

Lock Your Car

Your Jeep is equipped with an Ignition Lock to protect it against theft.

Locking is a part of parking. The ignition switch is operated by a key which should be removed after turning off the ignition.

CAUTION: Every owner should record the number of the ignition lock key so that in case the keys are lost others may be obtained by number. See Page 6.

Willys-Overland

OWNER'S MANUAL

Universal Jeep
Model CJ-3A

FIRST EDITION

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Willys-Overland Motors

Willys-Overland Export Corporation
Toledo, Ohio, U. S. A



THE UNIVERSAL JEEP (FOUR WHEEL DRIVE), MODEL CJ-3A

Foreword

IN YOUR possession is a motor vehicle that has been thoroughly tested and inspected. Like any other piece of machinery, to maintain it in first class condition, you should lubricate it at the time prescribed with the proper grade of oil and grease and keep all working parts and oil holes clean and free from dirt and grit. You should also periodically have it systematically inspected at an Authorized Willys-Overland Service Station.

In the following pages we have set forth the knowledge every owner should have of his vehicle, that he may know how to take the best care of it and handle it in such a way that he will get maximum service. Information is also made available covering external adjustments and minor emergency repairs. Read and follow these instructions carefully; we are sure that you will then enjoy the satisfactory operation that you rightfully anticipate.

Should adjustment or repair seem necessary beyond your ability, don't experiment; have the work done by a competent repair man. It will always prove best and cheapest in the end to have the work done by the Dealer from whom you purchased your car. Many Willys-Overland Dealers have factory trained mechanics and all are familiar with the construction and adjustments through the cooperation of the Manufacturer.

Do not attempt any adjustments as long as the vehicle is operating satisfactorily.

Be sure to obtain the Owner Service Policy, provided by your Dealer on delivery of your new vehicle.

Caution

Accept and use only Genuine Factory Parts

Imitation parts are usually of inferior quality and can do serious damage to other mechanical parts of your vehicle.

Genuine parts are sold by all authorized Willys-Overland Dealers. Be sure none other than genuine parts are placed in your vehicle.

Presence of parts other than those furnished by Willys-Overland will void the manufacturer's Warranty.

NOTE: Parts replaced under the terms of the Warranty (Page 4) must be left with the Willys-Overland Dealer who makes the replacement, if full credit is expected.

This is important for Owners to know, when traveling outside the territory in which their vehicle was originally purchased, particularly when credit for old parts cannot be established to the satisfaction of the Dealer.

In this connection, a forwarding address should be given by the Owner in order to insure the credit reaching him.

Standard Warranty

THE only Warranty under which new Willys-Overland Motor Vehicles are sold is that of the Manufacturer, being the Standard Warranty recommended by the Automobile Manufacturer's Association, and is as follows:

"This is to certify that we, WILLYS-OVERLAND MOTORS, INC., TOLEDO, OHIO, U.S.A. warrant each new motor vehicle manufactured by us, to be free from defects in material and workmanship under normal use and service, our obligation under this Warranty being limited to making good at our factory any part or parts thereof, including all equipment or trade accessories (except tires) supplied by the Car Manufacturer, which shall, within ninety (90) days after making delivery of such vehicle to the original purchaser or before such vehicle has been driven 4000 miles (6400 Km.), whichever event shall first occur, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on our part, and we neither assume nor authorize any other person to assume for us any other liability in connection with the sale of our vehicles. This warranty shall not apply to any vehicle which shall have been repaired or altered outside of an Authorized Willys-Overland Service Station in any way so as, in the judgment of the Manufacturer, to affect its stability or reliability, nor which has been subject to misuse, negligence or accident."

The Manufacturer makes no warranty against, nor assumes any liability for any defect in metal or other material in any part, device or trade accessory which cannot be discovered by ordinary factory inspection.

WILLYS-OVERLAND MOTORS, INC.

NOTE—Willys-Overland Motors, Inc., reserves the right at any time or times to revise, modify, discontinue or change any models of its vehicles, or any part or parts thereof, without notice; and, without it or the Seller, incurring any liability or obligation to the Purchaser.

General Data

Engine—Model	CJ-3A	
Number of Cylinders	4	
Bore	3-1/8"	79.37 mm.
Stroke	4-3/8"	111.12mm
Piston Displacement	134.2 cu. in.	2199.53 cc
Compression Ratio	6.48 to 1	
Horsepower SAE	15.6	
Horsepower Actual	60	
Revolutions per minute	4000	
Torque ~Maximum Lbs. Ft	105	14.5 kg.m
Revolutions per minute	2000	
Wheelbase	80"	203.2 cm.
Tread	48-1/4"	122.55 cm
Overall Width	68-25/32"	174.703 cm
Overall Height—Top up	69-7/32"	175.81 cm
—Top down	53-1/2"	135.89 cm
Overall Length	126-25/32"	322.023 cm
Road Clearance	8-3/32"	20.556 cm
*Weight Maximum Pay Load	800 lbs.	362.88 kg
Shipping (Less water, oil and fuel)	2110 lbs.	955.83 kg
Curb (Including water, oil and fuel)	2203 lbs.	997.95 kg
Gross (Loaded)	3500 lbs.	1585.50 kg
*If equipped with aluminum full enclosure add 55 lbs. . (24.95 kg.)—if aluminum cab only add 40 lbs. (18.14 kg.).		
Maximum Approved Draw Bar Pull (Continuous Operation)	1200 lbs.	544.32 kg
Fuel Tank Capacity	10.5 gals.	39.74 liters
Cooling System Capacity	11 qts.	10.41 liters

LAMP BULBS

Head Lamp (7 in. Sealed Beam Type)	
Upper Beam	45 watts
Lower Beam	35 watts
Parking Lamp Bulb	3 CP-SC- -No. 63
Tail and Stop Lamp Bulb	21-3 CP-DC —No. 1158
Instrument Lamp Bulb	2 CP-SC---No. 55.
Fuse (Thermal Type)—On Light Switch	30 Amperes
Location of Serial Number: Plate on right side of dash under hood.	
Location of Engine Number: Stamped on water pump boss.	

