seated in the counterbore in the differential side gears.

Select the proper axle shaft spacer so that there is from a free fit to .014" clearance between the ends of the axle shafts and the spacer. See Fig. 4.

Axle Shaft Spacers

There are three sizes of axle shaft spacers serviced for the ½ and all ¾-ton truck rear axles. The dimensions of these spacers are:

Narrow—1.1485" Wide Across Ground Surfaces.

Wide
- **1.1575" Wide Across Ground Surfaces.**
- **1.1675" Wide Across Ground Surfaces.**

These three dimensions are obtained with the use of only two axle shaft spacers, the 1.1485" spacer being ground on only two sides, while the larger spacer is ground on all four sides to obtain both the 1.1575" and the 1.1675" dimensions.

After the proper clearance is obtained between the axle shafts and the spacer and it is properly installed in its place, assemble the pinion differential shaft and lock it in place with the special screw, using a lockwasher under its head.

Replace the axle housing cover, using a new cork gasket and fill the differential with the proper hypoid gear lubricant.

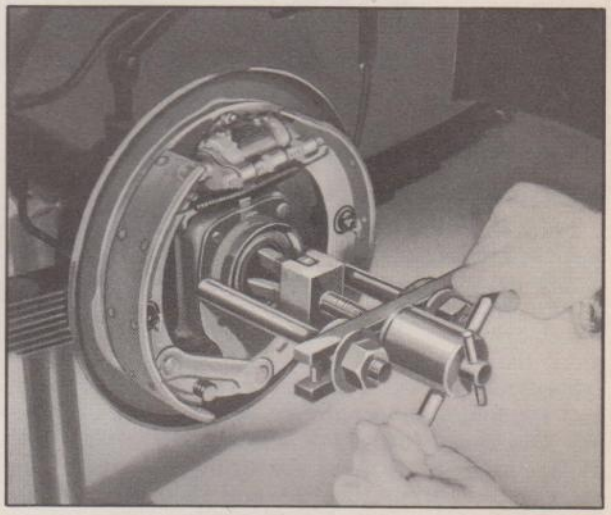


Fig. 5—Axle Shaft Bearing Puller

AXLE SHAFT BEARING

Disassembly

The wheel end of the axle shaft is mounted in a Hyatt roller bearing which is pressed into the axle housing. To remove this bearing, it is necessary to remove the wheels and axle shafts as previously described and insert the special bearing puller, K-344, shown in Fig. 5. This puller should be assembled into the bearing and the axle housing with the jaws

of the puller in a vertical position so as to keep them away from the welding flash on the inside of the axle housing. This tool not only removes the bearing but the bearing retainer on the inside and the leather oil seal on the outside.

Reassembly

To replace a new bearing and leather oil seal in the axle housing, the special driver, K-466-A, shown in Fig. 6, can be used to locate the bearing in its correct position.

With the bearing and inside bearing retainer and the outside leather oil seal assembled to the end of the driver, start the bearing into the axle housing. A few light blows with a hammer on the end of the tool will seat the bearing in its correct position, as well as the retainer and the oil seal. After the tool has been removed, the oil seal should be staked in place with a prick punch.

Assemble the axle shafts and wheels as previously described.

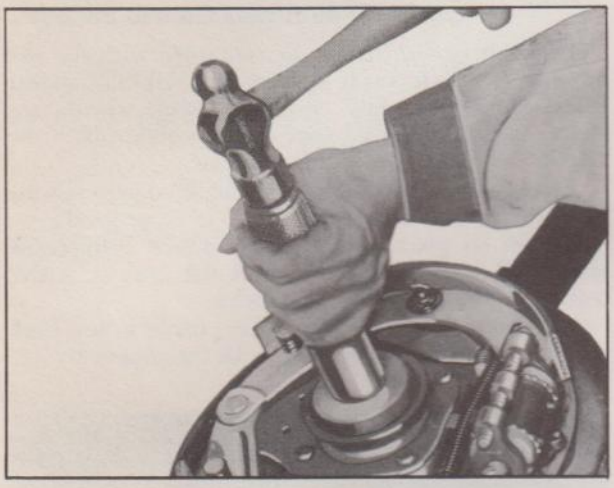


Fig. 6—Axle Shaft Bearing and Retainer Replacer

MAJOR SERVICE OPERATIONS

Removing Rear Axle Assembly

Raise the truck from the floor by the use of jacks and car horses, or by the use of a chain hoist and a lifting device. Remove both rear wheels and brake drums. Install wheel cylinder clamps on the brake wheel cylinders. Disconnect the hand brake cables from the brake pull rods, and remove the brake cables from the cable clamps on the frame. Disconnect the hydraulic connection at the rear axle housing. Disconnect the shock absorber "I" bolts from the spring seats. Remove the spring "U" bolts; disconnect the spring shackles and drop the springs. Slide the axle back to disconnect the torque tube at the front end. The axle is now free and can be moved to the axle stand.

During the disassembly operations, all adjustments should be closely checked. This inspection will be of material assistance in making the necessary repairs to insure a satisfactory job.

1. Check the clearance between the spacer and the end of the axle shafts.
2. Check ring gear and pinion back lash.
3. Check pinion depth in ring gear.
4. Check for ring gear being loose on the differential case.
5. Check and make sure the propeller shaft and pinion assembly rolls free in its bearings.
6. Check for looseness at the front propeller shaft bushing.

The axle shafts are removed as previously described and the third member is removed by the removal of the nuts which hold it to the axle housing. The differential assembly may be removed by taking out the two adjusting nut locks, the four differential carrier cap screws and removing the bearing caps and adjusting nuts.

The pinion and propeller shaft assembly can then be removed from the third member by removing the three tapered bearing retaining screws on the side of the carrier and letting it drop so that the spline end of the propeller shaft will strike on a wooden block or wooden floor and the pinion shaft will slide out. Remove the shims from the inside of the propeller shaft housing.

After the axle has been disassembled, all of the parts removed should be washed in cleaning solvent to insure absolute cleanliness.

Propeller Shaft Housing—½-Ton Truck

It is good practice when the propeller shaft is being removed from the propeller shaft housing, to check to see that there is not too much clearance between the propeller shaft and its bushing. If this clearance exceeds .010", the bushing should be replaced.

Propeller Shaft and Pinion Assembly

1. Inspect the splines for excessive wear or looseness in the universal joint; also inspect the shaft at the propeller shaft bushing location.
2. After the bearings have been thoroughly cleaned, oil with engine oil and check them for roughness. The double row thrust bearing should be checked for end play, because any end play in this bearing will allow the pinion to work back and forth, thereby changing the pinion depth in the ring gear.
3. Examine the pinion for cracked, chipped or scored teeth.

Propeller Shaft Bushing and Oil Seal Replacement

1. Drill out the dowel pins which retain the bushings and drive out both bushings and oil seal from the pinion end of the housing.

   NOTE—A new oil seal must be installed whenever the bushings are removed.

2. Start a new oil seal into the housing with the free side of the leather towards the front, then install a new rear bushing, driving both the oil seal and bushing firmly against their seat, using J-968 bushing driver. Drill the dowel hole in the bushing, being careful to control the depth. Coat the dowel with sealing compound to seal against leakage. Peen the dowel in place.
3. Install the front propeller shaft bushing, using J-968 bushing driver. When drilling the dowel pin hole in this bushing, great care must be exercised not to break through the wall of

the bushing. Due to the thin wall of this bushing, an arbor of the right size or a universal joint rear yoke should be used to prevent distortion while peening the dowel pin.

4. Any burrs that may have been set up during the peening operation should be dressed down with a fine cut mill file.

Propeller Shaft and Pinion Disassembly

The following covers the operations necessary when replacing the propeller shaft, pinion or the pinion bearings:

1. To disassemble the pinion from the propeller shaft, first drill the end of the rivet to clear the countersink into which it is upset, being careful to properly center the rivet with a center punch. Then drive out the rivet.
2. Loosen the pinion bearing lock nut and then disassemble the pinion from the propeller shaft.
3. Remove the front pinion bearing lock nut and press the bearing from the pinion, using J-996 pinion bearing remover.
4. Remove the rear pinion bearing lock ring and remove the bearing.

Reassembly

1. Install the rear Hyatt roller pinion bearing on the pinion shaft and install the lock ring in its groove in the shaft. Then thread the pinion front bearing oil retainer over the shaft with the bevel of the large diameter of the retainer toward the pinion.
2. Install the lock sleeve with its beveled side towards the pinion. Press the front (double row) bearing on the pinion shaft and install the bearing lock nut.

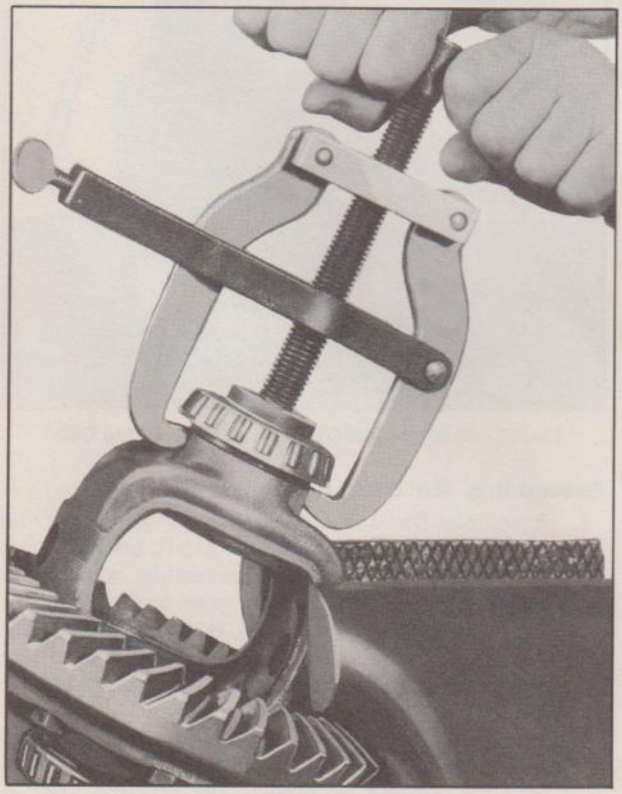


Fig. 7—Removing Differential Bearings

3. The pinion assembly may now be assembled to the propeller shaft by pressing the splined end into the coupling on the end of the propeller shaft so that the rivet hole in the pinion shaft lines up with the hole in the propeller shaft. Insert a new rivet in this hole and rivet over both ends.
4. Tighten the bearing lock nut and lock it in the milled slot in the pinion shaft.

Front Propeller Shaft—¾-Ton Truck

Instructions covering the repair of the ¾-ton front propeller shaft will be found on page 4 - 17 in this section.

Differential Assembly

1. Examine both differential side gear bearing surfaces in the differential case; also the thrust surfaces for the differential pinion gears.
2. Check both differential side bearings for roughness after they have been thoroughly cleaned and oiled.
3. Check each ring gear bolt to make sure they are all tight.
4. Inspect the differential side gears for scored hubs or thrust surfaces. Examine the internal splines and check their fit on an axle shaft.
5. Inspect the thrust surfaces on the differential pinion gears and check their fit on the pinion shaft.

Any worn or damaged parts should be replaced.

Fig. 8—Replacing Differential Bearings

Differential Bearing Replacement

The differential side bearings are a press fit on the hubs on each side of the differential case. These bearings must be removed and replaced as follows:

1. The legs of differential bearing puller, TR-278-R, should be fitted into the two notches in the case and the clamp screw tightened. Turning the puller screw will remove the bearing without damage to either the bearings or the case, Fig. 7.
2. After the bearings have been removed, they should be thoroughly cleaned, oiled and then checked for roughness.
3. To replace the differential side bearings, place them on the hubs with the thick side of the inner race towards the case and drive them in place with J-994 differential side bearing replacer, Fig. 8.

Ring Gear Replacement

1. Remove the bolts. The ring gear may then be tapped off the case with a soft-faced hammer.
2. Place the differential case in the "V" blocks of the checking fixture U-4 and indicate the run-out of both the ring gear pilot and the case flange, Fig. 9. Neither of these run-outs should exceed .001".
3. When replacing the ring gear, it is good practice to use five guide pins made by cutting the heads from ⅜"—24 cap screws about 1½" long. Slots should be cut in the heads of these guide pins so that they may be easily removed with a screwdriver. Install these guide pins in alternate bolt holes in the ring gear, Fig. 10, and slip the ring gear over the pilot diameter of the case, making sure that the back face of the ring gear and the face of the case are free from dirt and burrs. Install every other ring gear bolt and draw them up evenly and snugly so that the ring gear face is flush with the face of the case. Remove the guide pins and install the remaining bolts.

   Tighten all ring gear bolts.

Fig. 9—Checking Run-Out of Differential Case

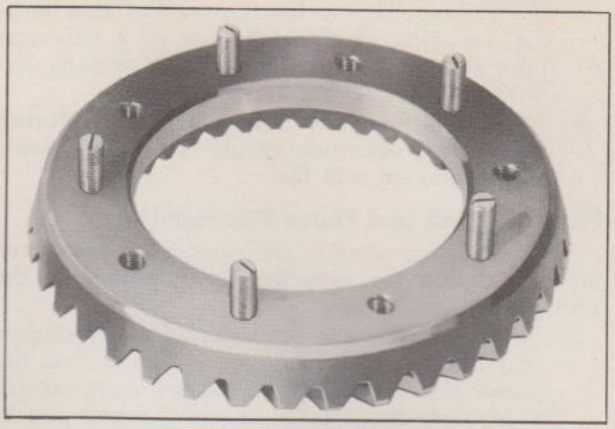


Fig. 10—Use of Guide Pins in Ring Gear

NOTE—New lockwashers should be used under the head of each bolt.

With the assembly mounted in "V" blocks, check the run-out of the back face of the ring gear with a dial indicator, Fig. 11. This run-out must not exceed .004".

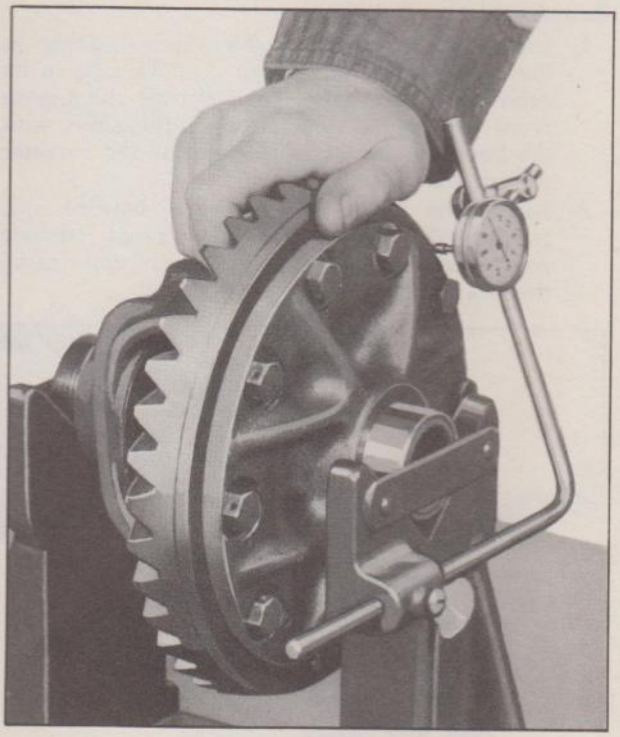


Fig. 11—Checking Run-Out of Back Face of Ring Gear

Assembling the Rear Axle

1. Assemble the same thickness of shims in the counterbore of the propeller shaft housing that were removed when the assembly was taken down (if the original ring gear and pinion are to be used), making sure that the shims are flat in the counterbore and are not cocked. The total thickness of the shims will be found to be from .030" to .036" and usually .033". Shims are serviced in thicknesses of .012", .015", .018", and .021" so that a combination of shims may be selected to replace the original ones if they are damaged.

NOTE—Whenever a new ring gear and pinion is installed, one .015" shim and one .018" shim should be used as this is the standard setup.

2. Assemble the propeller shaft assembly, driving it down until the bearings are seated in the housing. Drive by using a drift in the 7/8" hole in the pinion, and NOT on the pinion teeth.
3. Check through the bearing lock screw holes to make sure that the lock sleeve is in the correct position up against the back of the front pinion bearing. Install the three tapered lock screws and draw them down evenly and tightly. Tighten the lock screw lock nuts.

Ring Gear and Pinion Adjustment

1. Install the differential case assembly in the carrier and then install the adjusting nuts, taking care to slide these nuts alongside the bearings so that the threads on the nuts fit into the threads of the differential carrier. Install the bearing caps, making sure that the marks on the caps line up with the marks on the carrier. Tighten the cap screws until the lockwashers just flatten out.

NOTE—This adjustment should be made only with the third member assembly out of the rear axle housing.

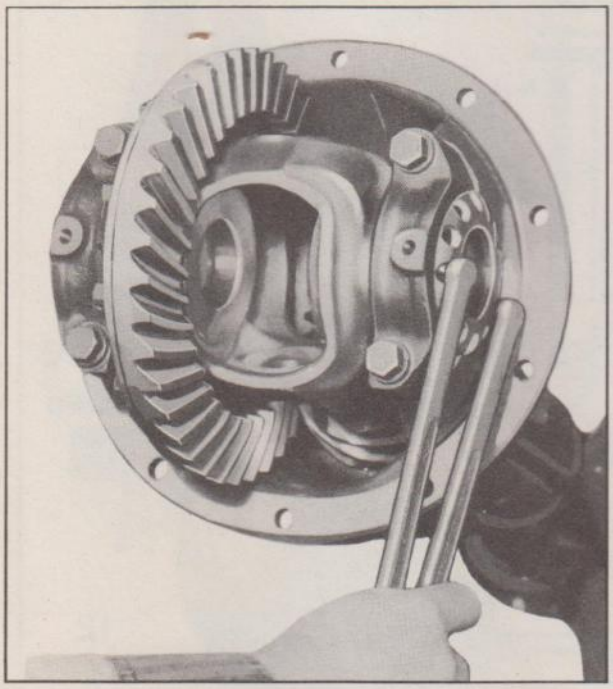


Fig. 12—Adjusting Ring Gear and Pinion Back Lash

2. Loosen the right-hand adjusting nut and tighten the left-hand adjusting nut, using differential adjusting wrench J-972, while at the same time turning the ring gear. Continue tightening the left-hand nut until all lash is removed, then back off the left-hand nut one notch.
3. Tighten the right-hand adjusting nut snugly (this position may easily be determined as the nut comes to a definite stop). Then tighten the right-hand nut from a minimum of one to a maximum of two notches more, to a locking position, Fig. 12.
4. Mount a dial gauge on the carrier and check the back lash between the ring gear and pinion, Fig. 13; this should be from .005" to .007".
   If the back lash is more than the above, loosen the right-hand adjusting nut one notch and tighten the left-hand adjusting nut one notch. If the back lash is less than above, loosen the left-hand adjusting nut one notch and tighten the right-hand nut one notch.
5. Tighten the bearing cap bolts securely, then recheck the back lash. Install both adjusting nut locks.
6. Assemble the third member assembly to the axle housing, using a new gasket. Lubricate the hubs of the differential side gears with hypoid gear lubricant and install them in the differential case.
7. Install the axle shafts, making sure that the longer shaft is used on the right-hand side, and install the "C" shaped axle shaft locks. Spread the ends of the axle shafts to make sure that the shafts, locks and differential side gears are in positive contact. Roll the two differential pinions into place and install the axle shaft spacer, pinion gear shaft and lock screw. Check the clearance between the end of the axle shaft and spacer—this should be from a free fit to .014". See Fig. 4.
8. Install the inspection cover, using a new cork gasket and fill the differential with 3½ pints of the proper hypoid lubricant.

