

## SECTION 2-F

### COOLING AND OILING SYSTEMS SERVICE

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### 2-20 COOLING SYSTEM SERVICES

#### a. Checking and Filling Cooling System

The coolant level should be checked only when the engine is cold and only enough coolant should be added to bring the level halfway between core and tank top.

It is unnecessary and undesirable to remove the radiator cap and check the coolant level each time the car stops at a filling station for gasoline or oil, since the engine is usually hot at such times.

CAUTION: Never remove the radiator cap quickly when engine is HOT. Sudden release of cooling system pressure may cause the coolant to boil and some of it may be ejected from the radiator filler neck, resulting in injury to persons or damage to the car finish.

If it is necessary at any time to remove the radiator cap when engine is hot, rotate the cap counterclockwise until a stop is reached. Leave cap in this position until all pressure in cooling system has been released, then turn cap forcibly past the stop and remove it.

#### b. Draining, Flushing, Conditioning Cooling System

It is advisable to drain and flush

the engine cooling system twice a year. This should be done when the anti-freeze solution is added in the fall and again when it is removed in the spring.

To drain the cooling system, remove radiator cap, open the drain cock in the lower radiator tank and remove drain plugs on both sides of cylinder block. If car is heater equipped, set heater temperature control valve at full heat position.

After the cooling system is drained, plugs reinstalled and cock closed, fill the system with clean water. Run the engine long enough to open the thermostat for complete circulation through the system, then completely drain the cooling system before sediment has a chance to settle.

#### c. Conditioning the Cooling System

"Rust Inhibitor and Stop Leak", listed under Group 8.800 is recommended for use in the cooling system, particularly when preparing for installation of anti-freeze solution. This material stops small seepage leaks, has rust preventive properties and its soluble oil is effective in eliminating a squealing noise which sometimes develops at the water pump seal washer. Instructions for its application are printed on the conditioner bottle.

It is very important to make certain that the cooling system is properly prepared before an anti-freeze solution is installed; otherwise, loss of solution through leakage may occur or seepage may result in damage to the engine. The cooling system should be drained and flushed as described above (subpar. b.), all joints should be checked for leakage and corrected, and the conditioner described above should be added with the anti-freeze solution.

Inspect the water pump, radiator core, heater and defroster cores, drain cocks, water jacket plugs, and edge of cylinder head gaskets for evidence of water leaks. Tighten all hose clamps in the cooling and heating systems and replace any deteriorated hoses.

#### d. Using and Testing Anti-Freeze Solutions

Volatile (alcohol) type anti-freeze solutions up to 50% may be used with the standard 170° radiator thermostat. If a non-volatile (ethylene glycol) type solution is used, the higher limit 180° radiator thermostat may be used to improve car heater performance.

The practice of mixing alcohol type anti-freeze with ethylene glycol type anti-freeze is not recommended. Although anti-freeze protection may be afforded, the level of protection is impossible

to check with a specific gravity type of instrument due to the difference in weight of the two types of anti-freeze.

Every anti-freeze solution may be used in accordance with the instructions and in proportions specified by the anti-freeze manufacturer. The proportions must be selected as specified for the lowest temperature at which protection against freezing will be required.

The following solutions have been found to be unsatisfactory for use in automobile cooling systems: Salt solutions such as calcium or magnesium chloride, sodium silicate, etc.; honey, glucose, sugar solutions, oils or kerosene, untreated glycerine, untreated ethylene glycol.

It is advisable to test the anti-freeze solution at intervals during the winter to make certain that the solution has not been weakened by evaporation or leakage. Use only hydrometers which are calibrated to read both the specific gravity and the temperature, and have a table or other means of converting the freezing point at various temperatures of the solution. Disregarding the temperature of the solution when making the test may cause an error as large as 30°F. Care must be exercised to use the correct float or table for the particular type of anti-freeze being tested.

## 2-21 FAN BELT ADJUSTMENT OR REPLACEMENT

A tight fan belt will cause rapid wear of the generator and water pump bearings. A loose belt will slip and wear excessively and will cause noise, engine overheating, and unsteady generator output. A fan belt which is cracked or frayed, or which is worn so that it bottoms in the pulleys should be replaced.

The fan belt may be replaced by loosening the generator brace at both ends, slightly loosening the generator mounting bolts and moving generator inward to provide maximum slack in the belt. On a car equipped with power steering, it is also necessary to remove the oil pump drive belt after loosening the pump mounting bolts.

The generator must be moved sidewise to adjust the fan belt. After the generator brace and mounting bolts are securely tightened, the fan belt tension should be checked as shown in Figure 2-39.

