

GENERAL LUBRICATION

Lubrication of any vehicle is important to prevent damage to moving parts. Because all moving parts are not subjected to the same operating conditions, the lubricants specified are those which most nearly meet the requirements of the parts involved. In some places excessive heat or cold is a problem to overcome, in others it is extreme pressure, water, sand or grit. The type of operating surfaces must also be taken into consideration as parts rotate or oscillate on various types of bearings. Each of the above conditions in construction make necessary the application of the specified lubricant.

Lubricants should be applied regularly to secure maximum useful service from the vehicle. 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 in this section should be referred to for instructions on mileage of application, grade and quantity of lubricant required for all parts of the vehicle. A more detailed account of certain phases of lubrication is given in the following paragraphs.

ENGINE

Lubrication of the engine is accomplished by means of a force-feed continuous circulating system. This is effected by means of a planetary gear type pump located externally on the left side of the engine, and is driven by a spiral gear on the camshaft.

The oil is drawn into the circulating system through a floating oil intake. The floating intake does not permit water or dirt to circulate, which may have accumulated in the bottom of the oil pan, because the oil is drawn horizontally from the top surface. Oil pressure is maintained under all driving and climatic conditions.

Oil is forced to the crankshaft and camshaft bearings through drilled passages in the cylinder block and then to the connecting rod bearings through drilled passages in the crankshaft. A drilled passage in the crankshaft, from the front bearing to holes in the crankshaft sprocket provides positive lubrication for the timing chain. Direct spray from connecting rod bearings lubricates the cylinder walls, pistons, piston pins and the valve mechanism.

The pressure under which the oil is forced to the bearings is controlled by a pressure regulator or relief valve, located in the cover of the oil pump. The valve is set to relieve at an indicated pressure of 75 lbs. at a car speed of approximately 30 miles per hour, with warm oil, assuring ample lubrication at all speeds. An oil pressure gauge is mounted in the instrument panel, and indicates the pressure being supplied. Failure of the gauge to register may indicate absence of oil or leakage and the engine should be stopped immediately.

If there is plenty of oil in the reservoir, the oiling system should be carefully checked before starting the engine.

For capacity of the oiling system see Page 3. Care should be taken to replenish the supply when the oil level indicator, which is combined with the oil filler cap located in the oil filler pipe, shows the oil below the full mark, No. 6, Fig. 1. Fresh oil should be poured into the reservoir through the filler pipe sufficiently to bring level to full mark.

WHEN TO CHANGE CRANKCASE OIL

When the vehicle leaves the factory the crankcase is filled to the correct level with oil of the proper viscosity for the "break-in" period. (Decked vehicles in freight cars have engine oil drained and five quarts of oil in cans in freight car for each vehicle.)

At 500 miles and 1500 miles, then every 2500 miles thereafter completely drain the oil by removing the drain plug, in the lower left side of the oil pan and refill with 4 quarts of fresh lubricant, in accordance with specifications.

To insure continuation of best performance and long engine life, it is necessary to change the crankcase oil whenever it becomes diluted or contaminated with harmful foreign materials. Under the adverse driving conditions described in the following paragraphs, it may become necessary to drain the crankcase oil more frequently.

Vehicles operated in extremely dusty country, should have the oil drained both winter and summer, at 1,000 mile intervals or oftener, and extra precaution should also be taken to keep the carburetor airfilter clean and supplied with oil. The frequency of cleaning the Carburetor Oil Bath Air Cleaner depends upon severity of dust conditions and no definite refill periods can be recommended.

Thinning of the oil by unburned fuel leaking by the piston rings and mixing with the oil, is known as crankcase dilution.

Leakage of fuel into the oil pan mostly occurs during the "Warming-Up" period, when the fuel is not thoroughly vaporized and burned.

Short runs in cold weather do not permit thorough warming up of the engine and water may accumulate in the crankcase from condensation of moisture from piston blow-by.