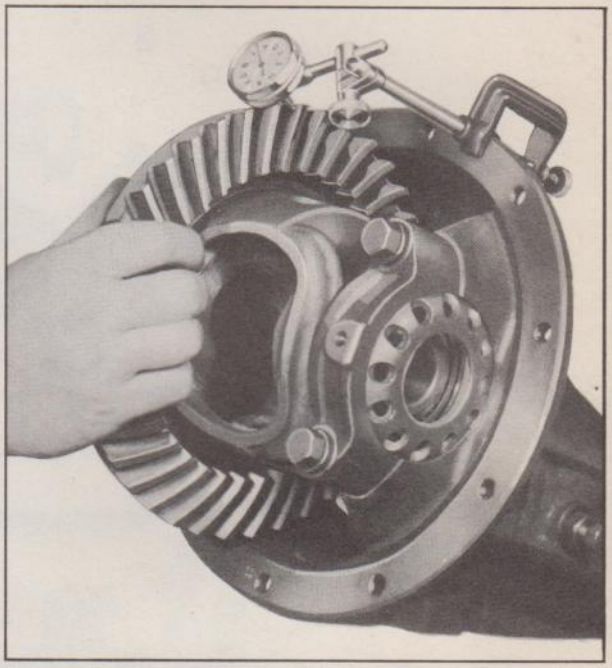


Fig. 13—Checking Ring Gear and Pinion Back Lash

To Replace the Rear Axle Assembly

Reverse the operation shown under the removal of the rear axle. Care should be taken to see that

all cotter pins are assembled and securely bent over. The "U" bolts holding the springs to the spring seats must be drawn up securely.

When connecting the brake cables, make sure that all of the play is out of the cables before installing the clevis pin.

After replacement of the rear axle, it will be necessary to bleed the brake lines at ALL FOUR WHEELS, as described in the "Brake Section" of this Manual.

Lubricate the universal joint through the battery ground cable bolt hole at the rear of transmission case. This provides initial lubrication for the universal joint and propeller shaft bushings.

REAR AXLE ASSEMBLY
1½-TON TRUCKS

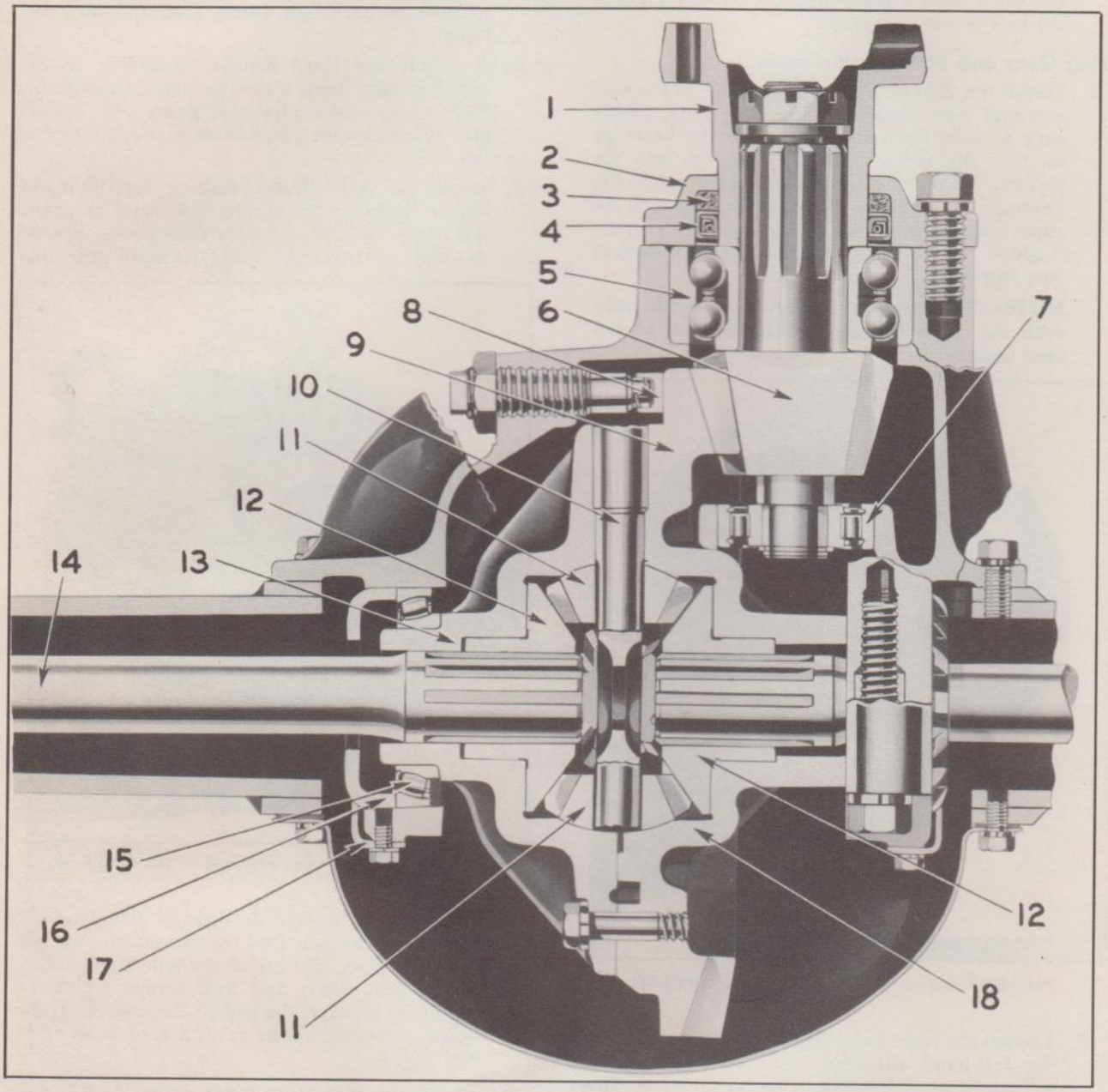


Fig. 14—1½-Ton Truck Rear Axle

1—Universal Joint Yoke
2—Pinion Bearing Retainer and Oil Seal
3—Oil Seal Packing
4—Oil Seal
5—Front Pinion Bearing
6—Drive Pinion
7—Rear Pinion Bearing
8—Ring Gear Thrust Pad
9—Ring Gear
10—Differential Spider
11—Differential Pinion (Spider) Gear
12—Differential Side Gear
13—Differential Case—Left Half
14—Axle Shaft
15—Differential Bearing
16—Differential Bearing Adjusting Nut
17—Adjusting Nut Lock
18—Differential Case—Right Half

Construction

The full-floating type rear axle used on 1½-ton trucks is so constructed that the axle shafts can be removed without removing the truck load or jacking up the rear axle. This axle is equipped with a hypoid ring gear and pinion, Fig. 14.

The differential bearing caps are piloted to the carrier by sleeve dowels, preventing any possibility of the bearing caps shifting.

The differential case is a two-piece case with the ring gear piloted to the right side. The case halves and the ring gear are bolted together with ½" bolts. This permits ring gear replacement without changing the differential case. The differential bearings are of Hyatt barrel roller type.

The front pinion bearing is a large double row ball bearing, and the rear pinion bearing is a large Hyatt roller bearing. A spring-loaded rawhide oil seal is used at the rear of the universal joint yoke.

The axle shaft to wheel hub gasket is made of soft sheet aluminum to reduce the load on the bolts. A lock plate is used to lock these bolts.

Identification of Rear Axles

The 6.16 to 1 rear axle ratio may be identified by the serial number stamped on the top right-hand side of the housing being prefixed by the letters "BR" or "BS."

The 5.43 to 1 ratio rear axle may be identified by the letters "BT" prefixed to the serial number.

MINOR SERVICE OPERATIONS

Axle Shaft Removal

1. With a cold chisel and hammer, bend the lugs of the lock plate away from the bolt heads.
2. Remove the eight ½" cap screws and lock plate.
3. Install two 7/16"—14 cap screws in the threaded holes provided in the axle shaft flange. Turning these cap screws alternately, the axle shaft may easily be removed. Remove the axle shaft and aluminum gasket, Fig. 15.

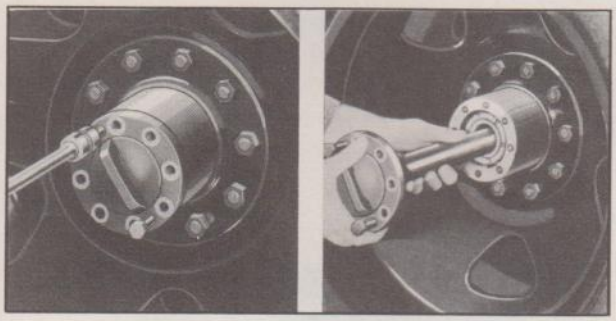


Fig. 15—Loosening and Removing Axle Shaft

Axle Shaft Replacement

Place a new aluminum axle shaft flange gasket on the axle shaft and push the shaft into the housing. Use a new lock plate at the axle shaft cap screws and insert the eight cap screws in the axle shaft flange, tightening them alternately and make sure they are all pulled up tight. Then bend the tangs of the lock plate against the heads of the cap screws.

Removal of Rear Wheel Bearings

1. Jack up the rear axle and remove the wheel and axle shaft.

   NOTE—Removal of the wheel is important; it prevents damage to the oil seal and permits more accurate adjustment of the bearings.

2. Raise the lip of the special lock from the notch in the lock nut. Remove lock nut with special wrench J-870, and remove the lock, inner adjusting nut, and thrust washer.

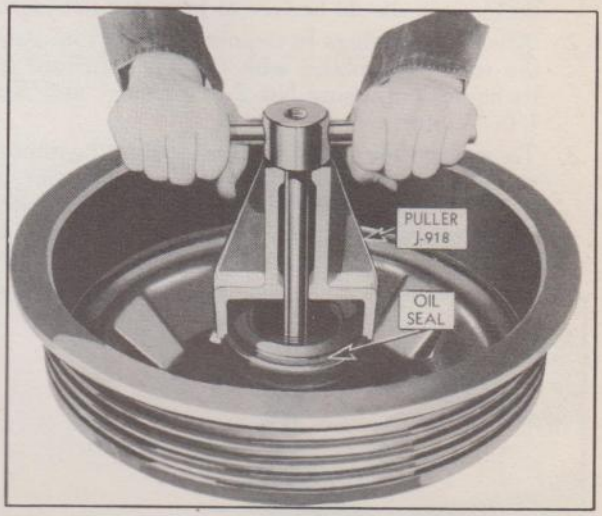


Fig. 16—Removing Inner Bearing and Oil Seal

3. Remove the hub and drum assembly.
4. Install brake wheel cylinder clamp to prevent the brake fluid from leaking should the brake pedal be accidentally depressed.
5. To remove the inner bearing and oil seal, use puller J-918-A.

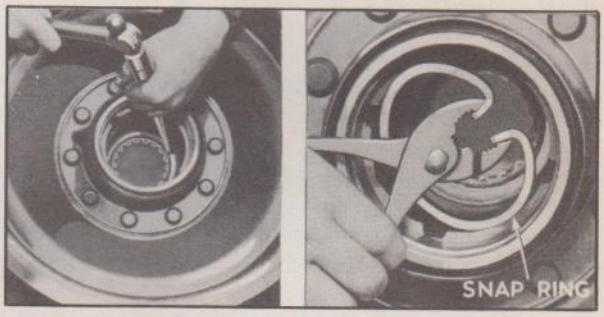


Fig. 17—Removing Outer Bearing Snap Ring

The puller is installed by tilting the plate with the chain attached, so that it may be slipped through the bearing and engage the outer race of the bearing. The plate is then held in this position by the chain while threading the puller shaft into the tapped hole. The puller body is then located against the housing and the bearing assembly and oil seal are removed by turning the puller handle, Fig. 16.

6. To remove the outer bearing, first tap the outer race to relieve the tension at the snap ring; then remove the snap ring on the inside of the hub, Fig. 17. Remove the bearing by driving on the

outer race of the bearing by using a long 1/8" punch through the cap screw holes in the end of the hub. This will also bring out the inner race and roller assembly.

NOTE—Care must be taken to engage the edge of the race with the punch and not damage the bearing seat in the housing; the race must also be driven out evenly.

Replacement of Rear Wheel Bearings

1. Check the fit of the inner races on housing; these races should be free to turn, but not loose.
2. Wash the bearings in cleaning solvent and pack the roller assemblies with Marfak lubricant or its equivalent, using No. 2 in Summer and No. 1 in Winter.
3. To replace the outer bearing, place the inner-race-and-roller assembly and the outer race in the wheel hub with the thin edge of the outer race downward. Use outer wheel bearing replacer, J-872-1, to press the bearing in the hub.

Fig. 18—Driving Outer Race into Contact with Snap Ring

CAUTION—Press the race only far enough to install the snap ring; this operation should be done in an arbor press.

Install the snap ring in the groove on the inside of the hub. Use special driver J-872-3 through the cap screw holes in the end of the hub to force the outer race back in positive contact with the snap ring, Fig. 18.

4. To replace the inner bearing, place outer race of the bearing in the wheel hub with the wide side of the race down. Use special driver J-872-4 to press the race against its seat. Install the inner race and roller assembly. Install the oil seal, using the wheel bearing oil seal replacer J-872-2, with an arbor press. Lock the seal in place by prick punching at three equally spaced places.
5. Install the wheel hub and drum assembly, turning the hub to properly line up the bearings.
6. Install the thrust washer and adjusting nut, Fig. 19.

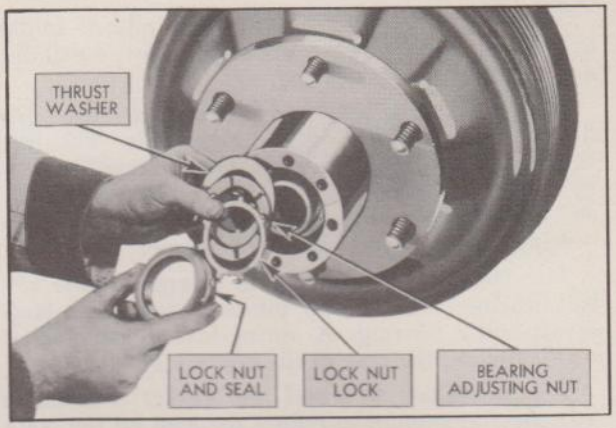


Fig. 19—Installing Thrust Washer, Adjusting Nut, Lock Nut and Lock Nut Lock

Adjustment of Rear Wheel Bearings

1. Using special wrench J-870, tighten the adjusting nut tight, then back it off 45 degrees. Turn the wheel hub by hand to make sure the hub turns freely.
2. Install the adjusting nut lock and check the alignment of the tangs with the slots in the nut.
3. Rotate the hub by hand, grasping the hub at the wheel bolts, to see that the bearings are properly seated and that the hub turns freely.
4. Bend the tang on the lock down into the notch of the adjusting nut. Install the outer lock nut and pull up tight to prevent any loosening of the adjusting nut. Bend the tang of the lock into the notch of the lock nut.
5. Install the axle shaft, and a new aluminum gasket.
6. Install the lock plate.
7. Install the axle shaft bolts and tighten securely.

Replacement of Oil Slinger

The location of the oil slinger requires that it be driven on the rear axle housing. If for any reason

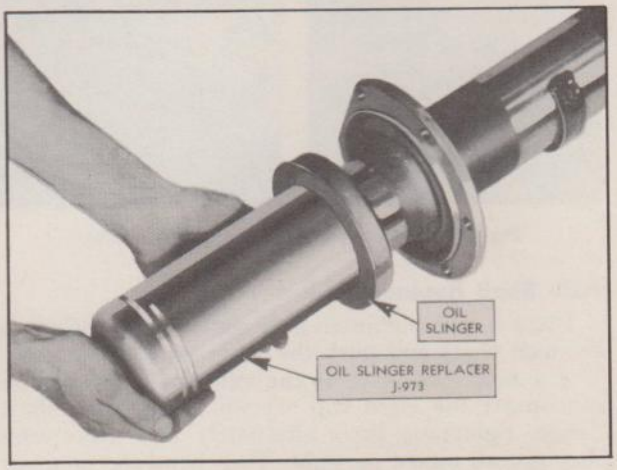


Fig. 20—Oil Slinger Replacer

the oil slinger is removed, it must be replaced with a new one.

A special tool is necessary for this purpose because the slinger must be located with relation to the bearings. The oil slinger replacer J-973 is designed so it will pilot on the housing and drive the slinger into proper position so it will mate with the oil slinger in the wheel hub, Fig. 20.

MAJOR SERVICE OPERATIONS

Differential Carrier Removal

To remove the differential carrier or third member from the truck, proceed as follows:

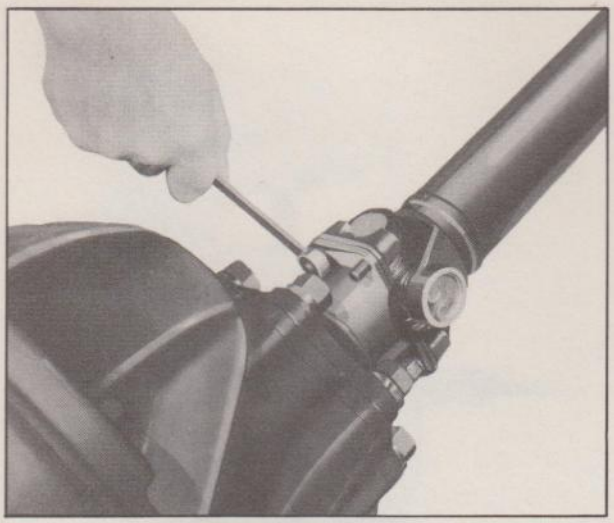


Fig. 21—Removing Rear Universal Joint "U" Bolts

1. Drain lubricant from differential, remove differential cover and axle shafts.
2. Split the rear universal joint by removing the two trunnion bearing "U" bolts from the rear yoke as shown in Fig. 21. The bearings can be left on the trunnion and held in place with tape. This will prevent dirt getting into the bearings as well as saving considerable time in reassembly.

   Sufficient clearance can be obtained for dropping the propeller shaft by sliding the entire assembly forward on the splines of the propeller shaft.
3. Remove the bolts and lockwashers which retain the differential carrier assembly to the axle housing and remove the differential carrier.

Disassembly

1. Mount the assembly in a bench vise and remove the ring gear thrust pad. Remove differential adjusting nut locks. Remove the bearing cap bolts and lockwashers. The bearing caps may now be removed. Then remove the differential case and ring gear assembly from the carrier.
2. Remove the bolts from the pinion bearing retainer and oil seal, remove the pinion and shaft assembly from the carrier.

Pinion Disassembly

1. Clamp the rear yoke of the universal joint in a bench vise and remove the cotter pin, nut and washer from the end of the pinion shaft.

   The universal joint as well as the bearing retainer and oil seal may then be removed from the pinion shaft.

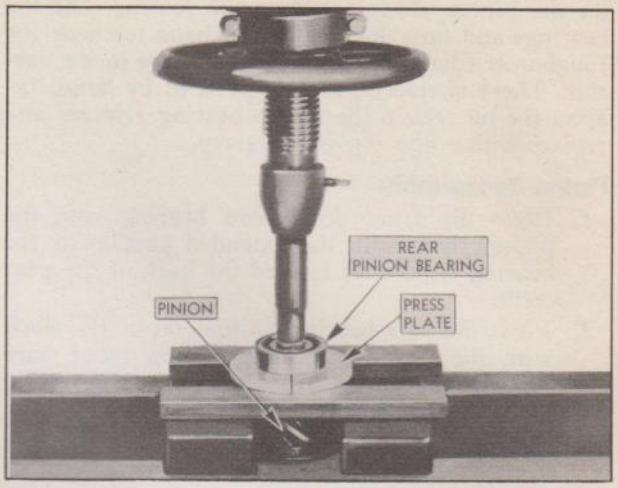


Fig. 22—Removing Rear Pinion Bearing

2. To remove the rear pinion bearing, take off the lock ring and then, using a special press plate, J-1453, press the pinion and shaft out of the bearing, Fig. 22.