If the power steering oil pump belt is removed it should be adjusted as shown in Figure 2-39.

If the Air Conditioner compressor belts are removed they should be adjusted as shown in Figure 2-40.

## 2-22 RADIATOR THERMOSTAT INSPECTION AND TEST

A sticking radiator thermostat will prevent the cooling system from functioning properly. If the thermostat sticks in the open position, the engine will warm up very slowly. If the thermostat sticks in the closed position, overheating will result.

The thermostat may be removed for inspection and test by partially draining the cooling system and disconnecting the water outlet and hose from the water manifold, in which the thermostat is located.

If the thermostat valve does not fully close when cold, replace the thermostat. If the valve will fully close when cold, test the thermostat for correct opening temperature by immersing the unit and a thermometer in a container

of water over a heater. While heating the water do not rest either the thermometer or thermostat on bottom of container as this will cause them to be at higher temperature than the water. Agitate the water to insure uniform temperature of water, thermostat and thermometer.

The standard thermostat (170°) valve should start to open at a temperature of 167°F. to 172°F., and should be fully open at a temperature not in excess of 192°F. On the high temperature (180°) thermostat which may be installed to improve car heater performance, the valve should start to open at a temperature of 177°F. to 182°F., and should be fully open at a temperature not in excess of 202°F. If thermostat does not operate at specified temperatures it should be replaced as it cannot be adjusted.

## 2-23 WATER PUMP REPAIRS

The water pump cover is die cast aluminum into which the water pump bearings are shrunk fit. For this reason the cover, shaft bearings and hub are not replaceable separately. The shaft seal and impeller are the only replaceable parts of the water pump.

### a. Removal

1. Drain cooling system being sure to drain into a clean container if anti-freeze solution is to be saved.
2. Loosen belt or belts, then remove fan blade, spacer and pulley or pulleys from hub on water pump shaft. Remove belt or belts.
3. Disconnect hose from water pump inlet and heater hose from nipple. Remove bolts then remove pump assembly and gasket from timing chain cover.