Inspection

Your Jeep was carefully lubricated and inspected at the factory and again thoroughly serviced by the Selling Dealer.

After your vehicle has been operated 1000 miles (1600 Km.) and also 2000 miles (3200 Km.), return it to your Dealer for the free inspections in accordance with Factory Service Policy. These inspections are free with the exception of engine oil and anti-freeze solution used.

Free Inspection

1000 Mile (1600 Km.)

2000 Mile (3200 Km.)

Check steering system and front wheel alignment.
 Check spring clip nuts and spring shackles.
 Check rear axle for oil and leaks.
 Adjust body bolts.
 Test service and hand brakes—Inflate tires.
 Check cooling system for leaks and anti-freeze and fan belt adjustment.
 Adjust clutch pedal.
 Check operation of transmission and transfer case—Check for oil level and leaks.
 Check battery, generator output, headlamps and horn.
 Tighten universal joint companion flange bolts.
 Check operation of ammeter, heat indicator, fuel and oil gauges.
 Tighten cylinder head nuts—Check timing and distributor points.
 Set spark plugs—Adjust carburetor—Check throttle controls.
 Check engine for oil leaks—Check fuel line connections.
 Adjust valve tappets, if required.
 Change engine oil (charge for oil)—Lubricate vehicle.
 Clean and refill, air cleaner.
 Clean fuel pump sump and strainer.
 Check extra equipment attaching screws—Check for oil level and leaks.

FILL IN FOR YOUR REFERENCE

Vehicle Serial Number

Engine Serial Number

Purchase Date

Ignition Key Number

SPECIAL PRECAUTIONS

There are several points of difference between the Universal Jeep and a conventional vehicle to receive attention. As a general precaution and for your information we are listing these "cautions" below:

The Jeep is equipped with a transfer case and four-wheel drive to provide additional traction and a lower gear ratio for use on difficult terrain. Use the front wheel drive only when necessary. Consider the front wheel drive and the transfer case as a lower gear ratio than the standard transmission low gear and use it only when greater power is required.

The use of four-wheel drive on hard surfaced highways will result in rapid tire wear and hard shifting of the transfer case, particularly when the front wheels are steered even at a slight angle from the straight ahead position. If hard shifting occurs, disengage the clutch, start engine, shift transmission into reverse gear, back vehicle a few feet, and disengage clutch. If transfer case is in low range, shift into high then shift front axle drive into "out" position (lever forward).

Two drain cocks are provided to drain the cooling system. A drain cock is located under the left side of the radiator, however, it is necessary to drain the cylinder block separately. The cylinder block drain is located at the right front corner of the block directly under the generator. Loosen the radiator filler cap to break the seal and permit complete draining.

Check the level of the lubricant often in the transmission and transfer case. Be sure the lubricant is at filler level in both units at all times.

As a standard, the clutch pedal is adjusted with 114" (31.75 mm.) free travel. As the clutch wears this becomes less. Be sure that there is free travel at all times to prevent continuous operation of the clutch release bearing and rapid wear and slippage of the clutch. This adjustment is made by lengthening or shortening the clutch control cable.

The ventilator valve, mounted in the intake manifold, must be free to operate. If it is stuck open very uneven engine operation at low speed will result.

Be sure the exhaust manifold heat control valve is free at all times and the thermostatic control spring is above the stop.

Six screws are used to attach the front wheel brake backing plate and spindle to the spindle housing. These screws are standard in dimensions and thread pitch, however, they are made of special steel and receive special heat treatment. Safety demands that only genuine factory screws be used at this point.

Proper Operation

DRIVING A NEW "JEEP"

Do not run your "Universal Jeep" faster than 40 miles an hour (64 Km. /h.) for the first 500 miles (800 Km.) or if used on the farm or for industrial operation, use care when pulling heavy loads in the lower gear ratios. If the vehicle is operated at high speeds while new or used for heavy pulling for a long period, the closely fitted parts might possibly become overheated, resulting in scored pistons, cylinders or burned bearings. During its entire life, never race the engine while making adjustments or when the vehicle is standing idle. If the vehicle is not properly lubricated, our Warranty is null and void. Be sure to have your Willys-Overland Dealer inspect your vehicle at the end of 1000 miles (1600 Km.) or equivalent usage and again at 2000 miles (3200 Km.).

TO MAKE VEHICLE READY.

Fill the radiator with clean, soft water. Put gasoline in the tank.

Fill the oil reservoir through the filler pipe at right side of engine until the oil indicator stick registers "FULL". (See "Lubrication Chart", Page 36). Supply all parts requiring lubrication with oil or lubricant.