   NOTE—The raised portion of the press plate must be against the inner race otherwise the bearing will be damaged.
3. Install the front pinion bearing remover J-1439 for 6-tooth pinions, J-1440 for 7-tooth pinions, over the pinion teeth and against the inner race of the double row bearing. Then press the bearing off the pinion shaft, Fig. 23.

Inspection

Wash all parts in cleaning solvent. Inspect the pinion for worn or chipped teeth. Inspect the splines

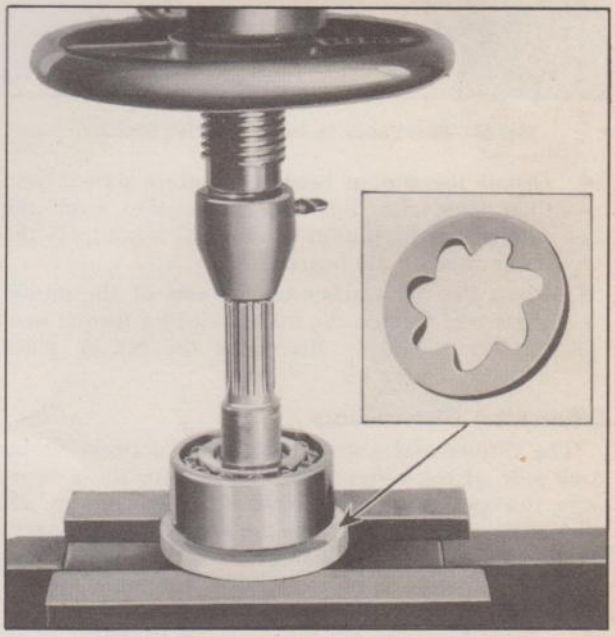


Fig. 23—Removing Front Pinion Bearing

on the pinion shaft for wear or scoring. Oil the bearings and turn them slowly by hand to check for roughness. Check the fit of the bearings in the carrier. These should be a close push fit by hand. Inspect the oil seal in the pinion bearing retainer and replace with a new one if necessary.

Pinion Reassembly

1. Press the front double-row bearing onto the pinion shaft with the extended portion of the bearing inner race toward the back of the gear teeth.
2. Press the rear bearing on the end of the shaft with the chamfered side of the inner race towards the pinion. Install the lock ring, using the lock ring installer J-1364, Fig. 24.
3. Slide the pinion bearing retainer and oil seal over the universal joint yoke. If replacement of the oil seal is necessary, install the felt packing toward the bottom of the recess and then the oil seal with the open end of the leather toward the pinion bearing. The oil seal should be pressed down against the felt packing, see Fig. 14.

NOTE—Soak a new leather oil seal in light engine oil for at least one hour before installing.

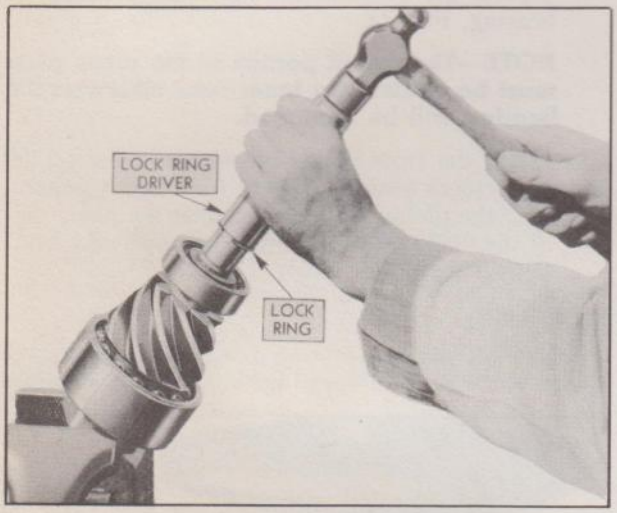


Fig. 24—Rear Pinion Bearing Lock Ring Installer

4. Install the pinion bearing retainer gasket and then slide the universal joint yoke over the splines on the pinion shaft until it contacts the inner race of the bearing.
5. Place the flat washer on the end of the pinion shaft and tighten the nut down to a torque load of 160 to 280 ft. lbs. Lock the nut in place with the cotter pin.

Differential Disassembly

The differential side bearings are a press fit on each side of the differential. To remove these bearings, the special puller TR-278-R, shown in Fig. 25, should be assembled to the case with the two fingers of the puller in the two notches of the case. This allows the fingers to pull in against the inner race of the bearing which will prevent damage to the bearing. These bearings should never be removed in an arbor press because removing them in this way will damage the bearings so that they will be unusable.

After the bearings have been removed, they should be washed in cleaning solvent and blown out with clean air. They should then be oiled and rotated by hand, to check for roughness.

To disassemble the differential, check and make sure the case halves are marked (Fig. 26) so it may be assembled in the same position. Remove the twelve ½" bolts from the case. Lift off the case cover and remove the differential gears and pinions.

The ring gear may be removed from the right-hand side of the case by tapping it with a soft-faced hammer.

Fig. 25—Differential Bearing Puller

Inspection

Wash all parts thoroughly in cleaning solvent. Check all gears for chipped, cracked or scored teeth. Inspect the differential side gear and pinion thrust surfaces in the housing halves for wear or score marks. Check the fit of the side gear hubs in the differential case halves. The fit of the pinions should be checked on the spider. The differential side bearings should be carefully inspected for worn, checked, scored or broken rollers. They should then be oiled and rotated by hand to check for roughness.

Any damaged or worn parts should be replaced.

NOTE—If any one of the differential gears are damaged or scored all should be replaced.

Reassembly

When reassembling the differential, the flanges of the case, ring gear pilot and the back of the ring gear must be clean and free from burrs.

When replacing the ring gear, it is good practice to use two guide pins made from differential and ring gear screw, part No. 3652253. Their ends should be slightly tapered and screwdriver slots cut so they may be easily removed, Fig. 27.

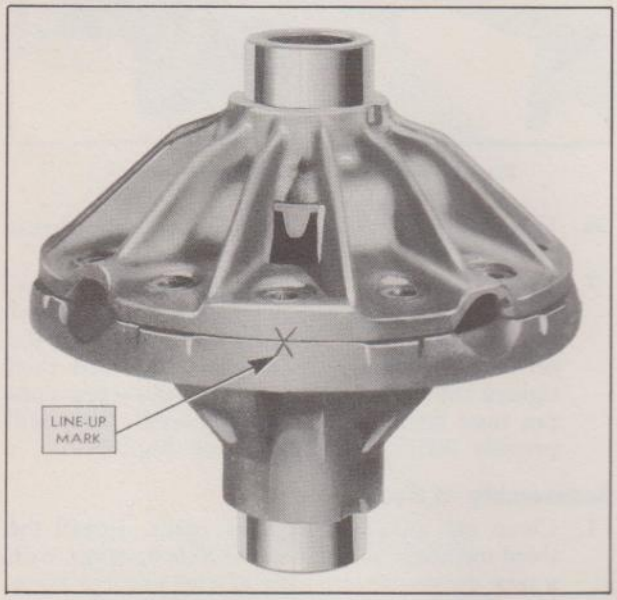


Fig. 26—Differential Case Marks

1. Lubricate the differential side gears and pinions and install them in the left half of the differential case.
2. Assemble the right side of the case to the left side, being sure to line up the marks on the case halves, Fig. 26.

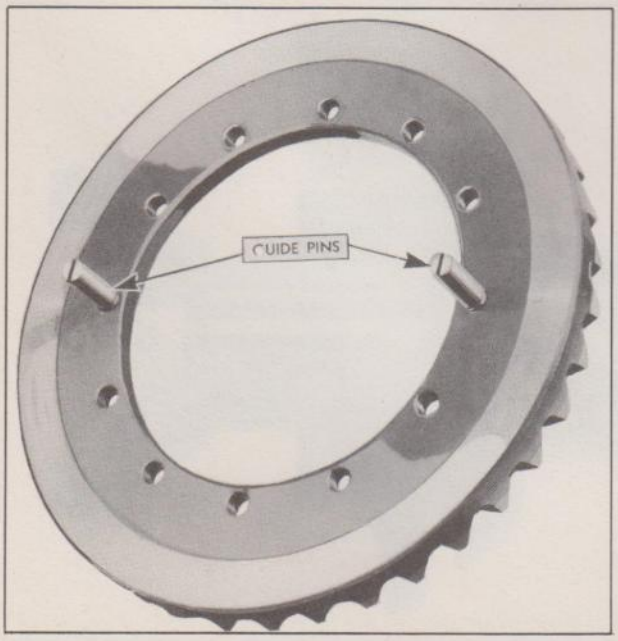


Fig. 27—Guide Pins in Ring Gear

3. Install the guide pins. Slip the ring gear over the pilot diameter of the right-hand half of the differential case.
4. Install ten differential to ring gear cap screws and lockwashers, tightening them evenly one turn at a time until the ring gear face is flush with the case flange. Remove the guide pins and install the two remaining bolts and lockwashers. Then pull up all twelve bolts *tight*.
5. Assemble the differential side bearings to the case, using the special driver, J-1488.

   NOTE—The wide side of the inner race must be towards the case.

Differential Carrier Reassembly

1. Place the differential carrier in a vise and install the bearing cap dowels in the carrier or in the bearing caps.
2. Assemble pinion assembly to the carrier using new gaskets and tighten the pinion bearing retainer bolts securely.
3. Install the differential assembly in the carrier. Install the bearing caps, making sure the marks on the caps line up with marks in the carrier. Install the cap screws and tighten them until the lockwashers just flatten out. Screw the adjusting nuts into the carrier, making sure they turn freely. Tighten them snugly to straighten up bearing outer races.

Fig. 28—Adjusting Ring Gear and Pinion Back Lash

4. Back off the right-hand adjusting nut and tighten left-hand adjusting nut, using wrench J-972, just to a point where all lash between the ring gear and pinion is removed. Then back off the left-hand nut approximately two notches and to locking position. Tighten right-hand nut to solid

position. Back off right-hand nut free of bearing, then tighten up right-hand nut until all play in bearing is removed and then one to two notches more to a locking position, Fig. 28.

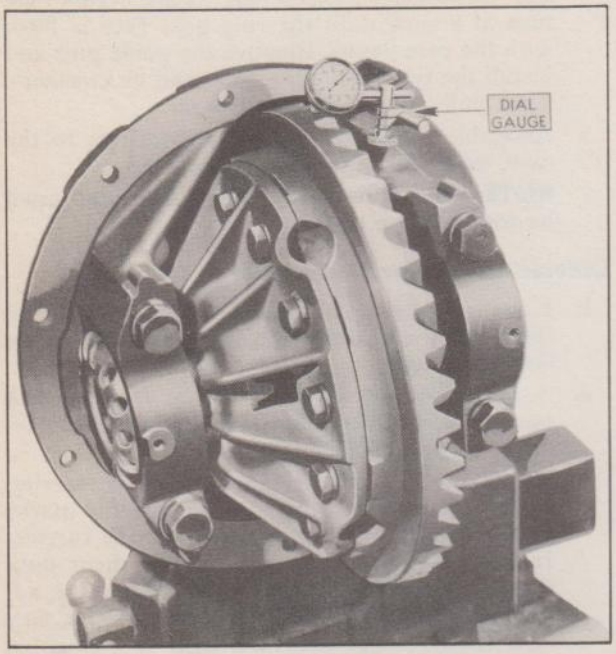


Fig. 29—Checking Ring Gear and Pinion Back Lash

5. Check ring gear and pinion back lash. This should be from .005″-.008″. If it is more than .008″, loosen the right-hand adjusting nut one notch and tighten left-hand nut one notch. If less than .005″, loosen the left-hand nut one notch and tighten the right-hand nut one notch. Tighten down the cap screws and recheck the ring gear and pinion back lash with a dial gauge as shown in Fig. 29. Assemble and tighten the adjusting nut locks.

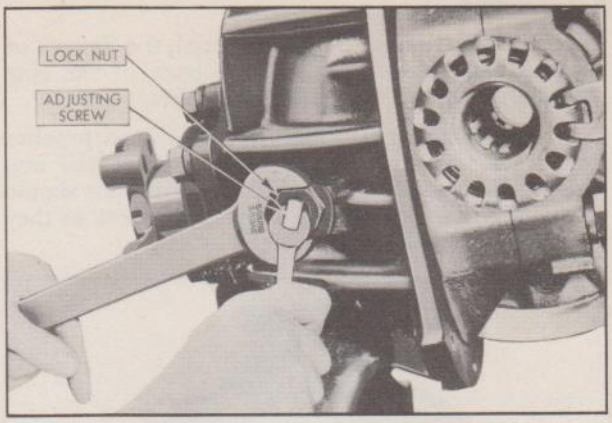


Fig. 30—Ring Gear Thrust Pad Adjustment

6. Examine the bronze tip of the ring gear thrust pad and, if worn, install a new one.
7. Install the thrust pad and tighten the screw until the bronze tip lightly engages the back of the ring gear while rotating gear. Back off the screw one-twelfth (1/12) of a turn and then tighten the lock nut, making sure the screw does not turn during the locking process. This will provide .005″ to .007″ clearance, Fig. 30.

Reassembly of Rear Axle

1. Clean out axle housing and cover. Install the third member assembly in the axle housing, with a new gasket between the carrier and the housing. Install the cap screws and tighten them securely.
2. Assemble the axle shafts, using a new aluminum gasket between the axle shaft flange and wheel hub. Install the bolts through a new locking plate and pull them down tight. Lock the bolts by bending the tangs on the locking plate firmly against each bolt head.
3. Assemble the rear universal joint.

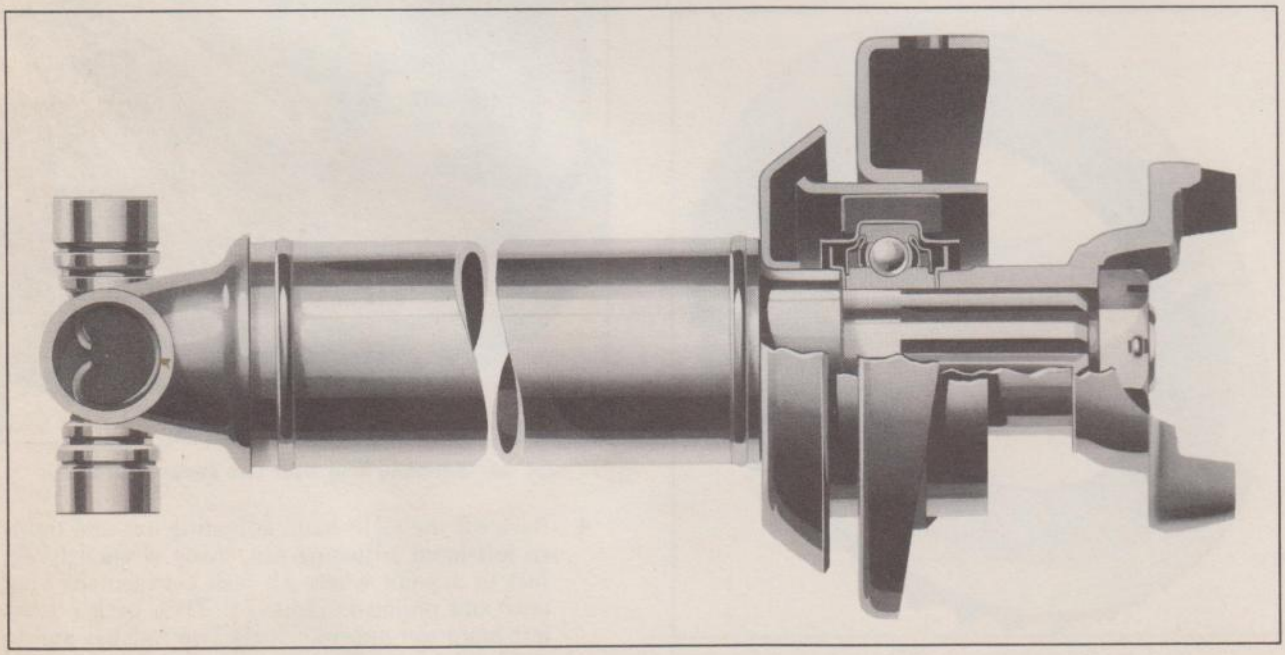


Fig. 31—1½ Ton Front Propeller Shaft

4. Replace the axle housing cover and gasket.
5. Fill the rear axle with eleven (11) pints of lubricant of the type recommended in the Lubrication Section.

PROPELLER SHAFTS

1½ Ton Trucks

The drive line from the transmission to the rear axle comprises two tubular propeller shafts and three needle bearing universal joints. On the front propeller shaft the rear yoke of the front universal joint is an integral part of the propeller shaft. The rear end of this shaft is machined to receive the support bearing, and it is also splined and threaded to mount the front yoke of the intermediate universal joint, Fig. 31.

The support bearing is mounted in the support bracket by means of a rubber cushion which fits over the outer race of the bearing and inside a sleeve in the support bracket. This bearing is of the permanently lubricated and sealed type.

On the rear propeller shaft the front yoke of the rear universal joint is an integral part of the propeller shaft. The front end of this shaft is splined to fit the splines in the rear yoke of the intermediate universal joint.

UNIVERSAL JOINTS

All three universal joints are of the needle bearing type. The front and rear yoke of each universal is machined to receive the trunnion bearings. The bearings are anchored to the front yokes of the front and intermediate universals and the rear yoke of the rear universal by "U" clamps. The bearings in the rear yokes of the front and intermediate universals and the front yoke of the rear universal are pressed into the yokes and locked by snap rings. The front yoke of the front universal is splined to the transmission main shaft, and the rear yoke of the rear universal is splined to the rear axle drive pinion.

Each trunnion is drilled and fed by a central lubrication fitting for lubricating the bearings, Fig. 32. On the side opposite the lubrication fitting, a relief valve is mounted. This valve is adjusted to "pop" at from 40 to 80 pounds pressure, thereby preventing overlubrication or damage to the trunnion bearing seals.

A lubrication fitting is mounted on the rear yoke of the intermediate universal to lubricate the splines, Fig. 32. A plug is staked into the forward end of the splined opening to retain the lubricant. A small hole is drilled in the center of this plug to relieve trapped air. The rear end of the splined opening is sealed by a cork packing contained in a retainer cap which screws on the end of the yoke.

Propeller Shaft Disassembly

1. Remove the nuts from the trunnion bearing "U" clamps and remove the clamps. (This may be done at either or both the transmission end and/or the rear axle end depending upon the amount of disassembly desired.)
2. Unscrew the oil seal retainer from the rear yoke of the intermediate, or center, universal joint.

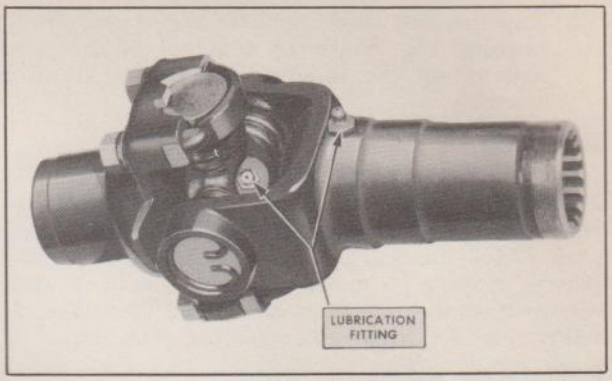


Fig. 32—Truck Intermediate Universal Joint

3. Remove the rear propeller shaft from the front propeller shaft by slipping it out of the universal joint splines.
4. Split the front universal joint at the transmission end of the front propeller shaft.
5. Remove the two bolts which mount the intermediate universal joint support bracket to the frame cross member.
6. Disconnect the intermediate universal joint by removing the two trunnion-bearing "U" clamps.
   NOTE—To hold the trunnion bearings in place as well as to prevent dirt entering and save time in reassembling, leave the bearings in the trunnion and tape them in place.
7. Clamp one side of the front yoke of the intermediate universal in a bench vise and remove the retaining nut with a 1½" socket wrench.
8. Using a soft hammer for the purpose, tap the yoke from the propeller shaft.
9. Wet the rubber cushion located in the support bracket with water to soften the soap used on the rubber when assembled. Mount the support bracket in a bench vise and move the propeller shaft from side to side to work the rubber cushion out of the support.
10. After the support bracket has been removed, the rubber cushion can be removed from the bearing with the hands as shown in Fig. 33.