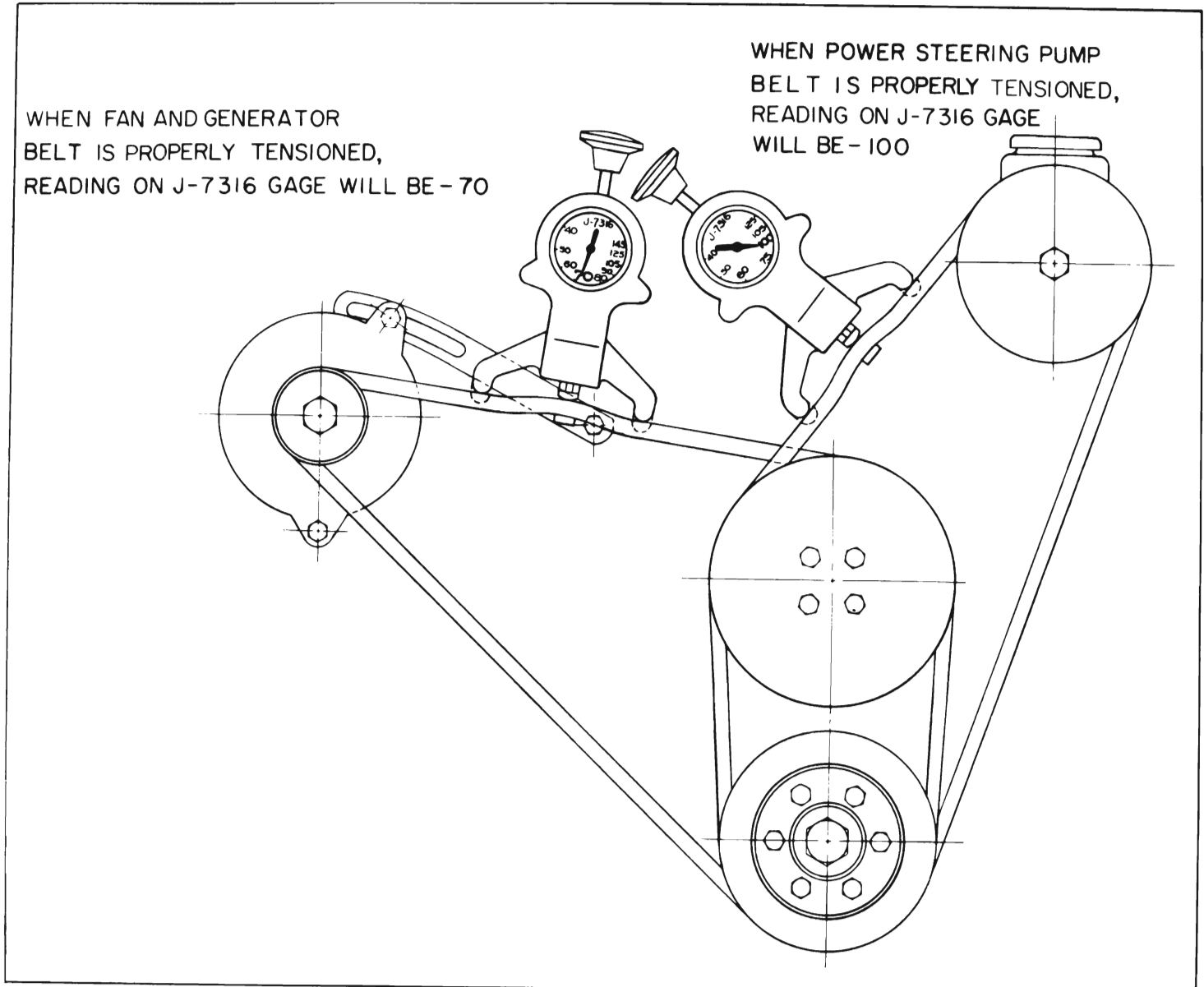


Figure 2-39—Belt Tension Chart - Non Air Conditioned Jobs

4. Check pump shaft bearings for end play or roughness in operation. If bearings are not in serviceable condition, the assembly must be replaced.

#### **b. Disassembly for Seal Replacement**

1. Support impeller and shaft on anvil or in vise to avoid any shock or thrust load on bearing when impeller is cracked. Crack impeller in two or three places with chisel. See Figure 2-41.

2. Remove impeller. Insert a punch through vent hole in pump body and drive out old seal and sleeve.

3. Clean pump cover to remove scale, old gasket, etc. Do not use cleaning solvent as solvent may leak into bearings and destroy the lubricant.

4. Carefully press new seal assembly into cover using thick walled tube of suitable diameter.

5. Coat face of carbon washer

and impeller hub with rust preventive or Seco oil. Press new impeller on shaft until .035" to .040" clearance exists between impeller and pump cover.

**CAUTION:** Avoid any pressing techniques that are likely to impose thrust loads on water pump bearings. Pump must be supported on forward end of shaft only while pressing on impeller. See Figure 2-14.

#### **c. Installation**

1. Make sure the gasket surfaces

WHEN AIR CONDITIONER COMPRESSOR BELTS ARE PROPERLY TENSIONED, READING ON J-7316 GAGE WILL BE 90 (EACH BELT)