See that the tires have proper pressure (See Tire Pressure, Page 51).

Adjust the rear view mirror to correct position for driver. If adequate view is not obtainable, the mirror may be adjusted by loosening the screw through the mounting bracket or by tilting in the ball and socket connection.

CONTROLS AND SWITCHES

The position of all controls and switches is shown in Fig. 1.

The horn is operated by pressing the button located at the top center of the steering wheel.

The main light switch No. 27 controlling all lights is conveniently located on the instrument panel to the left of the steering post. It is of the plunger type—pull all the way out for the "full on" position, half-way for "parking" and all the way in is the "off" position.

In addition to the main light switch, the high and low beams of the head lamps are controlled by a selector foot switch, located on the toe board to the left of the clutch pedal. Pressing and releasing the switch button, with the foot, alternately changes the beam from high to low and vice versa.

TO START ENGINE

Put the transmission gearshift lever No. 12, Fig. 1 in neutral. Place the transfer case low and high shift lever No. 17 in direct gear or in the rear position and disengage the front axle drive by placing the shift lever No. 16 in the forward position.

Pull the choke control button No. 8 one-fourth of the way out which also opens the throttle slightly. Place the key in ignition lock No. 29 and turn it to the right, closing the ignition circuit. Disengage the clutch by depressing the pedal. Depress the foot starting switch No. 15. Should the engine fail to start at once, pull the choke all the way out and press the starting switch. When the engine starts, push the choke in about one-third of the way. Set the choke control at the best operating position and as the engine warms up, push the choke all the way in. Do not run with the choke out as fuel is wasted and the engine fouled. Should the engine fail to start, see the "Emergency Chart", Page 54.

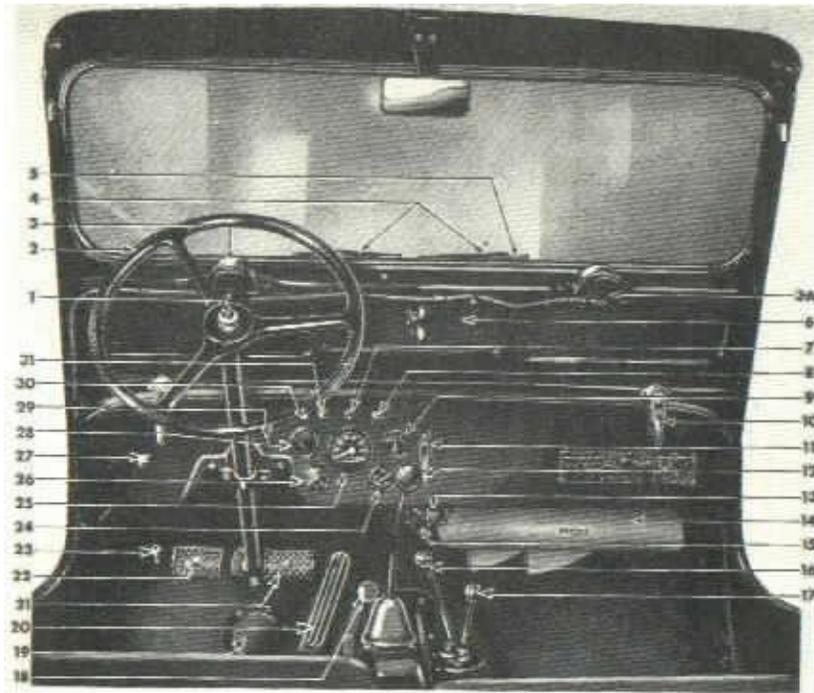


FIG. 1—VEHICLE CONTROLS

- | | |
|--|---|
| 1—Horn Button | 16—Front Axle Drive Shift Lever |
| 2—Steering Wheel | 17—Underdrive Shift Lever |
| 3—Windshield Wiper Motor, Left | 18—Accelerator Foot Rest |
| 3A—Windshield Wiper Motor, Right (Extra Equipment) | 19—Brake Master Cylinder Inspection Plate |
| 4—Windshield Wiper Arms | 20—Accelerator Pedal |
| 5—Windshield Wiper Blade | 21—Brake Pedal |
| 6—Ventilator | 22—Clutch Pedal |
| 7—Instrument Panel Light | 23—Headlight Dimmer Switch |
| 8—choke control | 24—Heat Indicator Gauge |
| 9—Ammeter | 25—Speedometer |
| 10—Windshield Clamp | 26—Oil Gauge |
| 11—Hand Brake Handle | 27—Main Light Switch |
| 12—Transmission Shift Lever | 28—Fuel Gauge |
| 13—Heater Switch | 29—Ignition Switch |
| 14—Heater (Extra Equipment) | 30—Tell-Tale Light |
| 15—Starter Control Switch | 31—Hand Throttle |