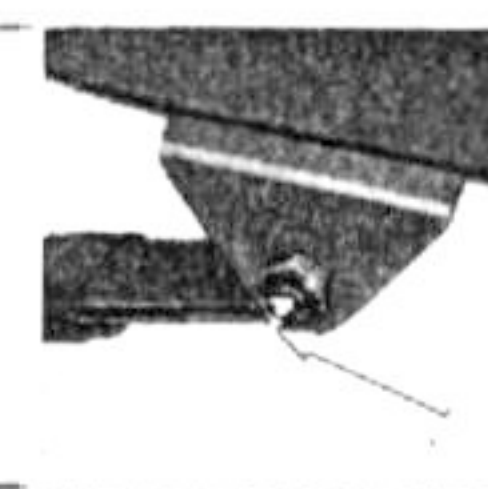

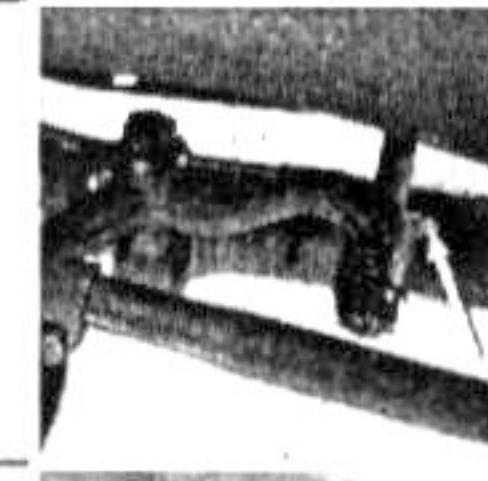


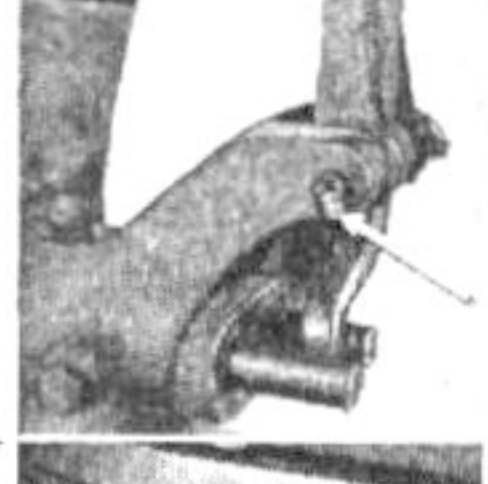
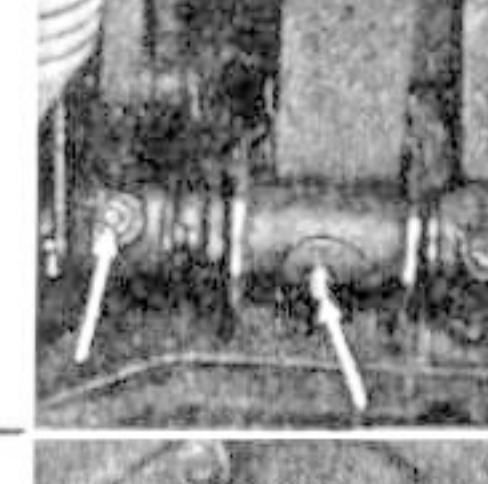