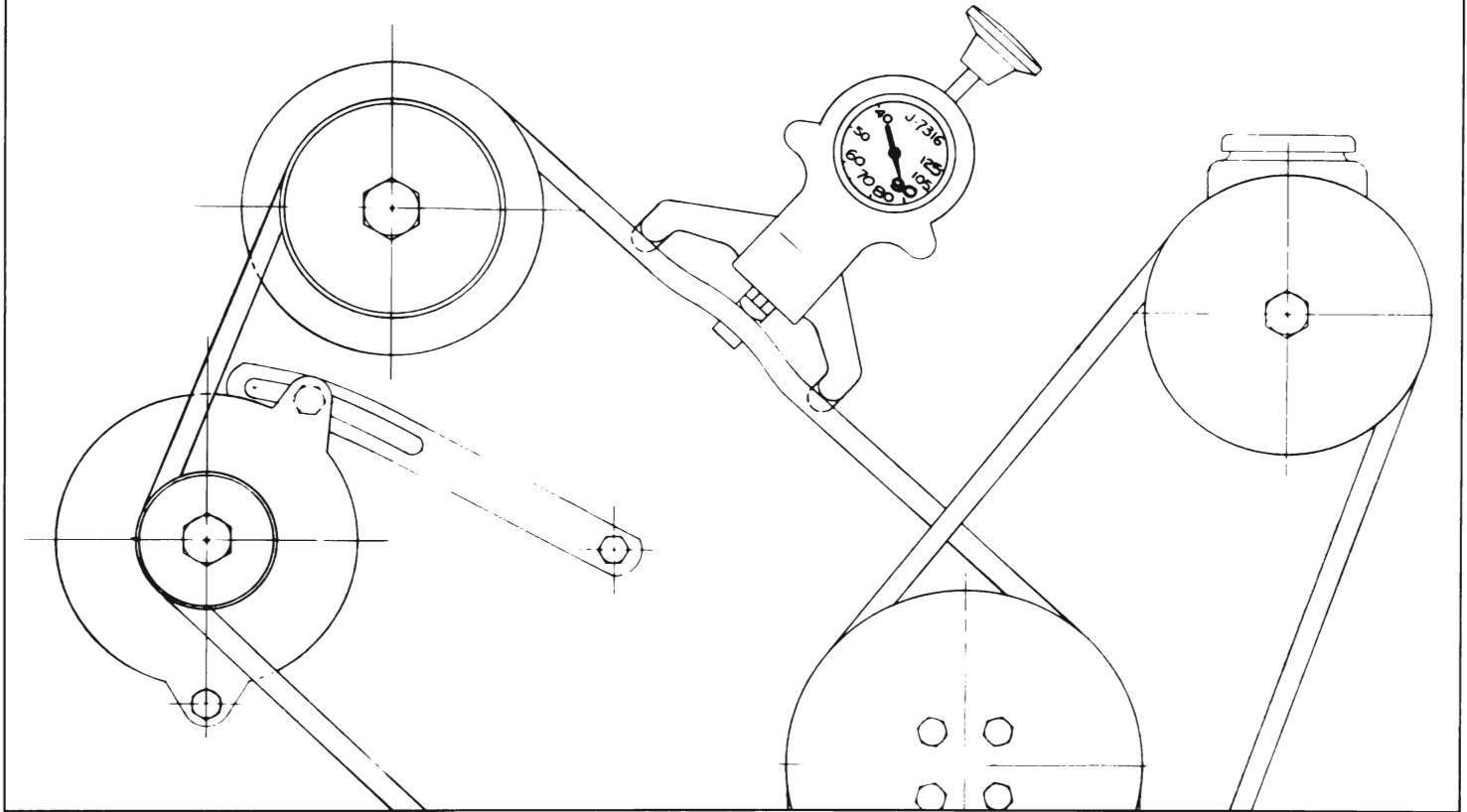


Figure 2-40—Belt Tension Chart Air Conditioned Jobs

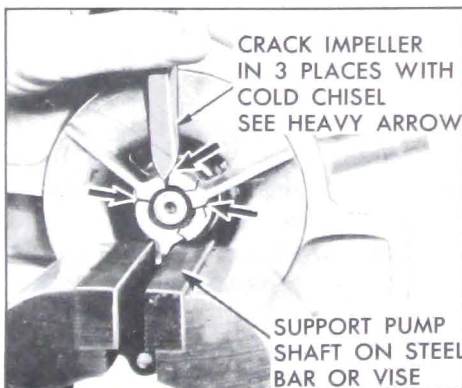


Figure 2-41—Cracking Water Pump Impeller

on pump and timing chain covers are clean. Install pump assembly with new gasket. Bolts with lock washers must be tightened uniformly.

2. Connect radiator hose to pump inlet and heater hose to nipple, then fill cooling system and check for leaks at pump and hose joints.

3. Install fan pulley or pulleys, spacer and fan blade, tighten attaching bolts securely. Install belt or belts and adjust for proper tension. See Figures 2-39 and 2-40.

## 2-24 OIL PUMP REPAIRS

When an oil pump is removed for repairs the following procedure must be used to inspect parts and assemble pump in order to insure adequate oil pressure when the work is completed.