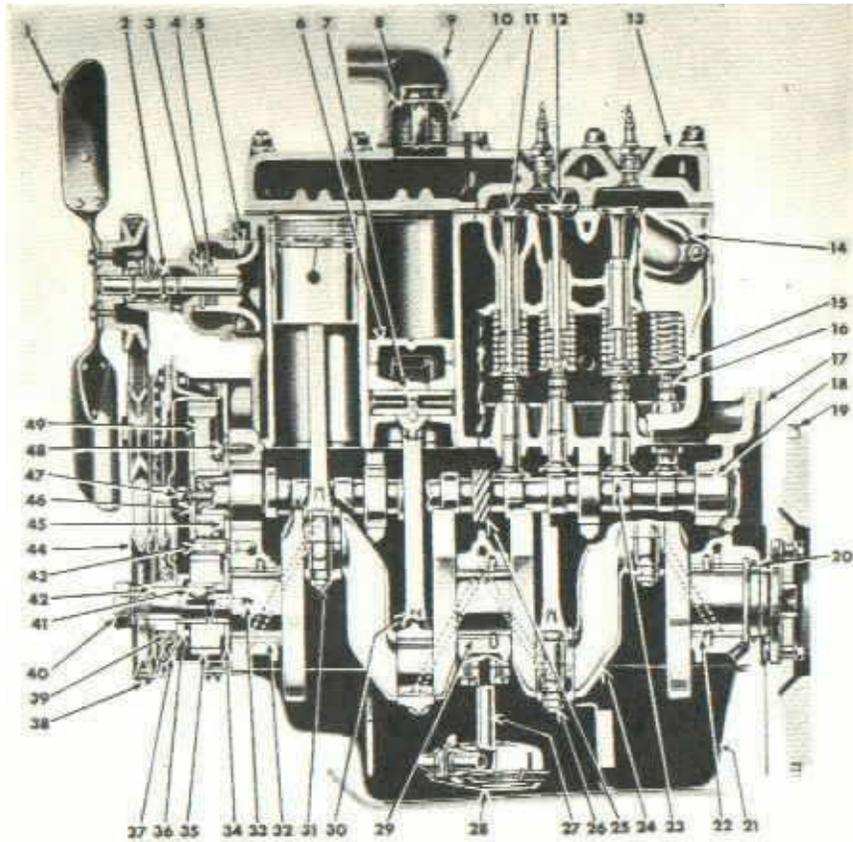


FIG. 2—SIDE SECTIONAL VIEW OF ENGINE.

FIG. 2 SIDE SECTIONAL VIEW OF ENGINE

- | | |
|--|---|
| 1—Fan Assembly | 2—Water Pump Bearing and Shaft Assembly |
| 3—Water Pump Seal Washer | 4—Water Pump Seal Assembly |
| 5—Water Pump Impeller | 6—Piston |
| 7—Wrist Pin | 8—Thermostat Assembly |
| 9—Water Outlet Elbow | 10—Thermostat Retainer |
| 11—Exhaust Valve | 12—Intake Valve |
| 13—Cylinder Head | 14—Exhaust Manifold Assembly |
| 15—Valve Spring | 16—Valve Tappet Self-Locking Adjusting Screw |
| 17—Engine Plate—Rear | 18—Camshaft |
| 19—Flywheel Ring Gear | 20—Crankshaft Packing—Rear End |
| 21—Oil Pan | 22—Crankshaft Bearing Rear Lower |
| 23—Valve Tappet | 24—Crankshaft |
| 25—Oil Pump and Distributor Drive Gear | 26—Connecting Rod Cap Bolt |
| 27—Oil Float Support | 28—Oil Float Assembly |
| 29—Crankshaft Bearing Center—Lower | 30—Connecting Rod Assembly—No. 2 |
| 31—Connecting Rod Bolt Nut | 32—Crankshaft Bearing Front Lower |
| 33—Crankshaft Oil Passages | 34—Crankshaft Thrust Washer |
| 35—Crankshaft Gear | 36—Crankshaft Gear Spacer |
| 37—Timing Gear Cover Assembly | 38—Fan and Governor Drive Belt |
| 39—Crankshaft Oil Seal | 40—Crankshaft Nut |
| 41—Crankshaft Gear Key | 42—Fan and Governor Drive Pulley Key |
| 43—Timing Gear Oil Jet | 44—Fan, Generator and Governor Drive Pulley |
| 45—Camshaft Thrust Plate | 46—Camshaft Gear Retaining Washer |
| 47—Camshaft Gear Retaining Screw | 48—Camshaft Gear Thrust Plate Retaining Screw |
| 49—Camshaft Gear | |

TO START VEHICLE.

Release hand brake, if set. Depress clutch pedal. Move transmission gearshift lever to first speed position—see Fig. 3. (Note that the front axle and transfer case shift levers are not used when the vehicle is driven on the highway in rear wheel drive.) Depress the foot accelerator pedal gradually and at the same time, slowly release the clutch pedal. Allow the vehicle to gain momentum (two or three vehicle lengths), then release the accelerator and depress the clutch pedal at the same moment. Move the shift lever promptly to the second speed position. Depress the foot accelerator pedal gradually and at the same time, slowly release the clutch pedal. Shift to third or “high” speed in the same way at approximately 18 to 20 mph (29-32 Km./h.), releasing the accelerator and depressing clutch pedal before moving the shift lever. The synchronizing mechanism in the transmission makes gear shifting silent and easy. This device adjusts the speeds of the two gears to be engaged and prevents “clashing”.

TO CHANGE TO LOWER SPEED.

Depress the clutch pedal. Move gearshift lever quickly in next lower speed, increase the engine speed slightly, if traveling on level road and release the clutch pedal. It will be found advisable to make this change when the engine is placed under heavy pull, or when dropping down to a very low speed, as when traveling up a steep grade, in sand or in congested traffic. Never attempt to make the change with the vehicle traveling at a high rate of speed.