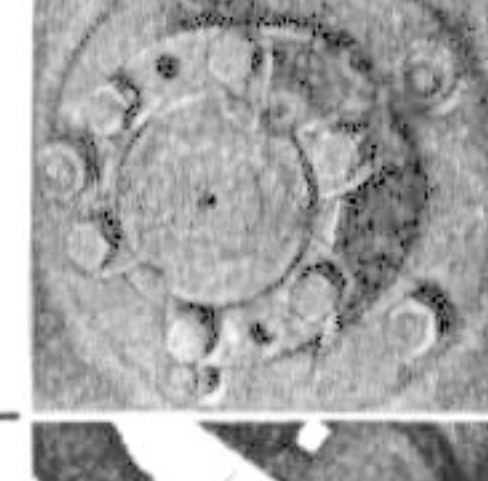


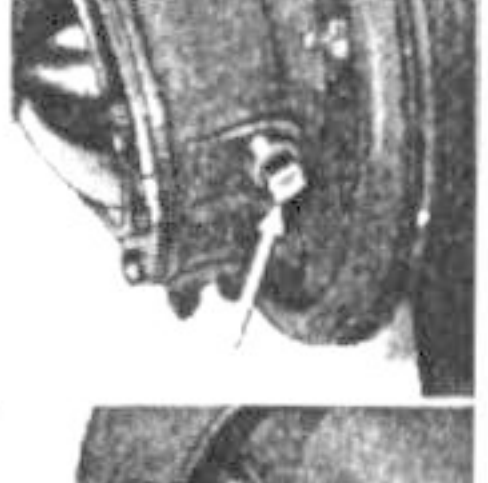

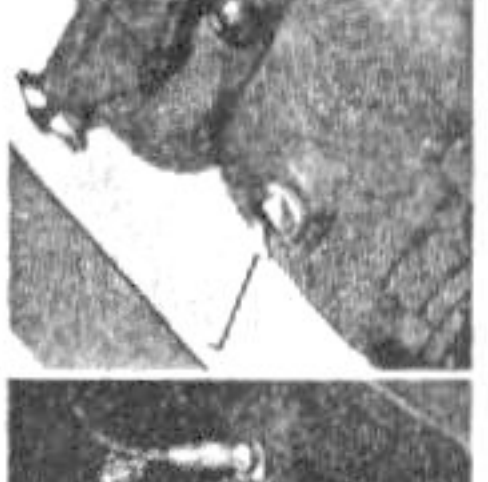
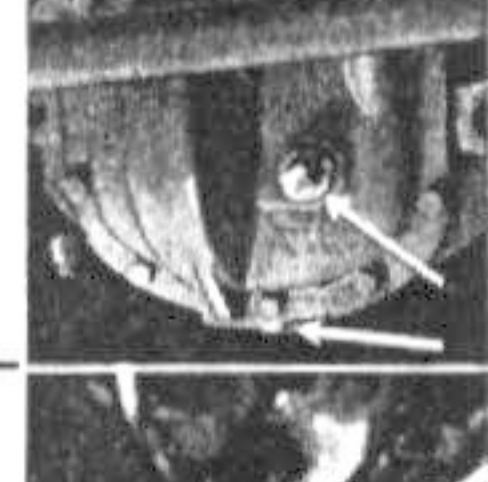




Practically all present-day engine fuels contain a small amount of sulphur which, in the state in which it is found, is harmless; but this sulphur on burning, forms certain gases, a small portion of which is likely to leak past the pistons and rings and reacting with water when present in the crankcase forms sulphurous acid. 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 manifests itself by broken valve springs and excessively rapid wear on piston pins, crankshaft bearings and other parts of the engine.

In view of these conditions it is necessary to drain the crankcase oil at regular intervals. It is always advisable to drain the oil when the engine is warm. The benefit of draining is, to a large extent, lost if the crankcase is drained when the engine is cold because some of the foreign material will remain in the bottom of the oil pan and will not drain out readily with the oil.

At least once a year, preferably in the Spring, the oil pan and floating oil intake should be removed from the engine and thoroughly washed with cleaning solution.