1. Remove Pipe and screen assembly.

2. Remove cover. Slide gears out of body.

3. Wash all parts in solvent and blow dry with air hose.

4. Inspect body, cover gears and shaft for evidence of wear, scoring, etc. Replace any parts not found serviceable.

5. Install gear and shaft and idler gear in pump body.

6. Check for clearance between gears and cover by using a straight edge as shown in Figure 2-43.

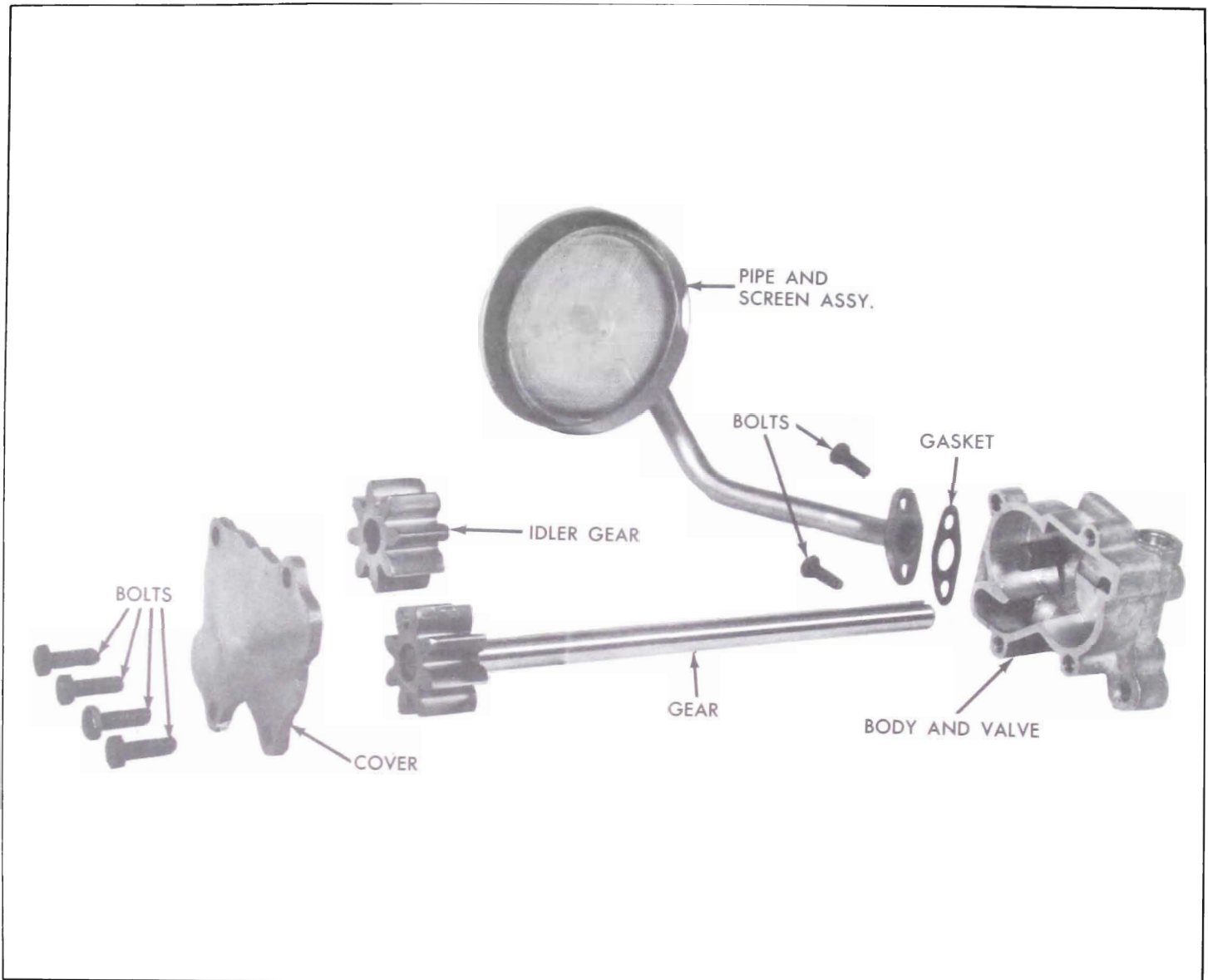


Figure 2-42—Oil Pump Exploded View

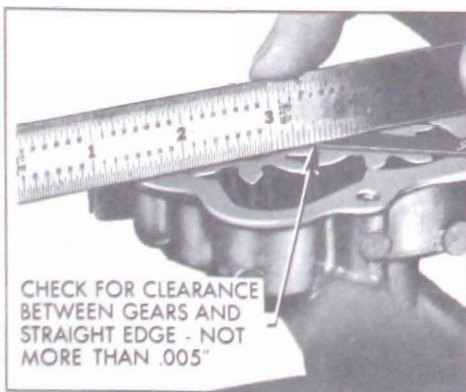


Figure 2-43—Checking Clearance of Gears at Cover

7. Clearance should be not more than .005" or less than .0005".

8. Pack cavity and space between gears and body with petroleum jelly. Do not use chassis lube.

9. Install pump cover (side with groove toward gears).

10. Tighten bolts to 6-8 ft. lbs. torque.

11. Use new gasket and install pipe and screen to body. Tighten bolts to 6-8 ft. lbs. torque.

12. Before installation of pump be sure surface of crankcase is free of dirt or burrs that might tilt the pump and cause a bind.

13. Install oil pump with new gasket. Tighten bolts a little at a time while turning pump shaft through gear lash. If pump shaft tends to bind when bolts are tightened, it may be freed up by rapping body with mallet. Pump shaft must be free of bind when bolts are tightened. Torque bolts to 30 ft. lbs.