TO STOP THE VEHICLE.

Release the foot accelerator. Depress the clutch pedal and apply foot brake. When stopped, move gearshift lever into neutral. Set the hand brake and release the clutch and brake pedals.

TO REVERSE VEHICLE.

With vehicle at a standstill, depress the clutch pedal. Shift the gear lever into reverse position, slowly release the clutch pedal and regulate the car speed with the foot accelerator.

TO USE ENGINE AS A BRAKE.

The most effective brake for holding the vehicle back on a steep grade is the engine. To use the engine as a brake, shift into one of the lower speeds before starting to descend. Keep the clutch engaged, the throttle closed and the ignition “ON”. Low gear will hold any vehicle effectively on any hill it can climb.

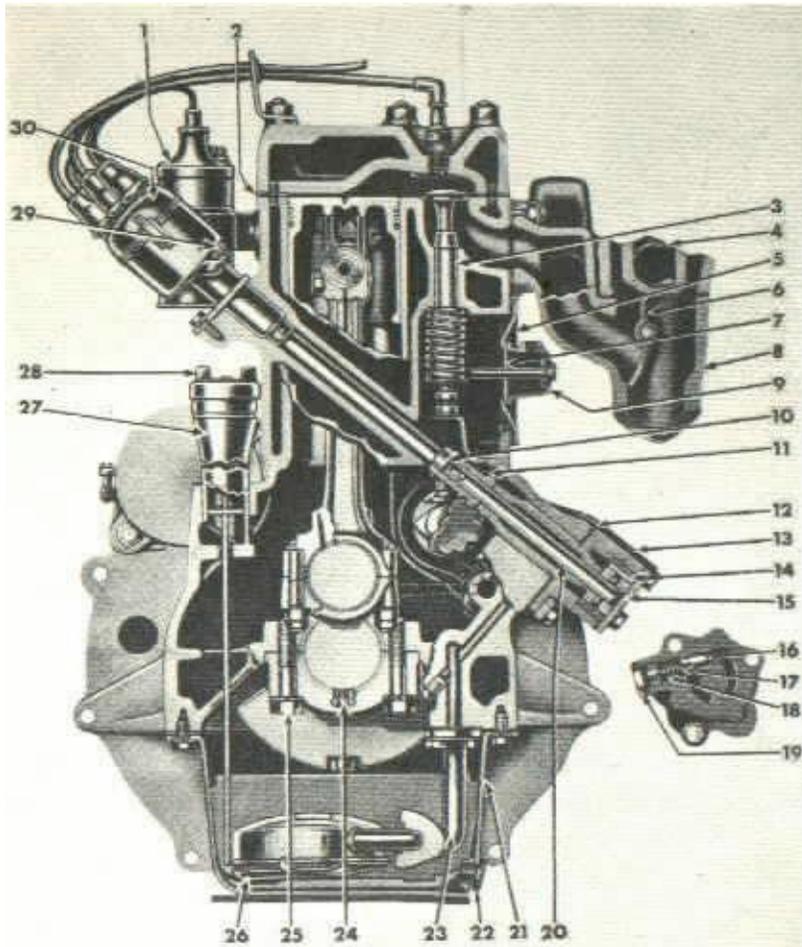


FIG. 4—END SECTIONAL VIEW OF ENGINE

- | | |
|--|---------------------------------------|
| 1—Ignition Coil | 2—Cylinder Head Gasket |
| 3—Exhaust Valve Guide | 4—Intake Manifold Assembly |
| 5—Valve Spring Cover Assembly | 6—Heat Control Valve |
| 7—Crankcase Ventilator Gasket | 8—Exhaust Manifold Assembly |
| 9—Crankcase Ventilator Assembly | 10—Distributor Shaft Friction Spring |
| 11—Oil Pump Driven Gear | 12—Oil Pump Gasket |
| 13—Oil Pump Assembly | 14—Oil Pump Pinion |
| 15—Oil Pump Cover | 16—Oil Pump Relief Valve |
| 17—Oil Pump Relief Plunger Spring | 18—Oil Pump Relief Plunger Shim |
| 19—Oil Pump Relief Plunger Spring Retainer | 20—Oil Pump Shaft |
| 21—Oil Pan Assembly | 22—Oil Pan Drain Plug |
| 23—Oil Float Support | 24—Crankshaft Bearing Dowel |
| 25—Crankshaft Bearing Cap to Crankcase Screw | 26—Oil Float Assembly |
| 27—Oil Filler Tube | 28—Oil Filler Cap and Level Indicator |
| 29—Distributor Oiler | 30—Distributor Assembly |

Never engage the clutch suddenly when the vehicle is coasting with clutch released and the transmission gears in mesh, as damage to the driving mechanism may result.

STARTING VEHICLE ON UPGRADE.

In starting on an upgrade, hold the vehicle with the hand brake, disengage the clutch and shift the transmission into low speed, then accelerate the engine with the foot accelerator in the regular way while simultaneously releasing the hand brake and engaging the clutch.

SHIFTING GEAR IN TRANSFER CASE.

The transfer case is essentially a two speed transmission, which provides a low and a direct gear and also a means of connecting the engine power to the front axle. It is an auxiliary unit attached to the rear of the standard transmission.