Lubrication Chart Index

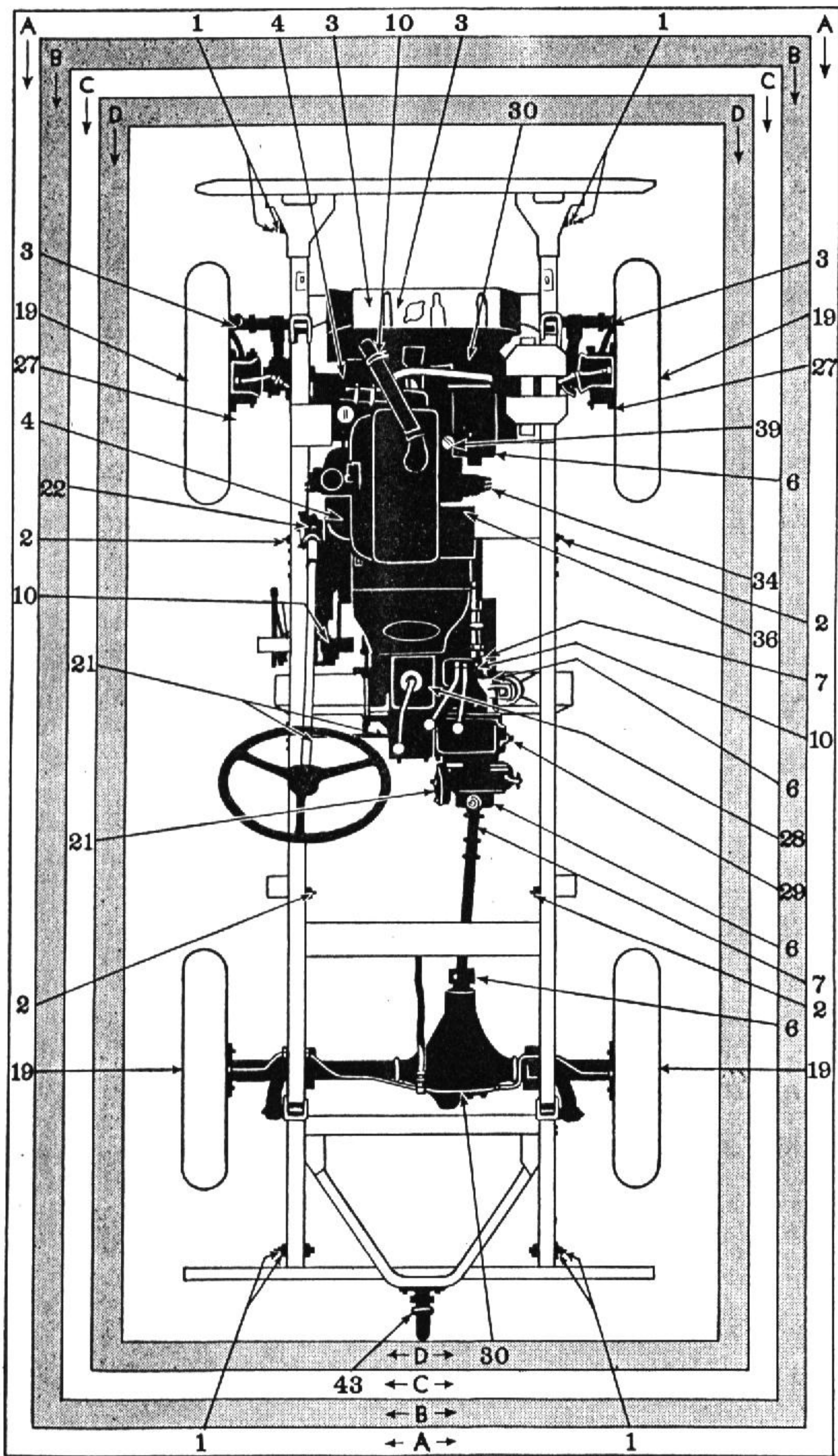
See Page 13 for Details

<p>1—Spring Shackle (4) 2 hydraulic fittings Pressure gun Chassis grease #1</p>		<p>2—Spring Bolt (5) 1 hydraulic fitting Pressure gun Chassis grease #1</p>	
<p>3—Tie Rod (2) 2 hydraulic fittings Pressure gun Chassis grease #1</p>		<p>4—Drag Link 2 hydraulic fittings Pressure gun Chassis grease #1</p>	
<p>6—Universal Joint Needle Bearings (4) 1 hydraulic fitting in center Pressure gun (hand) & adapter Mineral oil gear lubricant</p>		<p>7—Slip Joint (2) 1 hydraulic fitting Pressure gun Chassis grease #1</p>	
<p>10—Lever Shaft Transfer case shift 1 hydraulic fitting Pressure gun Chassis grease #1</p>		<p>10—Lever Shaft Clutch and brake pedal 2 hydraulic fittings Pressure gun Chassis grease #1</p>	
<p>10—Lever Shaft Steering belcrank 1 hydraulic fitting Pressure gun Chassis grease #1</p>		<p>19—Wheel Bearings (4) Remove and repack Chassis grease #1</p>	
<p>21—Linkage All clevis pins Oil can Engine oil</p>		<p>22—Steering Gear Housing 1 plug Pressure gun (hand) Chassis grease #1</p>	
<p>27—Front Axle Universal (2) 1 plug—fill to level Pressure gun Chassis grease #1</p>		<p>28—Transmission 1 fill and 1 drain plug Pump Mineral oil gear lubricant</p>	
<p>29—Transfer Case 1 fill and 1 drain plug Pump Mineral oil gear lubricant</p>		<p>30—Axle Housing (2) 1 fill and 1 drain plug Pump Hypoid gear lubricant</p>	
<p>34—Distributor 1 oiler—1 wick—1 post Oil can Engine oil Grease cam</p>		<p>36—Starter 1 oil hole Oil can Engine oil</p>	
<p>39—Crankcase 1 fill pipe and 1 drain plug Oil can Engine oil</p>		<p>40—Pintle Hook 2 points Oil can Engine oil</p>	