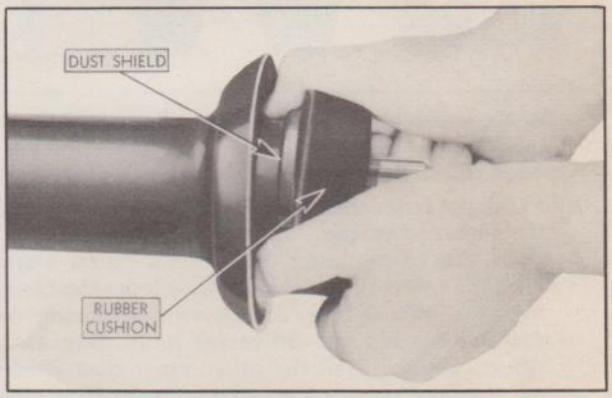


Fig. 33—Removing or Replacing Bearing Rubber Cushion

11. Mount the special puller, J-1619, in a bench vise and fit the jaws of the puller in behind the bearing outer race. Turning the screw of the puller will remove the bearing from the shaft, Fig. 34.

12. Tap the dust shields off the outer race of the bearing. Fig. 35 shows a layout of the parts making up the intermediate support bearing assembly.

Inspection

Thoroughly wash all parts, EXCEPT THE SUPPORT BEARING, in cleaning solvent. Inspect the shaft for worn splines and replace shafts if necessary. Check the bearing for roughness or excessive play by holding the inner race with one hand while slowly turning the outer race with the other. If either condition is present, replace the bearing.

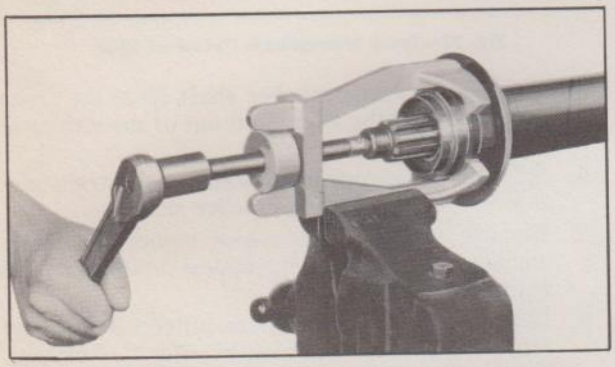


Fig. 34—Removing Propeller Shaft Intermediate Bearing

NOTE—The intermediate support bearing is of the permanently lubricated and sealed type, therefore, no attempt should be made to wash it out with cleaning solvent or to re-lubricate it.

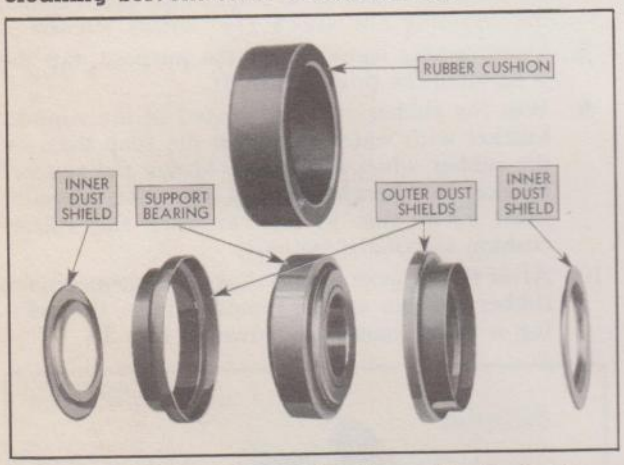


Fig. 35—Layout of Intermediate Support Bearing Parts

Propeller Shaft Reassembly

1. Press the outer dust shields on the outer race of the support bearing.
2. Place one of the inner dust shields on the shaft with the offset in the shield away from the bearing as shown in Fig. 35. Drive the bearing on the shaft using the universal joint yoke as a driver. Then install the other inner dust shield on the shaft with the offset away from the bearing.
3. Install the rubber cushion over the bearing as shown in Fig. 33.
4. Coat the outside surface of the rubber cushion lightly with soft soap and slide the support bracket over the rubber cushion as in Fig. 36.
5. Install the front yoke of the intermediate universal joint, making sure that the yoke is turned 90 degrees, in relation to the rear yoke of the front universal joint which is a part of the propeller shaft. Then by installing the rear yoke of the intermediate universal onto the rear propeller shaft so that it is in the same plane (line) with the front yoke of the rear propeller shaft rear universal joint, it will correctly align all three universal joints.
6. Reassemble the front universal joint and then bolt the intermediate support bracket to the frame cross member.
7. Assemble the rear propeller shaft and adjust the packing retainer on the rear sleeve yoke of the intermediate universal joint.

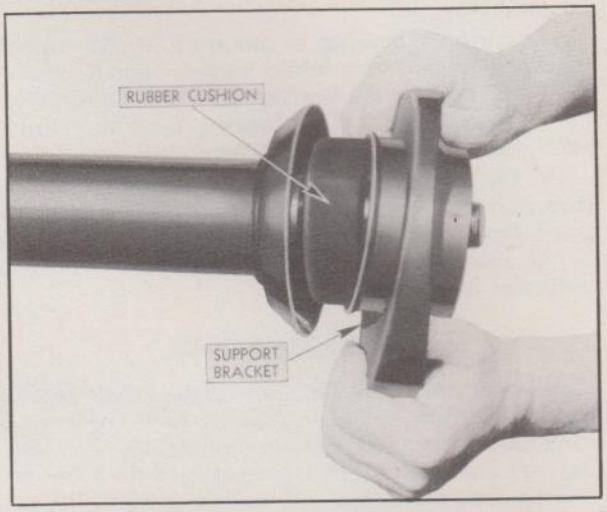


Fig. 36—Installing Bearing Support Bracket

NOTE—When necessary to replace a cork oil seal in this retainer, press the old one out of the retainer, and, because it is split, Fig. 37, it can then be removed from the propeller shaft.

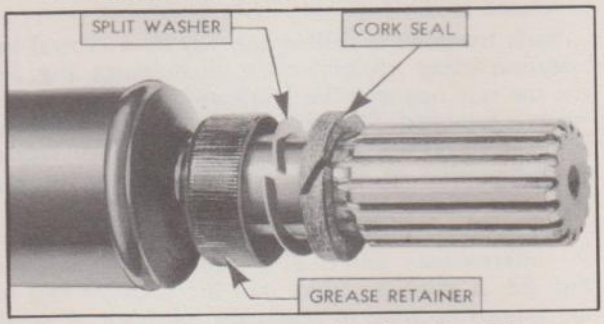


Fig. 37—Packing at Intermediate Joint Rear Yoke

8. Lubricate the universal joints with S.A.E. 90 gear lubricant—(transmission lubricant).

FRONT PROPELLER SHAFT ASSEMBLY

¾ Ton Trucks

The front propeller shaft assembly used on the ¾ ton truck differs from that used on the 1½ ton models in that it is of the enclosed type, Fig. 38.

The housing incorporates the universal ball as part of the assembly. A thin wall bushing is pressed into the front end of the housing tube.

The hub of the rear yoke of the front universal joint takes its bearing in this bushing. The rear end of the shaft is supported by a single row ball bearing of the permanently lubricated and sealed type. A spring loaded oil seal is pressed into the housing ahead of the bearing and a dust shield is assembled on the shaft at the rear of the bearing.

A rubber cushion slips over the machined rear end of the housing. This cushion in turn fits inside the sleeve which is a part of the support bracket.

Removal from Truck

1. Split the intermediate universal joint by removing the two trunnion bearing "U" clamps from the front yoke of the universal. Tape the bearings as already described and drop the front end of the rear propeller shaft.
2. Remove the four bolts which attach the universal ball retainer to the rear end of the transmission and slip the retainer back on the tube.
3. Remove the nuts from the bolts which attach the support bracket to the cross member. Then pull the assembly towards the rear to clear the splines in the front universal joint.

Disassembly

1. Clamp one side of the universal joint yoke in a bench vise. Remove the cotter pin and nut from the shaft. The yoke may now be tapped off the shaft splines with a soft hammer. Remove the bearing dust shield.
2. Wet the inside of the sleeve in the support bracket with water to soften the soap used when assembling. Place the bracket in a bench vise, then by moving the housing from side to side and at the same time pulling on the housing, it may be removed from the support bracket.
3. Remove the rubber cushion from the housing by slipping it off the machined part of the housing. The universal ball retainer may then be removed over the rear end of the housing.
4. With a pair of pliers compress the tangs on the end of the bearing retainer snap ring and remove the snap ring.
5. Using a brass drift and hammer drive the propeller shaft and bearing from the housing.
6. The bearing may now be removed by pressing it off the shaft in an arbor press.

Wash all parts except the bearing thoroughly in cleaning solvent.

Examine the leather oil seal for wear or damage.

NOTE—The seal should not be removed unless for the purpose of replacement. To remove the seal drive it out from the front of the housing using a piece of shafting. When installing a new seal, be sure that the free end of the leather is toward the front end of the housing.

NOTE—The seal should be thoroughly soaked in light engine oil before assembling.

Inspect the bushing in the front of the housing for wear. Check the ball bearing for roughness by turning it by hand.

Propeller Shaft Bushing Replacement

Drill out the dowel pin which retains the bushing and drive out bushing from pinion end of housing. A new oil seal must be installed whenever the bushing is removed.

Reassembly

1. Press the bearing on the shaft in an arbor press.
2. Assemble the shaft and bearing in the housing. Seat the bearing by tapping around its outer race using a soft drift punch and hammer. Then install the snap ring.
3. Install a new cork packing in the universal ball retainer. It is recommended that the packing be shellacked to the retainer. Install the retainer over the housing.
4. Install the rubber cushion over the machined end at the rear of the housing.
5. Coat the rubber cushion lightly with soft soap and assemble the support bracket over the cushion.
6. Install the bearing dust shield and universal joint front yoke. Tighten the nut and cotter pin securely.

Replacement in Truck

1. Place the transmission in gear and then slide the splines of the front propeller shaft into the rear yoke of the front universal joint.
2. Bolt the support bracket to the cross member.
3. Lubricate the universal ball and then bolt the universal ball retainer to the rear end of the transmission housing.

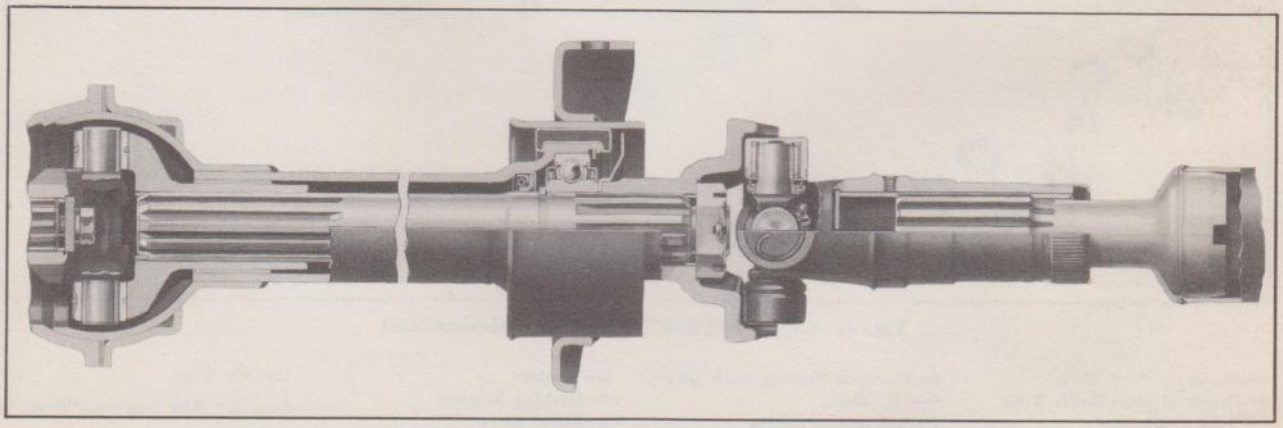


Fig. 38—¾ Ton Truck Front Propeller Shaft Assembly

4. Raise the rear propeller shaft; remove the tape from the trunnion bearings. Seat the bearings in the front yoke of the universal; install the "U" clamps and tighten the nuts securely.
5. Lubricate the intermediate universal joint with S.A.E. 90 transmission lubricant and lubricate the front universal by filling the housing with 1 pint of S.A.E. 90 transmission lubricant.

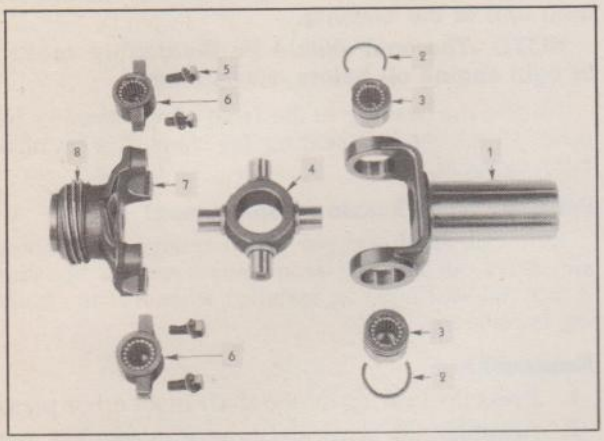


Fig. 39—½ Ton Truck Universal Joint

1—Front Universal Yoke
2—Trunnion Bearing Lock Ring
3—Front Trunnion Bearing and Rollers
4—Universal Joint Trunnion
5—Cap Screw
6—Rear Trunnion Bearing and Rollers
7—Rear Universal Yoke
8—Speedometer Drive Gear

UNIVERSAL JOINT

½ Ton Truck

The universal joint is a fully enclosed needle bearing unit. This type unit provides great smoothness and durability, and at the same time reduces friction. Figure 39 shows a layout of the universal joint parts.

Service operations of the universal joint are as follows:

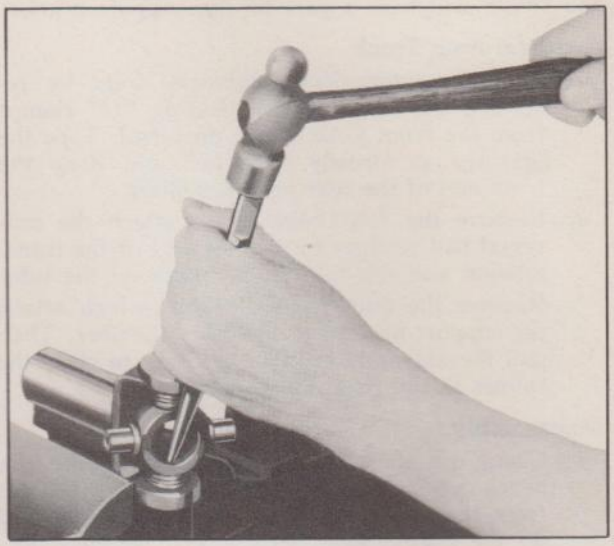


Fig. 40—Disassembly of Universal Joint

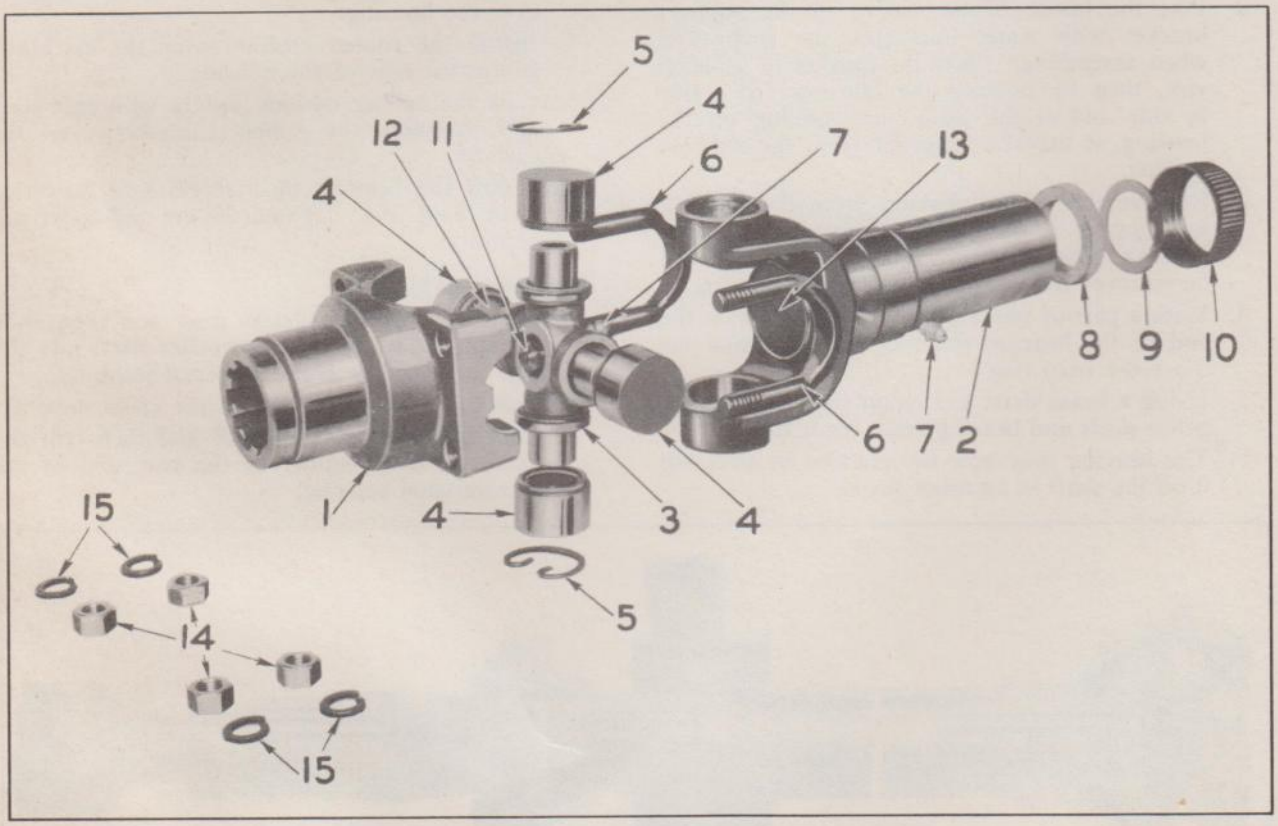


Fig. 41—Layout of Truck Intermediate Universal Joint

1—Universal Joint Yoke
2—Universal Joint Sleeve Yoke
3—Yoke Trunnion
4—Trunnion Bearing
5—Trunnion Bearing Lock Ring
6—"U" Bolt
7—Lubrication Fitting
8—Oil Seal
9—Washer
10—Packing Retainer
11—Relief Valve
12—Trunnion Bearing Rollers
13—Air Vent
14—"U" Bolt Retaining Nuts
15—Lockwashers

Disassembly

1. Remove the four cap screws which fasten the retaining collar to the ball retainer and slide the ball back on the propeller shaft housing.
2. Remove the four cap screws which fasten the front trunnion bearings to the front yoke. Remove the two front yoke trunnion bearings and split the joint.
3. The rear yoke and trunnion can then be removed from the propeller shaft splines. The front yoke can be removed from the transmission mainshaft by removing the bolt and lockwasher.
4. Wash all parts in cleaning solvent, and inspect the yokes, trunnion, and bearings for wear. Worn or damaged parts must be replaced.
5. Remove the lock rings from the trunnion bearings and drive the caps from the yoke, using a drift punch in the center of the trunnion as shown in Fig. 40. After the trunnion has been driven down to the yoke, raise the trunnion and slip a flat washer 15/16" in diameter over the bearing. Again drive on the center of the trunnion until the bearing is free of the yoke. This method prevents cocking the bearing, which would result in damage to both the yoke and the bearing.