Control of the transfer case is through the two shift levers, Fig. 1 No. 16 and No. 17. The left lever, No. 16, is used to connect and disconnect the power to the front axle. The right lever, No. 17 is used to shift the transfer case gears to secure either "High" (direct drive) or a very low gear ratio for heavy pulling requirements.

Instructions for shifting gears in the transfer case and engagement of the front axle drive are as follows: See Fig. 3.

1. To engage front axle drive, depress the clutch pedal, release accelerator and move the left hand shift lever (No. 16) to rear position.
2. With the front axle drive engaged, the right hand lever (No. 17) may be shifted to the rear into "High" (direct) or forward into "Low". The "Neutral" position midway between "High" and "Low" is for use when the power take-off belt drive is used. The vehicle cannot be driven when this lever is in "Neutral".
3. To disengage the front axle drive, depress the clutch pedal, release the accelerator and shift the left lever to the forward position. The transfer case can be operated only in "High" (direct drive) when the front axle drive is disengaged.
4. Shifting from high to low transfer case gear should not be attempted except when the vehicle is practically at a standstill. The front axle drive must be engaged for this shift. Release the accelerator and depress the clutch pedal—move the left hand shift lever to the rear position to engage the front wheel drive, then move the right hand shift lever to forward position (low transfer case gear).
5. Shifting from low to high transfer case gear may be accomplished at any time, regardless of vehicle speed. Release accelerator and depress clutch pedal and shift right hand lever into rear position.

USE OF FOUR WHEEL DRIVE.

The "Universal Jeep" is equipped with four-wheel drive and transfer case to provide additional traction and a lower gear ratio for use on difficult terrain and to provide low speed pulling power for industrial and agricultural use. Four-wheel drive should be used only when greater traction and power are required than that provided by the standard transmission low gear.

Tire maintenance is of utmost importance when using four-wheel drive. Slight difference in the overall diameter of the front and rear wheels will result in hard shifting. This difference may be caused by using a badly worn tire on one wheel and new tires on the others or by operating the vehicle with one or more of the tires underinflated.

Balance tire wear between the front and rear wheels as closely as possible. Keep tires inflated to recommended pressure (Page 51) especially when operating the vehicle with maximum load. Avoid the use of four-wheel drive on hard surfaced highways as it will result in rapid tire wear and hard shifting of the transfer case gears. Should hard shifting occur, disengage the clutch, start engine, shift the transmission into reverse gear, back the vehicle a few feet and disengage the clutch. If transfer case is in low range, shift into high, then disengage front axle drive (left lever forward).

STEERING KNUCKLE OIL SEAL.

When parking during cold, wet weather, swing the front wheels from right to left to wipe away moisture adhering to the front axle universal joint housings and oil seals, Fig. 5. This will prevent freezing with resulting damage to the oil seal felts. When the vehicle is stored for any period, the front axle universal joint housings should be coated with light grease to prevent rusting.

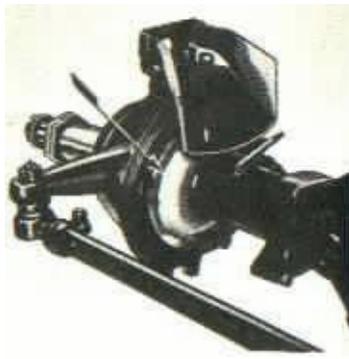


FIG. 5—KNUCKLE OIL SEAL

How to Save Gasoline

1. In cold weather economical starting of the engine is easily obtained by pressing down on the accelerator pedal once or twice, then push down on the clutch pedal and start engine using the choke sparingly. Do not use the choke when starting a warm engine.
2. Do not use the choke excessively while engine is warming up and never leave it out longer than absolutely necessary.
3. Accelerate gently. Tramping on the accelerator pumps more gasoline into the cylinders than can be effectively used.
4. Holding the car in second gear until you get up to high speeds may easily double the gasoline you should use in getting under way. Shift into high gear at about 20 miles per hour (32 Km./h.).
5. Fast driving uses up more gasoline. Travel at moderate speeds if you want gasoline economy.
6. Decelerate to a gradual stop. Sudden stops, like sudden starts, are wasteful of gasoline.
7. Park your car in the shade if possible, hot sun evaporates gasoline.
8. Don't drive your tires with less than the proper air pressure. Under-inflated tires mean more road friction, more work for the engine to do—and therefore more gasoline consumed. See "Tire Pressure" Page 51.
9. Keep the battery charged up in good condition. It helps starting and provides good ignition thereby reducing loss of gasoline.
10. Letting the engine idle for long periods wastes gasoline.
11. Be sure that the carburetor is in proper condition for maximum mileage and power.

12. One faulty or dirty spark plug may waste as much as 10 per cent of your gasoline. Have the spark plugs tested occasionally.
13. Keep your car well lubricated at all times, and be very careful to follow the instructions on "Lubrication".
14. Keep the radiator filled to the proper level, your engine will remain at a more constant temperature. An overheated engine uses more gasoline.
15. Check the operation of the automatic heat control on the exhaust manifold. The purpose of this heater is to warm the mixture of air and gasoline as it leaves the carburetor, in order to give better vaporization. (See Manifold Heat Control, Page 23.)
16. It is a good idea to have a complete engine tune-up every 5,000 miles (8000 Km.), or at least twice a year—in the Fall when preparing for Winter driving and again in the Spring. The Owner Service Policy entitles you to an adjustment and complete inspection without charge at the end of the first 1000 miles (1600 Km.) and again at 2000 miles (3200 Km.).