LUBRICATION CHART

1/4 Ton 4 x 4 Chassis
Hydraulic Brakes

**Make Willys
Model MB**



- 1—Spring Shackle
- 2—Spring Bolt
- 3—Tie Rod
- 4—Drag Link
- 6—Universal Joint Needle Bearings
- 7—Slip Joint
- 10—Lever Shaft—Transfer Case Shift
- 10—Lever Shaft—Clutch Shaft and Brake Pedal
- 10—Lever Shaft—Steering Belcrank
- 19—Wheel Bearings
- 21—Linkage
- 22—Steering Gear Housing
- 27—Front Axle Universal
- 28—Transmission
- 29—Transfer Case
- 30—Axle Housing
- 34—Distributor
- 36—Starter
- 39—Crankcase
- 40—Pintle Hook

TOOLS

- Cleaning Rag
- Adjustable Wrench
- Square Shank Wrench, 3/8"
- Wheel Bearing Nut Wrench
- Screw Driver

INSTRUCTIONS

Clean and lubricate all points in the order indicated, except those which require disassembly. Clean all vents. Check and adjust level in housings. Disassemble as separately instructed. Drain as separately instructed. See page 13.

FIG. 1—CHASSIS

Predominating Temperature

	Above 32° F.	Between 32° F. and 0° F.	Below 0° F.
Chassis Grease	# 1	# 1	# 1
Gear Lubricant.....	90	90	80
Engine Oil.....	30	10W	10W plus 10% Kerosene

- Frame A—Chassis Lubricant
- Frame B—(Mineral Oil) Gear Lubricant.
- Frame C—Engine Oil
- Frame D—(Hypoid) Gear Lubricant.

LUBRICATION CHART

U. S. GOVERNMENT

For Canadian and British Lubrication
Specifications see reverse side of Index
Page in front of Manual.

ITEM TO BE LUBRICATED See Page 10 & 11	HOW APPLIED	Capacity	GRADE RECOMMENDED						MILES
			Winter			Summer			
			SAE	Navy	Army	SAE	Navy	Army	
Engine Crankcase (39)	Filler pipe R. side check level daily	Refill 4 qts	10W	1042		30	1065		2500
*Transmission Case (28)	Filler plug R. side—add Oil to level of plug	2 pts	90	1100		90	1100		6000
Transfer Case (29)	Filler plug—add oil to level of plug	3 pts	90	1100		90	1100		6000
Differential F. & R. (30)	Filler plug in cover—add Hypoid oil to level of plug	2½ pts	90EP		Fed. Spec. VVL 761 Class 2	90EP		Fed. Spec. VVL 761 Class 2	6000
Propeller Shaft Universal Joints F & R (6)	Fitting		140	1120		140	1120		1000
Air Cleaner	Remove Cover	1¼ pt	10W	1042		30	1065		2000
Front Axle Shaft Universal Joint & Steering Knuckle Bearings (27)	Filler plug outer casing	½ lb	NLGI No. 1		NLGI No. 1	NLGI No. 1		NLGI No. 1	1000
F & R Wheel Bearings (19)	Remove and Repack		NLGI No. 1		NLGI No. 1	NLGI No. 1		NLGI No. 1	6000
Steering Gear Housing (22)	Remove Plug	6½ oz	NLGI No. 1		NLGI No. 1	NLGI No. 1		NLGI No. 1	1000
Steering Bell Crank (10) Steering Tie Rods (3) Steering Connecting Rod (4) Spring Shackles F & R (1) Spring Pivot Bolts F & R (2) Clutch & Brake Pedal Shaft (10) Propeller Shaft Slip Joints (7)	Fitting Fitting each end Fitting each end Fittings 8 Fittings 2 Fittings 5 Fitting 1 each		Lubricate with NLGI No. 1 Summer & Winter						1000
Starter Front (36)	Oil Hole	5 Drops	10W	1042		30	1065		1000
Distributor (34)	Oil Cup on side	5 Drops	10W	1042		30	1065		1000
Distributor Shaft Wick (34)	Oil Can	1 Drop	10W	1042		30	1065		2500
Distributor Arm Pivot (34)	Oil Can	1 Drop	10W	1042		30	1065		2500
Distributor Cam (34)	Wipe with grease		NLGI No. 1		NLGI No. 1	NLGI No. 1		NLGI No. 1	2500
Clevis Pins, Yokes & Cables (21)	Oil Can	5 Drops	10W	1042		30	1065		1000
Pintle Hook (40)	Oil Can	5 Drops	10W	1042		30	1065		1000
Hydraulic Brake System	Oil Can	¾ Pts.	Lockheed No. 21 Brake Fluid						