Reassembly

1. Install the front yoke on the transmission mainshaft. Install the lockwasher and bolt.
2. Install the trunnion by threading it into the rear yoke.
3. Coat the inside of the trunnion bearings with light cup grease and install the 19 roller bearings. Then start the trunnion bearings into the rear yoke, at the same time fitting the ends of the trunnion into the bearings. Press each bearing into the yoke just far enough to install the snap ring. Install the rear yoke and trunnion on the propeller shaft splines.
4. Install the rollers in the front yoke trunnion bearings and place them on the ends of the trunnion. Line up the trunnion bearings with the front yoke, making sure the pilots on the trunnions fit into the opening of the yoke. Install the lockwashers and cap screws and tighten them securely.
5. Slide the universal ball forward and install the four cap screws which attach the retainer collar to the rear of the transmission. Fill the universal joint housing with transmission lubricant through the opening for the speedometer driven gear.

UNIVERSAL JOINTS

¾ Ton and 1½ Ton Trucks

Whenever it becomes necessary to remove the trunnion and trunnion bearings from the rear yokes of the front or intermediate universals and the front yoke of the rear universal, the snap rings and lubrication fittings should be removed. Support the yoke on a bench vise, then, using a soft drift and hammer, drive on the end of one trunnion bearing. The shock loads of the hammer blows are transmitted through the trunnion to the other trunnion bearing driving it out of the yoke, Fig. 42.

Fig. 42—Removing Trunnion Bearings from Joint Yoke

Care should be exercised when driving through the trunnion not to drive it into the side of the yoke. After one bearing has been removed, support the other side of the yoke on the vise and drive the other bearing out by using a brass drift on the end of the trunnion pin.

When reassembling the bearings they should be pressed into the yokes just far enough to install the snap rings. Then, while holding the trunnion in one hand, strike the yoke a few light blows with a hammer to firmly seat the bearings against the lockrings.

REAR SPRINGS

The rear springs on all truck models are of the semi-elliptic type and are designed for each individual unit to provide adequate load-carrying capacity and a spring rate which is proportional to that of the front springs to give the smoothest ride possible. The rear spring data is given in the specifications at the end of this section.

Rear Spring Shackle

The threaded type spring shackle is used at the rear of the rear spring on the ½ ton truck, Fig. 43.

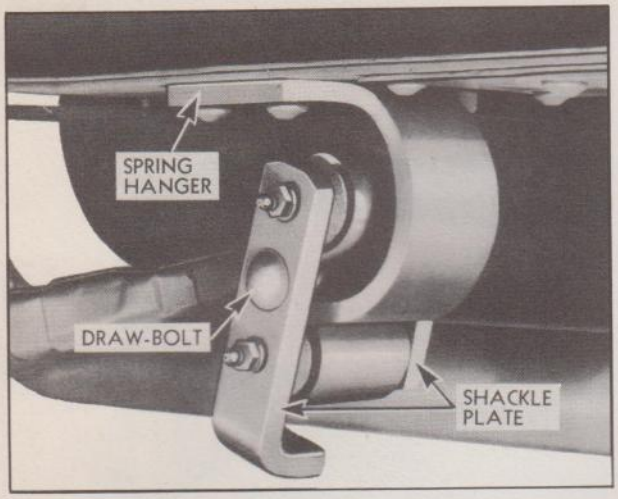


Fig. 43—½ Ton Truck Rear Shackle

To replace the threaded bushing raise the truck with a chain hoist just enough to relieve the spring tension. Remove the draw bolt and the shackle plates. Unscrew the shackle pins from the bushings. The threaded end of the bushing removing and replacing tool J-553 should be screwed into the threaded bushing. Turning the pull nut on the tool with a wrench will remove the bushing.

To install a new bushing insert the threaded end of the tool through the spring eye or spring hanger and screw a new bushing on the shaft of the tool. Turning the pull nut on the tool will draw the bushing into place. Screw a new shackle pin into the bushing until each end projects 21/32" from the end of the bushing. Place the four cork gaskets over the ends of the pins and assemble the shackle plates. Insert the draw bolt and draw the nut up snugly. Strike each end of the shackle a sharp blow with a hammer to insure seating of the tapers and retighten the shackle bolt.

Examine the lubrication fittings for damage. Replace them when necessary and fill the pins completely full with chassis lubricant.

PLAIN BUSHED SHACKLE

This type of shackle is used at the rear of the rear springs on all ¾ and 1½ ton trucks, Fig. 44. It consists of a heavy malleable shackle bushed at the upper end to serve as a bearing for the upper shackle pin which passes through the shackle and the spring hanger, and a lower shackle pin which passes through the shackle and the spring eye bushing. A "pinch" bolt at the spring hanger keeps the upper pin from turning while the lower pin is anchored in the same way by the "pinch" bolt at the shackle.

The upper shackle pin may be removed by first removing the "pinch" bolt and then driving the pin out from the inside, using a drift through the hole in the frame side rail for that purpose. The shackle pin at the front of the rear spring may be removed by driving the pin from the spring eye bushing, through the hole in the frame side rail, and into the "alligator jaw" of the frame cross member.

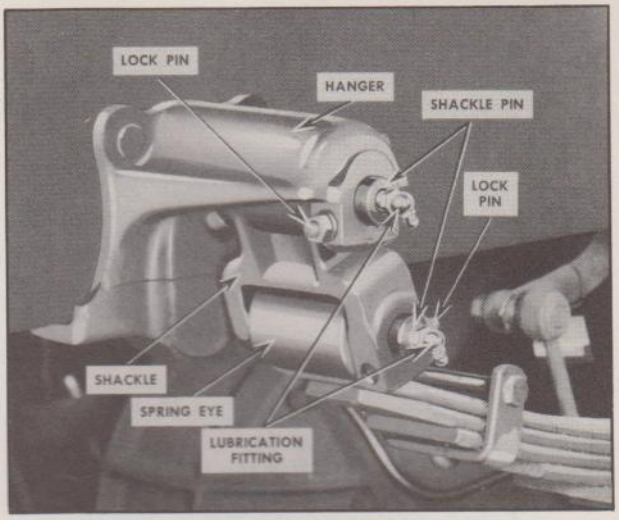


Fig. 44—¾ and 1½ Ton Truck Rear Shackle

If the spring eye bushings or shackle bushings require replacement, press out the spring eye bushings, using driver J-1668 and the shackle bushings, using driver J-1667.

After pressing in the new bushing on an arbor press, use a .877" reamer to provide .002" to .004" clearance between the housing and the shackle pin.

NOTE—On all ¾ ton trucks the rear springs are 2" wide, while on the 1½ ton truck they are 2½" wide. In order to use the same shackle bracket on both trucks it is necessary to use ½" spacers on all ¾ ton models to fill this space. These spacers are located on the inner side of the spring.

FITTING ½ TON TRUCK REAR SPRING SEATS

If it becomes necessary to adjust the rear spring seats on the truck models the correct clearance between the spring seat and the rear axle housing may be obtained as follows:

1. Jack up the rear end of the truck and block it in this position by using car horses under the frame side rails.
2. Disconnect the spring shackle and drop the rear end of the spring.
3. Remove the spring U-bolts.
4. Remove the two screws from the lower spring seat cap and remove both halves of the spring seat.
5. Clamp the two halves of the spring seat in a bench vise and file evenly from face of each half. Assemble the spring seat to the axle housing and check the fit of the seat on the housing. Continue to file evenly from both halves until such a fit is obtained that a slight drag is felt when turning the spring seat on the axle housing.

REAR AXLE TROUBLES AND REMEDIES

Symptom	Probable Remedy
Axle Noisy on Drive	
1. Ring gear and pinion adjustment too tight.	1. Readjust ring gear and pinion (see Instructions).
2. Rear side of double row pinion bearing rough.	2. Replace bearing and readjust ring gear and pinion.
Axle Noisy on Coast	
1. Excessive lash between ring gear and pinion.	1. Readjust ring gear and pinion (see Instructions).
2. Front side of double row bearing rough.	2. Replace bearing and readjust ring gear and pinion.
3. End play in double row bearing.	3. Replace bearing and readjust ring gear and pinion.
Axle Noisy on Both Drive and Coast	
1. Pinion too deep in ring gear.	1. Double row bearing installed backward (see Instructions — Pinion Reassembly).
2. Ring and pinion adjustment too tight.	2. Readjust ring gear and pinion (see Instructions).
3. Worn or damaged pinion or differential bearings.	3. Replace damaged bearing or bearings.
4. Loose or worn wheel bearings.	4. Adjust or replace bearings as necessary.
Backlash	
1. Axle shaft flange loose.	1. Replace aluminum gasket, retighten and lock axle shaft flange bolts.
2. Worn differential and side gear spacers.	2. Replace any worn spacers.
3. Worn universal joints.	3. Replace worn universal joint parts.

TOOLS REQUIRED

The following tools manufactured by the Kent-Moore Organization or their equivalent are recommended for use when overhauling the rear axle:

½ Ton and ¾ Ton Rear Axle

Tool Number	*Description*
J-973	Oil Slinger Replacer
J-554	Axle Shaft Peening Tool and Anvil
K-344	Axle Shaft Bearing Puller
K-466-A	Axle Shaft Bearing and Retainer Replacer
J-968	Propeller Shaft Bushing Driver
J-996	Pinion Bearing Remover
TR-278-R	Differential Bearing Puller
J-994	Differential Side Bearing Replacer
U-4	Differential Checking Fixture
J-972	Differential Side Bearing Adjusting Wrench
J-553	Spring Bushing Removing and Replacing Tool (½ Ton)

1½ Ton Rear Axle

J-870	Rear Wheel Bearing Lock Nut Wrench
J-918-A	Inner Bearing and Oil Seal Puller
J-872-1	Outer Wheel Bearing Replacer
J-872-3	Special Bearing Race Driver
J-872-4	Special Bearing Race Driver
J-872-2	Bearing Oil Seal Replacer
J-973	Oil Slinger Replacer
J-1453	Rear Pinion Bearing Press Plate
J-1439	Front Pinion Bearing Remover (6-Tooth Pinion)
J-1440	Front Pinion Bearing Remover (7-Tooth Pinion)
J-1364	Rear Pinion Bearing Lock Ring Installer
TR-278-R	Differential Side Bearing Puller
J-1488	Differential Side Bearing Driver
J-972	Differential Side Bearing Adjusting Wrench

REAR AXLE SPECIFICATIONS

	½-Ton Truck	All ¾-Ton Trucks	Heavy Duty 1½-Ton Trucks
Type	Semi-Floating	Semi-Floating	Full-Floating
Type of Gearing	Hypoid	Hypoid	Hypoid
Regular Gear Ratio	4.111 to 1	4.55 to 1	6.17 to 1
Number of Gear Teeth	37	41	37
Number of Pinion Teeth	9	9	6
Optional Gear Ratio	None	None	5.43 to 1
Number of Ring Gear Teeth	—	—	38
Number of Pinion Teeth	—	—	7
Back Lash Between Ring Gear and Pinion	.005″ to .008″	.005″ to .008″	.005″ to .008″
Clearance Between Axle Shaft and Spacer	Free Fit to .014″	Free Fit to .014″	—
Allowance Run-Out of Propeller Shaft Assembly at:			
Front Bearing	.002″	.002″	.003″
Front of Rear Splines	.010″	.010″	.010″
Center of Propeller Shaft	.015″	.015″	.015″
Extreme Forward End	.005″	.005″	.005″
Allowable Run-Out of Differential Case at:			
Ring Gear Pilot	.004″	.004″	.004″
Face to Which Ring Gear is Bolted	.004″	.004″	.004″
Back of Ring Gear After Bolted to Case	.007″	.007″	.007″
Clearance Between Thrust Pad and Back of Ring Gear	—	—	.005″ to .007″

	½-Ton Truck	¾-Ton Trucks	1½-Ton Trucks
Front Pinion Bearing	New Departure ND-5306	New Departure ND-5306	New Departure ND-H-5310A
Rear Pinion Bearing	Hyatt U-1506	Hyatt U-1506	Hyatt U-1305
Differential Side Bearing	Hyatt KA-11445Z	Hyatt KA-11445Z	Hyatt KA-11820Z
Wheel Bearing (Inner)	—	—	Hyatt KD-12051
Wheel Bearing (Outer)	Hyatt C-1500	Hyatt 1512	Hyatt KB-11786
Propeller Shaft Support Bearing	—	New Departure NDX-88107	New Departure NDX-88107

	½-Ton	¾-Ton	1½-Ton Except Panel	1½-Ton Panel
REAR SPRINGS				
Type	Semi-Elliptic	Semi-Elliptic	Semi-Elliptic	Semi-Elliptic
Length	54⅛″	46″	46″	46″
Width	1¾″	2″	2½″	2½″
Number of Leaves	8	7	10	8
Leaf Thickness				
Nos. 1, 2, 3, 4	.291″	.291″	.323″	.291″
No. 5	.291″	.323″	.323″	.323″
Nos. 6, 7	.291″	.323″	.323″	.323″
No. 8	.291″	—	.323″	.323″
Nos. 9, 10	—	—	.323″	—
Total Thickness	2.328″	2.133″	3.230″	2.424″
Spring Clip and Type	4-Clinch	3-Bolt	2-Bolt	4-Bolt
Mounting;				
Front	Plain Bushing	Plain Bushing	Plain Bushing	Plain Bushing
Rear	Threaded "H" Shackle	Plain Shackle	Plain Shackle	Plain Shackle
Axle Housing	2 U-Bolts	2 U-Bolts	2 U-Bolts	2 U-Bolts

AUXILIARY SPRINGS—1½ Ton Trucks

Number Leaves	6
Leaf Thickness	.323″
Total Thickness	1.938″
Length	31″ Between Bracket Centers
Width	2½″

Section 5

BRAKES

The braking system of all trucks combines hydraulically operated service brakes with a mechanically operated parking brake. Fundamentally, the braking system of all the trucks is the same. However, due to variance in the brake lining sizes, wheel brake drum sizes, and frame design there are several differences in the braking systems. Fig. 1 shows the brake construction.

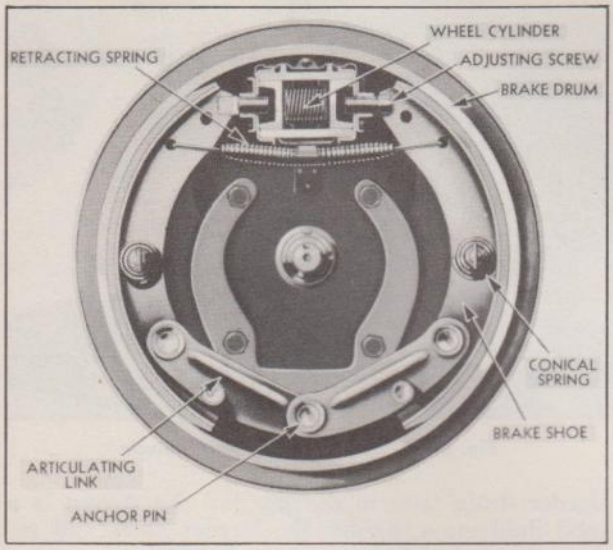


Fig. 1—Front Brake Mechanism

In order to thoroughly understand the operation of the hydraulic brake system, it is necessary to have a good knowledge of the various parts and their functions and to know what takes place throughout the system during the application and release of the brakes.

MAIN CYLINDER

The piston in the main cylinder, Fig. 2, receives mechanical pressure from the push rod and exerts pressure on the fluid in the lines, building up the hydraulic pressure which moves the wheel cylinder pistons. The primary cup is held against the piston by the piston return spring which also retains the return valve against its seat. The spring maintains a slight pressure in the lines and in the wheel cylinders to prevent the possible entrance of air into the system. The secondary cup, which is secured to the opposite end of the piston, prevents the leakage of fluid into the rubber boot. Holes in the piston head allow the fluid to flow from the annular space around the piston into the space between the primary cup and the check valve thereby keeping sufficient fluid in the lines at all times. Holes in the valve cage allow the fluid to flow through the cage and around the lip of the rubber valve cup and out into the lines during brake application. When the brake is released the valve is forced off its seat, permitting the fluid to return to the main cylinder. The push rod assembly is held in the opposite end of the housing by means of a snap ring. The rubber boot that fits around the push rod and over the end of the housing prevents dirt or any other foreign matter from entering the main cylinder, Fig. 2.

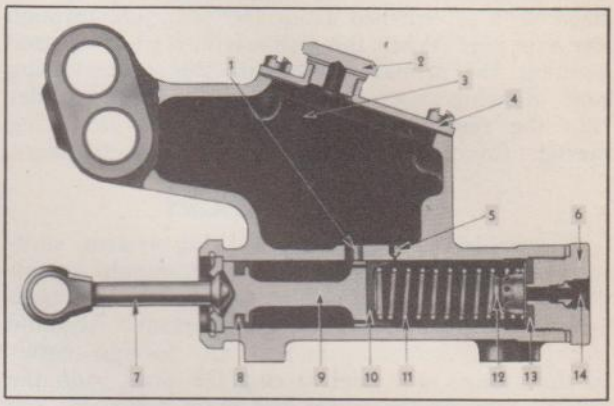


Fig. 2—Main Cylinder Cross Section

1—Inlet
2—Filler Plug
3—Reservoir
4—Housing Cover
5—Compensating Port
6—End Plug
7—Pedal Link
8—Piston Cup—Secondary
9—Piston
10—Piston Cup—Primary
11—Spring
12—Valve
13—Valve Seat
14—Outlet

WHEEL CYLINDER

The wheel cylinder (see Fig. 1) contains two pistons, the purpose of the two pistons being to distribute the pressure evenly to each of the two brake shoes. The rubber piston cups maintain pressure on the pistons and prevent the leakage of fluid past the pistons. The adjusting covers serve two purposes: first, to cover the ends of the cylinder and prevent the entrance of dirt and foreign matter into the cylinder, and second, serve as a means of adjusting the brake shoes to the proper drum clearance, being threaded to receive the slotted adjusting screws which fit the webs of the brake shoes.

SEQUENCE OF OPERATION

As pressure is applied to the brake pedal and is transmitted from the push rod to the piston in the main cylinder, the primary cup closes the compensating port and fluid is forced through the holes in the valve cage, around the lip of the rubber valve cup, into the pipe lines and into the wheel cylinders. This pressure forces the pistons in the wheel cylinders outward, expanding the brake shoes against the drums. As the pedal is farther depressed, higher pressure is built up within the hydraulic system, causing the brake shoes to exert greater force against the brake drums. Fig. 1.

As the pedal is released, the hydraulic pressure is relieved and the brake shoe retracting springs draw the shoes together, pressing the wheel cylinder pistons inward and forcing the fluid out of the wheel cylinders back into the lines toward the main cylinder. The piston return spring in the

main cylinder returns the piston to the pedal stop faster than the brake fluid is forced back into the lines, creating a slight vacuum in that part of the cylinder ahead of the piston. This vacuum causes a small amount of fluid to flow through the holes in the piston head, past the lip of the primary cup and into the forward part of the cylinder. This action keeps the cylinder filled with fluid at all times, ready for the next brake application. As fluid is drawn from the space behind the piston head it is replenished from the reservoir through the inlet port. When the piston is in a fully released position, the primary cup clears the compensating port, allowing excess fluid to flow from the cylinder into the reservoir as the brake shoe retracting springs force the fluid out of the wheel cylinders.

SERVICE OPERATIONS

To properly maintain the braking system, servicemen must appreciate that a thorough knowledge of the system, absolute cleanliness, and careful workmanship are very important. Absolute cleanliness is necessary in that, any foreign matter in the system will tend to clog the lines, ruin the rubber cups of the wheel and main cylinders, and cause inefficient operation or even failure of the braking system; dirt or grease on a brake lining will cause that lining to take effect first on brake application and fade out on heavy brake application. Careful workmanship will result in a well done job.