General Lubrication

The use of high grade lubricants and regular application is specially essential when operating the "Jeep" because of the diversified service it performs. The amount of trouble free service received will be in proportion to the care given. Lubricate the vehicle in accordance with the type of service performed.

The following pages should be referred to for instructions covering grade and quantity of lubricant required for all parts of the vehicle. The mileage instructions should be followed when the vehicle is used for road work. It is impossible to give accurate hourly instructions because of the diversified service and conditions under which the vehicle may be operated. The hours indicated are approximate. To obtain maximum service, good judgment must be used to lubricate the vehicle according to the type of work being done. As an example—when used as a farm tractor under dusty conditions the chassis should be lubricated daily as the new lubricant forces grit and dirt, which has accumulated during the day, from the bearing surfaces. Under these conditions, the air cleaner should also be cleaned and refilled daily or under extreme conditions twice daily.

Because of the importance of correct lubrication, detailed recommendations, unit capacities and specifications are given in the following paragraphs. Also refer to the Lubrication Chart on Page 36.

Lubrication Specifications

	Type		Winter	Summer
Chassis Lubrication		Chassis Grease	No. 0	No. 1
Transmission and Differentials—Front and	Transfer Case	Transmission Gear Oil	SAE 80	SAE 90
Steering Gear	Rear	Hypoid Gear Oil	SAE 90	SAE 90
Wheel Bearings		Steering Gear Lubricant	SAE 140	SAE 140
Universal Joints (Front)	Axle Shaft)	Wheel Bearing Lubricant	No. 2	No. 2
		Universal Joint Lubricant	No. 0	No. 1
Universal Joints	(Propeller Shaft)	or Chassis Grease	No. 0	No. 1
Power Take-Off Housing		Chassis Grease	No. 0	No. 1
Air Cleaner		... Hypoid Gear Oil	SAE 80	SAE 80
Governor		... Engine Oil		Same Grade used in engine
Engine		... Engine Oil		Same Grade used in engine
		... Engine Oil		See Below
Above 90° F	Not Lower than 32° F.	As Low as +10° F.	As Low as -10° F.	
32° C	0° C.	-12° C.	-23° C.	
SAE30	SAE20or30	SAE20W	SAE10W	
For temperatures below -10° F. (-23° C.) use SAE 10 plus 10% kerosene or SAE 5 W.				

Lubrication Capacities

	U. S.	Imperial	Metric
Engine Crankcase—oil filter empty (qts.)	5	4-1/2	4.73 liters
Transmission			
Transfer Case (pts.)	6-1/2	5-1/2	3.7 liters
Differential—Front Axle (pts.)	2-1/2	2	1.18 liters
Differential—Rear Axle (pts.)	2-3/4	2-1/4	1.30 liters
Oil Bath Air Cleaners (pts.)	1-1/4	1	591.40 CC
Brake System Fluid (pts.)	3/4	5/8	354.84 CC
Power Take-Off (pts.)	1	3/4	.473 liters
Pulley Drive Unit (pts)	3/4	5/8	354.84 CC

ENGINE LUBRICATION.

Lubrication of the engine is accomplished by means of a force-feed continuous circulating system. This is effected by means of a rotor type pump, located externally on the left side of the engine, and 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 near the top surface.

An oil pressure gauge is mounted in the instrument panel, which indicates the pressure being supplied to the circulating system. Failure of the gauge to register may indicate absence of oil, leakage or a fault in the lubrication system and the engine should be stopped immediately. If there is plenty of oil in the reservoir the mechanical fault must be corrected before starting the engine. Standard gauge reading is approximately 30 to 35 lbs. (5.355 to 6.247 Kg./cm.) at 30 miles per hour (48 Km./h.) and 5 to 10 (.892 to 1.785 Kg. /cm.) at idle speed.

The quantity of oil in the crankcase is measured by the bayonet type oil level indicator which is combined with the oil filler cap located in the oil filler pipe at the right side of the engine. When the oil level is below the "Full" mark, pour sufficient new oil into the reservoir to bring the level to the "Full" mark.

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. When the vehicle is used on the highway, completely drain the engine oil at 500 miles (800 Km.), and at 1000 miles (1600 Km.), then every 2000 miles (3200 Km.) thereafter, by removing the drain plug in the lower left side of the oil pan. Replace the drain plug and refill with 4 qts. (3.8 liters) (5 qts. [4.7 liters] when the oil filter has been drained) of fresh oil. For heavy industrial or dusty field work, change the oil at the first 10 hours, and each 50 hours thereafter. To secure maximum engine life, watch the condition of the oil closely and should it become contaminated, due to the conditions under which the vehicle is being operated, change it immediately.

Always 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, as some of the foreign matter will remain in the bottom of the oil pan.

At least once a year, preferably in the Spring, remove the oil pan and floating oil intake and wash thoroughly with cleaning solution.

CHASSIS LUBRICATION.

When lubricating the chassis refer to the Lubrication Chart on Page 36.