*Remove Skid Plate to drain Transmission Shock Absorbers Non-Refillable

See Page 3 for Imperial and Metric qualities

The following table shows at a glance the specification of oil to use in the engine according to temperature conditions:

	GRADE
Above 90° Fahr.....	30
Not lower than 32° above zero Fahr.....	20 or 20W
As low as 10° above zero Fahr.....	20W
As low as 10° below zero Fahr.....	10W
Lower than 10° below zero Fahr.....	10W plus 10% Kerosene

Always select an oil with a temperature range which agrees as closely as possible with the outdoor temperature range likely to be encountered. When the crankcase is drained and refilled, the oil should be chosen, not on the basis of the existing temperature at the time of change, but on the minimum temperatures that might reasonably be expected until time to change the oil again.

In warm weather, light oil tends to be used up a little faster than heavier oil; accordingly heavier oil is recommended for Summer use. In cold weather, however, it is important to use a light oil so that the engine can be started easily and to assure an adequate, early flow of oil to every part of the engine when first started and cold.

CHASSIS LUBRICATION

All hydraulic lubrication fittings indicated by No. 1-2-3-4 & 10 in Fig. 1 should be wiped clean and gone over with a compressor every 1,000 miles.

Make certain that each bearing surface is properly lubricated. All clevis pins, yokes and upper end of hand brake conduit should be oiled.

STEERING GEAR

Check level of lubricant in steering gear housing No. 22, Fig. 1, every 1,000 miles, keeping it filled at all times with NLGI No. 1 lubricant. Avoid the use of cup grease, graphite, white lead or heavy solidified oil.

Remove plug in steering housing and with a hand gun fill the housing slowly. When housing is full, replace the filler plug.

FAN AND WATER PUMP

The fan and water pump bearings are prelubricated and the lubricant lasts for the life of the bearings.

IGNITION DISTRIBUTOR

The oiler, on the distributor indicated by No. 34 in Fig. 1, should be lubricated every 1,000 miles with several drops of engine oil.

Every 2,500 miles when engine oil is changed apply a drop of light engine oil on the wick located in the top of the shaft which is accessible by removing the rotor arm. Also put a wipe of soft grease on the breaker arm cam, and a drop of oil on the breaker arm pivot.

GENERATOR

The Generator Bearings are prelubricated and require no attention.

STARTER

The oil hole cover on Commutator (Front) End slips to one side; 3 to 5 drops of medium engine oil is recommended every 1,000 miles, No. 36, Fig. 1. Be sure to slip cover back in place.

UNIVERSAL JOINTS—(Propeller Shaft)

Every 1,000 miles lubricate the propeller shaft universal joints with a hand gun and adaptor using S.A.E. 140 No. 6, Fig. 1. Use NLGI No. 1 in the slip joint, No. 7, Fig. 1.

UNIVERSAL JOINTS—(Front Axle Shaft)

Front axle shaft universal joints should be checked every 1,000 miles thru plug hole in rear of housing and add NLGI No. 1 lubricant to level of filler plug. Every 12,000 miles remove, clean, inspect and refill with 1/2 lb. No. 27, Fig. 1.