BLEEDING THE HYDRAULIC BRAKE SYSTEM

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. A leak in the system may sometimes be evident through the presence of a "spongy" brake pedal. Air trapped in the system is compressible, and does not permit all pressure applied to the brake pedal to be transmitted through to the brake shoes. The system must be *absolutely* free from air at all times.

The longest pipe line of the brake system should be bled first. The proper sequence for bleeding is: left rear, left front, right rear, and lastly, right front. During bleeding operations the main cylinder must be kept at least half full of hydraulic brake fluid. The main cylinder filler, (J-713C) Fig. 3 automatically maintains the correct fluid level in the main cylinder during bleeding.

TO BLEED THE HYDRAULIC BRAKE SYSTEM

Carefully clean all dirt from around the main cylinder filler plug.

Remove filler plug, install adapter and automatic filler. Open automatic valve in the filler.

Remove bleeder valve screw. Attach bleeder drain, (J-747) Fig. 4, keeping the end of the drain hose below the surface of the fluid in the jar.

Unscrew bleeder valve in wheel cylinder 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 in the jar and the stream is a solid fluid mass, tighten the bleeder valve and remove the drain hose.

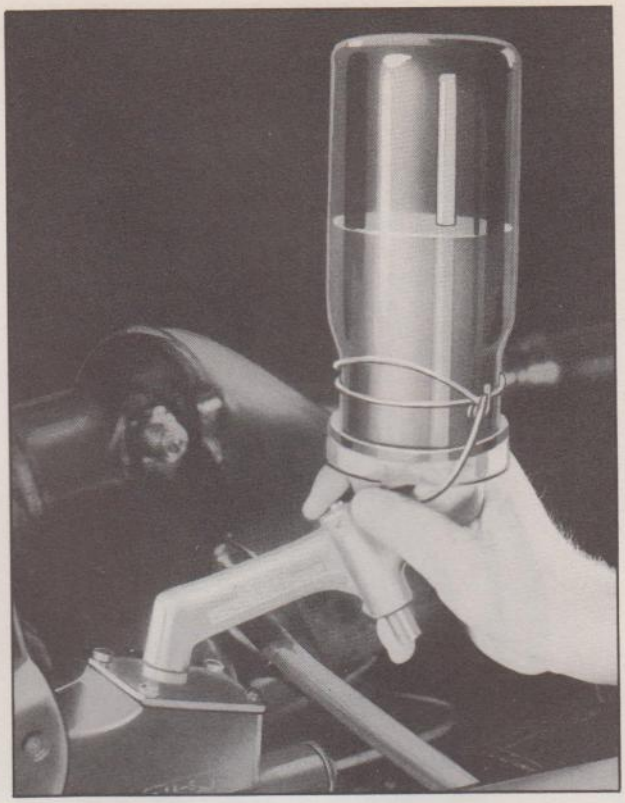


Fig. 3—Filling Main Cylinder Reservoir

Replace and tighten the screw at the end of the bleeder valve.

After bleeding operation has been completed at all wheels, fill the main cylinder reservoir approximately full, and replace the filler plug.

NOTE—Fluid withdrawn in the bleeding operation should not be used again.

HYDRAULIC BRAKE FLUID

As there are several general classifications of Hydraulic Brake Fluids on the market, care should be taken to make certain that the fluid being used will not injure the brake parts. Some brake fluids may have a rather severe action on the rubber parts, causing them to become sticky, preventing proper piston action or, due to expansion of the rubber parts, cause them to lose their sealing qualities. Other types of fluid may cause vapor lock or, due to extreme thinness, leak past the rubber cups in the wheel cylinders and saturate the brake linings.

G. M. Hydraulic Brake Fluid-Super No. 9 can be used with certainty that it will not have a damaging effect upon the rubber cups in the brake system.

In the event that improper fluid has entered the system, it will be necessary to:

1. Drain the entire system.
2. Thoroughly flush out the system with clean alcohol, 188 proof, or a hydraulic brake system cleaning fluid, known to the industry as Declene.
3. Replace all rubber parts of the system.
4. Refill with proper Hydraulic Brake Fluid.

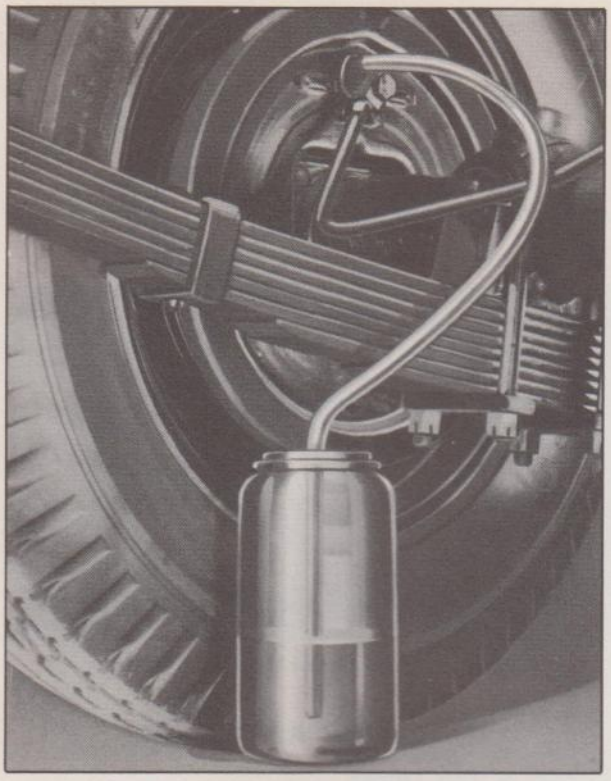


Fig. 4—Bleeding Brake System at Wheel Cylinder

HYDRAULIC BRAKE TUBING

The hydraulic brake tubing is a double layer flexible steel, copper-coated, tin-plated tubing which resists corrosion and also stands up under the high pressures which are developed when applying the brakes.

The important thing in connection with making up hydraulic brake pipes is the proper flaring of the ends of the tubing for the compression couplings. Unless the tubing is properly flared the couplings will leak and the brake will become ineffective.

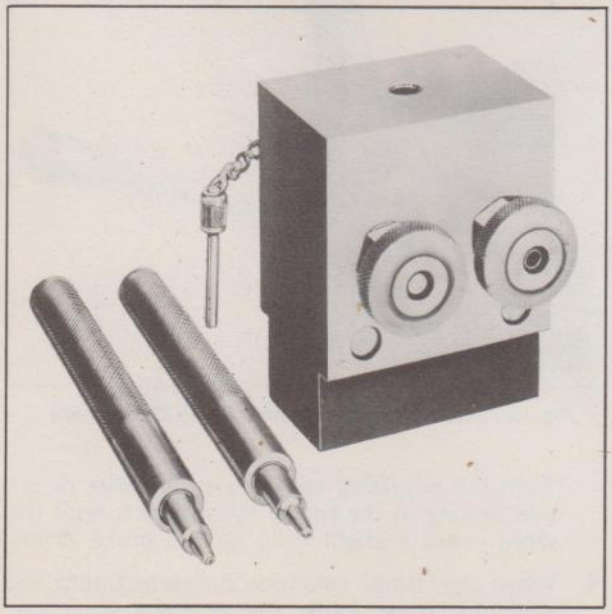


Fig. 5—Hydraulic Brake Tubing Flaring Tool

This safety steel tubing must be double-lap flared at the ends in order to produce a strong, leak-proof joint.

The brake tube flaring tool shown in Fig. 5 is used to form the double-lap flare.

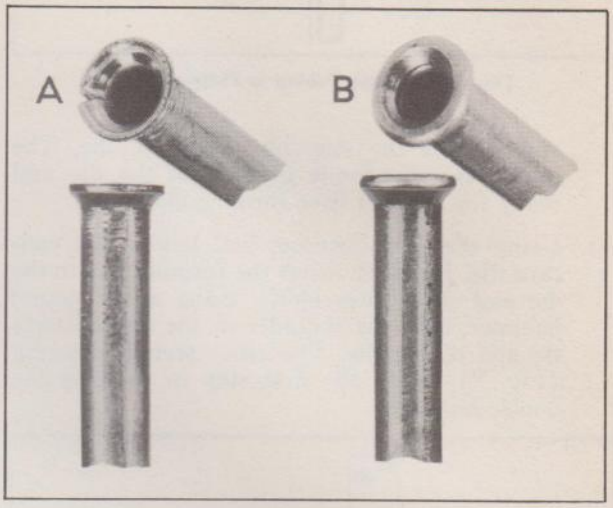


Fig. 6—Single and Double-Lap Flare on Tubing End

Fig. 6 shows two pieces of tubing—one with a single-lap flare ("A") and the other with the double-lap flare ("B"). It will be noted that the single-lap flare split the tubing while the one shown in "B" has a heavy, well-formed joint.

DIRECTIONS

1. Cut the tubing to the desired length, using tube cutter KMO3 to prevent flattening the tubing. Square off the end with a fine-cut mill file, then ream the sharp edges with the reamer blade provided on the tube cutter. (Fig. 7.)

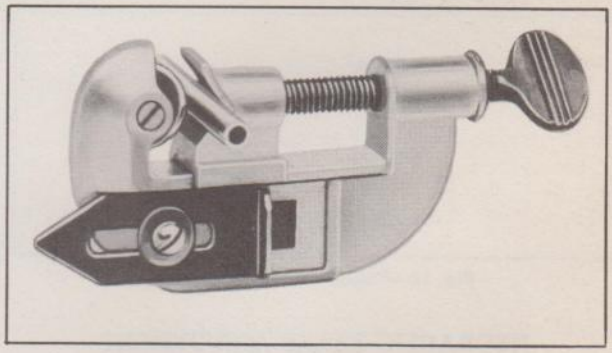


Fig. 7—Cutting Hydraulic Brake Tubing

2. Place new compression coupling nuts on the tubing. Dip end of tubing to be flared in hydraulic brake fluid. This lubrication results in a better formation of the flare. Loosen the clamping nuts on the flaring tool, KMO J-1280-1, and insert finished end of the tubing in the channel of the die until it bears against the stop pin, Fig. 8.

   Tighten the clamping nuts by hand and place the fixture in a bench vise. Then tighten down the clamping nuts firmly with a wrench

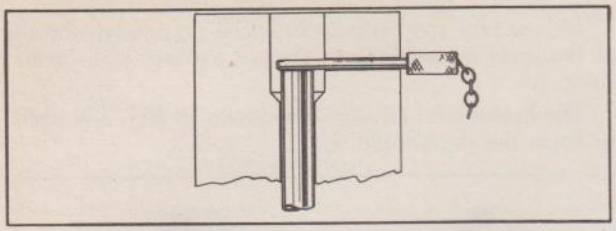


Fig. 8—Installing Tubing to Proper Depth

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.

3. Using the flare forming tool having the concave die, J-1280-2, insert the forming tool in the die and strike firm blows, using a one pound hammer, until the shoulder of the tool contacts the top of the die. The cross section drawing (Fig. 9) shows the first step in forming the double-lap flare.

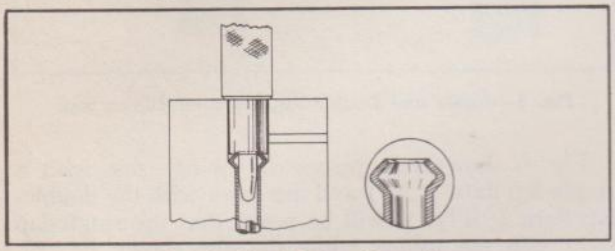


Fig. 9—First Flaring Operation

4. Next, use the flare forming tool, J-1280-3, having the 45 degree die at its lower end. Insert the tool in the die and strike firm blows, using a one pound hammer, until the shoulder of the tool contacts the top of the die. The cross section drawing, Fig. 10, shows the second and final forming operation in making a double-lap flare.

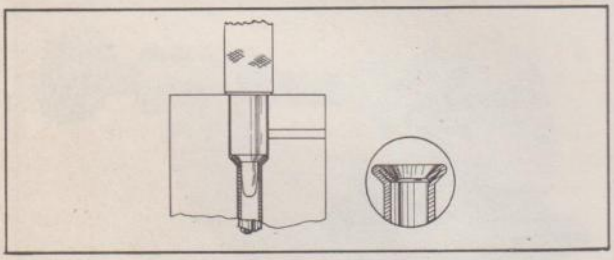


Fig. 10—Finish Flaring Operation

HYDRAULIC BRAKE ADJUSTMENT

Chevrolet hydraulic brakes can be adjusted without the removal of the wheels as all brake flange plates have openings with spring snap covers to simplify brake adjustment.

TOE-BOARD CLEARANCE

Toe-board clearance very seldom needs to be adjusted. The pedal stop, located in the brake main cylinder, is permanent. Before attempting to adjust this stop, be certain that the pedal returns to the fully released position freely, with no binding, and that the pedal retracting spring has not lost its tension.

1. Loosen the check nut on the rear of the clevis on the main cylinder push rod.
2. Remove clevis pin and turn the clevis attached to the main cylinder push rod, Fig. 11, in the proper direction to secure ¼" toe-board clearance—measurement being taken between pedal arm and underside of toe-pan.
3. Tighten the check nut against the clevis.

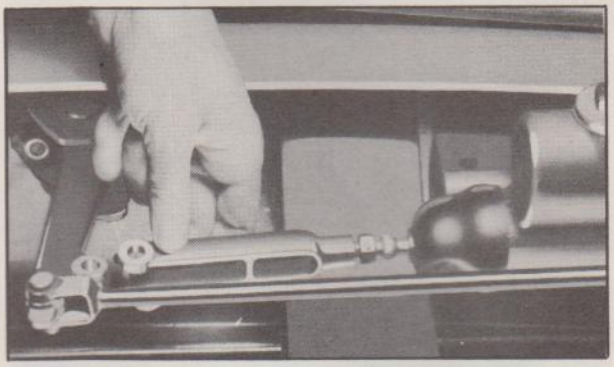


Fig. 11—Adjusting Pedal Toe-Board Clearance

BRAKE SHOE ADJUSTMENT

½ and ¾ Ton Trucks

1. Raise the truck and place stand jack front and rear so that all four wheels rotate freely.
2. Disconnect the parking brakes. This precaution should be taken to eliminate the possibility of the brake shoes dragging the drum due to misadjustment of the parking brakes.
3. Remove the adjusting hole covers and insert a screwdriver through the adjusting hole and engage the teeth on the adjusting cover of the wheel cylinder. Fig. 12.

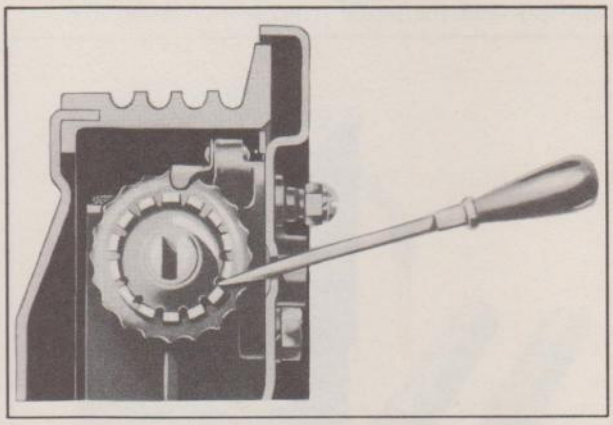


Fig. 12—Adjusting Brakes Through Slot in Flange Plate

Turn the adjusting cover in a clockwise direction looking at the end of the cylinder, until the shoes cause a slight drag on the brake drum.

4. When the "drag" condition is reached, turn the adjusting cover back, the opposite direction, four (4) notches.

BRAKE SHOE ADJUSTMENT

1½ Ton Trucks

The adjustment of the front brakes on the 1½ ton trucks is the same as for the ½ and ¾ ton trucks with the exception that the wheel cylinder adjusting covers are backed off five (5) notches instead of four (4).

To adjust the rear brakes on these trucks use a ⅝" open end wrench to turn the adjusting pinion.

1. Turn the adjusting pinion in a clockwise direction until the shoe causes a slight drag on the brake drum, as shown in Fig. 13.
2. Turn the adjusting pinion back in the opposite direction ¾ of a turn to provide running clearance.

The backing-off of the adjusting cover, the specified number of notches will be indicated by a faint click of the cover lock spring as the cover is turned. This backing-off of the adjusting cover moves the brake shoe away from the drum to insure proper running clearance of the shoes in the drum.

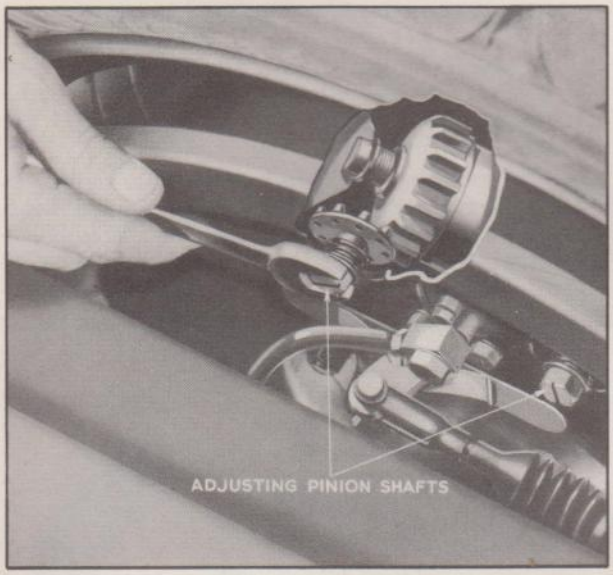


Fig. 13—Adjusting 1½-Ton Truck Rear Brakes

PARKING BRAKE ADJUSTMENT

½ and ¾ Ton Trucks

The parking brake adjustment should be checked each time the hydraulic service brakes are adjusted.

When making a parking brake adjustment the service brakes must be properly adjusted first as a base for adjusting the parking brakes:

1. Set the parking brake lever in the fully released position.
2. Loosen the check nuts at the cable ends.
3. Pull the cables out of the conduit by hand until a positive stop is felt. While holding the cable in this position, adjust the check nuts against the clevis plates. Then tighten the check nuts securely.

1½ Ton Trucks

The parking brake adjustment should be checked each time the Hydraulic Service Brakes are adjusted.

When making a parking brake adjustment, the service brakes must be properly adjusted first as a base for adjusting the parking brakes.

1. Set the parking brake lever in the fully released position.
2. Remove the cotter pin and clevis pin from the pull rods. Loosen the check nut.
3. Pull the cables out of the conduit by hand until a positive stop is felt. While holding the cable in this position, turn the clevis until the hole in the clevis registers with the hole in the rod eye on the cable. Replace the clevis pin and cotter pin. Tighten the check nut securely.
4. Check the brakes for freedom from drag or unequal braking. If further adjustment is necessary to eliminate either shoe drag or unequal braking, proceed as outlined in 2 and 3 above. Never attempt to eliminate shoe drag by making adjustments at the wheel cylinder, as this would result in improper running clearance between shoe and drum.

BRAKE LININGS

Inspection

After removal of the brake drums and before disassembly of the shoes from the flange plate, all linings should be inspected for wear, improper alignment causing uneven wear and oil or grease on linings. If any of these conditions exist, it will be necessary to replace or reline the shoes. If in checking the lining it is noticed that they have the appearance of being glazed, this is a normal condition with the hard type lining used. Do not use a wire brush or any abrasive on the lining to destroy this glazed surface as it is essential for proper operation.

Satisfactory performance can be obtained by replacing only the forward shoes when the reverse shoe linings do not show excessive wear. Tests have shown that in most cases the reverse lining will outlast two sets of forward linings. This is true of both front and rear wheel brakes.

Shoes should be changed in sets; that is, both forward shoes on the front wheels, or both forward and reverse shoes on front wheels. The same is true on the rear wheels.