For highway travel, clean and lubricate points indicated as No. 1 each 1000 miles (1600 Km.). When used in industrial or agricultural work the

period for lubrication depends entirely upon the type of work being done. When doing dusty field work, lubricate these points daily as grit and dirt will work into the bearing surfaces and cause rapid wear unless forced out by new lubricant.

The importance of using a good grade of chassis lubricant can not be exaggerated, for the cost will be more than repaid by longer wear and good service.

OIL FILTER.

The oil filter should be dismantled, cleaned and the filter element replaced at the end of the first 2000 miles (3200 Km.) of highway travel, or 100 hours of industrial or field use. Drain the filter at each oil change to prevent the old oil contained in the filter from mixing with and contaminating the new oil. Replace the element at each 8000 miles (12,800 Km.) of highway travel or 200 hours of industrial or field use.

AIR CLEANER.

Care of the air cleaner is **EXTREMELY IMPORTANT**—especially when the vehicle is used under dusty conditions. Clean and refill the air cleaner reservoir to the level mark, with oil of the same grade used in the engine, at each engine oil change. When the vehicle is used for field work, clean and change oil in the cleaner **DAILY** and under extremely dusty conditions **TWICE DAILY**. When cleaning, use a long screw driver or other suitable tool to dislodge dirt sticking to the bottom and sides of the intake passage in the body of the cleaner.

STEERING GEAR.

Check the level of the lubricant in the steering gear housing every 1000 miles (1600 Km.). Avoid the use of cup grease, graphite, white lead or heavy solidified oil. Remove the plug in the steering gear housing and use a hand gun to fill the housing slowly.

WATER PUMP- CLUTCH.

The water pump bearing and clutch release bearing are prelubricated at assembly and the lubricant lasts for the life of the bearings.

GENERATOR.

Two oilers are provided, one at each end; three to five drops of engine oil is recommended every 1000 miles (1600 Km.). Be sure to slip the commutator end hole cover back in place.

STARTING MOTOR.

The oil hole cover on the commutator (front) end slips to one side; put three to five drops of engine oil in this hole every 1000 miles (1600 Km.). Be sure to slip cover back in place.

IGNITION DISTRIBUTOR

The oiler on the distributor should be lubricated every 1000 miles (1600 Km.) with several drops of engine oil, Fig. 7, No. 6. Also place one drop of light engine oil on the wick, No. 2 located in the top of the shaft, which is accessible by removing the rotor arm and sparingly apply soft grease on the breaker arm cam No. 4, and a drop of oil on breaker arm pivot, No. 3.

SPEEDOMETER AND DRIVE.

Remove the drive shaft from the tube once each year, clean it thoroughly and lubricate with a good quality light graphite grease.

UNIVERSAL JOINTS (PROPELLER SHAFT).

Every 1000 miles (1600 Km.) lubricate propeller shaft universal joints and slip joints with a good quality lubricant. Lubricate daily for field work.

UNIVERSAL JOINTS (FRONT AXLE SHAFT).

The front axle universal joints are inclosed in the steering knuckle housings which are filled with lubricant so require no attention other than checking each 1000 miles (1600 Km.) to be sure the housings are filled to plug level.

Once each year (12,000 miles) (19,200 Km.) the axle shafts and universal joint assemblies should be removed, thoroughly cleaned and the housings filled with new lubricant. When the vehicle is used for dusty field work, clean and repack the housings twice each year.

POWER TAKE-OFF PROPELLER SHAFT UNIVERSAL JOINTS.

For average service the original factory lubrication will last the life of the vehicle. If the power take-off is used often for continuous operation, disassemble and repack once each year.

WHEEL BEARINGS.

Front wheel bearings should be removed, thoroughly cleaned, checked and repacked twice yearly or every 6,000 miles (9600 Km.).

The rear wheel bearings are equipped with hydraulic lubricators. Lubricate them sparingly to guard against surplus oil saturating the brake lining. An oil relief hole at top of housing, Fig. 32, No. 1, indicates when the bearing is filled with oil.

TRANSMISSION AND TRANSFER CASE.

Drilled passages are provided between the transmission and transfer case housings for circulation of the lubricating oil to provide unit lubrication of the two assemblies. Service each assembly individually. Check the oil level each 1000 miles (1600 Km.) or at each lubrication. Drain and refill at each 6000 miles (9600 Km.) or 300 hours of field work.

Note: The requirements of these housings are small for economy, therefore, it is very important that the lubricant be changed every 300 hours when the vehicle is used for dusty field work.

FRONT AND REAR DIFFERENTIALS.

The differential gears require extreme pressure lubricant, which is suitable for hypoid gear type axles. The level of the lubricant in these units should be checked every 1000 miles (1600 Km.). Do not mix different types of hypoid lubricants.

Drain and refill the housings each 6000 miles (9600 Km.) or twice yearly. Use a light engine or flushing oil to clean out the housings.

Note: Do not use water, steam, kerosene, or gasoline for flushing. If the oil is decomposed, dismantling is necessary.

GOVERNOR.

At each lubrication, check the oil level in the governor housing. Use oil of the same grade used in the engine to maintain the lubricant at filler plug level. Drain and refill the housing at each engine oil change.

POWER TAKE-OFF SHAFT AND PULLEY DRIVE HOUSINGS.

Check the lubricant level at each lubrication job, maintaining the lubricant at filler plug level. Should the power take-off be used frequently, change the lubricant each 300 hours.