WHEEL BEARINGS

Wheel Bearings should be removed, thoroughly cleaned and repacked every 6,000 miles, No. 19, Fig. 1, using NLGI No. 1 lubricant

TRANSMISSION AND TRANSFER CASE

Transmission and Transfer cases are filled with S.A.E. 90 mineral oil lubricant at the factory, this being satisfactory for "year round" use except where extremely cold temperatures are experienced in which case use S.A.E. 80 or the oil should be diluted 10% to 20% with Kerosene. It should be checked each 1,000 miles when vehicle is lubricated and renewed each 6,000 miles. See Fig. 1, No. 28 and Fig. 29. To drain transmission remove skid plate. Lubricate transfer case shift lever shaft hydraulic fitting with NLGI No. 1 lubricant.

FRONT AND REAR AXLE

Hypoid gears require extreme pressure lubricant, therefore the lubricant manufacturers have developed a special lubricant, which is suitable for hypoid axles.

The level of the lubricant in these units should be checked every 1,000 miles. Do not mix different types of Hypoid Lubricants.

Seasonal changes of lubricant are not required except where extremely cold temperatures are experienced in which case use S.A.E. 80 or the oil should be diluted 10% to 20% with Kerosene. It is recommended that the housings be drained and refilled with 2 1/2 pts. of S. A. E. 90 EP lubricant at least twice a year or every 6,000 miles. Use a light engine oil or flushing oil to clean out housings. See Fig. 1, No. 30.

Note—Do not use water, steam, kerosene, or gasoline for flushing.

AIR CLEANER

Each engine oil change or oftener, when vehicle is operated in sandy or dusty areas, remove, clean and refill oil cup to indicated oil level. See Lubrication Chart on Page 12. To clean element, see Page 50.

PERIODIC INSPECTION

OPERATION	Daily	Each 1000 Miles	Each 8000 Miles	12,000
Front Axle				
Check Wheel Alignment.....		X		
Inspect Tie Rod Ends for Wear.....		X		
Inspect Steering Arms for Tightness.....		X		
Inspect Steering Knuckle Bearings and Oil Seals for Looseness and Wear.....		X		
Check Axle Shaft Universal Joints for Wear.....			X	
(Make same Inspections as for Rear Axle).....				
Rear Axle				
Check Axle Shaft Flange Bolts for Tightness.....		X		
Check Wheel Bearings for Looseness and Wear.....		X		
Inspect for Oil Leaks at Pinion Shaft Oil Seals.....		X		
Check Axle Housing Cover Bolts.....		X		
Inspect Axle Shaft Oil Seals for Grease Leak.....		X		
Check for End Play in Pinion Shaft.....		X		
Check Universal Joint Flanges for Looseness.....		X		
Body				
Check Body Bolts.....		X		
Brakes				
Inspect Fluid Supply in Master Cylinder.....		X		
Make Visual Inspection of Brake Lines and Hoses.....	X			
Test Service Brakes; adjust if necessary.....	X			
Remove Wheels; inspect brake lining.....			X	
Flush entire system with new fluid.....				X
Check Brake Pull Back Springs.....		X		
Test Hand Brake.....	X			
Clutch				
Check Free Pedal Travel; adjust when necessary.....	X			
Check Adjustment on Clutch Cable to determine when Driven Plate is required—(Last adjustment).....		X		
Cooling				
Check Water in Radiator.....	X			
Test Anti-Freeze Solution (During Winter).....	X			
Check Fan Belt for Tension.....	X			
Inspect Radiator Hoses and Connections.....	X			
Check Water Pump for Leaks.....	X			
Check Temperature Gauge.....	X			
Flush System Twice a year. Before and after using Anti-Freeze; test Thermostat; replace Radiator Hoses.....				X
Battery				
Check Gravity and add Distilled Water every 2 weeks				
Check Terminals.....		X		
Check and Tighten Ground Straps.....		X		
Check Hold Clamp Bolts.....		X		
Wiring				
Inspect all Connections.....		X		
Inspect for Chaffed or Broken Wires.....		X		
Inspect Retaining Clips and Grommets.....		X		