BRAKE SHOE REMOVAL

½ and ¾ Ton Trucks

1. Jack up the truck and remove wheel and brake drum.
2. Install wheel cylinder clamp, Fig. 14 (J-718C) to keep the wheel cylinder pistons in place and prevent leakage of brake fluid while replacing shoes.
3. Remove brake shoe retracting spring with special pliers, KMO 142, Fig. 15.
4. Remove conical guide springs.

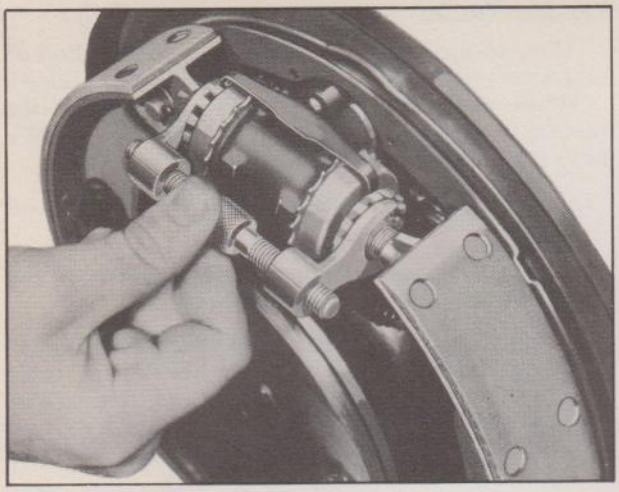


Fig. 14—Installing Brake Wheel Cylinder Clamp

5. Remove brake shoe anchor pin lock and pin. On rear brakes—remove toggle lever, eccentric bolt and nut from the rear brake shoe.
6. Remove articulating link friction spring pin lock, pin and spring. Disassemble articulating links from shoes by removing pin lock and pin.

The illustration, Fig. 16, shows a layout of the ½ and ¾ ton truck rear brake parts.

1½ Ton Trucks

The removal and replacement of the brake shoes of the 1½ ton trucks is identical with that of the ½ and ¾ ton trucks except for slight variations in the design of the hook-up.

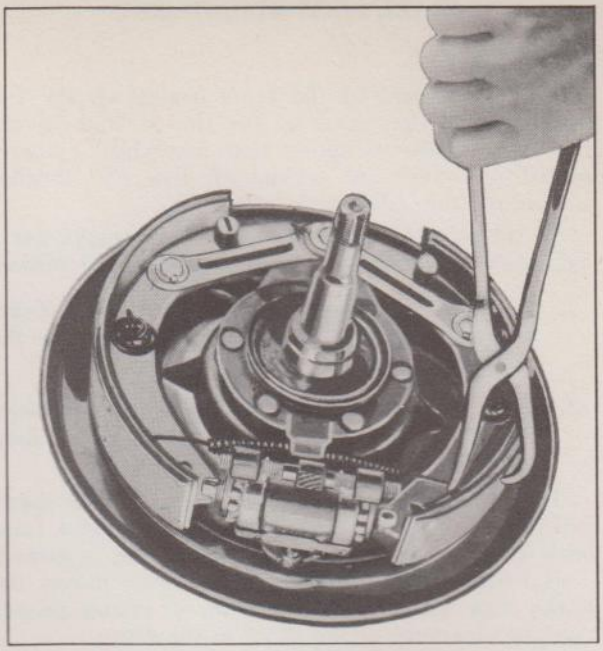


Fig. 15—Removing Brake Shoe Retracting Spring

1. It is necessary to remove the wheels and brake drums with the wheel hubs to replace brake linings, necessitating the readjustment of the wheel bearings.
2. The operating mechanism of the parking brakes at the rear wheels on the trucks is a lever and link assembly. This lever and link assembly is attached to the rear brake cable on the outside of the brake flange plate. The lever on the in-

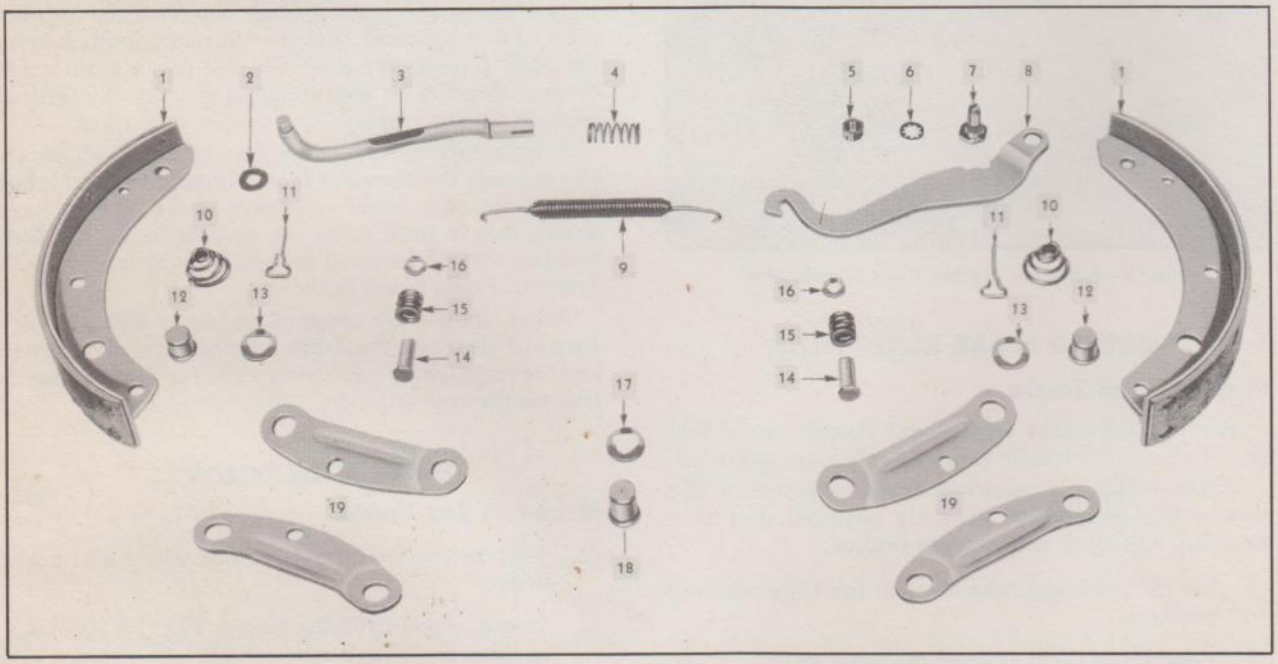


Fig. 16—Layout of Rear Wheel Brake Parts—½ and ¾-Ton Trucks

1—Brake Shoe and Lining
2—Parking Brake Lever Extension Washer
3—Parking Brake Lever Extension
4—Parking Brake Lever Extension Spring
5—Parking Brake Lever Anchor Bolt Nut
6—Parking Brake Lever Anchor Bolt Lockwasher
7—Parking Brake Lever Anchor Bolt
8—Parking Brake Lever
9—Brake Shoe Retracing Spring
10—Brake Shoe Guide Spring
11—Brake Shoe Guide Spring Pin
12—Articulating Link Pin
13—Articulating Link Pin Lock
14—Articulating Link Friction Spring Pin
15—Articulating Link Friction Spring
16—Articulating Link Friction Spring Pin Lock
17—Anchor Pin
18—Anchor Pin Lock
19—Articulating Link

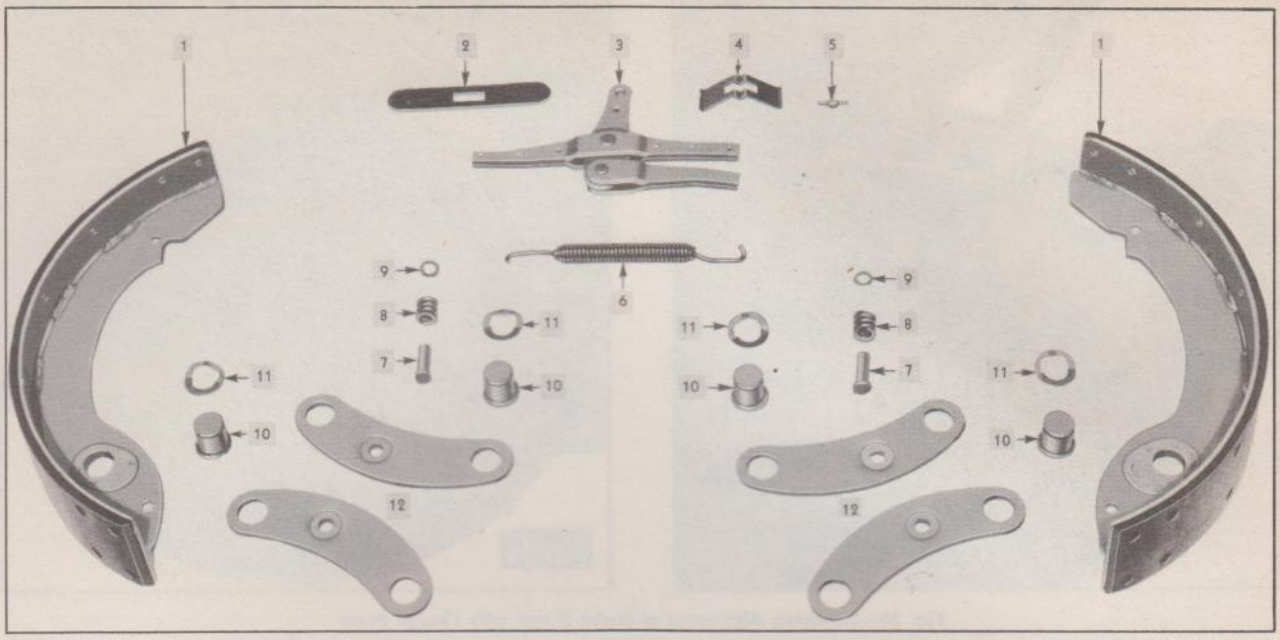


Fig. 17—Layout of Rear Wheel Brake Parts—1½-Ton Trucks

1—Brake Shoe and Lining
2—Camshaft Hole Cover
3—Parking Brake Link Assembly
4—Brake Camshaft Hole Cover Spring
5—Parking Brake Lever Hole Cover Spring Pin
6—Brake Shoe Retracting Spring
7—Brake Shoe Articulating Link Friction Spring Pin
8—Brake Shoe Articulating Link Friction Spring
9—Brake Shoe Articulating Link Friction Spring Pin Lock
10—Brake Shoe Articulating Link Pin
11—Brake Shoe Articulating Link Pin Lock
12—Brake Shoe Articulating Link

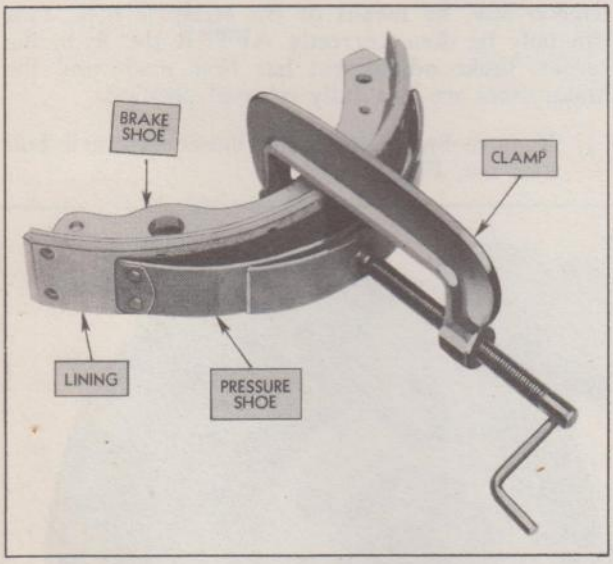


Fig. 18—Installing Brake Lining Clamp

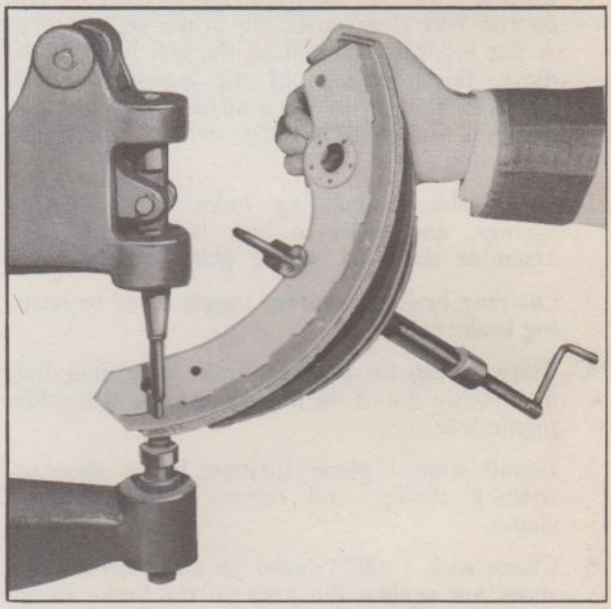


Fig. 19—Riveting Brake Lining to Shoe

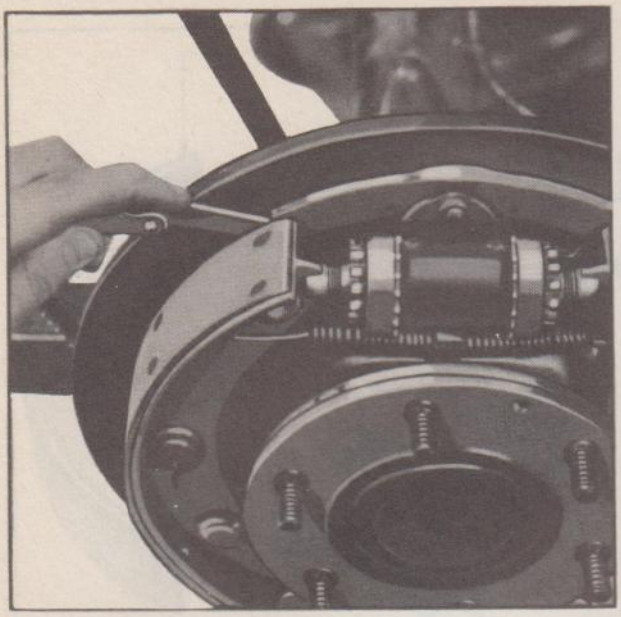
side, as it is actuated by the parking brake lever to set the brakes, moves the links outward expanding the brake shoes. Each link has a support at its outer end.

3. Each brake shoe of the rear brakes has an individual anchor pin.

The illustration, Fig. 17, shows a layout of the 1½ ton truck rear brake parts.

BRAKE SHOE RELINING

1. Remove the rivets, using the deliner punches in a brake shoe relining machine.
2. Wash the shoes in cleaning solvent, then buff them on a wire buffer.
3. Install new lining in place on shoe and rivet two holes at center.
4. In order to eliminate air pockets between lining and shoe which might cause uneven contact or squeaky brakes, a brake shoe lining clamp should be used to force the lining against the shoe, Fig. 18.
5. After the end holes in the lining and shoe are in alignment, the rivets may be installed in both ends, Fig. 19.
6. Remove the clamp and install the remaining rivets.



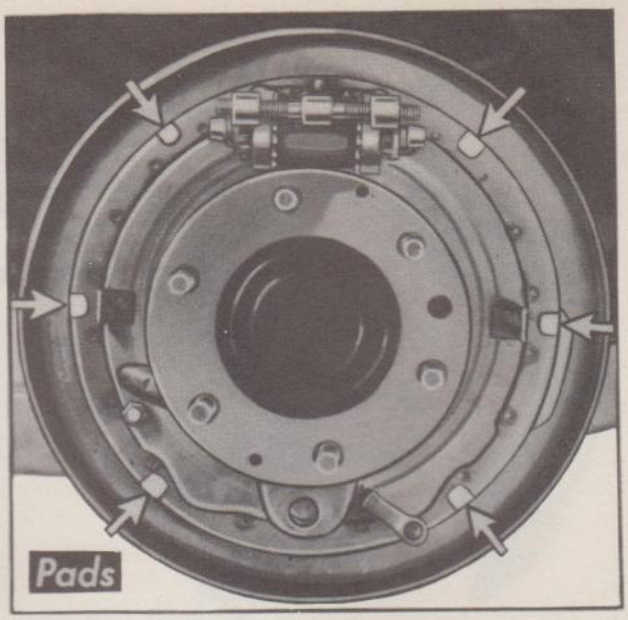


Fig. 20—Checking Alignment of Brake Shoes with Flange Plate

BRAKE SHOE REPLACEMENT

½ and ¾-Ton Truck Rear Brakes

1. Reassemble toggle lever to new shoe assembly, making sure that the high side of the eccentric on the bolt is towards the brake shoe facing. A flat has been ground on the bolt head to indicate the high side of the eccentric. (This eccentric bolt is used to adjust the clearance between the parking brake extension and the toggle link.)
2. Reassemble articulating links, pins, friction springs, and locks to new brake shoes and assemble shoes to anchor plate.
3. On rear brakes, hook-up toggle lever to parking brake cable.
4. Place spring on parking brake extension link and line up slot of the link so that it will straddle toggle lever.
5. Install conical guide springs, brake shoe retracting spring, and remove wheel cylinder clamp.
6. Check with a .002" feeler to make certain the shoes are against the pads on the brake flange plate, Fig. 20. If the shoes do not touch all pads it may be necessary to bend the anchor plate to correct this condition.
7. When replacing rear brake drums, make sure the tongue in the web section of the drum extends into the drain hole in the axle shaft flange. This serves as a positive locating point to line up the hole in the drum with the drain hole in the axle shaft flange.

   Whenever a brake drum has been removed for replacement of brake shoes or for shoe adjustment, it will be necessary to depress the foot pedal firmly to align the brake shoe articulating links before making brake adjustment.

PARKING BRAKE TOGGLE LEVER ADJUSTMENT

Whenever new rear brake shoes are installed on the ½ ton and all ¾ ton trucks, it is necessary to adjust the toggle lever with the emergency brake extension link, by means of the eccentric bolt. This can only be done correctly AFTER the hydraulic service brake adjustment has been made and the brake shoes are in a fully released position.

1. Remove brake drum and loosen eccentric bolt lock nut, Fig. 21.

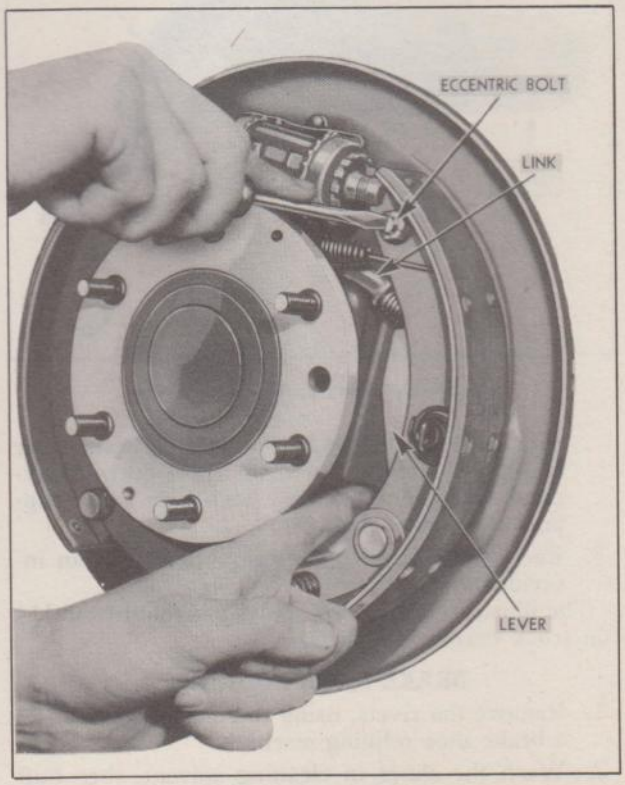


Fig. 21—Adjusting Rear Brake Toggle

2. Hold the toggle lever against the shoe and turn the eccentric bolt until there is only a slight clearance between the lever and the bottom of the slot in the parking brake extension link.
3. Tighten eccentric bolt lock nut and again check for clearance.
4. Replace brake drum, adjust parking brakes and road-test car for performance.

½ and ¾-Ton Truck Front Brakes

The front brake shoes on ½ and ¾ ton trucks are installed in the same manner as on the rear with the exception that the front brakes do not have a parking brake toggle link.

1½-Ton Truck Brakes

1. Reassemble articulating links, pins, friction springs, and locks to new brake shoes and assemble shoes to anchor plate.
2. Check fit of shoe in the brake shoe guide riveted to the anchor plate. The shoe should be free without excessive side movement.
3. Install brake shoe retracting spring and remove wheel cylinder clamp.
4. Replace wheels and hubs and adjust the wheel bearings as outlined in the Front and Rear Axle Sections.
5. Adjust brakes as previously outlined under Wheel Cylinder and Emergency Brake Adjustments.

Brake Drums

The brake drums are attached to the wheel hubs by serrated bolts. These bolts are also used for mounting the wheels to the hubs.

To remove a brake drum, drive out the serrated bolts and remove the drum.

When replacing a drum, the gasket between the inside of the brake drum and oil deflector should be coated with heavy shellac or paint on both sides to prevent oil from leaking on to the braking surface of the drum. The small hole in the gasket and the channel in the oil deflector must be lined up with the oil relief hole in the drum. Insert six new bolts through the oil deflector, brake drum and hub flange, then place the assembly on the riveting fixture with the threaded end of the bolt passing into the hole in one of the supports. Drive the bolts into place, solidly. Place the assembly on the fixture as shown in Fig. 22 and peen the shoulder of the bolt into the chamfer in the hub flange. It is good practice to turn the peening tool after each hammer blow to prevent damage to the tool.

NOTE—The above operation is very important from a safety standpoint.

Fig. 22—Peening Hub and Drum Bolts

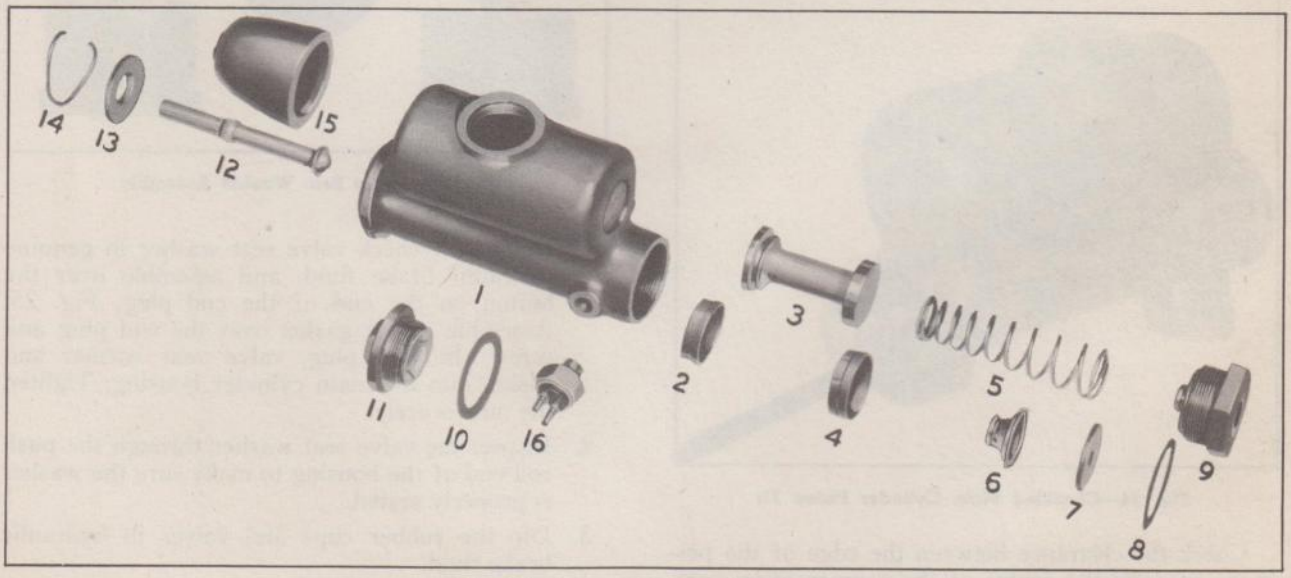


Fig. 23—Layout of Main Cylinder Parts

1—Main Cylinder Body
2—Secondary Piston Cup
3—Piston
4—Primary Piston Cup
5—Return Spring
6—Outlet Valve
7—Valve Seat
8—End Plug Gasket
9—End Plug
10—Filler Plug Gasket
11—Filler Plug
12—Pedal Link
13—Link Retainer
14—Snap Ring
15—Dust Boot
16—Stop Light Switch

MAIN CYLINDER OVERHAUL

Disassembly

1. Remove the end plug and valve seat washer.
2. Remove the valve seat washer from the button on the end plug, Fig. 25.
3. Remove the valve assembly and spring.
4. Remove the main cylinder boot.
5. Remove the pedal stop snap ring with a screwdriver and remove the pedal stop assembly.
6. Remove the piston with the secondary cup.
7. Remove the primary cup.

After all parts have been removed from the main cylinder, they should be washed in CLEAN ALCOHOL. Special care should be taken to make sure that the compensating port in the main cylinder housing, and the bleeder holes of the piston are clean. BEFORE WASHING PARTS, HANDS MUST BE CLEAN. DO NOT WASH HANDS IN GASOLINE OR OIL BEFORE CLEANING HYDRAULIC BRAKE CYLINDER PARTS. USE SOAP AND WATER TO CLEAN HANDS.

The illustration, Fig. 23, shows a layout of the main cylinder parts.

Inspection

Inspect the cylinder bore to make sure it is smooth.

Inspect primary and secondary cups, valve and valve seat for damage or swelling. Replace when necessary. Swelling of the rubber parts is due to the use of improper brake fluid, or the washing of the parts in gasoline, or kerosene.

NOTE—The primary cup of the main cylinder has a brass support ring vulcanized in its base to prevent the primary cup from imbedding in the bleeder holes during braking action.

Check piston fit in the cylinder bore, see Fig. 24. The clearance between the piston and wall of the cylinder should be from 1 to 5 thousandths of an inch.

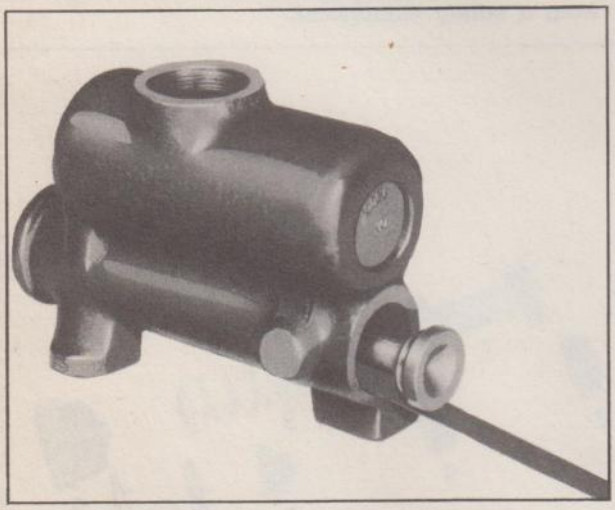


Fig. 24—Checking Main Cylinder Piston Fit

Check the clearance between the edge of the primary cup and the center of the compensating port, Fig. 25. In order to check this clearance accurately the main cylinder must be partially assembled as follows:

1. Install pedal stop assembly and lock in place with snap ring.
2. Assemble secondary cup on piston and install assembly in housing. Place the primary cup in the housing, with the flat side of the cup against the piston.
3. Push the piston and cup against the pedal stop and check the clearance between the edge of the primary cup and the center of the compensating port. This clearance should be a minimum of 35 thousandths of an inch. This check is made easiest by using a wire inserted through the reservoir of the housing and extending into the piston chamber, Fig. 25. If the clearance is less than 35 thousandths of an inch, the primary cup must be replaced with a new one.
4. After this clearance has been checked, the main cylinder must be again completely disassembled and reassembled according to the following directions.

Reassembly

Whenever a hydraulic brake master cylinder is being overhauled for any purpose, care must be taken to reassemble the valves and seats correctly. Improper assembly of the check valve seat rubber washer will result in its distortion. When the check valve seat is distorted, there will be no check valve seal and there will be a loss of brake pedal travel and the pedal must be depressed or pumped one or more times before actual car braking occurs.

In order to minimize the chances of distorting the check valve seat the following method of assembly is recommended:

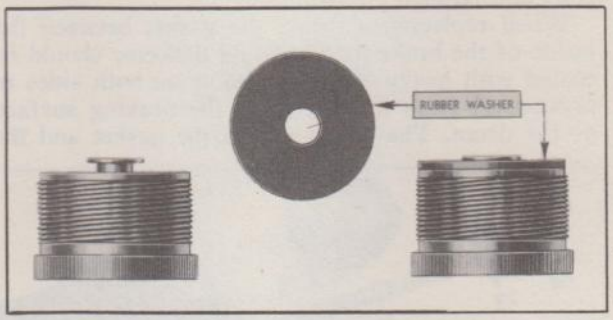


Fig. 25—Valve Seat Washer Assembly

1. Dip a new check valve seat washer in genuine hydraulic brake fluid, and assemble over the button on the end of the end plug, Fig. 25. Assemble a new gasket over the end plug and screw the end plug, valve seat washer and gasket into the main cylinder housing. Tighten the nut securely.
2. Inspect the valve seat washer through the push rod end of the housing to make sure the washer is properly seated.
3. Dip the rubber cups and valves in hydraulic brake fluid.
4. Install the valve assembly from the push rod end of the main cylinder.
5. Install piston spring.

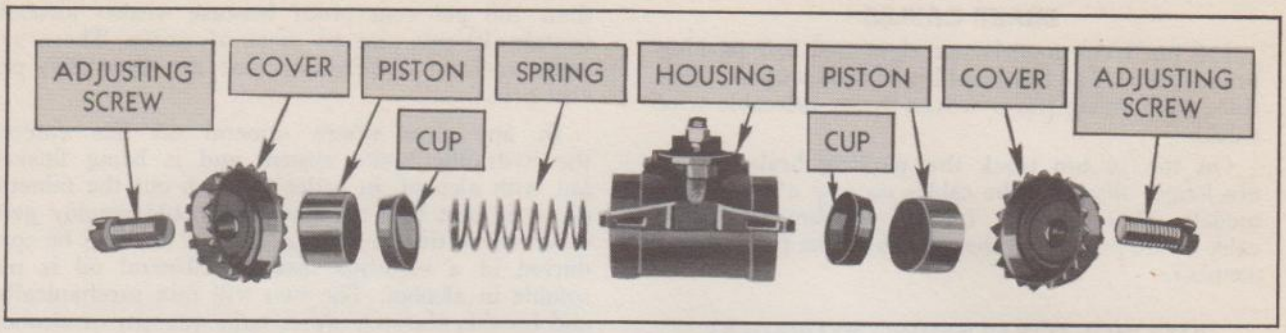


Fig. 26—Wheel Cylinder Parts Layout

6. Place the primary cup in the housing, with the cupped side against the spring.
7. Assemble secondary cup to the piston and install assembly to the housing so that the bleeder hole end of the piston will be against the flat side of the primary cup.
8. Install the pedal stop assembly and lock in place with the snap ring.
9. Install the rubber pedal stop boot, making sure this seal is tight on the housing and the vent hole in the boot is at the bottom. This seal must be tight to keep water and other foreign matter from entering the main cylinder through the pedal stop.
10. After the main cylinder has been assembled to to the chassis, it should be filled with genuine G. M. Super No. 9 hydraulic brake fluid, and all pipe lines at each wheel cylinder bled.

WHEEL CYLINDER OVERHAUL

Removal

In order to remove a hydraulic brake wheel cylinder the truck must be jacked up, the wheel and brake drum removed, the brake system wheel cylinder pipe or hose disconnected at the wheel, and the brake shoe retracting spring disconnected from the brake shoes. Two cap screws which hold the cylinder to the brake flange plate must be removed before the cylinder can be taken from the flange plate.

Fig. 27—Checking Wheel Cylinder Piston Fit

Disassembly

1. Remove the cylinder adjusting covers.
2. Remove the pistons, rubber cups and spring.
3. Wash all parts in CLEAN ALCOHOL. WASH YOUR HANDS BEFORE WASHING THE PARTS IN ALCOHOL. HANDS MUST BE CLEAN.

The illustration, Fig. 26, shows a layout of the wheel cylinder parts.

Inspection

1. Inspect the cylinder bore, making sure that it is smooth. A scored or damaged cylinder must be replaced.
2. Check rubber cups for damage or swelling due to improper brake fluid. Replace the cups when necessary. Improper brake fluid will cause the cups to swell as much as 40 per cent.
3. Check the fit of the piston in the cylinder bore, using a feeler gauge, Fig. 27. This clearance should be from 2 to 4 thousandths of an inch.

Reassembly and Replacement

1. Dip pistons and rubber cups in brake fluid.
2. Place the spring in the center of the housing, the rubber cups at each end of the spring, with their open face to the spring and the flat face of the cup flush with the piston.
3. Replace the adjusting covers with the adjusting screws in place.
4. Reassemble the wheel cylinder to the flange plate, connect the wheel cylinder pipe or hose and replace the brake shoe retracting spring, brake drum, and the wheel.

After a wheel cylinder has been overhauled and replaced, all hydraulic brake lines must be bled.

WHEEL CYLINDER SIZES AND IDENTIFICATION

Each brake has a specified wheel cylinder, depending on the area of the brake shoe. It is important that *only the specified wheel cylinder be used* at that wheel.

	Front	Rear
½ and ¾ Ton Truck	1¼"	1-3/16"
1½ Ton Truck	1¼"	1½"

The above sizes are stamped under the adjusting cup lock spring on each cylinder housing. The numbers stamped on the housing indicate the size of the piston.

BRAKE CABLES

1½ ton truck models use right and left parking brake cables. The left hand brake cable may be identified by a string tracer woven under the cable wire shield.

On the ½ ton truck the parking brake cables are longer than are the cables on any of the other models. This provides for the attachment of the cable to the pull rod at the pulleys on the frame cross member.

ALCOHOL FOR CLEANING HYDRAULIC BRAKE PARTS

We cannot recommend using any alcohol for cleaning the hydraulic brake system which is less than 188 per cent proof because weaker alcohols contain 10 per cent or more of water. There are some radiator antifreezes that are even 200 per cent proof.

In any case where mineral oil has entered the hydraulic brake system and is being flushed out with alcohol, in order to clean out the mineral oil, it is best that the flushing should employ generous quantities of alcohol and the flushing be conducted in a vigorous manner. Mineral oil is not soluble in alcohol. The two will mix mechanically, and for this reason a rather large quantity of alcohol, with considerable pressure behind it, must be used. Alcohol that has been used for cleaning out a system containing any mineral oil should never be used again.

BRAKE TROUBLES AND REMEDIES

Symptom	Probable Remedy
Brake Pedal	
1. Brake pedal "spongy."	1. Air in lines, bleed brakes.
All Brakes Drag	
1. Mineral oil in system.	1. Thoroughly wash out all lines and cylinders, and replace all rubber parts.
2. Improper toe-board clearance.	2. Adjust toe-board clearance. See Instructions.
3. Dirt in main cylinder compensating port.	3. Remove main cylinder and clean thoroughly. See Instructions.
One Brake Drags	
1. Loose wheel bearing.	1. Adjust wheel bearing.
2. Weak retractor spring.	2. Replace spring.
3. Brake shoes adjusted too close to drum.	3. Readjust brakes according to instructions.
Loose Brakes	
1. Normal lining wear.	1. Readjust brakes according to instructions.
2. Brake lining worn out.	2. Replace linings and readjust.
3. Fluid low in main cylinder.	3. Fill main cylinder and bleed all brake lines.
Brakes Uneven	
1. Oil on lining.	1. Thoroughly clean brake mechanism and install new lining.
2. Shoes tight on brake anchor.	2. Remove brake drum and free up shoes on anchor.
3. Tires improperly inflated.	3. Inflate tires according to specifications.
4. Spring center bolt sheared and spring shifted on axle.	4. Replace spring center bolt, relocate spring on axle.
Excessive Pedal Pressure, Poor Brakes	
1. Oil on lining.	1. Thoroughly clean brake mechanism and install new lining.
2. Full area of lining not contacting drum.	2. Sand shoes so linings contact drum properly.
3. Scored brake drum.	3. Turn drum, or replace it. If lining is badly scored, it should also be replaced.

TOOLS REQUIRED

The following tools manufactured by the Kent-Moore Organization or their equivalent are recommended for use when overhauling brakes:

Tool Number	*Description*
J-713C	Brake Main Cylinder Filler
J-747	Brake Bleeder Tube
J-718C	Brake Cylinder Clamps (Set of four)
KMO-142	Brake Spring Pliers
J-554	Hub Bolt Peening Tool
J-1280	Brake Tube Flaring Tool
KMO-3	Tube Cutter

BRAKE SPECIFICATIONS

SERVICE BRAKE TYPE....4-Wheel Hydraulic

HAND BRAKE TYPE.....Mechanical Linkage to Rear Brake Shoes

MAIN CYLINDER
- Mounting.....L.H. Frame Side Rail
- Size
  - ½ Ton .....1"
  - ¾ and 1½ Ton.....1¼"

FRONT WHEEL CYLINDER
- Size
  - All .....1¼"

REAR WHEEL CYLINDER
- Size
  - ½ and ¾ Ton ..... 1-3/16"
  - 1½ Ton ..... 1½"

BRAKE DRUM DIAMETER
- Front
  - ½ and ¾ Ton.....11"
  - 1½ Ton .....14"
- Rear
  - ½ and ¾ Ton.....11"
  - 1½ Ton .....16"
- Regrinding Limits..... .125" on Diameter

BRAKE LINING—FRONT
- Width
  - ½ and ¾ Ton.....1¾"
  - 1½ Ton .....2"
- Length
  - ½ and ¾ Ton.....11-5/16"
  - 1½ Ton .....14⅛"
- Thickness
  - ½ and ¾ Ton..... .187"—.194"
  - 1½ Ton Conventional..... .243"—.250"

BRAKE LINING—REAR
- Width
  - ½ and ¾ Ton.....1¾"
  - 1½ Ton .....3"
- Length
  - ½ and ¾ Ton.....11-5/16"
  - 1½ Ton .....17-37/64"
- Thickness
  - ½ and ¾ Ton..... .187"—.194"
  - 1½ Ton Conventional..... .243"—.250"

AREA—BOTH AXLES
- Service Brakes
  - ½ and ¾ Ton.....158¼ Sq. In.
  - 1½ Ton .....330¼ Sq. In.
- Hand Brakes
  - ½ and ¾ Ton.....79⅛ Sq. In.
  - 1½ Ton .....214¾ Sq. In.

MASTER CYLINDER
- Fluid Level .....Check Periodically
- Brake Fluid.....DuPont or Delco Super No. 9
- Piston Clearance ..... .001"—.005"

WHEEL CYLINDER
- Piston Clearance ..... .002"—.004"

FRONT SHOE ADJUSTMENT

From slight drag on drum back off 4 notches, adjusting screw at each end of wheel cylinder.

REAR SHOE ADJUSTMENT

From slight drag on drum back off 2/3 turn or 4 sides of hexagon head of adjusting bolt, adjusting bolt outside of shoe backing plate at each end of wheel cylinder.

HAND BRAKE ADJUSTMENT

With brake lever fully released, adjust clevis on end of pull rod to engage hole in idler lever when cables are pulled out of conduits by hand until a positive stop is felt.

PEDAL ADJUSTMENT
- Pedal to Toe-Board Clearance.....¼"