PERIODIC INSPECTION—Continued

OPERATION	Daily	Each 1000 Miles	Each 6000 Miles	12,000
Starting Motor				
Clean Commutator with .00 Sand Paper.....			X	
Check Brushes for Wear and Tension.....			X	
Check Mounting Bolts for Tightness.....			X	
Overhaul.....				X
Clean Bendix Drive.....				X
Check Cable Connections.....			X	
Generator				
Clean Commutator with .00 Sand Paper.....			X	
Check all Terminals.....			X	
Check Brushes for Wear and Tension.....			X	
Overhaul.....				X
Check Voltage Regulator.....			X	
Lights and Switches				
Check Operation of Lights.....	X			
Horn				
Check for operation.....	X			
Distributor and Spark Plugs				
Clean and Adjust Distributor Points and Spark Plug Gaps.....			X	
Replace Plugs.....				X
Check and Test Condenser.....			X	
Overhaul Distributor.....				X
Check Timing.....			X	
Check Automatic Spark Advance.....			X	
Clean Distributor Cap—Terminal Towers.....			X	
Test Coil (Heat Test).....				X
Engine				
Check Cylinder Head Nuts and Bolts.....			X	
Check Manifold Nuts and Gaskets.....		X		
Check Oil Pan Bolts; Check for Oil Leaks.....		X		
Check Compression.....			X	
Check Tappet Clearance.....			X	
Check Engine Mounting Bolts and Nuts.....			X	
Check Oil Pressure Gauge Reading.....	X			
Check Oil Level. (Add Necessary).....	X			
Remove and Clean Oil Pan and Floating Intake.....				X
Change Oil Filter.....				X
Definite Periods for Major operations or overhauling cannot be predetermined. They are dependent upon service to which Engine has been subjected.				
Fuel System				
Remove, clean and refill air cleaner.....		X		
(Vehicles operated in Dusty or Sandy regions, the air cleaner should be inspected and cleaned if necessary).....	X			
Clean Fuel Pump Sediment Bowl and Strainer.....		X		
Clean Fuel Filter.....		X		
Tighten Carburetor Flange to Manifold Nuts.....		X		
Check Carburetor Adjustments.....		X		
Inspect all Fuel Lines and Connections for leaks.....		X		

PERIODIC INSPECTION—Continued

OPERATION	Daily	Each 1000 Miles	Each 6000 Miles	12,000
Fuel System				
Test Fuel Pump Pressure.....			X	
Overhaul Carburetor and adjust.....			X	
Drain Fuel Tank and Flush out Sediment.....				X
Lubrication				
Refer to Lubrication Chart.....	X	X	X	X
Springs				
Inspect Spring Clips to Axle for Tightness.....		X		
Inspect Spring Shackles and Bushings.....		X		
Check condition Front and Rear Springs.....		X		
Shock Absorbers				
Inspect Mounting Bushings, replace when necessary.....		X		
Inspect Mounting Brackets.....		X		
Check for Control (off car) adjust or replace.....				X
Steering System				
Check Steering System (Loss Motion).....	X			
Inspect Steering Connecting Rod, Ball and Sockets.....		X		
Check Steering Post Bolts to frame.....		X		
Check Steering Pitman Arm Nut.....		X		
Transmission and Transfer Case				
Inspect for Oil Leaks.....		X		
Check Transmission to Bell Housing Bolts.....			X	
Check Oil Seals at Propeller Shafts.....		X		
Universal Joints				
Check Flange Nuts.....		X		
Inspect Joint Bearings for wear.....		X		
Wheels and Tires				
Check Tire Pressures.....	X			
Tighten Wheel Hub Bolt Nuts.....		X		
Remove Wheel Bearings, inspect, replace worn or chipped cups or cone repack and adjust.....			X	
Check Tire Wear, check toe-in, caster and camber.....		X		

Inspection

The importance of regular inspection cannot be over-emphasized. Making adjustments, tightening bolts, nuts and wiring connections when needed, will go far towards avoiding trouble and delay on the road and uphold the high standards of reliability and performance built into the vehicle by the Manufacturer.

After maneuvers involving operations in swamps and streams inspect for water and sludge in engine, transmission, transfer case, front and rear axles, wheel bearings and front universal joints.